Courses

Academic Year 2021-2022
Throughout this document, courses are listed alpha-numerically by their subject and catalog number designation. The numerical designation assigned to each course is unique, and can be used to identify if the course is lower division (100-299), upper division (300-499), or graduate level (500 and above).

How to read a course description:

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Accounting

AC 1 (3, 5...) Accounting Elective
A college level course for which there is no comparable Clarkson course. Used for transfer credit only.
Credits: (2-4), Graded, Semester Calendar
Independent Study, Transfer Credit Only

AC 2 (4, 6...) Accounting Elective
A college level course for which there is no comparable Clarkson course. Used for transfer credit only.
Credits: (2-4), Graded, Semester Calendar
Independent Study, Transfer Credit Only

AC 202 Financial Accounting
In this course students will gain the fundamental knowledge of analyzing, recording, classifying, and summarizing accounting information into financial statements. These financial statements are important both inside and outside of the reporting entity, as they aid business managers, creditors, and investors in making many types of business decisions. This course will allow students to become proficient in preparing financial statements in accordance with Generally Accepted Accounting Principles by developing their ability to identify and interpret financial transactions, classify and record business transactions in a financial accounting system, and complete the accounting cycle.
Credits: (3), Graded, Semester Calendar
Lecture, Spring Terms

AC 203 Managerial Accounting
The purpose of this course is to provide future managers with an introduction to and an appreciation of the vast array of tools and techniques that comprise managerial accounting. Managerial accounting information is used widely in an organization, from pricing products to allocating company resources. This course develops your understanding of procedures, methods, and information gathering techniques that managers and other business professionals use to analyze financial data in order to make managerial decisions and budget/forecast results of operations. Prerequisite: AC202
Credits: (3), Graded, Semester Calendar
Lecture, Fall Terms

AC 205 Introduction to Financial and Managerial Accounting
(Cross-listed with EM 205) An introductory survey of accounting information to guide and improve decision making. Many course topics involve cost planning and control techniques used to evaluate and improve the financial performance of organizations and/or products.
Credits: (3), Graded, Semester Calendar
Lecture, Every Semester

AC 305 Cost Accounting
Cost accounting information is used for both internal and external reporting purposes and plays a vital role within an organization as a basis for making sound business decisions. This course is an extension of Managerial Accounting with its primary objective to develop an in-depth understanding of cost accounting tools and techniques at an advanced cost accounting level. More specifically, students will learn fundamental cost analysis principles, generalizations and theories and gain in-depth factual knowledge of various product costing management systems (terminology, classifications, methods & trends), and learn various cost allocation methods. Overall, students are introduced to various methods to assist in decision-making, both operational and strategic within the organization developing their skills, competencies, and points of view needed by accounting professionals. Prerequisites: AC203 or EM205 or AC205
Credits: (3), Graded, Semester Calendar
Lecture, Spring Terms

AC 311 Intermediate Financial Accounting I
First course in a two-course sequence in financial reporting at the professional level. Seeks to develop student's' understanding of the environment in which financial reporting choices are made and how they impact financial statement information. The course integrates the perspectives of accounting, corporate finance, and economics to help understand how business transactions get reported and their decision implications. Examines the principles and practices of external financial reporting, with particular emphasis on balance sheet valuation and income determination. Reviews basic accounting concepts and the essentials of the accounting process. Covers the measurement and disclosure problems associated with such topics as cash, receivables, inventories, long-lived assets, and intangibles. Prerequisites: AC203
Credits: (3), Graded, Semester Calendar
Lecture, Spring Terms

AC 312 Intermediate Financial Accounting II
Continues the two-course sequence begun in AC 311 by exploring additional coverage of generally accepted accounting principles such as current liabilities, long-term debt, stockholders' equity, earnings per share, accounting for income taxes, accounting changes, and the Statement of Cash Flows. Pro forma 'as if' disclosures, earnings, and financial statements are introduced as well as present value techniques to accounting valuations. Prerequisites: AC 311
Credits: (3), Graded, Semester Calendar
Lecture, Fall Semesters

AC 407 Taxation of Business Entities
Emphasis is placed on federal income tax responsibilities of individual taxpayers and small businesses. Topics covered include tax planning, compliance, sales taxes, and payroll taxes. Prerequisites: Must have junior or senior standing.
Credits: (3), Graded, Semester Calendar
Lecture, Fall Semesters

AC 421 Accounting Information Systems
The course covers the design and installation of accounting systems that provide relevant and reliable information. Special emphasis is given to potential risks of errors or irregularities and the need for systems control. Projects may include analysis, design and implementation of an accounting system. Prerequisites: AC305 or AC203.
Credits: (3), Graded, Semester Calendar
Lecture, Spring Terms
AC 431 Advanced Accounting: Investment and Ownership Interests
This course examines the theory and practice of accounting for business combinations, consolidated financial statements, partnerships, foreign currency transactions, and foreign inter-company investments. Additional topics may also be covered. Current issues in these areas will also be discussed. Prerequisites: AC311 Credits: (3), Graded, Semester Calendar Lecture, Given When Needed

AC 436 Auditing
A study of the independent auditor’s examination of his or her clients’ recording of events, periodic adjustments and formal statements. Topics will include the auditor’s opinion, sampling as used in auditing, auditing and the computer. Prerequisites: AC311, senior standing and at least a C average in all previous accounting courses taken at Clarkson. Credits: (3), Graded, Semester Calendar Lecture, Spring Terms

AC 487 Special Project in Accounting
An investigation of a problem or in-depth topic undertaken by the student under the guidance of a faculty member. Prerequisites: junior standing, grade of at least C in all Clarkson accounting courses, and consent of the instructor. Credits: (1-3), Graded, Semester Calendar Research, Given When Needed

AC 490 Internship in Accounting
An unpaid internship that is related to the student’s professional goals. Credits: (1-3), Graded, Semester Calendar Independent Study, Given When Needed

Aeronautical Engineering

AE 1 (3, 5…) Mechanical and Aeronautical Engineering Elective
A college level course for which there is no comparable Clarkson course. Used for transfer credit only. Credits: (2-4), Graded, Semester Calendar Independent Study, Transfer Credit Only

AE 2 (4, 6…) Mechanical and Aeronautical Engineering Elective
A college level course for which there is no comparable Clarkson course. Used for transfer credit only. This course may be used as a Professional Elective. Credits: (2-4), Graded, Semester Calendar Independent Study, Transfer Credit Only

AE 201 Intro to Experimental Methods in Mechanical & Aeronautical Engineering
This course provides an introduction to experimental methods including the structure of experiments, measurement error types, statics, frequency distributions, error propagation, plot types, introductory design of experiments and use of computer for data processing. Experiments are used to demonstrate principles of material science, statics, strength of materials, rigid body dynamics and electrical science. Experiments are documented using written memoranda and worksheets. Prerequisites: ES220, ES222, ES223 Credits: (1), Graded, Semester Calendar Lecture, Spring Terms Comm Points: 2

AE 212 Introduction to Engineering Design
This course lays the foundation for the design curriculum of the MAE Department. Students are introduced to how to solve complex, open-ended engineering problems. Core topics covered are: the design process; engineering ethics and professional responsibilities; design for safety; mathematical and computer modeling; and written, oral and graphical communication. These topics are presented within the framework of at least two open-ended design projects which students must propose and accomplish through the completion of the preliminary design phase including a design report and presentation slides for each project. Prerequisite: ES100. Corequisite: ES220. Credits: (3), Graded, Semester Calendar Lecture, Spring Terms

AE 301 Experimental Methods in Mechanical and Aeronautical Engineering
[Cross-listed with ME 301] This course covers experimental methods including sampling statistics, uncertainty analysis, error propagation, variable transformations, multi-variable regression, design of experiments and use of computers for data acquisition and processing. Experiments demonstrate principles from fluid mechanics, thermodynamics and introductory vibrations. Experiments are documented using written memoranda. Corequisites: ES330 and ES340 (or CH271) Credits: (1), Graded, Semester Calendar Lecture, Fall Semesters Comm Points: 2

AE 342 Introduction to Numerical Methods with Application
The goal of this course is to introduce the techniques needed for the numerical solution of ordinary and partial differential equations. These techniques will include the formulation of physical problems for numerical simulations, discretization and solution methods, and use of commercial software for solving engineering problems governed by differential equations. Specific topics covered are numerical differentiation, integration, interpolation, and associated errors, the solution of systems of non-linear algebraic equations, and the solution of initial and boundary value problems using finite difference and finite element methods. Prerequisites: ES 100, MA 232 Corequisites: ES 222, MA 231 Credits: (3), Graded, Semester Calendar Lecture, Laboratory, Every Term

AE 350 Aircraft Structural Analysis
[Cross-listed with ME 350] Properties of wing sections. Beam-column moments; torsion of thin-walled and skin-stringer multiple-cell sections; non-symmetrical bending of skin-stringer wing sections; flexural shear in open and closed thin-walled and skin-stringer sections; loads and stresses in rib system; cut-outs and shear lag; modified beam theory for wing design; deflection by energy method; fundamentals of static aeroelasticity. Prerequisites: ES 222 and ES223 Credits: (3), Graded, Semester Calendar Lecture, Fall Terms
AE 365  Independent Projects I

[Cross-listed with ME 365] An opportunity for the student to become involved singly, or with a group, working on a special project under the guidance of a faculty member. Topics are often suggested by the faculty but suggestions from the students are encouraged. By permission of adviser only.
Credits: (3), Graded, Semester Calendar
Independent Study, Every Term

AE 366  Independent Projects II

[Cross-listed with ME 366] Continuation of AE 365.
Credits: (3), Graded, Semester Calendar
Independent Study, Every Term

AE 401  Advanced Experimental Methods in Mechanical and Aeronautical Engineering

[Cross-listed with ME 401] This course covers advanced experimental methods including Fourier analysis filtering, computer data acquisition. Experiments demonstrate principles of heat transfer, fluid mechanics, gas dynamics and aerodynamics. Experiments are documented using written memoranda and worksheets. Prerequisites: AE/ME201 or AE/ME301 Corequisites: AE425 or AE455 Credits: (1), Graded, Semester Calendar
Lecture, Spring Semesters

AE 425  Aerodynamics

Topics covered include: Wing aerodynamics, thin airfoil theory, source panel methods, and supersonic and subsonic finite wing theories. Boundary layer theory and flow separation will also be discussed. Prerequisites: ES330, ES340 and MA231
Credits: (3), Graded, Semester Calendar
Lecture, Spring Terms

AE 427  Design of Propulsion Systems

[Cross-listed with ME 427] The course covers the preliminary design of various propulsion devices of historical and modern significance including propellers, ramjets, turbojets and its variations and rockets and its variations and supersonic nozzles. These systems will be designed in the context of aircraft, watercraft and land vehicle applications. Detailed design on components such as turbine blades, diffusers, compressor stages, combustors, fans and two-dimensional supersonic nozzle shapes will be addressed. Many lessons will include examination of actual component hardware. Instruction on design methodology is combined with fluid and thermodynamic analysis techniques to form computational schemes for testing design variations. Design decisions will be based on matching application performances, optimizing, meeting application constraints and iterative selection. A series of engineering homework assignments and design projects will be used to learn about each system. Most work will be individual with one or two projects requiring teamwork. Methods and results will be documented with engineering memoranda. Prerequisites: ME326 or ME431 or AE431, and ES340.
Credits: (3), Graded, Semester Calendar
Lecture, Spring Terms
Comm Points: 2

AE 429  Aircraft Performance and Flight Mechanics

Credits: (3), Graded, Semester Calendar
Lecture, Spring Semesters

AE 430  Stability and Control of Aerospace Vehicles

Credits: (3), Graded, Semester Calendar
Lecture, Fall Terms

AE 431  Gas Dynamics

The fundamental theories of modern compressible flow and their applications to aerodynamics are introduced. Topics include steady and unsteady supersonic flows, transonic flows, high-temperature gas dynamics, numerical methods and nozzle design. Prerequisites: ES330, ES340 and MA 232 or equivalent.
Credits: (3), Graded, Semester Calendar
Lecture, Fall Terms

AE 443  Optimal Engineering

[Cross-listed with ME 443] An introduction to the optimal design of mechanical systems. This course involves the application of mathematical optimization techniques, including linear and nonlinear methods, to the design of devices and systems of interest to mechanical engineers. Emphasis is placed on the formulation of problems which can be solved by these techniques. Use is made of currently available optimal design computer programs. Prerequisites: AE/ME350 or ME341.
Credits: (3), Graded, Semester Calendar
Lecture, Fall Terms

AE 450  Aircraft Design I

An introduction to basic methodology and decisions surrounding aircraft design leading to the conceptual and preliminary design of an aircraft. Topics include preliminary sizing, requirements and constraints, mission definition, layout, stability and performance estimation, structural issues, economics, trade studies, and ethical implications of the design and decision process. Prerequisites: AE212, AE425, AE429, AE458
Corequisites: AE430, AE431
Credits: (3), Graded, Semester Calendar
Research, Fall Terms
(TECH), Comm Points: 1
### Undergraduate Level Courses

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<th>Prerequisites</th>
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<tr>
<td>AE 451</td>
<td>Aircraft Design II</td>
<td>Continuation of concepts introduced in Aircraft Design I on the basic methodology and decisions surrounding aircraft design with a focus on the specific design of an aircraft in the context of a company type of environment. The course is supplemented by lectures on various topics including conceptual design issues, detailed system considerations, trade studies, propulsion integration, structural issues, CFD methods, testing considerations, cost, and manufacturing. Prerequisites: AE450. Corequisites: AE427. Credits: (3), Graded, Semester Calendar. Lectures, Laboratory, Spring Terms, (TECH)</td>
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<tr>
<td>AE 455</td>
<td>Mechanical Vibrations and Control</td>
<td>[Cross-listed with ME 455] Fundamentals, free vibration, harmonically excited vibration, transient vibration, multi-degree freedom systems, vibration measurements, introduction to control theory, linear feedback control, vibration control, adaptive and optimal control, numerical methods. Prerequisites: ES223. Credits: (3), Graded, Semester Calendar. Lecture, Fall Terms.</td>
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<tr>
<td>AE 458</td>
<td>Design of Aircraft Structures</td>
<td>Properties of fuselage sections; modified beam theory for fuselage design; linear elastic plate theory and analyses; linear elastic shell theory and analyses; numerical techniques for complex structures; failure modes of plates and shells; introduction to composite materials; design techniques for plates and shells. Prerequisites: AE350. Credits: (3), Graded, Semester Calendar. Lecture, Spring Terms.</td>
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<tr>
<td>AE 460</td>
<td>Introduction to Spacecraft Engineering</td>
<td>One-semester elective course offered to Juniors and Seniors in the ME or AE programs. Introduces the major engineering subsystems and disciplines required to design and operate a space satellite e.g. configuration and structure, electrical power subsystem, attitude control subsystem etc. Also basic orbital mechanics, launch vehicles, space environment including ionizing radiation and Sun-Earth-spacecraft geometries, ground operations; overall mission and spacecraft system engineering. Prerequisites: ME212 or AE212. Credits: (3), Graded, Semester Calendar. Lecture, Fall Terms.</td>
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<tr>
<td>AE 465</td>
<td>Advanced Independent Projects I</td>
<td>[Cross-listed with ME 465] An opportunity for the advanced student to undertake an independent investigation in a mechanical engineering field of his or her own choice. Assistance will be given only when the student requests it. The project may be a comprehensive literature investigation, involve laboratory experiments, or involve analytical work by permission of adviser only. Credits: (3), Graded, Semester Calendar. Independent Study, Spring Terms.</td>
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<tr>
<td>AE 466</td>
<td>Aircraft Accidents: Causes and Consequences</td>
<td>This course explores key accidents in aerospace history from technical, professional, and organizational perspectives. Students will complete hands-on analyses that apply content from the aeronautical engineering program. Topics include aviation regulations, professional ethics, human factors, and systems considerations. Prerequisites: AE458, AE425, AE429, AE430, AE450, AE427. Credits: (3), Graded, Semester Calendar. Lecture, Spring Terms.</td>
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<tr>
<td>AE 470</td>
<td>Orbital Mechanics</td>
<td>[Cross-Listed ME570] This course provides an overview of the fundamentals of orbital mechanics. Beginning from kinematics and rigid body dynamics, students are introduced to topics in orbital and attitude dynamics and control. In orbital dynamics and control, core topics covered include: the two-body problem, orbital motion, Kepler’s Laws, orbital elements, orbital perturbations, orbital maneuvers, interplanetary trajectories, and the restricted three-body problem. In attitude dynamics and control, core topics covered include: attitude stabilization, torques on a spacecraft, torque-free motion, spin and dual-spin stabilization, gravity-gradient stabilization, and active attitude control. Credits: (3), Graded, Semester Calendar. Lecture, Spring Terms.</td>
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#### American Studies

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<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
<th>Terms</th>
<th>Notes</th>
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<tbody>
<tr>
<td>AMST 1 (3, 5…)</td>
<td>American Studies Elective</td>
<td>A college level course for which there is no comparable Clarkson course. Used for transfer credit only.</td>
<td>(2-4), Graded, Semester Calendar. Independent Study. Transfer Credit Only.</td>
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#### Anthropology

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<th>Course Code</th>
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<th>Notes</th>
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<tbody>
<tr>
<td>ANTH 1 (3, 5…)</td>
<td>Anthropology Elective</td>
<td>A college level course for which there is no comparable Clarkson course. Used for transfer credit only.</td>
<td>(2-4), Graded, Semester Calendar. Independent Study. Transfer Credit Only.</td>
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<tr>
<td>ANTH 2 (4, 6…)</td>
<td>Anthropology Elective</td>
<td>A college level course for which there is no comparable Clarkson course. Used for transfer credit only.</td>
<td>(2-4), Graded, Semester Calendar. Independent Study. Transfer Credit Only.</td>
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ANTH 201 Introduction to Cultural Anthropology

Using case studies examining a number of different cultures, the course gives students the opportunity to explore the similarities and differences of cultures around the world by showing them the varieties of ways in which humans organize their lives and understand their worlds. The course also introduces students to the concepts and methods that anthropologists use to describe and understand those similarities and differences, providing them with the tools to better understand the complexity and the diversity of the human condition. The course gives students an introduction to the basic theoretical concepts and methods used in social analysis and it provides them the opportunity to see the use of those tools in a variety of specific, ethnographic cases drawn from a range of societies and cultures.

Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed
UNIV/CGI/CSO

ANTH 220 Understanding the Americas

When does America begin? With Columbus, with the arrival of the Mayflower, or with the arrival of hunters coming from Asia through the Bering Strait? The Americas are continents with a complex history before European arrival, and a complex history since then, in which commonalities and experiences between the peoples of the Americas are often overlooked. In contrast to the European Union, countries in the Americas are enforcing their borders to stem the huge population flows from desperate regions into more prosperous regions. In this course, we will be looking at the origins and experiences that tie the peoples of the Americas together as well as tear them apart. We will be reading an eclectic mix of fiction and nonfiction.

Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed
UNIV/CSO/STS
Comm Points: 1

ANTH 225 Global Perspectives on Sexuality

Sexuality is often thought of as one of the most private aspects of life. Yet, it is also the subject of politics, commerce and public imagination at the state and global level. Exploring such topics as Human Trafficking, HIV/AIDS, Cybersex, and the emergence of new sexualities, this course examines sexuality in a global context.

Credits: (3), Graded, Semester Calendar
Lecture, Even Spring Semesters
UNIV/CGI/STS

ANTH 230 Introduction to Race and Ethnicity

[Formerly LC315/Cross-Listed with SOC230] Variations in phenotype-skin color-have always existed, but has 'race'? What are the bases of racial identity in the contemporary United States? How have they changed? How are 'race' and 'ethnicity' related? In this course we will address broader questions about race by focusing on contemporary racial and ethnic divisions and by examining the history of these concepts in the Western Hemisphere.

Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed
UNIV/CGI/IG
Comm Points: 1

ANTH 235 Europe Through Film and Fiction

This introductory Anthropology course introduces students to the diversity of European cultures through film and fiction, and through various themes, including love across cultures, post Cold War transitions, the expansion of the European Union, the growing integration between European states, cultural conflicts, and the rise of anti-immigrant movements and politics in wide swaths of Europe.

Credits: (3), Graded, Semester Calendar Lecture,
CSO
Comm Points: 1

ANTH 238 Men and Masculinities

[Formerly LC393] Over the last few decades, manhood has come under attack. Instead of warrior heroes like John Wayne and James Bond, TV shows today feature a good number of losers like Homer Simpson and Frazier and numerous men’s movements have emerged centered on such issues as ‘male bonding’ and atonement. At the same time, other aspects of popular culture bombard us with an image of men as muscle-packed, mean, lean fighting machines or as exploitative pimps. While the average size of men’s muscles seemed to have increased dramatically, what has happened to men’s sense of self, how they see each other, and how they see women? Is this all the result of feminists attacking men as being domineering, oppressive chauvinists? Or is this a period of sorely needed male self-reflection? In this discussion-based course we take a critical look at the role of manhood in our society and elsewhere, by looking at how it is represented in popular culture, and lived in such institutions as sports, schools and college, military, prisons, marriage, politics or work, and within the social dimensions of race and class. This will help us to develop a better understanding of what it means to be considered ‘a man.’

Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed
CSO

ANTH 240 The Diversity of the U.S. in Ethnographic Perspective

The United States is often referred to as a ‘melting pot’ of cultures. This metaphor is said to represent the ways in which people of diverse racial and ethnic backgrounds make up the American nation. As components of diversity in the U.S., race and ethnicity are understood in varied ways. Racial and ethnic conflict, clashes, disparities, and inequalities sometimes manifest themselves across professions, housing, access to opportunities, and livelihoods in general. But a closer look can unveil the remarkably creative ways in which different groups of people establish meaningful connections to bridge differences, allowing productive syntheses to emerge in social, cultural, political, religious, and economic realms. This course offers a window into some of these clashes and collaborations through engaging readings and audiovisual materials putting U.S. diversity into context. Anthropologists and other social scientists usually call such a window an ethnographic one. In other words, the course will help you put diversity into perspective by bringing you in touch with miscellaneous on-the-ground experiences of new immigrant groups in the U.S. hailing from Bosnia, Albania, Liberia, Congo, and Iraq; as well as with those of more established groups such as African Americans, Arab Americans, and Hispanic Americans.

Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed
UNIV/CGI/CSO
What is the status of racial equality today, four decades after the civil rights struggle? Have we ceased to judge people 'by the color of their skin,' have we achieved a society where all members share 'equal opportunities' to succeed? Has the 'appreciation of cultural diversity' in America abolished notions of white superiority and practices of white privilege? Or have we returned, albeit in a more invisible form, to the hypocrisy of the 1896 Apartheid doctrine of 'separate but equal'? Or, is racism permanent and racial inequality a critical element in the fabric of American society? This course attempts to arrive at an understanding of how systems of racial inequality are maintained in a seemingly democratic system that allegedly upholds the civil rights of all its citizens. We will first assess the extent of racial inequality in the contemporary US and then review current theories that explain the persistence of inequality. Facing the paradox of explaining the social reality of race while asserting its biological non-existence, we will then launch a deeper investigation into the origins and meanings of the construction of race. We will explore how race and 'race science' evolved in the 17th and 18th century in the context of colonialism and slavery and functioned to justify domination.

Credits: (3), Graded, Semester Calendar
Lecture, Spring Terms
UNIV/CGI/IG, Comm Points: 1

ANTH 325 Sex and Commerce
This course, designed for upper division students who have been taking courses on sexuality and/or gender, examines in depth the commercial aspects of sex. From looking at the concept of marriage as an economic transaction, to the ways in which sex is sold or is used as a vehicle to sell, this course provides an in depth discussion of the question of pornography, sex-trafficking, and prostitution. It raises fundamental questions about sexuality, love, and gender.

Credits: (3), Graded, Semester Calendar
Lecture,
UNIV/CGI/IG, Comm Points: 1

ANTH 332 Cities and Social Justice
[Formerly LP310] Understanding Cities: New York, Los Angeles, Berlin. For many Americans, cities have become synonymous with violence, poverty and decay, homelessness and racial tension, as well as excessive consumerism. But they are also places of intense cultural activities. In any case, cities are where most jobs are concentrated and where most of us will eventually live. Understanding how cities work and the problems they face is therefore critical for all of us. Using a comparative and international perspective, this course explores such issues as cities' management of natural and vital resources (f.ex. water or electricity), the built environment and its relationship to social identities and social engineering, global networks of cities in terms of labor markets, capital, and commodities, and their effects on urban lives, cities as sustainable environments, and last but not least, the cities as sites of social and racial injustice. Students are to conduct team-based research projects that tackle real-life problems in one of the three cities or Potsdam (which will serve as our immediate proxy for understanding some urban functions). Research results will be made available to the public as websites. Fieldtrips to places such as New York or Montreal, as well as to civic functions in Potsdam will be part of the course. There is also the possibility that a trip to Berlin will be offered during spring break, for which students will have the opportunity to receive two credit points if they complete additional research. Given the multi-disciplinary nature of this course, it is of interest not only to humanities and social sciences majors, but also to those interested in civil and environmental engineering, business, and management.

Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed

ANTH 255 Culture and the Environment
[Cross-listed with ANTH555] As our world faces ever-more urgent challenges related to climate change and environmental instability, the very categories of "nature," "environment," and "climate" deserve critical and innovative thought. Central to this rethinking is a consideration of the cultural, political, and economic aspects of these terms, thereby creating space for careful critiques and alternative engagements. Anthropologists have long been active in examining cultural beliefs and practices related to environments. Today, these perspectives are changing to reflect a better understanding of human relationships with non-human actors and processes. This class provides an introduction to Environmental Anthropology, with particular attention to the power and politics of knowledge production about environments and climates. It begins with a historical look at the sub-discipline, followed by a discussion of more recent theoretical and methodological approaches to rethinking how we study and engage with the environment.

Credits: (3), Graded, Semester Calendar
Lecture, Fall and Spring Terms
UNIV/CGI/CSO

ANTH 285 Food and Society or What to Think About What You Eat
[Formerly SOC 285] [Formerly LC 397, ANTH 385] Food is central to how we understand ourselves and our world. This class examines the cultural politics of food, exploring the social, political, and economic implications of global food production and consumption. We will examine the nature and history of contemporary food networks and the impacts of these patterns on our society, economy, health, and environment. In so doing, we will use food as a lens through which to understand larger relationships and processes, from social inequality to climate change.

Credits: (3), Graded, Semester Calendar
Lecture, Fall Terms
UNIV/CGI/STS

ANTH 311 Ethnography
[Cross-listed with ANTH511] Ethnographic methods, the key research methodology of cultural anthropologists, are now used in a wide variety of disciplines, such as education, to health, environment, business, to name just a few. An exploration of anthropological research and writing through the analytical and practical study of "fieldwork" and "ethnography", this course examines a variety of anthropological research methods and genres of representation, and teaches students how to conduct an ethnographic fieldwork project of their own. This course is in large part a workshop in which students will learn and mobilize various ethnographic methods and techniques, identify a research project and conduct ethnographic fieldwork. The culminating experience of the course is the writing of a 10-15 pages mini ethnography, based on the fieldnotes that students are writing.

Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed
IG, Comm Points: 1

ANTH 320 Racial Inequality in the United States
[Formerly LC356] What is the status of racial equality today, four decades after the civil rights struggle? Have we ceased to judge people 'by the color of their skin,' have we achieved a society where all members share 'equal opportunities' to succeed? Has the 'appreciation of cultural diversity' in America abolished notions of white superiority and practices of white privilege? Or have we
ANTH 360 The Ethics of Eating
Walking through the grocery store, we’re confronted by a range of ethical claims—from Fair Trade to Cage-Free, food companies ask us to demonstrate who we are and what we value. In this class, students learn about how eating is positioned as an (un)ethical act. Focusing on the methods and approaches of cultural anthropology, students explore food and eating in a variety of cultural contexts, with particular attention to the inequalities embedded in food systems. The course culminates with a research paper in which students themselves detail their own understanding of what it means to eat ethically.
Credits: (3), Graded, Semester Calendar
Lecture, Every Other Spring Term

ANTH 499 Minor Portfolio
In this course, students complete their Liberal Arts Minor Portfolios under the direction of their minor advisor. The course is graded on a Pass-No Credit Basis.
Credits: (0), P/NC, Semester Calendar
Independent Study,

Visual and Performing Arts

ARTS 1 (3, 5…)
A college level course for which there is no comparable Clarkson course. Used for transfer credit only.
Credits: (2-4), Graded, Semester Calendar
Lecture, Transfer Credit Only

ARTS 2 (4, 6…)
A college level course for which there is no comparable Clarkson course. Used for transfer credit only. This course may be used to satisfy a Knowledge Area requirement.
Credits: (2-4), Graded, Semester Calendar
Lecture, Transfer Credit Only

ARTS 100 Introduction to Art
Credit for this course is awarded only in the following cases: 1) receipt of a 4 or 5 on the AP Art History Exam, 2) receipt of a score of 5 through 7 on the International Baccalaureate Visual Arts Higher-Level Examination, or 3) satisfactory completion of a college-level introductory art appreciation or art history course.
Credits: (3), Graded, Semester Calendar
Independent Study, Transfer Credit Only
IA

ARTS 101 Introduction to Music Theory
Credit for this course is awarded only in the following cases: 1) receipt of a 4 or 5 on the AP Music Theory Exam or 2) satisfactory completion of a college-level introductory music theory course.
Credits: (3), Graded, Semester Calendar
Independent Study, Transfer Credit Only
IA

Aerospace Studies

AS 1 (3, 5…)
Air Force Elective
A college level course for which there is no comparable Clarkson course.
Credits: (1-9), Graded, Semester Calendar
Lecture, Transfer Credit Only

AS 2 (4, 6…)
A college level course for which there is no comparable Clarkson course.
Credits: (1-9), Graded, Semester Calendar
Lecture, Transfer Credit Only

AS 101 Air Force Heritage and Values I
This is a survey course focusing on the organizational structure and missions of Air Force organizations, military customs and courtesies, officeriship and core values, and an introduction to written and oral communication skills. AFROTC cadets must take AS 103 Leadership Laboratory in conjunction with this course.
Credits: (1), Graded, Semester Calendar
Lecture, Fall Terms

AS 102 Air Force Heritage and Values II
This is a continuation of the overview of the organizational structure and missions of Air Force organizations, military customs and courtesies, officeriship, and core values, and an introduction to written and oral communication skills. AFROTC cadets must take AS 104 Leadership Laboratory in conjunction with this course.
Credits: (1), Graded, Semester Calendar
Lecture, Spring Terms

AS 103 Leadership Laboratory
Leadership Laboratory is the application of personal leadership skills, demonstration of command, effective communication, individual leadership instruction, physical fitness training, and knowledge of US Air Force customs and courtesies. Corequisites: AS101
Credits: (0), P/NC, Semester Calendar
Laboratory, Fall Semesters

AS 104 Leadership Laboratory
Leadership Laboratory is the application of personal leadership skills, demonstration of command, effective communication, individual leadership instruction, physical fitness training, and knowledge of US Air Force customs and courtesies. Corequisites: AS102
Credits: (0), P/NC, Semester Calendar
Laboratory, Spring Semesters

AS 201 Team and Leadership Fundamentals I
Team and Leadership Fundamentals is a survey course designed to provide a fundamental understanding of both leadership and team building. Communication skills are emphasized throughout the course. AFROTC cadets must take AS 203 Leadership Laboratory in conjunction with this course.
Credits: (1), Graded, Semester Calendar
Lecture, Fall Terms
AS 202 Team and Leadership Fundamentals II
This is a continuation of the AS 201 survey course designed to provide a fundamental understanding of both leadership and team building. Communication skills are emphasized throughout the course. AFROTC cadets must take AS 204 Leadership Laboratory in conjunction with this course. Prerequisites: AS201 or consent of the instructor.
Credits: (0), Graded, Semester Calendar
Lecture, Spring Terms

AS 203 Leadership Laboratory
Leadership Laboratory is the application of personal leadership skills, demonstration of command, effective communication, individual leadership instruction, physical fitness training, and knowledge of US Air Force customs and courtesies. Corequisites: AS201
Credits: (0), P/NC, Semester Calendar
Laboratory, Fall Semesters

AS 204 Leadership Laboratory
Leadership Laboratory is the application of personal leadership skills, demonstration of command, effective communication, individual leadership instruction, physical fitness training, and knowledge of US Air Force customs and courtesies. Corequisites: AS202
Credits: (0), P/NC, Semester Calendar
Laboratory, Spring Semesters

AS 301 Leading People and Effective Communication I
This course is a study of leadership and quality management fundamentals, professional knowledge, leadership ethics, and communication skills required of an Air Force junior officer. Case studies are used to examine Air Force leadership and management situations as a means of demonstrating and exercising practical application of the concepts. AFROTC cadets must take AS 301 Leadership Laboratory in conjunction with this course. Prerequisites: AS202 or consent of the instructor.
Credits: (3), Graded, Semester Calendar
Lecture, Fall Terms

AS 302 Leading People and Effective Communication II
This is a continuation of the study of leadership and quality management fundamentals, professional knowledge, leadership ethics, and communication skills. AFROTC cadets must take AS 304 Leadership Laboratory in conjunction with this course. Prerequisites: AS301 or consent of the instructor.
Credits: (3), Graded, Semester Calendar
Lecture, Spring Terms

AS 303 Leadership Laboratory
Leadership Laboratory is the application of personal leadership skills, demonstration of command, effective communication, individual leadership instruction, physical fitness training, and knowledge of US Air Force customs and courtesies. This course provides advanced leadership experiences in officership activities, giving students the opportunity to apply leadership and management principles learned in AS 301. Corequisites: AS301
Credits: (0), P/NC, Semester Calendar
Laboratory, Fall Semesters

AS 304 Leadership Laboratory
Leadership Laboratory is the application of personal leadership skills, demonstration of command, effective communication, individual leadership instruction, physical fitness training, and knowledge of US Air Force customs and courtesies. This course provides advanced leadership experiences in officership activities, giving students the opportunity to apply leadership and management principles learned in AS 301 and AS 302. Corequisites: AS302
Credits: (0), P/NC, Semester Calendar
Laboratory, Spring Semesters

AS 401 National Security, Leadership Responsibilities, and Commissioning Preparation I
This course covers the Armed Forces as an integral element of contemporary society with specific emphasis on the military profession, civil-military interaction, and the formulation, organization, and implementation of US national security policy. In addition, students study leadership and management, ethical decision making, and communication skills. AFROTC cadets must take AS 403 Leadership Laboratory in conjunction with this course. Prerequisites: AS302 or consent of the instructor.
Credits: (3), Graded, Semester Calendar
Lecture, Fall Terms

AS 402 National Security, Leadership Responsibilities, and Commissioning Preparation II
This is a continuation of the study of the military profession, civil-military interaction, and US national security policy. Midway through the course, the focus shifts to orient junior officers toward their first duty assignment in the Air Force. AFROTC cadets must take AS 404 Leadership Laboratory in conjunction with this course. Prerequisites: AS401 or consent of the instructor.
Credits: (3), Graded, Semester Calendar
Lecture, Spring Terms

AS 403 Leadership Laboratory
Leadership Laboratory is the application of personal leadership skills, demonstration of command, effective communication, individual leadership instruction, physical fitness training, and knowledge of US Air Force customs and courtesies. This course provides advanced leadership experiences in officership activities, giving students the opportunity to apply leadership and management principles learned throughout their AFROTC experience. Corequisites: AS401
Credits: (0), P/NC, Semester Calendar
Laboratory, Fall Semesters

AS 404 Leadership Laboratory
Leadership Laboratory is the application of personal leadership skills, demonstration of command, effective communication, individual leadership instruction, physical fitness training, and knowledge of US Air Force customs and courtesies. This course provides advanced leadership experiences in officership activities, giving students the opportunity to apply leadership and management principles learned throughout their AFROTC experience. Corequisites: AS402
Credits: (0), P/NC, Semester Calendar
Laboratory, Spring Semesters

Beacon Institute
BEA 113 Gender, Bias, and Business in the Equestrian Industry
Despite being ostensibly the sport with the greatest gender equality—men and women compete equally at all levels—the $112-billion equestrian industry of the twenty-first century struggles to address issues of economics, business, and gender. In this course students will explore the influences on and of diversity, equity, and
inclusion in a sport in which, at the younger and lower levels, >90% of equestrians are women, while the sport’s leadership, champions, and Olympians are predominately (>70%) men. Using the interdisciplinary tools of economics, psychology, and gender studies, students in this course will learn how the status quo evolved and can be navigated through cultural norms, customs, and niche market biases. Issues of power and justice as they apply to the coach/riding experience and patterns of abuse within the industry will also be explored.

Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed

BIE 114 English Riding: History, Culture, and Industry Evolution, 1950 to Present

In this course, students gain understanding and knowledge about the nature of cultures and societies and their influence on organizations and norms. Specifically, this course applies a historical and political lens to the sport of English Riding. As the only sport where professional men and women compete equally in every class, English riding carries a futuristic mentality on many issues while also clinging to customs and traditions of the past. From changes in equine physiology over time, globalization and increased importation/exportation, changes in show regulations, structures, and governance, and increased socio-economic influences, the course explores the factors that have influenced this insular, yet globe-spanning industry and the communities engaged in the sport itself. Students will encounter the history of English riding and the cultural and political systems that shaped its culture through readings and video interactions with professionals in the field.

Credits: (3), Graded, Semester Calendar
Lecture,

BEA 115 Grit, Toughness, and Contemporary Equestrian Coaching

The equestrian sport industry is changing rapidly due to shifts in social policy, parental involvement, expense, regulation, and mental skills. As a result, successfully coaching and teaching riders means running an equestrian business. Students will discover the philosophy and individual-group behaviors that result from and education challenges facing young riders and how to critically and creatively substantiate which methodologies serve riders best. Given the historic nature of the sport and its traditions, studying the impacts of regulation on horse shows and points systems, micromarkets, and consumer behaviors will provide context for rider growth. Data and texts from sources in both the equine industry and the broader athletic community will support our study of long-standing and contemporary issues in modernizing education in the equestrian industry.

Credits: (3), Graded, Semester Calendar
Lecture,

Bioethics

BIE 400 Responsible Conduct of Research

This course is designed to provide students with an introduction to the ethics of scientific research, including research involving human participants and animal subjects. The course will start with a discussion of responsible conduct of research (also known as research integrity and commonly referred to by the acronym RCR). As close to ninety percent of the work that research ethicists do focuses on the education, promotion and adjudication of RCR issues, these issues are applicable to all aspects of the research endeavor and all fields of scientific study. Understanding these issues and being able to apply the basic principles to critically analyze cases is thus an essential starting point for anyone interested in research and research ethics.

The course will also delve briefly into some of the basic ethical, legal, and social issues surrounding research using animal subjects or human volunteers.

Credits: (3), Graded, Semester Calendar
Lecture, Spring Terms

BIE 410 Biomedical Ethics

This online course covers seminal developments and areas of inquiry within biomedical ethics, starting with a look at the history of medicine and ethics followed by a tracing of the foundational arguments related to areas of inquiry central to biomedical ethics. This course will be taught simultaneously with the Master’s level course of the same name (BIE 510: Biomedical Ethics), with undergraduate students receiving additional training in critical thinking and moral reasoning. Requirement: Approval of Bioethics Department Chair or Instructor.

Credits: (3), Graded, Semester Calendar
Lecture, Fall Terms

Biomedical & Rehabilitation Engineering

BR 200 Introduction to Biomedical & Rehabilitation Engineering, Science and Technology

Introductory course focused on biomedical and rehabilitation engineering, science and technology (BEST). With remarkable progress in medical technology for saving lives and improving quality of life, this course will focus on advances in biomedical engineering and its application to rehabilitation technology. Using ten most significant technological innovations, a quantitative focus will consider fundamental scientific bases and engineering concepts for devices and technologies as well as the societal context of which these innovations arose. We will explore various factors that impact the technological solution including culture, medical ethics, regulatory issues, economics and marketing. Students will focus on one specific problem, apply design principles and develop a solution while considering the factors which impact the design.

Credits: (3), Graded, Semester Calendar
Lecture, Every Semester
STS, Comm Points: 2

BR 400 Biomedical Engineering Fundamentals

[Cross-listed with BY 440, ES 402, EE400] This interdisciplinary course will introduce students to basic principles of biomedical rehabilitation engineering. The course will present principles of disability and the diverse roles of engineering in medicine and rehabilitation. Students will use engineering methods to study anatomical and physiological systems including applications in rehabilitation engineering, bioinstrumentation, biosignal and image processing, biomechanics, and biomaterials. Prerequisites: MA131/132, PH131/132, junior or senior standing.

Credits: (3), Graded, Semester Calendar
Lecture, Spring Terms

BR 450 BEST Capstone Design I

Biomedical Engineering, Science, and Technology (BEST) senior capstone design course. Students will be divided into multi-disciplinary teams charged with investigating a BEST-related open ended project. Students focus on one aspect of design/production/marketing appropriate for their background and be conversant on other area of the project, including design, human
interface, regulatory, ethics, marketing and economics. Includes written reports and oral presentations.
Credits: (3), Graded, Semester Calendar
Project Team, Fall Semesters

Biology

BY 1 (3, 5...) Biology Elective
A college level course for which there is no comparable Clarkson course. Used for transfer credit only.
Credits: (2-4), Graded, Semester Calendar
Independent Study, Transfer Credit Only

BY 2 (4, 6...) Biology Elective
A college level course for which there is no comparable Clarkson course. Used for transfer credit only. This course may be used to satisfy a Science Foundation Curriculum Requirement.
Credits: (2-4), Graded, Semester Calendar
Independent Study, Transfer Credit Only

BY 100 Biology Elective with Laboratory Experience
Credit for this course is awarded only on the basis of an incoming student's performance on the Biology Advanced Placement (AP) exam or in the International Baccalaureate (IB) Biology course. See the AP/IB policy for specifics. Biology, Biomolecular Science, and Environmental Science (EHS and ES&P) majors may not use credit for BY100 as one of their required Biology Electives.
Credits: (4), Graded, Semester Calendar
Lecture, Transfer Credit Only

BY 110 Biology and Society
Definition of science, the scientific method, overview and scope of modern biology, introduction to biomolecules and cell structure, Mendelian inheritance and genetics, human physiology, evolution, and ecology. Course topics are presented from the perspective of current issues in biotechnology, medicine, and human impact on the biosphere. This course is intended for students who are not majoring in the biological sciences and may not be taken by students with credit for BY100 or BY140. Restriction: Students may not enroll in this course if they have credit for BY140 or BY160.
Credits: (3), Graded, Semester Calendar
Lecture, Every Term

BY 112 Laboratory for Biology and Society
Companion laboratory course to BY110 introducing students to the scientific method of laboratory and field experimentation used by contemporary biologists. Corequisite: BY110.
Credits: (1), Graded, Semester Calendar
Laboratory, Every Semester

BY 115 Introduction to Environmental Sustainability
This course will provide students with a basic understanding of environmental science and sustainability concepts. Students will gain an understanding of the impacts that humans have on atmosphere, lithosphere, and hydrosphere. The course will also focus on sustainability concepts that are particularly relevant to business practices and engineering. Specific case studies will also be used to increase understanding of how businesses are tailoring their practices to meet sustainability goals. The course will be lecture based, and active learning exercises will be implemented to enhance understanding of sustainability concepts. Students will be evaluated through homeworks, examinations, and a group project. Restriction: Students may not enroll in this course if they have credit for BY140 or BY160.
Credits: (3), Graded, Semester Calendar
Lecture, Spring Terms

BY 120 Introduction to Biotechnology Sciences and their Applications
Students in today's competitive market often need to possess multifaceted knowledge and skills. The interdisciplinary structure of BY120 encourages collaborations across schools and fields. The syllabus is designed to meet the needs and spark the interest of non-biology majors in biotechnology. By creating a stimulating, lecture-based, solid foundation in basic molecular biology and providing insight into the innovative discipline of biotechnology, students will be inspired and encouraged to apply their own academic backgrounds in a creative manner to drive innovations and applications in this field forward and to investigate possible employment niches for themselves. Aside from covering the fundamentals, the lectures will venture into bioinformatics, DNA amplification and sequencing technologies, genetic engineering and gene expression systems, large scale production, molecular diagnostics, personalized medicine, commercial products, gene therapy, stem cells, transgenic animals and plants, synthetic biology, patenting, as well as societal and ethical impacts. Extra credit opportunities will be offered for students who would like to deepen their knowledge on specific topics.
Credits: (3), Graded, Semester Calendar
Lecture, Spring Semesters

BY 130 Contemporary Issues in Environmental Science
This course examines how human activity impacts the environment. Topics include air and water pollution, environmental systems management, industrial ecology and environmental policy with emphasis on the multidimensional aspects of currently environmental issues. Case studies of chemical exposures, life cycle assessments, and integrated resources management will be used to discuss the process of environmental decision making.
Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed

BY 140 Biology I - Inheritance, Evolution, and Diversity
Introduction to the scientific method, mitotic and meiotic cell division, genetic inheritance, evolution of species, phylogenetics, systematics, paleobiology, survey of the tree of life, population biology, ecology and behavior.
Credits: (3), Graded, Semester Calendar
Lecture,Discussion, Fall Semesters

BY 142 Biology I Laboratory
Companion laboratory course to BY140 providing practical exposure to the scientific method of hypothesis testing, presentation and statistical analysis of biological data, writing scientific reports and papers in the context of field and laboratory experimentation related to BY140. Corequisite: BY140.
Credits: (2), Graded, Semester Calendar
Laboratory, Fall Semesters
Comm Points: 1

BY 160 Biology II - Cellular and Molecular Biology
Introduction to biomolecules, organelles, and cytoarchitecture of cells, energy metabolism and photosynthesis, DNA replication, transcription of RNA, protein synthesis, gene regulation, development and differentiation with a view towards biotechnology.

Credits: (3), Graded, Semester Calendar
Lecture, Discussion, Spring Semesters

BY 162 Biology II Laboratory
Companion laboratory course to BY160 providing a hands-on experience to put your knowledge to the test. Here you will be introduced to the scientific method and you will be describing, analyzing, and reporting your results the way a scientist would in a real laboratory setting. Experiments include chemical properties of the molecules of life, enzymatic analyses, microscopy and microdissections, photosynthesis and respiration, mitosis and meiosis, Drosophila genetics, molecular biology of nucleic acids and bacteriology. You will be presenting your results orally and in writing.
Credits: (2), Graded, Semester Calendar
Laboratory, Spring Semesters
Comm Points: 1

BY 214 Genetics
The overall goal of this course is to provide a comprehensive introduction to the science of genetics. Classical principles of Mendelian genetics will be covered, however, the emphasis will be placed on fundamentals of molecular genetics and recent advances. Major topics include gene structure and function, genetic recombination, genetic engineering, genomics, gene and chromosome mutations, regulation of gene transcription, cell cycle and cancer genetics, developmental genetics, and an introduction to population genetics. Prerequisites: BY160 or consent of the instructor
Credits: (3), Graded, Semester Calendar
Lecture, Every Semester
STS

BY 218 Cell Biology
This course examines the fundamental principles of eukaryotic cell biology at the molecular level, with an emphasis on roles in human homeostasis and disease. Topics will include: structure and function of the plasma membrane, transmembrane transport, protein trafficking, the cytoskeleton, signal transduction pathways, cellular energetics, and the control of cell division and cellular proliferation. Students will be introduced to the process of experimental cell biology, methods, and data analysis in relation to societal issues. Prerequisite: BY160 or Instructor consent
Credits: (3), Graded, Semester Calendar
Lecture,

BY 220 Intro to Evolution
An introduction to evolutionary biology, in particular how scientists observe evolution, what drives it, and what we can learn from it. We will begin with a brief evolutionary history of life on earth - from the first microbes, to multicellular life, to the transition from water to land, dinosaurs, and the emergence of humans - exploring and interpreting the various types of evidence that support this history. We will focus on the basic processes that drive evolutionary change - mutation, natural selection, and genetic drift, as well as some additional complexities such as the evolutionary consequences of sex and ecological interactions, highlighting interesting and unique examples of biodiversity from across the tree of life, as well as applied examples from healthcare and environmental science. Note that BY 214 is not a prerequisite for this course. Prerequisite: BY140
Credits: (3), Graded, Semester Calendar
Lecture,

BY 222 Ecology
Ecology is the study of factors that control the distribution and abundance of species in nature. Ecological interactions will be explored at the individual through ecosystem level in terrestrial, freshwater, and marine habitats. Emphasis will be on fundamental ecology, but applications to human-related problems will be explored. Prerequisite: BY140 or Corequisite: BY140
Credits: (3), Graded, Semester Calendar
Lecture, Fall Semesters
Comm Points: 1

BY 224 Ecology Laboratory
Field and laboratory exploration of physical, chemical, and biological factors influencing animal and plant species, populations, and communities in upstate New York. Students will learn field and laboratory techniques in ecology and general identification of some organismal groups. Course will include required field trips to surrounding habitats and laboratory experiments. Corequisites: BY222
Credits: (2), Graded, Semester Calendar
Laboratory, Fall Semesters
Comm Points: 1

BY 226 Plant Biotechnology
This course will provide knowledge and understanding of molecular biology in plants, focusing on biotechnological tools for crop improvement. Despite wide application of “omics” tools in applied plant research, a one-gene-at-a-time approach is still required for understanding the mechanisms of how gene expression is regulated and how gene products function. This course covers the basic principles and application of gene expression measurements, mechanisms of regulating gene expression, recombinant DNA technology and genetic transformation and their application to crop improvement, and genome editing with RNAi and CRISPR. This course will provide an opportunity for students to develop critical thinking on biotechnological tools for plant improvement by understanding experimental techniques and how they can be applied to revealing mechanisms that regulate gene expression. Prerequisite: BY 220
Credits: (3), Graded, Semester Calendar
Lecture, Spring Terms

BY 280 Environmental Science
This course will investigate the key concepts and principles of environmental science, emphasizing human impacts to the earth. The themes will include, energy flows through nature, and biogeochemical systems and how they have been perturbed by human activities. Technology and population growth have enabled humans to increase both the rate and scale of their impact on the environment. Quantitative analysis or air, soil, and water quality on local, regional, and global scales will be a significant component of the course. Emerging principles in environment science, including sustainability, industrial ecology, risk assessment, and the precautionary principle will be introduced. The course will prepare students to qualitatively and quantitatively analyze fluid and contaminant flow in varied biological and geologic systems.
Prerequisites: Sophomore standing, CM131/CM132 or CM103/CM104, or consent of the instructor. 
Credits: (3), Graded, Semester Calendar 
Lecture, 

BY 300 Recent Advances in Biological Research 
The objective of this course is to present recent advances in biological and biomolecular research, and to describe opportunities for graduate study and undergraduate summer research. Students will receive one credit for attending biology seminars (6 per semester), reading a journal article prior to each presentation, writing short review of each seminar, and participating in discussions. This course can be taken for credit more than once. Prerequisites: BY140 and BY160 
Credits: (1), Graded, Semester Calendar 
Lecture, Every Semester 
Comm Points: 1 

BY 302 Plant Science of Northern New York 
Upon completion of the course, the student will be aware of the classification of plants, recognize and appreciate the life cycles of the main plant phyla, plant physiology, plant metabolism, understand the relationships among plant tissue and organ structures and function, and the plant community structure along environmental gradients in a temperate zone such as the region in northern New York. Prerequisites: BY140 and BY160 
Credits: (3), Graded, Semester Calendar 
Lecture, Every Semester 
Comm Points: 1 

BY 304 Introductory Zoology 
In this course, we will conduct a diversity survey of animal life with emphasis on invertebrates. Course content will primarily consist of comparing the major animal phyla emphasizing integration of form, function, ecology, and phylogeny. Prerequisites: BY140/142 and BY160/162, or consent of the instructor 
Credits: (3), Graded, Semester Calendar 
Lecture, Given When Needed 

BY 309 Introduction to Environmental and Occupational Health 
[Cross-listed with EHS309] Study of the recognition, evaluation and control of chemical, biological, radiological, physical and ergonomic hazards found in the work environment and surrounding community. Key aspects of the course will include hazard assessment, basic anatomy and physiology associated with routes of entry and toxicology of hazardous agents, environmental, health and safety regulations, exposure monitoring instrumentation, and effective controls to minimize the risk of illness or injury. Prerequisites: CM132 or CM104/106 
Credits: (3), Graded, Semester Calendar 
Lecture, Spring Terms 

BY 310 Adirondack Ecology and Environmental Science 
[Cross-listed with EV 312] This course introduces ecological and environmental science concepts relevant for understanding the structure and function of terrestrial, aquatic, and human systems in the Adirondack Park. Students will learn to identify important plant and animal species representative of the Adirondack Mountains, and learn major features of ecological systems in the Park. The course will also provide the students an assessment of human impacts on the ecology of the Adirondack Park. 

Enrollment is limited to those students participating in the Adirondack Semester Program. 
Credits: (3), Graded, Semester Calendar 
Lecture/Laboratory, Given When Needed 
(TECH) 

BY 313 Biogeochemical Earth Systems Science 
[Cross-listed with CE 313, EV 313] This course will investigate the key concepts and principles of environmental science emphasizing the earth's biogeochemical cycles and how they have been perturbed by human activities. Quantitative analysis or air, soil and water quality on local, regional and global scales will be a significant component of the course. Emerging principles in environmental science, including sustainability, industrial ecology, risk assessment and the precautionary principle will be introduced. In addition to the quantitative aspects, the course will consider the historical, social, and political contexts in which the practice of environmental science takes place. Prerequisites: CM132 (or CM104), or consent of the instructor 
Credits: (3), Graded, Semester Calendar 
Lecture, Spring Semesters 
(TECH) 

BY 314 Bioinformatics 
[Cross-listed with CM 314] This course and companion lab provides students with an introduction to the theory and methods of DNA and protein sequence analysis. Students receive experience retrieving information from sequence and genome databases. Methods of sequence alignments include dynamic programming and statistical methods of molecular evolutionary change are outlined. Emphasis is also placed on calculating the statistical significance of results. Protein structural alignments and displays, and structural prediction are covered. Gene prediction algorithms, methods of phylogenetic analysis and database similarity searching are explained. The course introduces students to the analysis of genomes for protein families and domains and to the analysis of gene expression patterns. Prerequisites: BY160 and BY214. 
Credits: (4), Graded, Semester Calendar 
Lecture, Laboratory, Even Fall Semesters 
(TECH) 

BY 319 Current Readings in Animal Behavior 
[Cross-listed with PY 319] The field of animal behavior is a rapidly advancing one, especially at the interface of neurobiology and cognition, and the interface of cognition and functional analysis of behavior (behavioral ecology and sociobiology). This one credit hour course is designed as a 'journal club' with a focus on the latest developments in theory and empirical research on animal behavior. The course is intended for any student who has a sincere interest in integrative animal behavior. Prerequisites: BY222 or PY151 
Credits: (1), Graded, Semester Calendar 
Lecture, Fall Semesters 

BY 320 Microbiology 
This course will provide a fundamental introduction to the study of microbial life forms. The diverse biology of these organisms will be reviewed and application to human health and society, the natural environment, and biotechnology will be emphasized. Upon completion of the course, students will be capable of assessing microbial growth and metabolism and understand its applications in
natural and engineered environments. Prerequisites: BY160, BY214 and CM132 or CM104 or consent of the instructor.
Credits: (3), Graded, Semester Calendar
Lecture, Spring Semesters

BY 322 Microbiology Laboratory
Laboratory exercises will stress the classical techniques for handling bacteria and demonstrate concepts presented in the lecture series: both clinical and environmental aspects of applied microbiology will be explored. Upon completion of the course, students will be capable of safely manipulating microbes in a laboratory setting, as well as become competent in techniques used to observe and culture microbes. Prerequisites: BY162, CM132 or CM104 or consent of the instructor.
Credits: (2), Graded, Semester Calendar
Laboratory, Spring Semesters
Comm Points: 2

BY 324 Parasitology
The natural history, ecology and molecular biology of parasites are explored with an emphasis on life cycles, host/parasite interactions and evolution of parasitism. Basic principles of epidemiology, transmission, diagnosis, treatment and prevention are examined in parasites of medical, veterinary, and economic importance. Lectures will be supplemented by demonstrations of fixed materials and by exercises in identification and diagnoses. Prerequisite: BY 140 and BY 160
Credits: (3), Graded, Semester Calendar
Lecture, Even Fall Semesters

BY 328 Conservation Biology
BY428 provides an overview of the core theory of conservation biology, and how conservation biology is applied for environmental conservation and management. Major topics of this course will include conservation prioritization, the problems of small population size on the long-term persistence of a species, conservation genetics, habitat fragmentation and nature reserve design, invasive species, consequences of extinctions on an ecosystem processes and community structure, and the possible effects on biodiversity of global climate change. A course emphasis will be on the challenge of translating the core lessons of conservation biology to effective policy and environmental management.
Prerequisites: BY222 or consent of the instructor. Prerequisites: BY222 or consent of instructor.
Credits: (3), Graded, Semester Calendar
Lecture, Even Spring Semesters
STS

BY 330 Great Lakes Water Protection
[Cross-listed with EV 330] The Laurentian Great Lakes contain 20% of the world's surface fresh water and serve both water supply and waste disposal services for over 30 million residents in the United States and Canada. Technological advances have controlled the outflow of the Great Lakes at the St. Lawrence River and this has brought with it social benefits and environmental costs. The United States and Canada share the management of this resource and have shared notable success controlling environmental consequences of development yet are faced with emerging issues. The LGL/SLR system will be examined from a multidisciplinary, multinational perspective to illustrate that a shared resource can be maintained. Students will be able to understand the forces (geomorphic, biological, chemical, social, economic, and political) that have shaped and impacted a globally significant resource. Prerequisite: At least Sophomore standing.
Credits: (3), Graded, Semester Calendar
Lecture, Fall Terms
UNIV/CGI/STS
Comm Points: 1

BY 340 Behavioral Ecology and Sociobiology
[Cross-listed with PY 340] This course is concerned with the adaptive functions of animal behavior, emphasizing ecological and evolutionary perspectives. Topics covered include foraging behavior, sexual selection, social systems, parental care, and cooperation and conflict. One major focus will be on evaluating the arguments of proponents and critics of sociobiology on whether the field is useful at explaining human behavior. Prerequisites: BY140 or PY151 or consent of instructor.
Credits: (3), Graded, Semester Calendar
Lecture, Odd Spring Semesters
IG

BY 345 The Human Genome
This course explores our current understanding of genomics as applied to the human genome. We will begin with an introduction to genome structure and function, and then apply that knowledge to understanding patterns of human history and evolutionary adaptation, exploring the genetic causes of disease with genome-wide association studies, and discuss the multifaceted impacts of the personal genomics revolution. Prerequisites: BY140 or permission of the instructor
Credits: (3), Graded, Semester Calendar
Lecture, Spring Terms
STS

BY 350 Comparative Vertebrate Anatomy
This course compares anatomical structures throughout different classes of vertebrates. We begin by defining anatomical terms and identifying what constitutes a vertebrate. We will also learn how vertebrate organ systems develop and the physical constraints placed on development of these systems. The anatomical study will be broken down into major organ systems that will be discussed one at a time. For each of the organ systems, there will be a discussion of relevant structure and function followed a description of the major changes in form and function throughout vertebrate evolution. Since there are numerous classes of vertebrates, we will concentrate on representatives from some of the better studies examples.
Prerequisites: BY160 or consent of the instructor.
Corequisite: BY352.
Credits: (3), Graded, Semester Calendar
Lecture, Fall Semesters

BY 352 Comparative Vertebrate Anatomy Lab
Through the use of dissection and histological observation, we will observe and make direct comparisons of anatomical structures from representative vertebrates. The organ systems that are dissected in this course will follow the topics presented in BY350. After the first two introductory labs, you will dissect specific organ systems one at a time in each of your specimens. This will allow you to make direct comparisons between comparable structures in different vertebrates. The animals that will be dissected (Necturus – Mud Puppy, Dogfish shark, pigeon, and cat) are representative vertebrates
chosen to illustrate changes to the organ systems as vertebrates became more complex. Prerequisites: BY160 or consent of the instructor.
Corequisite: BY350.
Credits: (2), Graded, Semester Calendar
Laboratory, Fall Semesters

BY 357  Human Cognitive Evolution
[Cross-listed with PY 357] Evolutionary psychology is concerned with the adaptive problems and selective pressures our ancestors encountered in their environments, the psychological mechanisms that evolved to help them solve those problems, and the way those evolved mechanisms function in current environments. This way of thinking about the brain, mind, and behavior is changing how scientists approach old topics, and is opening up new ones. This course will focus on current developments and selected topics in evolutionary psychology (e.g., foraging, mate choice, parental investment, cooperation and culture) and explore the evolution of cognition from a broad comparative perspective. Prerequisites: PY151 or junior or senior standing.
Credits: (3), Graded, Semester Calendar
Lecture, Fall Semesters

BY 358  Animal Learning and Cognition
[Cross-listed with PY 358] This course focuses upon how animals acquire, process, store and recall information about their environment and social partners. Topics that will be examined include how animals perceive and classify stimuli; how they learn and remember; how they orient and navigate; how they measure time, number, and amount; how they acquire abstract concepts; how they perceive social relationships; and how they communicate. A diversity of invertebrate and vertebrate organisms will be included (sea slugs to primates!), and there will be an emphasis on understanding taxon-specific specializations as well as general patterns across animals. Prerequisites: BY140 or PY151 or consent of the instructor.
Credits: (3), Graded, Semester Calendar
Lecture, Even Spring Semesters

BY 359  Perception
Perception deals with our conscious experience of the world, ourselves and each other. This course will examine how perceptions are measured (psychophysics); how visual, auditory, touch and pain sensory stimulation is actively organized into conscious perceptions; developmental aspects of perception; the role of cognitive factors, such as attention; and how altered conscious states (e.g., achieved through meditation, hallucinogenic drugs) affect perception. Fundamental principles of perception discussed in this course will be used to explain how we experience the world, ourselves, and each other. Prerequisites: PY151 or junior or senior standing.
Credits: (3), Graded, Semester Calendar
Lecture, Fall Semesters

BY 360  Comparative Physiology
In this course, students will be instructed in all the main branches of modern animal physiology with a strong emphasis on the integration of physiological knowledge, ecology, and evolutionary biology. In addition to an in-depth treatment of mammalian physiology, students will be exposed to the various physiological systems that have evolved in other vertebrate, as well as invertebrate, animals. The primary goal is to understand how these physiological systems allow animals to survive in the environments that they inhabit.

Prerequisite: BY160 or consent of the instructor. Prerequisites: BY160 or consent of instructor.
Credits: (3), Graded, Semester Calendar
Lecture, Spring Semesters

BY 362  Comparative Physiology Laboratory
In this laboratory-based course, students will gain practical exposure to basic research techniques used in the study of animal physiology. Class activities include studying action potential propagation, the mammalian dive reflex, electrooculography and the physiological effects of exercise. Corequisite: BY360.
Credits: (2), Graded, Semester Calendar
Laboratory, Spring Semesters
Comm Points: 1

BY 363  Pharmacology of Infectious Disease
This course will introduce students to the basic principles of immunology and pharmacology with an emphasis on current treatment strategies employed to combat infectious disease. Students will learn how vaccines are used to prevent infection, in addition to the deployment of small molecule drugs and newer antibody-based therapies for the treatment of existing infectious disease. Course information will be disseminated to students in the form of lectures, readings from review and original research articles, and through group discussion that involves case studies and problem-based learning. Prerequisites: BY160
Credits: (3), Graded, Semester Calendar
Lecture, Even Spring Terms

BY 368  Mathematical Biology Seminar
[Cross-listed with MA 368] The objective of this course is to present recent advances in research that combines biological and mathematical analysis, and to describe opportunities for interdisciplinary summer research in biology and mathematics. Students will receive one credit for attending seminars (6 per semester), reading a journal article prior to each presentation, writing a short review of each seminar, and participating in discussions. This course can be taken for credit more than once.
Credits: (1), Graded, Semester Calendar
Seminar, Fall Terms

BY 380  Techniques in Immunological Research
This course will provide students with a basic understanding of molecular, cellular and imaging techniques used at the Trudeau Institute to help researchers study the immune system. Students will learn principles and procedures relating to molecular biology, cellular biology, histology, flow cytometry, light microscopy, and cell sorting. The course will cover basic quantification of gene expression at the transcriptional and post-translational level. The course will also cover basic quantification of cell populations using flow cytometers to collect and analyze subpopulations of cells from tissues. Histology and light microscopy techniques will be used to locate similar cell populations within a tissue section. Students will gain confidence in the selection and application of the appropriate cell imaging techniques required to assess mammalian cell tissues. Enrollment is limited to students participating in the Trudeau Semester.
Credits: (3-6), Graded, Semester Calendar
Lecture, (TECH)
BY 385 Plant Biotechnology
This course will provide knowledge and understanding of plant biotechnological tools for plant improvement. Topics include the basic principles and application of tissue culture, recombinant DNA technology and genetic transformation and their application to crop improvement, genome editing with RNAi and CRISPR, and social and environmental impacts of biotechnology. This course will provide an opportunity for students to develop critical thinking on biotechnological tools for plant improvement. Prerequisites: BY214
Credits: (3), Graded, Semester Calendar
Lecture,

BY 387 Plant Biotechnology Lab
This course will provide you with a hands-on experience and knowledge and understanding of plant biotechnological tools for plant improvement. During this course, you will drive one big project which transforms a dwarf Arabidopsis mutant. By doing this project, you will learn hormone physiology and the function of a green revolution gene. Topics include the basic principles and application of tissue culture, recombinant DNA technology and genetic transformation using both bacteria and Agrobacterium and their application to crop improvement. This course will provide an opportunity for students to develop critical thinking on biotechnological tools for plant improvement. Prerequisites: BY162.
Corequisites: BY385.
Credits: (2), Graded, Semester Calendar
Laboratory, Spring Terms

BY 399 Sustainability & Environmental Conservation in Kenya
Students explore the economic, political, and social development of Kenya, and the environmental and social consequences of the Kenya’s development path, with in focus on different strategies for environmental conservation, agriculture development, and infrastructure development. The objectives are to understand (1) how a model developing nation with an export and tourism-based economy functions, (2) what are the environmental and social consequences of development and (3) how an African nation’s economy and its social & environmental welfare are linked to the political and economic policies of the US and other developed nations.
Credits: (3), Graded, Semester Calendar
Lecture, Even Spring Terms
UNIV/CGI/CSO

BY 400 Directed Study in Bioscience
Students study specialized topics in bioscience not otherwise available in formal courses. Under supervision of a faculty member, a semester-long course of study tailored to professional interests is designed based on readings from relevant texts and primary literature.
Prerequisites: Consent of the instructor.
Credits: (1-4), Graded, Semester Calendar
Independent Study, Given When Needed

BY 401 Professional Assessment
This course is designed to assess the professional development of biology majors by (1) completion of a standardized test to assess their level of knowledge in the field of biology, (2) submission of a professional resume, and (3) submission of a personal statement for graduate/professional school or employment. Restriction: Senior standing or consent of the Biology Department Chair.
Credits: (0), P/NC, Semester Calendar
Independent Study,

BY 405 Undergraduate Research in Bioscience
Students conduct an original bioscience research project based on investigation of a specific problem related to areas of faculty expertise. Research methodology may involve field, laboratory, computational, or theoretical approaches. Presentation of research results at a scientific meeting or local symposium is strongly encouraged.
Prerequisite: consent of the instructor.
Credits: (1-6), Graded, Semester Calendar
Research, Given When Needed

BY 406 Biomedical Analysis and Instrumentation
[Cross-listed with CM 406] Biomedical Analysis and Instrumentation is a lecture course designed to provide advanced undergraduates and graduate students in basic sciences, biosciences and bioengineering disciplines with scientific and engineering aspects of instrumentation, sample analysis, measuring and processing signals from living organisms. Functioning and calibration of biomedical transducers and devices actually used in clinical practice for analyzing clinical biomarkers for disease diagnostics will be reviewed. Emerging research in bioinstrumentation, biomedical technologies, stand alone and wearable sensing devices, analytical method development and validation will be also be covered. Special emphasis will be placed on measurement principles of medical instrumentation used in health technologies ranging from laboratory scale to next generation wearables. Training in professional ethics, grant writing, patenting, innovation, entrepreneurial activities and FDA regulation for new device development, laboratory management, as well as communication skills will also be provided. Undergraduate assignments include a mid term exam, a research proposal and 2 short review papers. Graduate students will prepare a research proposal and 3 review papers in addition to a mid term exam. Graduate students will also participate in a research proposal panel and prepare short presentations featuring innovative emerging research in the development and prototyping of novel bioinstrumentation.
Credits: (3), Graded, Semester Calendar
Lecture, Even Spring Terms

BY 410 Undergraduate Thesis Research in Bioscience
A formal thesis project is arranged under supervision of a faculty member who guides the student in planning and execution of original research work and preparation of a written thesis. This course is primarily intended for junior or senior biology majors who wish to pursue graduate or professional studies in bioscience. Work done in satisfaction of the requirements for a degree will be assigned a grade when the thesis is submitted and approved.
Prerequisite: consent of the instructor.
Credits: (1-6), Graded, Semester Calendar
Research, Given When Needed

BY 412 Molecular Biology Laboratory
This course will provide students with a hands-on introduction to modern molecular biology techniques. Students will learn techniques such as bacterial transformation and plasmid DNA purification, restriction digest and gel electrophoresis, isolation of DNA and RNA from eukaryotic cells, Southern hybridization, reverse transcription, polymerase chain reaction, and cloning PCR products, and web-based...
analytical programs. The lectures and reading will cover the theory and applications of these molecular techniques. Prerequisites: BY214 or consent of the instructor.

Credits: (4), Graded, Semester Calendar Laboratory, Fall Semesters (TECH)
Comm Points: 1

BY 416 Principles of Toxicology and Epidemiology

(Cross-listed with EHS 518) See EHS 416 Occupational Toxicology for description. Prerequisites: EHS 309 or consent of the instructor.

Credits: (3), Graded, Semester Calendar Lecture, Spring Semesters

BY 419 Immunology

An overview of the immune system, with emphasis on current concepts and literature. Topics covered include: cells and tissues of the immune system; structure and function of antibodies; genetic basis of antibody diversity; humoral and cellular immunity; cellular interactions; major histocompatibility complex; the complement system; transplantation; tumor immunity. Prerequisites: BY 140, BY 160 and BY 214, or consent of the instructor

Credits: (3), Graded, Semester Calendar Lecture, Fall Semesters
Comm Points: 1

BY 420 Advanced Evolutionary Biology

An in-depth look into the mechanisms driving evolution at both the phenotypic and genomic level, and how an understanding of evolution is crucial for many applied problems in environmental science and human health. Topics include ecological drivers of evolution, how and why DNA sequences and genomes change, population genetics and evolutionary theory, the evolution of gene families and networks, and horizontal gene transfer. The processes driving evolution will also be explored using computer simulations and evolution experiments with microbes. Students registering in the graduate section of this course will be required to complete extended versions of assignments and exams. Prerequisites: BY220 or permission of the instructor.

Credits: (3), Graded, Semester Calendar Lecture, Spring Terms

BY 424 Experimental Evolution Laboratory

(Cross-listed with BY524) An introduction to experimental approaches used in evolutionary biology. Students will conduct lab experiments using microbes to investigate a range of topics in experimental evolution, observing and exploring evolution as it happens in real time. Topics explored will include adaptive diversification, the evolution of fitness trade-offs, evolutionary loss of redundant traits, and evolutionary rescue. Corequisites: BY420 and BY522

Credits: (2), Graded, Semester Calendar Laboratory, Fall Terms

BY 425 Biological Systems and Environmental Change

Human activities are resulting in dramatic global environmental change, in the forms of biodiversity loss, altered biogeochemical cycles, introduced invasive species, chemical toxification of the environment, climate change, unsustainable exploitation of natural resources, and habitat loss, degradation, and fragmentation. In this course, we will examine how these forms of environmental change disturb biological systems by critically reading key research papers, and discussing their implications for future research and policy action. Prerequisites: BY222 or graduate standing.

Credits: (3), Graded, Semester Calendar Lecture, Odd Spring Semesters UNIV/CGI/STS

BY 426 Introduction to Biophysics

(Cross-listed by PH 426) This course concentrates on the fundamental physical processes that occur within living organisms, particularly the cell. Topics include the structure and physics of macromolecules, biological membranes, the thermodynamics of living systems, muscle contraction and the propagation of signals in nerve cells. Prerequisites: BY160 or BY312 or consent of instructor

Credits: (3), Graded, Semester Calendar Lecture,

BY 427 Advanced Mass Spectrometry: Practical Applications

Practical Applications will introduce the students to mass spectrometry and its applications within different fields, including pharmaceutical and biotech industry, academia, government, forensics, etc. Various types of instruments will be discussed, as well as their application within different fields. The course will then focus on different types of well-known “omics”, such as proteomics, metabolomics, glycomics, or lipidomics, but also on specialized types of “omics” such as peptidomics, post-translational modification-omics (PTM-omics), interactomics, foodomics, microbiomics, venomics, DNA- RNA- Protein- adductomics, genomics, proteogenomics or transcriptomics. Particular applications of all these kinds of “omics” in biotechnology & pharmaceutical industry, healthcare, biowarfare and forensics will also be discussed. Prerequisites: CM/BY460/560, or consent of the instructor

Credits: (3), Graded, Semester Calendar Lecture, Spring Terms

BY 428 Kinesiology

Knowledge of the correlates of structure and function is fundamental to the measurement and evaluation of human movement in movement science, health care professions, and product design. This course focuses on application of concepts of human movement to specific regions and joints of the human musculoskeletal system. Included are 1) application of the concepts of biological tissues and tissue mechanics in understanding non-pathological and pathological human movement of each joint and region, and 2) use of tools of measurement and evaluation in studying non-pathological and pathological human movement. Prerequisites: BY471 and PH131 or PH141.

Credits: (3), Graded, Semester Calendar Lecture, Even Spring Terms

BY 430 Developmental Biology

The course will focus on how an organism develops into a complex multicellular organism from a single cell. We will begin with the genetics of development and discuss mechanisms by which genes become sequentially activated as embryogenesis proceeds. The mechanics and genetics of both invertebrate and vertebrate development will be discussed beginning with fertilization and ending as embryogenesis is completed. We will also discuss some additional developmental events that occur during embryogenesis and later in adults. Because of technological advances in developmental biology, topics in this field have also become important societal issues.
Throughout the semester, we discuss the ethical implications of using these advances and their impact on society. Prerequisites: BY160 or consent of the instructor
Credits: (3), Graded, Semester Calendar
Lecture, Odd Spring Terms

BY 431  Limnology
Limnology is the study of physical, chemical, and biological properties of fresh water bodies, e.g. lakes, rivers, reservoirs, and wetlands. This introductory course will provide an array of topics that will, by the multi-disciplinary nature of limnology, call upon students' knowledge of biology, chemistry and physics and place them within the context of aquatic science. The focus of the instruction will be aquatic ecology at all levels of biological organization. Upon completion of the course, the student will be able to characterize the physical, chemical and biological/ecological properties of a freshwater through the selection and application of appropriate sampling methods. Some fieldwork will be required. Prerequisites: BY222 or CM132 or consent of the instructor. Corequisite: BY 432
Credits: (3), Graded, Semester Calendar
Lecture, Even Fall Semesters

BY 432  Limnology Laboratory
This corequisite of Limnology (aquatic science) will provide students the opportunity to engage in water sampling of regional lakes and rivers, analysis of samples in the laboratory, introduction to data synthesis, and report writing. Some fieldwork will be required. Corequisite: BY431
Credits: (2), Graded, Semester Calendar
Laboratory, Even Fall Semesters

BY 440  Biomedical Engineering Fundamentals
[Cross-listed with BR 400, ES 402] This interdisciplinary course will introduce students to basic principles of biomedical rehabilitation engineering. The course will present principles of disability and the diverse roles of engineering in medicine and rehabilitation. Students will use engineering methods to study anatomical and physiological systems including applications in rehabilitation engineering, bioinstrumentation, biosignal and image processing, biomechanics, and biomaterials. Prerequisites: MA131/132, PH131/132, junior or senior standing.
Credits: (3), Graded, Semester Calendar
Lecture, Fall Semesters

BY 445  Biological Oceanography
The goal of this course is to introduce students to the fundamentals of ocean science through an integrative approach that emphasizes physical (circulation, tides & waves), chemical (biogeochemistry) and biological (marine life) principles. Through a series of inquiry based and computational exercises, an exploration of the scientific literature and the use of flipped classrooms, we will consider the future of the world’s oceans in light of the contemporary challenges they face such as global climate change, pollution and an ever expanding aquaculture trade. Prerequisites: BY140, BY160, and MA180 or MA131
Credits: (3), Graded, Semester Calendar
Lecture, Even Spring Terms

BY 448  Medical Microbiology
This course will systematically examine human pathogens with a focus on why the biologic properties of organisms are important to disease in humans, including the basic principles of the host immune response, laboratory diagnosis, bacteriology, virology, mycology and parasitology. This class will emphasize basic science with clinical practice to understand the clinical relevance of the organisms examined using clinical cases from literature reports to illustrate the epidemiology, diagnosis, and treatment of infectious diseases. The course will emphasize student interaction and exploration of the scientific literature. Prerequisites: BY 160 and BY 214 (or instructor approval)
Credits: (3), Graded, Semester Calendar
Lecture, Spring Semesters
Comm Points: 1

BY 450  Biochemistry I
[Cross-listed with CM 460] This course is a one semester introduction to the molecular basis of biological processes. The first part of the course will cover the structure and function of the four major classes of biomolecules - proteins, carbohydrates, lipids, and nucleic acids. The second part covers the organization and regulation of the major energy generating and biosynthetic pathways. Prerequisites: CM241 or consent of the instructor.
Credits: (3), Graded, Semester Calendar
Lecture, Fall Semesters

BY 451  Biochemistry II
[Cross-listed with CM 461] A continuation of Biochemistry I focusing on autotrophic and anabolic metabolism. Prerequisite: BY450 or equivalent
Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed

BY 452  Pharmacology
[Cross-listed with CM 452] The science of Pharmacology concerns the molecular mechanisms by which drugs act on the human body and the applications of drugs in clinical therapy. This course will introduce students to general principles of drug action and survey selected classes of drugs according to their physiological effects and uses in the treatment of certain diseases. Prerequisites: BY160 and CM241 or consent of the instructor
Credits: (3), Graded, Semester Calendar
Lecture, Fall Semesters

BY 453  Pharmacology Lab
The goal of this course is to facilitate a greater understanding of key concepts in pharmacodynamics, pharmacokinetics that are discuss in the lecture component and observe how they are applied in the context of the clinical environment. The lab will be simulation based, employing virtual organ bath experiments to derive and interpret dose-response curves, and virtual patient software to investigate drug pharmacokinetics and dosing strategies. Corequisites: BY 160 and BY 452
Credits: (2), Graded, Semester Calendar
Laboratory, Even Spring Semesters

BY 454  Biological Psychology
[Cross-listed with PY 454] A comprehensive investigation of the neuroanatomical and neurophysiological foundations of behavior. Topics include, but are not limited to: perception, motivation,
emotion, states of consciousness, learning, memory and mental illness. Prerequisites: PY151 or junior or senior standing.
Credits: (3), Graded, Semester Calendar
Lecture,

BY 455  
Cell and Molecular Biology of Cancer
This course will focus on the cellular and molecular alterations that cause human cancer. Topics include cell cycle regulations, oncogenes and tumor suppressor genes, cancer viruses, multistep tumorigenesis, invasion and metastasis, and new developments in cancer diagnosis and therapy. Emphasis will be placed on student interaction and exploring the scientific literature. Prerequisites: BY160 and BY214 or consent of the instructor.
Credits: (3), Graded, Semester Calendar
Laboratory, Spring Terms
Comm Points: 2

BY 458  
Cognitive Neuroscience
[Cross-listed with PY 458] This course introduces a sampling of the theories and research concerning how various mental processes are accomplished within the brain. Emphasis will be placed on developing an understanding of both the physiological bases of the techniques and the issues involved in relating measures of brain activity to cognitive functioning. Students will be exposed to current topics of study in a number of areas of cognition: perception, language, memory, among others. In this course we will study a number of different techniques for studying the brain, including electrophysiological recording techniques, functional imaging techniques, and methods that involve brain lesions and disrupting neural activity. Prerequisites: PY151 or junior or senior standing.
Credits: (3), Graded, Semester Calendar
Lecture, Odd Spring Terms
IG/STS

BY 460  
Neurobiology
[Cross-listed with PY 460] Neurons are electrically excitable cells that initiate or control many complex functions such as sensory perception, locomotion, memory, and learning. This course introduces the study of neuronal mechanisms at the cellular and molecular level. Topics include: membrane biophysics, ion channels, electrical signaling, synaptic transmission, glia, sensory transduction, neuromodulation, and neuronal plasticity. Prerequisites: BY160 or BY360 or consent of instructor.
Credits: (3), Graded, Semester Calendar
Lecture, Fall Semesters

BY 465  
Molecular and Genome Evolution
[Cross-listed with BY565] An overview of the molecular underpinnings of evolution, and how those molecular changes can be used to characterize and understand the evolutionary history of genes, proteins and organisms. Topics include how and why DNA sequences and genomes change, molecular phylogenetics and evolutionary models, gene duplication and the evolution of gene families, and horizontal gene transfer. For BY 565, additional readings and an additional written and oral report will be required. Prerequisite: BY420
Credits: (3), Graded, Semester Calendar
Lecture, Spring Terms

BY 470  
Biochemistry & Biotechnology Laboratory
[Cross-listed with CM 470] This course is a one semester course in the fundamental laboratory approaches for biochemistry and biotechnology. While largely a hands-on course, laboratory experiments will be supplemented with lectures that integrate the theoretical and practical principals covered in the exercises. Topics include protein purification, characterization and analysis, enzyme kinetics and molecular modeling. Prerequisites: CM221 and CM223 or BY450/CMA460 or consent of the instructor.
Credits: (3), Graded, Semester Calendar
Laboratory, Spring Terms
Comm Points: 1

BY 471  
Anatomy and Physiology I
This course is the first course in a two semester sequence that studies the anatomy and physiology of the human body in detail. Topics covered in this semester include basic cellular activities, anatomy and physiology of skeletal, muscular, circulatory and lymphatic systems. This course is appropriate for students in the pre-PT program as well as pre-health majors in any other health-related field that require a two-semester Anatomy and Physiology sequence. Prerequisites: BY 160 or by consent of the instructor
Corequisite: BY 473
Credits: (3), Graded, Semester Calendar
Lecture, Fall Terms

BY 472  
Anatomy and Physiology II
This course is the second course in a two semester sequence that studies the anatomy and physiology of the human body in detail. Topics covered in this semester include the anatomy and physiology of major organ systems as well as homeostasis. This course is appropriate for students in the pre-PT program as well as pre-health majors in any other health-related field that require a two-semester anatomy and physiology sequence. Prerequisites: BY471 and BY473, or consent of the instructor.
Corequisites: BY474.
Credits: (3), Graded, Semester Calendar
Lecture, Spring Semesters

BY 473  
Anatomy and Physiology I Lab
Companion laboratory course to Anatomy and Physiology I, introducing students to anatomical terminology and histology. The students will focus on anatomy of the human skeletal, muscular and circulatory systems. Prerequisites: BY 160, or by permission of the instructor
Corequisite: BY471
Credits: (2), Graded, Semester Calendar
Laboratory, Fall Terms

BY 474  
Anatomy and Physiology II Laboratory
Companion laboratory course to Human Anatomy and Physiology II, introducing students to anatomical terminology, histology, and organ physiology. The students will focus on human physiology of the major organ systems and the technology used to analyze them. Prerequisite: BY471 and BY473, or consent of the instructor.
Corequisite: BY472.
Credits: (2), Graded, Semester Calendar
Laboratory, Spring Terms
(TECH)
Comm Points: 1

BY 476  
Current Topics in Biology & Medicine
[Cross-listed with BY576] This is a discussion-based seminar course that broadly examines advances and implications of modern biology of interest to society, scientists, and students planning a career in
medicine, research, or teaching. Students are required to read a variety of current texts, participate in class discussions, and write a substantive essay. Example topics include the discovery of DNA, genome sequencing, applications of bioinformatics, the revolution in applied biotechnology, human physiology under extreme conditions, intellectual history of biology and medicine as explored by prominent science writers, the prognosis for life on earth. Prerequisites: BY160 or BY214 or consent of instructor.

Credits: (3), Graded, Semester Calendar
Lecture, Spring Terms
Comm Points: 1

BY 480 Advanced Cell Biology
This course will focus on understanding how cells function normally, and how cell dysfunction can cause human disease. Topics include DNA replication and repair, cell cycle control and cancer, cell communication and intracellular signaling, regulation of gene expression, the cell surface and the cytoskeleton. Current methods used in cell and molecular biology research will be discussed. The course will emphasize student interaction and exploration of the scientific literature. Prerequisites: BY160/162 and BY214 or consent of the instructor.

Credits: (3), Graded, Semester Calendar
Lecture, Fall Semesters
Comm Points: 1

BY 482 Molecular Genetics
This course will provide students with detailed information on the structure, packages, and expression of genes within the genome of both prokaryotes and eukaryotes. Topics will include chromatin packaging and structure; DNA replication mutation and repair; transcription; RNA splicing; translation; and control of gene expression. Included with each of these topics will be primary research papers, which will be discussed during class. During discussions, experiments in the papers will be analyzed as to how they work (focusing on current biotechnology) and critical analysis of the conclusions. Evaluation will involve exams based on material presented during the course as well as participation in discussions and written analysis of presented research papers. This course contains advanced topics and is designed primarily for graduate or advanced undergraduate students. Prerequisites: BY160, BY214, BY450, CM103 or 131, and CM104 or 132.

Credits: (3), Graded, Semester Calendar
Lecture, Spring Semesters

BY 485 Neural Engineering
[Cross-listed with EE 485, ES 485] This course applies engineering principles to the study of neuroscience and to the design of devices or techniques intended to replace missing or augment existing functions such as seeing, hearing, speaking, and walking. The course provides a detailed overview of sensorimotor systems, neurophysiology, neuroanatomy, neuropathology and clinical neurology. The class sequences through the various sensory and movement systems, providing a quantitative basis for how the nervous systems works for these systems, for how it dysfunctions, for the disability produced, and finally for how function can be restored by neuroprostheses. Students will prepare and present a paper on a neural engineering topic.

Credits: (3), Graded, Semester Calendar
Lecture, Fall Semesters
bioscience-related, but clearly meets the professional goals of the student and the Clarkson university-wide requirements for a professional experience. The experience should involve minimally 120 hours of training and work, and must be pre-approved by the student’s faculty advisor or Chair of Biology. A formal report upon completion of the internship is required.

Credits: (0), P/NC, Semester Calendar
Independent Study, Given When Needed

Civil and Environmental Engineering

CE 1 (3, 5…)
Civil and Environmental Engineering Elective
A college level course for which there is no comparable Clarkson course. Used for transfer credit only. (Not offered at Clarkson, for transfer credit only.)
Credits: (2-4), Graded, Semester Calendar
Independent Study, Transfer Credit Only

CE 2 (4, 6…)
Civil and Environmental Engineering Elective
A college level course for which there is no comparable Clarkson course. Used for transfer credit only. This course may be used as a Professional Elective. (Not offered at Clarkson, for transfer credit only.)
Credits: (2-4), Graded, Semester Calendar
Independent Study, Transfer Credit Only

CE 212
Introduction to Engineering Design
This course lays the foundation for the design curriculum of the MAE Department. Students are introduced to how to solve complex, open-ended engineering problems. Core topics covered are: the design process; engineering ethics and professional responsibilities; design for safety; mathematical and computer modeling; and written, oral and graphical communication. These topics are presented within the framework of at least two open-ended design projects which students must propose and accomplish through the completion of the preliminary design phase including a design report and presentation slides for each project. Prerequisites: Civil & Environmental Engineering at least Sophomore standing or consent of the instructor.
Credits: (3), Graded, Semester Calendar
Lecture, Laboratory, Spring Terms
Comm Points: 1

CE 301
Introduction to Geospatial Analysis and Geographic Information Systems
(Cross-listed with SC 301) An introductory course in the concepts and uses of Geographic Information Systems (GIS) including analysis of GIS-based local and global geographic datasets. Provides basic knowledge of GIS theory and applications using existing state-of-the-art GIS software and current spatial data resources. Applications include: overlay analysis, spatial data query, map generation and terrain surface analysis. Students will also learn the basics of GPS data collection, remote sensing, 3D visualization, probability, statistics, and error analysis. Prerequisite: At least Sophomore standing.
Credits: (3), Graded, Semester Calendar
Lecture, Laboratory, Every Term (TECH)

CE 302
Surveying, Geodetic Control, and Engineering Measurements
Fundamentals of terrestrial surveying measurements include leveling, distances, and angle measurements to compute Orthometric heights relative to a vertical survey datum and 2-D Cartesian coordinates in a horizontal survey datum for engineering projects. Exposure to advanced surveying techniques including GPS, UAV, bathymetric survey, LiDAR, and use of Autodesk Civil3D will be covered. Prerequisite: MA131
Credits: (3), Graded, Semester Calendar
Lecture, Fall Terms

CE 304
Introduction to Scheduling and Estimating
An introduction to the principles and theories of estimating and scheduling a construction project. Basic and advanced estimating and scheduling techniques will be discussed for both building and heavy/civil projects. The use of computers in estimating and scheduling will be highlighted in the course. Project: the student will estimate the cost of and submit a schedule for a medium sized building project given a complete set of contract documents and other project information. (2 credits of design) Prerequisite: At least Sophomore standing.
Credits: (3), Graded, Semester Calendar
Lecture, Spring Terms

CE 305
Construction Planning and Management
This course will focus on project planning, design services contracts, construction contract documents, construction management, labor relations, construction bonds and insurance, construction scheduling, estimating and bidding procedures, cost control, value engineering, and construction administration. Some topics will be presented by guest lecturers. (1 credit of design) Requirement: Must have Sophomore or above standing.
Credits: (3), Graded, Semester Calendar
Lecture, Spring Terms

CE 310
Geotechnical Engineering I: Soil Mechanics
An introduction to geotechnical engineering. Identification, classification and engineering properties of soil. Topics include stress-strain and strength relationships, consolidation, permeability and compaction of soils. Related geotechnical design problems included. Laboratory experience included. (1 credit of design) Prerequisites: ES222
Credits: (3), Graded, Semester Calendar
Lecture, Laboratory, Spring Terms
Comm Points: 1

CE 313
Biogeochemical Earth Systems Science
(Cross-listed with EV 313, BY 313) This course will investigate the key concepts and principles of environmental science emphasizing the earth’s biogeochemical cycles and how they have been perturbed by human activities. Quantitative analysis or air, soil and water quality on local, regional and global scales will be a significant component of the course. Emerging principles in environmental science, including sustainability, industrial ecology, risk assessment and the precautionary principle will be introduced. In addition to the quantitative aspects, the course will consider the historical, social, and political contexts in which the practice of environmental science takes place. Prerequisites: CM132 (or CM104), or consent of the instructor
Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed, (TECH)
CE 315  Geology For Engineers
This course explores the fundamentals of geology with respect to civil engineering. Topics include rock and mineral types, soils, soil formation and properties, geologic structures and topography, active tectonics and earthquake hazards. In addition, course will cover slope stability, landslides, sediments and sediment transport, groundwater, formation and use of earth materials, and alteration of rocks and minerals. Instruction is conducted through lecture and laboratory exercises. Prerequisite: CM 131 and PH 131
Corequisite: CM 132
Credits: (3), Graded, Semester Calendar
Lecture, Even Fall Terms

CE 320  Structural Analysis
Linear elastic analysis of structural systems including the computation of internal and external forces and displacements produced by the application of loads. Statically determinate and indeterminate systems are considered. Laboratory experience included. (1 credit of design) Prerequisites: ES222
Credits: (3), Graded, Semester Calendar
Lecture, Laboratory, Fall Semesters
Comm Points: 1

CE 330  Water Resources Engineering I
An introduction to water resources engineering. Topics include flow in pressurized conduits, hydraulic machinery, open channel flow, design of wastewater flow systems, hydrological cycle, rainfall and runoff analysis. Laboratory experience included. (1 credit of design) Prerequisite: ES330.
Credits: (3), Graded, Semester Calendar
Lecture, Laboratory, Fall and Spring Terms
Comm Points: 1

CE 340  Introduction to Environmental Engineering
An introduction to the fundamentals of environmental engineering and science. Discussion of the role of engineering in current and emerging environmental issues. Topics include: materials balances, reactor flow models, and chemical fate and transport, with applications in natural and engineered environmental systems. (1 credit of design) Prerequisites: MA131 and CM104 or CM132.
Corequisite: MA232.
Credits: (3), Graded, Semester Calendar
Lecture, Laboratory, Spring Terms

CE 380  Fundamentals of Environmental Engineering
This course explores chemical and physical fundamentals in solving environmental engineering problems related to water quality, water and wastewater treatment, air pollution, solid and hazardous waste management, sustainability, and risk assessment. The importance of mass balances and the physical and chemical processes involved in transferring chemicals within and between air, water and soil will be studied. Laboratory experiences included. (1 credit of design) Prerequisites: CH210 or consent of instructor
Credits: (3), Graded, Semester Calendar
Lecture, Laboratory, Spring Terms
Comm Points: 1

CE 404  Applications in Scheduling and Estimating
An application of estimating and scheduling for a construction project. Students will take part in an intensive, project-based scheduling and estimating effort leading up to and including regional level competition as part of the Associated Schools of Construction. Projects will include commercial building, heavy/civil works, pre-construction services, and design-build projects. As part of a team, participants will prepare bid or proposal documentation, develop detailed reports, and provide an oral presentation to a client panel. (This course includes 2 design credits) Prerequisites: CE 304, or consent of the instructor
Credits: (3), Graded, Semester Calendar
Lecture, Fall Terms

CE 406  Infrastructure Construction
This course develops the procedures for the design and construction for a heavy civil construction project. Estimating resources (labor, materials, and equipment selection) as well as determining the sequence and required planning for a horizontal construction effort and/or a foundation/retaining structure (including: contract documents, project reports, equipment rental rates and equipment brochures and other project information). Students will also develop a distinct project packet to execute a project of this type for presentation to the faculty, potential guests, and students. (2 credits of design) Prerequisites: CEE junior or senior standing.
Credits: (3), Graded, Semester Calendar
Lecture, Fall Terms

CE 408 Building Information Modeling (BIM) and Intergrated Project Delivery (IPD)
Course provides an introduction to the emerging field of building information modeling and integrated project management for construction projects. Course will cover basic techniques and methods to the use of current/state of the art computer aided design software including Autodesk Revit, and Autodesk Navisworks. (2 credits of design) Prerequisites: CEE Junior or Senior standing.
Credits: (3), Graded, Semester Calendar
Lecture, Every Semester

CE 409  Fundamentals of Building Systems
An examination of building life support systems and technology of interest to civil engineers in the planning, operation, and maintenance of buildings. Topics include human comfort, electrical, mechanical, water and waste, transportation, lighting, and other systems necessary for building utilization. Special cases will be examined in integrated project delivery, sustainable design practices, and energy modeling. Prerequisites: Must have junior or senior standing.
Credits: (3), Graded, Semester Calendar
Lecture, Spring Semesters

CE 410  Sustainable Infrastructure and Building
A study of the use of sustainability rating systems for infrastructure and building projects. Utilizing the USGBC LEED and the ISI Envision rating systems, this course will teach the fundamentals of sustainable building and acquaint students with the processes required to certify/verify projects to meet an independent rating standard. This course will prepare students to take the LEED GA and/or Envision ENV PV exams. Prerequisites: Must have junior or senior standing.
Credits: (3), Graded, Semester Calendar
Lecture, Fall Terms

CE 411  Construction Materials Engineering
Proper procedures for installation of major construction materials, including soil, concrete, steel, pipe, masonry units, etc. Material
production including Portland cement concrete, concrete masonry units, bituminous concrete, and structural steel. Project specifications will be reviewed governing above material, including methods of designing, testing and inspecting construction materials and completed installations. (2 credits of design) Prerequisites: Junior or Senior standing
Credits: (3), Graded, Semester Calendar
Lecture, Fall Terms

CE 415 Foundations, Stability, and Retaining Structures
Application of principles of soil mechanics to the design of shallow and deep foundations, retaining structures and slope stability. Bearing capacity theory and settlements. Interpretation of soil boring logs as related to geotechnical engineering design. (3 credits of design) Prerequisite: CE310.
Credits: (3), Graded, Semester Calendar
Lecture, Fall Semesters

CE 420 Computational Methods of Structural Analysis
The matrix stiffness method, theory and implementation in MATLAB, for the analysis for trusses, beams, frames, and grids. Discussion of thermal effects, support settlements, nonlinear effects, and other modeling considerations. Prerequisites: CE320 with minimum grade of C or consent of the instructor.
Credits: (3), Graded, Semester Calendar
Lecture, Spring Terms

CE 430 Water Resources Engineering II
Hydraulic structures, design of open channels, flood routing, runoff models, design of stormwater management systems, groundwater hydrology, transport and mixing processes. (1 credit of design) Prerequisite: CE330.
Credits: (3), Graded, Semester Calendar
Lecture, Spring Semesters

CE 433 Human Exposure Analysis
Human exposure analysis is an emerging science concerned with how humans come into contact with chemicals in the environment via inhalation, ingestion, and dermal contact. The course focuses on scientific and engineering issues, including direct measurement and model constructs. Students gain an understanding of the complexities, uncertainties, and physical, chemical and biological issues relevant to human exposures resulting from the use and release of toxic compounds. Topics include human exposure analysis terminology, pollutant fate and transport, human activity patterns, occupational exposure, indoor air quality, dosimetry, and statistical and mechanistic tools for exposure assessment. For the final project, the students design and perform a small-scale human exposure study using monitoring instruments and/or exposure models. (2 credits of design.) Prerequisites: Senior or graduate status in engineering or IH or consent of the instructor.
Credits: (3), Graded, Semester Calendar
Lecture, Even Fall Terms

CE 434 Sustainable Development Engineering
This course outlines the principles of sustainable engineering for improving sanitation and environmental health in developing communities both internationally and nationally. Topics include sustainable development and appropriate technologies for water and wastewater treatment, water storage and delivery, watershed management, solid waste management, and indoor air quality. The course highlights the importance of community participation and relationship building throughout the development and implementation of engineering projects. At least 2/3 of the course is dedicated to a team-based, sustainable development design project. (2 credits of design) Prerequisite: CE340 or consent of the instructor.
Credits: (3), Graded, Semester Calendar
Lecture, Spring Semesters
STS
Comm Points: 1

CE 435 Groundwater Hydrology and Geochemistry
[Cross-listed with EV 435] This class provides fundamental understanding of the key physical and chemical processes impacting groundwater resources and quality. Emphasis is on groundwater geology, physical characteristics of flow, and geochemical properties of groundwater. Groundwater contamination and contaminant transport and modeling will be introduced. The course will prepare students to qualitatively and quantitatively analyze fluid and contaminant flow in varied geologic systems. Prerequisites: CM132 (or CM104/106), and MA131, and (or EV/BY280)
Credits: (3), Graded, Semester Calendar
Lecture, Odd Fall Terms

CE 441 Reinforced Concrete Design
The investigation and design of reinforced structural elements such as beams, slabs, columns and footings to meet ACI 318 code requirements. (3 credits of design) Prerequisite: ES 222; Corequisite: CE 230
Credits: (3), Graded, Semester Calendar
Lecture, Fall Semesters

CE 442 Steel Design
Determination of loads for design; behavior and design of tension members, columns, beams, beam-columns, bolted connections, and welded connections; use of LRFD specifications and the Uniform Building Code. (3 credits of design) Prerequisite: CE320 or consent of the instructor.
Credits: (3), Graded, Semester Calendar
Lecture, Spring Semesters

CE 445 Timber Design
This course develops concepts for the design of structures using timber. (3 credits of design) Prerequisites: CE320
Corequisites: CE442
Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed

CE 448 Introduction to Architectural Engineering
This course will examine the integration of architecture and engineering disciplines in building design and will include introduction to the architectural design process; historical development of architecture/engineering; issues of structural, electrical, HVAC, plumbing, environmental, and acoustical engineering in buildings; economic, construction, and spatial maintenance considerations; professional practice and building codes. Students will be assigned graphic, freehand drawing/drawing, calculation and written exercise as well as a final project. (2 credits of design) Prerequisites: ES220 and CE212, or consent of instructor.
Credits: (3), Graded, Semester Calendar
Lecture, Laboratory, Fall Terms
CE 452  Advanced Strength of Materials
A study of properties of materials, general stress-strain relationships, modern strength theories, unsymmetrical bending, curved beams, beams on elastic foundations, the equations of elasticity and plasticity (1 credit of design) Prerequisites: ES222
Credits: (3), Graded, Semester Calendar
Lecture,

CE 453  Properties & Performance of Concrete Materials
This course explores the materials science aspects of properties and behavior of Portland Cement Concrete, including the properties of raw materials in concrete such as cement, aggregates, mineral and chemical admixtures, and fibers. Topics include: physical and chemical aspects of cement hydration and the role of binder types, the influence of type and morphology of hydrates, fresh and hardened concrete properties, introduction to fracture behavior of concrete, and concrete durability issues such as freezing and thawing, sulfate attack, and corrosion of reinforcing steel. (1 credit of design) Prerequisite: ES260.
Credits: (3), Graded, Semester Calendar
Lecture, Spring Terms

CE 461  Transportation Systems Design
Planning and design of transportation systems with emphasis on highway geometric design components, highway pavement, airport and other selected topics. (3 credits of design) Prerequisites: At least junior standing.
Credits: (3), Graded, Semester Calendar
Lecture, Fall Semesters

CE 463  Railroad Engineering
[Cross Listed with CE563] This course focuses on principles of railroad transportation and covers the following topics: Railroad engineering efficiency, economics, and energy; Cost-benefit analyses of rail transportation systems; Route selection; Geometric design of railroad alignment; Train speed, power, and acceleration requirements; Railroad engineering materials characterization (rail, crosstie, ballast, sub-ballast, and subgrade); Subgrade design and construction and drainage; and High Speed Rail (HSR) design and construction.
Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed

CE 470  River Restoration
This course provides fundamental understanding of hydrologic, hydraulic, and geomorphic processes of river restoration systems and their ecological impacts. Topics include river hydraulics, sediment transport, fluvial geomorphology, aquatic habitats, channel design, reservoir sedimentation, dam removal/decommission, and fish passage. Emphasis will be given to fluvial geomorphology and hydraulic design of river restoration projects. Computer modeling of river hydraulics and morphodynamics with applications to river restoration design will be introduced. Prerequisites: CE330; or permission of the instructor.
Credits: (3), Graded, Semester Calendar
Lecture, Fall Terms

CE 477  Atmospheric Chemistry
[Cross-listed with CM 476] This course will cover the evolution of the atmosphere from its initial formation to its natural background condition to its current state perturbed by human activities and reviews appropriate legislation; detailed descriptions of the chemistry of the carbon, nitrogen and sulfur cycles; characterization of the atmospheric aerosol and its role in heterogeneous reaction sand materials transport; stratospheric ozone and problems with its depletion; airborne radio-activity and its role in atmospheric ion chemistry. Prerequisites: CM370 or CM371 or ES340.
Credits: (3), Graded, Semester Calendar
Lecture, Spring Semesters

CE 478  Solid Waste Management and Landfill Design
This course provides a basic understanding of the essential concepts of solid waste management to include identification, collection, transport, processing and disposal of solid wastes. Emphasis is placed upon the legal requirements and practice resulting from the Resource Conservation and Recovery Act (RCRA) and applicable state law. Solid waste issues include characterization, generation, collection, routes, recycling, landfills, and siting. The design and operation of collection routes, transfer stations, Material Recovery Facilities (MRFs), and landfills are covered. Composting and thermal processing operations are also included. (2 credits of design) Prerequisites: Must have junior or senior standing.
Credits: (3), Graded, Semester Calendar
Lecture, Fall Semesters

CE 479  Water and Wastewater Treatment Design
A study of physical and chemical operations and biological processes utilized in the treatment of water and wastewater for municipalities and industry. The course emphasizes theoretical and design aspects of these processes. Prerequisites: ES330, CE340, or consent of the instructor.
Credits: (3), Graded, Semester Calendar
Lecture, Laboratory, Fall Terms
Comm Points: 1

CE 480  Chemical Fate and Transport in the Environment
This course covers the basic principles of chemical behavior in the environment including factors that control movement and fate. The processes involved in transferring chemicals within and between air, water and soil will be studied. Factors influencing interphase equilibrium, reactions, transport processes and the lifetime of chemicals in the environment will be investigated. (1 credit of design) Prerequisite: CE340 or consent of the instructor.
Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed
Comm Points: 1

CE 481  Hazardous Waste Management Engineering
This course is an introduction to the emerging field of hazardous waste management. This course provides an understanding of environmental regulations, management techniques to minimize the generation and disposal of hazardous wastes, and technologies to treat wastes and remediate disposal sites. Prerequisite: CE340 or Corequisite: CE340.
Credits: (3), Graded, Semester Calendar
Lecture, Odd Spring Semesters
Comm Points: 1

CE 482  Environmental Systems Analysis Design
This course presents the basic principles of systems analysis as applied to resource allocation and design problems commonly encountered in the field of environmental engineering. Central to the material covered is the concept of optimal problem solution and its
use in choosing among alternative designs or policies. All students will complete a semester project; a greater level of quantitative analysis will be expected from students taking the course for graduate credit. (2 credits of design) Prerequisites: CE340 or CE579 or equivalent course, EC350, or consent of the instructor.
Credits: (3), Graded, Semester Calendar
Lecture, Odd Fall Terms

CE 486 Industrial Ecology
An exploration of the methods necessary for designing and implementing changes in manufacturing processes to increase sustainability. This course will identify the impacts associated with resource consumption and environmental pollution, and present the quantitative tools necessary for assessing environmental impacts and to design for sustainability. Topics include: industrial ecology, life cycle analysis and the integration of the environment into economic activities. (1 credit of design) Prerequisites: Prior college level exposure to the concepts of mass and energy conservation, one of the following: CE340, CH220, ES330, ES340, CH301, CH271, or consent of the instructor.
Credits: (3), Graded, Semester Calendar
Lecture, Even Fall Terms

CE 490 Senior Design (Structures, Transportation, Geotechnical, Construction, Architectural/Facilities)
A comprehensive design of an open ended project related to structural, foundation/geotechnical, architectural/facilities and/or transportation design as well as construction management will be developed by teams of students. The design will be based on knowledge acquired in prior courses, professional ethics and engineering economics. Written reports and oral presentations about the design will be made to the faculty, potential guests, and student peers. (3 credits of design) Prerequisites: Senior standing Corequisites: CE310, and either CE441 or CE442 (or consent of the instructor)
Credits: (3), Graded, Semester Calendar
Lecture, Spring Terms
(TECH)
Comm Points: 1

CE 491 Senior Design (Water Resources, Environmental)
A comprehensive design of an open ended project related to water resource and environmental engineering design will be developed by teams of students. The design will be based on knowledge acquired in prior courses, professional ethics and engineering economics. Written reports and oral presentations about the design will be made to the faculty and student peers. (3 credits of design) Prerequisites: Senior standing and CE430, CE479, CE480, CE481, CE478 or CE586, or consent of instructor.
Credits: (3), Graded, Semester Calendar
Lecture, Spring Semesters
(TECH)
Comm Points: 1

CE 495 Special Projects in Civil and Environmental Engineering
An individual project is undertaken by the student under the guidance of a staff member. A complete report is required. Prerequisite: consent of the department chair.
Credits: (1-3), Graded, Semester Calendar
Independent Study, Fall Semesters

CE 496 Special Projects in Civil and Environmental Engineering
An individual project is undertaken by the student under the guidance of a staff member. A complete report is required.
Prerequisite: consent of the department chair.
Credits: (1-3), Graded, Semester Calendar
Independent Study, Spring Semesters

CE 499 Fundamentals of Engineering Exam Preparation
This course provides preparation for students taking the NCEES Fundamentals of Engineering (FE) Exam. Topics covered will mirror the materials covered specific to the Civil Engineering and Environmental Engineering FE examinations. Lectures will be provided by faculty from across the department facilitated by the department office.
Credits: (0), P/NC, Semester Calendar
Lecture, Spring Terms

Chemical Engineering

CH 1 (3, 5...)
Chemical Engineering Elective
A college level course for which there is no comparable Clarkson course. Used for transfer credit only.
Credits: (2-4), Graded, Semester Calendar
Independent Study, Transfer Credit Only

CH 2 (4, 6...)
Chemical Engineering Elective
A college level course for which there is no comparable Clarkson course. Used for transfer credit only. This course may be used as a Professional Elective.
Credits: (2-4), Graded, Semester Calendar
Independent Study, Transfer Credit Only

CH 210 Molecular Properties
An introduction to key chemical engineering concepts that include properties of gases, laws of thermodynamics, transport of gases and liquids, and chemical kinetics. Prerequisites: CM132 (or CM104), MA132 and PH131
Credits: (3), Graded, Semester Calendar
Lecture, Laboratory, Fall Terms

CH 220 Material Balances
Students will learn how to set up flow sheets for chemical processes with multiple units and perform material balances accounting for chemical reactions, phase equilibria, multistage separations, and recycle. While emphasis will be on steady state operations, unsteady processes will also be considered. A case study will be performed in teams. Prerequisites: CM 132 (or CM 104), MA 132, and PH 131 Corequisite: CH 210 or CM 371
Credits: (3), Graded, Semester Calendar
Lecture, Discussion, Fall Terms

CH 260 Thermodynamics & Energy Balances
The fundamentals of thermodynamics, including real fluids, thermodynamic properties of gases. Application of conservation of energy principles in chemical engineering. Prerequisites: CH210
Credits: (3), Graded, Semester Calendar
Lecture, Spring Terms
CH 320 Phase Equilibria
Thermodynamics of pure components and solutions. Fugacities, activities, and equilibrium calculations. Prerequisites: CH260 or ES340
Credits: (3), Graded, Semester Calendar
Lecture, Fall Terms

CH 330 Transfer Process Fundamentals
Fundamentals of fluid mechanics, heat and mass transfer relevant to transfer processes: Newtonian and non-Newtonian flow behavior, hydrostatics, macroscopic and microscopic balances, flow measurement, dimensional analysis, laminar and turbulent flow in ducts and over immersed bodies, Fourier's law, steady and unsteady conduction in rectangular, cylindrical, and spherical geometries, fins, convective heat transfer in flow through ducts and over immersed objects, natural convection, Fick's law, diffusion in binary and multicomponent systems, correlations for heat and mass transfer. Prerequisites: MA232; Corequisites: CH210 and CH220
Credits: (3), Graded, Semester Calendar
Lecture

CH 350 Chemical Engineering Laboratory
A series of experiments in fluid mechanics, heat transfer, complementing the junior ChE courses, are performed. Laboratory safety, data analysis, and communications skills stressed. Does not meet each week; schedule will be posted. Prerequisites: CH330
Corequisites: CH370
Credits: (1), Graded, Semester Calendar
Laboratory, Spring Semesters
Comm Points: 1

CH 360 Chemical Reactor Analysis I
The principles of chemical reactor design for homogeneous and heterogeneous reactions. Analysis of the chemical reactor from a kinetic and thermodynamic point of view, including design methods for flow and non-flow reactors and experimental methods. Prerequisites: CH330 and CH210
Credits: (3), Graded, Semester Calendar
Lecture, Spring Semesters

CH 370 Transfer Process Design
Fundamentals of transfer process design, design of pipes, flow meters, pump calculation, heat transfer equipment design, correlations for various heat transfer coefficients, pressure drop in heat transfer equipment, pumping requirements for heat transfer equipment, mass transfer equipment, tray, rotating, pulsed, packed column design, efficiency concept, transfer unit concept, membrane separations, chromatographic separation methods. Prerequisites: CH330
Credits: (3), Graded, Semester Calendar
Lecture, Spring Terms
Comm Points: 2

CH 390 Undergraduate Research Project
A theoretical or experimental investigation of an original problem under the supervision of a faculty member. Student should select topic from list in ChE office and discuss with indicated faculty member.
Credits: (1-4), Graded, Semester Calendar
Research, Every Term

CH 391 Undergraduate Research Project
A theoretical or experimental investigation of an original problem under the supervision of a faculty member. Student should select topic from list in ChE office and discuss with indicated faculty member.
Credits: (1-4), Graded, Semester Calendar
Research, Every Term

CH 392 Undergraduate Research Project
A theoretical or experimental investigation of an original problem under the supervision of a faculty member. Student should select topic from list in ChE office and discuss with indicated faculty member.
Credits: (1-4), Graded, Semester Calendar
Research, Every Term

CH 410 Chemical Engineering Laboratory
A series of experiments complementing the ChE senior courses are conducted. The student will gain familiarity with the equipment, practices, tools, and scope of Chemical Engineering. Extensive report writing. Laboratory safety and applied statistics and data analysis stressed. Does not meet each week; schedule will be posted. Prerequisites: CH330
Credits: (2), Graded, Semester Calendar
Laboratory, Fall Terms
Comm Points: 2

CH 413 Carbon Capture and Sequestration
[Cross-listed with CM 413] Sustainable energy generation is seen as one of the largest challenges of our generation. All long-term solutions rely on the direct or indirect conversion of solar energy, yet these solutions appear to be years from implementation. In the coming decades then, while the relative importance of fossil fuels will decrease, absolute use of fossil fuels will not. Carbon Capture and Sequestration (CCS) employed on a global scale can sustain the world’s energy use and help mitigate alarmingly high carbon dioxide levels in the atmosphere. The goal of this course is to provide students with a modern view of current and emerging research in CCS. Topics will include our current understanding of carbon dioxide and around the planet, the geological storage of carbon dioxide, and the science and technology of capturing carbon dioxide with focus on material chemistry aspects. Development of analytical methods and characterization tools for assessing CCS properties and materials will also be discussed. Through this series of lectures, students will learn about the contemporary research related to CCS, as well as learn to develop, analyze, and compare various CCS solutions.
Credits: (3), Graded, Semester Calendar
Lecture, Spring Terms

CH 420 Process Economics & Conceptual Design
Engineering economics, conceptual design principles, equipment costing, safety considerations. Prerequisites: CH330 Corequisites: EC350, or the combination of EC150 and EC200, or the combination EC151 and EC200.
Credits: (3), Graded, Semester Calendar
Lecture, Laboratory, Fall Terms (TECH)
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Prerequisites</th>
<th>Credits</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CH 430</td>
<td>Chemical Process Safety</td>
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<td>(3)</td>
<td>Graded, Semester Calendar</td>
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<td></td>
<td>Applications of chemical process principles to process safety and hazards analysis, mitigation and prevention, with emphasis on the chemical process industries.</td>
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<tr>
<td>CH 440</td>
<td>Plasma Engineering</td>
<td>CH330 and CH360</td>
<td>(3)</td>
<td>Graded, Semester Calendar</td>
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<td>[Cross Listed with CH540] This course will focus on the fundamentals of plasma science and engineering with particular emphasis on non-equilibrium plasmas and plasma in water environments. Focus areas addressed include material processing, chemical synthesis and conversion, environmental remediation, disinfection and biomedical applications. Prerequisites: CH330 and CH360</td>
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<tr>
<td>CH 441</td>
<td>Introduction to Nanophotonics</td>
<td>PH132 and MA232</td>
<td>(3)</td>
<td>Graded, Semester Calendar</td>
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<td>This course introduces the principles of nanophotonics-an emerging frontier at the nexus of nanotechnology and photonics. Nanophotonics deals with light-matter interactions on the nanometer length scale, and provides enormous opportunities for fundamental research and new applications. The course will cover the theoretical foundations of nanoscale optical interactions, growth and characterization of optical nanomaterials, nanolithography, plasmonics, metamaterials, manipulation and integration of nanostructured architectures, nanoscale optical microscopy, nanophotonic devices and systems, as well as a review of applications of nanophotonics, especially in biotechnology and nanomedicine. The students will be exposed to various new concepts, properties and phenomena in a bright nanoworld. Prerequisites: PH132 and MA232</td>
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<tr>
<td>CH 456</td>
<td>Experimental Projects</td>
<td>Junior or Senior Standing</td>
<td>(1-3)</td>
<td>Graded, Semester Calendar</td>
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<td>One or more project experiments related to various chemical processes are conducted. Selection of experiments is based on the student's needs and interests, and may involve existing experiments or the development of new ones.</td>
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<tr>
<td>CH 460</td>
<td>Process Dynamics and Control</td>
<td>CH220, CH330, and MA231.</td>
<td>(3)</td>
<td>Graded, Semester Calendar</td>
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<td>Process systems analysis and control. Methods for the analysis of systems and the use of these methods in the design of control systems. Prerequisites: CH220, CH330, and MA231.</td>
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<tr>
<td>CH 465</td>
<td>Biochemical Engineering</td>
<td>CH330</td>
<td>(3)</td>
<td>Graded, Semester Calendar</td>
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<td>Use of microorganisms and enzymes to carry out industrial scale production of useful products. Enzyme and cell growth kinetics, reactor types, design principles and operating processes (agitation, aeration, sterilization, separations), and examples of some typical industrial processes. Prerequisite: CH330</td>
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<tr>
<td>CH 482</td>
<td>Design Project</td>
<td>CH420</td>
<td>(3)</td>
<td>Graded, Semester Calendar</td>
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<td>A comprehensive design is performed independently. When possible, the work will be done in a team. Prerequisite: CH420</td>
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<td>CH 484</td>
<td>Polymer Engineering</td>
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<td>Principles of polymer rheology from both continuum and molecular viewpoints, including differences in the flow behavior of polymers and Newtonian fluids. Application to polymer processing operations, extrusion, fiber spinning and injection molding. Prerequisites: Must have a 2.0 GPA, CH330 or ES330 (either can be taken as a corequisite.)</td>
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<tr>
<td>CH 486</td>
<td>Industrial Chemistry</td>
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<td>[Cross Listed with CH586/CM486/586]This course will benefit junior and senior undergrads plus grads in chemistry and chemical engineering, and allow them to learn of real ways such talents are used in the professional world. It will involve different industrial chemists and chemical engineers to come to Clarkson University for each of 12 of the 14 weeks of a semester and give two lectures of about 1 hour 15 min each - one on an afternoon and the other following morning. The first lecture will relate the areas of chemistry their company was known for; the second lecture an in-depth discussion on how one project was carried out at the bench and the pitfalls that had to be resolved along the way to achieve success. The intent is to select lecturers from Clarkson Chemistry and Chemical Engineering major alumni at various lengths of time they have been professionals. Prerequisites: Junior or Senior Standing</td>
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<tr>
<td>CH 490</td>
<td>Elementary Transport Phenomena</td>
<td>CH330 and 3.5 GPA or consent of the instructor</td>
<td>(3)</td>
<td>Graded, Semester Calendar</td>
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<td>Principles of transport of momentum, energy, and mass will be covered from a fundamental perspective, pointing out analogies where appropriate. Topics include the Navier-Stokes and continuity equations, analysis of one dimensional flows, boundary layer theory, the energy and species conservation equations, energy transport by conduction and convection, steady two-dimensional problems, and unsteady one-dimensional problems. Enrollment is restricted to seniors who will graduate in the calendar year in which the course is offered. Prerequisites: CH330</td>
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</table>

### Chemistry

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<tr>
<td>CM 1 (3, 5...)</td>
<td>Chemistry Elective</td>
<td>(1-4)</td>
<td>A college level course for which there is no comparable Clarkson course. Used for transfer credit only.</td>
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<td></td>
<td>A college level course for which there is no comparable Clarkson course. Used for transfer credit only. This course may be used to satisfy a Science Foundation Curriculum Requirement.</td>
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<tr>
<td>CM 2 (4, 6...)</td>
<td>Chemistry Elective</td>
<td>(1-4)</td>
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**Undergraduate Level Courses**

Clarkson University Course Catalog 2021-2022
Independent Study, Transfer Credit Only

CM 31  HEOP Introduction to General Chemistry I  
Introduction to the foundations of major theories of chemistry and their practical applications. Topics include: foundation of measurement, chemical calculations and dimensional analysis, the concept of the mole, reaction stoichiometry, basic thermo-chemical principles, and the structure and organization of the periodic table.  
Restriction: For HEOP students only.  
Credits: (2), Graded, Semester Calendar  
Lecture, Summer Semesters

CM 103  Structure and Bonding  
An introduction to the electronic and geometric structures of representative inorganic and organic molecules, to the relations between structure and chemical and physical properties, and to the principles of chemical bonding. This course is designed for students majoring in chemistry.  
Credits: (3), Graded, Semester Calendar  
Lecture, Discussion, Fall Semesters

CM 104  Chemical Equilibrium and Dynamics  
This course is an introduction to chemical equilibrium and kinetics. It includes some basic thermodynamics and the evaluation and use of equilibrium constants, and also the measurement and mechanistic interpretation of the rates of chemical reactions. Examples are selected to cover a wide spectrum of chemical problems and to stress experimental techniques as well as theory.  
Prerequisites: CM103 or CM131  
Credits: (3), Graded, Semester Calendar  
Lecture, Discussion, Spring Semesters

CM 105  Chemistry Laboratory I  
Some fundamental principles underlying the experimental study of chemical phenomena. Some typical reactions of inorganic and organic compounds will be studied. This course will include introductions to various fields of chemical experimentation.  
Corequisites: CM103  
Credits: (2), Graded, Semester Calendar  
Laboratory, Fall Semesters

CM 106  Chemistry Laboratory II  
Experimental studies of the equilibria and rates of some chemical reactions, employing some volumetric and gravimetric analysis and including introductions to spectrophotometric and potentiometric measurements and to the use of computers in chemical experimentation.  
Prerequisites: CM105 or, with consent of the instructor, CM131.  
Corequisite: CM104.  
Credits: (2), Graded, Semester Calendar  
Laboratory, Spring Semesters

CM 121  Freshmen Seminar  
A course to acquaint incoming freshmen with activities and facilities in the Chemistry Department, provide a forum for discussion of curriculum choices and career options in chemistry.  
Credits: (1), Graded, Semester Calendar  
Seminar, Spring Semesters

CM 131  General Chemistry I  
A general overview of chemistry, including principles and theories as well as descriptive chemistry of important elements and compounds. Laboratory experiments augment lecture topics to provide a small group hands-on learning experience.  
Credits: (4), Graded, Semester Calendar  
Laboratory, Discussion, Lecture, Fall and Spring Terms

CM 132  General Chemistry II  
A continuation of CM 131. Chemical principles, theories, and descriptive chemistry with laboratory experiments to provide additional exposure to lecture topics in a small group environment.  
Prerequisites: CM131  
Credits: (4), Graded, Semester Calendar  
Laboratory, Discussion, Lecture, Spring Semesters

CM 221  Spectroscopy  
A study of spectroscopic techniques, including both their analytical applications and the use of molecular spectroscopy in the identification and characterization of chemical compounds. The techniques discussed include atomic emission and absorption, fluorescence, visible-ultraviolet, infrared and mass spectroscopy and nuclear magnetic resonance spectroscopy.  
Prerequisites: CM104 or CM132  
Credits: (3), Graded, Semester Calendar  
Lecture, Fall Semesters

CM 223  Spectroscopy Laboratory  
This laboratory course accompanies CM 221. Prerequisites: CM106 or CM132  
Corequisites: CM221  
Credits: (3), Graded, Semester Calendar  
Laboratory, Fall Semesters  
Comm Points: 2

CM 241  Organic Chemistry I  
An introductory course in organic chemistry dealing with the structures, names, chemical and physical properties, preparations, spectroscopy and reaction mechanisms of organic compounds.  
Prerequisites: CM104 or CM132  
Credits: (3), Graded, Semester Calendar  
Lecture, Fall Semesters

CM 242  Organic Chemistry II  
A continuation of CM 241. Prerequisite: CM241  
Credits: (3), Graded, Semester Calendar  
Lecture, Spring Semesters

CM 244  Organic Chemistry Laboratory I  
In this laboratory course, procedures for the synthesis of typical organic compounds are combined with spectroscopic and other physical and chemical techniques to illustrate the study of functional-group chemistry and the characterization and identification of organic compounds.  
Prerequisite: CM 241, Organic Chemistry I  
Corequisite: CM 242, Organic Chemistry II  
Credits: (3), Graded, Semester Calendar  
Laboratory, Fall and Spring Terms  
Comm Points: 2
CM 300 Instrumental Laboratory
Laboratory work designed to illustrate principles discussed in CM 320, CM 371 and CM 372. Prerequisite: CM371, Corequisite: CM320
Credits: (3), Graded, Semester Calendar
Laboratory, Spring Semesters, (TECH), Comm Points: 2

CM 302 Forensic Chemistry
This course introduces the principles, methods and instrumentation of chemistry behind the work of crime investigation and will be illustrated with case studies. It will explain how to obtain analytical results through sample preparation, instrumental analysis and data interpretation. It covers topics commonly applicable to the everyday functions of a crime laboratory including forensic analysis of drugs, explosives and inks, DNA profiling, blood analysis etc. The laboratory section will provide an opportunity for students to practice forensic chemistry techniques. This course is open to students with minimal study in chemistry but who are interested in forensic chemistry as well as those with a substantive background in chemistry. Prerequisite CM223 Spectroscopy Laboratory or approval by Instructor
Credits: (3), Graded, Semester Calendar
Lecture,

CM 312 Survey of Inorganic Chemistry
A review of fundamental chemical principles and a study of the qualitative description of binding in inorganic molecules and of the properties, structures and reactions of elements and their compounds. Prerequisites: CM371 or equivalent
Credits: (3), Graded, Semester Calendar
Lecture, Spring Semesters

CM 320 Separations and Electrochemistry
This course deals with techniques of separation and electrochemical techniques used in research and analysis. It includes single- and multistage techniques of separation, with emphasis on chromatographic methods; and the principles and applications of potentiometric, polarographic, voltammetric and some other electroanalytical techniques. Prerequisites: CM221
Credits: (3), Graded, Semester Calendar
Lecture, Fall Semesters

CM 342 Food Chemistry
Food chemistry is a one-semester course that will teach about basic structural principles of food essentials and their chemistry. The course will teach specifically: (i) Molecular basis for the sensation of flavor; (ii) Structure and properties of edible polysaccharides, proteins, and fats; (iii) Chemical and physical changes that these molecules undergo under different food-related treatments (e.g. heating, cooling, mechanical processing); (iv) Brief chemistry of digestion (enzymatic and microbial). Prerequisites: CM241 with a grade of B or higher
Corequisites: CM242
Credits: (2), Graded, Semester Calendar
Lecture, Fall Terms

CM 345 Advanced Laboratory
Advanced techniques in manipulation of chemical compounds and their isolation and characterization are studied. Examples are low temperature and inert atmosphere reaction conditions, synthesis of both inorganic and organic compounds in the form of fine particles, use of thermal analysis, electron microscopy and X-ray diffraction to determine product shapes and composition, and spectroscopic evaluation of metallo-organic complexes having industrial relevance. Course involves extensive use of library facilities to identify background materials as well as details for techniques employed. Course also includes a final presentation based on laboratory and literature findings. Prerequisites: CM242 and CM244
Credits: (4), Graded, Semester Calendar
Laboratory, Fall Semesters
Comm Points: 2

CM 371 Physical Chemistry I
[Cross-listed with PH 371] This course covers the gaseous state, kinetic theory and chemical thermodynamics, with applications to chemical and phase equilibria. The emphasis is on mathematics and problem solving. Prerequisites: CM104 or CM132, MA132, PH131
Corequisites: PH132
Credits: (3), Graded, Semester Calendar
Lecture, Fall Semesters

CM 372 Physical Chemistry II
[Cross-listed with PH 372] A continuation of CM 371. Topics may include quantum mechanics, atomic structure, chemical bonds, intermolecular forces, spectroscopy, molecular symmetry, optical activity, photochemistry and photobiology. Prerequisites: CM371 or equivalent
Credits: (3), Graded, Semester Calendar
Lecture, Spring Semesters

CM 391 Independent Study
An opportunity for junior chemistry majors to undertake research under a faculty member's direction. The research work to be arranged with the faculty member who assists in the choice of a problem and in the planning and execution of the work. A written report must be submitted at the end of each semester summarizing the work and results to date.
Prerequisites: consent of the instructor.
Credits: (3), Graded, Semester Calendar
Independent Study, Every Semester

CM 406 Biomedical Analysis and Instrumentation
[Cross-listed with BY 406] Biomedical Analysis and Instrumentation is a lecture course designed to provide advanced undergraduates and graduate students in basic sciences, biosciences and bioengineering disciplines with scientific and engineering aspects of instrumentation, sample analysis, measuring and processing signals from living organisms. Functioning and calibration of biomedical transducers and devices actually used in clinical practice for analyzing clinical biomarkers for disease diagnostics will be reviewed. Emerging research in bioinstrumentation, biomedical technologies, stand alone and wearable sensing devices, analytical method development and validation will be also be covered. Special emphasis will be placed on measurement principles of medical instrumentation used in health technologies ranging from laboratory scale to next generation wearables. Training in professional ethics, grant writing, patenting, innovation, entrepreneurial activities and FDA regulation for new
device development, laboratory management, as well as communication skills will also be provided. Undergraduate assignments include a mid term exam, a research proposal and 2 short review papers. Graduate students will prepare a research proposal and 3 review papers in addition to a mid term exam. Graduate students will also participate in a research proposal panel and prepare short presentations featuring innovative emerging research in the development and prototyping of novel bioinstrumentation. Prerequisites: CM221
Credits: (3), Graded, Semester Calendar
Lecture, Even Spring Terms

CM 409 Ugrd Teaching Assist in Chem
Assisting a faculty member in a chemistry course as an undergraduate teaching assistant. Students should check with their major department to determine whether these credits can be used to meet their degree requirements.
Credits: (1-2), Graded, Semester Calendar
Lecture, Every Semester

CM 413 Carbon Capture and Sequestration
[Cross-listed with CH 413] Sustainable energy generation is seen as one of the largest challenges of our generation. All long-term solutions rely on the direct or indirect conversion of solar energy, yet these solutions appear to be years from implementation. In the coming decades then, while the relative importance of fossil fuels will decrease, absolute use of fossil fuels will not. Carbon Capture and Sequestration (CCS) employed on a global scale can sustain the world’s energy use and help mitigate alarmingly high carbon dioxide levels in the atmosphere. The goal of this course is to provide students with a modern view of current and emerging research in CCS. Topics will include our current understanding of carbon dioxide in and around the planet, the geological storage of carbon dioxide, and the science and technology of capturing carbon dioxide with focus on material chemistry aspects. Development of analytical methods and characterization tools for assessing CCS properties and materials will also be discussed. Through this series of lectures, students will learn about the contemporary research related to CCS, as well as learn to develop, analyze, and compare various CCS solutions.
Credits: (3), Graded, Semester Calendar
Lecture, Spring Terms

CM 417 Directed Research in Inorganic Chemistry
Students will carry out research in inorganic chemistry under the supervision of a faculty member. Topics will be determined by faculty research programs. A formal report is required at the conclusion of this course.
Credits: (1-3), Graded, Semester Calendar
Research, Every Term

CM 422 Advanced Mass Spectrometry: Practical Applications
Practical Applications will introduce the students to mass spectrometry and its applications within different fields, including pharmaceutical and biotech industry, academia, government, forensics, etc. Various types of instruments will be discussed, as well as their application within different fields. The course will then focus on different types of well-known “omics”, such as proteomics, metabolomics, glycomics, or lipidomics, but also on specialized types of “omics” such as peptidomics, post-translational modification-omics (PTM-omics), interactomics, foodomics, microbiomics, venomics, DNA- RNA- & Protein- adductomics, genomics, proteogenomics or transcriptomics. Particular applications of all these kinds of “omics” in biotechnology & pharmaceutical industry, healthcare, biowarfare and forensics will also be discussed. Prerequisites: CM/BY460/560, or consent of the instructor
Credits: (3), Graded, Semester Calendar
Lecture, Spring Terms

CM 427 Directed Research in Analytical Chemistry
Students will carry out research in analytical chemistry under the supervision of a faculty member. Topics will be determined by faculty research programs. A formal report is required at the conclusion of the course.
Credits: (1-3), Graded, Semester Calendar
Research, Every Term

CM 428 Directed Study in Analytical Chemistry
The study of a subject not otherwise available in analytical chemistry courses may be undertaken under the supervision of a faculty member.
Credits: (1-3), Graded, Semester Calendar
Independent Study, Every Semester

CM 430 Colloids and Interfaces
Physico-chemical principles and experimental techniques related to the characterization and investigation of colloidal systems and interfaces are covered on an introductory level. From the many areas of application, the emphasis will be on those situations that are encountered in everyday life such as environmental problems (aerosols, water treatment), biological aspects (transport and absorption of fat, biological membranes), foods and cosmetics (emulsions), detergency and various technological processes.
Credits: (3), Graded, Semester Calendar
Lecture, Fall Terms

CM 432 Fine Particle Characterization
This course is intended to familiarize the students with the analytic techniques routinely used to characterize the size, size distribution, shape, composition, structure, and surface properties (composition, charge, topography) of individual particles as well as the properties of dispersion particles. In conjunction with the latter, the course will discuss many concepts covered by colloids and surface science courses.
Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed

CM 435 Better Materials through Chemistry
[Cross-Listed with CM535] Our physical world relies on a broad spectrum of materials of different properties around us to fulfill their functions to serve our daily life. It is one of the missions of chemists to improve and optimize materials chemically to make them more efficient and effective in diverse processes and devices. In this course, subsequent to a brief survey of the fundamental chemistry and physics of polymers, ionic liquids, carbon nanomaterials and composite materials their potential and current applications will be treated. Particularly, preparations, characterizations and applications of porous polymers and carbons, membranes and “smart” materials will be delineated. Prerequisites: CM241
Credits: (3), Graded, Semester Calendar
Lecture, Odd Fall Terms
CM 437  Directed Research in Colloid Chemistry
Students will carry out research in colloid chemistry under the supervision of a faculty member. Topics will be determined by faculty research programs. A formal report is required at the conclusion of the course.
Credits: (1-3), Graded, Semester Calendar
Research, Every Term

CM 441  Physical Organic Chemistry
Current views of the collection and interpretation of data relating to organic reaction mechanisms and reactive intermediates. Prerequisite: CM242 or consent of the instructor.
Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed

CM 442  Advanced Organic Chemistry
The course will cover essential topics of organic chemistry including dynamic stereochemistry, conformational analysis, photochemistry, pericyclic reactions, and chemistry of free radicals.
Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed

CM 444  Medicinal Chemistry
Various classes of medicinal agents will be discussed in relation to the diseases that they are used to treat. The history and development of these drugs will be covered as well as attempts to correlate chemical structure with biological activity. Prerequisite: CM242.
Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed

CM 445  Organometallic Chemistry
[Cross-listed with CM545] The course will provide introduction into structure and properties of compounds possessing metal-carbon bonds and their reactions with emphasis on homogeneous catalysis. Graduate students will do additional course work. Prerequisite: CM242.
Credits: (3), Graded, Semester Calendar
Lecture, Odd Fall Terms

CM 446  Modern Spectroscopic Methods in Organic Chemistry
This course deals largely with the applications of spectroscopic techniques to the identification of organic compounds. Heavy emphasis will be given to nuclear magnetic resonance techniques for protons, carbon and other nuclei. Practical and theoretical aspects of FT NMR will be emphasized. Prerequisites: CM242 and CM371.
Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed

CM 447  Directed Research in Organic Chemistry
Students will carry out research in organic chemistry under the supervision of a faculty member. Topics will be determined by faculty research programs. A formal report is required at the conclusion of the course.
Credits: (1-3), Graded, Semester Calendar
Research, Given When Needed

CM 448  Directed Study in Organic Chemistry
The study of a subject not otherwise available in organic chemistry courses may be undertaken under the supervision of a faculty member.
Credits: (1-3), Graded, Semester Calendar

CM 450  Introduction to Polymer Chemistry
An introduction to the chemistry of synthetic and natural polymers, emphasizing the unity of principles inherent in describing polymeric systems. Prerequisites: CM242 and CM372.
Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed

CM 451  Manufacturing Implications of Advanced Materials Processing
The processing of materials into manufactured goods requires an understanding of the chemical composition of the starting substrates, the nature of intermediates, and the properties of final products. This course focuses on the preparation, modification, characterization, and the applications of fine, ultra-fine, and nanosize metallic particles. The objectives are to: a) provide an overview of the relevant theoretical and practical aspects related to the preparation, characterization, and modification of fine particles in general and metallic particles in particular, b) familiarize students with the industrial approaches for developing and manufacturing fine particles on large scale, and c) teach students how the properties of the resulting particles/colloids can be tailored in order to ensure optimal performance in specific applications. During the semester the students will also participate in several practical sessions in which metal colloids will be prepared and characterized.
Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed

CM 453  Introduction to Biomaterials
This course deals with biomaterials in medical and pharmaceutical applications. Basic concepts and requirements of biomaterials will be introduced. Classification and properties of a wide range of biomaterials will be discussed according to their particular applications, such as drug delivery, artificial organs, implants and devices. In addition, standard testing and evaluation aspects of the biomaterials will also be addressed. Prerequisites: CM241 and CM242.
Credits: (3), Graded, Semester Calendar
Lecture, Spring Semesters

CM 457  Directed Research in Polymer Chemistry
Students will carry out research in polymer chemistry under the supervision of a faculty member. Topics will be determined by faculty research programs. A formal report is required at the conclusion of the course.
Credits: (1-3), Graded, Semester Calendar
Research, Given When Needed

CM 458  Directed Study in Polymer Chemistry
The study of a subject not otherwise available in organic chemistry courses may be undertaken under the supervision of a faculty member.
Credits: (1-3), Graded, Semester Calendar
Independent Study, Given When Needed

CM 460  Biochemistry I
[Cross-listed with BY 450] This course is an introduction to the molecular basis of biological processes. The first part of the course will cover the structure and function of the four major classes of biomolecules - proteins, carbohydrates, lipids and nucleic acids. The
second part covers the organization and regulation of the major energy generating and biosynthetic pathways. Prerequisites: CM241 or consent of the instructor. Credits: (3), Graded, Semester Calendar Lecture, Fall Semesters

CM 461 Biochemistry II
[Cross-listed with BY 451] A continuation of Biochemistry I dealing mainly with metabolic pathways, intermediary metabolism, protein synthesis, membrane transport, DNA replication and RNA transcription. Prerequisite: CM460 or equivalent. Credits: (3), Graded, Semester Calendar

CM 466 Bioelectronics & Bionanotechnology
This course covers novel areas in science and technology that have high importance for fundamental science and practical applications. Bioelectronics is a scientific and technological area that includes electronic coupling of biomaterials (enzymes, DNA, recognition proteins, biological cells) with electronic devices. The bioelectronic systems can be used to develop sensing devices (enzyme-based biosensors, DNA sensors, immunosensors, etc.) and to develop biofuel cells (implantable biofuel cells for biomedical applications, self-powered biosensors, autonomously operated devices). New methods and new materials (functionalized nanoparticles, quantum dots, carbon nanotubes, etc.) developed due to the tremendous recent success in nanotechnology pave the way for the novel possibilities to couple biomaterials and electronic transducers, thus resulting in the new technological field named Bionanotechnology. The students will be introduced into the most important areas of Bioelectronics and Bionanotechnology. Prerequisites: CM372, CM460. Credits: (3), Graded, Semester Calendar Lecture, Given When Needed

CM 467 Directed Research in Biochemistry
Students will carry out research in biochemistry under the supervision of a faculty member. Topics will be determined by faculty research programs. A formal report is required at the conclusion of the course. Credits: (1-3), Graded, Semester Calendar Research, Every Term

CM 468 Directed Study in Biochemistry
The study of a subject not otherwise available in biochemistry courses may be undertaken under the supervision of a faculty member. Credits: (1-3), Graded, Semester Calendar Independent Study, Every Semester

CM 469 Implantable and Wearable Bioelectronics
Chemistry CM469/569 is a lecture course designed to provide graduate students and advanced undergraduates with a working knowledge in the multidisciplinary research area of bioelectronics, giving particular information about implantable and wearable bioelectronics. The course will concentrate on concepts, experimental realizations and practical applications. This course covers novel areas in science and technology that have high importance for fundamental science and practical applications. Major science areas covered by the course will be in chemistry, particularly biochemistry and electrochemistry. Minor sub-areas studied in the course will be related to biomedical applications and electrical/electronic engineering. All studies in the course will not require any background knowledge except general chemistry and basics of biochemistry. The major topics covered by the class will be related, but not limited, to biosensors, biofuel cells, bioelectronic devices concentrating on the concepts rather than technical details. The course work for the graduate students will include oral presentations based on the provided books (electronic pdf file given to the students). The undergraduate students will be involved in the discussions on the topics covered by the graduate students and by the instructor. Overall, the oral presentations will be performed by graduate students only, while both categories (graduate and undergraduate students) will participate in the discussions on the topics. Credits: (3), Graded, Semester Calendar Lecture, Spring Terms

CM 470 Biochemistry & Biotechnology Laboratory
[Cross-listed with BY 470] This course is a one semester course in the fundamental laboratory approaches for biochemistry and biotechnology. While largely a hands-on course, laboratory experiments will be supplemented with lectures that integrate the theoretical and practical principals covered in the exercises. Topics include protein purification, characterization and analysis, enzyme kinetics and molecular modeling. Prerequisites: CM221 and CM223 or BY450/CM460, or consent of the instructor. Credits: (3), Graded, Semester Calendar Laboratory, Spring Terms Comm Points: 2

CM 471 Fundamental Chemical Kinetics
Basic principles. From stoichiometry and rate law to mechanism. Simple gas-phase reactions. Collision and transition-state theories. Temperature effects. Catalysis. Prerequisites: CM104 or CM132, MA132, or consent of the instructor. Credits: (3), Graded, Semester Calendar Lecture, Given When Needed

CM 472 Chemistry at Surfaces: Structure and Catalysis
This senior undergraduate and graduate course will survey the field of surface chemistry, with specific attention dedicated to the structure of solid surfaces and chemical processes at solid interfaces. This course will cover the basics of the structure of periodic solids, relate that understanding to solid interfaces, and finally address how surface structure and reduced dimensionality impact chemical reactions (i.e. heterogeneous catalysis). Analytical techniques common to this discipline will also be discussed. Graduate students will be assessed differently than undergraduates in this course. Graduate students will have the additional responsibility of delivering a presentation discussing one of several primary research articles germane to the field that were selected by the instructor, while undergraduate students will submit a paper describing one of these articles in detail. Prerequisites: CM371 and CM372, or consent of the instructor. Credits: (3), Graded, Semester Calendar Lecture,

CM 475 Sustainable Nanotechnology
The goal of this course is to provide graduate students and advanced undergraduates with a modern view of current and emerging research in nanotechnology. Topics will include: fundamental nanoscale properties and applications, green manufacturing and assembly in functional devices, interaction of nanomaterials with
biological systems, the physical and chemical phenomena at nano-bio interfaces, fate, transport and transformation of engineered nanomaterials, environmental and health impact, nanometrology, nanotoxicology and hazard identification of nano-based products. Development of analytical methods and characterization tools for assessing nanoscale properties and materials will also be discussed. Students will be exposed to interdisciplinary topics and an integrated training bridging material and environmental sciences with biology and analytical chemistry. Students will be able to demonstrate a basic awareness of risks and benefits of emerging technologies and evaluate overall environmental and societal impact.

Credits: (3), Graded, Semester Calendar
Lecture, Spring Semesters

CM 476  Atmospheric Chemistry
(Cross-listed with CE 477) The course will cover the evolution of the atmosphere from its initial formation to its natural background condition to its current state perturbed by human activities; detailed descriptions of the chemistry of the carbon, nitrogen and sulfur cycles; characterization of the atmospheric aerosol and its role in heterogeneous reactions and materials transport; stratospheric ozone and problems with its depletion; airborne radioactivity and its role in atmospheric ion chemistry. Prerequisites: CM370 or CM371 or ES340.
Credits: (3), Graded, Semester Calendar
Lecture, Spring Semesters

CM 477  Directed Research in Physical Chemistry
Students will carry out research in physical chemistry under the supervision of a faculty member. Topics will be determined by faculty research programs. A formal report is required at the conclusion of the course.
Credits: (1-3), Graded, Semester Calendar
Research, Every Term

CM 478  Directed Study in Physical Chemistry
The study of a subject not otherwise available in physical chemistry courses may be undertaken under the supervision of a faculty member.
Credits: (1-3), Graded, Semester Calendar
Independent Study, Given When Needed

CM 481  Computational Chemistry
(Cross Listed with CM581) Computational Chemistry is senior undergraduate and graduate course which will discuss theoretical and computational methods in chemistry and their applications. This course will include both lectures and computer lab. The lectures will introduce the fundamental theories and methods in chemistry and their applications in the cutting-edge research. The computer lab will be hands on tutorials on calculating the structures and properties of chemicals, exploring the reaction mechanisms, reactivities, and selectivities. The objectives of this course are: (1) to provide students with the basic background of computational methodologies and their applications. (2) to enhance their experiences with common computational methods by class project. (3) to encourage their creativity, critical thinking and problem-solving ability. Graduate students will have additional course work. Prerequisites: CM371 and CM372.
Credits: (3), Graded, Semester Calendar
Lecture, Even Fall Terms

CM 482  Information Processing by Chemistry
The course is composed of lectures and student presentations on signal-switchable chemical and electrochemical systems. These systems perform Boolean logic operations, memory function and control of bioelectronic devices, e.g., biofuel cells. Students will gain knowledge on chemical/biochemical systems of various complexity logically processing different input signals. Preparation of sensing switchable interfaces will be explained. Finally, bioelectronic systems processing information and operating as signal-switchable devices will be discussed.
Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed

CM 483  Introduction to Polymer Science
(Cross-listed with PH 483) This course is about fundamental aspects of polymer science. It introduces the world of chain molecules from synthesis and properties to applications. Basic knowledge from polymer chemistry and physics are combined in the one course in a form appropriate for undergraduates and graduates in chemistry, physics and engineering to develop the understanding of polymeric behavior in synthetic materials and natures. Prerequisites: Junior standing or permission of instructor
Credits: (3), Graded, Semester Calendar
Lecture, Spring Semesters

CM 484  Functional Polymer Systems
(Cross listed with CM584) This senior undergraduate and graduate course will introduce students to the world of polymer materials, which deliver concrete functions and may serve our daily life in our modern society. These polymer systems exist in different structural forms and can have multicomponents, including surfactants, fillers, etc. The role of the interfacial phenomena in controlling specific functions and materials performance is strongly emphasized in the course through the fundamentals of polymer and colloid science. Main modern tendencies in polymer advanced materials (nanocomposites, smart polymer materials, (nano)porous materials, membranes, biocompatible polymeric materials, applications of polymers in electrochemical energy devices, sensor design and actuator fabrication) are covered in the course. Students are encouraged to take CM483/CM583 before participation of this course. Graduate students will do additional work. Restriction: Senior standing or permission of the instructor
Credits: (3), Graded, Semester Calendar
Lecture, Odd Spring Terms

CM 485  Nanostructured Materials
(Cross-listed with PH 585) This course reviews the methods to make nanoscale building blocks and approaches to arrange the building blocks into functional architectures for advanced materials. The list of topics includes: chemical patterning and lithography, layer-by-layer self assembly, synthesis and self assembly of nanoparticles, nanotubes and nanowires, properties of nanoclusters and self assembled structures (photonic crystals, plasmonic effects, quantum dots, porous materials, biomimetics). Prerequisites: Senior Standing or consent of the instructor.
Credits: (3), Graded, Semester Calendar
Lecture, Odd Spring Semesters

CM 486  Industrial Chemistry
(Cross-Listed with CMS586/CH486/586)This course will benefit junior and senior undergrads plus grads in chemistry and chemical
engineering, and allow them to learn of real ways such talents are used in the professional world. It will involve different industrial chemists and chemical engineers to come to Clarkson University for each of 12 of the 14-weeks of a semester and give two lectures of about 1 hour 15 min each - one on an afternoon and the other following morning. The first lecture will relate the areas of chemistry their company was known for; the second lecture an in-depth discussion on how one project was carried out at the bench and the pitfalls that had to be resolved along the way to achieve success. The intent is to select lecturers from Clarkson Chemistry and Chemical Engineering major alumni at various lengths of time they have been professionals. Prerequisites: Junior or Senior Standing
Credits: (1), Graded, Semester Calendar
Lecture, Spring Terms

CM 487 Applications of Synchrotron and Electron Based Techniques
The purpose of the course is to familiarize all students with the x-ray and electron based experimental techniques available at Brookhaven National Lab and other similar facilities. Students will be cognizant of the applications of these cutting edge facilities, and well positioned to use them in their own research. This course is suitable for graduate students, postdocs, and advanced undergrads in physical sciences and engineering, as well as students in biological, environmental, and chemical sciences who may have the interest to learn more about the techniques they may use for their research. Prerequisites: PH132 or consent of the instructor; ES260 and/or PH231 are recommended prerequisites
Credits: (3), Graded, Semester Calendar
Lecture, Spring Terms

CM 491 Undergraduate Thesis
Research work to be arranged with the consent of a staff member who assists the student in the choice of a problem and in the planning and execution of work on it. For senior chemistry majors.
Prerequisite: consent of a department faculty member.
Credits: (6), Graded, Semester Calendar
Research, Fall Terms

CM 492 Undergraduate Thesis
A continuation of CM 491. A written thesis is required at the end of the course.
Prerequisite: consent of a department faculty member.
Credits: (6), Graded, Semester Calendar
Research, Spring Terms
Comm Points: 2

CM 495 Internship/Co-op in Chemistry & Biomolecular Science
Students will gain practical work experience in chemistry or biomolecular science under direction and supervision of professionals outside their department. Students must submit a formal report describing work performed as well as the Internship/Co-op learning opportunities. Report approval is required for the award of credit. Feedback will be provided by their Internship/Co-op field supervisor. This course will be graded on a pass/no-credit basis.
Credits: (1), P/NC, Semester Calendar
Independent Study,

CM 497 Directed Study
The study of a subject not otherwise available in formal courses may be undertaken under the supervision of a faculty member.
Credits: (1-3), Graded, Semester Calendar

Independent Study, Every Semester
CM 499 Directed Study
The study of a subject not otherwise available in formal courses may be undertaken under the supervision of a faculty member.
Credits: (1-3), Graded, Semester Calendar

Communications
COMM 1 (3, 5,...) Communication Elective
A college level course for which there is no comparable Clarkson course. Used for transfer credit only.
Credits: (2-4), Graded, Semester Calendar
Lecture, Transfer Credit Only

COMM 2 (4, 6,...) Communication Elective
A college level course for which there is no comparable Clarkson course. Used for transfer credit only. This course may be used to satisfy a Foundation Curriculum Humanities Requirement.
Credits: (2-4), Graded, Semester Calendar
Lecture, Transfer Credit Only

COMM 31 Communication Elective
Credits: (2-4), Graded, Semester Calendar
Lecture, Transfer Credit Only

COMM 33 Communication Elective
Credits: (2-4), Graded, Semester Calendar
Lecture, Transfer Credit Only

COMM 100 2D Digital Design
[Cross-listed with DA 100] [Formerly COMM 221] This introductory studio course explores many of the key principles, techniques and dialogues governing the creative potential of digital technologies within art and design. Topics of study include bitmap and vector-based digital imaging together with digital approaches to time-based media. The goal of the course is to empower students with an artistic and technological understanding of the subject, while encouraging an experimental approach to digital media.
Credits: (3), Graded, Semester Calendar
Lecture, Every Semester
IA
Comm Points: 1

COMM 101 Introductory Writing
Credit for this course is awarded only on the basis of an incoming student having taken a college-level introductory writing course at another college or university. The focus of this type of course is the teaching of writing itself, and typical titles include 'Freshman Composition,' 'Composition 1,' 'Expository Writing,' 'Freshman English,' and 'Writing and Critical Thinking,' among others. The two communication points associated with COMM101 can be counted toward the Clarkson Common Experience’s communication requirement.
Credits: (3), Graded, Semester Calendar
Lecture, Transfer Credit Only
Comm Points: 2
COMM 125 Social Media Analysis and Applications
Social Media Analysis and Applications introduces students to the global social media landscape. This course is geared toward understanding the functionality, impact, history, and precautions needed around various social media channels.
Credits: (1), Graded, Semester Calendar
Lecture, Given When Needed

COMM 126 Fundamentals of User Experience
In Fundamentals of User Experience (UX), students will be introduced to the core concepts of UX: user research, story mapping, wireframing, and interaction flows, and learn to design a user-centered interface or application.
Credits: (1), Graded, Semester Calendar
Lecture, Given When Needed

COMM 127 Foundations of Data Visualization
In Foundations of Data Visualization, students will study the essential principles of communicating visual information: rhetoric, graphic displays, interpretation, and misrepresentation, and learn to design an infographic.
Credits: (1), Graded, Semester Calendar
Lecture,

COMM 150 Making and Communicating Innovation
[Cross listed with IGN120]This course helps students learn how to develop innovative digital and physical technologies, from ideation to prototyping and pitching. Topics covered may include 3D modeling/printing, producing and editing audio and video pitches, and collaboratively writing and revising project reports. This hybrid course will include in-person as well as synchronous and asynchronous online sessions.
Credits: (1), Graded, Semester Calendar
Lecture, Spring Terms

COMM 190 Writing Center Tutor
Students will be introduced to Writing Center theory which includes collaborative learning, the writing process, rhetorical concepts, disciplinary genres, and interpersonal communication skills. Students will also apply these concepts by conducting writing conferences with members of the Clarkson community. In the process, students will deepen their understanding of the dynamics of interpersonal communication, develop their writing skills and their knowledge of writing in the disciplines.
Prerequisite: Admission by invitation from the Director of the Writing Center. Students may enroll in COMM190 only twice.
Credits: (0), P/NC, Semester Calendar
Independent Study, Every Semester
Comm Points: 1

COMM 210 Theory of Rhetoric for Business, Science, and Engineering
[Formerly TC 210] This course introduces students to a rhetorical perspective of communication. Students will develop their abilities to: identify and analyze communication problems and issues in a given context; develop effective arguments; and communicate with others using various communication media (written, electronic, oral, visual). The course contains a substantial reading component, as well as instruction, practice, and feedback in writing and speaking.
Credits: (3), Graded, Semester Calendar
Lecture, Fall Terms

COMM 217 Introduction to Public Speaking
This lecture and laboratory course is designed to enhance the individual’s effective public communication by giving him or her a variety of speaking roles in different situations. The objective of the course is to develop an awareness of the speaking potential of each student with emphasis on listening ability, nonverbal behavior, idea organization and effective use of language and visual aids.
Credits: (3), Graded, Semester Calendar
Lecture, Every Semester
Comm Points: 2

COMM 219 Introduction to Social Media
This course is geared toward understanding and utilizing the various social media channels for personal, professional and community benefit. In this course we will: Assess a variety of social media channels, examine successful users of new media, construct/refine our social media presence, relate social media attributes to our future paths, understand the social media climate through current articles, case studies, readings, and reports, Skype with industry professionals to gain varied insight, create a social media campaign to help spread awareness on some component of Clarkson University, understand how some component of social media campaigns could impact your future aspirations.
Credits: (3), Graded, Semester Calendar
Lecture, Fall Terms
IG
Comm Points: 2

COMM 226 Short Film Screenwriting
[Cross-listed with FILM 226] In this course, you will learn the process of writing short screenplays for narrative fiction films of any genre. Short films can be anywhere from 30 seconds to 40 minutes long, though the majority of them fall between seven and fifteen minutes. Each student will complete two short scripts and then revise one of these from the ground up. Since this is a workshop, you are expected to comment thoughtfully on your classmates’ work, as they will comment thoughtfully on yours. Though there is some reading in this course, your primary concern should be writing, writing, writing!
Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed
IA
Comm Points: 2

COMM 229 Principles of User-Experience Design
This course introduces the processes and practices of user experience design (UXD) as it applies to websites, applications, and product development, and includes grounding in theories and techniques for developing websites, user-interfaces, media artifacts, and products. Students think critically about and practice design thinking and iteration, analyze and theorize design choices, communicate ideas in multimedia, collaborate with others, perform research, hypothesize, conduct tests, and report data. By the end of the course, students will have a solid understanding of major user-experience design methodologies.
Credits: (3), Graded, Semester Calendar
Lecture, Spring Terms
IA (TECH)
Comm Points: 2
COMM 245: Writing for Media
Writing for Media helps students learn to write for a diverse range of media and genres, including traditional areas such as journalism and social media. Students will develop skills at analyzing communication needs in diverse contexts; writing communications that work effectively for readers, viewers, listeners, and users in those contexts. Students will also learn how to adapt their own skills to emerging media in the future.
Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed IA

COMM 310: Mass Media and Society
This course consists of readings in and analysis of modern media communication and its influence. It includes the history of the media, media control, and various media effects on special audiences and on the development of other media. The course centers on an analysis of how society controls the media and how the media controls society. The course is based on discussion of opinion pieces and other readings.
Credits: (3), Graded, Semester Calendar
Lecture, Every Semester UNIV/EC/IA

COMM 312: Public Relations
This course will introduce students to the history, nature, theory and practice of public relations in the United States by examining the activities of public relations professionals and firms. Attention will be given to the communication process and how persuasion is employed to influence various publics via traditional PR strategies and approaches, as well as how emerging media are changing current practice in various fields (e.g., health care, entertainment, government, and non-profits). Frequent practical exercises, communication tasks, and activities could include developing written and/or video press releases, maintaining a blog, running a press conference, planning events for a PR campaign in coordination with a client’s goals, creating ‘press kits,’ developing strategies for building relationships with the media, developing a crisis communication plan for an organization, and associated oral presentations.
Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed Comm Points: 2

COMM 313: Professional Communication
This course presents students opportunities to learn how to design and present effective professional documents. The course emphasizes a rhetorical approach to analyzing the issues and details important to the communication to be produced (e.g., audience, style, format, purpose). Students will practice writing both individually and collaboratively and will be expected to present their work orally on occasion. Students will encounter topics such as, but not limited to, abstracts, email, instructions, letters, memoranda, proposals, and various types of reports. Students of any major may take this course.
Prerequisites: Must have junior or senior standing.
Credits: (3), Graded, Semester Calendar
Lecture, Spring Terms Comm Points: 2

COMM 314: Placemaking, Marketing and Promotion
This course includes a foundational understanding of the construct of Placemaking or the ways in which people in places at various geographic scopes (neighborhood, community, town, or region) explore collaboratively their needs and develop planning and entrepreneurial strategies for more livable, sustainable and productive communities. This exploration interrogates multiple disciplines and fields including physical geography, architecture, community planning, sustainability certification programs (e.g., LEED), civic engagement, entrepreneurship, regulatory frameworks, as well as current trends in the literature and practice. A focus will also be on Creative Placemaking initiatives that put artists and The Arts at the forefront of community development. The course also builds on this foundation to examine the various ways in which communities utilize Placebranding as well as Marketing and Promotional Strategies to reach their goals including tourism, residential growth and sustainable, economic development.
Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed UNIV/EC/IA Comm Points: 1

COMM 315: STEAM Journalism
Writing is one of the most varied fields in the modern workforce. From full-time and freelance journalists covering breaking news – to media writers and PR professionals working in-house to tell organizational stories across multi-media and even technical genres, the role of “writer” is complex and diverse. What has become more evident with advances in technology is that writers in these wide-ranging capacities, whose task is to illuminate stories about science, technology, engineering and math (STEM), have something in common: integration of the “Arts” (the addition of “A”) to deepen and contextualize stories embedded in technical information and data. These approaches take the form of creative practices, elements, design principles, and standards, to foster inquiry, collaboration, and emphasis on process-based writing. This course introduces students to journalism, field and practice, and the ways in which journalism is evidenced in writing roles and functions in organizations and media production. Students will focus experientially on developing and improving their journalistic capabilities -- from interview and writing -- to editorial review to final deliverable, using creative processes and design thinking, covering STEM topics of interest. Special attention will be paid to understanding, integrating and communicating data via stories and infographics, and students will propose individualized stretch projects in which they can tackle something unique and personally challenging in the journalism genre.
Credits: (3), Graded, Semester Calendar
Lecture, Comm Points: 2

COMM 316: Health Communication
This course explores topics at the intersection of health communication and health promotion. We will explore research, theory, and practice across levels of communication (i.e., interpersonal, organizational, intercultural, mass) and evidence for their influence on health behaviors and outcomes. Relevant topics include health information seeking, patient-provider interactions, social support (i.e., patient-patient & patient-caregiver dyads), and communication within healthcare organizations conducted in-person or through mediated environments (e.g., telehealth, social media, virtual reality). Strong attention will be paid to the role of
communication in health disparities relevant to culture, rurality, and literacy.
Credits: (3), Graded, Semester Calendar
Lecture,

COMM 322  Typography and Design
This course introduces students to typography as a design discipline. We will discuss the history and current state of typography, analyze the ways that type and design contribute to different meanings, and produce specific designs using type and other graphic elements in print and online forms. Prerequisites: COMM/DA 100 or DA120
Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed
IA
Comm Points: 2

COMM 326  Feature Film Screenwriting
In this course, you will learn the process of writing a feature-length screenplay. You will devise an original story idea, craft intermediate documents (i.e. logline, treatment, and beat sheet), and then write a first draft. Our goal is to complete a polished draft (most screenplays go through at least a dozen revisions), but rather to execute a full draft in proper screenplay format that hits all the dramatic turning points, fleshes out characters and dialog, and leaves you will a document ready for substantive revision - now that you know what you’re writing. Since this is a workshop, you are expected to comment thoughtfully on your classmates’ work, as they will comment thoughtfully on yours. Along the way, you will read several professional scripts and complete a brief critique of each. We will also learn about the profession of screenwriting, including what to do with finished scripts, how to seek representation, and what the Writers Guild of America is. Though there is a good amount of reading in this course, your primary concern should be writing, writing, writing!
Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed
IA
Comm Points: 2

COMM 327  Digital Video Production I
This course presents students with a hands-on opportunity to gain knowledge and experience in digital video production. The focus of this course will be on mastering the technical fundamentals of video production: recording high quality video and audio, lighting, editing, and color grading. Students will work alone and in small teams to produce video projects throughout the semester and will have the opportunity to gain experience in the entire video production process from conceptual development through video delivery. Emphasis will be on practical exercises with material presented via lectures, discussions, and hands-on practice.
Credits: (3), Graded, Semester Calendar
Lecture, Fall Terms
IA
Comm Points: 1

COMM 328  Video Production with Impact
Video production with impact is a hands-on video production course where students learn how to produce high quality scripted and unscripted videos for different professional and creative applications. The class will focus on the creative skills related to communicating ideas clearly and effectively through video. Students will leave the class with a demonstrated ability to write, film, and editing compelling and impactful video content. The class will teach basic technical skills, but the emphasis will be on professional communication and creative problem solving.
Credits: (3), Graded, Semester Calendar
Lecture, Spring Terms

COMM 329  Front-End Development for the Web
This course focuses on the technical, rhetorical, and critical knowledge necessary to produce web and mobile applications, focusing especially on developing proficiency with the core technologies: HTML5, CSS3, and JavaScript (including frameworks, pre-processors, and script libraries). Students will invent, critique, and develop standards-compliant websites and applications, write and debug code, produce visual and informational designs, collaborate with others, and articulate principles of workflow, user-experience, and design. (COMM 229 recommended but not required.)
Credits: (3), Graded, Semester Calendar
Lecture, Fall Terms
(TECH)
Comm Points: 1

COMM 330  Science Journalism
Popular media has a tremendous influence on the production and reception of modern science. News and magazine articles, television shows, and movie documentaries influence public policy on science, research funding, the general public’s interest in and understanding of scientific research, and even young people’s willingness to choose a career in science. Drawing on student research experience in undergraduate science, students will learn about reporting science using a range of approaches and media. The class will investigate the influence popular accounts of science have on multiple audiences including specialist and non-specialist groups. Assignments will challenge students to understand the societal implications of scientific research and to identify and address different constituent positions and interests. Prerequisites: COMM210 and six (6) hours of a science, or permission of the Comm & Media department
Credits: (3), Graded, Semester Calendar
Lecture, Spring Semesters
STS
Comm Points: 2

COMM 345  Information Design
Information Design explores ways to structure complex data into usable information in genres including websites, computer interfaces, information visualizations, charts, interactive media, and more. Drawing on theories and practices from disciplines including communication theory, cognitive psychology, visual theory, and new media, students will learn to understand users and their contexts, select appropriate media and genres, and design effective and efficient informational texts.
Credits: (3), Graded, Semester Calendar
Lecture, Odd Fall Terms
IA
Comm Points: 2
COMM 347  Design Thinking
In this practice-based course, students will learn how to apply Design Thinking frameworks, methods, and tools to problems within their discipline(s). They will also learn about Design Thinking's strengths and weaknesses, and how it varies across different industries and cultures.
Credits: (3), Graded, Semester Calendar
Lecture, Spring Terms
IA
Comm Points: 2

COMM 360  Sound Design
This course covers basic audio production including topics such as acoustics, microphones, speakers, amplification, effects, recording, and editing. Students will learn methods for recording, editing, and mixing music and spoken word as well as basic sound design for movies and video games. The course will include reading about concepts and practices as well as extensive hands-on work in the studio.
Credits: (3), Graded, Semester Calendar
Lecture,
IA (TECH)
Comm Points: 2

COMM 375  Product Design
Provides students with a framework for developing consumer products ranging from interfaces to physical products. The course covers fundamentals of product design, user needs analysis, competition assessment, ideation, critique, and virtual and physical prototyping.
Credits: (3), Graded, Semester Calendar
Lecture, Fall Terms
UNIV/IA/STS
Comm Points: 2

COMM 391  Special Topics Course
These courses reflect ongoing developments in communication practice and theory, often related to the particular faculty member’s research interests.
Prerequisites: one course in communication or consent of the instructor.
Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed

COMM 392  Special Topics Course
These courses reflect ongoing developments in communication practice and theory, often related to the particular faculty member’s research interests.
Prerequisites: one course in communication or consent of the instructor.
Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed

COMM 393  Special Topics Course
These courses reflect ongoing developments in communication practice and theory, often related to the particular faculty member’s research interests.
Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed

COMM 394  Special Topics
These courses reflect ongoing developments in communication practice and theory, often related to the particular faculty member’s research interests.
Credits: (3), Graded, Semester Calendar
Lecture, Spring Semesters

COMM 395  Special Topics
These courses reflect ongoing developments in communication practice and theory, often related to the particular faculty member’s research interests.
Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed

COMM 410  Theories and Philosophies of Communication
This course explores a range of approaches to understanding human communication, including work from communication, philosophy, cognitive science, social science, and more. Through extensive reading, discussion, and writing, students investigate how people communicate—and miscommunicate—with each other as individuals and communities.
Credits: (3), Graded, Semester Calendar
Lecture, Fall Terms
IG
Comm Points: 1

COMM 412  Organizational Communications and Public Relations Theory
This course examines the nature of the organization and the strategic communication processes that build relationships between organizations and their publics. Through assigned readings, lectures, and class discussion and analysis, students are exposed to communication theory and trends relevant to the workplace. Students will examine the communicative implications of such topics as organizational structure and goals; corporate culture; managerial schools of thought; leadership styles; superior-subordinate relationships; and communication consulting. In addition, students will address communicative implications in a changing economy; employee loyalty and dissent; gender and the workplace; and corporate image in crisis situations. This course seeks to provide students with insight into the organizational context, not only to make them more effective communicators but also to help them make informed choices in their careers.
Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed
IG
Comm Points: 1

COMM 415  STEAM Journalism
Writing is one of the most varied fields in the modern workforce. From full-time and freelance journalists covering breaking news – to media writers and PR professionals working in-house to tell organizational stories across multi-media and even technical genres, the role of “writer” is complex and diverse. What has become more evident with advances in technology is that writers in these wide-ranging capacities, whose task is to illuminate stories about science, technology, engineering and math (STEM), have something in common: integration of the “Arts” (the addition of “A”) to deepen and contextualize stories embedded in technical information and data. These approaches take the form of creative practices, elements, design principles, and standards, to foster inquiry, collaboration, and
emphasizes process-based writing. This course introduces students to journalism, field, and practice, and the ways in which journalism is evidenced in writing roles and functions in organizations and media production. Students will focus experimentally on developing and improving their journalistic capabilities—"from interview and writing to".

COMM 420 Communication: Independent Study
Designed primarily for a student who wishes to pursue special interests in communication for one or more semesters, this series of courses allows individual students to define independent study projects. Prerequisites: one course in communication, consent of the instructor. Credits: (1-9), Graded, Semester Calendar
Independent Study, Every Semester

COMM 421 Communication: Independent Study
Designed primarily for a student who wishes to pursue special interests in communication for one or more semesters, this series of courses allows individual students to define independent study projects. Prerequisites: one course in communication, consent of the instructor. Credits: (1-9), Graded, Semester Calendar
Independent Study, Every Semester

COMM 422 Communication: Independent Study
Designed primarily for a student who wishes to pursue special interests in communication for one or more semesters, this series of courses allows individual students to define independent study projects. Prerequisites: one course in communication, consent of the instructor. Credits: (1-9), Graded, Semester Calendar
Independent Study, Every Semester

COMM 423 Communication: Independent Study
Designed primarily for a student who wishes to pursue special interests in communication for one or more semesters, this series of courses allows individual students to define independent study projects. Prerequisites: one course in communication, consent of the instructor. Credits: (1-9), Graded, Semester Calendar
Independent Study, Every Semester

COMM 424 Communication: Independent Study
Designed primarily for a student who wishes to pursue special interests in communication for one or more semesters, this series of courses allows individual students to define independent study projects. Prerequisites: one course in communication, consent of the instructor. Credits: (1-9), Graded, Semester Calendar
Independent Study,

COMM 425 Communication: Independent Study
Designed primarily for a student who wishes to pursue special interests in communication for one or more semesters, this series of courses allows individual students to define independent study projects. Prerequisites: one course in communication, consent of the instructor. Credits: (1-9), Graded, Semester Calendar
Independent Study, Given When Needed

COMM 427 Digital Video Production II
COMM 427 builds on the concepts and skills learned by students in COMM 327 (Digital Video Production I). This is a hands-on course that will include: conceptual, aesthetic and technical production of the film-style, single-camera, 30-second segment; instructional and training program development; and live multi-camera studio production for interactive video teleconferencing and streaming media on the WWW. Although a text will be used, emphasis will be on practical exercises, with students frequently working in small teams. Prerequisites: COMM 327, or permission of the Comm & Media department Credits: (3), Graded, Semester Calendar
Lecture, Spring Semesters
Comm Points: 2

COMM 428 Environmental Communication
This course focuses on the intersection of theory, environmental challenges and communication; specifically, the ways in which varied people and stakeholders identify, label, frame, shape, and convey these challenges, as well as the ways in which they make decisions and policies in the public sphere at varied scales and levels of governance, and in the face of risk and uncertainty. Exploration includes historic and contemporary environmental movements, key leaders and figures, environmental law and seminal policy frameworks, including agencies and institutions, and the ways in which we are grappling with current challenges through communication mediums and changing media. Students will engage in critical reading, case studies, discussion, and research, as well as guest speaker presentations and field trips when possible. Credits: (3), Graded, Semester Calendar
Lecture, Spring Terms
UNIV/CGI/STS

COMM 429 Full-stack Development
This course focuses on systematically developing and deploying web technologies in contexts ranging from the personal to the professional. Students will develop with major back-end technologies and learn the related disciplines of server administration, content management, information architecture, and scalable application development. By the end of the course, students will be able to build and deploy applications, write and debug server-side code, design, implement, and administer content management systems, and plan and manage large-scale development projects. The primary
languages students will develop facility with include PHP, SQL, Javascript, and Ruby (as well as HTML5 and CSS3). Prerequisite: COMM329
Credits: (3), Graded, Semester Calendar
Lecture, Spring Terms

COMM 447 Advanced Design Thinking
This course focuses on design frameworks, processes, and tools for invention, innovation, and change. With their emphasis on out-of-the-box thinking, creativity, and originality, these frameworks both build on and go beyond the Design Thinking methods taught in COMM347. Examples include Double Diamond Design, Frame Innovation, and Far Field Design. During the semester, you will find and solve several challenges within your chosen area(s) of interest. In keeping with a design orientation, classes will follow a studio format, where studio entails creatively making to learn in hands-on ways.
Credits: (3), Graded, Semester Calendar
Lecture, Fall Terms
IG
Comm Points: 2

COMM 448 Portraying Innovation
This practice-based course focuses on how to effectively communicate innovation and invention across disciplines and sectors (e.g., engineering, sciences, the arts, business, creative industries, public sector). Photography, videography, narrative methods, and portrait theory will be used throughout.
Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed
(TECH)
Comm Points: 2

COMM 449 Narrating Innovation
This course focuses on innovation from a design-led perspective. During the semester, you will find and solve several innovation challenges within your chosen area(s) of interest. Relative to “design” we will use a number of design lenses, ranging from easy to difficult, and from incremental to frame-changing. In keeping with a design orientation, classes will follow a studio format, where studio entails “creatively making to learn in hands-on ways.” Hands-on means that you will work on challenges using both 2D and 3D methods (e.g., modeling, prototyping, enacting). “Innovation” can be defined in many ways; here we will broadly think of it as both inventive (coming up with original, creative solutions) and potentially generative (creates some kind of good—societal, commercial, or otherwise).
Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed
Comm Points: 2

COMM 450 Leading Innovation
Today's emphasis on 'innovation everywhere' has created a big need for people who can lead others around innovation. The questions around this are many—for example, how to lead innovation efforts within teams, R&D settings, new ventures, organizations of all kinds, and how to enact the role of Chief Innovation Officer. This course assumes that effective innovation leadership requires inspiration, creative direction and vision, finding ways to effectively communicate this, and finding ways to get others on board. With this, the course examines how to artfully create innovation vision, fashion innovation narratives and styles, communicate these through multiple means and media, and effectively design innovation systems. The course uses a studio-based, live-case format where you will take a challenge that an actual innovation leader is facing, creatively work on it using arts-based methods within a studio format, present your solutions to the relevant stakeholders, and get feedback on your ideas. We will work on innovation leadership cases from a variety of settings; e.g., technology companies, creative industries, eco-focused & sustainability enterprises, social enterprises, manufacturing, and retail.
Credits: (3), Graded, Semester Calendar
UNIV/IA/IG
Lecture, Given When Needed
Comm Points: 2

COMM 470 Communication Internship
These internships are designed to provide practical work experience for the communication major or concentration student. Students work with a professional on communication projects areas such as public relations, publication design, advertising, editing, or digital media design. Students can earn credit for only one course for each internship experience.
Credits: (3), Graded, Semester Calendar
Independent Study, Given When Needed

COMM 480 Undergraduate Teaching Assistantship in Communication & Media
Students assist a faculty member in teaching a Communication & Media course. Students engage in substantial pedagogical work beyond mastery of the target course material. Such activities might include mentoring students in course work, leading class discussions or demonstrations, designing or assessing course modules.
Prerequisites: the student will have already taken the course in a previous semester or receive consent from the instructor.
Credits: (1-3), Graded, Semester Calendar
Independent Study

COMM 490 Advanced Communication Internship
These internships are designed to provide practical work experience for the junior or senior communication major or concentration student. Generally, students work with a professional on communication projects in the fields such as web development, public relations, publication design, advertising, editing, or digital media design and production. Prerequisites: Junior or Senior Standing
Credits: (3), Graded, Semester Calendar
Independent Study, Every Term

COMM 499 Senior Project
Students will plan and complete a complex, large communication project over the course of a full semester with ongoing feedback from peers and faculty. The course culminates in an exhibition during commencement week. Prerequisites: Senior Standing
Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed
Computer Science Elective

CS 1 (3, 5, ..., 10)  Introduction to Computer Science I
A college level course for which there is no comparable Clarkson course. Used for transfer credit only. Check with major department to determine whether credits count toward graduation.
Credits: (2-4), Graded, Semester Calendar
Lecture, Transfer Credit Only

CS 2 (4, 6, ..., 10)  Introduction to Computer Science II
A college level course for which there is no comparable Clarkson course. Used for transfer credit only. This course may be used to satisfy a Programming Foundation Curriculum Requirement.
Credits: (2-4), Graded, Semester Calendar
Independent Study, Transfer Credit Only

CS 141  Programming Languages
This course is an introduction to basic concepts of computer science, with emphasis on programming. It is a primary tool for implementing algorithms in computer science. Fundamental techniques for software design and implementation will be covered and these concepts demonstrated in a programming language like C++. Additional topics include top-down modular design, developing general-purpose software tools, procedural and data abstraction, algorithms, and an introduction to recursion and dynamic data structures. The course consists of three hours of lecture and a one hour computer laboratory session per week.
Credits: (4), Graded, Semester Calendar
Lecture, Laboratory, Every Semester

CS 142  Computer Organization
An introduction to computer organization and assembly language programming. Topics include the functional organization of computer hardware; data representation, and computer arithmetic; instruction sets, addressing modes and low-level I/O. Introduces machine and assembly language, and systems programming techniques in the programming language C. This course serves as a foundation for courses on operating systems, compilers, networks, and computer architecture. Prerequisites: CS 142 or equivalent
Credits: (3), Graded, Semester Calendar
Lecture, Spring Semesters

CS 241  Advanced Programming Concepts in Java
This course builds upon the foundation topics covered in CS 142, and covers concepts and skills required for real-life, modern programming. Topics will include basic object-oriented programming design, graphical user interfaces (GUIs), exception handling, multithreading and synchronization, networking, and client/server applications. The programming language Java with its companion OOP/GUI libraries will be used to illustrate these topics. This course will emphasize team programming on a large-scale project with a realistic deadline.
Prerequisites: CS142, EE262, or EE361
Credits: (3), Graded, Semester Calendar
Lecture, Fall Terms

CS 242  Automata Theory and Formal Languages
[Cross-listed with MA 345] This course gives an introduction to formal languages and their relation to automata. Topics include deterministic and non-deterministic finite automata, regular expressions and languages, closure properties and decision procedures for context-free languages, recursive and recursively enumerable sets, Turing machines, and decidability. Some aspects of computational complexity may also be explored.
Prerequisites: CS 142, EE262, or EE361, and MA211
Credits: (3), Graded, Semester Calendar
Lecture, Fall Terms

CS 244  Algorithms and Data Structures
The primary goal of this course is to build on the programming skills gained in CS 141 and 142 to introduce students to more sophisticated algorithms and data structures and the notion of algorithm design. The course also introduces the basic formalism and concepts used in the analysis of algorithms. The relative efficiency of the algorithms studied is estimated by informal application of these ideas. The algorithms and data structures discussed include those for sorting and searching, pattern matching, set representation, graph problems, dynamic programming and others. Programming exercises based on ‘realistic’ applications help students to understand the often difficult process of reducing a real-world problem to a standard algorithmic question.
Prerequisites: CS142 or EE262 or EE363, and MA132
Credits: (3), Graded, Semester Calendar
Lecture, Spring Terms

CS 341  Programming Languages
This course examines the major paradigms underlying modern programming languages. The course currently focuses on object-oriented and logic programming. The rationale of the paradigms is discussed along with typical programming idioms used with them. Programming exercises are used to illustrate concepts—the course does not aim to make students proficient programmers in all the languages that will be studied.
Prerequisites: CS142, EE262, or EE361
Credits: (3), Graded, Semester Calendar
Lecture, Fall Terms

CS 344  Software Design and Development
Working in teams, students will learn tools and strategies for designing and implementing medium/large software projects. Suitable project ideas will be solicited from the community in order to match student teams with real users where possible. Students will learn to elicit requirements from users and to work in an effective team. Students will learn and practice techniques for software testing including black-box testing, stress testing, performance testing, code reviews, and code coverage tools. Students will produce...
Undergraduate Level Courses

documentation that is appropriate at various stages in the software life cycle including for example, requirements documents, project plans and user manuals. The work will include oral presentations and written reports. Prerequisites: CS344 or CS242.
Credits: (3), Graded, Semester Calendar
Lecture, Fall Terms, Comm Points: 2

CS 407 Directed Study in Computer Science
This is a directed study course that will allow the student the opportunity to pursue special interests in Computer Science.
Credits: (1-15), Graded, Semester Calendar
Research, Given When Needed

CS 408 Directed Study in Computer Science
This is a directed study course that will allow the student the opportunity to pursue special interests in Computer Science.
Credits: (1-15), Graded, Semester Calendar
Research, Given When Needed

CS 411 Directed Study in Applied Computer Science
This is a directed study course that will allow the student the opportunity to pursue special interests in Applied Computer Science.
Credits: (1-15), Graded, Semester Calendar
Independent Study, Given When Needed

CS 412 Directed Study in Applied Computer Science
This is a directed study course that will allow the student the opportunity to pursue special interests in Computer Science.
Credits: (1-15), Graded, Semester Calendar
Research, Given When Needed

CS 442 Computational Complexity
The complexity of a computational problem is the amount of computer resources it requires. Computational complexity theory studies the complexity of computational problems as well as relationships between different types of resources. This course will cover both classical and research-related topics in computational complexity, such as: complexity measures and complexity classes for sequential machines and Boolean circuits, reductions and completeness, hierarchy theorems, relativization, circuit complexity, and proof complexity. Prerequisites: CS345 or equivalent MA345.
Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed

CS 444 Operating Systems
This course is an introduction to the concepts of operating systems, their structures and organization. Major topics include process management (asynchronous processes, interprocess communication and synchronization, multithreading, deadlock and starvation, scheduling), storage management (paging/segmentation, virtual memory, file systems), protection and security issues, and an introduction to distributed systems. To demonstrate these concepts, case studies of operating systems will be presented, and a programming project will be an integral part of the course. Prerequisites: CS 344; and CS241 or EE360 or EE264
Credits: (3), Graded, Semester Calendar
Laboratory, Spring Semesters

CS 445 Compiler Construction
A study of compiler design. Overview of the compilation process. Formal definition of syntax, lexical scanning, parsing including LL and LR grammars, run-time structures, intermediate code generation, and storage allocation. Students are expected to develop a compiler for a substantial subset of a high-level language using compiler tools such as lex and a compiler yacc. Prerequisites: CS344, CS345, CS241 and CS341
Credits: (3), Graded, Semester Calendar
Lecture, Spring Terms

CS 447 Computer Algorithms
[X-Cross-listed with MA 447] This course will study and contrast a variety of computational algorithms and develop tools for algorithm analysis. Methods and topics such as dynamic programming, greedy algorithms, graph algorithms, circuits, parallel algorithms, matrix and polynomial algorithms, string matching, and geometrical algorithms will be explored. The theory of NP-completeness and methods of managing NP-complete problems will also be covered. Prerequisites: CS344 and MA211
Credits: (3), Graded, Semester Calendar
Lecture, Fall Terms

CS 449 Computational Learning
[X-Cross-listed as MA 449] Computational learning studies algorithmic problems for inferring patterns and relations from data. This course describes the mathematical foundations of learning and explores the important connections and applications to areas such as artificial intelligence, cryptography, statistics, and bioinformatics. A list of relevant topics may include perceptron and online learning, graphical models and probabilistic inference, decision tree induction and boosting, analysis of Boolean functions, sample complexity bounds, cryptographic and complexity hardness, and reinforcement learning. Basic ideas from computer science and mathematics are employed to describe the main ideas and major developments in computational learning. Prerequisites: CS344 and CS345, or consent of the instructor.
Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed

CS 451 Artificial Intelligence
This course is a comprehensive introduction to core concepts in artificial intelligence and surveys active research areas. Fundamental ideas in knowledge representation and search will be emphasized. Methods for encoding knowledge will include predicate logic, production rules, semantic networks, frames and other schemata. Data-driven and goal-driven search strategies will be covered, along with heuristic search algorithms. Additional topics will be drawn from knowledge-based systems, reasoning under uncertainty, planning, natural language understanding, neural networks and learning. Throughout the course, students will learn AI programming techniques and applications using languages such as LISP or Prolog. Prerequisites: CS344 (CS250 and CS341 recommended)
Credits: (3), Graded, Semester Calendar
Lecture, Spring Semesters

CS 452 Computer Graphics
[X-Cross-listed with EE 465] An introduction to computer graphics. Graphics hardware, algorithms for generating and displaying two and three-dimensional geometric figures, animation, interactive displays.
Programming projects using OpenGL will be assigned. Prerequisites: CS142 or EE361, and MA232 or MA239 (or MA339 as a corequisite) Credits: (3), Graded, Semester Calendar
Lecture, Spring Terms

**CS 455  Computer Networks**

[Cross-listed with EE 407] This course covers layered networking protocols with an emphasis on common Internet protocols such as TCP, IP, HTTP, and SMTP. It also covers local area networking, focusing on link layer standards such as the IEEE standards for Ethernet and wireless. Additional topics such as security and congestion control will also be covered. EE407 and CS455 are offered each fall as one course with multiple listings. Prerequisites: One of course in computer architecture (EE264, CS241 or IT502 or equivalent). One course in computer programming (EE261, CS141 or equivalent.) Note: IT501 also satisfies the programming requirement.
Credits: (3), Graded, Semester Calendar
Lecture, Laboratory, Fall Semesters

**CS 456  Cryptography**

[Cross-listed with MA 456] Cryptography is the discipline which studies the making of 'secret' codes. This course will examine some of the methods of cryptography together with many surprising applications. The language of modern cryptography is primarily number theory, and various tools of number theory will be developed as needed. No background in number theory or cryptography will be necessary, but some mathematical sophistication and familiarity with proofs will be assumed. Topics will include: one-way functions, public-key cryptosystems, digital signatures, probabilistic encryption, primality testing, interactive proof systems, and methods of secret sharing. Prerequisites: CS142, EE262, or EE361, and MA211 (CS 344 recommended)
Credits: (3), Graded, Semester Calendar
Lecture, Spring Terms

**CS 457  Computer and Network Security**

[Cross-listed with EE 410] Attacks on networked computer systems are an increasingly important problem. This course covers the types of vulnerabilities that are present in modern computer systems and the types of malicious software that exploit these vulnerabilities. It also covers best practices for preventing, detecting and responding to such attacks including anti-virus software, defensive programming techniques, intrusion detection systems, honeypots and firewalls. Prerequisites: A general course in computer networking such as CS455/555 or EE407/507. Programming experience to the level of CS142 or EE361.
Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed

**CS 458  Formal Methods for Program Verification**

Formal methods are algorithms and techniques that actually prove that a program meets its design criteria, and are the only way to guarantee that a program works correctly. As computer software increases in size and complexity, formal methods are becoming an essential part of software engineering. This is especially true of safety critical and life critical systems, where software errors can have life threatening consequences. Until recently, formal methods have had limited application because they were difficult to use. This is changing, and they are receiving greater acceptance from software engineers in industry and government. This course introduces students to the basic concepts and methods of program verification.
A variety of techniques and tools will be covered, and students will gain experience in applying the tools to actual programs. After completing the course, students will have sufficient expertise to learn new methods as they become available. Prerequisites: MA211 or MA346; and CS344
Credits: (3), Graded, Semester Calendar
Lecture, Spring Semesters

**CS 459  Human-Computer Interaction**

This course provides an introduction to the field of human-computer interaction (HCI). This discipline focuses on the design, evaluation and implementation of interactive computing systems from a user's point of view. The course will give a broad overview of the ideas, techniques, and tools in the subject, with a systematic approach to designing visual interfaces and evaluating their effectiveness. Case studies of existing interfaces, technologies, and data display methods will be discussed and critiqued. Topics include: programming and command languages; menus and forms graphical user interfaces, computer-supported cooperatorative work, information search and visualization; input/output devices; and display design. A collaborative course project will explore issues in HCI and design.
Prerequisites: CS242 or EE408
Credits: (3), Graded, Semester Calendar
Lecture, Fall Terms

**CS 460  Database Systems**

[Cross-listed with EE 468] An introduction to database systems. The entity-relationship and relational models are presented and applied to the design of typical databases. New developments in object-oriented and multimedia databases are presented. Emphasis will be placed on database design for applications in the context of an existing database management system such as ORACLE or ACCESS.
Prerequisites: Programming experience in a high-level language
Credits: (3), Graded, Semester Calendar
Lecture, Spring Semesters

**CS 461  Mixed Reality**

[Cross-Listed with CS561] This course provides an introduction to the mathematics and computing underlying virtual (VR) and augmented reality (AR). Students will learn stereo camera geometry for VR, recovery of 3D scene structure from images for content manipulation in AR, acquiring of illumination maps for photorealistic AR, and capture of human interaction for virtual environments. Students will perform several short and long projects as part of the course.
Prerequisites: CS142/EE361, and MA232/MA239 or corequisite of MA339.
Credits: (3), Graded, Semester Calendar
Lecture, Spring Terms

**CS 466  Blockchain Technologies**

Blockchain technologies are the underlying technological foundation of almost all digital currencies, such as Bitcoin and Ethereum. Without the need of a trusted authority or central server, Blockchain technologies can securely archive and are inherently resistant to modification of data. The course will cover the basics and advanced topics of Blockchain technologies. The basics include public key cryptography and cryptocurrency, hashing algorithms, mining process, proof of work, block structures, transactions and wallets. Advanced topics may include consensus algorithms, smart contracts, blockchain network security and applications. We will discuss the limitations of current applications and explore new systems and
propose solutions that overcome them. The course will offer many hands-on lab components and a blockchain-based course project. Students should already have had solid programming skills, such as C, C++ or Python, to take the course. Prerequisites: CS344

CS 469 Quantum Information and Computation
(Cross-listed with CS569 and MA469) This course studies information and computation based on quantum mechanical laws. The first part of the course will cover the relevant background in quantum information theory. A brief discussion of several universal quantum computational models will be given. The second part will cover algorithmic techniques important for developing quantum algorithms. Topics to be covered include amplitude amplification, quantum walks, phase estimation, hidden subgroup problems, and quantum protocols. Background in physics would be helpful but is not required. Prerequisites: CS344 and MA232 or MA339
Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed

CS 470 Deep Learning
This course will cover the principles of modern deep learning architectures from a theoretical and practical perspective. Course topics covered will include an introduction to machine learning and basic neural network architectures, and in-depth discussions on convolutional neural networks, recurrent neural networks based on units such as LSTMs and GRUs, and, if time permits, GANs. Students will be required to implement programming assignments and projects that apply deep learning architectures to solve classification and regression problems. Prerequisites: CS142, EE262, or EE361, and MA339.

Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed

CS 471 System Administration and Network Operations
This course is designed to give students the basic skills and knowledge to administer Unix/Linux machines as standalone workstations or in a network environment. For example, students will learn to install and configure the Linux operating system, create and maintain system users and groups, maintain and administer a file system, configure and maintain network services, troubleshoot system and network problems, and secure the system and network environment. Comprehensive hands-on labs throughout the course will reinforce learning and develop skills and competency. Prerequisites: CS241, EE260, or EE264

Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed

CS 472 Image Understanding
This course is an introduction to image processing and computer vision algorithms. Students will learn concepts such as image formation, how to store a digital image on a computer, how to use it in a program, different image features and their importance in computer vision, as well as some advanced computer vision topics such as object classification. Students will implement these concepts as part of the programming assignments. They will also do some theoretical assignments and a project. Prerequisites: CS142 or EE262 or EE361, and MA232 or MA239 (or MA339 as a corequisite)

Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed

CS 473 Computer Vision
(Cross-listed CS573/EE473) This course will cover an overview of basic theoretical underpinnings and practical applications of computer vision, with particular emphasis on geometrical techniques underlying 2D and 3D vision. Topics covered include, but are not restricted to, estimation of image transformations, image formation, pose estimation, camera calibration, epipolar geometry, structure-from-motion, stereo reconstruction, filtering, interest point detection, motion estimation, image segmentation, and object recognition. Prerequisites: CS142 or EE262, and MA339.

Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed

CS 475 Computing, Ethics and Society
(Cross-listed CS575) This course focuses on the increasing ubiquitous nature of computing, its impact on society and the ethical issues related to the design, implementation and deployment of computing technologies. We will examine case studies of the impact of computing technology on society and reflect on issues such as privacy, equality, justice, security, accountability, transparency, safety and reliability. Prerequisite: CS141

Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed

CS 497 Undergraduate Research I
Students engage in computer science research with a faculty member. The topic will be determined by student interest and faculty research programs. This course may be repeated for credit.
Prerequisites: consent of the instructor.
Credits: (1-3), Graded, Semester Calendar
Research, Given When Needed

CS 498 Undergraduate Research II
A continuation of CS 497.
Prerequisites: consent of the instructor.
Credits: (1-3), Graded, Semester Calendar
Research,

CS 499 Professional Experience
This course records successful completion of an approved professional experience meeting the requirements of the Clarkson Common Experience. Typical activities include internships and co-ops, directed research, and suitable semester-long class projects.
Credits: (0), P/NC, Semester Calendar
Independent Study,

CS 999 Special Graduate Topics
A graduate level course for which there is no comparable Clarkson course. Used for transfer credit only.
Credits: (1-10), Graded, Semester Calendar
Lecture, Transfer Credit Only

Digital Arts

DA 1 (3, 5...) Digital Arts Elective
A college level course for which there is no comparable Clarkson course. Used for transfer credit only.
Credits: (2-4), Graded, Semester Calendar
Independent Study, Transfer Credit Only
DA 2 (4, 6...)  Digital Arts Elective
A college level course for which there is no comparable Clarkson course. Used for transfer credit only. This course may be used to satisfy a Common Experience Requirement.
Credits: (2-4), Graded, Semester Calendar
Independent Study, Transfer Credit Only

DA 100  Introduction to Digital Art: Time & Image
[Cross-listed with COMM 100] This introductory studio course explores many of the key principles, techniques and dialogues governing the creative potential of digital technologies within art and design. Topics of study include bitmap and vector-based digital imaging together with digital approaches to time-based media. The goal of the course is to empower students with an artistic and technological understanding of the subject, while encouraging an experimental approach to digital media.
Credits: (3), Graded, Semester Calendar
Lecture, Spring Terms
IA
Comm Points: 1

DA 110  Drawing
This perceptually based studio course serves as one of the foundations for the DA&S major. Students will learn the importance of line, value, perspective, and human anatomy through the use of media such as graphite, charcoal, and ink. The translation of the 3D world to the 2D world through drawing will be emphasized.
Credits: (3), Graded, Semester Calendar
Lecture, Fall Terms
IA
Comm Points: 1

DA 120  Elements of Design
In this traditional studio art course, the foundations of visual design will be studied, particularly in the fields of color theory and two and three dimensional design. Students create projects with a strong focus on basic elements such as: line, shape, texture, value, color, composition, plane, volume, and space. Other concepts, such as form vs. function and conceptual vs. perceptual creativity will also be studied.
Credits: (3), Graded, Semester Calendar
Lecture, Fall Terms
IA
Comm Points: 1

DA 140  Introduction to Digital Art: Form & Code
This course introduces the key principles of computer programming. Through workshops, presentations, quizzes, readings, and project-based exercises and assignments, the course embarks on an investigation into the creative possibilities of computer programming within the digital arts. The skills and concepts taught in this course set a foundation for higher level DA&S courses within e.g. game design, web programming, and computational arts.
Credits: (3), Graded, Semester Calendar
Lecture,

DA 200  3D Digital Modeling & Imagery
This studio course introduces the creation of 3D imagery through the use of the computer. Students will gain experience through the creation and rendering of polygonal models, textures, and lights. This course will demonstrate the importance this medium has in fine art, film, advertising, and video games. Recommended to take DA/COMM 100 prior to taking DA 200, but not required.
Credits: (3), Graded, Semester Calendar
Lecture, Fall Terms
IA

DA 207  Media Landscapes I
Students will watch, discuss, and critique media objects such as movies and other forms of popular culture. The course focuses on historical and contemporary examples of work that offer ongoing cultural legacies and represent significant achievements within their genre.
Credits: (1), Graded, Semester Calendar
Lecture, Given When Needed

DA 208  Media Landscapes II
Students will watch, discuss, and critique media objects such as movies and other forms of popular culture. The course focuses on historical and contemporary examples of work that offer ongoing cultural legacies and represent significant achievements within their genre.
Credits: (1), Graded, Semester Calendar
Lecture, Given When Needed

DA 212  Art in Context
This course offers a critical exploration of the key themes, ideas, and dialogues that inform and guide contemporary art practices. Through readings, writings, and discussions, students will analyze artists and art movements through both historical and theoretical perspectives with a special emphasis on the position of new media technologies in contemporary art and culture.
Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed

DA 225  Digital Painting and Illustration
This studio course teaches painting and illustration through the use of digital tools such as the computer and pen tablet. Building on the student’s previous knowledge of color theory, drawing, and design, this course will introduce a raster-based media that facilitates the digital creation of concept art, comics, paintings, and 3D textures. Prerequisites: DA100/COMM100, and DA110 or DA120 (or permission of the Communications & Media department).
Credits: (3), Graded, Semester Calendar
Lecture, Every Term

DA 250  Interactive & Algorithmic Art
In this course, students will be introduced to artistic expressions unique to digital art. They will experiment with creating forms, motions, and interactions through the design of algorithms and the manipulation of math functions. They will learn to conceive and design art works as a dynamic process and as an inseparable combination of audience participation and its visual manifestation. Through this course, students will garner an appreciation of contemporary and technological forms of artistic expression through the understanding of code-based art making. Students will also garner experience in deconstruction code-based digital art to garner a deeper appreciation of the art form. Throughout the course, students will be introduced to various examples of the application of code-based and interactive methods from artists who have a human-centered and critical approach to the role of technology in society.
Prerequisite: CS 141 or DA 140, or permission of the Comm & Media department
Credits: (3), Graded, Semester Calendar
Lecture, Fall Terms
IA

DA 300 3D Imagery & Animation
An advanced studio course in which students apply their 3D modeling knowledge to camera and object animations. Students will explore advanced procedures while incorporating their experience with digital video and sound editing into each project. Projects will include both digital still imagery and 3D animation shorts. Prerequisites: DA200, or permission of the Comm & Media department
Credits: (3), Graded, Semester Calendar
Lecture, Spring Terms

DA 320 Moving Images: Motion Graphics & Animation
Focusing predominantly on the software applications Adobe After Effects and Flash, this course explores creative and experimental uses of time-based media as both a form of artistic expression and as a vehicle for presenting data and information. While primarily a studio course, techniques and skills will be taught within a wider critical framework that explores the historical and theoretical precedents and contexts surrounding motion graphics and time-based art practices. Prerequisites: DA100 or COMM100, or permission of the department
Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed

DA 340 Virtual Reality (VR) and Mixed Reality
This exploratory class will delve into the use of virtual reality devices such as the Oculus Rift and HTC Vive for interactive content creation. Students will explore a mix between real-time, 360 video, and pre-rendered methods in order to produce challenging content which will explore the potential of what can be achieved with these exciting new platforms. Emphasis will be placed on the experimental application of techniques towards innovative content. Prerequisite: CS141 or DA100
Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed
IA (TECH)

DA 341 Animating and Visualizing Data
This studio course involves utilizing data as a means of linear and non-linear storytelling. Students will learn how to incorporate flat, time-series, and other types of data into moving images. Various methods will be introduced, but all will involve creating a data reader and the aspects of aesthetically displaying said data. Prerequisite: DA140 or CS141
Credits: (3), Graded, Semester Calendar
Lecture,

DA 342 3D Character Design, Sculpting and Rigging
Students will conceptualize, design and digitally paint 2D characters and realize them as high polygon sculpted models. Methods for sculpting, baking and retopology will be covered for high-fidelity characters in preparation for rigging. Advanced rigging methods will be introduced for full character dialogue and expressive movement. Students will be required to purchase a small digital Wacom tablet to realize their designs. Prerequisite: DA200 or permission of the department if you have a basic knowledge of 3D modeling software

Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed

DA 391 Special Topics: Digital Arts & Science
In DA&S Special Topics courses, students study topics not otherwise available in formal courses under the supervision of a faculty member. The specific topic and the course description for a special topics course are listed when it is offered. These courses reflect ongoing developments in digital art media and practice, which often are related to the particular faculty member’s research interests. These courses are intended primarily for advanced students who wish to pursue special interests in the field.
Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed

DA 392 Special Topics: Digital Arts & Science
In DA&S Special Topics courses, students study topics not otherwise available in formal courses under the supervision of a faculty member. The specific topic and the course description for a special topics course are listed when it is offered. These courses reflect ongoing developments in digital art media and practice, which often are related to the particular faculty member’s research interests. These courses are intended primarily for advanced students who wish to pursue special interests in the field.
Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed

DA 393 Special Topics: Creative Apps
This course is an introduction to designing and creating apps for smartphones and mobile touchscreen devices. Students will learn creative approaches and practical strategies for small screen application development through various technical frameworks that cater to varying skill levels such as Application Craft, PhoneGap and Unity3D. The class will involve hands-on workshops and a larger discussion of “app culture”. Students will be expected to produce an app for their final project. Note: We will use code simulators, so students do not have to own a smartphone or tablet to develop and test their apps.
Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed

DA 394 Special Topics in Digital Arts & Sciences
In DA&S Special Topics courses, students study topics not otherwise available in formal courses under the supervision of a faculty member. The specific topic and the course description for a special topics course are listed when it is offered. These courses reflect ongoing developments in digital art media and practice, which often are related to the particular faculty member’s research interests. These courses are intended primarily for advanced students who wish to pursue special interests in the field.
Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed

DA 400 Directed & Collaborative Study
A studio course available to advanced students wishing to pursue further research in a specific area of interest. Meeting at the same time as DA300, this course provides an opportunity for collaboration & directed research in the specified area. This optional course gives the student a chance to expand their portfolio in preparation for a career in the digital arts. Prerequisites: A 300-level DA course, DA&S major, and permission of the Comm & Media department
Credits: (3), Graded, Semester Calendar
Independent Study, Every Term

**DA 410 Directed & Collaborative Study**
A studio course available to advanced students wishing to pursue further research in a specific area of interest. Meeting at the same time as DA310, this course provides an opportunity for collaboration & directed research in the specified area. This optional course gives the student a chance to expand their portfolio in preparation for a career in the digital arts. Prerequisites: A 300 level DA course, DA&S majors only, and permission of the Comm & Media department
Credits: (1-3), Graded, Semester Calendar
Independent Study, Every Term

**DA 420 Digital Arts Independent Study**
Designed primarily for a student who wishes to pursue special interests in Digital Arts for one or more semesters, this series of courses allows individual students to define independent study projects. Prerequisites: One course in Digital Arts and permission of the Comm & Media department
Credits: (1-3), Graded, Semester Calendar
Independent Study,

**DA 421 Digital Arts Independent Study**
Designed primarily for a student who wishes to pursue special interests in Digital Arts for one or more semesters, this series of courses allows individual students to define independent study projects. Prerequisites: One course in Digital Arts and permission of the Comm & Media department
Credits: (1-3), Graded, Semester Calendar
Independent Study,

**DA 423 Digital Arts Independent Study**
Designed primarily for a student who wishes to pursue special interests in Digital Arts for one or more semesters, this series of courses allows individual students to define independent study projects. Prerequisites: One course in Digital Arts and permission of the Comm & Media department
Credits: (1-3), Graded, Semester Calendar
Independent Study,

**DA 480 Internship in Digital Arts**
These internships are designed to provide practical work or research experience for the Digital Arts & Sciences majors. Generally, students work with a professional on projects in the field of digital arts, interactive design, advertising, and/or digital media design and production. Prerequisites: DA&S Majors or permission of the Comm & Media department
Credits: (3), Graded, Semester Calendar
Independent Study, Given When Needed

**DA 490 Undergraduate Teaching Assistantship in Digital Arts & Science**
Students assist a faculty member in teaching a Digital Arts & Science course. Students engage in substantial pedagogical work beyond mastery of the target course material. Such activities might include mentoring students in course work, leading class discussions or demonstrations, designing or assessing course modules. Prerequisites: the student will have already taken the course in a previous semester or receive consent from the instructor.
Credits: (1-3), Graded, Semester Calendar

**DA 491 Professional Practice**
This is the first semester in the advanced studio sequence in which the DA&S major applies the knowledge and skills developed in the program to design a visual portfolio under the directed study of a specific faculty member. Each student should choose the proper section which correlates with the faculty member who they wish to work with for the semester. Prerequisites: Any 300 Level DA course and open to DA&S Majors only (or by permission of the Comm & Media department)
Credits: (3), Graded, Semester Calendar
Lecture, Fall Terms, Comm Points: 2

**DA 492 Senior Studies**
The capstone of the advanced studio sequence in which DA&S seniors integrate the knowledge and skills developed in the program to complete their portfolios by working independently on a large-scale project. Each student should choose the proper section which correlates with the faculty member who they wish to work with for the semester. Prerequisites: DA491 and Senior standing in DA&S
Credits: (3), Graded, Semester Calendar
Lecture, Spring Terms, Comm Points: 1

**DA 499 Digital Art Minor Portfolio**
Under the guidance of Digital Arts faculty advisers from within the Department of Communication, Media & Design, students will compile a portfolio that functions as a way of showcasing and reflecting upon their achievements within the minor. The portfolio will be completed within this course. Students must receive a P (pass) in the minor portfolio in order to complete the requirements for the minor.
Credits: (0), P/NC, Semester Calendar
Independent Study, Every Term

**Data Science**

**DS 241 Introduction to Data Science**
This course introduces the basics of data manipulation and pre-processing to analyze data for statistical decision-making, building the skills required to organize, visualize, and communicate using data. The course seeks to help students address this question: given data from the world of science, engineering, medicine, etc., collected from multitude of sensors and sources, how do you begin to make sense of that data – and how do you use it? The primary tool for coding will be R/RStudio, but supporting Python syntax and libraries may also be introduced. The course emphasizes not only the low-level coding skills, but also the higher-level critical and quantitative reasoning skills required to analyze real-world datasets. Topics introduce key concepts such as descriptive statistics and sampling distribution (as a means to view large and very large data sets) and the basic analysis tools of Linear Regression and Data Mining. Additional topics may include social network data, unstructured data, and natural language text processing. Corequisite: STAT282, or STAT383, or STAT318, or STAT389
Credits: (3), Graded, Semester Calendar
Lecture, Fall Terms
DS 392    Ethics in Data Science and Applied Mathematics
This course will consider real situations in which computational or data science delivers capabilities that may conflict with societal values. Students will analyze frameworks for promoting ethical decision making, such as audits, codes of conduct, and legal regulations. They will discuss how data-driven decision making can be aligned with societal values. (Discussion topics may include things like data stewardship, secondary-effect analysis, political and legal roles of mathematical professionals, and representative workforce.) Guest speakers from both physical and social sciences will introduce relevant, real-world examples, with a portion of course time dedicated to discussion of daily news items that relate to the topics of this course. Preerequisite: Any STAT or DS Course
Credits: (3), Graded, Semester Calendar
Lecture, Spring Terms
Comm Points: 1

English for Academic Purposes

EAP 1 (3, 5…)

[Formerly ESL 1] A college level English for Academic Purposes, English as a Second Language, or English for Specific Purposes course for which there is no comparable Clarkson course. Used for transfer credit only.
Credits: (2-4), Graded, Semester Calendar
Independent Study, Transfer Credit Only

EAP 2 (4, 6…)

A college level English for Academic Purposes, English as a Second Language, or English for Specific Purposes course for which there is no comparable Clarkson course. Used for transfer credit only.
Credits: (2-4), Graded, Semester Calendar
Independent Study, Transfer Credit Only

EAP 250    Academic Writing for Undergraduates I

[Formerly ESL250] This course, designed for non-native speakers of English at a low-advanced level of proficiency in written English, focuses on reading and writing for the academic context. Students read material from a variety of fields and develop their writing skills in definition, description, comparison and contrast, and analysis. The course also includes vocabulary-building techniques and a review of grammatical structures needed for effective writing.
Prerequisite: placement test.
Credits: (3), Graded, Semester Calendar
Lecture, Fall Semesters

EAP 255    Academic Spoken Communication Skills for TAs and other International Undergraduate Students

The course focuses on development of effective communication skills (including appropriate grammar and vocabulary) for various academic purposes (e.g., making presentations on a variety of academic themes, answering audience questions). As a group and individually, students also work on pronunciation, intonation patterns, and other features of fluent American English.
Credits: (3), Graded, Semester Calendar
Lecture, Fall Semesters

EAP 350    Academic Writing for Undergraduates II

[Formerly ESL350] This course integrates academic reading, writing, and critical thinking for non-native speakers of English who are at an advanced level of proficiency in written English. Students read short academic articles on various topics by a variety of authors, discuss and evaluate ideas, and write a number of analytical and argumentative papers, including a documented paper based on outside sources. Attention is given to key academic writing skills, e.g., summary, paraphrase, use of citations, and effective support of ideas.
Prerequisites: Placement test or grade of C or better in EAP250.
Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed

EAP 354    Advanced Academic Writing for Undergraduates

[Formerly ESL354] This writing seminar will provide high advanced non-native speakers of English with tools and teacher feedback to shape their writing skills for university level writing requirements. This seminar will focus primarily on the American cultural expectations/conventional structures for successful academic writing courses; students will enhance their tone, form, and structure of texts.
Prerequisites: Placement exam or completion of EAP250 with a grade of C or better.
Credits: (2), Graded, Semester Calendar
Lecture, Every Semester
Comm Points: 1

Economics

EC 1 (3, 5…)

A college level course for which there is no comparable Clarkson course. Used for transfer credit only.
Credits: (2-4), Graded, Semester Calendar
Independent Study, Transfer Credit Only

EC 2 (4, 6…)

A college level course for which there is no comparable Clarkson course. Used for transfer credit only.
Credits: (2-4), Graded, Semester Calendar
Independent Study, Transfer Credit Only

EC 150    Principles of Microeconomics

(May be used with EC 151 to satisfy a CUSB M.B.A. or M.S. foundation requirement.) An introduction to microeconomics covering the role of the price system in and public policies toward the allocation of resources and the distribution of income. Included are the basic concepts of industry, supply and demand, technological change, private and social costs, market structures, analysis of firm behavior, household behavior and the gains from international trade. Students will be expected to use personal computers. Restriction: Not open to Chemical, Civil, or Environmental Engineering majors. Students may not be granted credit for EC150 as well as EC350.
Credits: (3), Graded, Semester Calendar
Lecture, Fall and Summer Semesters
EC

EC 151    Principles of Macroeconomics

(May be used with EC 150 to satisfy a CUSB (Clarkson School of Business) M.B.A. or M.S. foundation requirement.) An introduction to macroeconomics including the analysis of national income determination, monetary and fiscal policy, aggregate economic growth and international economics. Price stability, balance of international payments and economic growth and development will
also be examined. Students will be expected to use personal computers and prerequisite software. Restriction: Not open to Chemical, Civil, or Environmental Engineering majors. Students may not be granted credit for EC151 as well as EC350
Credits: (3), Graded, Semester Calendar
Lecture, Spring and Summer Semesters

EC 200 Engineering Economics
A course to supplement EC150 for those students who are required to complete EC350 or its equivalent. The course will cover the topic of engineering economic analysis and provides preparation for the Fundamentals of Engineering Exam and the Professional Engineering Exam. Requisite: The course will only be offered to those students who have completed EC150. Prerequisite: EC150 or EC151
Credits: (1), Graded, Semester Calendar
Lecture,

EC 311 Introduction to Econometrics
Introduction to econometric techniques and statistical procedures required in analysis of economic problems. The course focuses on problems in estimation and inference of linear regression models. Topics include estimation and hypothesis testing using simple and multiple linear regression models under classical assumptions, binary variables, estimation and inference when the classical assumptions are violated, and basic time series analysis. This course requires the use of computers. Prerequisites: MA181 or equivalent and STAT282 or equivalent.
Credits: (3), Graded, Semester Calendar
Lecture, Every Semester

EC 313 Mathematical Economics
This course aims to have students be able to understand and apply mathematical concepts in the context of a wide range of fields in economics, including microeconomics, macroeconomics, finance, economics of risk and uncertainty, economic development, international trade, environmental economics, and industrial organization. The course will build upon basic economic theory and mathematical concepts to focus on topics such as: comparative statics, financial mathematics, unconstrained and constrained optimization, dynamic optimization, and applications in contexts of uncertainty and strategic behavior. Prerequisites: EC150, EC151, MA131, and MA132.
Credits: (3), Graded, Semester Calendar
Lecture, Fall Terms
Comm Points: 2

EC 315 Entrepreneurship and Economic Development in the Adirondacks
[Cross-listed with EV 315] This course will explore the characteristics of the entrepreneurs of the park while also understanding the opportunities and challenges that these entrepreneurs face. It will also explore the theories of externalities and public goods applied to pollution and environmental policy. The students will analyze the options for encouraging entrepreneurship and achieving economic development goals within the Adirondack Park.
Enrollment is limited to students participating in the Adirondack Semester Program.
Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed

EC 350 Economic Principles and Engineering Economics
An introduction to microeconomic concepts in a market type economy. Some of the issues covered are the role of supply, demand, market price determination, consumer behavior, production theory and cost, and market structure. An introduction to macroeconomic concepts including the analysis of national income determination, monetary and fiscal policy, aggregate economic growth, international economics and inflation. This course also includes a segment on engineering economic analysis. Engineering students should take this course rather than EC150 and EC151 because it provides preparation for the Professional Engineering exam. Prerequisite: Sophomore Standing, and Engineering or Engineering and Management majors only. Students cannot enroll in EC 350 if they have credit for EC 150 or EC 151
Credits: (3), Graded, Semester Calendar
Lecture, Every Semester
EC

EC 355 Entrepreneurship and Economic Development in the Adirondacks
[Cross-listed with EV 355] This course will explore the characteristics of the entrepreneurs of the park while also understanding the opportunities and challenges that these entrepreneurs face. It will also explore the theories of externalities and public goods applied to pollution and environmental policy. The students will analyze the options for encouraging entrepreneurship and achieving economic development goals within the Adirondack Park.
Enrollment is limited to students participating in the Adirondack Semester Program.
Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed

EC 357 Intermediate Microeconomics
The study of how producers and consumers, acting through the market, determine the prices and outputs of goods and the allocation and income of productive resources. Empirical materials are used, and emphasis is placed on the uses and limitations of economic reasoning. Prerequisites: EC/EM150 or EC350.
Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed

EC 358 Intermediate Macroeconomics
Macroeconomics is the study of the economy as a whole and is concerned with some of the most important questions in economics such as: Why is there unemployment? What are the sources of rapid inflation? What causes recessions? Why are some nations rich while others are poor? Why do some economies grow faster than others do? Can policymakers “fine-tune” the economy? This course analyzes the economy in a “general equilibrium” framework, where the performance of the economy in terms of output, employment and unemployment, inflation and international capital flows is determined by the simultaneous interaction of the goods, labor, money, and international markets. The course will highlight the critical difference between the economy in the short and long run, the important role that expectations about the future play in macroeconomic analysis, and the role, limits, and transmission mechanisms of fiscal and monetary policy in efforts at economic stabilization. Prerequisites: EC150, EC151, and EC313
Credits: (3), Graded, Semester Calendar
Lecture, Spring Terms

EC 360 Environmental Economics
[Cross-listed with EV 360] Economic analysis of problems caused by the impact of economic activities of society on the environment, and of the public and private policies that could be used for environmental improvement. Prerequisites: EC/EM150 or EC350.
Credits: (3), Graded, Semester Calendar
Lecture, Spring Terms
UNIV/EC/IG

EC 367 International Economics
A survey of current theory and practice of international trade and finance. Topics covered include international trade theory, tariffs and quotas, international commodity agreements, balance of payments, foreign exchange markets, adjustment mechanisms and the
international monetary system. Attention is given to the role of multinational corporations in the international economy. Prerequisite: At least one course in Economics (EC) Credits: (3), Graded, Semester Calendar Lecture, Given When Needed

EC 370 Economics of Innovation
This course is designed to introduce students to microeconomic concepts relating to innovation, learning, technology adoption, and intellectual property protection. Various economic models of innovation are addressed. Topics include: incentives to innovate, market effects of innovation, and models of firm behavior and investment in innovation under conditions of uncertainty, and the importance of network effects/externalities and standardization in technology adoption. Throughout the course, students will be exposed both to economic theory as well as existing real-world case studies. Prerequisites: Sophomore Standing and EC150. Credits: (3), Graded, Semester Calendar Lecture, Fall Semesters

EC 371 Financial Markets and Institutions
(Cross-listed with FN 468) Emphasis is placed on understanding the basics of managing financial institutions, such as banks, the flow of funds, markets, and regulatory agencies that affect the institutions. The course addresses risk management, term structure of interest rates, international and domestic market operations and policy questions about financial markets and related topics. Prerequisite: FN361. Credits: (3), Graded, Semester Calendar Lecture, Given When Needed

EC 475 Personnel Economics
This course makes use of economic theory and empirical evidence concerning personnel issues and the way incentives are structured within an organization. Topics include issues such as hiring standards, learning of worker productivity, compensation mechanisms, labor turnover, layoffs and buyouts, and various other personnel issues. Prerequisite: EC150. Credits: (3), Graded, Semester Calendar Lecture,

EC 476 Special Projects in Economics
An investigation of a problem or in-depth topic undertaken by the student under the guidance of a faculty member. Prerequisites: permission of the instructor Credits: (1-3), Graded, Semester Calendar Research, Given When Needed

Education

ED 300 Field Experience
(Minimum of 20 hours) Candidates are observers in a variety of education and education-related settings. Apart from community and after-school programs, there must also be a range of school and classroom experiences (e.g., urban, suburban, rural; high-and low-performing schools)-all taking place at the secondary level-so that candidates have a broad experience and learn as much as possible about secondary learners and secondary education philosophy. Credits: (1), Graded, Semester Calendar Field Studies, Fall and Spring Terms

ED 440 Seminar in Cultural Competency and Teaching in the STEM Classroom
This seminar focuses on how culture, gender, race, and class impact the nature of STEM Education in secondary schools. Content will include a mix of reading, invited speakers, and panel discussions chosen to introduce participants to teaching and learning issues of diversity, poverty, and social justice. Students will provide written responses each week and submit a self-assessment on their own cultural sensitivity and sense of educational equity and describe how it evolved over the semester in terms of being influenced and informed by the course content. Requires permission of instructor or department. Credits: (1), P/NC, Semester Calendar Seminar, Spring Terms

Electrical & Computer Engineering

EE 1 (3, 5…) Electrical and Computer Engineering Elective
A college level course for which there is no comparable Clarkson course. Used for transfer credit only. Credits: (2-4), Graded, Semester Calendar Lecture, Transfer Credit Only
EE 2 (4, 6...) Electrical and Computer Engineering Elective
A college level course for which there is no comparable Clarkson course. Used for transfer credit only.
Credits: (2-4), Graded, Semester Calendar
Lecture, Transfer Credit Only

EE 211 ECE Laboratory I
An introductory course that presents the fundamentals of electrical instrumentation while developing laboratory skills. Experiments explore basic electrical properties of analog and digital circuits. The development of sound techniques for circuit construction and troubleshooting are emphasized, as is the role of the computer in a laboratory environment. Use of CAD/CAE tools such as Pspice and LabView is integrated into the course. Lab safety and the documentation and reporting of laboratory results are covered.
Corequisite: EE221. Prerequisites: ES250 and EE264.
Credits: (3), Graded, Semester Calendar
Laboratory, Lecture, Spring Terms
Comm Points: 1

EE 221 Linear Circuits
Credits: (3), Graded, Semester Calendar
Lecture, Spring Terms

EE 260 Embedded Systems
An introductory course covering the fundamentals of microcontroller hardware and software. Topics include microcontroller systems, input/output (I/O) standards and data communication protocols, interfacing with memory systems and sensors, data collection, display, and control of peripheral modules and actuators. The microcontroller will be programmed in the C programming language. Interfacing assembly language to high level language code will be treated as well. A comprehensive term project will allow student teams to apply the theoretical concepts for solving a practical problem using a microcontroller and peripheral devices. Prerequisite: CS141
Credits: (3), Graded, Semester Calendar
Lecture, Laboratory, Spring Terms

EE 261 Introduction to Programming and Software Design
A first course in programming and software design. Assumes no prior programming experience. The focus is upon the design of well-structured programs using problems selected from engineering applications. Topics include: fundamentals of software engineering design; elements of modern C-family programming language (such as Java, C, or C++); object oriented programming; the specification, design and implementation of numerical algorithms.
Credits: (3), Graded, Semester Calendar
Lecture, Laboratory, Fall Semesters

EE 262 Intro to Object-Oriented Programming and Software Design
A thorough introduction to Object Oriented Programming, including classes, inheritance and subtyping, overloading, and overriding. Dynamic memory management. Debugging. Introduction to Testing Driven Development. Introduction to fundamental data structures. Prerequisite: CS141

EE 264 Introduction to Digital Design
An introductory course covering the fundamentals of computer system hardware. Topics include data representation using number systems and codes, Boolean algebra and logic, digital logic devices, combinational and sequential circuits, arithmetic logic units and simple processor organization including registers, memory, addressing and processing of machine instructions.
Credits: (3), Graded, Semester Calendar
Lecture, Fall Terms
Comm Points: 1

EE 291 Special Project in Electrical and Computer Engineering
Students are involved, individually or working in groups on a special project under the direction of a faculty member. Topics are ordinarily suggested by the faculty member. These projects are limited in scope, ordinarily not requiring a degree of expertise beyond the sophomore year. Not to be used as a professional elective in the Electrical Engineering program or in the Computer Engineering program.
Prerequisites: consent of the department chair.
Credits: (1-3), Graded, Semester Calendar
Independent Study, Every Semester

EE 301 ECE Area Elective
A college level course for which there is no comparable Clarkson course. Used for transfer credit only. This course may be used to satisfy an Area Elective.
Credits: (2-4), Graded, Semester Calendar
Independent Study, Transfer Credit Only

EE 311 Electrical Engineering Laboratory II
This laboratory course provides students with a series of experiments based on material in required sophomore and junior level courses. The experiments are designed to emphasize model identification, validation, and use. The course includes one or more design projects which include team oriented design, development, testing, and documentation components.
Credits: (3), Graded, Semester Calendar
Lecture, Laboratory, Fall Semesters
Comm Points: 1

EE 316 Computer Engineering Junior Laboratory
A design laboratory in computer engineering emphasizing the fundamentals of designing and testing computer system components. Sub-system level digital circuits are designed, constructed, and tested using standard small- and medium-scale integrated circuits and programmable logic devices. Software components which interface with hardware and operating systems are also designed, written and tested. All design projects employ a team based approach. Prerequisite: EE365.
Corequisite: EE211.
Credits: (3), Graded, Semester Calendar
Lecture, Laboratory, Spring Terms

EE 321 Systems and Signal Processing
Credits: (3), Graded, Semester Calendar
EE 324  Dynamical Systems
[Cross-listed with ME 324] Dynamic systems classification, mathematical modeling of mechanical, electrical and mixed dynamic systems, state space representation, equilibrium points and linearization, solution of linear input/output and state equations, Laplace transforms, transfer functions and block diagrams, first and second order systems, stability, frequency response and simulation techniques. Prerequisites: MA232.
Credits: (3), Graded, Semester Calendar
Lecture, Every Semester

EE 331  Energy Conversion
Credits: (3), Graded, Semester Calendar
Lecture, Fall Semesters

EE 333  Power System Engineering
Credits: (3), Graded, Semester Calendar
Lecture, Spring Semesters

EE 341  Microelectronics
Theory of semiconductor materials, p-n junctions, bipolar and field effect transistors. Analysis of device characteristics, device modeling and equivalent-circuits. PSpice simulation of electronic circuits. Applications including study of biasing, low frequency amplifiers, switching circuits and digital logic operations. Prerequisites: ES250.
Credits: (3), Graded, Semester Calendar
Lecture, Fall Semesters

EE 360  Microprocessors
An introductory course covering the fundamentals of microcomputer hardware and software. Topics include microprocessor system hardware, assembly language programming, input/output devices and bus discipline. Memory systems, serial interfacing, and interfacing assembly language to high level language code will be treated as well. Prerequisite: EE264.
Credits: (3), Graded, Semester Calendar
Lecture, Spring Semesters

EE 361  Fundamentals of Software Engineering
This is a foundation course in the design of computer software. It covers fundamental techniques and methodologies for software design and implementation. Topics include the software engineering life cycle, object-oriented design, data and procedural abstraction, recursion, iteration, file I/O, and elementary data structures. Prerequisite: EE262 Introduction to Object Oriented Programming and Software Design
Credits: (3), Graded, Semester Calendar
Lecture, Spring Terms

EE 363  Software Components and Generic Programming
This course is concerned with software design principles that foster creation of reusable software components. Topics include abstract data types, behavioral inheritance and subtyping, generics, interface design, dependency injection, and analysis of algorithmic behavior. Students will gain experience with software development best practices including design of test scenarios, unit testing, code reviews, refactoring and version control in the context of a modern integrated development environment. Prerequisites: EE262 Introduction to Object Oriented Programming & Software Design
Credits: (3), Graded, Semester Calendar
Lecture, Fall Terms

EE 365  Advanced Digital Circuit Design
An advanced course in digital circuit design. This course begins with an overview of electrical characteristics of logic gates, various standards for I/O buses and communication interfaces. Topics include hierarchical and modular design of digital logic circuits, simulation and synthesis of digital systems on programmable logic devices using computer-aided design software, and debug and verification of design using embedded and standalone logic analyzers. Prerequisites: EE264 or equivalent.
Credits: (3), Graded, Semester Calendar
Lecture, Fall Semesters
Comm Points: 1

EE 368  Software Engineering
Study of the principles and practices of software engineering. Topics include software quality concepts, process models, software requirements analysis, design methodologies, software testing, and software maintenance. Hands-on experience building a software system using the waterfall life cycle model and CASE tools. Students working in teams develop all life cycle deliverables: requirements document, specification and design documents, system codes, and user manuals. Prerequisites: CS344 or EE363 and CS242 or EE408.
Credits: (3), Graded, Semester Calendar
Lecture, Spring Semesters

EE 381  Electromagnetic Fields and Waves
Credits: (3), Graded, Semester Calendar
Lecture, Spring and Summer Semesters

EE 400  Biomedical Engineering Fundamentals
Cross-listed with BR 400, BY 440, ES 402] This interdisciplinary course will introduce students to basic principles of biomedical rehabilitation engineering. The course will present principles of disability and the diverse roles of engineering in medicine and rehabilitation. Students will use engineering methods to study anatomical and physiological systems including applications in rehabilitation engineering, bioinstrumentation, biosignal and image processing, biomechanics, and biomaterials. Prerequisites: MA131/132, PH131/132, junior or senior standing.
Credits: (3), Graded, Semester Calendar
Lecture, Spring Terms
EE 401 Digital Signal Processing
Prerequisites: EE321. 
Credits: (3), Graded, Semester Calendar Lecture, Fall Terms

EE 402 Machine Learning on Biomedical Signals
[Crosslisted with EE502] Machine learning methods and their application to the analysis and processing of biomedical signals. Topics include a review of EEG, EMG, EGG, and other biomedical signals. Acquisition of biomedical signals and filtering, spectral analysis, characteristic feature extraction and selection, and dimensionality reduction. In addition, basic classification methods such as LDA, Decision tree, Naive Bayes, KNN and Support Vector Machines will be studied. Basic regression analysis on biomedical signals for the prediction task will be covered. (Odd Fall) 
Prerequisites: MA132, and BR400 or equivalent or instructor approval 
Credits: (3), Graded, Semester Calendar Lecture,

EE 407 Computer Networks 
[Cross-listed with CS 455] This course covers layered networking protocols with an emphasis on common Internet protocols such as TCP, IP, HTTP, and SMTP. It also covers local area networking, focusing on link layer standards such as the IEEE standards for Ethernet and wireless. Additional topics such as security and congestion control will also be covered. EE407 and CS455 are offered each fall as one course with multiple listings. Prerequisites: One of course in computer architecture (EE264, CS241 or IT502 or equivalent). One course in computer programming (EE261, CS441 or equivalent.) Note: IT501 also satisfies the programming requirement. 
Credits: (3), Graded, Semester Calendar Lecture, Laboratory, Fall Semesters

EE 408 Software Design For Visual Environments
This course is an introduction to object-oriented, event-driven windowing environments. The primary focus will be interface design and development, with an emphasis placed on the event-driven paradigm. Topics will include: a thorough investigation of the underlying windowing framework selected, an examination of static and dynamic control objects used for system input and output, virtual functions, multithread programming, code synchronization and locking, and resource sharing. Several programming projects will be assigned throughout the semester. Prerequisite: EE262. 
Credits: (3), Graded, Semester Calendar Lecture, Fall Terms

EE 410 Computer and Network Security
[Cross-listed with CS 457] Attacks on networked computer systems are an increasingly important problem. This course covers the types of vulnerabilities that are present in modern computer systems and the types of malicious software that exploit these vulnerabilities. It also covers best practices for preventing, detecting and responding to such attacks including anti-virus software, defensive programming techniques, intrusion detection systems, honeypots and firewalls. 
Prerequisites: A general course in computer networking such as CS455/555 or EE407/507. Programming experience to the level of CS142 or EE361. 
Credits: (3), Graded, Semester Calendar Lecture, Given When Needed

EE 412 Senior Design
A series of one or more design projects. Projects typically involve planning, analysis, preliminary design, simulation, construction, testing and evaluation, documentation, class demonstrations and oral presentations. The thrust of this course is to provide the student with an opportunity to develop a complete solution to one or more design problems and to develop broad engineering skills, including communication skills. Prerequisite: EE311. 
Credits: (3), Graded, Semester Calendar Lecture, Laboratory, Every Semester (TECH) 
Comm Points: 1

EE 416 Computer Engineering Senior Laboratory 
In conjunction with EE464, students develop specifications for design, build, test, debug and document a complete digital system based on an embedded microcomputer and supporting integrated circuits. 
Prerequisite: EE316 and EE260 
Corequisite: EE464 
Credits: (3), Graded, Semester Calendar Lecture, Laboratory, Fall Terms (TECH) 
Comm Points: 1

EE 418 Software Engineering Senior Design
Working in a team environment, students will design and develop a complex software system. Using sound software engineering techniques, the students will take a conceptual idea for a software system and turn it into a well-engineered product. Prerequisites: EE368 and EE462. 
Corequisite: EE408. 
Credits: (3), Graded, Semester Calendar Lecture, Fall Semesters (TECH) 
Comm Points: 2

EE 422 Signal Processing and Applications
This project-driven course involves qualitative and quantitative descriptions of DSP algorithms, software and applications. The class covers applications in engineering, computing, music, and the arts, with MATLAB, Java and mobile simulations. Prerequisites: MA132 or equivalent, or instructor approval. 
Credits: (3), Graded, Semester Calendar Lecture, Even Fall Terms

EE 423 Introduction to Biometrics
Biometrics is the automated recognition of an individual based on their physiological or behavioral characteristics. This course is an introduction of fingerprint, face, voice, and iris recognition, as well as related aspects of system design, security, privacy, performance evaluation, and novel biometric modalities. 
Credits: (3), Graded, Semester Calendar Lecture, Discussion, Spring Semesters
EE 430  High-Voltage Techniques and Measurements
Credits: (3), Graded, Semester Calendar
Lecture, Even Fall Semesters

EE 431  Power Transmission and Distribution
Unbalanced fault current calculation, current and voltage transformer characteristics. Distribution system protection, transmission line protection. Generator, bus and transformer protection. Power system controls. Transient stability. Prerequisite: EE331
Credits: (3), Graded, Semester Calendar
Lecture, Fall Semesters

EE 438  Alternate Energy Systems
[Cross-listed with ES 438] The basic technology of emerging renewable or non-carbon based energy sources will be considered, and contrasted with traditional sources of energy. Topics will include photovoltaic, wind and others. The impacts of energy storage and electrified transportation will be discussed. The capability of these technologies will be assessed, and barriers to implementation will be explored. The role of the electric power grid in enabling alternate energy technologies will be covered. Prerequisite: ES250 or permission of the instructor.
Credits: (3), Graded, Semester Calendar
Lecture, Even Spring Semesters

EE 439  Dielectrics
Credits: (3), Graded, Semester Calendar
Lecture, Odd Fall Semesters

EE 441  Electronic Devices
[Cross listed with EE41] Study of modern electronic devices, p-n junctions, bipolar junction transistors (BJTs) and metal-oxide-semiconductor field-effect transistors (MOSFETs), for integrated circuit applications. SPICE device models are introduced, and several SPICE simulation projects are given for integrated circuit design and analysis. This course provides a foundation for understanding SPICE device models and the basics of the microelectronic technology. Corequisites: ES241 or EE341 or equivalent.
Credits: (3), Graded, Semester Calendar
Lecture, Even Fall Terms

EE 442  CMOS IC Design
An introduction to CMOS integrated circuit design and simulation. Students will learn CMOS device models and study design, simulation and layout of digital CMOS integrated circuit blocks. Prerequisite: EE264. Corequisite: EE341.
Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed

EE 443  Semiconductor Material and Devices for Engineers
Credits: (3), Graded, Semester Calendar
Lecture, Spring Terms

EE 450  Control Systems
[Cross-listed with ME 450] Introduction to the analysis and design of continuous-time feedback control systems. Topics include: mathematical representation of physical systems with linear differential equations, Laplace transforms, transfer functions, block diagrams and signal flow graphs, feedback, sensitivity, transient specifications, steady-state tracking errors, stability, root locus plots, compensator design, simulation. Prerequisites: AE/EE/ME324 or Corequisite: EE321.
Credits: (3), Graded, Semester Calendar
Lecture, Fall Semesters

EE 451  Digital Control
Introduction to the analysis and design of discrete-time feedback control systems. Topics include: mathematical representation of physical systems with linear difference equations, z-transforms, transfer functions, sampling, A/D and D/A converters, sampled-data systems, discrete equivalent systems, transient specifications, steady-state tracking errors, stability, controller design, quantization effects. Prerequisites: EE321.
Credits: (3), Graded, Semester Calendar
Lecture, Spring Semesters

EE 452  Optimization Techniques in Engineering
Introduction to optimization techniques in engineering. Topics include: engineering applications of optimization, types of optimization problems, linear programming and the simplex method, one-dimensional optimization, unconstrained nonlinear programming, nonlinear programming with equality and inequality constraints, advanced optimization techniques, practical aspects of optimization. Prerequisites: MA339 or equivalent or consent of instructor.
Credits: (3), Graded, Semester Calendar
Lecture, Fall Semesters

EE 455  Robotics I
[Cross-Listed EE555] The course presents an introduction to the fundamentals of mobile robotic systems including common mechanical configurations with sensors and actuators, as well as the typical sensory, perceptual, and cognitive layers that comprise the field of study. Topics explored will include: Mobile Robot Locomotion (e.g., Legged, Wheeled, and Aerial), Mobile Robot Kinematics (e.g., Models and Constraints, Maneuverability, Workspace Analysis, and Motion Control), Mobile Robot Perception (e.g., Exploration of Sensors, Fundamentals of Computer Vision, Fundamentals of Image Processing, Feature Extraction, and Place Recognition), Mobile Robot Localization (e.g., Noise and Aliasing, Localization-Based Navigation, Map Representations, Probabilistic Map-Based Localization and Autonomous Map Building), and Planning and Navigation (Path Planning, Obstacle Avoidance, and Navigation Architectures). Throughout the course, students will work in teams with a supplied robotics kit of parts to design and implement a mobile robot system that demonstrates various aspects of the course applied to a real-world problem. Prerequisites: EE321, EE/ME324, or MA339; or instructor permission Credits: (3), Graded, Semester Calendar
Lecture, Spring Terms
EE 456  Robotics II
The course presents an introduction to the fundamentals of industrial robotics. Topics explored will include: Robotic manipulation, direct kinematics, inverse kinematics, workspace analysis and trajectory planning, differential motion and statics, manipulator dynamics, robot control, robot vision and task planning. Throughout the course, students will work in teams with a supplied robotics kit of parts and appropriate software tools to design and implement a robot manipulator that demonstrates various aspects of the course applied to a real-world problem. Credits: (3), Graded, Semester Calendar Lecture, Fall Terms

EE 462  Software System Architecture
A study of system software components in the context of a modern operating system such as UNIX, together with the necessary tools and utilities for software development. Topics will include software development tools, operating system interfaces and utilities, and network access methods. Emphasis will be placed on conceptual understanding and practical use of system software components rather than on detailed implementation. Prerequisites: EE261 or CS141 or equivalent programming experience in C.
Credits: (3), Graded, Semester Calendar
Lecture, Laboratory, Spring Semesters

EE 464  Digital Systems Design
A study of embedded microcomputer system design. Topics include CPU architecture, memory organization, interrupts, real-time operation, and interfacing with a wide range of external devices. Practical problems in digital design, testability, hardware and software trade-off analysis are covered. In addition to the technical topics, students develop teamwork skills, learn project management, system specification and documentation. Each student does both significant written documentation and oral presentations of his or her work. This course and the senior lab (EE 416) together provide both the conceptual knowledge and practical skills necessary to design application-oriented digital systems. Prerequisites: EE316 and EE260
Corequisites: EE416
Credits: (3), Graded, Semester Calendar
Lecture, Fall Terms
Comm Points: 1

EE 465  Computer Graphics
[Cross-listed with CS 452] An introduction to computer graphics. Graphics hardware, algorithms for generating and displaying two and three-dimensional geometric figures, animation, interactive displays. Programming projects using OpenGL will be assigned.
Prerequisites: Programming experience in C/C++ family language, basic concepts in linear algebra and matrices. Prerequisites: CS142 or EE361, and MA232 or MA239 (or MA339 as a corequisite)
Credits: (3), Graded, Semester Calendar
Lecture, Spring Terms

EE 466  Computer Architecture
A study of modern processor system architecture including set design and performance enhancement of computer systems will be discussed. Topics include pipelining, cache organization, memory management, and multiprocessors. Tradeoffs in system design and the impact of hardware/software interactions will be discussed.
Prerequisite: EE264.
Credits: (3), Graded, Semester Calendar
Lecture, Spring Terms

EE 468  Database Systems
[Cross-listed with CS 460] An introduction to database systems. The entity-relationship and relational models are presented and applied to the design of typical databases. New developments in object-oriented and multimedia databases are presented. Emphasis will be placed on database design for applications in the context of an existing database management system such as ORACLE or ACCESS.
Prerequisites: Programming experience in a high-level language
Credits: (3), Graded, Semester Calendar
Lecture, Spring Semesters

EE 469  High Performance Computing
Principles and practices of high-performance computing (HPC) programming, associated computer architectures, and techniques for computing performance optimization. Topics include concepts of parallel and distributed computing, multicores architecture, POSIX threads programming, OpenMP (Open Multi-Processing), GPGPU (General purpose GPU) architecture, NVIDIA CUDA programming, computer cluster management system, MPI (Message Passing Interface) programming, and case studies regarding large-scale engineering applications through HPC and computing performance improvement. Hands-on assignments utilizing Linux based open source tools and compilers will be assigned. Students must have basic C/C++ programming skills to enroll. Suitable for junior and senior undergraduate and graduate students in all engineering and computer science majors. Prerequisites: EE262 or CS142, or consent of instructor.
Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed

EE 470  Coding and Info Transmission
Credits: (3), Graded, Semester Calendar
Lecture, Fall Semesters

EE 471  Principles of Digital and Data Communications
Amplitude modulation, double and single sideband, quadrature AM. Frequency and phase modulation. Stationary and ergodic random processes, correlation and spectral density. Noise models, filtering of random signals. Data transmission, frequency and phase shift keying, pulse amplitude modulation, pulse shaping, partial response signaling, channel equalization. Threshold decision receivers. Pulse code modulation, quantization, digital transmission lines. Prerequisites: EE321 and MA/STAT381 or MA/STAT383 (MA/STAT381 is preferred.)
Credits: (3), Graded, Semester Calendar
Lecture, Spring Semesters

EE 473  Computer Vision
[Cross-Listed CS473/CS573] This course will cover an overview of basic theoretical underpinnings and practical applications of computer vision, with particular emphasis on geometrical techniques underlying 2D and 3D vision. Topics covered include, but are not restricted to, estimation of image transformations, image formation, pose estimation, camera calibration, epipolar geometry, structure-from-motion, stereo reconstruction, filtering, interest point detection, motion estimation, image segmentation, and object
Recognizes. Prerequisites: CS142 or EE262, and MA339 (or equivalent, with consent from the instructor). EES73 Requisites
Credits: (0), Graded, Semester Calendar
Lecture, Given When Needed

EE 485 Neural Engineering
[Cross-listed with BY 485, ES 485, EE 585] This course applies engineering principles to the study of neuroscience and to the design of devices or techniques intended to replace missing or augment existing functions such as seeing, hearing, speaking, and walking. The course provides a detailed overview of sensorimotor systems, neurophysiology, neuroanatomy, neuropathology and clinical neurology. The class sequences through the various sensory and movement systems, providing a quantitative basis for how the nervous systems works for these systems, for how it dysfunctions, for the disability produced, and finally for how function can be restored by neuroprostheses. Students will prepare and present a paper on a neural engineering topic. Prerequisites: MA132 and PH132 or PH142.
Credits: (3), Graded, Semester Calendar
Lecture, Fall Semesters

EE 491 Directed Study in Electrical and Computer Engineering
Investigation of a special topic in consultation with a designated faculty member.
Credits: (1-3), Graded, Semester Calendar
Independent Study, Every Semester

Environmental Health Science

EHS 1 (3, 5...)
Industrial Hygiene Elective
A college level course for which there is no comparable Clarkson course. Used for transfer credit only.
Credits: (2-4), Graded, Semester Calendar
Lecture, Transfer Credit Only

EHS 2 (4, 6...)
Industrial Hygiene Elective
A college level course for which there is no comparable Clarkson course. Used for transfer credit only. This course may be used to satisfy a Science Foundation Curriculum Requirement.
Credits: (2-4), Graded, Semester Calendar
Lecture, Transfer Credit Only

EHS 309 Introduction to Environmental and Occupational Health
[Cross-listed with BY309] Study of the recognition, evaluation and control of chemical, biological, radiological, physical and ergonomic hazards found in the work environment and surrounding community. Key aspects of the course will include hazard assessment, basic anatomy and physiology associated with routes of entry and toxicology of hazardous agents, environmental, health and safety regulations, exposure monitoring instrumentation, and effective controls to minimize the risk of illness or injury. Prerequisites: CM132 or CM104/106
Credits: (3), Graded, Semester Calendar
Lecture, Spring Terms

EHS 310 Introduction to Industrial Hygiene Laboratory
This is a lab course that meets for three hours a week. The course consists of weekly labs. Students must prepare lab reports on a weekly basis. These lab reports are evaluated for consistency, accuracy, presentation and overall quality. The course ends with students individually presenting scenarios that encompass knowledge gained over the length of the course. Students are expected to communicate knowledge of both environmental health and public health. In addition, each student must prepare a final report to accompany their presentation. The written material will be critiqued by the instructor and feedback will be provided to each student. A portion of the labs will be dedicated to instruction on writing and presentation skills. Corequisite: EHS309
Credits: (2), Graded, Semester Calendar
Laboratory, Spring Terms
Comm Points: 1

EHS 330 Occupational Safety and Ergonomics
This course will provide students with an overview of the contemporary Environmental, Health and Safety (EHS) management techniques for occupational settings. The EHS management systems of today have evolved over many years (ISO 14001, ISO 45001). The Occupational Safety and Health Administration (OSHA) and Environmental Protection Agency are the primary regulatory organizations in the United States. However, compliance is the minimum standard of care. Cost effective systems to minimize risk among the community and workers as well as ensure compliance with state and federal regulation must include a comprehensive and integrated Environment, Health, and Safety Management System (EHS-MS) that is sustainable for the long term. The course will introduce techniques used to assess the risk of injury including job safety analysis, fault tree analysis, systems safety and design for safety. In addition, this course will provide the students with the fundamental elements of occupational ergonomic assessments, risk factors and controls. The course will be a combination of lectures, case studies and projects.
Credits: (3), Graded, Semester Calendar
Lecture, Fall Terms

EHS 405 Methods and Analysis
IH405, Methods and Analysis, is a combined lecture/laboratory course. Students complete nine full laboratory assignments requiring complete reports (~10 pages) to be turned in weekly or bi-weekly. Students are provided feedback on content and writing mechanics (technical reporting) and are offered (sometimes requested) the opportunity to resubmit. Prerequisites: EHS 309 and open to students majoring in EHS, ES&P and Chemistry only. Two years of college chemistry is recommended.
Credits: (4), Graded, Semester Calendar
Lecture/Laboratory, Fall Semesters, Comm Points: 1

EHS 406 Industrial Hygiene Control Methods
Various ways to prevent and solve common industrial hygiene problems will be considered; topics will include typical engineering controls, administrative controls and personal protection to control chemistry exposure and releases. In addition controls for temperature extremes, noise and vibration exposure, and ergonomic stressors will be studied. About two-thirds of the course is devoted to industrial exhaust ventilation design. (2 credits of design, for Civil and Environmental Engineering Majors) Prerequisite: EHS309 or consent of the instructor.
Credits: (3), Graded, Semester Calendar
Lecture, Odd Spring Terms
EHS 416  Principles of Toxicology and Epidemiology

[Cross-listed with BY 416] This is an introductory course in toxicology and epidemiology. Toxicology is the study of the harmful interactions, including absorption, distribution, metabolism and disease effects, of chemical, biological and physical agents with biological systems, when administered by accident or design. Epidemiology is the study of the distribution and determinants of disease frequency in populations exposed to these toxicants and stressors. The first two thirds of this course will focus on the toxicological interaction and effects of environmentally and occupationally derived toxicants with the human body. The last third of the course will focus on the epidemiological tools to evaluate the risk of exposure to such toxins, and will examine, in detail, several important historical and recent case studies of toxic exposures to individuals and populations in the home, the outdoor environment, and the workplace. Toxicology and Epidemiology are important sciences that provide a sound basis for developing measures to reduce the risk of human exposure to toxic chemicals and agents. Prerequisites: EHS 309 or consent of the instructor.

Credits: (3), Graded, Semester Calendar
Lecture, Spring Semesters

EHS 481  Advanced Topics in Environmental and Occupational Health

This course is a project based course that requires students to work on a broad array of topics in environmental health. Students will have multiple projects (6-8) running simultaneously and each will require writing assignments and presentations. Literature and text reviews will be necessary for most of the projects. Group communication skills are also developed as some projects are done in groups. Course work and lab preparation call for combining both lab work and lecture material in a cohesive and accessible format. The course also involves consistent review of student work by the instructor, in the form of both written and oral feedback. IH481 also requires for a minimum of three oral presentations by individuals. Prerequisite: Senior standing in the following majors or minors: EHS or ES&P, or consent of the instructor.

Credits: (3), Graded, Semester Calendar
Lecture, Spring Terms
Comm Points: 1

EHS 490  Internship/Co-op

Students who obtain a (summer) internship/co-op position may obtain credit for the work experience by registering for this course the semester following the position. Students will be required to keep a daily journal of work activities and submit the journal entries to the EHS Program Director every two weeks. During the semester following the internship/co-op, a 10-page report on some aspect of their work experience and a 30 minute presentation will be required. Prerequisite: Open to EHS or ES&P major or minor only, or by consent of the program director

Credits: (0-3), Graded, Semester Calendar
Independent Study, Every Semester

EHS 494  Directed Research for Undergraduates

A research project will be completed; research projects may include laboratory projects or individual study of industrial hygiene topics not available in other industrial hygiene courses. Prerequisite: Open to EHS or ES&P major or minor only, or by consent of the program director.

Credits: (1-3), Graded, Semester Calendar
Research, Every Term

EHS 495  Directed Research for Undergraduates

A research project will be completed; research projects may include laboratory projects or individual study of industrial hygiene topics not available in other industrial hygiene courses. Prerequisite: Open to EHS or ES&P major or minor only, or by consent of the program director

Credits: (1-3), Graded, Semester Calendar
Research, Every Term

EHS 497  Directed Study

A research project will be completed; research projects may include laboratory projects or individual study of industrial hygiene topics not available in other industrial hygiene courses. Prerequisite: Open to EHS or ES&P major or minor only, or by consent of the program director

Credits: (1-3), Graded, Semester Calendar
Independent Study, Every Semester

Engineering & Management

EM 1 (3, 5...)

Engineering and Management Elective

A college level course for which there is no comparable Clarkson course. Used for transfer credit only.

Credits: (2-4), Graded, Semester Calendar
Independent Study, Transfer Credit Only

EM 2 (4, 6...)

Engineering & Management

A college level course for which there is no comparable Clarkson course. Used for transfer credit only. This course may be used as a Professional Elective.

Credits: (2-4), Graded, Semester Calendar
Independent Study, Transfer Credit Only

EM 120  Team-based Design and Innovation

The first in a two-course sequence, this course is required for all first-year students in the Engineering & Management Program. Students will undertake a yearlong project to design, produce, and potentially commercialize a product. Projects will require the application of both engineering and management tools and principles. The primary focus of the fall semester is to build functional teams, introduce design tools and complete a conceptual design of the product. Open only to E&M, University Studies, Engineering Studies, and Science Studies first-year students unless approved by E&M Director.

Credits: (3), Graded, Semester Calendar
Lecture, Laboratory, Fall Semesters
Comm Points: 1

EM 121  Technological Entrepreneurship

The second in a two-course sequence, this course is required for all first-year students in the Engineering & Management Program. Students will undertake a yearlong project to design, produce, and potentially commercialize a product. The primary focus of the spring semester is to build a business plan from the fall semester conceptual design. Open only to E&M, University Studies, Engineering Studies, and Science Studies first-year students unless approved by E&M Director. Prerequisite: EM120.

Credits: (2), Graded, Semester Calendar
Laboratory, Lecture, Spring Semesters (TECH)
Comm Points: 1
EM 190  
Independent Study  
An investigation of an interdepartmental socio-technical problem undertaken by an upperclass student under the guidance of a faculty member. Credits: (1-3), Graded, Semester Calendar  
Independent Study, Given When Needed

EM 205  
Introduction to Financial and Managerial Accounting  
[Cross-listed with AC 205] An introductory survey of accounting information to guide and improve decision making. Many course topics involve cost planning and control techniques used to evaluate and improve the financial performance of organizations and/or products. Prerequisites: Restricted to E&M majors only  
Credits: (3), Graded, Semester Calendar  
Lecture, Every Semester

EM 211  
Intro to Enterprise Information Systems  
This course will introduce students to enterprise information systems, their components, integration, and use as part of the business process. The distributed, accurate, real time flow of information is a critical success factor for most organizations. The ability of an organization to collect and analyze this information is crucial in today's data-driven economy. The focus of this course is on the functional and strategic use of enterprise resource planning (ERP) software, its application, input devices, implementation issues and use. Hands-on experience with SAP ERP is integral to this course. Offered fall and spring semesters. Prerequisites: Students may not receive credit for IS200 as well as EM211 and restricted to E&M majors.  
Credits: (3), Graded, Semester Calendar  
Lecture, Every Term, (TECH)

EM 286  
Organizational Behavior I  
[Cross-listed with OS 286, PY 286] (May be used to satisfy a CUSB MBA or MS foundation requirement.) An introduction to the processes required to manage contemporary organizations with a focus on individual behaviors as they relate to the functions of planning, organizing, controlling, and leading. The most recent concepts of behavioral science in the practice of management are presented to assist the student in gaining understanding of the pervasiveness of the discipline in all types of organizations and processes. Topics include motivation, leadership, perceptions, personality theory, learning theory, personnel issues, stress management, organizational culture, and decision making. Prerequisites: Sophomore standing and restricted to E&M majors.  
Credits: (3), Graded, Semester Calendar  
Lecture, Every Semester, IG

EM 301  
Applied Data Analytics  
Proper utilization of modern analytical tools is a critical component of effective and timely creation and use of organizational intelligence in a variety of fields of human endeavor: management, social science, health care, engineering etc. This course focuses on critical skills for using software tools such as Excel, SQL, and Tableau (or their equivalents) for the purpose of conducting a variety of analytics tasks and operations to improve gathering, generation and presentation of organizational intelligence. Focus is on proper data gathering and preparation, followed by the use of key analysis grouping and summation tools as well as data presentation and visualization. Prerequisite: IS110  
Credits: (3), Graded, Semester Calendar  
Lecture, Every Term, (TECH)

EM 310  
E&M Professional Experience  
Project-based professional experience in engineering & management, related to student career interests and/or field of study. Fulfills Clarkson Common Experience Professional Experience requirement for E&M students. Course registration requires E&M approval of application. Completion of course requires approval of E&M Director.  
Credits: (0), P/NC, Semester Calendar  
Independent Study, Every Semester

EM 313  
Professional Communication  
[Cross-listed with COMM313] This course presents students opportunities to learn how to design and present effective professional documents. The course emphasizes a rhetorical approach to analyzing the issues and details important to the communication to be produced (e.g., audience, style, format, purpose). Students will practice writing both individually and collaboratively and will be expected to present their work orally on occasion. Students will encounter topics such as, but not limited to, abstracts, email, instructions, letters, memoranda, proposals, and various types of reports. Students of any major may take this course.  
Credits: (3), Graded, Semester Calendar  
Lecture, Spring Terms  
Comm Points: 2

EM 314  
Database Design & Management  
[Cross-listed with IS 314] This course provides the student with in-depth knowledge of database analysis, design, and implementation principles. Students who successfully complete this course will be able to use the entity-relationship data model to represent business data requirements, to translate that model into a relational schema, to normalize this schema and to build and use a relational database that implements the schema, using the Standard Query Language (SQL). Restricted to E&M students.  
Credits: (3), Graded, Semester Calendar  
Lecture, Fall Semesters

EM 331  
Operations & Supply Chain Management  
[Cross-listed with OM 331] (May be used to satisfy a CUSB MBA and MS foundation requirement.) An introduction to the planning, analysis and control of production systems. Topics include product and service design, manufacturing processes, aggregate production planning, inventory models and MRP, just-in-time systems, facility layout, forecasting/demand planning, project management, and quality management. Students acquire problem solving experience using ERP software. Prerequisites: STAT 282 or STAT 383 or MA 330, and at least sophomore standing  
Corequisite: IS 211 or EM211(CUSB majors) or IS 110  
Credits: (3), Graded, Semester Calendar  
Lecture, Every Term

EM 333  
Elements of Operations Research  
Application of optimization models to typical engineering and management situations and problems. Topics include: optimization theory (linear programming, transportation and assignment models), decision analysis under uncertainty, queuing theory and Monte Carlo simulation. Prerequisites: STAT383 and at least junior standing, and restricted to E&M majors only.  
Credits: (3), Graded, Semester Calendar  
Lecture, Every Semester
EM 341 Supply Chain Design & Management

[Cross-listed with OM 341] Fierce competition in today’s global markets has forced business enterprises to focus on reducing costs while meeting rising customer expectations by designing and managing effective and sustainable supply chains. This course focuses on a systems approach to review state-of-the-art models and practical tools for inventory and materials management, design for supply chain, as well as supply chain integration. Topics covered include managing inventories in the supply chain, the bullwhip effect, risk pooling, delayed differentiation, measuring the financial performance of supply chains, the value of information and the role of information technology in the supply chain, coordination and collaboration with channel partners, supply chain related strategic alliances, and outsourcing/off-shoring/reshoring trends. Several team projects and hand-on experiences are utilized to demonstrate real world issues and applications. Prerequisites: EM331 and restricted to E&M majors. Credits: (3), Graded, Semester Calendar Lecture, Spring Terms

EM 356 Invention Development and Protection

[Cross-listed with SB356] In this course, students learn how to develop inventions and protect them. Students will work in small teams to develop and describe their inventions in a form suitable for filing provisional patent applications with the U.S. Patent and Trademark Office. Aspects of intellectual property laws in the US and other countries will be covered to guide the student inventing process. Open only to E&M students. Requirements: E&M major and Junior standing. Credits: (3), Graded, Semester Calendar Lecture, Every Term

EM 361 Supply Chain Environmental Management

[Cross-listed with SB 361] This course aims to gain a greater understanding of supply chain environmental management by examining: (i) the advantages and business risks of adopting and implementing environmental practices and technologies in the supply chain, (ii) the role of suppliers and customers to facilitate the adoption/implementation of environmental practices and technologies, and (iii) the implications of such supply chain activities on an organization’s operations strategy. This course consists of a mix of lectures and class discussion. Prerequisite: EM331 and restricted to E&M majors. Credits: (3), Graded, Semester Calendar Lecture, Spring Semesters

EM 371 Strategic Sourcing

This course provides an in-depth analysis of the procurement process and supplier management, with strong emphasis on managing a supplier base for both products and services. Topics covered include the strategic role of sourcing in supply chains, the identification and evaluation of requirements, the strategic make versus buy decision, supplier selection, development and evaluation processes, the supplier coordination and control mechanisms, the relationship between product design and the supplier base and the impact of information technology on strategic sourcing. Both theoretical and quantitative perspectives will be offered. In addition, the topics will be addressed from strategic, financial, sustainability and global perspectives. Students will also develop practical skills in using quantitative tools to select and evaluate suppliers. Prerequisites: OM/EM331 and at least junior standing. Credits: (3), Graded, Semester Calendar Lecture, Spring Terms

EM 380 Project Management

[Cross-listed with OM 380] This course will introduce students to all phases of project management from project initiation to termination. Topics covered include project selection, organization, contracts, planning and scheduling (PERT and CPM), estimating, budgeting and cost control, procurement, resource allocation, variance analysis, auditing and termination procedures. Project management software, case studies, and student team projects will be an integral part of the course. Restrictions: Enrollment is limited to students in E&M, or consent of instructor. Corequisites: STAT 383 Credits: (3), Graded, Semester Calendar Lecture, Every Term EC

EM 381 Logistics Management

[Cross-Listed SB381] Logistics involves planning, implementation and control of the forward and reverse flow and storage of goods, services, and information in the supply chain in order to effectively meet customer demand. Primary topics covered include management and location of facilities, management of channel networks, warehousing, transportation, management and design of integrated logistics networks, distribution strategies, third-party logistics, international logistics, and vehicle routing. In addition to lectures, case studies, numerical assignments and simulation of logistics systems may be utilized. Prerequisites: MK 320 and OM/EM 331 Credits: (3), Graded, Semester Calendar Lecture,

EM 415 Data Warehousing for Analytics

[Cross-listed with IS 415] This course covers the fundamental concepts, design, management and application of data warehouses and business/enterprise intelligence systems. Specific topics covered include the logical design of a data warehouse, the data staging area and extraction-transformation-loading process, the design, implementation and utilization of multi-dimensional data analysis systems, as well as key business/enterprise intelligence concepts, processes and techniques including knowledge discovery and exploratory analysis. Offered Fall semesters. Prerequisite: EM314 or CS460/E468 and Restricted to E&M students. Credits: (3), Graded, Semester Calendar Lecture, Fall Semesters

EM 432 Organizational Policy and Strategy

[Cross-listed with OS 432] A capstone course designed to integrate the functional areas and tools of management studied in previous courses within a strategic planning framework giving due attention to ethical and social responsibility concerns and international business issues. Emphasis is placed on the business environment in a global economy, industry analysis, tactical planning, overall strategic planning, policy establishment and implementation. Case analysis, in the small group setting, is utilized, enabling students to share their expertise and explore their value structure. Students present results via written and oral reports. Prerequisites: FN361, EM331, EM286, MK320, senior standing, and restricted to E&M majors. Credits: (3), Graded, Semester Calendar Lecture, Every Semester Comm Points: 2
EM 441  Advanced Topics in Global Supply Chain Management

[Cross-listed with SB 441] This course introduces several emerging topics in supply chain management, including: demand management, revenue management, risk management, supply chain agility and flexibility, supply chain disruption management, and supply chain contracts. This course also provides students with the opportunity to gain experience dealing with complex supply chain issues by utilizing a simulation game. The simulation deals with both strategic and tactical aspects of managing the supply chain. Prerequisite: EM341 and restricted to E&M majors.

Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed

EM 451  Quality Management & Lean Enterprise

[Cross-listed with OM 451] This course will introduce the students to both the managerial and technical aspects of quality improvement. The course emphasizes statistical applications to quality related topics such as process/product design, process capability, quality control, design of experiment, and inspections/sampling. Other topics of interest include: Juran quality trilogy, six-sigma project methodology, and cost of quality. The course consists of a series of lecture and problems solved in class. Prerequisites: STAT 383 and restricted to E&M majors.

Credits: (3), Graded, Semester Calendar
Lecture, Every Semester

EM 456  Process Engineering and Design

This course is a capstone design experience for students who have completed a foundation engineering science education. Primarily designed for the Engineering & Management (E&M) program, this course involves solution of a real world technical problem. Requires both written reports and oral presentations. Senior Standing in E&M or IE&M. Prerequisites: ES220, and two of ES250, ES330, or ES340. Prerequisite: EM331, EM333, and EM380.

Credits: (3), Graded, Semester Calendar
Lecture, Every Semester, (TECH)
Comm Points: 1

EM 461  Management of Technology

[Cross-listed with OM 461] Management of technology links together the engineering, science, and management disciplines to plan, develop, and implement technological capabilities to be competitive in the global arena. Students taking the course will gain an understanding of the following topics: innovation, product life cycles, product development process, concurrent engineering, management of technology strategy, selecting technical projects, management of the R&D process, initiating new ventures, international technology transfer, and the management of complex projects. Prerequisites: EM331 and restricted to E&M majors.

Credits: (3), Graded, Semester Calendar
Lecture, Spring Semesters
STS

EM 482  Systems Engineering and Management

Systems Engineering (SE) is an iterative process of top-down synthesis, development, and operation of real-world systems that combines technical leadership and systems management. Technical leadership is necessary for incorporating and balancing the contributions of structural, mechanical, electrical, software, systems safety, and power engineers, among others, to produce a coherent whole. Through the interdisciplinary approach of SE, systems management is focused on effectively and efficiently managing the development and operation of complex systems that result from integrating physical, smart, software, and connectivity components. Students taking this course will gain an understanding of how to create a design that considers both the business and technical needs of all customers with the goal of providing a quality product that meets customers' needs and maintain its integrity throughout its life cycle. Topics include but are not limited to fundamental concepts of systems theory and systems thinking used for SE, life cycle process models, technical and management processes, and introduction to model-based systems engineering. In addition to lectures, case studies, numerical assignments, and simulation may be utilized. Restrictions: Junior or Senior standing in an engineering or EM major, or permission by the instructor.

Credits: (3), Graded, Semester Calendar
Lecture, Every Term

EM 487  Special Project in Engineering and Management

An investigation of a problem or in-depth topic undertaken by the student under the guidance of a faculty member. Prerequisites: Permission of instructor.

Credits: (1-3), Graded, Semester Calendar
Research, Given When Needed

EM 490  Internship

An investigation of a problem or in-depth topic undertaken by the student under the guidance of a faculty member. Prerequisite: Permission from the instructor.

Credits: (1-3), Graded, Semester Calendar
Independent Study, Given When Needed

EM 494  Directed Research

A research project will be completed; research projects may include laboratory projects, literature research, or individual study of interdisciplinary engineering and management topics not available in other Clarkson courses. Restriction: Open to Engineering and Management majors only.

Credits: (1-3), Graded, Semester Calendar
Research, Given When Needed
Engineering Science

ES 1 (3, 5,...) Engineering Science Elective
A college level course for which there is no comparable Clarkson course. Used for transfer credit only.
Credits: (2-4), Graded, Semester Calendar
Independent Study, Transfer Credit Only

ES 2 (4, 6,...) Engineering Science Elective
A college level course for which there is no comparable Clarkson course. This course may be used as a Professional Elective.
Credits: (2-4), Graded, Semester Calendar
Independent Study, Transfer Credit Only

ES 41 Spatial Thinking Skills
This course develops 3D spatial visualization skills through tutorials and exercises. Coverage includes (as time permits): surfaces and solids of revolution, combining solid objects, isometric drawings and coded plans, orthographic drawings, orthographic projections and inclined and curved surfaces, flat patterns, rotation of objects about axes, object reflections and symmetry, and cutting planes and cross sections.
Credits: (1), Graded, Semester Calendar
Lecture, Given When Needed

ES 100 Introduction to Engineering Use of the Computer
[Cross-listed with HP 103] Introduction to computer programming using equation solving software applied to engineering problems.
Credits: (2), Graded, Semester Calendar
Lecture, Laboratory, Spring Semesters

ES 110 Engineering and Society
Engineers apply scientific knowledge and principles, and use the engineering design process to develop technology. While engineers frequently develop solutions to problems in controlled environments, the products that are developed are used by 'real people' in the 'real world.' Thus, it is essential that engineers have an understanding of the interactions between engineering, technology development, and society. This course will highlight the diverse applications of engineering and technological skills in addition to ethical and other concerns about the societal consequences of technological developments. Students will gain an understanding of ways that conceptual models can be used to frame how both science and technology shape society and how society can shape science and technology. Students will be introduced to the engineering design process and use it to solve a simple engineering problem. Then, through case study, they will apply the societal models and gain an understanding of how the design process can be used to solve complex, open-ended, 'real-world' problems in the context of social, economic, and environmental considerations. Corequisites: MA 180 or equivalent. Open to all majors - engineering majors must be first year students to enroll.
Credits: (3), Graded, Semester Calendar
Lecture, Every Semester
STS (TECH)
Comm Points: 1

ES 147 First Year Research Experience
The student conducts research under the guidance of a research advisor. Appropriate for paid or voluntary non-credit bearing research experiences. By permission of research advisor or academic advisor only. Pass/no credit only.
Credits: (0), P/NC, Semester Calendar
Research, Every Term

ES 220 Statics
Fundamental concepts of the statics of rigid bodies using a vector analysis approach; force systems, analysis of simple structures, centroids and centers of gravity, free body diagrams, equilibrium, friction and moments of inertia. Prerequisites: MA131 and PH131
Credits: (3), Graded, Semester Calendar
Lecture, Tutorial, Every Semester

ES 221 Strength of Materials
Elementary analysis of the strength and deformation of deformable bodies; stress and strain at a point, Mohr's circle, axial loads, flexure, torsion, deflections and column action. Introduction to design concepts. Prerequisites: ES220 or consent of instructor
Credits: (3), Graded, Semester Calendar
Lecture, Tutorial, Every Semester

ES 222 Rigid Body Dynamics
Introduction to the basic principles of Newtonian mechanics. Topics covered include kinematics of particles; Newton's laws of motion, energy and momentum methods; systems of particles; planar kinematics of rigid bodies; planar dynamics of rigid bodies; forces and acceleration energy and momentum methods. Special topics such as non-inertial reference frames may be introduced. Prerequisites: ES220 and MA232 (for CE students, MA232 is a corequisite)
Credits: (3), Graded, Semester Calendar
Lecture, Tutorial, Every Semester

ES 223 Introduction to Energy Systems
The focus of this course is to introduce fundamental energy principles and discuss various energy resources and options currently available, including the supply and availability as well as the demand for these energy resources. Primary consideration is given to current strategies for energy production, conversion and use, with a brief overview of renewable technologies. The course topics are presented within a social, economic, political, and environmental context to provide a comprehensive understanding of the role of energy in our current and future society. Students examine the sustainability of our current and future systems of energy resource consumption, including U.S. and global energy consumption rates as well as societal and environmental impacts. Issues such as energy efficiency, conservation, systems analysis and life cycle analysis, and the environmental and economic consequences of various sources, will be discussed. Finally, implications and relationships between global climate change and growing global energy use in the 21st century will be examined. Prerequisite: ES110 OR Corequisite: ES110
Credits: (3), Graded, Semester Calendar
Lecture, Spring and Summer Semesters

ES 238 Solid-State Material Systems for Advanced Technologies
Topics include: Crystal structure of solid-state materials system, structural stability of materials, electronic properties of materials, optoelectronic properties of materials, engineered materials,
metamaterials, low-dimensional materials, introduction of solid-state materials-based device technologies. Prerequisites: PH131, CM103 or CM131, and MA131
Corequisites: MA132
Credits: (3), Graded, Semester Calendar
Lecture, Fall Terms

ES 243  
**Introductory Undergraduate Research I**
The student participates in the research process under the guidance of a faculty research advisor. May include some independent work. For 1-2 credits, student prepare a short paper or report. For 3-4 credits, student prepares a paper and gives an oral presentation. By permission of research advisor only.
Credits: (1-4), Graded, Semester Calendar
Research, Every Term

ES 244  
**Introductory Undergraduate Research II**
A Continuation of ES 243. By permission of research advisor only.
Credits: (1-4), Graded, Semester Calendar
Research, Every Term

ES 245  
**Introductory Undergraduate Research III**
A Continuation of ES 244. By permission of research advisor only.
Credits: (1-4), Graded, Semester Calendar
Research, Every Term

ES 247  
**Sophomore Research Experience**
The student conducts research under the guidance of a research advisor. Appropriate for paid or voluntary non-credit bearing research experiences. By permission of research advisor or academic advisor only. Pass/no credit only.
Credits: (0), P/NC, Semester Calendar
Research, Every Term

ES 250  
**Electrical Science**
Network concepts. DC circuits: mesh and node equations, network theorems, operational amplifiers. Complex numbers, effective values, sinusoids and phasors. AC circuits: phasor diagrams, power. Time domain solution of first order circuits. Corequisites: MA232, PH132
Credits: (3), Graded, Semester Calendar
Lecture, Every Semester

ES 260  
**Materials Science and Engineering I**
The fundamentals of the interactions between structure, processing, properties and applications of solid metals, non-metallic elements, inorganic compounds, and polymers. Topics include atomic bonding, structure, imperfections, diffusion, mechanical properties, deformation and strengthening mechanisms, failure. Possible additional topics include phase diagrams, phase transformations, electrical properties, processing, composites, corrosion, thermal properties, and environmental consideration. Prerequisites: PH131, CM103 or CM131, MA131
Corequisite: MA132
Credits: (3), Graded, Semester Calendar
Lecture, Every Semester
(TECH)

ES 330  
**Fluid Mechanics**
Basic principles of fluid mechanics. Topics include statics, forces on plane and curve surfaces, kinematics of fluid motion, integral and differential representation of conservation of mass, balance of linear and angular momenta, the first Law of Thermodynamics, Bernoulli's equation, dimensional analysis, and elementary viscous flow. Frictional losses, simple pipeline analysis and steady channel flow are covered. Understanding of the physical phenomena is stressed and vector notation is used wherever suitable. Prerequisites: MA232 or MA231 and ES220.
Credits: (3), Graded, Semester Calendar
Lecture, Every Semester

ES 340  
**Thermodynamics**
The fundamental concepts of thermodynamics and their application to pure substances. Topics include: properties of pure substances; work, heat, energy and the First Law of Thermodynamics; technique of First Law analysis; disorder, entropy and the Second Law of Thermodynamics; technique of Second Law analysis. Prerequisites: MA231 and PH132
Credits: (3), Graded, Semester Calendar
Lecture, Every Semester

ES 347  
**Junior Research Experience**
The student conducts research under the guidance of a research advisor. Appropriate for paid or voluntary non-credit bearing research experiences. By permission of research advisor or academic advisor only. Pass/no credit only.
Credits: (0), P/NC, Semester Calendar
Research, Every Term

ES 360  
**Materials Science and Engineering II**
Continuation of the study of the science and engineering of materials. Emphasis is placed on the processing of materials to achieve optimum engineering properties. Topics include: heat treatment of metals and ceramics to yield strength and toughness at high temperatures; formation of composite materials (directionally solidified superalloys, transformation strengthened ceramics, fiber reinforced polymers); processing of amorphous materials for optical applications (lens, fibers, lasers); processing of magnetic materials for both hard and soft applications; and, protection of materials in corrosive environments. Prerequisites: ES260.
Credits: (3), Graded, Semester Calendar
Lecture, Spring Semesters

ES 361  
**Fine Particle Technology**
An introduction to the characterization, processing and applications of ceramic, metal and polymer fine particles and composites. Analysis of property-structure relationships. Formation of novel bulk materials from fine powders through sintering. Prerequisite: CM104 or CM132.
Credits: (3), Graded, Semester Calendar
Lecture, Fall Semesters

ES 365  
**Polymer Materials**
An introduction to the chemical and physical properties of polymeric materials, including basic polymer chemistry, elementary rheology, polymerization processes and polymer properties. Prerequisites: CM104 or CM132 and at least junior standing.
Credits: (3), Graded, Semester Calendar
Lecture, Even Fall Semesters

ES 375  
**Directed Study**
Special reading or laboratory study of a specific problem or subject area under the direction of a member of the faculty.
ES 380  Special Topics: Biomechanics

Cross-listed with ME 380. This course will examine the application of engineering principles to biologic systems. The structure and function of biologic tissue will be examined in the context of engineering mechanics. Emphasis will be placed on the biomechanics of human movement, including the basic principles of orthopedic biomechanics. Students will develop the skills necessary to explore biomechanics in the contemporary scientific literature and will write a term paper on a biomechanics topic of their choice. Prerequisites: PH131 and MA132. Credits: (3), Graded, Semester Calendar Lecture, Discussion, Fall Semesters

ES 400  Numerical and Engineering Computing

Topical coverage includes numerical methods for solving single nonlinear equations, matrix computations, systems of nonlinear equations, ordinary differential equations, partial differential equations, differential algebraic equations, and much more. Prerequisite: ES100 or consent of the instructor. Credits: (3), Graded, Semester Calendar Lecture, Given When Needed

ES 402  Biomedical Engineering Fundamentals

Cross-listed with BR 400, BY 440. This interdisciplinary course will introduce students to basic principles of biomedical rehabilitation engineering. The course will present principles of disability and the diverse roles of engineering in medicine and rehabilitation. Students will use engineering methods to study anatomical and physiological systems including applications in rehabilitation engineering, bioinstrumentation, biosignal and image processing, biomechanics, and biomaterials. Prerequisites: MA131/132, PH131/132, junior or senior standing. Credits: (3), Graded, Semester Calendar Lecture, Fall Semesters

ES 405  Design of Experiments and Analysis of Data

Modern techniques for the analysis of data and for the planning of experiments in research and in manufacturing. Includes use of software to design factorial and response surface method experiments, interpret the results, and fit data to equations. Prerequisites: MA232 or MA239 or MA339 Credits: (3), Graded, Semester Calendar Lecture, Spring Semesters

ES 422  Signal Processing and Applications

This project-driven course involves qualitative and quantitative descriptions of DSP algorithms, software and applications. The class covers applications in engineering, computing, music, and the arts, with MATLAB, Java and mobile simulations. Prerequisites: MA132 or equivalent, or instructor approval. Credits: (3), Graded, Semester Calendar Lecture, Even Fall Terms

ES 432  Risk Analysis

Risk assessment entails the evaluation of the hazardous properties of substances, the extent of human exposure to them and the characterization of resulting risk. It is a systematic approach to organizing and analyzing the scientific knowledge regarding potentially hazardous activities or substances. Variability and uncertainty are used to estimate the level of confidence in the risk assessment. The general approach to risk assessment including the use of default assumptions and uncertainty analysis will be presented along with illustrative examples. Graduate Students will be required to do an additional work at the graduate level. Prerequisites: CM131 or CM103. Credits: (3), Graded, Semester Calendar Lecture, Spring Semesters (TECH) Comm Points: 1

ES 436  Global Climate Change: Science, Engineering & Policy

The primary objective of the course is to provide the necessary background that will permit undergraduate students to understand and accurately describe the workings of the Earth’s climate system, the interactions between the atmosphere, ocean, and climate, and human’s involvement in altering these processes. The course is broken into four primary components: earth science, energy, policy, and programming. The highly quantitative course will use project-based experiences to allow each student an opportunity to complete a data acquisition/modeling project of their own design to show correlations between human activities, current atmospheric concentrations and resulting ecosystem change. Students will use computational programming tools (Matlab) in combination with mapping tools (Google Maps API) to quantify, analyze, and display geographical variations of integrated and averaged values of quantities studied. Prerequisites: Quantitative and modeling skills (Matlab, Excel) are required, statistics is recommended. Credits: (3), Graded, Semester Calendar Lecture, Odd Spring Semesters UNIV/CGI/STS (TECH)

ES 438  Alternate Energy Systems

Cross-listed with EE 438. The basic technology of emerging renewable or non-carbon based energy sources will be considered, and contrasted with traditional sources of energy. Topics will include photovoltaic, wind and others. The impacts of energy storage and electrified transportation will be discussed. The capability of these technologies will be assessed, and barriers to implementation will be explored. The role of the electric power grid in enabling alternate energy technologies will be covered. Prerequisite: ES250 or permission of the instructor. Credits: (3), Graded, Semester Calendar Lecture, Even Spring Semesters

ES 443  Undergraduate Research I

The student develops and conducts a self-contained independent research project under the guidance from a faculty research advisor. For 1-2 credits, student prepares a short paper or report. For 3-4 credits, student prepares a paper and gives an oral presentation. Junior standing required. By permission of research advisor only. Credits: (1-4), Graded, Semester Calendar Research, Every Term

ES 444  Undergraduate Research II

A continuation of ES 443. Junior standing required. By permission of research advisor only. Credits: (1-4), Graded, Semester Calendar Research, Every Term
ES 445 Undergraduate Research III
A Continuation of ES 444. Junior standing required. By permission of research advisor only.
Credits: (1-4), Graded, Semester Calendar
Independent Study, Every Semester

ES 446 Undergraduate Research IV
A Continuation of ES 445. Junior standing required. By permission of research advisor only.
Credits: (1-4), Graded, Semester Calendar
Research, Every Term

ES 447 Senior Research Experience
The student conducts research under the guidance of a research advisor. Appropriate for paid or voluntary non-credit bearing research experiences. By permission of research advisor or academic advisor only. Pass/no credit only.
Credits: (0), P/NC, Semester Calendar
Research, Every Term

ES 452 Biomaterials and Biomedical Engineering Applications
This course will examine the biomaterials, biomolecular engineering, and tissue engineering aspects of biomedical engineering. Topics covered will include metallic, ceramic, and polymeric biomaterials; manufacturing technologies; sterilization and degradation; the characterization of bulk and surface properties; mechanical and electrical properties of tissues; the interactions between biomaterials and the physiological environment; orthopedic, neural, and cardiovascular biomaterials; and biomaterials for drug delivery and medical imaging. Requirement: Junior or Senior Standing
Credits: (3), Graded, Semester Calendar
Lecture, Even Spring Terms

ES 459 Electrochemical Processes for Sustainability
This course introduces the fundamentals of electrochemistry and applications of electrochemical technologies for sustainability. General theory, electroanalytical techniques, and interfacial structure are discussed. These principles are then used to describe and quantify the controlling features in electrochemical separations, electrochemical water treatment, and electrochemical energy systems. Prerequisites: CM132 (or CM104), ES340 (CH260 or CM371)
Credits: (3), Graded, Semester Calendar
Lecture, Even Spring Terms

ES 464 Corrosion of Metals
Mechanisms of environmental degradation of materials. Methods for eliminating or reducing environmental degradation. Prerequisite: CM132 (or CM104), and ES 260
Credits: (3), Graded, Semester Calendar
Lecture, Fall Terms

ES 485 Neural Engineering
This course applies engineering principles to the study of neuroscience and to the design of devices or techniques intended to replace missing or augment existing functions such as seeing, hearing, speaking, and walking. The course provides a detailed overview of sensorimotor systems, neurophysiology, neuroanatomy, neuropathology and clinical neurology. The class sequences through the various sensory and movement systems, providing a quantitative basis for how the nervous systems works for these systems, for how it dysfunctions, for the disability produced, and finally for how function can be restored by neuroprostheses. Students will prepare and present a paper on a neural engineering topic. Prerequisites: MA132 and PH132 or PH142.
Credits: (3), Graded, Semester Calendar
Lecture, Fall Semesters

ES 499 Professional Experience for Engineering Majors
This course number is used to matriculate the Professional Experience requirement of the Clarkson Common Experience curriculum. The student must participate in a project-based professional experience such as a co-op, internship, directed research, significant responsibility in an appropriate team project, or a community project clearly related to the student's professional goals. Enrollment is restricted to engineering majors.
Prerequisite: Pre-approval (using the PRE-APPROVAL WORKSHEET for the PROFESSIONAL EXPERIENCE Requirement in the Wallace H. Coulter School of Engineering.)
Credits: (0), P/NC, Semester Calendar
Independent Study, Every Term

Environmental Science & Policy

EV 1 (3, 5...) Environmental Elective
A college level course for which there is no comparable Clarkson course. Used for transfer credit only.
Credits: (2-4), Graded, Semester Calendar
Independent Study, Transfer Credit Only

EV 2 (4, 6...) Environmental Elective
A college level course for which there is no comparable Clarkson course. Used for transfer credit only. This course may be used to satisfy a Professional Elective requirement.
Credits: (2-4), Graded, Semester Calendar
Independent Study, Transfer Credit Only

EV 100 Introduction to Environmental Science & Policy Professions
The purpose of this course is to introduce students to environmental science and policy issues. The course is an overview of local and global issues relating to safety, health, environmental science and policy, and industrial hygiene concerns in the community and the work place. Students will review journal articles on selected topics and attend 1-2 field trips to local industries. The course will provide an open forum for discussion of curriculum choices and career options in environmental science and policy.
Credits: (1), Graded, Semester Calendar
Lecture, Fall Semesters

EV 280 Environmental Science
This course will investigate the key concepts and principles of environmental science, emphasizing human impacts to the earth. The themes will include, energy flows through nature, and biogeochemical systems and how they have been perturbed by human activities. Technology and population growth have enabled humans to increase both the rate and scale of their impact on the environment. Quantitative analysis or air, soil, and water quality on local, regional, and global scales will be a significant component of the course. Emerging principles in environment science, including sustainability, industrial ecology, risk assessment, and the
precautionary principle will be introduced. The course will prepare students to qualitatively and quantitatively analyze fluid and contaminant flow in varied biological and geologic systems. Prerequisites: sophomore standing, CM131/CM132 or CM103/CM104, or consent of the instructor.

Credits: (3), Graded, Semester Calendar

Lecture,

EV 305 Sustainability & the Environment
This course is an introduction to sustainability and the environment. Students are expected to harness initial knowledge from science, engineering, and policy courses to collectively address environmental problems and issues on campus, or in the local community. Class time is split between lectures on sustainability and the environment, and a projects (real-world) on a local community or campus environmental issue. In addition, EV 305 allows for direct review and instructor on the quality of the written and oral communication by the students. Written and oral progress reports will be required throughout the semester by each student/group. The papers and presentations are intended to be professional format to motivate. Prerequisite: At least Sophomore standing

Credits: (3), Graded, Semester Calendar

Lecture, Odd Spring Terms
Comm Points: 1

EV 312 Adirondack Ecology and Environmental Science

[Cross-listed with BY 312] This course introduces ecological and environmental science concepts relevant for understanding the structure and function of terrestrial, aquatic, and human systems in the Adirondack Park. Students will learn to identify important plant and animal species representative of the Adirondack Mountains, and learn major features of ecological systems in the Park. The course will also provide the students an assessment of human impacts on the ecology of the Adirondack Park.

Enrollment is limited to those students participating in the Adirondack Semester Program.

Credits: (3), Graded, Semester Calendar

Lecture, Laboratory, Given When Needed

(TECH)

EV 313 Biogeochemical Earth Systems Science

[Cross-listed with BY 313, CE 313] This course will investigate the key concepts and principles of environmental science emphasizing the earth’s biogeochemical cycles and how they have been perturbed by human activities. Quantitative analysis or air, soil and water quality on local, regional and global scales will be a significant component of the course. Emerging principles in environmental science, including sustainability, industrial ecology, risk assessment and the precautionary principle will be introduced. In addition to the quantitative aspects, the course will consider the historical, social, and political contexts in which the practice of environmental science takes place. Prerequisites: CM132 (or CM104), or consent of the instructor

Credits: (3), Graded, Semester Calendar

Lecture, Spring Semesters

(TECH)

EV 314 Adirondack Integrated Research Project

This problem-based learning course will task students to analyze and suggest solutions to complex problems relevant to the economic, social, and environmental welfare of the Adirondack Park. The course is intended to reinforce what students have learned in other Adirondack courses.

Enrollment is limited to students participating in the Adirondack Semester Program.

Credits: (3), Graded, Semester Calendar

Research, Given When Needed

UNIV/CGI/STS, Comm Points: 2

EV 315 Entrepreneurship and Economic Development in the Adirondacks

[Cross-listed with EC 315] This course will explore the characteristics of the entrepreneurs of the park while also understanding the opportunities and challenges that these entrepreneurs face. It will also explore the theories of externalities and public goods applied to pollution and environmental policy. The students will analyze the options for encouraging entrepreneurship and achieving economic development goals within the Adirondack Park.

Enrollment is limited to students participating in the Adirondack Semester Program.

Credits: (3), Graded, Semester Calendar

Lecture, Given When Needed

EC

EV 316 Adirondack Environmental Science

A brief history of air, soil, and water pollution in the Adirondacks followed by an investigation into the major sources and concerns of pollution in the region. Through lectures and laboratory experiences the following areas will be studied: air, water and soil quality parameters and their measurements; material and energy balances; water, air and soil chemistry concepts; toxicology and risk assessment.

Credits: (1-3), Graded, Semester Calendar

Lecture, Given When Needed

EV 320 Social and Political Issues in the Adirondacks

[Cross-listed with SS 320] The historical, social, political, and environmental factors contributing to the fabric of the Adirondack Park is an evolving social experiment. The course readings will focus upon the New York State constitutional provisions that engendered the park, the policies that shaped the park, along with the political actions that influence the park today. The Adirondack State Park is extraordinary for its history and because it is a place where human residents live and recreate in sustainable ways that conserve resources and ‘forever wild’ regions of the park.

Enrollment is limited to those students participating in the Adirondack Semester Program.

Credits: (3), Graded, Semester Calendar

Lecture, Given When Needed

CSO, Comm Points: 2

EV 322 Adirondack Park

To understand a place, one must often understand the views of nature and the environment as seen by writers and essayists. Students will explore the Adirondacks through literature while experiencing the lakes, rivers, streams, and mountains. The readings, discussions, and written assignments will explore the aesthetics, the social and political climate, and the prevailing attitudes toward the environment that helped create the Adirondack Park. In addition, the course will provide students with an opportunity to participate in seasonal outdoor activities to learn how recreational activities have
impacted the social, cultural, economic, and physical aspects of the Park. Enrollment is limited to those students participating in the Adirondack Semester Program.

Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed
UNIV/CSO/IA, Comm Points: 1

**EV 330 Great Lakes Water Protection**

[Cross-listed with BY 330] The Laurentian Great Lakes contain 20% of the world's surface fresh water and serve both water supply and waste disposal services for over 30 million residents in the United States and Canada. Technological advances have controlled the outflow of the Great Lakes at the St. Lawrence River and this has brought with it social benefits and environmental costs. The United States and Canada share the management of this resource and have shared notable success controlling environmental consequences of development yet are faced with emerging issues. The LGL/SLR system will be examined from a multidisciplinary, multinational perspective to illustrate that a shared resource can be maintained.

Students will be able to understand the forces (geomorphic, biological, chemical, social, economic, and political) that have shaped and impacted a globally significant resource. Prerequisite: At least Sophomore standing.

Credits: (3), Graded, Semester Calendar
Lecture, Fall Terms
UNIV/CGI/STS, Comm Points: 1

**EV 390 Sustainability Project Experience**

This course prepares students for and includes a two-week intensive work/study experience at a business with a stated sustainability focus. Students will study the nature of the business and their current sustainability practices through structured class time prior to traveling. Students successfully completing this course will gain a better perspective on the technology, business, cultural and regulatory constraints and opportunities that enable the enterprise to operate in a sustainable fashion. Interdisciplinary teams of students will identify additional possible projects to creatively overcome complex, real-world sustainability challenges for the business, and complete a preliminary feasibility study that includes interdependent technical, economic and environmental considerations. Project ideas and progress will be communicated through oral presentations and progress reports throughout the semester, culminating in a presentation and report to the business staff. [3 Design Credits] Prerequisites: At least sophomore standing & permission of the instructor

Credits: (3), Graded, Semester Calendar
Lecture, Spring Semesters
STS (TECH)
Comm Points: 2

**EV 400 Environmental Science Capstone**

This course is part one of a two course sequence with EV 401 that acts as the cornerstone of the Environmental Science and Policy and Environmental Health Science Programs. Each student will conduct a research project as an individual or in a group that involves several components of the scientific process. Students will be given lectures on research methods and will be required to have weekly meetings with a capstone advisor. At these meetings, work that has been completed will be evaluated and subsequent goals will be planned and established. In addition, several drafts of a final Capstone report will be written throughout the semester. The final paper is meant to be similar to the process of writing a thesis, both in scope and quality. The final presentation of this course is designed to be the culmination of a student's experience in the Environmental Science & Policy and Environmental Health Science Program, and the projects will be presented at the SURE conference or a similar type of forum. Prerequisites: Senior status in EHS or ES&P or consent of the instructor

Credits: (1-3), Graded, Semester Calendar
Lecture, Every Semester
Comm Points: 1

**EV 401 Capstone Project (continuation)**

This senior level course is the conclusion of the Capstone Project. The course is for students who have taken EV400 and will be finishing their Capstone Project. The course will conclude with a final paper and presentation. Prerequisite: EV400 or consent of the instructor. Credits: (1-3), Graded, Semester Calendar
Independent Study, Spring Semesters

**EV 410 Where the Wild Things Are: Environmental Philosophy and the Emergence of the Ecosphere**

[Cross-listed with PHIL 410] This course takes Henry David Thoreau's claim 'In Wildness is the Preservation of the World' as the philosophical starting point of the American environmental movement and its attempts to conceptualize nature as a collection of ecosystems and as an ecosphere; along with the ontological, epistemological and ethical implications that result. Authors include Thoreau, Emerson, Muir, Leopold, Stan Rowe, Wes Jackson and Stuart Kauffman. Special emphasis will be given to applications to, and issues and challenges confronting, the Adirondack Park.

Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed
STS, Comm Points: 1

**EV 435 Groundwater Hydrology and Geochemistry**

[Cross-listed with CE 435] This class provides fundamental understanding of the key physical and chemical processes impacting groundwater resources and quality. Emphasis is on groundwater geology, physical characteristics of flow, and geochemical properties of groundwater. Groundwater contamination and contaminant transport and modeling will be introduced. The course will prepare students to qualitatively and quantitatively analyze fluid and contaminant flow in varied geologic systems. Prerequisites: CM132 (or CM104/106), and MA131, and (or EV/BY280)
Credits: (3), Graded, Semester Calendar
Lecture, Odd Fall Terms

**EV 490 Internship/Co-op**

Students who obtain a internship/co-op position should register for this course to document their professional experience on their transcript. During the fall semester, spring semester, or summer, a student must complete a professional experience that is not necessarily directly environmental science or environmental health science related, but clearly meets the professional goals of the student and the Clarkson university-wide requirements for a professional experience. The experience must involve a minimum of 120 hours of training and work, and must be pre-approved by the student's faculty advisor or director of the program. The student can obtain credit for the work experience by registering for this course the semester following the position, then writing a paper 20 page...
paper and doing a formal presentation. The amount of credit will be commiserate with the amount of work. Students will be required to keep a journal of work activities and submit the journal entries to the EHS program director upon completion of the professional experience. Prerequisite: Open to EHS or ES&P major or minor only, or by consent of the program director
Credits: (0-3), P/NC, Semester Calendar
Independent Study, Every Term

EV 492 Internship/Co-op
Students who obtain a (summer) internship/co-op position may obtain credit for the work experience by registering for this course the semester following the position. Students will be required to keep a daily journal of work activities and submit the journal entries to the ES&P Program Director every two weeks. During the semester following the internship/co-op, a 10-page report on some aspect of their work experience and a 30 minute presentation will be required. Prerequisite: Open to EHS or ES&P major or minor only, or by consent of the program director
Credits: (0-3), Graded, Semester Calendar
Independent Study, Every Semester

EV 494 Directed Research for Undergraduates
A research project will be completed; research projects may include laboratory projects, literature research, or individual study of environmental science, environmental engineering, and/or environmental policy topics not available in other Clarkson courses. Prerequisite: Open to EHS or ES&P major or minor only, or by consent of the program director
Credits: (1-3), Graded, Semester Calendar
Research, Every Term

EV 495 Directed Research for Undergraduates
A research project will be completed; research projects may include laboratory projects, literature research, or individual study of environmental science, environmental engineering, and/or environmental policy topics not available in other Clarkson courses. Prerequisite: Open to EHS or ES&P major or minor only, or by consent of the program director
Credits: (1-3), Graded, Semester Calendar
Research, Every Term

EV 496 Directed Research for Undergraduates
A research project will be completed; research projects may include laboratory projects, literature research, or individual study of environmental science, environmental engineering, and/or environmental policy topics not available in other Clarkson courses. Prerequisite: Open to EHS or ES&P major or minor only, or by consent of the program director
Credits: (1-3), Graded, Semester Calendar
Research, Every Term

EV 497 Directed Study
A directed study project will be completed; research projects may include laboratory projects, literature research, or individual studies of environmental science, environmental engineering, and/or environmental policy topics not available in other Clarkson courses. Prerequisite: Open to EHS or ES&P major or minor only, or by consent of the program director
Credits: (1-3), Graded, Semester Calendar
Research, Every Term

EV 498 Directed Study
A directed study project will be completed; research projects may include laboratory projects, literature research, or individual studies of environmental science, environmental engineering, and/or environmental policy topics not available in other Clarkson courses. Prerequisite: Open to EHS or ES&P major or minor only, or by consent of the program director
Credits: (1-3), Graded, Semester Calendar
Research, Every Term

Film Studies

FILM 1 (3, 5...)
A college level course for which there is no comparable Clarkson course. Used for transfer credit only.
Credits: (2-4), Graded, Semester Calendar
Independent Study, Transfer Credit Only

FILM 2 (4, 6...)
A college level course for which there is no comparable Clarkson course. Used for transfer credit only. This course may be used to satisfy a Humanities or Social Science Foundation Curriculum Requirement, depending on the specific designator.
Credits: (2-4), Graded, Semester Calendar
Independent Study, Transfer Credit Only

FILM 226 Short Film Screenwriting
[Cross-listed with COMM 226] In this course, you will learn the process of writing short screenplays for narrative fiction films of any genre. Short films can be anywhere from 30 seconds to 40 minutes long, though the majority of them fall between seven and fifteen minutes. Each student will complete two short scripts and then revise one of these from the ground up. Since this is a workshop, you are expected to comment thoughtfully on your classmates' work, as they will comment thoughtfully on yours. Though there is some reading in this course, your primary concern should be writing, writing, writing! Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed
IA
Comm Points: 2

FILM 230 Cinemas of Resistance
This course means to explore major film-making movements that fall within a category of “cinema of resistance.” We will discuss concepts in and approaches to film theory and film-making that resist a Western, hetero-normative, white, and/or patriarchal discourse and will contextualize feminist and queer cinema, black cinema, postcolonial, imperfect, and third cinema, among others. We will furthermore emphasize how films are tied to the political reality of their time and pace, including major historical moments of resistance such as decolonization, the feminist movements, the Civil Rights Movement, LGBTQ rights movements, and others. While these will be our major points of discussion, we will also touch on issues like genre, spectatorship, and politics of marketing and distribution. We will watch and discuss films by filmmakers such as Vittorio De Sica, Ousmane Sembene, Julie Dash, Sally Potter, Spike Lee, Gillo Pontecorvo, and Stephen Frears, among others.
Credits: (3), Graded, Semester Calendar
Lecture, Laboratory, Given When Needed
CGI
Comm Points: 1
In this class, we want to take a close look at the representation of migration and border crossings in global cinema from the U.S., Canada, Germany, France, the U.K., Senegal, Nigeria, Algeria, Iran, Israel, Mexico, Argentina, and China.

More often than not, conversations approach the issue of migration on a policy level, but in this class we want to take a look at how filmmakers from around the world imagine individual migrant stories and get a sense of the body of migration films that has emerged over the past three decades. Although we will certainly address policy issues, political debates, and legal frameworks, we want to focus on how cinema can create an individual humanitity of migrant and refugee characters. What are the politics of representation in an unequal world order? How is the migrant humanized or de-humanized? Does a certain way of representing immigrants indicate specific national anxieties? We will discuss issues such as clandestine border crossings, migrant labor, global mobility, privilege of citizenship, gendered migration, asylum, deportation, and many more. In addition, we will learn how to effectively read and analyze films and contribute to an ever-developing field of transnational and diasporic cinema studies and its relationship with other cinema traditions.

Credits: (3), Graded, Semester Calendar
Lecture, Laboratory, Given When Needed

Comm Points: 1

In this class, we want to explore the representations of various forms of dystopias in international cinema and our own fascination with these "bad" fictional places. How might dystopian films represent and recreate societal developments and anxieties? How do filmmakers and authors respond to different socio-political contexts and concerns, such as oppressive totalitarian regimes, environmental destruction, natural disasters, and/or medical catastrophes? Finally, we will investigate issues such as religion, gender, sexuality, race, and class as they relate to dystopian scenarios.

Credits: (3), Graded, Semester Calendar
Lecture, Laboratory, Given When Needed

IA
Comm Points: 1

In addition to being one of the most consistently profitable film genres, horror movies also provide a window into the culture anxieties captured at the time these films were made. This course examines horror films across a variety of sub-genres over the past several decades. In addition to watching these films, students will read commentary by critics and scholars that has shaped the way we think about horror films. Students will also have an opportunity to learn the basic tools of film studies while also honing their writing abilities.

Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed

IA
Comm Points: 1

In this course, you will learn the process of writing a feature-length screenplay. You will devise an original story idea, craft intermediate documents (i.e., logline, treatment, and beat sheet), and then write a first draft. Our goal is not to complete a polished draft (most screenplays go through at least a dozen revisions), but rather to execute a full draft in proper screenplay format that hits all the dramatic turning points, fleshes out characters and dialogue, and leaves you with a document ready for substantive revision - now that you know what you're writing. Since this is a workshop, you are expected to comment thoughtfully on your classmates' work, as they will comment thoughtfully on yours. Along the way, you will read several professional scripts and complete a brief critique of each. We will also learn about the profession of screenwriting, including what to do with finished scripts, how to seek representation, and what the Writers Guild of America is. Though there is a good amount of reading in this course, your primary concern should be writing, writing, writing!

 Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed

IA
Comm Points: 2
**FILM 340**  
*World in a Frame*  
[formerly LF370] Film is a complex medium that surrounds its participants, conveying ideas and emotions through the combination of words, images, sounds, and music. This course will explore the different means through which movies communicate with viewers, focusing on technical components such as photography, frame composition, movement, sound, and editing, as well as on more literary components such as screenplay, acting, directing, and producing. In the process of this exploration, class members will also learn about the major areas of film theory, since the ultimate goal of the course is to gain a better understanding of the movies that both reflect and affect the lives and times of those who make and see them.  
Credits: (3), Graded, Semester Calendar  
Lecture, Laboratory, Given When Needed  
IA  
Comm Points: 1

**FILM 345**  
*Film and Native America*  
This course focuses on the filmmaking practices of Native American and global Indigenous communities over the past 30 years. We will consider such concepts as Fourth Cinema, self-representation, authorship and genre definitions. How, for example, does Indigenous horror or documentary film have its own aesthetic and cultural concerns? Students will be introduced to both the history and theory of Indigenous cinema, from the factors motivating its emergence to the major movements and representative filmmakers. Further, students will become acquainted with aesthetic and narrative practices in Indigenous filmmaking. Although our focus will be on Turtle Island (the landmass now known as North America), we will also broaden our perspective to compare global Indigenous movements. Through the study of films by Native American and global Indigenous peoples, along with critical readings about film studies and Indigenous cultures, students will be introduced to, discuss, research, and analyze the complex nature of Indigenous cultures and societies. While the focus of this class is on contemporary film and issues, students will be introduced to Indigenous histories as told by Indigenous peoples, primarily through discussion of documentary film and critical texts. As the study of Native American film necessarily invites comparisons between Indigenous and Western cultures and worldviews, some discussions and readings will focus on Hollywood representations of Native Americans as opposed to Native American self-representations to allow us to better understand differences in cultural and social values and worldviews. Each week, students will practice analyzing films about Native American, First Nations, Aboriginal, Maori, and Sami peoples. Additionally, students will write informal responses analyzing various critical texts. The final assessment is a formal film analysis paper, in which students will interpret one or more films by Indigenous filmmakers. Examples of films and filmmakers studied include Chris Eyre’s (Cheyenne/Arapaho) Smoke Signals (1998), Jeff Barnaby’s (Mi’kmaq) Rhymes for Young Ghouls (2013), and Taika Waititi’s (Maori) Boy (2010).  
Credits: (3), Graded, Semester Calendar  
Lecture, CSO  
Comm Points: 1

**FILM 490**  
*Independent Study*  
Designed primarily for an advanced student who wishes to pursue special interests in film studies for one or more semesters, this series allows students to design and conduct independent study projects under faculty guidance.  
Prerequisite: consent of the instructor.  
Credits: (1-10), Graded, Semester Calendar  
Independent Study, Every Semester

**Finance**

**FN 1 (3, 5...)**  
*A college level course for which there is no comparable Clarkson course.* Used for transfer credit only.  
Credits: (2-4), Graded, Semester Calendar  
Independent Study, Transfer Credit Only

**FN 2 (4, 6...)**  
*A college level course for which there is no comparable Clarkson course.* Used for transfer credit only.  
Credits: (2-4), Graded, Semester Calendar  
Independent Study, Transfer Credit Only

**FN 361**  
*Financial Management*  
(May be used to satisfy a CUSB M.B.A. or M.S. foundation requirement.)  
The basic goals of this introductory finance course are to familiarize students with the concepts and tools used in corporate financial management decisions. These include the analysis of financial statements for long-term financial planning, the notion of present value in addition to the relationship between risk and return. The concepts and techniques are, in turn, used to evaluate and make decisions regarding the firm’s capital expenditures and capital structure as well as security valuation. Prerequisites: MA/STAT282, MA/STAT383 or MA330, EC150 or EC350, AC203 or AC/EM205 (or their equivalents) and sophomore standing, or the permission of the instructor.  
Credits: (3), Graded, Semester Calendar  
Lecture, Every Term

**FN 455**  
*Venture Capital and Private Equity*  
Course is designed to address financial issues relating to high tech industries and the new economy. Topics covered will include venture capital, and in-depth study of the IPO process, valuation, capital structure, long run performance and other issues related to new industries. Prerequisite: FN361.  
Credits: (3), Graded, Semester Calendar  
Lecture, Given When Needed

**FN 462**  
*Investments*  
Beginning with the formulation of individual and institutional investment objectives and policies, this course examines the various assets, securities, and contracts provided in the private and public sector. Besides the characteristics of these investments vehicles, the course also looks at how trades occur in the respective markets and the general investment-decision making process. Prerequisite: FN361.  
Credits: (3), Graded, Semester Calendar  
Lecture, Fall Semesters
FN 464  Financial Management II
This course introduces students to the complexities of financial management while providing a comprehensive overview of the major issues in Financial Management. Picking up where FN361 left off, FN464 will focus on financial strategy and the right-hand side of the balance sheet. Specific topics will include: an introduction to capital markets and the issuing of securities, capital structure issues, dividend policy, working capital considerations, mergers and acquisitions, and corporate governance. The course will integrate concepts from accounting, statistics, and economics. Prerequisite: A grade of C or better in FN361; Corequisite: AC 312
Credits: (3), Graded, Semester Calendar Lecture, Fall Semesters

FN 467  International Finance
This course explores issues in international finance, especially as they pertain to financial management. Coverage includes an overview of the international financial environment, encompassing topics such as the international monetary system, balance-of-payments, trade agreements, and capital flows such as foreign direct investment. Specific attention is given to understanding exchange rate systems, purchasing-power parity (PPP), interest rate parity and international arbitrage. Techniques for measuring and managing exchange rate risk are covered in detail. Prerequisites: FN361, EC/EM150 and EC151 or EC350.
Credits: (3), Graded, Semester Calendar Lecture, Given When Needed

FN 468  Financial Markets and Institutions
[Cross-listed with EC 468] Emphasis is placed on understanding the basics of managing financial institutions, such as banks, the flow of funds, markets, and regulatory agencies that affect the institutions. The course addresses risk management, term structure of interest rates, international and domestic market operations and policy questions about financial markets and related topics. Prerequisite: FN361.
Credits: (3), Graded, Semester Calendar Lecture, Given When Needed

FN 470  Strategic Financial Management
This case oriented capstone Finance course is designed to acquaint students with the fundamental issues in strategic financial management using financial markets. Using the underlying principle of shareholder wealth maximization, the key role of valuation in the strategic planning process will be highlighted by studying corporate decisions that interface with financial markets. Both theoretical valuation models and methods used in practice ‘on the street’ will be discussed, compared and implemented to measure the value created by investment, divestment, and restructuring decisions. The course examines the causes of value gaps in firms and develops methods to close the gaps and unlock hidden value. We will rely heavily on material from all previous Finance and Accounting courses. Prerequisite: FN464
Credits: (3), Graded, Semester Calendar Lecture, Spring Semesters

FN 474  Models for Financial Analysis
The objective of the course is to understand how financial statement information affects the market value of securities. This course examines assessment of the firm through in-depth analysis of the financial statements. In addition to direct and ratio analysis of the financial statements, the course examines analysis of such topics as short and long-lived assets, tax strategy, leasing, pension plans & benefits, hedging, off-balance sheet considerations, business combinations, other forms of restructuring, multinational operations, credit and other risk analysis. The impacts of import FASB and international accounting and tax rules are examined. Coverage is done within a CFA (TM) framework. Prerequisites: FN361.
Credits: (3), Graded, Semester Calendar Lecture,

FN 487  Special Project in Finance
An investigation of a problem or in-depth topic undertaken by the student under the guidance of a faculty member. Prerequisites: Permission from the instructor.
Credits: (1-3), Graded, Semester Calendar Research, Given When Needed

First Year Studies
FY 100  First Year Seminar
[Cross-listed with PE 100] With a focus on group work and team dynamics, this adjustment course is required for all first-year students. It introduces the mission and expectations of the learning process at Clarkson; builds communication and teamwork skills; and provides some fundamental content relating to wellness and relationships during the college experience. Discussion, team activities, leadership opportunities, and interaction with upperclass peer educators form the foundation of the course. Restriction: Freshman standing
Credits: (1), P/NC, Semester Calendar Seminar, Fall Terms

History
HIST 1 (3, 5….)  History Elective
A college level course for which there is no comparable Clarkson course. Used for transfer credit only.
Credits: (2-4), Graded, Semester Calendar Independent Study, Transfer Credit Only

HIST 2 (4, 6….)  History Elective
A college level course for which there is no comparable Clarkson course. Used for transfer credit only. This course may be used to satisfy a Humanities or Social Science Foundation Curriculum Requirement, depending on the specific designator.
Credits: (2-4), Graded, Semester Calendar Independent Study, Transfer Credit Only

HIST 100  European History Survey
Credit for this course is awarded only in the following cases: 1) receipt of a 4 or 5 on the AP European History Exam, 2) receipt of a score of 5 through 7 on the International Baccalaureate European History Higher-Level Examination, or 3) satisfactory completion of a college-level European History survey course.
Credits: (3), Graded, Semester Calendar Independent Study, Transfer Credit Only UNIV/CSO/IG
### HIST 101 World History Survey
Credit for this course is awarded only in the following cases: 1) receipt of a 4 or 5 on the AP World History Exam, 2) receipt of a score of 5 through 7 on the International Baccalaureate History Higher-Level Examination, or 3) satisfactory completion of a college-level World History survey course.
Credits: (3), Graded, Semester Calendar
Independent Study, Transfer Credit Only
UNIV/CSO/IG

### HIST 102 History of the Americas Survey
Credit for this course is awarded only in the following cases: 1) receipt of a score of 5 through 7 on the International Baccalaureate History of the Americas Higher-Level Examination or 2) satisfactory completion of a college-level History of the Americas survey course.
Credits: (3), Graded, Semester Calendar
Independent Study, Transfer Credit Only
UNIV/CSO/IG

### HIST 103 Islamic History Survey
Credit for this course is awarded only in the following cases: 1) receipt of a score of 5 through 7 on the International Baccalaureate Islamic History Higher-Level Examination or 2) satisfactory completion of a college-level Islamic History survey course.
Credits: (3), Graded, Semester Calendar
Independent Study, Transfer Credit Only
UNIV/CSO/IG

### HIST 210 The Ancient World
This course traces the birth and development of civilization in the ancient world from the 3rd millennium BC in Mesopotamia to the height of the Roman Empire in the 3rd century AD. Students will study the cultural values, economic organization and political systems of Mesopotamia, Egypt, Greece and Rome. Students will also consider the processes of social, cultural and geopolitical change in the ancient world and critically evaluate primary sources from each area in terms of their original function, and what types of information we can glean from them.
Credits: (3), Graded, Semester Calendar
Lecture, CSO

### HIST 220 American History: 1776 - 1877
[Formerly LC250] This course will survey developments in American history from the American Revolution to post-Civil War Reconstruction. Topics for special consideration will include: the American Revolution and its aftermath, the economic and political 'revolutions' of the first half of the 19th century, immigration and the opening of the West to settlement, the critical decade of the 1850's, and the Civil War and its aftermath. The focus of the course will be on the larger political and economic trends of this transformative period, but some attention will be paid to the social and intellectual developments as well. The course will alternate between lecture and discussion. A comprehensive text may be used but discussion will center on interpretive texts and primary documents. This is an entry-level course for people who want to prepare for more advanced work in American history at the upper division level.
Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed
UNIV/CSO/IG

### HIST 221 American History: 1877 - Present
[Formerly LC251] A social, political, cultural and economic survey of the United States from Reconstruction through the present.
Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed
UNIV/CSO/IG

### HIST 230 Science and Society
This course will acquaint students with the multifaceted ways in which science and society interface in the modern world. It will discuss important developments in the history of modern science (17th century-present). But examining the conceptual development of scientific theories is only part of the story. The course will also explore the broader institutional, cultural and political contexts of the theories in questions. It will analyze how science influenced the societies which nurtured it as well as how societal values impact the nature and practice of science. Relationships between religion and science, science and political authority as well as the social and ethical responsibility of the scientist will be explored. Students will understand science, not as a collection of disembodied ideas about the natural world, but as a historically and socially situated activity best understood in relation to the historical contexts in which it occurs.
Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed
STS, Comm Points: 1

### HIST 240 War and Society
[Formerly LP398] War is as old as society, and from earliest times, changes in warfare have reflected changes in society. Through primary source material (eyewitness accounts and descriptions) and selected historical writings, we will study the battle experience of soldiers and civilians, and the shifting relationship between the military and society. The course will concentrate on four stages of military/ cultural experience: 'the army of heroes' in which the warrior fights for personal honor; 'the professional army' in which training comes to the fore; 'the gentleman's war', in which the professional soldier follows a strict code of moral behavior; and 'the modern war', in which technology changes conventional warfare with dire consequences to the military and society.
Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed
UNIV/CSO/IG, Comm Points: 1

### HIST 241 War Stories I
[Formely LF392] [Cross-listed with LIT241] The oldest and most enduring stories describe war and its consequences. Reading these stories helps us see how different societies valued leadership, honor, loyalty, courage, and death on the battlefield. Not all war literature, however, glorifies heroic warriors and their exploits. Some war stories, even in the distant past, question martial codes imposed on men. Others examine what is worth dying or killing for, and still others lament the inevitable wastage and brutality of war, of the costs to individuals, civilizations, and the environment. Most of them are ambivalent. Text will range from the ancient world to the Renaissance and from Asia to Europe.
Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed
UNIV/CSO/IA, Comm Points: 1
### HIST 245  Introduction to Environmental History
In this class, students will be introduced to the major problems, current trends, and "classic" issues in the study of North American environmental history. Topics may include: climate changes and society, environments and technologies, parks and conservation, the history of environmental racism, gender and the environment, indigenous environmental knowledge, animals, pests, and animal control, water studies, and the history of Arctic environments. By the end of the course, students will have a basic understanding of what environmental history is and how it is conducted, and will be encouraged to think like historians in their everyday lives.

Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed
CSO

### HIST 250  History of 20th Century Germany
[Formerly LC375] Was Germany responsible for World War I? How and why did the Nazis rise to power? How was Auschwitz possible? Why were there two German states? What are the problems facing a reunified Germany? This course proposes to investigate these and other interesting questions by examining the social, political and cultural history of Germany from the end of the 19th century to the present. Through a combination of lectures, discussion and film, an attempt will be made to get a sense of the fabric of German society as it developed over the past hundred years.

Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed
CSO

### HIST 253  Greek Mythology
[Cross-listed with LIT253] This course will explore the beginnings of Greek culture through its myths, recorded primarily in Homer, Hesiod, the Greek dramatists of the 5th century BCE, and by later writers of the classical period, such as Apollonius of Rhodes, the Roman poet Ovid, and mythographers such as Apollodorus. As important as this rich textual record is the physical evidence of ancient Greek society. Since the late nineteenth century, archaeological excavations of sites associated with the ancient myths have steadily increased our understanding of their meaning and significance, as well as their relationship to ancient Greek religion and ritual. Finally, visual representations of the figures from myth and legend, found in vase paintings and sculptures, are essential to our full comprehension of the role of myth in the lived lives of Greeks.

Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed
UNIV/CSO/IA
Comm Points: 2

### HIST 255  Introduction to Global History
Introduction to Global History is a course that looks at global patterns through time, and attempts to see history as an integrated whole. Topics are studied in a general chronological order, but each is examined through a thematic lens, showing how people and societies experience exchanges, integration and differences. The course consists of lectures that allow exploration of these issues at either introductory levels or at a more advanced level.

Credits: (3), Graded, Semester Calendar
Lecture, Spring Semesters
UNIV/CSO/IG

### HIST 260  The Soviet Union at War
The Soviet Union engaged in war throughout its 74-year history. This course will address the experience of World War One as a contributing factor to the Russian Revolution, the Russian Civil War (1918-1921), the Russo-Polish War (1919-21), intervention in the Spanish Civil War (1936-9), the Winter War (1939-40), the Great Patriotic War (1941-45), the Cold War including proxy wars and Soviet interventions during the period, the Soviet-Afghan War (1979-89) and the Gulf War (1990-91). Aspects to be considered include the conduct of and experience of war, development of Soviet defense capabilities, the diplomacy of war and peacemaking, the impact of war on Soviet society, and the international reactions to the Soviet Union.

Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed
UNIV/CSO/IG

### HIST 270  Introduction to Society, Culture & Biology
This course welcomes students into the interdisciplinary world of the human and biological sciences. In this class we will encounter the myriad ways in which the human and biological sciences were constituted, defined, and intertwined in the nineteenth and twentieth century. Students will learn to place ideas and controversies within a broad historical and cultural context. They will gain experience evaluating and interpreting historical texts. They will evaluate scientific theories, controversies, and ethical failures.

Credits: (3), Graded, Semester Calendar
Lecture, Fall Semesters
UNIV/CSO/STS

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**Undergraduate Level Courses**

*For the full catalog, please visit the Clarkson University Course Catalog.*
populations. We will explore public health responses to diseases such as smallpox, tuberculosis, typhoid, syphilis, and HIV/AIDS and examine the ways in which those responses actually framed the conceptions of disease. Some of the questions we will address include: Who is responsible for the public’s health? To what extent has the responsibility for the public’s health changed over time? What rights should individuals have if they endanger the health of others? How have class, race, ethnicity, gender, and sexuality shaped public responses to and understandings of disease?

Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed
UNIV/CSO/STS, Comm Points: 1

HIST 322 Indigenous North America Post-Contact
This course studies the history of North America—what some Indigenous peoples call “Turtle Island”—from contact to present. This course will introduce students to the historical processes that shaped Indigenous and settler history in North America. Throughout this course, students will analyze Indigenous history through a variety of historical lenses, including those of ethnohistory, environmental history, political history, and legal history. This course will cover a variety of themes including the nature of contact between Indigenous peoples and settlers, treaties, land claims, and education. The course explores a variety of sources for studying and engages with Indigenous-centered perspectives that challenge conventional histories of colonialism, focusing on human migrations, economic expansions, and cultural developments.

Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed, CSO

HIST 323 Modern War Literature
Although war is one of the constants of human history, societies have always struggled to come to terms with it. Reading accounts of war helps us see how different societies value leadership, honor, loyalty, courage, and death on the battlefield, even as they question what is worth dying or killing for, and recognize the inevitable wastage and brutality of war, the costs to individuals, families, civilizations, and the land itself. Most war narratives are ambivalent, depicting both the heroism and the horror of war. This course examines both fiction and non-fiction accounts of war in the modern, industrialized world.

Credits: (3), Graded, Semester Calendar
Lecture, Even Fall Terms
CSO, Comm Points: 1

HIST 327 History of Women and Gender in America
This course focuses on the historical experiences of American women from the seventeenth-century era of colonization to the modern era (with an emphasis on the nineteenth and twentieth centuries), and it explores the role gender plays in shaping and defining American history. A separate investigation of women’s experiences provides an understanding of 1) the distinct contributions of women to the American heritage, and 2) the ways in which gender intersects with race, ethnicity, class, sexuality, region, and religion in explaining social, cultural, and political developments in the United States.

Credits: (3), Graded, Semester Calendar
Lecture, Fall Terms
UNIV/CSO/IG, Comm Points: 1

HIST 328 History of Gender and Sexuality in the Transatlantic World
This is a historical look at the constructions of gender and sexuality throughout the Transatlantic world. Chronologically, it will focus on the period of 1492-1999. Topics to be covered include the constructions of genders in Europe, the Americas and Africa. The course will progress chronologically, however it will cover certain topics in depth and other topics as part of a broad overview. Students will come to understand how cultures and societies shape and are shaped by gender constructions. In addition, students will come to appreciate the historical individual’s negotiation of gender within a social grouping.

Credits: (3), Graded, Semester Calendar
Lecture, UNIV/CSO/IG

HIST 329 History of the American Family
What is a family? How have social, political, and economic forces shaped American families? How has the family changed throughout history? Did the end of the twentieth century see the demise of the American family, as some social critics have claimed? Focusing on the United States, this course will examine the history of marriage, divorce, childrearing, sexuality, families of different races, ethnicities, religions, classes, and regions, and the portrayal of the family in the media, as well as controversial issues concerning the American family today.

Credits: (3), Graded, Semester Calendar
Lecture, Fall Semesters
UNIV/CGI/CSO, Comm Points: 1

HIST 331 Ancient Medicine and Magic
[Formerly LC331] In a seemingly hostile world controlled by unseen forces, ancient man fought to gain the upperhand in a daily struggle against illness and death. Using magic and medicine (both thought to be equally valid) he sought to understand his body and maintain his health. Primary written sources and information gleaned from skeletal and mummified human remains allow us to trace the development of medicine from its earliest appearance in Mesopotamia and Egypt to its more advanced form in Greece and Rome. Topics will include: disease, wounds, cures, surgery, the interplay between the supernatural and the mundane, physiology, life expectancy, nutrition, gynecology, and hygiene.

Credits: (3), Graded, Semester Calendar
Lecture, Spring Semesters
STS

HIST 332 Documenting Social Activism
The course explores social movements in United States after World War II and allows students to describe and interpret the complex nature of cultures and societies in historical context. The movements will focus on issues of racial civil rights, workers’ rights, the women’s movement, the gay rights movement, the American Indian Movement and the Students’ Movements. Ranging from 1945 until the present day the course illustrates the process of social, cultural, and geopolitical change over time. This is a team taught course in which students will be required to create a documentary film. Therefore students will split their time between history lectures, seminar style discussion and documentary film production. The course has 3 hours of class and 3 hours of lab per week, and students should expect to do extensive out-of-class work. Limit of 20 students. Permission of one of the instructors required.

Credits: (4), Graded, Semester Calendar
Lecture, Laboratory, UNIV/CSO/IA
Comm Points: 1
HIST 333  Science, Technology, and Society in the Renaissance
[Formerly LC395] Guns and printing were among the many revolutionary technological developments in Renaissance Europe. With the increased scale of war, feudal structures gradually dissolved and nationalism began to emerge. At the same time, religious reformation, with its theses disseminated through the printed page, helped shift the balance of power among states and individuals. Meanwhile, banking, commerce, and colonization, fueled by advances in navigation, promoted the beginning of capitalism. The theories of Copernicus, Kepler, and Galileo irreversibly changed ideas about man’s place in the universe. Beginning with mathematical perspective and ending with the new scientific method, this course will chart the extraordinary technological and scientific advances and profound economic and social changes that together mark the birth of the modern world.
Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed
UNIV/CSO/STS

HIST 335  History of Medicine in Europe and North America
History of medicine is important even to those who think of themselves primarily as scientists or historians of science. Much of what we might initially see as biology, chemistry or physics was done within medicine, and even today a great deal of science either goes on in hospitals and the associated laboratories, or is at least nominally directed towards medical ends.
Credits: (3), Graded, Semester Calendar
Lecture, Fall Semesters
UNIV/CGI/STS

HIST 337  Medicine in Europe and America
From a distance, the study of medical history might appear little more than an idle pursuit - perhaps only a study of great men and their discoveries. However, even slight reflection on the social, institutional, and cultural features of medicine will lead us to reconsider much about medicine that we might before have taken for granted. Enrollment is limited to students participating in the Trudeau Semester. Enrollment is limited to students participating in the Trudeau Semester.
Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed
UNIV/CSO/STS
Comm Points: 1

HIST 338  Women, Gender and Science in American History
Why have science, medicine, and technology traditionally been the domains of men? What are the consequences of that? What has motivated women to become scientists, health care practitioners, and engineers? Has their growing participation changed the cultures of science, medicine, and technology? Focusing on the United States, this course examines (1) how preconceived notions about women, men, gender, and sexuality have shaped scientific ideas, and (2) the history of women as actual participants in science, medicine, and technology. We will use a historical perspective to shed light on current discussions about the gender dimensions of science.
Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed
UNIV/CSO/STS
Comm Points: 1

HIST 339  Engineering and the Environment in the Ancient World
Since earliest times humans have attempted to improve their lives by controlling their environments, often with unintended consequences. This course explores the impact of engineering on the environment in ancient Mesopotamia, Egypt, Greece and Rome. Students will consider such topics as irrigation and agricultural practices, exploitation of natural resource, water supply and management, fortifications, communication pathways (roads and shipping), sewage systems, and mining. We will also learn about the effects of climate change on human populations and productivity.
Credits: (3), Graded, Semester Calendar
Lecture, Even Fall Terms
UNIV/CSO/STS
Comm Points: 1

HIST 340  Warfare in Ancient Greece
Study the major conflicts and conquests from the late Bronze Age to the founding of the Roman Empire. Topics include: weaponry and technological advances; reconstructions and battle-plans of specific engagements; combatants, non-combatants, and leaders; motivations, causes, and consequences; empire-building.
Credits: (3), Graded, Semester Calendar
Lecture, CSO

HIST 341  War in Ancient Rome
The Romans developed the most successful military organization of the ancient world, but it took a great deal of painful experience, political maneuvering, and reform to move from volunteer citizen-soldiers to the highly trained professional legionaries of the Empire. This course traces the history of the Roman military from the inception of the Republic to the height of the Empire. Using primary and secondary sources, we will study the major wars of the Republic and early Empire: the Punic Wars, Caesar’s Gallic Wars, the Civil Wars, and the wars of Imperial expansion. Specific topics will include weapons and armor, tactics, strategy, fortifications, artillery, leadership, and the campaign experience of legionaries. We will also consider the social, political, and economic consequences of warfare, and the impact of the Roman army on non-Roman cultures.
Credits: (3), Graded, Semester Calendar
Lecture, Odd Spring Semesters
UNIV/CSO/IG
Comm Points: 1

HIST 342  War and Gender
War and Gender will examine the historical category of gender as it pertains to war in the Modern Era. The course will span several cultures in Europe, the Americas and Africa as they relate to gender and war. The course breaks down into roughly four sections: introduction to the historical analysis of gender and war, conventional war, unconventional war and the imagined war. Each of these sections breaks down further into an analysis of masculinity and femininity. The course structure will alternate between lecture and source discussions seminar style. Students will be expected to analyze a variety of primary and secondary audio-visual source material for all sections. A significant portion of the class will focus on primary and secondary sources drawn from art, photography, literature and film in order to understand how gender shapes social values and worldviews regarding war.
Credits: (3), Graded, Semester Calendar
Lecture, UNIV/CSO/IA, Comm Points: 1
HIST 343  
**War in the Middle Ages**  
[Formerly LC392] One popular image from the Middle Ages is the brightly armored knight, charging into battle on his steed and performing brave deeds of arms. While war was a defining force in the medieval era, the picture is somewhat more complex. This course will consider European warfare from the Carolingian period to the dawn of the Renaissance, including the origins of feudalism, the Crusades, and the Hundred Years War. Using primary and secondary sources, we will look at developments in arms, armor, training, strategy, tactics, logistics, and battlefield experience. Our problem will be to determine the relationship between warfare and the economic, social, religious, and political culture of medieval Europe.  
Credits: (3), Graded, Semester Calendar  
Lecture, Given When Needed  
UNIV/CSO/IG  
Comm Points: 1

HIST 347  
**World War I**  
This course offers an in-depth examination of the World War I of 1914-18, its causes, campaigns, and consequences. Taking into account long-term and short-term factors, the war is considered as the first truly 'modern' war with new technologies playing a role in a conflict of truly catastrophic scale. While many of the histories of World War I focus on Western Europe, this course will consider the war in global context, provide an insight into how great power politics was changed by it, an examination of strategy and campaigns, and a consideration of scientific and technological development. Students will engage with both primary and secondary sources relating to the war including government documents, diaries, letters, artistic and literary depictions, film, as well as considering how the war has been and can be represented in various ways.  
Credits: (3), Graded, Semester Calendar  
Lecture, Given When Needed  
UNIV/CSO/IA  
Comm Points: 1

HIST 348  
**World War II**  
World War II was one of the pivotal events of the twentieth century, and its legacies remain important to this day. The course will address the origins, outbreak, course, impact, and resolutions of the war. Taking a global perspective, the course goes beyond simply a study of battles and addresses all aspects of the war, from great civilian and military leaders to the common soldiers, along with social, cultural, and economic changes on the various home fronts. Students will engage with a range of primary and secondary material relating to World War II, including texts, film, novels, and material artifacts.  
Credits: (3), Graded, Semester Calendar  
Lecture,  
UNIV/CSO/IG  
Comm Points: 1

HIST 349  
This course is intended to provide a general history of the Cold War, 1945-1991. We will discuss not only the evolution of the Soviet-American rivalry, but also the many smaller wars which emerged out of this larger conflict. Special attention will be paid throughout to the social, political, and cultural aspects of the Cold War. We will consider how the conflict was driven by social and political currents within the contending parties, and how the war shaped and transformed the societies that were a part of it.  
Credits: (3), Graded, Semester Calendar

HIST 351  
**The Holocaust in Text and Film**  
The Nazi mass murder of European Jewry during World War II occupies a special place in the annals of history. The attempted genocide of an entire people by a so-called 'advanced' nation gives rise to the historically and sociologically perplexing question 'how could it happen?' and undermines our faith in human reason and progress. The Holocaust also suggests that the nature of 'human nature' may be more complex than most care to admit. This course seeks to examine the experience of the Holocaust through a combination of literary and non-literary texts.  
Credits: (3), Graded, Semester Calendar  
Lecture, Given When Needed  
UNIV/CSO/IG  
Comm Points: 1

HIST 353  
**Medicine and Medical Ethics During the Third Reich**  
This seminar will attempt to explain how and why German medical professionals made the "Faustian bargain" with the Nazi regime. Although emphasis will be placed on the myriad ways in which an eugenic outlook and the aspirations of German physicians gave rise to Nazi medical practices, including the notorious medical experiments in hospitals and concentration camps, we will also examine the 1947 Doctors' Trial at Nuremberg and the Nuremberg Code of Medical Ethics that followed from it. Throughout the course, students will discuss the moral decisions made by medical professionals during the Third Reich as well as the ethical implications of Nazi medicine for our own twenty-first century age of genomic medicine. Prequisites: BY214 or any of the following courses: HIST351, HIST354, HIST356 or consent of the instructor  
Credits: (3), Graded, Semester Calendar  
Lecture, Spring Semesters  
UNIV/IG/ST  
Comm Points: 1

HIST 365  
**Technology and the Modern State**  
In this course, students will explore how technologies of various types have been used in service of, or against, the modern state in the 19th-21st centuries. Topics may include: mega-projects and national identity, military technology, narratives of "invention" and "firsts," gender, race, and technology, technological modernity, technological discourses, and bodily experiences of everyday technology. At the end of the semester, students will create a public-facing project using primary and secondary historical sources.  
Credits: (3), Graded, Semester Calendar  
Lecture, Given When Needed  
UNIV/CSO/STS

HIST 370  
**Extreme Science: Marginal Environments in the History of Science**  
In this class, students will learn about the history of how science has been practiced in "extreme" environments at the limits of the geographic and environmental imagination since the seventeenth century. Topics may include: the microscopic world and the development of scientific instruments; empire, colonialism, and the sciences of oceanic and terrestrial exploration; geopolitics and international scientific cooperation; the "space race" and the "races" for the North and South Poles; and "extreme environments" in

Undergraduate Level Courses  
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culture, art, and literature. By the end of the course, students will have a basic understanding of the connections between science, the environment, and the larger socio-cultural imagination, and will be encouraged to think like historians in their everyday lives.

Credits: (3), Graded, Semester Calendar
Lecture,

UNIV/CSO/STS

HIST 380  Special Topic in History
Special topics courses are developed to cover emerging issues or specialized content not represented in the main curriculum. Not all courses are offered each semester. See the course schedule for a detailed topic description.

Credits: (3), Graded, Semester Calendar
Lecture, Fall Semesters
CSO

HIST 390  Special Topic: History
Special topics courses are developed to cover emerging issues or specialized content not represented in the main curriculum. Not all courses are offered each semester. See the course schedule for a detailed topic description.

Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed

HIST 393  Special Topic: History of Social Activism after WWII
The course explores social movements in United States after World War II. The movements will focus on issues of race and ethnicity, poverty, civil rights, civil liberties and gender discrimination. The social movements explored will cover the main organizations and key individuals. Special attention will be paid to the religious liberal tradition and grass roots activism.

Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed

HIST 394  Special Topic: History of Social Activism after WWII
The course explores social movements in United States after World War II. The movements will focus on issues of race and ethnicity, poverty, civil rights, civil liberties and gender discrimination. The social movements explored will cover the main organizations and key individuals. Special attention will be paid to the religious liberal tradition and grass roots activism.

Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed

HIST 459  Neuroscience and Society
[Cross-listed with PY 459] The word 'neuroscience' is of recent origin. Yet we can trace neuroscientific ideas back to Rene Descartes. Since Descartes, social understanding of madness, the relationship between mind and brain, and the nature of sensation and perception has changed frequently. Beginning in the Age of Mechanical Man and ending in the Age of Prozac, our course focuses mainly on ways contemporary society has influenced neuroscientific thought and, in turn, the ways neuroscience has influenced society.

Credits: (3), Graded, Semester Calendar
Lecture, Spring Semesters
STS
Comm Points: 1

HIST 490  Independent Study
Designed primarily for an advanced student who wishes to pursue special interests in history for one or more semesters, this series allows students to design and conduct independent study projects under faculty guidance.

Prerequisite: consent of the instructor.

Credits: (1-10), Graded, Semester Calendar
Independent Study, Every Semester

HIST 498  Undergraduate TA
A student assists a faculty member in teaching a course. The student engages in substantial pedagogical work beyond mastery of the course material. Such activities may include mentoring students in course work, leading class discussions, designing and presenting course modules, etc. The primary objective is for the students to work with a faculty member to learn and practice pedagogical approaches in the discipline.

Credits: (1-3), Graded, Semester Calendar
Independent Study, Every Semester

HIST 499  Minor Portfolio
In this course, students complete their Liberal Arts Minor Portfolios under the direction of their minor advisor. The course is graded on a Pass-No Credit Basis.

Credits: (0), P/NC, Semester Calendar
Independent Study, Every Semester

Honors Program

HP 100  The Social and Ethical Implications of Research I
This course will provide an opportunity to assess and develop one's own skills in group work, information technology, original research, and project-based learning. As part of the Honors Program, students are expected eventually to pursue their own thesis research and explore cutting-edge issues in science, technology, and society. This course is designed to prepare them to investigate the social and ethical implications of emerging knowledge and its applications. Students will be required to hone their skills in investigation, critical thinking, written and oral communication of complex ideas, working as part of a team, and problem-solving. They will also be expected to acquire computer competencies necessary for work at Clarkson and eventual research at the University. Prerequisite: Open to Honors Program Students only.

Credits: (3), Graded, Semester Calendar
Lecture,Discussion, Fall Semesters

HP 101  The Social and Ethical Implications of Research II
This course will provide an opportunity to assess and develop one's own skills in group work, information technology, original research, and project-based learning. As part of the Honors Program, students are expected eventually to pursue their own thesis research and explore cutting-edge issues in science, technology, and society. This course is designed to prepare them to investigate the social and ethical implications of emerging knowledge and its applications. Students will be required to hone their skills in investigation, critical thinking, written and oral communication of complex ideas, working as part of a team, and problem-solving. They will also be expected to acquire computer competencies necessary for work at Clarkson and eventual research at the University. Prerequisite: Open to Honors Program Students only.

Credits: (3), Graded, Semester Calendar
Lecture,Discussion, Spring Semesters
**Undergraduate Level Courses**

### HP 102  
**Introduction to Programming I**
This lab section will teach the computer competencies necessary for work at Clarkson and eventual research at the University. Prerequisite: Open to Honors Program Students only.  
Credits: (1), Graded, Semester Calendar  
Laboratory, Fall Semesters

### HP 103  
**Introduction to Programming II**
(Cross-listed with ES 100) This lab section will teach the computer competencies necessary for work at Clarkson and eventual research at the University. Prerequisite: Open to Honors Program Students only.  
Credits: (1), Graded, Semester Calendar  
Laboratory, Spring Semesters

### HP 200  
**Honors Sophomore Seminar**
Prerequisite: Open to Honors Program Students only.  
Credits: (3), Graded, Semester Calendar  
Seminar, Fall Semesters

### HP 201  
**Honors Problem Seminar**
Blending consideration of classic texts from the 17th c. to the present with an assessment of contemporary writings, this course examines two, crucial intellectual developments in the modern West. The first is the emergence of the mechanistic conception of things. This conception is expressed not only in the West's understanding of the physical universe but also in its perception of social, political, and economic relationships. The second development involves the rise of new concerns with the treatment of both the natural world and human relationships. Triggered in part by a Romantic reaction, this development finds expression in both environmentalism and communitarian movements. Participants in this course should be prepared for substantial reading and writing, ongoing discussions, and some independent research. This satisfies the LS 195 (Great Ideas in Western Culture I) or LS 196 (Great Ideas in Western Culture II) requirement for Honors students. Prerequisite: Open to Honors Program Students only.  
Credits: (3), Graded, Semester Calendar  
Seminar, Spring Semesters

### HP 280  
**Honors Independent Study**
This series allows students to design and conduct independent study projects under faculty guidance. Permission of the Honors Director is required.  
Credits: (1-10), Graded, Semester Calendar  
Independent Study, Every Semester

### HP 300  
**Honors Junior Science Seminar**
Credits: (3), Graded, Semester Calendar  
UNIV/CGI/CSO

### HP 380  
**Honors Independent Study**
This series allows students to design and conduct independent study projects under faculty guidance. Permission of the Honors Director is required.  
Credits: (1-10), Graded, Semester Calendar

### HP 390  
**Honors Undergraduate Thesis**
Research project to be arranged with the consent of the Honors Research Committee and, typically, a staff member of the student's major department. The faculty director of the project assists the student in the choice of the research problem and the planning and execution of the project.  
Credits: (3-10), Graded, Semester Calendar  
Research, Every Term

### HP 391  
**Honors Undergraduate Thesis**
Credits: (1-9), Graded, Semester Calendar  
Research, Every Term

### HP 400  
**Honors Senior Seminar on Modernity**
In the late fifteenth and early sixteenth centuries the Modern Age began with a technological revolution that paved the way for our modern vision of the world. These three areas - technology, science and cartography, and the military revolution - have been credited with ushering in a new world of politics (the nation-state with large standing armies), a new world of knowledge (the Scientific Revolution), a new world of religion (the Reformation), a new social world (the middle class), a new economic world (Capitalism), and what was literally called the New World. These were irreversible changes with global implications. In this class we will explore and compare early technologies to the current state of digital, positioning, and military technology. Prerequisite: Open to Honors Program Students only.  
Credits: (3), Graded, Semester Calendar  
Lecture, Spring Semesters  
UNIV/CGI/CSO

### HP 480  
**Honors Independent Study**
Designed for Honors Program seniors who wish to pursue special interests that are consistent with the goals of the Honors Program. This series allows students to design and conduct independent study projects under faculty guidance. Permission of the Honors Director is required.  
Credits: (1-10), Graded, Semester Calendar  
Independent Study, Every Semester

### HP 490  
**Honors Undergraduate Thesis**
A continuation of HP 390. A written thesis is required at the end of the course.  
Credits: (3-10), P/NC, Semester Calendar  
Research, Every Term

### HP 491  
**Honors Undergraduate Thesis**
Credits: (1-9), P/NC, Semester Calendar  
Research,

### Health Sciences

#### HS 1 (3, 5...)
**Health Science Elective**
A college level course for which there is no comparable Clarkson course. Used for transfer credit only.  
Credits: (1-4), Graded, Semester Calendar  
Independent Study, Transfer Credit Only
HS 200  Health Coaches I: Introduction to Community Healthcare
In a new collaboration with Canton-Potsdam Hospital, HS 200 is the first in a 2-semester sequence that trains students to become Health Coaches in the Potsdam community. Students will attend a weekly 2-hour seminar class in which they learn about key issues in current healthcare policy, management, and delivery. Each week, different healthcare practitioners will discuss a variety of topics, including healthcare delivery challenges in the community, ethical concerns regarding insurance, and heart disease. The end of the course focuses on patient care and skill building. The course will culminate in a group presentation of a case study. By the conclusion of this course, students will be equipped to begin health coaching with continued guidance. Application required. Contact the instructor for more information.
Credits: (2), Graded, Semester Calendar
Lecture, Fall Terms

HS 210  Health Coaches II: Community Healthcare Practicum
HS210 is the second in a 2-semester sequence that trains students to become Community Health Coaches in the Potsdam area. This course is offered in collaboration with the Canton Potsdam Hospital, part of the St. Lawrence Health System. During this practicum, each student will be assigned a patient to work with and will visit the patient in their home and maintain phone contact. The Health Coach will help the patient manage their health and navigate the healthcare system. The Health Coach will also meet regularly with a Canton-Potsdam Hospital healthcare team to discuss their coaching approach and gain knowledge on how to best manage the particular situation of their patient. All HS210 students must have access to personal transportation. Prerequisites: HS200 and approval of instructor(s). Requirement: Access to transportation
Credits: (2), Graded, Semester Calendar
Practicum, Given When Needed

HS 220  Medicine & Healthcare Profession Seminar
Organized by the Career Center with assistance of the Pre-Health Advising Coordinator and in consultation with the Clarkson Health Professions Committee Chair, this course meets semi-weekly, and uses the seminar format to bring in human health professionals from a diversity of fields to discuss their professions, including what their professions encompass, the academic and experiential track they followed to become medical professionals, their perspective on the future directions of their fields, and opportunities for Clarkson students to pursue these fields. It will also bring representatives of different professional schools to discuss admission, expenses, and career opportunities.
Credits: (1), P/NC, Semester Calendar
Seminar,

HS 405  Experiential Learning in Medicine & Healthcare
This is an independent study course under the mentorship of a member of the Health Professions committee. The student is required to complete at least 50 hours of work in a health profession setting. The work must include some form of interaction with health professionals and with patients or analogous health-service recipients. Examples include healthcare internships or volunteer positions at a hospital or clinic, completions of HS 210 Health Coaches II, serving as an EMT or emergency first-responder, serving as an athletic trainer. Conducting research with medical applications that does not involve working with patients/health-service recipients will not meet the requirements for this course. Upon completing the experience, the student will prepare a short (around 3 page) self-reflective essay on what the student did and learned during the experience, and how the experience has affected the student’s professional goals and preparation.
Credits: (1), P/NC, Semester Calendar
Independent Study, Fall and Spring Terms

Humanities & Social Sciences

HSS 210  Professional and Technical Writing
HSS 210 is an introduction to technical and professional writing. This course provides students with practical information about communicating in different kinds of workplace environments and professional/technical discourse communities. Throughout the semester students will produce and analyze common technical writing genres, including emails, letters, resumes, memos, reports, proposals, technical descriptions, technical definitions, technical manuals, and proposals. Students will work toward understanding how to analyze and react to rhetorical situations each genre and writing situation presents, including issues of audience, organization, visual design, style, and the material production of documents.
Credits: (1), Graded, Semester Calendar
Lecture, Given When Needed
Comm Points: 2

HSS 220  Writing Across the Disciplines
The overall goal of this online course is to enable students to be successful writers and scholars in the academy and to help students produce genres of writing used in their professions. Students will learn how to research and analyze in their chosen academic disciplines and how to use writing as a tool for discovery, thinking, and problem-solving. They will identify the conventions of their discourse communities and use these conventions in their own writing. While we will address the differences and similarities between writing in varying academic disciplines, most of the work in this course will be devoted to the study of students’ own disciplinary groups and chosen fields. Where possible, students will work in smaller disciplinary cohorts to foster collaborative research and
writing skills. Through flexible and rigorous research, students will be able to locate and define various genres of writing in their disciplines and gain the skills to become confident and competent writers.

**Credits: (3), Graded, Semester Calendar**
Lecture, Given When Needed
Comm Points: 2

### Humanities

#### HUM 1 (3, 5...)
**Humanities Elective**
A college level course for which there is no comparable Clarkson course. Used for transfer credit only.
Credits: (2-4), Graded, Semester Calendar
Independent Study, Transfer Credit Only

#### HUM 2 (4, 6...)
**Humanities Elective**
A college level course for which there is no comparable Clarkson course. Used for transfer credit only. This course may be used to satisfy a Humanities Foundation Curriculum Requirement, depending on the specific designator.
Credits: (1-9), Graded, Semester Calendar
Lecture, Transfer Credit Only

### Information Systems

#### IS 1 (3, 5...)
**Information Systems Elective**
A college level course for which there is no comparable Clarkson course. Used for transfer credit only.
Credits: (2-4), Graded, Semester Calendar
Independent Study, Transfer Credit Only

#### IS 2 (4, 6...)
**Information System Elective**
A college level course for which there is no comparable Clarkson course. Used for transfer credit only.
Credits: (2-4), Graded, Semester Calendar
Independent Study, Transfer Credit Only

#### IS 110
**Introduction to Business Intelligence and Data Analytics**
This course is an introduction to the underlying technology components of modern information systems used in businesses. It is important for organizations to utilize technology to collect data and use modern analysis tools and techniques to transform that data into tactical and strategic information. Emphasis is on introducing students to the main building blocks of information systems in organizations, and how such systems can be used to support individual and organizational decision making. Students will gain hands on experience in using data gathering and analysis tools such as Microsoft Excel and Enterprise Resource Planning software. Offered Fall and Spring semesters. Prerequisite: Freshman or Sophomore standing.
Credits: (3), Graded, Semester Calendar
Lecture, Every Term (TECH)
IS 200  **ERP Fundamentals**
The course serves as an introduction to enterprise resource planning (ERP) concepts and navigation using SAS R/3 software. This course is a corequisite for non-CUSB or IE&M students taking MK320, OM331, or OS352 who have not taken IS211. Restriction: Students may not receive credit for IS200 as well as IS211.
Credits: (1), P/NC, Semester Calendar, Lecture, Every Semester

IS 237  **Introduction to Application Development**
This course will enable students to gain the knowledge and necessary skills required to develop standard software applications. Students will learn object-oriented application development and programming principles and how they are applied through all the stages of software development, from requirements to testing and deployment. Students will learn programming syntax and best programming practices including documenting, testing, and error correction. Offered Spring semesters.
Credits: (3), Graded, Semester Calendar Lecture, Spring Semesters (TECH)

IS 301  **Applied Data Analytics**
(Cross-listed with EM301) Proper utilization of modern analytical tools is a critical component of effective and timely creation and use of organizational intelligence in a variety of fields of human endeavor: management, social science, health care, engineering etc. This course focuses on critical skills for using software tools such as Excel, SQL, and Tableau (or their equivalents) for the purpose of conducting a variety of analytics tasks and operations to improve gathering, generation and presentation of organizational intelligence. Focus is on proper data gathering and preparation, followed by the use of key analysis grouping and summation tools as well as data presentation and visualization. Prerequisite: IS110. Students may not receive credit for IS200 as well as IS211.
Credits: (3), Graded, Semester Calendar Lecture, Every Term (TECH)

IS 314  **Database Design & Management**
(Cross-listed with EM 314) This course provides the student with in-depth knowledge of database analysis, design, and implementation principles. Students who successfully complete this course will be able to use the entity-relationship data model to represent business data requirements, to translate that model into a relational schema, to normalize this schema and to build and use a relational database that implements the schema, using the Standard Query Language (SQL).
Credits: (3), Graded, Semester Calendar Lecture, Fall Semesters

IS 400  **Process and System Analysis and Modeling**
Students are expected to master the fundamentals of business process analysis and application design using the traditional and agile analysis and modeling approaches. Students will learn methodologies and project management skills by completing an array of individual assignments that involve planning, design and prototyping of business application systems. A mock prototype software application based on the analysis will be developed throughout the course. Offered Fall semesters. Prerequisites: IS237 or CS141 or EE261
Credits: (3), Graded, Semester Calendar Lecture, Fall Terms

IS 415  **Data Warehousing for Analytics**
(Cross-listed with EM 415) This course covers the fundamental concepts, design, management and application of data warehouses and business/enterprise intelligence systems. Specific topics covered include the logical design of a data warehouse, the data staging area and extraction-transformation-loading process, the design, implementation and utilization of multi-dimensional data analysis systems, as well as key business/enterprise intelligence concepts, processes and techniques including knowledge discovery and exploratory analysis. Offered Fall semesters. Prerequisites: IS314 or CS460/EE468
Credits: (3), Graded, Semester Calendar Lecture, Spring Terms

IS 426  **Big Data Architecture**
This course will enable students to gain understanding of critical components and the processes of big data architecture. The course will take a hands-on approach, enabling students to develop skills for creating data processing pipelines and procedures to transform and integrate structured, semi-structured and unstructured data. The course will provide students with an understanding of web service based systems architecture and best practices for deployment of scalable applications for data analytics. Offered Fall semesters. Prerequisites: IS211, & IS314, & IS237, CS141 or EE261, or IS110
Credits: (3), Graded, Semester Calendar Lecture, Fall Terms

IS 428  **Information Systems for Supply Chain Management**
This course will be focused on information systems that enable supply chain integration. Redesign of core intra and inter-enterprise business processes will be discussed in detail. Students will be introduced to and will get hands-on experience with latest technologies such as Extended Enterprise Systems. The trend of outsourcing of business and supply chain processes to distant geographical locations and its impact on business practices and strategies will be discussed in detail. Course material will be comprised of book chapters, cases, labs, and project work to apply concepts learned in the course, and to include hands-on experience with business process driven enterprise software (e.g. SAP Advanced Planner & Optimizer). Prerequisite: OM331.
Credits: (3), Graded, Semester Calendar Lecture, Fall and Spring Terms

IS 437  **Data Analytics Project: Planning, Development, and Data Analysis**
This course highlights the development of business intelligence applications which use remote data and web services for the purpose of presentation to organizational decision makers. As an experiential course, students will be required to engage in all stages of planning, analyzing and building a complete connected software application stack for data analytics. Students will use the stack to analyze a real-life data set, delivering insight and recommendations based on the analysis. Offered Spring semesters. Prerequisites: IS314 and, IS237 or CS141 or EE261 Prerequisites: IS314 and, IS237 or CS141 or EE261
Credits: (3), Graded, Semester Calendar Lecture, Spring Terms

IS 487  **Special Project in Information Systems**
An investigation of a problem or in-depth topic undertaken by the student under the guidance of a faculty member. Permission of the instructor required.
Credits: (1-3), Graded, Semester Calendar Research, Given When Needed

**IS 999 Special Graduate Topics**
A graduate level course for which there is no comparable Clarkson course. Used for transfer credit only.
Credits: (1-10), Graded, Semester Calendar Independent Study, Transfer Credit Only

**Information Technology**

**IT 2 (4, 6...)** Information Technology Elective
A college level course for which there is no comparable Clarkson course. Used for transfer credit only. This course may be used to satisfy a Technology Requirement.
Credits: (2-4), Graded, Semester Calendar Independent Study, Transfer Credit Only (TECH)

**Language**

**LANG 1 (3, 5...)** Language Elective
A college level course for which there is no comparable Clarkson course. Used for transfer credit only. This course may be used to satisfy a Humanities Foundation Curriculum Requirement.
Credits: (2-4), Graded, Semester Calendar Independent Study, Transfer Credit Only

**LANG 2 (4, 6...)** Language Elective
A college level course for which there is no comparable Clarkson course. Used for transfer credit only. This course may be used to satisfy a Humanities Foundation Curriculum Requirement.
Credits: (2-4), Graded, Semester Calendar Independent Study, Transfer Credit Only

**LANG 100** Intermediate French Language
Credit for this course is awarded only in the following cases: 1) receipt of a score of 5 through 7 on the International Baccalaureate French B Higher-Level Examination or 2) satisfactory completion of a college-level Introductory French course.
Credits: (3), Graded, Semester Calendar Independent Study, Transfer Credit Only

**LANG 101** Intermediate German Language
Credit for this course is awarded only in the following cases: 1) receipt of a score of 5 through 7 on the International Baccalaureate German B Higher-Level Examination or 2) satisfactory completion of a college-level Introductory German course.
Credits: (3), Graded, Semester Calendar Independent Study, Transfer Credit Only

**LANG 102** Intermediate Italian Language
Credit for this course is awarded only in the following cases: 1) receipt of a score of 5 through 7 on the International Baccalaureate Italian B Higher-Level Examination or 2) satisfactory completion of a college-level Introductory Italian course.
Credits: (3), Graded, Semester Calendar Independent Study, Transfer Credit Only

**LANG 103** Introductory Spanish Language
Credit for this course is awarded only in the following cases: 1) receipt of a score of 5 through 7 on the International Baccalaureate Spanish B Higher-Level Examination or 2) satisfactory completion of a college-level Introductory Spanish course.
Credits: (3), Graded, Semester Calendar Independent Study, Given When Needed

**LANG 104** Introductory English Language
Credit for this course is awarded only in the following case: Receipt of a score of 5 through 7 on the International Baccalaureate English B Higher-Level Examination.
Credits: (3), Trans In, Semester Calendar Lecture, Transfer Credit Only

**LANG 110** Chinese Language and Culture
An Introductory Language course that covers both Chinese language and culture. No previous knowledge of Chinese language is required. Not open to native speakers of Chinese.
Credits: (3), Graded, Semester Calendar Lecture, CSO

**LANG 111** Japanese Language and Culture
Credit for this course is awarded only in the following cases: 1) receipt of a score of 5 or 6 on the AP Japanese Language & Culture Examination or 2) satisfactory completion of a comparable college-level course that covers both Japanese language and culture.
Credits: (3), Graded, Semester Calendar Independent Study, Transfer Credit Only CSO

**LANG 112** Spanish Language and Culture
An Introductory Language course that covers both Spanish language and culture. No previous knowledge of Spanish language is required. Not open to native speakers of Spanish.
Credits: (3), Graded, Semester Calendar Lecture, Given When Needed CSO

**LANG 150** Intermediate French Language
Credit for this course is awarded only in the following cases: 1) receipt of a 4 or 5 on the AP French Language Exam, 2) receipt of a score of 5 through 7 on the International Baccalaureate French A1 or A2 Higher-Level Examination, or 3) satisfactory completion of a college-level Intermediate French course.
Credits: (3), Graded, Semester Calendar Independent Study, Transfer Credit Only CSO

**LANG 151** Intermediate German Language
Credit for this course is awarded only in the following cases: 1) receipt of a 4 or 5 on the AP German Language Exam, 2) receipt of a score of 5 through 7 on the International Baccalaureate German A1 or A2 Higher-Level Examination, or 3) satisfactory completion of a college-level Intermediate German course.
Credits: (3), Graded, Semester Calendar Independent Study, Transfer Credit Only CSO
Do you find yourself drawn to the latest true crime documentary, book, or podcast? Are you intrigued by stories of infamous bad acts and their impact on society? Throughout history people have been captivated by stories of true crime in all formats. This discussion-based course will consider the history and analysis of information creation and use with an emphasis on true crime media and scholarly publishing. Students will learn to analyze the source, purpose, and quality of information and consider the ethical implications of information collection and use. Topics will include the history of the news media and propaganda, information production and ethics, evaluation of information, the movement toward a participatory culture, social media and the news, fake news and "alternative facts," media consumption, and the 1st Amendment and media regulation. Students will also be given an in-depth introduction to the college level research process, focused on a topic of their own choosing. Students will leave the course comfortable with using library resources and able to excel at college level research. Students will also be able to critically evaluate information and analyze the creation and use of information. All majors are encouraged to enroll. There are no prerequisites. Credits: (3), Graded, Semester Calendar Lecture, Every Term

Note: Some of this course material will be difficult and upsetting. The material cannot be vetted or tailored to suit individual tastes or beliefs. If you are easily frightened, offended, or disturbed, or if you are squeamish, please think carefully about whether to take this course. Difficulty tolerating the material will not be considered a valid reason for not participating. Credits: (3), Graded, Semester Calendar Lecture, Every Term

Literature

LIT 101  Literature & Writing
Credit for this course is awarded only in the following cases: 1) receipt of a score of 4 or 5 on the AP English Literature & Composition Exam; 2) receipt of a score of 5 through 7 on a designated International Baccalaureate Higher Level Examination; or 3) satisfactory completion of an approved college-level course. The University Registrar in Student Administrative Services maintains the current lists of the designated IB Exams and approved college-level courses. Credits: (3), Graded, Semester Calendar Lecture, Transfer Credit Only IA Comm Points: 1

LIT 102  French Literature
Credit for this course is awarded only in the following cases: 1) receipt of a score of 4 or 5 on the AP French Literature Examination or 2) satisfactory completion of a third-year college French Literature course.

LIT 103  The Works of Vergil
Credit for this course is awarded only in the following cases: 1) receipt of a score of 4 or 5 on the AP Latin: Vergil Examination or 2) satisfactory completion of a third-year college Latin Literature course that focuses on the works of Vergil.

LIT 104  Latin Literature
Credit for this course is awarded only in the following cases: 1) receipt of a score of 4 or 5 on the AP Latin: Literature Examination or 2) satisfactory completion of a third-year college Latin Literature course.
Independent Study, Transfer Credit Only  
UNIV/CSO/IA  

LIT 105  
**Spanish Literature**  
Credit for this course is awarded only in the following cases: 1) receipt of a score of 4 or 5 on the AP Spanish Literature Examination or 2) satisfactory completion of a third-year college Spanish Literature course.  
Credits: (3), Graded, Semester Calendar  
Independent Study, Transfer Credit Only  
UNIV/CSO/IA  

LIT 106  
**Chinese Literature**  
Credit for this course is awarded only in the following case -- Receipt of a score of 5 through 7 on the International Baccalaureate Chinese A: Literature Higher-Level Examination  
Credits: (3), Trans In, Semester Calendar  
Lecture, Transfer Credit Only  

LIT 200  
**Introduction to Literature**  
[Formerly LF200] This course introduces students to the three major literary genres: poetry, drama, and fiction. In addition, students explore various critical approaches to literature as they read, discuss and write about representative works.  
Credits: (3), Graded, Semester Calendar  
Lecture, Transfer Credit Only  
IA  
Comm Points: 1  

LIT 220  
**American Gods**  
This course focuses on the gods of American literature: Emerson, Hawthorne, Douglass, Melville, Whitman, Dickinson, Twain, and Poe. These authors and the themes they wrote about run so deep in the American psyche that they seem immortal. Foremost among those themes are spirituality and American individualism, the intertwined themes of Transcendentalist literature and its legacy. We will focus primarily on the mid-nineteenth century period of the American Renaissance, the efflorescence of American literature that produced the greatest number of authors in the American pantheon.  
Credits: (3), Graded, Semester Calendar  
Lecture, Given When Needed  
IA  
Comm Points: 1  

LIT 221  
**Great American Authors**  
[Formerly LF231] This course surveys great American authors of the "long" twentieth-century. Readings include such writers as Crane, London, Pound, Fitzgerald, Hemingway, Faulkner, Ellison, and Cisneros.  
Credits: (3), Graded, Semester Calendar  
Lecture, Given When Needed  
IA  
Comm Points: 2  

LIT 222  
**Philosophy for Life**  
[Cross-Listed as PHIL 222] In this course, we will learn to think philosophically (which is to say: critically, rigorously, and reflectively) about complex and difficult questions. We will study practical life philosophies from both the Eastern and Western traditions, from the Tao Te Ching to Marcus Aurelius, and from Plato to the Dalai Lama. We will reflect on the ontological, epistemological, rhetorical, and ethical perspectives of each of these philosophers and schools of thought. We will note striking similarities and important distinctions between them. Ultimately, we will reflect on our own life philosophies as well—each of us refining our personal life philosophy through reading, reflection, and discussion of these classic texts from the wisdom literature tradition.  
Credits: (3), Graded, Semester Calendar  
Lecture, Given When Needed  
UNIV/CGI/IG  
Comm Points: 1  

LIT 225  
**American Short Story**  
[Formerly LF351] Seeing short fiction as a distinct art form, this course will introduce students to selected masters of the short story. It will include works of short fiction by established authors as well as contemporary ones, and it will include stories by ethnic and racial minorities. It will introduce students to the key elements of fiction, such as character, theme, point of view, and symbolism, as a way to help students evaluate and interpret literature. Occasionally, filmed versions of short stories will be used for comparison.  
Credits: (3), Graded, Semester Calendar  
Lecture, Given When Needed  
IA  
Comm Points: 1  

LIT 226  
**Modern Fiction**  
This course focuses on fiction of the 20th and 21st centuries. We will explore literary challenges to previous ways of writing and understanding the world. Typical topics include modernism and postmodernism, science fiction, magic realism, and the graphic novel.  
Credits: (3), Graded, Semester Calendar  
Lecture, Given When Needed  
IA  
Comm Points: 1  

LIT 227  
**Tales from the Tropics**  
This course will examine short stories from Southeast Asian. Students will read and engage with texts by writers from Burma, Cambodia, Indonesia, Laos, Malaysia, Negara Brunei Darussalam, Singapore, Thailand, the Philippines, and Vietnam. We will explore topics such as race, family, tradition, modernity, marginality, displacement, intergenerational conflict, religion, and resistance. We will also pay close attention to the intended audience, implied author, and historical and cultural contexts of the texts.  
Credits: (3), Graded, Semester Calendar  
Lecture,  
UNIV/CSO/IA  
Comm Points: 1  

LIT 229  
**American Weird Fiction**  
This course will introduce students to that curious type of fiction known as "weird fiction" (also sometimes called slipstream fiction), which overlaps with a number of other genres such as science-fiction, fantasy, and horror. Weird stories often lack an explanation for the strange events they depict, and so the genre offers writers and readers a new perspective on the sometimes odd world in which we find ourselves. The course will introduce students to the most important American authors of weird fiction from the 20th and 21st Centuries, including H.P. Lovecraft, Joyce Carol Oates, Caitlin R. Kiernan, Thomas Ligotti, and Laird Barron.  
Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed
IA
Comm Points: 1

LIT 230 Monsters in the House
To label something monstrous may be to identify a primal source of fear or to construct a social barrier, deliberately marginalizing people who do not fit into the mainstream. This course explores portrayals of the monstrous across centuries, considering how they reflect and shape social norms. Texts may include, for example, fairy tales, Disney movies, horror films, and dystopian novels.
Credits: (3), Graded, Semester Calendar
Lecture, Even Spring Semesters
IA
Comm Points: 1

LIT 235 Science Fiction
Introduction to the genre of science fiction and, more broadly, speculative fiction as well as a survey of representative literary texts, including readings from such writers as Philip K. Dick, Margaret Atwood, Octavia Butler, and Orson Scott Card. Works of speculative fiction often serve as an allegory for, or social commentary of, existing cultural views and social structures. The genre’s focus on imagining other worlds and alternative realities make it particularly well-suited for viewing our own biases, prejudices, and social assumptions through the mirror of alien cultures.
Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed
IA
Comm Points: 1

LIT 239 Modern American Poetry
This course will examine the great revolution in the arts that initiated the great revolution in poetry around 1912, ushering in the period known as modernism. It will examine the poetry and impact of such modern masters as T.S. Eliot, Robert Frost, William Carlos Williams, Wallace Stevens, and Marianne Moore. In addition, it will examine the contributions made by a later generation of poets, including John Berryman, Elizabeth Bishop, and Richard Wilbur, as well as established and new voices writing today.
Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed
IA
Comm Points: 1

LIT 240 Gender and Popular Culture
This interdisciplinary multi-media course explores the ways conceptions of gender are constructed and challenged by popular culture, including literature, film, TV, and advertising. It considers the complex ways in which social perceptions of gender intersect with constructions of race, class, and sexuality to affect relations of power. It looks at pop culture not simply as entertainment but as something that contributes to collective identities and influences our ways of seeing ourselves and others, often unconsciously. And it explores means of ‘talking back,’ challenging dominant portrayals of gender to open up more liberating possibilities for imagining selves.
Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed
UNIV/CGI/IA
Comm Points: 1

LIT 241 War Stories I
[Cross-listed with HIST241] The oldest and most enduring stories describe war and its consequences. Reading these stories helps us see how different societies valued leadership, honor, loyalty, courage, and death on the battlefield. Not all war literature, however, glorifies heroic warriors and their exploits. Some war stories, even in the distant past, question martial codes imposed on men. Others examine what is worth dying or killing for, and still others lament the inevitable wastage and brutality of war, of the costs to individuals, civilizations, and the environment. Most of them are ambivalent. Text will range from the ancient world to the Renaissance and from Asia to Europe.
Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed
UNIV/CSO/IA
Comm Points: 1

LIT 248 Nobel Prize Winners in Literature
"Nobel Prize Winners in Literature" course offers a grand tour of world literature through the writings of Nobel Prize winners. It features different authors from a range of countries, languages, and traditions, and includes works of prose, poetry, and drama. Students will also study literary techniques and the cultural background and significance of each work. Possible authors include Alice Munro, Orhan Pamuk, Dario Fo, Seamus Heaney, Toni Morison, Derek Walcott, WB. Yeats, and Rabindranath Tagore.
This is a Clarkson Common Experience University (UNIV) course. This course fulfills the learning outcomes of both the Imaginative Arts (IA) and Cultures and Societies (CSO) Knowledge Areas. This course also fulfills the requirements for a one-unit communication-intensive (C1) credit and will require at least 10—20 pages of graded writing.
Credits: (3), Graded, Semester Calendar
Lecture,
UNIV/CSO/IA
Comm Points: 1

LIT 250 World Literature
An introduction to representative works of world literature, other than British and American, including fiction, poetry, drama and film.
Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed
UNIV/CSO/IA
Comm Points: 1

LIT 252 African Literature
A study of African literary works from the 19th century, to the present. In this course, students will read memoirs, songs, stories, novels, poems, and plays written by authors from the continent of Africa, considering thematic and stylistic trends and transformations over time.
Credits: (3), Graded, Semester Calendar
Lecture,
UNIV/CSO/IA
Comm Points: 1

LIT 253 Greek Mythology
[Cross-listed with HIST253] This course will explore the beginnings of Greek culture through its myths, recorded primarily in Homer, Hesiod, the Greek dramatists of the 5th century BCE, and by later writers of the classical period, such as Apollonius of Rhodes, the Roman poet Ovid, and mythographers such as Apollodoros. As important as this rich textual record is the physical evidence of ancient Greek society.
Since the late nineteenth century, archaeological excavations of sites associated with the ancient myths have steadily increased our understanding of their meaning and significance, as well as their relationship to ancient Greek religion and ritual. Finally, visual representations of the figures from myth and legend, found in vase paintings and sculptures, are essential to our full comprehension of the role of myth in the lived lives of Greeks.

Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed
UNIV/CSO/IA
Comm Points: 2

LIT 255 Close Encounters of the X Kind
This course will examine Anglophone plays and other plays in English translation. The selected texts revolve around close’ encounters with the unknown or the foreign, and the impacts of such encounters on all parties involved. The course will expose students to different cultures and theatrical traditions, with playwrights hailing from, among others, Kenya, South Africa, Indonesia, India, the Caribbean, and Ireland. Possible readings might include Wole Soyinka’s Death and the King’s Horseman, Athol Fugard’s Boesman and Lena, Arifin C. Noer’s Moths, Girish Karnad’s Tughlaq, Derek Walcott’s Dream on Monkey Mountain, and Brian Friel’s Translations.

Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed
UNIV/CSO/IA
Comm Points: 1

LIT 260 Introduction to Poetry
[Formerly LF360] This course is designed to introduce students to the pleasures of poetry. It is intended not only for students who already appreciate poetry, but also for those students who fear or dislike it. The course will teach students how to read poetry for both enjoyment and understanding. It will introduce students to the nature and variety of poetry as well as provide them with a few primary concepts on how to evaluate it. As an introduction to poetry, the course will help students to find ‘the real toads’ (reality) in ‘imaginary gardens’ (poems).

Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed
IA
Comm Points: 1

LIT 262 Women Acting Out
This course will examine dramatic texts by women playwrights. The selected texts revolve around issues pertinent to gender and women’s issues such as family, love, employment, empowerment, and abuse/violence. Students will read and engage with plays from different cultures and theatrical traditions, and with playwrights hailing from Argentina, England, India, Indonesia, and the United States. Possible readings include Caryl Churchill’s Top Girls, Griselda Gambaro’s Antigona Furiosa, Maria Irene Fornes’ Conduct of Life, Mahasweta Devi’s Bayen, Ntozake Shange’s for colored girls, Sarah Daniels’s The Gut Girls, Susan Glaspell’s Trifles, Spiderwoman Theater’s Sun, Moon, and Feather, and Tsitsi Dangarembga’s She No Longer Weeps.

Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed
UNIV/CSO/IA
Comm Points: 1

LIT 265 Creative Writing
[Formerly LF365] This course is designed to introduce students to the main genres of imaginative writing and the basic techniques of those genres. Students will work primarily within the genres of fiction and poetry, though the course will also include brief sections on drama and memoir. Coursework will consist of reading examples and producing exercise in fiction, poetry, and (optionally), drama or memoir. The goal of the course is to make students familiar with the techniques of literary practice and to provide hands-on experience using those techniques.

Credits: (3), Graded, Semester Calendar
Lecture, Odd Fall Semesters
IA
Comm Points: 2

LIT 270 Comics of Conscience
Comics of Conscience will examine graphic novels or book-length comics which raise important social and political issues. It will explore how graphic novels are built and told—we will learn to use a conceptual vocabulary so we can discuss how the graphic novel achieves its objective of obtaining the reader’s attention and engagement. We will learn how to read them, how to talk about how they get made and how they work, how to understand—and how to enjoy—some of the kinds of comics and graphic novels. Emphasis in our studies will examine the co-mixing of genres within telling a visual story: we will look at journalism comics, memoir comics, realistic fiction comics, and fantasy comics. The overall objective is to learn how to read graphic novels—e.g., how to understand the way the verbal and the non-verbal/graphic work together—and how to write about them.

Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed
UNIV/CSO/IA
Comm Points: 1

LIT 275 Demons and Witches
“Demons and Witches among Us” will help you to develop skills in reading and analyzing fiction, as well as introduce you to the fascinating world of horror fiction. We will explore the genre of ghost story or horror literature in contemporary Asian literature, including short stories, novels, and comic books. How do Asian writers utilize elements of conventional horror, and to what effect? Can horror literature be used to address important issues such as abuse of power by authoritarian regimes, conflicts between the traditional and the modern, gender discrimination, urban alienation, and environmental destruction? We will examine supernatural motifs, including ghosts, zombies, witches, demons, and psychopaths, in fiction by writers from India, China, Japan, Cambodia, Malaysia, Singapore, and Indonesia. We will investigate how horror holds power over us the reader and what is the place of horror in society. We will also discuss the various elements of fiction: character analysis, plot, use of symbols, theme, tone, and style.

Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed
UNIV/CSO/IA
Comm Points: 1

LIT 280 Disaster Lit
Disaster Lit forces us to confront our own mortality and to ask ourselves how we would respond if facing a similar crisis, threat, or catastrophe. The genre also offers social commentary by
extrapolating current trends to disastrous conclusions, and showing how our political and social institutions might respond—or fail to respond—during extraordinary situations. We will consider both fiction and nonfiction depictions of catastrophes and disasters, and natural as well as political or socioeconomic disasters. Possible readings include: Albert Camus’s The Plague, Robert Harris’s historical thriller Dictator, Walter Miller’s post-apocalyptic novel A Canticle for Leibowitz, and H.G. Wells’s alien invasion novel War of the Worlds.

Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed
IA
Comm Points: 1

LIT 325 Greek Drama
Greek drama has given western society some of its most powerful and enduring ideas. The iconic figures of Oedipus, Antigone, and Prometheus are unforgettable examples of self-knowledge and of the interdependence of individual and community responsibilities. Dramatic performances in the west first appeared in the classical period in Athens – from around 500 CE. As the century progressed, the plays became more complex, both structurally and thematically, and more reflective of changes in Athenian society. In this course students will read several Greek tragedies and comedies and explore them from a literary, cultural, and continuing perspective.

Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed
CSO/IA
Comm Points: 1

LIT 328 African-American Literature
[Formerly LF335] This course will survey African-American novelists, dramatists, and poets of the twentieth century in their social and political context and in their own sense of their literary tradition. It will begin, however, by looking back, (to the slave narrative of Frederick Douglass for instance), before moving into the four stages, broadly speaking, of African-American literature: The Harlem Renaissance: 1915-1935 (e.g., Zora Neale Hurston, Langston Hughes, Alain Locke); The Age of Protest: 1935-1955 (e.g., Richard Wright, James Baldwin, Gwendolyn Brooks); African-American Militant Literature: 1955-1970 (e.g., Amiri Baraka, Ishmael Reed, Nikki Giovanni); and Literature by African-American Women: 1970-1991 (e.g., Alice Walker, Toni Morrison, Toni Cade Bambara, Maya Angelou). Because in the 1950s and 1960s there is a ‘rediscovery’ of Africa, the survey will also include such influential African writers as Chinua Achebe. The course will be conducted as an exploration, mainly in class discussions, but also in formal written analysis, of some of the most powerful literature of this century.

Credits: (3), Graded, Semester Calendar
Lecture, Odd Fall Semesters
UNIV/CSO/IA
Comm Points: 1

LIT 329 Modern & Contemporary African American Fiction
This course surveys the work of African American writers from the mid-twentieth century to the present. By close reading of representative texts, students explore the development of African American prose fiction from the naturalism of Richard Wright to the experimental work of Ishmael Reed to the post-modern work of Charles Johnson and Colson Whitehead. The course situates each work in its socio-historic context and explores the interaction of representational style and themes. In particular, the course focuses on how African American male writers negotiate identity and manhood in their fictional worlds. Readings may include texts by Wright, Himes, Baldwin, Reed, Gaines, Bambara, Butler, Morrison, Johnson, Wideman, Mosely, and Whitehead.

Credits: (3), Graded, Semester Calendar
Lecture, Even Fall Semesters
UNIV/CSO/IA
Comm Points: 1

LIT 335 Violence and Reconciliation
[Cross-listed with POL 335] While scholars have labeled the 20th century ‘the century of genocide,’ the past two decades have catalyzed global changes in the ways we think about peace-building and reconciliation. But reconciliation after mass conflict remains a difficult process. Can you forgive someone who has done irreparable harm to you or your loved ones? Can you reconcile –literally, return to a previous state of harmony- with someone if you never shared a harmonious relationship with that person? Is reconciling with a whole community the same as reconciling with an individual? This course examines the challenges to reconciliation after political trauma and assesses the strengths and weaknesses of major reconciliation mechanisms. Through the lens of two case studies, South Africa and Northern Ireland, and the disciplines of film, fiction, and political theory, students will compare the consequences of criminal trials, truth commissions, and informal efforts at communal healing. As a final project, the class will participate in a simulation of negotiations for reconciliation in the aftermath of a nationwide conflict.

Credits: (3), Graded, Semester Calendar
Lecture, Even Spring Semesters
UNIV/CGI/IA
Comm Points: 1

LIT 355 Power, Exploitation, and Freedom: Postcolonial Literature
Colonialism is the process of one country taking political, economic, and cultural control of another country. From the 15th-20th centuries, European countries colonized swathes of Asia, Africa, and South and Central America. They exploited the economic resources of those countries, subjugated their populations, and labeled indigenous cultures “inferior.” In the mid-20th century, independence movements led to the decolonization of many countries and gave rise to an important body of literature. Postcolonial literature explores the effects of colonialism and challenges the misrepresentation of colonized countries by colonizing powers. It helps readers understand the cultures of colonized countries, their fight for independence, and their evolution after decolonization. This course examines postcolonial literature from a wide range of countries and cultures, including India, Nigeria, South Africa, and the Caribbean.

Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed
IA
Comm Points: 1

LIT 365 Advanced Creative Writing
This course is designed to further develop students’ knowledge of and interest in imaginative writing. This course will focus on building deep understanding of literary devices, forms, and techniques used in creative writing. Students will spend time doing close readings and analysis of works of literature and crafting their own original work. The course will be focused primarily on the genres of poetry and creative non fiction. Prerequisite: 1 other LIT course or permission of the instructor.
Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed
IA
Comm Points: 2

LIT 380 Shakespeare’s Game of Thrones: Blood, Lust, and Power

[Formerly LF480] While Shakespeare’s plays are unquestionably part of our literary heritage, there were also written by a practical man of the theater who was fully engaged in the changing culture of late Elizabethan and early Jacobean England. During the semester, students will read Shakespeare’s plays for their literary values and their theatrical values, while placing them specifically in their historical context. Class discussion will involve literary analysis, questions or effective staging and stage history, and the most pressing social and political issues of Renaissance England. Students will read, see, and hear a representative selection of plays.
Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed
IA
Comm Points: 2

LIT 490 Independent Study

[Formerly LF490] Designed primarily for an advanced student who wishes to pursue special interests in literature for one or more semesters, this series allows students to design and conduct independent study projects under faculty guidance. Prerequisite: consent of the instructor.
Credits: (1-10), Graded, Semester Calendar
Independent Study, Every Semester

LIT 499 Minor Portfolio

[Formerly LF499] In this course, students complete their Liberal Arts Minor Portfolios under the direction of their minor advisor. The course is graded on a Pass-No Credit basis.
Credits: (0), P/NC, Semester Calendar
Independent Study, Every Semester

Law

LW 1 (3, 5...)

Law Elective

A college level course for which there is no comparable Clarkson course. Used for transfer credit only.
Credits: (2-4), Graded, Semester Calendar
Discussion, Transfer Credit Only

LW 2 (4, 6...)

Law Elective

A college level course for which there is no comparable Clarkson course. Used for transfer credit only. This course may be used to satisfy a Business Foundation Curriculum Requirement.
Credits: (2-4), Graded, Semester Calendar
Independent Study, Transfer Credit Only

LW 270 Law and Society I

A course designed to provide a basic understanding of (1) the nature, functions and limitations of law and legal systems; (2) the basic relationship among justice, ethics, legal systems and social structure; and (3) the relationship among society, law and business activity. Further, it is designed to enlighten with respect to rules, principles, standards and doctrines of law fundamental to a free enterprise system. The course covers the substantive areas of constitutional law, torts, contracts, and property and estate law. Prerequisite: At least sophomore standing.
Credits: (3), Graded, Semester Calendar
Lecture, Every Semester

LW 352 Reading for the Law: Legal Issues Through Non-Fiction Literature

Understanding “black letter law” is but one window in to legal understanding. In order to contextualize the law, we must understand the social and political issues which have given rise to, and are affected by, the statutes and judicial decisions that shape our legal system. Prerequisites: LW270
Credits: (3), Graded, Semester Calendar
Lecture, Every Semester

CGI, Comm Points: 1

LW 466 The Law of the Workplace

This course is designed to review areas of law affecting the workplace both from the perspective of the employer as well as the employee. The students will study the environment of the workplace from a legal perspective. Topics will include the National Labor Relations Act and the jurisdiction of the National Labor Relations Board, the rights and obligations of management and labor under the Act. The course will also review the law which governs the public employer in the form of federal, state and local governments. Finally, the course will review other areas of law which affect the workplace such as the doctrine of ‘employment at will,’ Worker’s Compensation and Disability Law, Social Security Law, the law governing discriminatory practices, the Americans with Disabilities Act, the law of the Occupational Safety and Health Agency and developing topics such as drug testing in the workplace and pay equity issues. Prerequisites: LW270 or consent of the instructor.
Credits: (3), Graded, Semester Calendar
Lecture, Fall Semesters

LW 471 Law and Society II

A continuation of LW 270, including the substantive areas of agency law, business organizations (including the law of partnerships, corporations and the limited liability company), negotiable instruments, sales and secured transactions. Prerequisite: LW270.
Credits: (3), Graded, Semester Calendar
Lecture, Spring Semesters

LW 487 Special Project in Law

An investigation of a problem or in-depth topic undertaken by the student under the guidance of a faculty member. Prerequisites: Permission from the instructor.
Credits: (1-3), Graded, Semester Calendar
Independent Study, Given When Needed

LW 490 Internship

An unpaid internship that is related to the student’s professional goals. Prerequisite: consent of the instructor.
Credits: (1-3), Graded, Semester Calendar
Independent Study, Given When Needed

LW 499 Law Studies Minor Portfolio

A student completing the Law Studies Minor will compile a portfolio that manifests his or her learning experience in the minor. In this course, students complete their Law Studies Minor portfolio under...
the direction of their minor advisor. The course is graded on a Pass-No Credit basis.
Credits: (0), P/NC, Semester Calendar
Independent Study, Given When Needed

Mathematics

MA 1 (3, 5...)

Mathematics Elective
A college level course for which there is no comparable Clarkson course. Used for transfer credit only. This course may not be used to satisfy the requirements of the Mathematics or Applied Mathematics and Statistics major. Check with major department to determine whether credits count toward graduation.
Credits: (2-4), Graded, Semester Calendar
Independent Study, Transfer Credit Only

MA 2 (4, 6...)

Mathematics Elective
A college level course for which there is no comparable Clarkson course. Used for transfer credit only. This course may be used to satisfy the requirements of the Mathematics or Applied Mathematics and Statistics major.
Credits: (2-4), Graded, Semester Calendar
Independent Study, Transfer Credit Only

MA 30

Introductory Mathematics Summer Program
This course is intended primarily as a preparation for students who will be starting their Clarkson careers in MA 180, Introduction to College Mathematics. Course topics include: a brief review of elementary algebra, linear, quadratic, exponential, logarithmic, and trigonometric functions. The course emphasizes an applied approach to all topics through real-life examples. You should check with your major department to determine whether this course can be used to satisfy your degree requirements in specific majors.
Credits: (3), Graded, Semester Calendar
Lecture, Summer Semesters

MA 31

Pre-Calculus Mathematics
This course is a comprehensive review of the high school level mathematics whose mastery is necessary for success in calculus. Topics include: Elementary algebra, geometry and trigonometry; coordinate geometry; linear, quadratic, trigonometric, exponential and logarithmic functions. Check with major department to determine whether credits count toward graduation.
Credits: (2.5), Graded, Semester Calendar
Lecture, Fall and Summer Terms

MA 41

Co-Calculus Mathematics
This course provides support for students in Calculus I by reviewing topics from algebra, functions, geometry and trigonometry as they are being used in calculus. Enrollment is by invitation of the Mathematics Department. Check with major department to determine whether credits count toward graduation. Corequisite: MA 131
Credits: (2), Graded, Semester Calendar
Lecture, Fall Semesters

MA 42

Co-Calculus II
This course provides help sessions for students in Calculus II by reviewing carefully selected examples as the corresponding topics are being studied in calculus. Review of background topics from Calculus

I will also be included as needed. Enrollment is by invitation of the Mathematics Department. Given Pass/No Credit only.
Credits: (0), P/NC, Semester Calendar
Discussion, Spring Semesters

MA 120

Introduction to STEM Mathematics
Prepares students for Calculus and higher mathematics in the science, technology, and engineering majors. Topics include algebraic concepts, lines and quadratic equations; functions; exponential and logarithmic functions and equations, trigonometry and trigonometric functions, identities and equations; systems of equations and inequalities. This course will focus on illustrating these mathematical topics from pre-calculus within the context of applications taken from the sciences and engineering.
Grading for this course is done using Mastery Based Assessment. This course is normally taken for 4 credits. However, students joining after normal add period may be directed by the Math Department Chair to take this course for fewer than 4 credits. Under these conditions of reduced credit, the grade assigned will consider the learning outcomes mastered commensurate to the number of credits attempted. Restriction: This course is not available for students who already have credit for any one of the following: MA 131, MA 132, or MA 181. Students may not receive credit for both MA 120 and MA 180.
Credits: (1-4), Graded, Semester Calendar
Lecture, Discussion, Fall Terms

MA 131

Calculus I
Functions and graphs; derivative concept and formulas, including chain rule and implicit differentiation; integral concept; the Fundamental Theorem of Calculus; properties and applications of the derivative, including max-min problems and graph sketching; exponential, logarithmic, and inverse trigonometric functions. Prerequisites: high school algebra and trigonometry. Corequisite: MA 41
Credits: (3), Graded, Semester Calendar
Lecture, Discussion, Every Semester

MA 132

Calculus II
A continuation of MA 131. Properties and applications of the integral, including areas, volumes, arc length and differential equations; integration techniques, including parts, partial fractions, trigonometric substitution, and numerical integration; indeterminate forms; improper integrals; infinite series and Taylor series; introduction to polar coordinates, complex numbers, and parametric equations. Prerequisite: MA 131
Credits: (3), Graded, Semester Calendar
Lecture, Discussion, Every Semester

MA 180

Introductory College Mathematics
Review of basic algebra and functions, differences, an introduction to discrete calculus, rates of growth, introduction to the derivative. This course is not available for students who already have credit for any one of MA131, MA132, or MA181. Restriction: Not open to students who have taken, or are taking MA120, MA181, MA131, or MA132
Credits: (4), Graded, Semester Calendar
Lecture, Discussion, Fall Terms

MA 181

Basic Calculus
The fundamentals of differential calculus with applications to business, life and social sciences, optimization, the fundamental
**MA 200 Introduction to Mathematical Modeling and Software**
Introduction to the use of mathematics in solving real-life problems. Basics of using mathematical software (such as MATLAB and Maple) to apply calculus and other methods. Group projects. Communication skills including ethical considerations, presentation and mathematical exposition. Introduction to mathematical professions. Prerequisite: MA131.
Credits: (3), Graded, Semester Calendar
Lecture, Discussion, Spring Terms

**MA 211 Discrete Mathematics and Proof**
A transitional course between the technique-oriented lower-level courses and the concept-oriented upper-level courses in both mathematics and computer science. Topics include logic, quantifiers, proof techniques (including mathematical induction), integers, sets, functions, equivalence relations, and basic combinatorics. A major emphasis of the course is learning to write mathematical proofs. This course is intended for students majoring in Mathematics, Computer Science, and related fields. Prerequisites: MA132
Credits: (3), Graded, Semester Calendar
Lecture, Every Term
Comm Points: 2

**MA 230 3-D Space and Projective Geometry**
An introduction to the mathematics of 3 dimensional space, including vector functions, elementary vector calculus and partial derivatives, introductory projective geometry especially as applied to projections of 3-D images on two dimensional media, translations, rotations and an introduction to their matrix representations. A student may not receive credit for both MA230 and MA231. MA231 satisfies any requirement for MA230. Prerequisite: MA131
Credits: (3), Graded, Semester Calendar
Lecture, Discussion, Spring Terms

**MA 231 Calculus III**
Vectors and vector-valued functions; functions of several variables; partial differentiation, including the chain rule, gradients, and maxima and minima; multiple integration, including polar, cylindrical, and spherical coordinates; vector calculus, including Green's, Divergence, and Stokes's Theorems. A student may not receive credit for both MA230 and MA231. MA231 satisfies any requirement for MA230. Prerequisite: MA132
Credits: (3), Graded, Semester Calendar
Lecture, Discussion, Every Semester

**MA 232 Elementary Differential Equations**
Solutions and applications of first-order differential equations and linear differential equations with constant coefficients. Laplace transform methods. Introduction to matrix algebra, systems of algebraic equations, eigenvalues and eigenvectors, with application to systems of differential equations. Other topics may include modeling, engineering applications or numerical methods. Prerequisite: MA132
Credits: (3), Graded, Semester Calendar
Lecture, Discussion, Every Semester

**MA 239 Elementary Linear Algebra**
Introduction to matrices and matrix operations, Linear systems of equations, Elementary treatment of eigenvalues, parameter estimation by least squares, Introduction to linear programming, MATLAB will be used throughout (Instruction in MATLAB is included.)
Prerequisites: MA 131 or MA181
Not open to Mathematics or Applied Math and Stats majors; not open to students who have taken or are taking MA 232 or MA 339
Credits: (3), Graded, Semester Calendar
Lecture, Even Spring Terms

**MA 241 Introduction to Data Science**
(Cross listed as DS 241) This course introduces the basics of data manipulation and pre-processing to analyze data for statistical decision-making, building the skills required to organize, visualize, and communicate using data. The course seeks to help students address this question: given data from the world of science, engineering, medicine, etc., collected from multitude of sensors and sources, how do you begin to make sense of that data – and how do you use it? The primary tool for coding will be R/Studio, but supporting Python syntax and libraries may also be introduced. The course emphasizes not only the low-level coding skills, but also the higher-level critical and quantitative reasoning skills required to analyze real-world datasets. Topics introduce key concepts such as descriptive statistics and sampling distribution (as a means to view large and very large data sets) and the basic analysis tools of Linear Regression and Data Mining. Additional topics may include social network data, unstructured data, and natural language text processing. Corequisite: STAT282, or STAT383, or STAT318, or STAT389
Credits: (3), Graded, Semester Calendar
Lecture,

**MA 277 Elementary Numerical Methods**
An introductory course on numerical methods as applied in scientific computing. Topics include application of Taylor polynomials and representations of functions, numerical calculus, solving linear systems, and interpolation. Optional topics may include numerical solution of differential and difference equations and solutions to nonlinear equations. This course is intended for students outside of engineering/math/physics that seek to expand their skill set in applying computational tools. Students may not receive credit for both MA277 and MA377. Prerequisites: MA239, and MA230 or permission of the instructor
Not open to students who have credit for MA377
Credits: (3), Graded, Semester Calendar
Lecture, Even Fall Terms

**MA 300 Seminar in Actuarial Mathematics**
Seminar for students with interest in an actuarial career. Especially recommended for those preparing for the actuarial exams.
Requisite: Permission of the Instructor
Credits: (1), Graded, Semester Calendar
Seminar, Given When Needed

**MA 301 Mathematics Elective**
An upper-division mathematics course for which there is no comparable Clarkson course. Used for transfer credit only. This course may be used to satisfy the requirements of the Mathematics or Applied Mathematics and Statistics major or the Mathematics minor.
Credits: (3-4), Graded, Semester Calendar
Independent Study, Transfer Credit Only

MA 311 Abstract Algebra
A study of mathematical systems, including an introduction to the theory of groups, rings, ideals and fields. Polynomials over a field; matrix polynomials. Prerequisites: MA211
Credits: (3), Graded, Semester Calendar
Lecture, Odd Fall Semesters
Comm Points: 1

MA 313 Abstract Linear Algebra
Credits: (3), Graded, Semester Calendar
Lecture, Even Fall Semesters
Comm Points: 1

MA 314 Number Theory and Its Applications
Divisibility; the fundamental theorem of arithmetic; linear diophantine equations; fundamentals of congruences; prime numbers and factoring; the theorems of Fermat and Wilson; quadratic residues. Additional topics may include arithmetic functions, the Mobius inversion formula; geometric number theory; partitions; continued fractions; primality testing and factoring; applications to crystallography and cryptography. Prerequisites: MA211
Credits: (3), Graded, Semester Calendar
Lecture, Odd Spring Semesters
Comm Points: 1

MA 321 Advanced Calculus I
A rigorous course in analysis on the real line and calculus of functions of one variable. Prerequisites: MA231 and MA211
Credits: (3), Graded, Semester Calendar
Lecture, Fall Semesters
Comm Points: 1

MA 322 Advanced Calculus II
Continuation of MA321 and extension to functions of several variables. Prerequisites: MA321
Credits: (3), Graded, Semester Calendar
Lecture, Even Spring Semesters
Comm Points: 1

MA 330 Advanced Engineering Mathematics
Introduction to linear algebra. Review of ordinary differential equations and Laplace transforms; ordinary boundary value problems. Fourier analysis; overview of partial differential equations. Introduction to probability and statistics. Modeling and applications to engineering problems will be emphasized throughout. This course is intended principally for Mechanical and Aeronautical Engineering majors; not open to Mathematics majors. Prerequisites: MA231 and MA232
Credits: (3), Graded, Semester Calendar
Lecture, Discussion, Fall and Spring Terms

MA 331 Fourier Series and Boundary Value Problems
Review of ordinary boundary value problems. Fourier series and integral. Derivation of heat, wave and potential equations with boundary and initial conditions. Solution by separation of variables. Additional topics may include multidimensional problems, Bessel functions, Laplace transforms, numerical methods. Prerequisites: MA231 and MA232
Credits: (3), Graded, Semester Calendar
Lecture, Spring Semesters

MA 332 Intermediate Differential Equations
Theory of linear differential equations; oscillation and boundedness. Nonlinear differential equations: stability, phase-plane analysis, exact solutions. Additional topics may include control theory, theory of first-order equations, singularities. Prerequisites: MA231 and MA232
Credits: (3), Graded, Semester Calendar
Lecture, Even Spring Semesters

MA 339 Applied Linear Algebra
This course is an introduction to matrices and linear algebra with applications in engineering and science. Algebra of matrices and systems of linear algebraic equations. Rank, inverse, eigenvalues, eigenvectors, vector spaces, subspaces, basis, independence, orthogonal projection, determinant. Other topics may include: systems of differential equations, numerical methods, linear programming. Prerequisites: MA132; MA230/231 recommended but not required
Credits: (3), Graded, Semester Calendar
Lecture, Every Semester

MA 345 Automata Theory and Formal Languages
[Cross-listed with CS 345] This course gives an introduction to formal languages and their relation to automata. Topics include deterministic and non-deterministic finite automata, regular expressions and languages, closure properties and decision procedures for context-free languages, recursive and recursively enumerable sets, Turing machines, and decidability. Some aspects of computational complexity may also be explored. Prerequisites: CS 142, EE262, or EE361, and MA211
Credits: (3), Graded, Semester Calendar
Lecture, Fall Terms

MA 362 Complex Analysis with Applications
Complex numbers and functions, conformal mapping and applications, derivative, Cauchy-Riemann equations, real and complex line integrals, Fundamental Theorem, Cauchy and Poisson formulas, Taylor series, analytic continuation, special functions, Laurent series, residues. Applications to partial differential equations. Prerequisites: MA231
Credits: (3), Graded, Semester Calendar
Lecture, Odd Spring Semesters

MA 363 Mathematical Modeling
Introduction to the use of mathematics in solving real-life problems. Topics include formulation and refinement of models, different types of models, application of results to prediction and design. Mathematical methods beyond the prerequisite courses will be presented as needed. Prerequisites: MA231, MA232 and PH132
Corequisites: MA330, or MA381, or STAT383
Credits: (3), Graded, Semester Calendar
Lecture, Spring Semesters, Comm Points: 2
MA 368 Mathematical Biology Seminar
[Cross-listed with BY 368] The objective of this course is to present recent advances in research that combines biological and mathematical analysis, and to describe opportunities for interdisciplinary summer research in biology and mathematics. Students will receive one credit for attending seminars (6 per semester), reading a journal article prior to each presentation, writing a short review of each seminar, and participating in discussions. This course can be taken for credit more than once.
Credits: (1), Graded, Semester Calendar
Seminar, Fall Terms

MA 377 Numerical Methods
Floating-point numbers and sources of error, direct solution of linear systems, nonlinear equations, interpolation, numerical integration and numerical solution of initial value problems in ordinary differential equations. Prerequisites: MA230 or MA231
Credits: (3), Graded, Semester Calendar
Lecture, Laboratory, Fall Semesters, Comm Points: 2

MA 381 Probability
[Cross-listed with STAT 381] Sample spaces; axioms of probability; basic theorems; random variables (discrete and continuous); combinatorial methods; Bayes' Theorem and conditional probability; expected values and variances; distribution functions, including: binomial and multinomial, Poisson, normal and bivariate normal distributions, and others such as geometric, hypergeometric, negative binomial, exponential, gamma and beta; joint distributions; covariance and correlation; central limit theorem; geometric probability; method of transformations; introduction to stochastic processes. Prerequisite: MA231 or MA230 (MA211 Recommended)
Credits: (3), Graded, Semester Calendar
Lecture, Fall Terms

MA 400 Undergraduate Seminar
This seminar will emphasize recreational mathematics and problem solving on the advanced undergraduate level. It is particularly recommended for those who are interested in preparing for the Putnam Undergraduate Mathematics Competition or the Mathematical Contest in Modeling.
Credits: (1-6), Graded, Semester Calendar
Seminar, Given When Needed

MA 401 Directed Study in Mathematics
Prerequisite: consent of the instructor.
Credits: (1-10), Graded, Semester Calendar
Research, Given When Needed

MA 405 Directed Study in Applied Mathematics
Prerequisite: consent of the instructor.
Credits: (1-10), Graded, Semester Calendar
Research, Given When Needed

MA 407 Directed Study in Numerical Analysis
A directed study in Numerical Analysis, intended to give a student the opportunity to further explore an area of interest to them under the supervision of a faculty member.
Credits: (1-10), Graded, Semester Calendar
Independent Study, Given When Needed

MA 409 Directed Study in Probability and Statistics
[Cross-listed with STAT 409] A directed study in Probability and Statistics, intended to give a student the opportunity to further explore an area of interest to them under the supervision of a faculty member.
Credits: (1-10), Graded, Semester Calendar
Independent Study, Given When Needed

MA 431 Mathematics Course Assistance
Assisting a faculty member in a mathematics course or project. Credit can be used as free electives to meet baccalaureate degree requirements, up to a maximum of 6 hours for MA431. This course is offered on a Pass/No-Credit basis only. (May be taken more than once for credit.)
Credits: (1-3), P/NC, Semester Calendar
Independent Study, Fall Semesters

MA 442 Computational Complexity
The complexity of a computational problem is the amount of computer resources it requires. Computational complexity theory studies the complexity of computational problems as well as relationships between different types of resources. This course will cover both classical and research-related topics in computational complexity, such as: complexity measures and complexity classes for sequential machines and Boolean circuits, reductions and completeness, hierarchy theorems, relativization, circuit complexity, and proof complexity. Prerequisites: CS345 or equivalent MA345.
Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed

MA 447 Computer Algorithms
[Cross-listed with CS 447] This course will study and contrast a variety of computational algorithms and develop tools for algorithm analysis. Methods and topics such as dynamic programming, greedy algorithms, graph algorithms, circuits, parallel algorithms, matrix and polynomial algorithms, string matching, and geometrical algorithms will be explored. The theory of NP-completeness and methods of managing NP-complete problems will also be covered. Prerequisites: CS344 and MA211
Credits: (3), Graded, Semester Calendar
Lecture, Fall Terms

MA 449 Computational Learning
[Cross-listed as CS 449] Computational learning studies algorithmic problems for inferring patterns and relations from data. This course describes the mathematical foundations of learning and explores the important connections and applications to areas such as artificial intelligence, cryptography, statistics, and bioinformatics. A list of relevant topics may include perceptron and online learning, graphical models and probabilistic inference, decision tree induction and boosting, analysis of Boolean functions, sample complexity bounds, cryptographic and complexity hardness, and reinforcement learning. Basic ideas from computer science and mathematics are employed to describe the main ideas and major developments in computational learning. Prerequisites: CS344 and CS345, or consent of the instructor.
Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed
MA 451 Introduction to Mathematical Research
Introduction to the methods and tools needed to prepare mathematical research papers and presentations. Course instruction includes an introduction to research journals, including databases and search tools; mathematical writing; mathematical authoring and presentation software; professionalism, diversity, and ethics in the mathematical professions. Elements of the student grade will be drawn from performance in this class, from peer-evaluations and from self-assessment through surveys. Only open to Math or Applied Math and Statistics majors with at least junior standing, or by permission of the instructor.
Credits: (2), Graded, Semester Calendar
Lecture, Spring Terms

MA 453 Introduction to Mathematical Instruction
Introduction to mathematical pedagogy. Students majoring in Math or Applied Math and Statistics register for 2 credits, consisting of: classroom presentation techniques; preparation of handouts; evaluation techniques; mathematical authoring and presentation software; professionalism, diversity, and ethics in the mathematical professions. Elements of the student grade will be drawn from performance in this class, from peer-evaluations and from self-assessment. Students are required to complete a semester-long non-paid teaching experience in conjunction with this course (for example, serving as a teaching assistant or a group tutor). Students enrolled in the pre-teaching minor register for one additional credit and complete additional assignments covering a broader range of topics in education; this additional credit may be taken in the same semester or in a later semester. Prerequisite: Only open to Math or Applied Math and Statistics majors with at least junior standing or permission of the instructor.
Credits: (1-3), Graded, Semester Calendar
Lecture, Spring Terms

MA 456 Cryptography
(Cross-listed with CS 456) Cryptography is the discipline which studies the making of 'secret' codes. This course will examine some of the methods of cryptography together with many surprising applications. The language of modern cryptography is primarily number theory, and various tools of number theory will be developed as needed. No background in number theory or cryptography will be necessary, but some mathematical sophistication and familiarity with proofs will be assumed. Topics will include: one-way functions, public-key cryptosystems, digital signatures, probabilistic encryption, primality testing, interactive proof systems, and methods of secret sharing. Prerequisites: CS142, EE262, or EE361, and MA211. (CS344 Recommended)
Credits: (3), Graded, Semester Calendar
Lecture, Spring Terms

MA 497 Undergraduate Research
Students engage in mathematical research with a faculty member. The topic will be determined by student interest and faculty research programs. This course may be repeated for credit.
Credits: (1-3), Graded, Semester Calendar
Research, Given When Needed

MA 499 Professional Experience
This course records success in completing the requirements other than conventional course work for all mathematics majors. The student must present evidence demonstrating skill in communications and understanding the profession. The requirement can be satisfied in a number of ways including internships or co-ops with appropriate professional content, participation in REU programs, a mathematical honors thesis, teaching assistance in mathematics, active participation in professional societies including attendance at regional or national conferences and presentation of work at such. Directed study or research courses that lead to such presentations would also satisfy the requirement. Check with the Math department for specific requirements.
Credits: (0), P/NC, Semester Calendar
Independent Study, Every Semester

Mechanical Engineering

ME 1 (3, 5...) Mechanical & Aeronautical Engineering Elective
A college level course for which there is no comparable Clarkson course. Used for transfer credit only.
Credits: (2-4), Graded, Semester Calendar
Lecture, Transfer Credit Only

ME 2 (4, 6...) Mechanical & Aeronautical Engineering Elective
A college level course for which there is no comparable Clarkson course. Used for transfer credit only. This course may be used as a Professional Elective.
Credits: (2-4), Graded, Semester Calendar
Lecture, Transfer Credit Only

ME 201 Intro to Experimental Methods in Mechanical & Aeronautical Engineering
(Cross-listed with AE 201) This course provides an introduction to experimental methods including the structure of experiments, measurement error types, statics, frequency distributions, error propagation, plot types, introductory design of experiments and use of computer for data processing. Experiments are used to demonstrate principles of material science, statics, strength of materials, rigid body dynamics and electrical science. Experiments are documented using written memoranda and worksheets.
Corequisites: ES220, ES222, ES223
Credits: (1), Graded, Semester Calendar
Lecture, Spring Terms
Comm Points: 2

ME 212 Introduction to Engineering Design
This course lays the foundation for the design curriculum of the MAE Department. Students are introduced to how to solve complex, open-ended engineering problems. Core topics covered are: the design process; engineering ethics and professional responsibilities; design for safety; mathematical and computer modeling; and written, oral and graphical communication. These topics are presented within the framework of at least two open-ended design projects which students must propose and accomplish through the completion of the preliminary design phase including a design report and presentation slides for each project. Prerequisites: ES100 or equivalent, PH131, or permission of the instructor.
Credits: (3), Graded, Semester Calendar
Lecture, Spring Terms
ME 301 Experimental Methods in Mechanical and Aeronautical Engineering

[Cross-listed with AE 301] This course covers experimental methods including sampling statistics, uncertainty analysis, error propagation, variable transformations, multi-variable regression, design of experiments and use of computers for data acquisition and processing. Experiments demonstrate principles from fluid mechanics, thermodynamics and introductory vibrations. Experiments are documented using written memoranda. Corequisites: ES330 and ES340 (or CH271)
Credits: (3), Graded, Semester Calendar
Lecture, Fall Semesters
Comm Points: 2

ME 310 Thermodynamic System Engineering

The preliminary design of thermodynamic systems made up of components such as turbines, pumps, compressors, boilers, evaporators, and condensers will be investigated. The major emphasis will be on the design of systems operating at steady-state, but start-up and transient operation will also be studied. Design work will consider actual, rather than ideal, thermodynamic systems, and account for the applicable combustion and psychrometric aspects of the system. Both individual and team work may be required. Open-ended problems on topics discussed will be assigned. Oral and written reports will be required. Some laboratory work may be required. Prerequisites: ES340 or CH260
Credits: (3), Graded, Semester Calendar
Lecture, Spring Terms

ME 324 Dynamical Systems

Dynamic systems classification, mathematical modeling of mechanical, electrical and mixed dynamic systems, state space representation, equilibrium points and linearization, solution of linear input/output and state equations, Laplace transforms, transfer functions and block diagrams, first and second order systems, stability, frequency response and simulation techniques. Prerequisites: MA232.
Credits: (3), Graded, Semester Calendar
Lecture, Every Semester

ME 326 Intermediate Fluid Mechanics

A continuation of ES 330. Topics include: deformation and stress in fluids; basic conservation laws; kinematics of fluid flow; theory of potential flow; introduction to compressible flows; isentropic flows and shock waves; compressible flows with friction and heat transfer; Navier-Stokes equation and theory of viscous flow; low Reynolds number flows with applications to hydrodynamic lubrication; laminar boundary layer theory and von Karman momentum integral method; introduction to computational fluid dynamics; applications of fluid mechanics to engineering problems including turbomachinery. Introduction to design concepts. Prerequisites: ES330, ES340 or CH271, MA232
Credits: (3), Graded, Semester Calendar
Lecture, Laboratory, Every Semester

ME 341 Mechanics of Machine Elements

The course reviews and extends the study of strength of materials and engineering materials behavior concepts with applications to mechanical design/behavior of classical machine elements. Additional coverage of multi-axial static failure theories, fatigue of materials and components and fracture mechanics is also provided. A self-directed study of a machine component is undertaken. Prerequisites: ES222.
Credits: (3), Graded, Semester Calendar
Lecture, Every Semester

ME 342 Introduction to Numerical Methods with Application

The goal of this course is to introduce the techniques needed for the numerical solution of ordinary and partial differential equations. These techniques will include the formulation of physical problems for numerical simulations, discretization and solution methods, and use of commercial software for solving engineering problems governed by differential equations. Specific topics covered are numerical differentiation, integration, interpolation, and associated errors, the solution of systems of non-linear algebraic equations, and the solution of initial and boundary value problems using finite difference and finite element methods. Prerequisites: ES 100, or HP102 and HP103, or EM120 and EM121, or CS141, and MA 232
Corequisites: ES 222, MA 231
Credits: (3), Graded, Semester Calendar
Lecture, Laboratory, Every Term

ME 365 Independent Projects I

[Cross-listed with AE 365] An opportunity for the student to become involved singly, or with a group, working on a special project under the guidance of a faculty member. Topics are often suggested by the faculty but suggestions from the students are encouraged. By permission of advisor only.
Credits: (3), Graded, Semester Calendar
Independent Study, Every Semester

ME 366 Independent Projects II

[Cross-listed with AE 366] Continuation of ME 365.
Credits: (3), Graded, Semester Calendar
Independent Study, Every Semester

ME 380 Special Topic: Biomechanics

[Cross-listed with ES 380] This course will examine the application of engineering principles to biologic systems. The structure and function of biologic tissue will be examined in the context of engineering mechanics. Emphasis will be placed on the biomechanics of human movement, including the basic principles of orthopedic biomechanics. Students will develop the skills necessary to explore biomechanics in the contemporary scientific literature and will write a term paper on a biomechanics topic of their choice. Prerequisites: PH131 and MA132
Credits: (3), Graded, Semester Calendar
Lecture, Discussion, Fall Semesters

ME 385 Design of Electromechanical Systems

This course will cover analog electronic design for purposes of controlling electromechanical systems, including electromechanical sensors and actuators, analog electronic design of filters, state space and classical controllers, and transistor-based servoamplifiers and high voltage amplifiers. The course has a significant laboratory component in which students are expected to design and fabricate circuits to control electromechanical systems. Implementation of digital controllers is also covered. Text Description: The Art of Electronics, Horowitz and Hill, Cambridge University Press, Second Edition, Mechatronics; An Integrated Approach, Clarence de Silva, CRC Press. Prerequisites: ES250, EE/ME324.
Credits: (3), Graded, Semester Calendar
Lecture, Spring Terms
Undergraduate Level Courses

ME 390 Advanced Manufacturing Processes
Brief introduction to the traditional manufacturing processes such as bulk deformation, extrusion, forging/forming, cold & hot working, and joining/welding. Emphasis will be on advanced near net shape forming/processes of engineering materials known as Additive Manufacturing/3D Materials Processing, including 3D processing for Polymers as well as metals. Prerequisites: ES260 and ME341
Credits: (3), Graded, Semester Calendar
Lecture, Fall Terms

ME 401 Advanced Experimental Methods in Mechanical and Aeronautical Engineering
[Cross-listed with AE 401] This course covers advanced experimental methods including Fourier analysis filtering, computer data acquisition. Experiments demonstrate principles of heat transfer, fluid mechanics, gas dynamics and aerodynamics. Experiments are documented using written memoranda and worksheets. Prerequisites: ME/AE 201 or ME/AE301
Corequisites: ME411 or ME326
Credits: (1), Graded, Semester Calendar
Lecture, Spring Semesters

ME 411 Introduction to Heat Transfer
Introductory treatment of steady and transient conduction, natural and forced convection and radiation heat transfer with applications to basic heat exchanger design and other multimode problems. Students will complete at least one design project. Laboratory work may be required. Prerequisites: ES330 or CH301, ES340 or CH271, and MA232 or equivalent.
Credits: (3), Graded, Semester Calendar
Lecture, Every Semester

ME 424 Advanced Biomechanics
[Cross-listed with ME524] Solid biomechanics including structure, function, and mechanical properties of biological tissues. Emphasis will be placed on cell mechanics and signalling, mechanobiology, and remodeling. Current literature topics will be covered. Prerequisites: MA232 and ES222.
Credits: (3), Graded, Semester Calendar
Lecture, Spring Terms

ME 441 Advanced Manufacturing Processes
Brief introduction to the traditional manufacturing processes such as bulk deformation, extrusion, forging/forming, cold & hot working, and joining/welding. Emphasis will be on advanced near net shape forming/processes of engineering materials known as Additive Manufacturing/3D Materials Processing, including 3D processing for Polymers as well as metals. Prerequisites: ES260 and ME341
Credits: (3), Graded, Semester Calendar
Lecture, Fall Terms

ME 411 Introduction to Heat Transfer
Introductory treatment of steady and transient conduction, natural and forced convection and radiation heat transfer with applications to basic heat exchanger design and other multimode problems. Students will complete at least one design project. Laboratory work may be required. Prerequisites: ES330 or CH301, ES340 or CH271, and MA232 or equivalent.
Credits: (3), Graded, Semester Calendar
Lecture, Every Semester

ME 424 Advanced Biomechanics
[Cross-listed with ME524] Solid biomechanics including structure, function, and mechanical properties of biological tissues. Emphasis will be placed on cell mechanics and signalling, mechanobiology, and remodeling. Current literature topics will be covered. Prerequisites: MA232 and ES222.
Credits: (3), Graded, Semester Calendar
Lecture, Spring Terms

ME 443 Optimal Engineering
[Cross-listed with AE 443] An introduction to the optimal design of mechanical systems. This course involves the application of mathematical optimization techniques, including linear and nonlinear methods, to the design of devices and systems of interest to mechanical engineers. Emphasis is placed on the formulation of problems which can be solved by these techniques. Use is made of currently available optimal design computer programs. Prerequisites: AE/ME350 or ME341.
Credits: (3), Graded, Semester Calendar
Lecture, Fall Semesters

ME 444 Computer Aided Engineering
An introduction to computer-aided design of mechanical and structural systems. The course deals with the use of commercially available computer-aided design software and hardware for the design of mechanical and structural assemblies. The production of engineering drawings using a CAD system will also be discussed. Hands-on experience is emphasized. Students entering the course are assumed to have a basic understanding of general computer usage

ME 445 Integrated Design I
This course provides a review and extension of the basic methodology and decisions surrounding design leading to the conceptual and preliminary design of mechanical systems. Topics covered included preliminary sizing, mathematical modeling, experimental evaluation, requirements and constraints, layout, fluid mechanics and thermal sciences issues, structural issues, economics, trade studies, and ethical implications of the design and decision process. Prerequisites: AE/CE/ME212, ES330, and ES340 or CH271
Corequisites: ME341
Credits: (3), Graded, Semester Calendar
Lecture, Fall Semesters

ME 446 Integrated Design II
Continuation of concepts introduced in the Integrated Design I on the basic methodology and decisions surrounding mechanical systems design including what is necessary for final detail design. The course is supplemented by lectures on various topics including conceptual design issues, detailed system considerations, trade studies, integration, structural issues, computational mechanics, testing considerations, cost, and manufacturing. Prerequisites: ME445
Credits: (3), Graded, Semester Calendar
Lecture, Spring Semesters

ME 450 Control Systems
[Cross-listed with EE 450] Introduction to the analysis and design of continuous-time feedback control systems. Topics include: mathematical representation of physical systems with linear differential equations, Laplace transforms, transfer functions, block diagrams and signal flow graphs, feedback, sensitivity, transient specifications, steady-state tracking errors, stability, root locus plots, compensator design, simulation. Prerequisites: AE/EE/ME324 or Corequisite: EE321.
Credits: (3), Graded, Semester Calendar
Lecture, Fall Semesters

ME 452 Advanced Strength of Materials
A study of properties of materials, general stress-strain relationships, modern strength theories, unsymmetrical bending, curved beams, beams on elastic foundations, the equations of elasticity and plasticity (1 credit of design) Prerequisites: ES222
Credits: (3), Graded, Semester Calendar
Lecture,

ME 455 Mechanical Vibrations and Control
[Cross-listed with AE 455] Fundamentals, free vibration, harmonically excited vibration, transient vibration, multi-degree freedom systems, vibration measurements, introduction to control theory, linear feedback control, vibration control, adaptive and optimal control, numerical methods. Prerequisites: ES223
Credits: (3), Graded, Semester Calendar
Lecture, Fall Semesters
ME 457  Composite Mechanics and Design

ME 465  Advanced Independent Projects I
[Cross-listed with AE 465] An opportunity for the advanced student to undertake an independent investigation in a mechanical engineering field of his or her own choice. Assistance will be given only when the student requests it. The project may be a comprehensive literature investigation, involve laboratory experiments, or involve analytical work by permission of advisor only. Credits: (3), Graded, Semester Calendar Independent Study, Every Semester

ME 492  Welding Metallurgy
Introduction to conventional and non-conventional welding processes. Weldability problems in ferrous, non-ferrous and metal-matrix composite materials will be discussed. Solidification modes and their effects on the mechanical properties of weldments will be examined. Students will perform arc welding and friction welding of alloys, and ultrasonic welding of plastics. Prerequisites: ES260 Corequisites: ME411 Credits: (3), Graded, Semester Calendar Lecture, Laboratory, Fall Terms

Marketing

MK 1 (3, 5...)
A college level course for which there is no comparable Clarkson course. Used for transfer credit only. Credits: (2-4), Graded, Semester Calendar Lecture, Transfer Credit Only

MK 2 (4, 6...)
A college level course for which there is no comparable Clarkson course. Used for transfer credit only. Credits: (2-4), Graded, Semester Calendar Lecture, Transfer Credit Only

MK 306  Professional Sales
This course focuses on understanding the sales process mainly at the business-to-business level. Students will learn both theoretical and applied models of sales, with a focus on practical application in the types of companies that Clarkson graduates work at. Topics covered include identification of customer needs, customer relationship management, identification of differentiating factors across products and services, fundamentals of relationship management, managing customer expectations, working with international customers (managing cultural and legal differences), working across internal functional boundaries to sell and support products and services, pricing, negotiation basics, closing a contract, customer satisfaction, and after-sales support and services. Prerequisite: At least Sophomore standing. Credits: (3), Graded, Semester Calendar Lecture, Given When Needed

MK 320  Principles of Marketing
(May be used to satisfy a CUSB MBA or MS foundation requirement). Familiarizes students with various marketing terms, concepts, principles, institutions and practices. Topics covered include: buyer behavior, market research, product planning, pricing, distribution, personal selling and advertising. The changing nature of marketing and the trends in domestic and international marketing are also examined. Experiential exercises are an intrinsic and important part of this course. Corequisite: IS211 or EM211 for CUSB majors, or IS110 Credits: (3), Graded, Semester Calendar Lecture, Every Term

MK 321  Consumer Behavior
[Cross-listed with PY 321] Extensive coverage of selected consumer behavior theories and models. Special emphasis given to the most recent research along with marketing mix applications. Topics include classic and operant conditioning, motivation and attribution theories and the elaboration likelihood model. Students are required to complete a term project. Prerequisite: MK320. Credits: (3), Graded, Semester Calendar Lecture, Fall Semesters

MK 332  Marketing Research
Introductory coverage of various concepts and tools relevant to market information acquisition, analysis, and interpretation. Primary focus is on decision making in marketing research. Students are required to complete a term project. Prerequisites: MK320 and MA/STAT282 or MA/STAT383. Credits: (3), Graded, Semester Calendar Lecture, Spring Semesters

MK 419  New Product Development and Marketing Portfolio
This New Product Development and Marketing Portfolio is the mechanism by which students enrolled in the New Product Development and Marketing Minor maintain a repository of their work within the minor and in related areas of study and work during their time at Clarkson. This portfolio should include at least evidence from four (4) new product development and/or marketing projects that were completed by the student during their Clarkson experience. The portfolio can by multimedia and include both coursework and work from extracurricular activities, entrepreneurial initiatives, or Internship/co-op work experiences. Prerequisites: Senior Standing Credits: (0), P/NC, Semester Calendar Independent Study, Fall and Spring Terms

MK 431  Supply Chain Distribution Channels
Few firms can survive in today's competitive marketplace without constant attention to improved product and service offerings while simultaneously minimizing transaction costs associated with their supply chains. To effectively manage supply chains, however, managers need to understand the nature of the network of channel intermediaries that constitute an important part of these supply chains and the functions they perform. This course will examine the latest channel design models and identify the core decision areas and the critical contemporary issues associated with the management of such channel networks. Primary topics to be covered will include
understanding the sociopolitical nature of channel networks and channel governance principles, developing and sustaining synergistic partnerships and strategic alliances with distributive intermediaries, role of trust in conflict management and channel coordination, and the impact of technology and internet on contemporary supply chains channels. Prerequisite: MK320.
Credits: (3), Graded, Semester Calendar
Lecture, Fall Semesters

MK 436  Creativity, Innovation & New Product Development
This course provides an introduction and broad overview of the strategic decision making process for managing three critical components for firm growth: creativity, innovation and new product development. The fostering of creativity, the stimulation and management of innovation and the strategic new product development process are discussed within the context of interdisciplinary management. This course concentrates on the front end of new product development focusing on understanding, fostering and managing the creative processes, grasping the importance of innovation in satisfying market needs, and the development of new products up to and including the design stage of new product development. The course provides students with the ability to understand, appreciate and manage new products and the new product development process. Marketing research methods, current topics and critical examination of traditional management strategies applicable to creativity, innovation and new product development and management will be explored through lecture, case analysis, and discussion. Prerequisite: MK320.
Credits: (3), Graded, Semester Calendar
Lecture, Fall Semesters

MK 487  Special Project in Marketing
An investigation of a problem or an in-depth topic undertaken by the student under the guidance of a faculty member.
Prerequisites: Permission of the instructor
Credits: (1-3), Graded, Semester Calendar
Research, Given When Needed

MK 490  Internship
An unpaid internship that is related to the student’s professional goals.
Prerequisite: consent of the instructor.
Credits: (1-3), Graded, Semester Calendar
Independent Study, Given When Needed

Multidisciplinary Courses

MP 151  Multidisciplinary Course (Open Source Software Projects)
Student teams will engage in projects in the following areas: administer, create, modify, test, or document Open Source Software (OSS); analyze business and policy issues involving OSS; and create and run outreach/tutorial programs that introduce interested persons to OSS or enhance the skill of persons already using OSS. Project status will be reported during regularly scheduled weekly meetings. Students will document projects on the Clarkson Open Source Institute (COSI) web site and will construct individual, web-based portfolios of their work. Students are expected to have some experience or course preparation in their project areas. Given Pass/No Credit.
Credits: (0-3), P/NC, Semester Calendar
Research, Given When Needed

MP 152  Internet Teaching Laboratory Projects Course
In conjunction with Clarkson’s Internet Teaching Laboratory, students will participate in projects related to computer networking such as implementing network software, configuring networking hardware, simulating large-scale networks, evaluating and testing computer security, administering the Internet Teaching Laboratory, deploying networked solutions for community members or developing network tutorials for other students. Students will construct web-based portfolios and give oral presentations of their work. Given Pass/No Credit. By permission of instructor.
Credits: (0-3), P/NC, Semester Calendar
Research, Every Term

MP 210 Food-to-Energy: A K-12/University Partnership to develop a Resource Recovery Program
Clarkson students will work with Clarkson University and a local school district to encourage food waste diversion from the solid waste stream and to explore beneficial uses of food waste for nutrient and energy recovery. Students will develop lesson plans to be implemented in K-12 classes as well as work with student teams to promote best food waste practices.
Credits: (1-3), Graded, Semester Calendar
Lecture, Spring Terms

MP 251  Open Source Software Projects
A continuation of MP 151
Credits: (0-3), P/NC, Semester Calendar
Research, Given When Needed

MP 252  Internet Teaching Laboratory Projects Course
In conjunction with Clarkson’s Internet Teaching Laboratory, students will participate in projects related to computer networking such as implementing network software, configuring networking hardware, simulating large-scale networks, evaluating and testing computer security, administering the Internet Teaching Laboratory, deploying networked solutions for community members or developing network tutorials for other students. Students will construct web-based portfolios and give oral presentations of their work. Given Pass/No Credit. By permission of instructor.
Credits: (0-3), P/NC, Semester Calendar
Research, Every Term

MP 310 Food to Energy: A K-12/University Partnership to develop a Resource Recovery Program
Clarkson students will work with Clarkson University and a local school district to encourage food waste diversion from the solid waste stream and to explore beneficial uses of food waste for nutrient and energy recovery. Students will develop lesson plans to be implemented in K-12 classes as well as work with student teams to promote best food waste practices.
Credits: (1-3), Graded, Semester Calendar
Lecture, Spring Terms

MP 351  Open Source Software Projects
A continuation of MP 251.
Credits: (0-3), P/NC, Semester Calendar
Research, Given When Needed

MP 352  Internet Teaching Laboratory Projects Course
In conjunction with Clarkson’s Internet Teaching Laboratory, students will participate in projects related to computer networking such as
implementing network software, configuring networking hardware, simulating large-scale networks, evaluating and testing computer security, administering the Internet Teaching Laboratory, deploying networked solutions for community members or developing network tutorials for other students. Students will construct web-based portfolios and give oral presentations of their work. Given Pass/No Credit. By permission of instructor.
Credits: (0-3), P/NC, Semester Calendar
Research, Every Term

MP 401  Multidisciplinary Course (Environmental Remediation Design)
Science and engineering concepts are synthesized to generate safe, economics and effective solutions to real-world environmental restoration projects. Emphasis is placed on multidisciplinary teamwork and communication.
Credits: (3), Graded, Semester Calendar
Lecture, Spring Semesters, (TECH)

MP 414  Multidisciplinary Course (Applied Robotics)
Clarkson students work together with high school students to participate in a nation-wide robotics competition and get hands-on, inside look at the engineering profession. During the fall semester, students plan for the upcoming spring competition by participating in a series of seminars that focus on various aspects of mobile robot design and construction. Competition rules are announced at the start of the spring semester, and during an intense six-week period, students work to brainstorm, design, construct, and test their robot entry. With only six weeks of build time, all jobs are critical path. Teams from across the nation then compete in a tournament complete with referees, cheerleaders and time clocks. The competition changes each year, so returning team members always have a new challenge.
Credits: (0-3), P/NC, Semester Calendar
Project Team, Every Term

MP 418  Project-Based Learning Program
Clarkson students will work with students from two local school districts to increase their understanding of science, math, engineering and technology. Clarkson students in this project will develop and then teach a holistic, project-based learning approach to problem solving. Both the Clarkson and K-12 students will gain an appreciation for the relevance and usefulness of science and engineering within a larger social, political and economic context. Year long projects will be oriented towards understanding and solving environmentally related problems that affect their school or community.
Prerequisite: consent of the instructor.
Credits: (3), Graded, Semester Calendar
Lecture, Every Semester

MP 425  Multidisciplinary Course - Sustainable Housing Solution
[XCross-listed with MP525] A team of Clarkson students from multiple majors will collaborate to design, optimize, and build a prototype of a housing solution. Principles of sustainable design, alternatives assessment, resource management, multidisciplinary teamwork, and communication will be emphasized.
Credits: (3), Graded, Semester Calendar
Lecture, Spring Terms, Comm Points: 1

MP 451  Open Source Software Projects
A continuation of MP 441
Credits: (0-3), P/NC, Semester Calendar
Research, Given When Needed

MP 452  Internet Teaching Laboratory Projects Course
In conjunction with Clarkson's Internet Teaching Laboratory, students will participate in projects related to computer networking such as implementing network software, configuring networking hardware, simulating large-scale networks, evaluating and testing computer security, administering the Internet Teaching Laboratory, deploying networked solutions for community members or developing network tutorials for other students. Students will construct web-based portfolios and give oral presentations of their work. Given Pass/No Credit. By permission of instructor.
Credits: (0-3), P/NC, Semester Calendar
Research, Every Term

MP 456  Special Topics in E&M: Lean Six Sigma for Healthcare
Students will have a first-hand experience in solving a real-world problem by applying lean six sigma tools. To this aim, students will be assigned to a process improvement research project and will closely collaborate with stakeholders of a Healthcare organization in the North Country. Students will gather and analyze data, and provide process insights and recommendations for redesigning a process. To this aim, students will have to commute on a regular basis to the Healthcare organization facilities that can be located in Canton, Potsdam, or in the Adirondacks. The goal is to bring a tangible improvement that ultimately results in an effective and efficient operational process that consistently satisfies customers/patients.
Requirement: Instructor permission
Credits: (3), Graded, Semester Calendar
Lecture, Spring Terms

Military Science

MS 1 (3, 5...): Military Science Elective
A college level course for which there is no comparable Clarkson course.
Credits: (1-9), Graded, Semester Calendar
Lecture, Transfer Credit Only

MS 111  Leadership and Personal Development
Introduces cadets to the personal challenges and competencies that are critical for effective leadership. Cadets learn how the personal development of life skills such as critical thinking, goal setting, time management, physical fitness, and stress management relate to leadership, officership, and the Army profession. The focus is on developing basic knowledge and comprehension of Army leadership dimensions while gaining a big picture understanding of the ROTC program, its purpose in the Army, and its advantages for the student. Class meets weekly for one hour with a corequisite laboratory and one weekend field training exercise. Physical fitness training is also required.
Credits: (1), Graded, Semester Calendar
Lecture, Laboratory, Fall Semesters

MS 112  Introduction to Tactical Leadership
Overviews leadership fundamentals such as setting direction, problem-solving, listening, presenting briefs, providing feedback, and
using effective writing skills. Cadets explore dimensions of leadership values, attributes, skills, and actions in the context of practical, hands-on, and interactive exercises. Continued emphasis is placed on recruitment and retention of cadets. Cadre role models and the building of stronger relationships among the cadets through comment experience and practical interaction are critical aspects of the MS112 experience. Class meets weekly for one hour with a corequisite laboratory and one weekend field training exercise. MS111 recommended but not required as prerequisite; Physical fitness training is also required. No military obligation for non-contracted students.

Credits: (1), Graded, Semester Calendar
Lecture, Laboratory, Spring Semesters

**MS 221 Innovative Team Leadership**

Explores the dimensions of creative and innovative tactical leadership strategies and styles by examining team dynamics and two historical leadership theories that form the basis of the Army leadership framework (trait and behavior theories). Cadets practice aspects of personal motivation and team building in the context of planning, executing, and assessing team exercises and participating in leadership labs.

Focus is on continued development of the knowledge of leadership values and attributes through an understanding of Army rank, structure, and duties and basic aspects of land navigation and squad tactics. Case studies provide tangible context for learning the Soldier s Creed and Warrior Ethos as they apply in the contemporary operating environment (COE). Class meets weekly for two hours with corequisite laboratory and one weekend field training exercise. Physical fitness training is also required. MS111 and MS112 recommended but not required as prerequisites. No military obligation for non-contracted students.

Credits: (2), Graded, Semester Calendar
Lecture, Laboratory, Fall Semesters

**MS 222 Foundations of Tactical Leadership**

Examines the challenges of leading tactical teams in the complex contemporary operating environment (COE). The course highlights dimensions of terrain analysis, patrolling, and operations orders. Further study of the theoretical basis of the Army leadership framework explores the dynamics of adaptive leadership in the context of military operations. MS222 provides a smooth transition into MS331. Cadets develop greater self awareness as they assess their own leadership styles and practice communication and team building skills. COE case studies give insight into the importance a context

**MS 331 Adaptive Tactical Leadership**

Challenges cadets to study, practice, and evaluate adaptive leadership skills as they are presented with challenging scenarios related to squad tactical operations. Cadets receive systematic and specific feedback on their leadership attributes and actions. Based on such feedback, as well as their own self-evaluations, cadets continue to develop their leadership and critical thinking abilities. The focus is developing cadets’ tactical leadership abilities to enable them to succeed at ROTC’s summer Leadership Development and Assessment Course (LDAC). Class meets weekly for three hours with corequisite laboratory and one weekend field training exercise. Physical fitness is also required.

Prerequisite: MS Basic Course or equivalent.
Credits: (3), Graded, Semester Calendar
Lecture, Laboratory, Fall Semesters
Comm Points: 1

**MS 332 Leadership in Changing Environments**

Uses increasingly intense situational leadership challenges to build cadet awareness and skills in leading tactical operations up to platoon level. Cadets review aspects of combat, stability, and support operations. They also conduct military briefings and develop proficiency in garrison operation orders. The focus is on exploring, evaluating, and developing skills in decision-making, persuading, and motivating team members in the contemporary operating environment (COE). MS332 cadets are evaluated on what they know and do as leaders is they prepare to attend the ROTC summer Leader Development Assessment Course (LDAC). Class meets weekly three hours with corequisite laboratory and one weekend field training exercise. Physical fitness training is also required.

Prerequisite: MS Basic Course or equivalent.
Credits: (3), Graded, Semester Calendar
Lecture, Laboratory, Spring Semesters
Comm Points: 1

**MS 441 Developing Adaptive Leaders**

Develops cadet proficiency in planning, executing, and assessing complex operations, functioning as a member of a staff, and providing performance feedback to subordinates. Cadets assess risk, make ethical decisions, and lead fellow ROTC cadets. Lessons on military justice and personnel processes prepare cadets to make the transition to Army officers. MS IV cadets analyze, evaluate, and instruct cadets for their first unit of assignment. They identify responsibilities of key staff, coordinate staff roles, and use situational opportunities to teach, train, and develop subordinates. Class meets weekly for three hours with corequisite laboratory and one weekend field training exercise. Physical fitness training is also required.

Credits: (3), Graded, Semester Calendar
Lecture, Laboratory, Fall Semesters
Comm Points: 1

**MS 442 Leadership in a Complex World**

Explores the dynamics of leading in the complex situations of current military operations in the contemporary operating environment (COE). Cadets examine differences in customs and courtesies, military law, principles of war, and rules of engagement in the face of international terrorism. They also explore aspects of interacting with non-government organizations, civilians on the battlefield, and host nation support. The course places significant emphasis on preparing cadets for their first unit of assignment. It uses case studies, scenarios, and what now, lieutenant? exercises to prepare cadets to face the complex ethical and practical demands of leading as commissioned officers in the United States Army. Class meets weekly for three hours with corequisite laboratory and one weekend field training exercise. Physical fitness training is also required.

Credits: (3), Graded, Semester Calendar
Lecture, Laboratory, Spring Semesters
Comm Points: 1
Materials Science and Engineering

MSE 451 Advanced Characterization of Materials
[Cross-listed with MSE551] Advanced methods for characterizing materials, such as scattering methods, including laser light scattering and x-ray diffraction (powder pattens & Laue pattens); microscopy, including optical microscopy; scanning electron microscopy (including EDX), transmission electron microscopy, and atomic force microscopy; and spectroscopy, including nuclear magnetic resonance, surface plasmon resonance, and scanning confocal Raman microscopy. Prerequisites: CM132 (or CM104 and CM106), PH132, and ES260. Credits: (3), Graded, Semester Calendar. Lecture, Given When Needed.

Multidisciplinary Project Team

MT 51 Introduction to Basic Shop Skills
This course covers simple shop procedures including measurement and layout, drills and drill presses, use of hand taps, proper use of the various ban saws, and use of the shear and brake; involves use of the composite lab and wood working equipment. MT 51 consists of three hours of lecture, and three hours of hands-on lab experience. Credits: (0), P/NC, Semester Calendar. Lecture, Laboratory, Every Term.

MT 52 Basic Lathe Operations
This course covers the basic theory and operation of the metal lathe; topics include tool grinding, turning, facing, boring, fits, tapers, etc. This course consists of three lectures of 1.5 hours each and four labs of 2 hours each. Offered Pass/No Credit. Prerequisite: MT 51. Credits: (0), P/NC, Semester Calendar. Lecture, Laboratory, Every Term.

MT 53 Basic Milling Procedures
Basic Milling will cover the theory and operation of the Bridgeport type mill; topics covered include set-up of the mill, fixturing, zeroing parts, cutters, and milling techniques for various materials. This course would consist of three lectures of 1.5 hours each and four labs of 2 hours each. Offered Pass/No Credit. Prerequisite: MT 52. Prerequisite: MT 51. Credits: (0), P/NC, Semester Calendar. Lecture, Laboratory, Every Term.

MT 54 CNC Mill Procedures
Basics of CNC Machine programming and operation of the Haas Bed Mill; topics covered include machine start up and homing, conversational programming, drill patterns, profiles, and pockets. The course would consist of three lectures of 1.5 hours each and four labs of 2 hours each. Prerequisite: MT53. Credits: (0), P/NC, Semester Calendar. Lecture, Laboratory, Given When Needed.

MT 55 Basic Welding Procedures
Basic welding addresses the operation and use of welding equipment in a safe and effective manner; topics include general welding safety, oxygen-acylene techniques, basic arc welding, MIG welding, TIG welding, and use of the plasma cutting torch. The course would consist of three lectures of 1.5 hours each and four labs of 2 hours each. Offered Pass/No Credit.

MT 56 Introduction to MasterCam
This course is an overview of the CAD software MasterCam. Students will draw, choose tool paths, create machine code, and run programs on CNC mills using CAD. Prerequisite: MT 54. Credits: (0), P/NC, Semester Calendar. Lecture, Laboratory.

MT 57 Advanced Lathes
This course will cover the use of the precision lathes in the student shop. Students will set up and machine on several different lathes using advanced techniques and tooling. Prerequisite: MT52. Credits: (0), P/NC, Semester Calendar. Lecture, Laboratory, Given When Needed.

MT 58 CNC Lathe Operation
CNC Lathe Operations and Programming. Topics covered include machine programming and operation; using g-code programs generated by CAD/CAM software, tool path creation utilizing conversational HAAS lathe programming and basic g-code. Students will learn how to turn complex profiles and mill a variety of 3D contours. This course will consist of four lectures of 1.25 hours each and four labs of 2 hours each. Prerequisites: MT56, and MT 57. Credits: (0), P/NC, Semester Calendar. Lecture, Laboratory, Given When Needed.

MT 109 Mini Baja Car Project
Active participation in Mini Baja Car project. Pass/No Credit only. Must have permission of instructor. Credits: (0), P/NC, Semester Calendar. Project Team, Every Semester.

MT 110 Multidisciplinary Course (CPS OM-DINI)
Active participation in Creative Problem Solving -- Odyssey of the Mind/Destination Imagination project. Pass/No Credit only. Must have permission of instructor. Prerequisite: consent of the instructor. Credits: (0-3), P/NC, Semester Calendar. Project Team, Every Semester.

MT 209 Mini Baja Car Project
Active participation in Mini Baja Car project. Pass/No Credit only. Must have permission of instructor. Credits: (0), P/NC, Semester Calendar. Project Team, Every Semester.

MT 210 Multidisciplinary Course (CPS OM-DINI)
See MT 110 for course description. Credits: (0-3), P/NC, Semester Calendar. Project Team, Every Semester.

MT 214 Multidisciplinary Course (FIRST Robotics Competition)
Clarkson students work together with local high school students to participate in a nation-wide robotics competition and get a hands-on, inside look at the engineering profession. During the fall semester, students plan for the upcoming spring competition by participating in a series of seminars that focus on various aspects of mobile robot engineering.
design and construction. Competition rules are announced at the start of the spring semester, and during an intense six-week period, students work to brainstorm, design, construct, and test their robot entry. With only six weeks of build time, all jobs are critical path. Teams from across the nation then compete in a tournament complete with referees, cheerleaders and time clocks. The competition changes each year, so returning team members always have a new challenge.

Credits: (0), P/NC, Semester Calendar
Project Team, Every Semester

MT 309 Mini Baja Car Project
Active participation in Mini Baja Car project. Pass/No Credit only. Must have permission of instructor.
Credits: (0), P/NC, Semester Calendar
Project Team, Every Semester

MT 310 Multidisciplinary Course (CPS OM-DIN)
See MT 110 for course description.
Credits: (0-3), P/NC, Semester Calendar
Project Team, Every Semester

MT 409 Mini Baja Car Project
Active participation in Mini Baja Car project. Pass/No Credit only. Must have permission of instructor.
Credits: (0), P/NC, Semester Calendar
Project Team, Every Semester

Operations Management

OM 1 (3, 5, ...) Operations Management Elective
A college level course for which there is no comparable Clarkson course. Used for transfer credit only.
Credits: (2-4), Graded, Semester Calendar
Lecture, Transfer Credit Only

OM 2 (4, 6, ...) Operations Management Elective
A college level course for which there is no comparable Clarkson course. Used for transfer credit only. This course may be used to satisfy a Business Foundation Curriculum Requirement.
Credits: (2-4), Graded, Semester Calendar
Independent Study, Transfer Credit Only

OM 331 Operations & Supply Chain Management
(Cross-listed with EM 331) (May be used to satisfy a CUSB MBA and MS foundation requirement.) An introduction to the planning, analysis and control of production systems. Topics include product and service design, manufacturing processes, aggregate production planning, inventory models and MRP, just-in-time systems, facility layout, forecasting/demand planning, project management, and quality management. Students acquire problem solving experience using ERP software. Prerequisites: STAT 282 or STAT 383 or MA 330, and at least sophomore standing
Corequisite: IS 211 or EM211 (CUSB majors) or IS 110
Credits: (3), Graded, Semester Calendar
Lecture, Every Term

OM 341 Supply Chain Design & Management
(Cross-listed with EM 341) Fierce competition in today’s global markets has forced business enterprises to focus on reducing costs while meeting rising customer expectations by designing and managing effective and sustainable supply chains. This course focuses on a systems approach to review state-of-the-art models and practical tools for inventory and materials management, design for supply chain, as well as supply chain integration. Topics covered include managing inventories in the supply chain, the bullwhip effect, risk pooling, delayed differentiation, measuring the financial performance of supply chains, the value of information and the role of information technology in the supply chain, coordination and collaboration with channel partners, supply chain related strategic alliances, and outsourcing/off-shoring/reshoring trends. Several team projects and hand-on experiences are utilized to demonstrate real world issues and applications. Prerequisite: OM331 and at least junior standing.
Credits: (3), Graded, Semester Calendar
Lecture, Spring Terms

OM 371 Strategic Sourcing
This course provides an in-depth analysis of the procurement process and supplier management, with strong emphasis on managing a supplier base for both products and services. Topics covered include the strategic role of sourcing in supply chains, the identification and evaluation of requirements, the strategic make versus buy decision, supplier selection, development and evaluation processes, the supplier coordination and control mechanisms, the relationship between product design and the supplier base and the impact of information technology on strategic sourcing. Both theoretical and quantitative perspectives will be offered. In addition, the topics will be addressed from strategic, financial, sustainability and global perspectives. Students will also develop practical skills in using quantitative tools to select and evaluate suppliers. Prerequisites: OM/EM331 and at least junior standing
Credits: (3), Graded, Semester Calendar
Lecture, Spring Terms

OM 380 Project Management
(Cross-listed with EM 380) This course will introduce students to all phases of project management from project initiation to termination. Topics covered include project selection, organization, contracts, planning and scheduling (PERT and CPM), estimating, budgeting and cost control, procurement, resource allocation, variance analysis, auditing and termination procedures. Project management software, case studies, and student team projects will be an integral part of the course.
Restrictions: Enrollment is limited to students in E&M, CUSB, Software Engineering, Project Management Minors, Construction Engineering Concentration or consent of instructor.
Prerequisites: STAT 383, STAT282, MA232 or MA330
Credits: (3), Graded, Semester Calendar
Lecture, Every Term

EC

OM 451 Quality Management & Lean Enterprise
(Cross-listed with EM 451) This course will introduce the students to both the managerial and technical aspects of quality improvement. The course emphasizes statistical applications to quality related topics such as process/product design, process capability, quality control, design of experiment, and inspections/sampling. Other topics of interest include: Juran quality trilogy, six-sigma project methodology, and cost of quality. The course consists of a series of lecture and problems solved in class. Prerequisites: MA/STAT282 or MA/STAT383 or MA330 or permission of instructor.
Credits: (3), Graded, Semester Calendar
Lecture, Every Term

OM 476 Management of Technology

[Cross-listed with EM 476] Management of technology links together the engineering, science, and management disciplines to plan, develop, and implement technological capabilities to be competitive in the global arena. Students taking the course will gain an understanding of the following topics: innovation, product life cycles, product development process, concurrent engineering, management of technology strategy, selecting technical projects, management of the R&D process, initiating new ventures, international technology transfer, and the management of complex projects. Lectures, readings, and case studies focus on firms operating in an international context. Prerequisite: OM331.
Credits: (3), Graded, Semester Calendar
Lecture, Every Semester

OM 484 Advanced Project Management

[Cross listed with EM484] This course builds on the foundation of EM/OM380 (Project Management) by introducing advanced topics in decision making, risk, and cost control as well as providing comprehensive knowledge of project scheduling and other PM tools. This course also provides an opportunity for students to further extend their PM skills in managing and controlling projects by applying the PM methods in a project management simulation using typical project management software. Students are exposed to advanced research topics in the emerging PM areas. Prerequisite: EM/OM380
Credits: (3), Graded, Semester Calendar
Lecture, Every Term

OM 487 Special Project in Operations Management

An investigation of a problem or in-depth topic undertaken by the student under the guidance of a faculty member.
Prerequisites: Permission of the instructor
Credits: (1-3), Graded, Semester Calendar
Research, Given When Needed

Organizational Studies

OS 1 (3, 5…)
Organizational Studies Elective
A college level course for which there is no comparable Clarkson course. Used for transfer credit only.
Credits: (2-4), Graded, Semester Calendar
Lecture, Transfer Credit Only

OS 2 (4, 6…)
Organizational Studies Elective
A college level course for which there is no comparable Clarkson course. Used for transfer credit only. This course may be used to satisfy a Business Foundation Curriculum Requirement.
Credits: (2-4), Graded, Semester Calendar
Lecture, Transfer Credit Only

OS 286 Organizational Behavior I

[Cross-listed with EM 286, PY 286] (May be used to satisfy a CUSB MBA or MS foundation requirement.) An introduction to the processes required to manage contemporary organizations with a focus on individual behaviors as they relate to the functions of planning, organizing, controlling, and leading. The most recent concepts of behavioral science in the practice of management are presented to assist the student in gaining understanding of the pervasiveness of the discipline in all types of organizations and processes. Topics include motivation, leadership, perceptions, personality theory, learning theory, personnel issues, stress management, organizational culture, and decision making. Prerequisites: sophomore standing or the permission of the instructor.
Credits: (3), Graded, Semester Calendar
Lecture, Every Semester

IG

OS 352 Strategic Human Resource Management

This course provides an introduction to the strategic management of human resources in organizations. Topics include human resource planning, recruitment and selection of employees, training and development, performance appraisal, employee motivation, compensation and benefits, and employee and labor-management relations. These topics should be understood in the context of business strategy, pressures external to organizations, and relevant theories of human and organizational behavior. Prerequisites: OS 286 (or equivalent)
Credits: (3), Graded, Semester Calendar
Lecture, Every Semester

OS 432 Organizational Policy and Strategy

[Cross-listed with EM 432] A capstone course designed to integrate the functional areas and tools of management studied in previous courses within a strategic planning framework giving due attention to ethical and social responsibility concerns and international business issues. Emphasis is placed on the business environment in a global economy, industry analysis, tactical planning, overall strategic planning, policy establishment and implementation. Case analysis, in the small group setting, is utilized, enabling students to share their expertise and explore their value structure. Students present results via written and oral reports. Prerequisites: FN361, OM331, OS286, MK320 and Senior standing.
Credits: (3), Graded, Semester Calendar
Lecture, Every Semester
Comm Points: 2

OS 452 Advanced Human Resource Management

This course provides advanced instruction in the strategic management of human resources in organizations. The focus is on the development and critical evaluation of sound HR policies and systems in key HR areas such as selection, training and development, performance management, and compensation. The course will also address the use of HR metrics, employee surveys, and the relationship between strategic HR practices and organizational performance. Knowledge and skills will be developed through qualitative and quantitative data analysis, evaluating best practices, and linking current HR research to practice. Prerequisites: OS352.
Credits: (3), Graded, Semester Calendar
Lecture, Spring Semesters

OS 466 Negotiations and Relationship Management

This course introduces students to the complex problems associated with the management of stakeholder relationships. The course emphasis is on the establishing, negotiating, building, sustaining, and repairing of both workplace and external relationships, including...
relationships with employees, management, customers, suppliers, manufacturers, shareholders, society, and other key stakeholders. This course introduces theories of negotiation, conflict, complaint handling, and norms and ethics of fairness. The course introduces labor relations, collective bargaining, and U.S. labor and employment laws, and considers corresponding implications for union and nonunion workplaces. Prerequisites: OS286 and Junior Standing.
Credits: (3), Graded, Semester Calendar
Lecture, Every Semester

OS 487 Special Project in Organizational Studies
An investigation of a problem or in-depth topic undertaken by the student under the guidance of a faculty member.
Prerequisite: Permission of the instructor
Credits: (1-3), Graded, Semester Calendar
Research, Given When Needed

Physical Education

PE 1 (3, 5…) Physical Education
Credits: (0), Graded, Semester Calendar
Lecture, Transfer Credit Only

PE 2 (4, 6…) Physical Education
Credits: (0), Graded, Semester Calendar
Lecture, Transfer Credit Only

PE 100 First Year Seminar
[Cross-listed with FY 100] See FY 100 First Year Seminar for description. Prerequisite: for Clarkson School students only.
Credits: (1), P/NC, Semester Calendar
Lecture, Fall Semesters

PE 101 Introduction to Lifetime Activities
This will be a 14 week course combining seven lifetime activities (racquetball, weight training/physical fitness, badminton, volleyball, golf, indoor soccer, and tennis)
Each activity will go for two weeks and will cover rules, strategies, and skills.
Credits: (0), P/NC, Semester Calendar
Physical Education, Spring Semesters

Physics

PH 1 (3, 5…) PH Elective
A college level course for which there is no comparable Clarkson course. Used for transfer credit only.
Credits: (2-4), Graded, Semester Calendar
Lecture, Transfer Credit Only

PH 2 (4, 6…) PH Elective
A college level course for which there is no comparable Clarkson course. Used for transfer credit only. This course may be used to satisfy a Science Foundation Curriculum Requirement.
Credits: (2-4), Graded, Semester Calendar
Lecture, Transfer Credit Only

PH 31 Elementary Physics I
Introduction to Newtonian Mechanics. Given as a Pass or No-Credit (P/NC) only. Credit does not count toward graduation.
Credits: (2), P/NC, Semester Calendar
Lecture, Given When Needed

PH 121 Physics Freshman Seminar
Activities and facilities in the Physics Department, curriculum choices, and career options in Physics will be introduced to incoming freshmen through group discussions and faculty seminars. Challenge problem solving and team projects will cover selected topics beyond the material in general freshman Science courses.
Credits: (1), P/NC, Semester Calendar
Seminar, Fall Semesters

PH 131 Physics I
Calculus-based general physics course covering elements of Newtonian mechanics and thermal physics. Laboratory experiments keyed to the lectures to illustrate and demonstrate some of the physical principles and concepts. Corequisite: MA 131
Credits: (4), Graded, Semester Calendar
Laboratory, Lecture, Every Semester

PH 132 Physics II
Calculus-based general physics course covering elements of electricity and magnetism, waves and optics. Laboratory experiments keyed to the lectures to illustrate and demonstrate some of the physical principles and concepts. Prerequisite: PH131
Corequisite: MA132
Credits: (4), Graded, Semester Calendar
Laboratory, Lecture, Every Semester

PH 141 Physics for Life Sciences I
General physics course covering elements of mechanics, thermal physics, and physics of fluids, with emphasis on topics and applications relevant for biological sciences, physical therapy, and pre-med (MCAT). Laboratory experiments keyed to the lectures to illustrate and demonstrate some of the physical principles and concepts. Corequisite: MA180.
Credits: (4), Graded, Semester Calendar
Laboratory, Lecture, Fall and Summer Semesters

PH 142 Physics for Life Sciences II
General physics course covering elements of electricity and magnetism, waves, optics, and modern physics, with emphasis on topics and application relevant for biological sciences, physical therapy, and pre-med (MCAT). Laboratory experiments keyed to the lectures to illustrate and demonstrate some of the physical principles and concepts. Prerequisite: PH141 or equivalent
Credits: (4), Graded, Semester Calendar
Laboratory, Lecture, Spring and Summer Semesters

PH 157 Elementary Astronomy
This course will cover basic concepts in astronomy. The course will cover the planets and planet formation, life cycle of stars, clusters, galaxies, and the scientific principles used in astronomy and astrophysics.
Credits: (3), Graded, Semester Calendar
Lecture, Spring Semesters

Undergraduate Level Courses
**PH 165 Solar Energy**
Solar radiation, Spectral irradiance, Air mass. Electricity basics. Si solar cells: Band structure and doping of semiconductors; Semiconductor junctions; Light absorption; I-V characteristics, fill factor and efficiency of a solar cell; Power losses. Si solar cell fabrication process. Solar panels and modules. Thin film solar cells; Solar energy storage. Electrical and mechanical designs of PV systems; Performance analysis and maintenance of PV systems. Applications: Domestic supply, telecommunication, satellite.
Credits: (3), Graded, Semester Calendar

**PH 221 Theoretical Mechanics I**
Kinematics and dynamics of a single particle and systems of particles, conservation laws, central force problem, oscillatory and rotational motion. Introduction to Lagrangian and Hamiltonian formulations of classical mechanics. Prerequisites: PH132
Corequisites: MA232
Credits: (3), Graded, Semester Calendar
Lecture, Spring Semesters

**PH 230 Physics III**
This course introduces certain fundamental concepts of waves, optics and thermal physics, including the basic mathematical framework necessary to describe the associated physical phenomena. Specific topics of waves phenomena include: Transverse and longitudinal waves, wave equation, superposition principle, interference of waves, phasors; electromagnetic waves, Maxwell's equations; Poynting vector, radiation pressure; polarization, reflection and refraction; Young's interference experiment; coherence; Michelson's interferometer; wave theory of light, diffraction grating, X-Ray diffraction; photoelectric effect, and matter waves. Topics of thermal physics include: Temperature, thermal expansion; absorption of heat; heat transfer mechanisms; first and second laws of thermodynamics; entropy. With an emphasis on problem solving, this course serves to bridge the concepts developed in Physics II (PH 132) and Modern Physics (PH 231), and is strongly recommended as a PH elective to physics majors. Prerequisites: PH132 and MA132
Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed

**PH 231 Fundamentals of Modern Physics**
Introduction to the most important developments of 20th century physics, including applications to technology. Foundations and implications of special relativity, introduction to waves and quantum theory. Survey of applications in solid state, atomic, nuclear and particle physics. Prerequisites: PH132
Corequisites: MA232
Credits: (3), Graded, Semester Calendar
Lecture, Fall Semesters

**PH 232 Modern Physics Laboratory**
Laboratory course to supplement PH 231. Experiments keyed to the lectures to illustrate and demonstrate some of the physical principles and concepts. Corequisites: PH231
Credits: (1), Graded, Semester Calendar
Laboratory, Fall Semesters
Comm Points: 1

**PH 245 Medical Physics**
Prerequisites: PH142 or Instructor Consent
Credits: (3), Graded, Semester Calendar
Lecture,

**PH 301 Teaching Methodology in Physics I**
Assisting a faculty member in a physics course, in order to prepare the student for teaching physics with emphasis on skills needed for work as a teaching assistant (TA) in a graduate school. Prerequisite: consent of the instructor.
Credits: (1-2), Graded, Semester Calendar
Independent Study, Fall Semesters

**PH 302 Teaching Methodology in Physics II**
Assisting a faculty member in a physics course, in order to prepare the student for teaching physics with emphasis on skills needed for work as a teaching assistant (TA) in a graduate school. Prerequisite: consent of the instructor.
Credits: (1-2), Graded, Semester Calendar
Independent Study, Spring Semesters

**PH 320 Physical Models of Living Systems**
This course focuses on modeling essential processes in living systems using the tools and techniques of physics, including computer modeling. Using case studies in virus dynamics, bacterial genetics and naturally evolved cellular circuits, the course will explore how living organisms use physical mechanisms to gain information about their surroundings, process information and make decisions. It will also examine some of the cutting edge techniques used by scientists at the forefront of biophysical and life sciences research to study living organisms and understand their behavior. This course is broadly aimed at students studying in physics, chemistry, mathematics, computer science, chemical engineering, and biomedical engineering, in addition to biology majors with advanced math classes. Prerequisites: PH132 and MA132
Credits: (3), Graded, Semester Calendar
Lecture, Even Fall Terms

**PH 323 Optics**
Geometrical optics: reflection and refraction at plane and spherical surfaces, lenses, lens aberrations. Physical optics: interference, diffraction, polarization, photons, absorption, scattering, electrooptics. Prerequisite: PH132 or consent of the instructor.
Credits: (3), Graded, Semester Calendar
Lecture, Even Fall Semesters
PH 325 Thermal Physics
Temperature, heat, thermodynamics and applications. Introduction to kinetic theory and classical and quantum statistical mechanics. Prerequisites: PH231 and MA231 or consent of the instructor. Credits: (3), Graded, Semester Calendar
Lecture, Fall Semesters

PH 327 Experimental Physics I
Experiments selected from the fields of atomic physics, electricity and magnetism, thermal physics, condensed matter physics and optics. A major component of the course involves statistical analyses of experimental data and random uncertainties. The topics of data analysis include: Standard deviation and standard deviation of the mean; variance, co-variance and Schwarz inequality; weighted averages, histograms and distribution functions; confidence limit; least-squares fitting, uncertainties in slopes and intercepts, error-bars, coefficients of correlation and determination, chi squared test; general formula of error propagation and its applications. Computer based graphing and data analyses are routinely used throughout the course. Elements of writing technical research papers are practiced in the laboratory reports. Prerequisites: PH 132 and MA 132, or consent of the instructor
Credits: (1-3), Graded, Semester Calendar
Lecture, Every Semester
Comm Points: 2

PH 328 Experimental Physics II
Continuation of PH 327. Prerequisite: PH327 or consent of the instructor.
Credits: (1-3), Graded, Semester Calendar
Lecture, Every Semester

PH 331 Quantum Physics I
Basic principles of quantum mechanics, Schrödinger equation for simple potentials including harmonic oscillator and hydrogen atom. Selected application to atomic, molecular and nuclear structure. Prerequisites: PH 231 and MA 232
Credits: (3), Graded, Semester Calendar
Lecture, Spring Semesters

PH 341 Solid State Physics I
This course focuses on the fundamental physical processes that occur in solid state materials. Topics include crystal structure of solids, point defects and dislocations, crystal bonding, X-ray diffraction, lattice vibrations, thermal properties, specific heat, thermal conductivity, free electron gas theory of metals, energy bands, theory of semiconductors, band gaps, doping, and a brief introduction to device physics. Graduate students will do additional coursework. Prerequisites: PH231, or ES260, or consent of the instructor
Credits: (3), Graded, Semester Calendar
Lecture, Odd Spring Semesters

PH 371 Physical Chemistry I
[Cross-listed with CM 371] This course covers the gaseous state, kinetic theory and chemical thermodynamics, with applications to chemical and phase equilibria. The emphasis is on mathematics and problem solving. Prerequisites: CM104 or CM132, MA132, PH131
Corequisites: PH132
Credits: (3), Graded, Semester Calendar
Lecture, Fall Semesters

PH 372 Physical Chemistry II
[Cross-listed with CM 372] A continuation of PH 371. Topics may include quantum mechanics, atomic structure, chemical bonds, intermolecular forces, spectroscopy, molecular symmetry, optical activity, photochemistry and photobiology. Prerequisites: CM371 or BY371 or PH371.
Credits: (3), Graded, Semester Calendar
Lecture, Spring Semesters

PH 380 Electromagnetic Theory I
Fundamental properties of electric and magnetic fields. Gauss law, Poisson equation, dielectrics, boundary value problems, vector potential, inductance, Maxwell equations, electromagnetic waves. Prerequisites: PH132 and MA231 or consent of the instructor
Credits: (3), Graded, Semester Calendar
Lecture, Fall Semesters

PH 401 Teaching Methodology in Physics III
Assisting a faculty member in a physics course, in order to prepare the student for teaching physics with emphasis on skills needed for work as a teaching assistant (TA) in a graduate school.
Prerequisite: consent of the instructor.
Credits: (1-2), Graded, Semester Calendar
Independent Study, Fall Semesters

PH 402 Teaching Methodology in Physics IV
Assisting a faculty member in a physics course, in order to prepare the student for teaching physics with emphasis on skills needed for work as a teaching assistant (TA) in a graduate school.
Prerequisite: consent of the instructor.
Credits: (1-2), Graded, Semester Calendar
Independent Study, Spring Semesters

PH 426 Introduction to Biophysics
[Cross-listed by BY 426] This course concentrates on the fundamental physical processes that occur within living organisms, particularly the cell. Topics include the structure and physics of macromolecules, biological membranes, the thermodynamics of living systems, muscle contraction and the propagation of signals in nerve cells. Prerequisites: BY160 or BY312 or consent of instructor
Credits: (3), Graded, Semester Calendar
Lecture, Even Fall Semesters

PH 432 Quantum Physics II
Continuation of PH 331. Transformation theory and matrix formulation of quantum mechanics; angular momentum, spin, perturbation theory, variational methods, scattering theory. Prerequisite: PH331 or consent of the instructor.
Credits: (3), Graded, Semester Calendar
Lecture, Fall Semesters

PH 435 Physics Senior Seminar
Forum for discussion of current research in physics. Exploration of employment and career opportunities for physics majors. Preparation for GRE in Physics.
Prerequisite: consent of the instructor.
Credits: (1), P/NC, Semester Calendar
Lecture, Fall Semesters
PH 442  
Solid State Physics II  
Continuation of PH 341. Band structure of solids, electrical and thermal transport properties, magnetism, optical properties, superconductivity, semiconductors, magnetic resonance. Prerequisite: PH341 or consent of the instructor. Credits: (3), Graded, Semester Calendar  
Lecture, Even Spring Semesters

PH 445  
Undergraduate Thesis I  
Investigation of a topic selected by the student in consultation with a thesis adviser. A written thesis is required. Prerequisite: consent of the instructor. Credits: (1-3), Graded, Semester Calendar  
Lecture, Given When Needed  
Comm Points: 2

PH 447  
Nuclear Physics  
An introduction to nuclear structure, nuclear radiation and elementary particle physics. Topics include properties of nuclei, the two-nucleon forces, complex nuclei, interaction of radiation with matter, accelerators, nuclear reactions, elementary particles and their classification. Prerequisites: PH331 or consent of the instructor. Credits: (3), Graded, Semester Calendar  
Lecture, Odd Spring Semesters

PH 451  
Statistical Mechanics I  
Review of thermodynamics and classical ensembles. Modern theories of phase transitions, critical phenomena, liquid structure. Introduction to Monte Carlo methods, nonequilibrium phenomena. Prerequisites: PH325 or consent of the instructor. Credits: (3), Graded, Semester Calendar  
Lecture, Spring Semesters

PH 455  
Mathematical Methods in Physics  
Mathematics methods used in theoretical physics. Topics covered include complex variables, Fourier transforms, special functions, eigenfunction expansions, Green's functions, differential equations, linear algebra and linear spaces, with physical applications. Prerequisite: consent of the instructor. Credits: (3), Graded, Semester Calendar  
Lecture, Given When Needed

PH 457  
Introduction to Astrophysics  
Radiation from astrophysical sources and measurement of position, mass, temperature, velocity, density, composition and age. Emphasis will be on recent discoveries and interpretations. Prerequisites: PH231 or consent of the instructor. Credits: (3), Graded, Semester Calendar  
Lecture, Given When Needed

PH 460  
Physics of Fluids  
Discussion of the mechanics of fluids based on the Navier-Stokes equation. Laminar and turbulent flows, dimensional analysis. Special topics with applications. Prerequisites: PH221 and PH325 or consent of the instructor. Credits: (3), Graded, Semester Calendar  
Lecture, Odd Spring Semesters

PH 463  
Computer Simulation Methods in Physics  
(Cross-listed with PH563) This is a computer laboratory course that explores physical concepts using computer simulations. Topics include: Euler method and its applications in classical mechanics and thermodynamics; the cooling of coffee, motion of falling objects, planetary motion with and without the solar wind, simple harmonic oscillator, damped oscillations, Molecular Dynamics, Boltzmann distribution, random walk and Brownian Dynamics, percolation model, and Monte Carlo Method. Prerequisites: PH132, MA232; PH325 or ES340 and PH380 or EE381 or instructor consent. Credits: (3), Graded, Semester Calendar  
Lecture, Given When Needed  
Comm Points: 2

PH 470  
Directed Study Experimental  
A course of study of subjects not otherwise available in formal courses may be undertaken under the supervision of a faculty member. Prerequisite: consent of the instructor. Credits: (1-3), Graded, Semester Calendar  
Independent Study, Given When Needed

PH 471  
Directed Study Experimental  
A course of study of subjects not otherwise available in formal courses may be undertaken under the supervision of a faculty member. Prerequisite: consent of the instructor. Credits: (1-3), Graded, Semester Calendar  
Independent Study, Given When Needed

PH 473  
Directed Study Experimental  
A course of study of subjects not otherwise available in formal courses may be undertaken under the supervision of a faculty member. Prerequisite: consent of the instructor. Credits: (1-3), Graded, Semester Calendar  
Independent Study, Given When Needed

PH 474  
Directed Study Theoretical  
A course of study of subjects not otherwise available in formal courses may be undertaken under the supervision of a faculty member. Prerequisite: consent of the instructor. Credits: (1-3), Graded, Semester Calendar  
Independent Study, Given When Needed

PH 475  
Directed Study Theoretical  
Prerequisite: consent of the instructor. Credits: (1-3), Graded, Semester Calendar  
Independent Study

PH 476  
Directed Study Theoretical  
Prerequisite: consent of the instructor. Credits: (1-3), Graded, Semester Calendar  
Independent Study

PH 478  
Directed Research in Experimental Physics  
Students will carry out research in experimental physics under the supervision of a faculty member. Topics will be determined by faculty research programs. A formal report is required at the conclusion of the course. Credits: (1-3), Graded, Semester Calendar  
Research,
PHIL 220 Philosophy and Shakespeare

This course is an introduction to ethics through a study of Shakespeare. The course pairs different moral theories with specific plays to examine their strengths and weaknesses and attempts to understand Shakespeare’s views on ethics. Along the way, the course examines the relationship between philosophy and art.

Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed
UNIV/IA/IG

PHIL 222 Philosophy for Life

[Cross-Listed as LIT 222] In this course, we will learn to think philosophically (which is to say: critically, rigorously, and reflectively) about complex and difficult questions. We will study practical life philosophies from both the Eastern and Western traditions, from the Tao Te Ching to Marcus Aurelius, and from Plato to the Dalai Lama. We will reflect on the ontological, epistemological, rhetorical, and ethical perspectives of each of these philosophers and schools of thought. We will note striking similarities and important distinctions between them. Ultimately, we will reflect on our own life philosophies as well—each of us refining our personal life philosophy through reading, reflection, and discussion of these classic texts from the wisdom literature tradition.

Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed
UNIV/CGI/IG, Comm Points: 1

PHIL 241 Medical Ethics

[Formerly LP241] The practice of modern medicine has created a number of moral dilemmas for healthcare providers, their patients, and society as a whole. This course will explore the roots and nature of these various dilemmas and examine the moral theories and principles used to resolve them.

Credits: (3), Graded, Semester Calendar
Lecture, Odd Spring Semesters
UNIV/CGI/IG, Comm Points: 1

PHIL 243 Business Ethics

[Formerly LP243] This course introduces students to ethical issues in business and the ethical concepts, theories, and methods they can apply to them. There are numerous examples of unethical behavior on the part of individual businesspersons, departments, and entire business organizations. Some of these are big enough to make the news media, but most are ethical missteps that negatively impact managers, employees, and customers without making the headlines. This course explores the causes and characteristics of ethical issues and problems in business, as well as ways to resolve them. Topics will include: Foundational theories about what makes an ethical decision correct. The role of such ethical theories in business. A decision procedure for thinking about and resolving ethical issues in business. Practice in applying the ethical theories and decision procedure to cases about issues such as honesty in business, fair and equitable treatment of employees, the environmental responsibilities of...
business, product safety, doing business in other countries, and corporate social responsibility. The central learning outcome for the course is a set of tools – concepts and methods – that students can use in taking an ethical approach to their business lives.

Credits: (3), Graded, Semester Calendar
Lecture, Fall Terms

CGI Comm Points: 1

**PHIL 245 Philosophy of Mind**

Most things don’t have minds. Mountains, molecules, suns, and apples are of the many things that lack consciousness and thought. Yet, somehow, in a universe in which barely anything can think, you have a mind. How is this possible, and what does this mean? Are there other sorts of things with minds? What about pigs, or spiders, or computers? Is the mind just the brain? This course introduces students to classic and contemporary debates in the philosophy of mind. We will investigate the nature of the human mind from a philosophical perspective and try to make progress in one of the most mysterious fields of human inquiry.

Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed
UNIV/IG/STS

**PHIL 330 Logic for Critical Thinking**

This course helps students develop practical reasoning ability, i.e., the ability to analyze the arguments that they encounter every day (for example, editorials, political speeches, memos and reports at work, and their roommate’s, friends’, and parents’ infuriating, but apparently irrefutable, arguments) and decide whether or not these arguments really support the conclusions, as well as to construct sound arguments of their own. Prerequisites: UNIV 190 and one additional course within the humanities and social sciences.

Credits: (3), Graded, Semester Calendar
Lecture, IG

**PHIL 350 Philosophy of Artificial Intelligence**

This course investigates ethical and metaphysical questions that are prompted by artificial intelligence and machine learning. The ethical questions concern the best way to integrate artificial intelligence into society. How much of our critical infrastructure should we leave up to artificial intelligence? When is it wrong to replace human labor with machines? Can AI show prejudice? The metaphysical questions concern the possibility of computer minds. Is a conscious AI possible? How do the processes of current AI differ from human cognition? Can computers be creative? Throughout this course, students will discover what the development of AI has revealed about individual and group behavior, and will learn how these innovations in science and technology promise to impact society.

Credits: (3), Graded, Semester Calendar
Lecture, UNIV/IG/STS

**PHIL 370 Environmental Ethics**

[Formerly LP342] Environmental issues and concerns are of primary importance as we enter the 21st Century. This course examines the ethical and social approaches to preserving the planet’s ecosystems and to developing an environmentally aware culture.

Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed

STS Comm Points: 1

**PHIL 485 Advanced Topics**

An advanced topics seminar open to students with at least 12 credit hours in the discipline or permission from the instructor. Limited to 12 students. Topics to be covered will be selected to conform to the mutual interests and needs of students and faculty. Additional prerequisites may be required depending on the topic. Graduate students will be required to perform additional work.

Credits: (3), Graded, Semester Calendar, Lecture,

**PHIL 490 Independent Study**

[Formerly LP490] Designed primarily for an advanced student who wishes to pursue special interests in philosophy for one or more semesters, this series allows students to design and conduct independent study projects under faculty guidance.

Prerequisite: consent of the instructor.
Credits: (1-10), Graded, Semester Calendar
Independent Study, Every Semester

**PHIL 491 Independent Study**

[Formerly LP491] Designed primarily for an advanced student who wishes to pursue special interests in philosophy for one or more semesters, this series allows students to design and conduct independent study projects under faculty guidance.

Prerequisite: consent of the instructor.
Credits: (1-10), Graded, Semester Calendar
Independent Study, Every Semester

**PHIL 499 Minor Portfolio**

In this course, students complete their Liberal Arts Minor Portfolios under the direction of their minor advisor. The course is graded on a Pass-No Credit basis.

Credits: (0), P/NC, Semester Calendar
Independent Study, Every Semester

**Political Science**

**POL 1 (3, 5...)**

A college level course for which there is no comparable Clarkson course. Used for transfer credit only.

Credits: (2-4), Graded, Semester Calendar
Lecture, Transfer Credit Only

**POL 2 (4, 6...)**

A college level course for which there is no comparable Clarkson course. Used for transfer credit only. This course may be used to satisfy a Humanities or Social Science Foundation Curriculum Requirement, depending on the specific designator.

Credits: (2-4), Graded, Semester Calendar
Lecture, Transfer Credit Only

**POL 220 American Politics**

[Formerly LP250] An introduction to the approaches to political inquiry, and the use of these to acquire an understanding of: the social and economic environment and purposes of the American political system; the political behavior of Americans; the patterns of decision-making within the American political system, and the consequences of public policy.

Credits: (3), Graded, Semester Calendar
Lecture, Every Semester

IG, Comm Points: 1
POL 230 Introduction to Global Politics
This course introduces students to key concepts, theories, and patterns for understanding politics in the international arena and within states. It aims to expose students to a broad spectrum of ideas and theories in international relations and comparative politics, and it does so by examining some enduring questions in the study of politics. Topics include the structure of the international system, causes of war and peace, economic globalization, international organizations, democratic processes and democratization, economic and political development, political institutions, civil society, and other issues and processes within and across national borders. Cases from different parts of the world are examined to provide grounding in comparative analysis. In addition to simply learning more about world politics, the course will equip students with key political science concepts, theories and explanations, through which they can improve their capacity to critically interpret current events. By the end of the course, students should have a strong analytic lens by which to interpret the most pressing contemporary issues. This course should appeal to students interested in understanding a multifaceted world, changing societies, and institutions.
Credits: (3), Graded, Semester Calendar Lecture, Given When Needed

POL 240 Politics, Decisions and War
The main objective of this course is to inquire into the causes of war. Following critical engagement with traditional theoretical approaches to the question of conflict and cooperation in international politics, students will be introduced to systemic, group, and individual-level explanations of war, as well as to case study discussions regarding the influence of these factors. The course provides students with a set of tools for the analysis of classic and contemporary civil and international conflicts and strives to show how evidence and theory can be effectively used in understanding peace and conflict. The course draws on a wide range of disciplines, including international relations, political theory, social psychology, economics, and environmental studies. By the end of the term, students should be able to understand the main factors that drive war, as well as to outline solutions for preventing them.
Credits: (3), Graded, Semester Calendar Lecture, UNIV/CGI/IG

POL 249 Zombie Politics
The zombie has spread throughout American popular culture since 2002, appearing in numerous films, television shows, video games and comic books. Why are American audiences fascinated by a reanimated corpse that feasts upon the living and brings about the apocalypse? What is the underlying meaning and significance of the zombie and its apocalyptic story? Our investigation will proceed down two pathways. First, we will examine how the zombie is similar to the monsters that appear in the work of political thinkers since Plato. Second, we will study the political and philosophical significance of zombie culture, including the film Dawn of the Dead, the television show The Walking Dead, and the numerous "zombie walks" that have occurred throughout the world. Throughout the course we will consider how the imaginary world of the zombie apocalypse shows us the dark side of American society, including mindless behavior and uncontrolled consumption.
Credits: (3), Graded, Semester Calendar Lecture, Spring Terms, CGI Comm Points: 1

POL 250 Government & Politics around the World
[Formerly LP260] This course introduces students to the study of political development and constitutionalism. By studying at least four countries, course participants will learn to develop and test explanations intended to account both for common patterns of modernization and for the unique features of social and political evolution in each nation-state. Countries to be studied represent developed Western democracies (France and Germany), post-communist regimes (Russia), and "third world" political systems (Mexico).
Credits: (3), Graded, Semester Calendar Lecture, Given When Needed

POL 251 Introduction to International Politics
This course introduces students to the prevailing explanations of international relations, and how they are used and misused in the analysis of contemporary policy issues. The main topics to be discussed include the definition and distribution of power in the international system, the role of individual leadership, the influence of international institutions, the impact of globalization and the future of international governance. Policy issues will include: national security strategy, the rise of China, democracy promotion, the role of the United Nations, terrorism and energy security.
Credits: (3), Graded, Semester Calendar Lecture, UNIV/CGI/IG

POL 260 Introduction to Public Policy
This is an introductory course to policy analysis. Policy analysts are responsible for defining and framing public problems, identifying and evaluating possible strategies for addressing problems, and recommending solutions that make the most sense. The goals of this course are to provide students with an understanding of the role that analysis plays in the policymaking process, and to make students critical consumers of policy analysis.
Credits: (3), Graded, Semester Calendar Lecture, Fall Semesters UNIV/CGI/IG Comm Points: 1

POL 268 Social Movements in the United States
When and why do social movements occur? What motivates some individuals to participate in organized collective action? What role do strategies, values, decision-making structures, and leaders play? How have recent technological developments transformed recruitment efforts? Which tactics are most effective in pressuring legislators to respond to movement demands? What impacts have oppositional movements had on politics and society in the United States? In considering these (and other) questions, we will explore a range of movements which have both animated previous cycles of protest such as civil rights, women's liberation, and antiwar mobilization along with several cases which characterize our own time including climate change advocacy, Occupy Wall Street demonstrations, and the Black Lives Matter campaign. When examining the issue grievances and proposed remedies of both historical and contemporary political struggles, we will also focus close attention on media coverage of social movements, intra-movement disputes and inter-movement coalitions, the rise of counter-movements, and movement relations with political parties and presidential administrations.
POL 301 Political Theory
[Formerly LP301] An historical and topical consideration of some prominent yet divergent conceptions of 'justice' and 'community' within the Western political tradition. Theorists to be considered include: Plato, Aristotle, Hobbes, Locke, Rousseau, Mill and Marx.
Credits: (3), Graded, Semester Calendar
Lecture, Fall Semesters
UNIV/CGI/IG, Comm Points: 1

POL 302 Contemporary Political Theory
[Formerly LP302] This course will begin by examining contemporary versions of liberalism, the still-dominant paradigm of political thought in the United States. Students will then read and discuss various critical perspectives on liberalism, such as communitarianism, 'civil society' theory, postmodernism, multiculturalism, and 'green' political thought. We shall try to decide whether liberalism has outlived its usefulness as a model of justice and/or political organization, or whether it can renew itself by responding to the countercurrents noted above.
Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed
IG, Comm Points: 1

POL 303 Foreign Policy Analysis
The course seeks to introduce the ways in which scholars of foreign policy analysis have understood the nature of decision-making processes prevalent within governments and their agencies. It seeks to understand the intentions of actors and the complex global contexts and challenges they face in pursuing their goals. Foreign policy analysis, a distinct subfield within international relations has adopted research from several other subfields such as American politics, comparative politics, political psychology and cultural studies. To that end the course covers two knowledge areas, 1) Contemporary/Global Issues and 2) Cultures and Societies.
Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed
UNIV/CGI/CSO

POL 320 The American Political Tradition
[Formerly LP390] The American Political Tradition: surveys shifting interpretations of American politics and society from colonial times to the present. Some themes to be addressed include: alleged American uniqueness and 'mission;' American democracy, the debate over liberalism versus republicanism, 'Hamiltonian means' and 'Jeffersonian ends,' the pervasiveness of Locke in American thought, the weakness or absence of socialist and conservative alternatives, and environmentalist interpretations of America. Prerequisites: POL220 or a course in American History or permission of the instructor.
Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed
CSO

POL 330 Politics in the Americas
This class is an introduction to the politics and governments of the countries that comprise the American continents and the Caribbean. It will focus predominantly on the Spanish & Portuguese-speaking countries in Mexico, Central & South America, and the Caribbean. It also may address relationships between or among Latin American countries and the United States and Canada. The course will address the region's political history, including periods of authoritarian rule, revolution and democratization. It also will examine the causes and consequences of these countries' institutional design, as well as the challenges to economic and political development they face, such as crime and corruption. Additionally the course will evaluate policy failures and successes from agrarian and land reform to economic development and wealth redistribution.
Credits: (3), Graded, Semester Calendar
Lecture, Odd Spring Terms
UNIV/CGI/CSO

POL 333 Latin American politics & Society through Cinema
This class is a course about Latin American politics and society through the use of film and literature. It is neither a critical film course, nor a course about the use of film in politics.
This course does not offer a broad overview of the politics of Latin America, but rather explores in greater depth particular political and social issues that popular films from around the world have brought to light. As many of these films have made their way to the United States (several have been entrants or winners in the Best Foreign Language Film category of the Academy Awards), they have raised global awareness of these issues. However, films that achieve success, particularly at an international level, often focus on very dramatic issues. As such, please be conscious that this course does not offer a comprehensive portrayal of Latin America. Nevertheless, we deal with very important and influential issues in Latin American political history, including colonialism, insurgencies, military dictatorships, human rights abuses, corruption, drug trafficking, violence and issues related to the politics stemming from socioeconomic class structures, and racial, ethnic, gender and sexuality-based identities.
Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed
UNIV/CGI/CSO
Comm Points: 1

POL 334 War-Making and World Order
A relatively small number of states have been responsible for an overwhelming number of wars over the last century. States that are engaged in security competitions and are active in the security sphere tend to shape the conflict space based on innovation in technology, the type of adversaries they are facing, and the nature of their regional and global ambitions. In this class a set of complex questions are address. The questions include: 1) how security competitions between states affects states' war-making capacity which includes technological innovation and institutional efficiency and its polarity; 2) how changes in state capacity affects the probability of major and minor wars; and 3) how such wars along with escalating tensions changes regional and world orders. The course draws on scholarship in conflict processes and international relations theory and also considers major case studies that include the rise of China and the global response to the same. To understand global security competitions and conflict, it is important for students to be able to understand how and why security competitions are initiated. Without understanding this aspect about international conflict, it is impossible to analyze the rise and fall of great powers and understand advanced topics in international relations. To that end, this course addresses Contemporary Global Issues (CGI), Individual Group Behavior (IG), and...
UNIV designations. It also fulfills the C1 communication points learning outcomes.
Credits: (3), Graded, Semester Calendar
Lecture,
UNIV/CGI/IA
Comm Points: 1

POL 335 Violence and Reconciliation
[Cross-listed with LIT 335] While scholars have labeled the 20th century 'the century of genocide,' the past two decades have catalyzed global changes in the ways we think about peace-building and reconciliation. But reconciliation after mass conflict remains a difficult process. Can you forgive someone who has done irreparable harm to you or your loved ones? Can you reconcile -literally, return to a previous state of harmony- with someone if you never shared a harmonious relationship with that person? Is reconciling with a whole community the same as reconciling with an individual? This course examines the challenges to reconciliation after political trauma and assesses the strengths and weaknesses of major reconciliation mechanisms. Through the lens of two case studies, South Africa and Northern Ireland, and the disciplines of film, fiction, and political theory, students will compare the consequences of criminal trials, truth commissions, and informal efforts at communal healing. As a final project, the class will participate in a simulation of negotiations for reconciliation in the aftermath of a nationwide conflict.
Credits: (3), Graded, Semester Calendar
Lecture, Even Spring Semesters
UNIV/CGI/IA
Comm Points: 1

POL 337 Dictatorships and Democracies
In this class students learn about differences among political regimes, not only between dictatorships and democracies, but also among subtypes within those broad categories. The focus of the course will be on political transitions from one regime type to another, examining revolutions, military and constitutional coups, bottom-up and top-down processes of democratization as well as the latest trend of democratic backsliding that has taken place in several countries around the world. Students will learn what distinguishes democracies from dictatorships in order to understand the various types of political transitions. The course material compares different paths countries have taken to democratize in order for students to understand the benefits and drawbacks of each path for the long-term health and survival of democracies. Students will read about a number of specific country cases to learn about regime changes around the world—including the causes and consequences of these political changes. Additionally, some of the material looks at cases in which democratization failed or in which authoritarianism remains resilient. Lastly, students will examine influences on or impediments to democratization, such as the media and access to information, contagion, religious beliefs and religious or ethnic conflict, natural resources, economic inequality, political polarization, immigration and foreign intervention.
Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed
CGI

POL 340 Lawmaking in the United States: How the Sausage is Made
There are two things that you don’t want to see made: laws and sausages. This course examines the institutions responsible for producing laws and public policy in the United States, especially the president, Congress, the federal bureaucracy, interest groups, and elections. The course makes extensive use of active learning through in-class simulations and games, including an immersive multi-week digitized simulation of lawmaking in American government. Students will also produce advertisements from the perspective of a given interest group.
Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed
UNIV/CGI/IA

POL 342 The American Nightmare? American Political Ideas in Literature and Film
This course explores the nature of political ideas in contemporary America through analyzing films and books. Through classroom discussion and close engagement with source material, we will consider topics such as America’s place in the world, the benefits and costs of capitalism, scapegoating, race relations, and the necessity of government. Our intent is neither to defend nor attack America; rather, our objective is to think critically about the society in which we live.
Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed
UNIV/CGI/IA

POL 345 Happiness: Politics, Policy, and More
[Cross-listed with POLS545] The U.S. Constitution argues for the rights of "life, liberty, and the pursuit of happiness." What makes us happy? Should we be happy? Why might happiness be critical to democracy? How do political decisions make us happy? Should happiness be a political goal? That said, this course will go well beyond politics and political science. It is explicitly multi-disciplinary in nature: we will study the question of happiness from disciplines based in the sciences, humanities, and social sciences, and we will study material informed by psychology, public policy, economics, biology, medicine, philosophy, literature, and film.
Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed
UNIV/CGI/IA
Comm Points: 1

POL 350 Political Economy of Development
[Cross-listed with SOC 350] [Formerly LP370] Explanations of social change and development in an international context are covered. The course moves from a starting point of the presentation of theories and explanations of how nations have historically attempted to modernize themselves and develop their economies, and concludes with a brief introduction to current discussions of the global economy and globalization. Students are introduced to competing explanations of the modernization process and the movement of nations from less industrialized to industrialized status. Other topics covered are the causes and consequences of poverty and famine and hunger, and policies to alleviate these social ills. This course is recommended for students interested in taking POL351: Globalization.
Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed
EC

POL 351 Globalization
[Cross-listed with SOC 351] [Formerly LP 371] This seminar style class addresses the economic, political and social change collectively referred to as 'globalization.' The concept of globalization will be
analyzed from a number of perspectives. Macro-level changes are addressed as are local adaptation strategies of individuals, communities and organized groups. Special attention is paid to the role of institutions, such as corporations, national and subnational governments and non-governmental and multilateral organizations, in the globalization process. The class will work through and discuss books critical of, and sympathetic to, the globalization process.

Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed
CGI
Comm Points: 1

**POL 353** Politics of Protest

To protest means to express strong disapproval or objection to something. With regard to the politics of protest, individuals or groups express their dissent or disapproval to a particular audience—usually local, national or even international governments, but also corporations, school administrations, etc. and the broader public—with the objective to change the behavior or policies that provoked their protest or to force a leadership or regime change. Protestors use myriad tactics to assert and publicize their dissent such as provocative art, cyber-attacks, street demonstrations and even violent rebellion. When protesters organize and carry out campaigns toward a common goal, we refer to the protesters as social movements. Social movements, however, do not monopolize protest. People also engage in less systematic protest. In this course, we study who engages in protest and to whom they protest. We study a variety of theories about social movements, collective organization and collective action. In this course, students examine why various people or groups protest, and when and how they are likely to do so. Students will compare various protest campaigns around the world—mostly concerned with issues of human rights, equality and justice—to learn which factors are more likely to produce successful outcomes and which protests fizzle out or fail. We also will examine less traditional forms of protest including the use of music and art. Students will actively participate in creating and presenting a Movement Action Plan (MAP) for a hypothetical social movement.

Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed
IG

**POL 355** Sex, Gender and Power

This course addresses the political, social, and economic circumstances of women in global perspective. Topics include: theories of gender and politics; intersectionality; the public/private divide; the construction and maintenance of gendered political interests; friction between feminism and multiculturalism in both the developed and developing worlds; issues surrounding the promotion of women’s rights; women as political candidates; and women as office-holders.

Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed
CGI
Comm Points: 1

**POL 360** Politics of Pandemics

Pandemics act as major shocks to regional and international system(s) and have the potential to change global power distribution, initiate new technological advancements and reshape domestic politics. In other words, pandemics can shape politics and the course of history. Likewise, politics and public policies affect pandemics from their geographic scope to their social and political costs. This course delves into the relationships between domestic and global institutions and politics and pandemics. Students will study how pandemics affect political behavior at different levels of analyses. Students learn about how national and subnational politics evolve in different countries on account of global shocks from pandemics, such as HIV/AIDS, H1N1 (Swine Flu), and COVID-19. Students will also explore how pandemics shape international aid programs and investigate who benefits from such programs. During the course, students will read and analyze literature on why states act through international organizations, such as the World Health Organization, and why international organizations prove effective (or not).

Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed
UNIV/CGI/IG

**POL 362** Human Rights Law and Politics

The politics and law framed around various conceptions of Human Rights are primarily responses to perceived crimes against people based on their ethnicity, religion, gender and/or age. This course is a historical, institutional, and political inquiry, therefore, on how we go about protecting and improving the lot of the most vulnerable populations throughout the world. The first half of the semester will examine the institutional responses to Human Rights (the formation of the Declaration of Human Rights, various international aid agencies, and war crimes tribunals). The second half of the semester will involve investigation into legal and political responses to torture, political repression, war crimes and genocide, the status of refugees, women’s rights, children’s rights, and humanitarian intervention.

Credits: (3), Graded, Semester Calendar
Lecture,
CGI
Comm Points: 1

**POL 370** Close and Contested Elections

Course material includes the study of electoral rules worldwide, including social and political consequences of these rules. The first section of this course examines the role of elections in both democratic and non-democratic systems. What are elections intended to accomplish? How do they work? The second, longer, section of the course turns to a series of case studies of contemporary close and contested elections in a number of different contexts, including cases ranging from the United States (2000) to Iran (2009). This latter portion of the course addresses such questions as (1) the tools and procedures that various kinds of states/regions have for dealing with such contestation, (2) the extent to which such contested elections may de-legitimize the entire political system, and (3) the role of the media. The final week addresses international election monitoring bodies.

Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed
CGI
Comm Points: 1

**POL 374** Environmental Political Theory

This course is designed for students with interests in environmental science and policy, and political theory, or both. We will examine the relationship between nature, politics, and the political economy. We will also examine a wide spectrum of ideas on political, economic, social and scientific matters expressed by contemporary environmental thinkers, though we will also discuss thinkers from the
past (Thoreau, Muir, Leopold, Carson). In particular, we will focus our discussions on the relationship between environmental concerns and dominant ideas in liberal capitalism and democracy. We will also study feminist, socialist, communitarian, authoritarian, and anarchist perspectives.
Credits: (3), Graded, Semester Calendar
Lecture, Odd Spring Semesters
UNIV/CGI/STS
Comm Points: 1

**POL 375 Environmental Law**
In this course we will be examining the relationship between the Courts and various policies, laws, and regulations pertaining to the restoration and management of the environment. The central issues in the cases we will be examining emerge from the tension between property rights and what has been conceived as a constitutional right to a clean, healthy environment. Areas where this tension plays out include: the Clean Air Act, the Clean Water Act, The Superfund Law, and the National Environmental Policy Act. In general, the course is designed to help students assess whether environmental laws provide us with a route for attaining ecological goals, and to think critically about the role of the Courts as a defender of the environment.
Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed
CGI

**POL 380 The Law and Bioethics**
This course explores the relation between law, ethics, and new technologies. In particular, we will be exploring issues of the right to privacy, abortion, state sterilization programs, cloning, rights of surrogate parents, doctor/patient confidentiality, the right to die, new definitions of death, the human genome project and intellectual property rights, and organ transplantation. This inquiry will be guided by the question: ‘Who Owns Life?’ There is no definitive answer to this question offered by the American court system. Through readings and discussions students will gain political and ethical perspective on how legal standards are formed in response to new demands by the public and government, and how new ethical questions are inspired by innovations in germline bioengineering, medical and rehabilitative technology, robotics, virtual reality, and nanotechnology. The material for the course will be case law and articles by leading scientists, physicians, ethicists, and legal scholars in this young field.
Credits: (3), Graded, Semester Calendar
Lecture, Spring Semesters
UNIV/CGI/STS
Comm Points: 1

**POL 388 Terrorism and Insurgencies**
This course will focus on terrorism as political violence carried out by non-state actors, although we will also explore the topic of state sponsorship of terrorist groups. The purpose of the course is to familiarize students with the theoretical approaches to and contemporary challenges in the study of terror and terrorism. Topics will include the nuances involved in defining terrorism; the political context in which terrorist groups emerge; the ideologies, motivations, organizational structure, and decision-making processes of important terrorist groups; the effectiveness of various counter-terrorism tools; and the role of technology in the evolution of terror and terrorism.

The course will provide a basis for discussing and analyzing contemporary terror/terrorist events and related security issues.
Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed
CGI
Comm Points: 1

**POL 391 Special Topic: American Politics in Comparative Perspective**
In what ways is the United States an outlier among western democracies, and in what ways does the United States resemble other democratic nations? To the extent that the United States is distinctive, what explains the differences between the United States and other advanced industrial societies? What do the structural differences of the American political system mean for democratic performance? Is the American way more or less effective than comparably developed states in Asia, Latin America, North America, or Europe? In order to explore these questions, this class examines major features of American democracy – political culture and public opinion, electoral institutions and behavior, interest groups, political parties, and social movements, the division of power between state and federal governments – from a comparative perspective.
Understanding American politics in the twenty-first century requires moving beyond national boundaries and situating the United States and its interventions in the world.
Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed
UNIV/CGI/IG
Comm Points: 1

**POL 400 Constitutional Law**
[Formerly LP400] [Cross-listed with POL500] An introduction to American Constitutional law and jurisprudence. Using a case study approach that focuses upon Supreme Court decision making, the course will pay particular attention to the evolution of discourse on 'rights' in the United States.
Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed
CGI

**POL 470 Environmental Policy**
[Cross-listed with SOC 470] [Formerly LP360] Public policy is developed in response to problems or issues in society that are presumed, for whatever reasons, not to be resolvable by the private sector. In theory, public policy as it relates to environmental issues is used to intervene to alleviate problems, such as industrial pollution, that threaten the integrity of the natural resource base and the natural and built environments on which our lives and livelihoods depend. However, public policy development and implementation in general, and environmental policy in particular, are not immune to political forces and influences. Even scientific institutions that often provide the empirical basis for environmental policy are potentially influenced and shaped by the political process and political and economic interests. This course introduces students to the distinctive features or characteristics of environmental policy development and implementation. The course primarily focuses on the United States but includes international environmental issues and policies. The course will help students understand how environmental policy fits within the large-scale social and economic changes in the U.S. and elsewhere that have resulted in greater environmental awareness. We will also consider how scientific evidence is created and
marshaled in support of competing interpretations of environmental problems, and the appropriate policies to address such problems. Case studies of particular environmental policies, such as regulation of transgenic crop development and commercialization, will be used to help students grasp the complexities of, and driving forces behind, environmental policy.

Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed
STS, Comm Points: 1

**POL 471 Energy Policy**

Energy policy is a critical component of state and national public policy. Issues surrounding the reliability and security of energy supplies directly affect national domestic and foreign policy, as well as state level environmental, economic development, and land use concerns. Via emphasis on specific issues unique to North American energy policy (US and Canada), the class will introduce students to the major theoretical frameworks used by political scientists, sociologists, economists, and other intellectual disciplines to understand how societies design and implement public policies related to energy, and how the energy industry responds. Topics covered will include theories of the state, monopoly and regulation, public choice, organizational behavior, international agreements, and innovation. The class will apply these theories to major current and historical issues in energy policy, such as ethanol, climate change, and renewable energy systems, nuclear power, energy efficiency, energy security, the world oil market, and OPEC, electricity production and markets and the California electricity crisis.

Credits: (3), Graded, Semester Calendar
Lecture, Spring Semesters
UNIV/EC/STS, Comm Points: 1

**POL 490 Independent Study**

Designed primarily for an advanced student who wishes to pursue special interests in political science for one or more semesters, this series allows students to design and conduct independent study projects under faculty guidance.

Prerequisite: consent of the instructor.
Credits: (1-10), Graded, Semester Calendar
Independent Study, Every Semester

**POL 491 Independent Study**

Designed primarily for an advanced student who wishes to pursue special interests in political science for one or more semesters, this series allows students to design and conduct independent study projects under faculty guidance.

Prerequisite: consent of the instructor.
Credits: (1-10), Graded, Semester Calendar
Independent Study, Every Semester

**POL 499 Minor Portfolio**

In this course, students complete their Liberal Arts Minor Portfolios under the direction of their minor advisor. The course is graded on a Pass-No Entry basis.

Credits: (0), P/NC, Semester Calendar
Independent Study, Every Semester

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**Physical Therapy**

**PT 1 (3, 5...)**  
A college level course for which there is no comparable Clarkson course. Used for transfer credit only.

Credits: (1-4), Graded, Semester Calendar
Lecture, Transfer Credit Only

**PT 2 (4, 6...)**  
A college level course for which there is no comparable Clarkson course. Used for transfer credit only. This course may be used to satisfy a Science Foundation Curriculum Requirement.

Credits: (1-4), Graded, Semester Calendar
Lecture, Transfer Credit Only

**PT 105 Introduction to Physical Therapy I**

Introduction to the profession of physical therapy, the pre-physical therapy and DPT programs at Clarkson, the problem-based learning (PBL) mode of curriculum, and the concept of the medical model and team in the U.S.

Credits: (1), P/NC, Semester Calendar
Lecture, Spring Semesters

**PT 300 Independent Study**

An opportunity for Pre-PT students to undertake a research project or clinical observation with approval by a PT faculty member. A portfolio or written report must be handed in at the end of the semester.

Prerequisite: consent of the instructor.
Credits: (1-3), Graded, Semester Calendar
Independent Study, Every Semester

**PT 305 Introduction to Physical Therapy II**

Introduction to the requirements and process of graduate physical therapy education, participation in the (PBL) mode of curriculum, and issues of professionalism in physical therapy practice. Prerequisites: PT105 or Permission of Instructor.

Credits: (1), P/NC, Semester Calendar
Lecture, Fall Semesters

**Psychology**

**PY 1 (3, 5...)**  
A college level course for which there is no comparable Clarkson course. Used for transfer credit only.

Credits: (2-4), Graded, Semester Calendar
Lecture, Transfer Credit Only

**PY 2 (4, 6...)**  
A college level course for which there is no comparable Clarkson course. Used for transfer credit only. This course may be used to satisfy a Social Science Foundation Curriculum Requirement.

Credits: (2-4), Graded, Semester Calendar
Lecture, Transfer Credit Only

**PY 151 Introduction to Psychology**

Emphasizes the scientific study of the human mind. Appropriate research methods and philosophical questions will be considered. Topics include the brain, memory, perception, development,
personality, social behavior, emotion, motivation, psychological disorders, stress, and states of consciousness.

Credits: (3), Graded, Semester Calendar
Lecture, Every Semester

IG

PY 246  Educational Psychology
This course will examine the ways in which theories of child development and learning inform classroom teaching methods, assessment, behavioral interventions, and student motivation.
Prerequisites: PY151 or permission of the instructor
Credits: (3), Graded, Semester Calendar
Lecture, Every Semester

PY 253  Social Psychology
Emphasis on the relative influences of society and other people on the individual. Topics include persuasion, attitude formation and change, group decision making, prejudice, social influence, altruism and aggression. Fundamental to the discussion of each topic is the scientific research that underlies it. A focus of the course is the means by which the individual can influence and be influenced by the organizations that play a major role in our lives. Prerequisite: PY151.
Credits: (3), Graded, Semester Calendar
Lecture, Spring Semesters

PY 255  Cognitive Psychology
Cognitive psychology is the study of how the mind perceives, attends to, remembers, and interacts with the world. The mental processes that will be examined include perception, attention, memory, language, decision-making, and problem solving. During this course, each topic will be explored by investigating theories and results from laboratory experiments, computer simulations and work in artificial intelligence. Prerequisite: PY151.
Credits: (3), Graded, Semester Calendar
Lecture, Spring Semesters

PY 258  Diversity Science
This course introduces the links between diversity and psychological processes at individual and interpersonal levels. The study of diversity in this course includes an understanding of the presence of, as well as the problems and issues associated with social and cultural differences in our society. The topics of this course cover concept and processes for understanding topics such as categorization, stereotyping, prejudice, and social stigma. This course is designed to be an active learning experience, providing students an opportunity to identify and reflect on their own cultures, values and preferences, and how this impacts their individual sphere of influence and the various contexts in which they interface.
Prerequisites: PY151 recommended, but not required.
Credits: (3), Graded, Semester Calendar
Lecture, Spring Terms

PY 286  Organizational Behavior I
[Cross-listed with EM 286, OS 286] (May be used to satisfy a CUSB MBA or MS foundation requirement.) An introduction to the processes required to manage contemporary organizations with a focus on individual behaviors as they relate to the functions of planning, organizing, controlling, and leading. The most recent concepts of behavioral science in the practice of management are presented to assist the student in gaining understanding of the pervasiveness of the discipline in all types of organizations and processes. Topics include motivation, leadership, perceptions, personality theory, learning theory, personnel issues, stress management, organizational culture, and decision making.
Prerequisites: sophomore standing or the permission of the instructor.
Credits: (3), Graded, Semester Calendar
Lecture, Every Semester

IG

PY 310  Human Sexuality
The course objective is to provide an informed perspective on human sexual behavior. Topics include anatomy and physiology, contraception, sexually transmitted diseases, sexual development and identity, varieties of sexual behavior across cultures and species, disorders and difficulties of sexual expression, therapeutic issues on the treatment of sexual disorders and the role of sex in interpersonal relationships.
Credits: (3), Graded, Semester Calendar
Lecture, Spring Semesters
UNIV/CGI/IG

PY 311  Cyberpsychology
Cyberpsychology is the branch of psychology that examines human behavior in the context of interaction with modern technologies. The research in this field is primarily focused on the use of Internet, particularly social media sites, but other technologies, such as gaming, mobile device applications, artificial intelligence and virtual reality are also within the scope of this area of psychological research and practice. The goal of this course is to provide students with an in-depth understanding of the psychological factors associated with using technologies and interacting in on-line environment.
Prerequisite: PY151
Credits: (3), Graded, Semester Calendar
Lecture,

PY 315  Personal Relationships
According to some statistics humans spend as much as 60% of their lives in the company of others. This course will focus on research and theory in the psychology of personal relationships. Characteristics of romantic, marital, family and other social relationships will be considered. Topics will include attraction, relationship development and maintenance, communication, social support, and relationship conflict. Prerequisites: PY151 or consent of the instructor.
Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed
Comm Points: 1

PY 317  Psyc of Psychoactive Drugs
The Psychology of Psychoactive Drugs will examine a number of medicinal and so-called recreational drugs that affect consciousness, including cocaine, morphine, LSD, marijuana, alcohol, nicotine and caffeine. The course will include a description of the drugs, their pharmacological action, and side-effects. Psychological, physiologial, and pharmacological theories of tolerance and addiction, and addiction treatment programs will also be covered.
Credits: (3), Graded, Semester Calendar
Lecture, Fall Semesters
UNIV/CGI/IG
PY 319 Current Readings in Animal Behavior
[Cross-listed with BY 319] The field of animal behavior is a rapidly advancing one, especially at the interface of neurobiology and cognition, and the interface of cognition and functional analysis of behavior (behavioral ecology and sociobiology). This one credit hour course is designed as a 'journal club' with a focus on the latest developments in theory and empirical research on animal behavior. The course is intended for any student who has a sincere interest in integrative animal behavior. Prerequisites: BY222 or PY151
Credits: (1), Graded, Semester Calendar
Lecture, Fall Semesters

PY 321 Consumer Behavior
[Cross-listed with MK 321] Extensive coverage of selected consumer behavior theories and models. Special emphasis given to the most recent research along with marketing mix applications. Topics include classic and operant conditioning, motivation and attribution theories and the elaboration likelihood model. Students are required to complete a term project. Prerequisite: MK320.
Credits: (3), Graded, Semester Calendar
Lecture, Fall Semesters

PY 335 Personality
Examines research evidence that treats various features of personality. Includes introversion-extroversion, authoritarian personality, the psychoanalysis, aggression, sexuality, dream interpretation, self-monitoring, locus of control, defense mechanisms, and unconscious motivation. Prerequisites: PY151 or junior or senior standing.
Credits: (3), Graded, Semester Calendar
Lecture, Fall Semesters

PY 340 Behavioral Ecology and Sociobiology
[Cross-listed with BY 340] This course is concerned with the adaptive functions of animal behavior, emphasizing ecological and evolutionary perspectives. Topics covered include foraging behavior, sexual selection, social systems, parental care, and cooperation and conflict. One major focus will be on evaluating the arguments of proponents and critics of sociobiology on whether the fields is useful at explaining human behavior. Prerequisites: BY140 or PY151 or consent of instructor.
Credits: (3), Graded, Semester Calendar
Lecture, Odd Spring Semesters

PY 357 Human Cognitive Evolution
[Cross-listed with BY 357] Evolutionary psychology is concerned with the adaptive problems and selective pressures our ancestors encountered in their environments, the psychological mechanisms that evolved to help them solve those problems, and the way those evolved mechanisms function in current environments. This way of thinking about the brain, mind, and behavior is changing how scientists approach old topics, and is opening up new ones. This course will focus on current developments and selected topics in evolutionary psychology (e.g., foraging, mate choice, parental investment, cooperation and culture) and explore the evolution of cognition from a broad comparative perspective. Prerequisites: PY151 or junior or senior standing.
Credits: (3), Graded, Semester Calendar
Lecture, Fall Semesters

PY 358 Animal Learning and Cognition
[Cross-listed with BY 358] This course focuses upon how animals acquire, process, store and recall information about their environment and social partners. Topics that will be examined include how animals perceive and classify stimuli; how they learn and remember; how they orient and navigate; how they measure time, number, and amount; how they acquire abstract concepts; how they perceive social relationships; and how they communicate. A diversity of invertebrate and vertebrate organisms will be included (sea slugs to primates!), and there will be an emphasis on understanding taxon-specific specializations as well as general patterns across animals. Prerequisites: BY140 or PY151 or consent of the instructor.
Credits: (3), Graded, Semester Calendar
Lecture, Even Spring Semesters

PY 359 Perception
Perception deals with our conscious experience of the world, ourselves and each other. This course will examine how perceptions are measured (psychophysics); how visual, auditory, touch and pain sensory stimulation is actively organized into conscious perceptions; developmental aspects of perception; the role of cognitive factors, such as attention; and how altered conscious states (e.g., achieved through meditation, hallucinogenic drugs) affect perception. Fundamental principles of perception discussed in this course will be used to explain how we experience the world, ourselves, and each other. Prerequisites: PY151 or junior or senior standing.
Credits: (3), Graded, Semester Calendar
Lecture, Fall Semesters

PY 360 Learning and Memory
The basic principles, major theories, and practical applications of learning and memory processes will be explored in humans and animals. Topics will include how knowledge is acquired (learning), how it is represented, stored and accessed (memory), and how these learning and memory principles can be applied in education and in clinical settings. The course will take a multidisciplinary approach that will allow examining the processes underlying learning and memory at the behavioral, cognitive, neurobiological, and genetic levels. Prerequisites: PY151 or junior or senior standing.
Credits: (3), Graded, Semester Calendar
Lecture, Fall Semesters

PY 361 Motivation and Emotion
This course examines the forces of personality, environment, and culture that lead people to want what they want, and do what they do. Motivation will be explored in the contexts of education, work, therapy, sports, and relationships. Topics include: self-efficacy, self-regulation, earned helplessness, intrinsic and extrinsic motivation, achievement motivation, goal-setting, implementation intentions, self-determination, and emotion. Recent developments in the field of motivation will be applied to the practice of motivating others. Prerequisites: PY151 or junior or senior standing.
Credits: (3), Graded, Semester Calendar
Lecture, Fall Semesters
PY 363 Judgment and Decision Making for the Biomedical Sciences
Decision making is using information (and in some cases emotion) to
guide behavior among multiple possible courses of action—for
example, which foods to choose, which stocks to invest in, who to
select for a romantic partner, or which products to buy. These choices
determine our success in meeting the challenges of life. This course
will cover a wide variety of topics regarding how individuals and
groups form judgments and make decisions, by drawing on findings
from psychology, economics, and biology. We will investigate the
various techniques used to study and assess human judgment and
decision making, explore how people reason under risk and
uncertainty and apply the research addressed in class to real-world
problems and issues. Particular focus will be given to judgment and
decision-making in applied health contexts that are of high relevance
for students with career goals in the biomedical sciences. Enrollment
is limited to students participating in the Trudeau Semester.
Credits: (3), Graded, Semester Calendar
Lecture, Odd Fall Semesters

PY 366 Cultural Psychology
This course introduces the field of cross-cultural psychology and
intricate connections between cultural experiences and psychological
processes. With critical examinations of the study of culture within
the field of psychology, the focus will be on developing an
understanding of recent cultural theory, research methods, and
critical interpretation of research results. This course includes topics
such as cross-cultural psychology’s contributions to human
development and socialization, identity and personality, emotions
and cognition, motivation, and behaviors. Prerequisites: PY151 or
Junior or Senior standing
Credits: (3), Graded, Semester Calendar
Lecture, Fall Terms

PY 370 Developmental Psychology
This course will examine normal development from conception
through old age and will cover theories of development and current
devvelopmental research. Consideration will be given to interaction of
physical, social and cognitive aspects. Topics include the development of
self, identity, moral beliefs, language, friendship, attachment,
sexualiy, and death/dying. Prerequisites: PY151 or junior or senior
standing.
Credits: (3), Graded, Semester Calendar
Lecture, Fall Semesters

PY 372 Community Psychology
This course is designed to introduce students to the field of
Community Psychology, which aims to improve community mental
health through research and social intervention programs such as
prevention, citizen participation, environmental change, and
influence of public policy. This course will introduce the background
and content of community mental health and community psychology,
present the key concepts involved, and engage students in practical
applications of the methods used by community psychologists.
Prerequisite: PY151, or Junior or Senior standing.
Credits: (3), Graded, Semester Calendar
Lecture, Spring Terms

PY 400 Internship - Professional Experience (Class Structure)
This course entails completing a professional experience (90 – 120
hours) through volunteer or work activities associated with
psychology and writing an APA style paper that integrates the
professional experience with relevant psychological literature.
Examples of professional experiences include, but are not limited to,
St. Lawrence Psychiatric Facility, Reach Out Crisis Hotline, Renewal
House, Canton-Potsdam Hospital Chemical Dependency Unit,
working in Human Resources or marketing/advertising departments,
Hospice, patient advocacy, counseling, or mental health diagnoses.
Note that the professional experience must be approved BEFORE the
student begins the experience; please contact the Psychology Front
Office for details. Requirement: Junior or Senior standing.
Credits: (3), Graded, Semester Calendar
Independent Study, Fall Terms
Comm Points: 2

PY 401 Internship - Clinical/Counseling Psychology (individual study format)
This course entails completing a professional experience (90 – 120
hours) through volunteer or work activities associated in
clinical/counseling psychology and writing an APA style paper that
integrates the professional experience with relevant psychological
literature. Note that the professional experience must be approved
BEFORE the student begins the experience; please contact the
Psychology Front Office for details. This class is taught in an individual
study format and can replace, if needed, the PY400 Internship
Professional Experience class. Prerequisites: Must have junior or
senior standing.
Credits: (3), Graded, Semester Calendar
Independent Study, Every Term
Comm Points: 2

PY 402 Internship: Personnel Relations (individual study format)
This course entails completing a professional experience (90 – 120
hours) through volunteer or work activities associated in relevant
organizations and writing an APA style paper that integrates the
professional experience with relevant psychological literature. Note
that the professional experience must be approved BEFORE the
student begins the experience; please contact the Psychology Front
Office for details. This class is taught in an individual study format and
can replace, if needed, the PY400 Internship - Professional Experience
class. Prerequisites: Must have junior or senior standing.
Credits: (3), Graded, Semester Calendar
Independent Study, Every Term
Comm Points: 2

PY 403 Internship - Psychology in Health Care Environments
(individual study format)
This course entails completing a professional experience (90 – 120
hours) through volunteer or work activities associated in health care
environments and writing an APA style paper that integrates the
professional experience with relevant psychological literature. Note
that the professional experience must be approved BEFORE the
student begins the experience; please contact the Psychology Front
Office for details. This class is taught in an individual study format and
can replace, if needed, the PY400 Internship - Professional Experience
class. Prerequisites: Must have junior or senior standing.
Credits: (3), Graded, Semester Calendar
Independent Study, Every Term
Comm Points: 2
PY 411 Counseling Psychology: Theory and Practice
This course builds a foundation of clinical knowledge and skills for those who may pursue work in counseling or psychotherapy. It surveys the most widely accepted theories of counseling and provides experiential opportunities to learn and practice facilitative communication skills. Students explore basic concepts for integrating diagnosis, evaluative testing, treatment planning, and appropriate referral into the counseling process. The various types of counseling professions and the ethical issues surrounding counseling are also discussed. Prerequisites: Psychology major with Senior or Junior standing, or consent of the instructor. Credits: (3), Graded, Semester Calendar Lecture, Spring Semesters

PY 412 Psychiatric Center Professional Experience
Students will spend one full day per week working with and observing Clinical Psychologists at the St. Lawrence Psychiatric Center in Ogdensburg, NY. The experience may include rounds at the Sex Offenders Treatment Program, Child and Youth Program, and the Adult Services Program. Activities include observing group therapy, developing a lesson plan for and delivering a therapy session under the supervision of a staff Psychologist, and observing treatment team meetings. This course is only open to Psychology majors. Prerequisites: PY151 and permission of the instructor. Acceptance into the course will be based on GPA and a short essay describing how this course will advance his/her personal and professional goals. Prerequisite: PY151 Credits: (6), Graded, Semester Calendar Lecture, Fall Semesters

PY 457 Experimental Psychology Laboratory
Students will work in teams to design and conduct an experiment, analyze the results and write up their findings in the American Psychological Association format. Corequisite: PY456 Credits: (2), Graded, Semester Calendar Laboratory, Fall Semesters Comm Points: 2

PY 458 Cognitive Neuroscience
[Cross-listed with BY 458] This course introduces a sampling of the theories and research concerning how various mental processes are accomplished within the brain. Emphasis will be placed on developing an understanding of both the physiological bases of the techniques and the issues involved in relating measures of brain activity to cognitive functioning. Students will be exposed to current topics of study in a number of areas of cognition: perception, language, memory, among others. In this course we will study a number of different techniques for studying the brain, including electrophysiological recording techniques, functional imaging techniques, and methods that involve brain lesions and disrupting neural activity. Prerequisites: PY151 or junior or senior standing. Credits: (3), Graded, Semester Calendar Lecture, Even Fall Terms UNIV/IG/STS

PY 459 Neuroscience and Society
[Cross-listed with HIST 459] The word 'neuroscience' is of recent origin. Yet we can trace neuroscientific ideas back to Rene Descartes. Since Descartes, social understanding of madness, the relationship between mind and brain, and the nature of sensation and perception has changed frequently. Beginning in the Age of Mechanical Man, and ending in the Age of Prozac, this course examines how society has influenced neuroscientific thought and how, in turn, neuroscience has influenced society. Restriction: Junior or senior standing, and permission of the instructor Credits: (3), Graded, Semester Calendar Lecture, Spring Semesters STS Comm Points: 1

PY 460 Neurobiology
[Cross-listed with BY 460] Neurons are electrically excitable cells that initiate and control many complex functions such as sensory perception, locomotion, memory, and learning. This course introduces the study of neuronal mechanisms at the cellular and molecular level. Topics include: membrane biophysics, ion channels, electrical signaling, synaptic transmission, glia, sensory transduction, neuromodulation, and neuronal plasticity. Prerequisites: BY160 or BY360 or consent of instructor. Credits: (3), Graded, Semester Calendar Lecture, Fall Semesters
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<th>Course Code</th>
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<tbody>
<tr>
<td>PY 461</td>
<td>Judgment and Decision Making</td>
<td>Decision making is using information (and in some cases, emotion) to guide behavior among multiple possible courses of action - which foods to choose, who to select for a romantic partner, or which products to buy. These choices determine our success in meeting the challenges of life. This course will cover a wide variety of topics regarding how people form judgments and make decisions by drawing on findings from psychology, economics, and biology. We will investigate the various techniques used to study and assess human judgment and decision making, explore how people reason under risk and uncertainty and apply the research addressed in class to real-world problems and issues. Prerequisites: PY 151 and Junior or Senior standing Credits: (3), Graded, Semester Calendar Lecture, Spring Semesters</td>
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<tr>
<td>PY 462</td>
<td>Abnormal Psychology</td>
<td>This course surveys the major syndromes of psychopathology, including schizophrenia, depression and manic-depression, anxiety disorders, and psychopathic personality. Reviews know causes, symptomatology, and both pharmacological and psychological modes of intervention. Prerequisites: PY 151 or Junior or senior standing Credits: (3), Graded, Semester Calendar Lecture, Fall Semesters</td>
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<tr>
<td>PY 463</td>
<td>Health Psychology</td>
<td>This course will provide an introduction to the field of health psychology, which is concerned with the role of psychological and social factors in health and illness. The course will address three general subject areas: 1) attitudes, behavior, and lifestyle factors affecting disease prevention and development, 2) stress and the related personality and social processes associated with disease development and progression, and 3) the psychological and social consequences of physical illness. Prerequisites: PY 151 or permission of the instructor Credits: (3), Graded, Semester Calendar Lecture, Fall Semesters Comm Points: 1</td>
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<tr>
<td>PY 464</td>
<td>Clinical Psychology</td>
<td>This course is designed to introduce students to the theoretical, empirical, and ethical foundations of clinical psychology. We will focus on the major roles of clinical psychologists, particularly psychotherapy, assessment, and issues in education and training. Students will also be asked to engage in self-reflection throughout the course, as the ongoing development of self-awareness and self-knowledge are essential to effective and ethical practice. Contemporary issues and controversies that are currently shaping the field of clinical psychology will also be addressed. Prior enrollment in PY 462 (Abnormal Psychology) is recommended. Prerequisites: PY 151 or Junior or Senior standing Credits: (3), Graded, Semester Calendar Lecture, Spring Terms</td>
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<td>PY 468</td>
<td>Directed Study in Social Psychology</td>
<td>This is a directed reading course that will allow the student the opportunity to pursue special interests in social psychology. Prerequisite: consent of the instructor Credits: (1-6), Graded, Semester Calendar Independent Study, Every Semester</td>
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<tr>
<td>PY 481</td>
<td>Directed Study in Social Psychology</td>
<td>This is a directed reading course that will allow the student the opportunity to pursue special interests in social psychology. Prerequisite: consent of the instructor Credits: (1-6), Graded, Semester Calendar Independent Study, Every Semester</td>
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<td>PY 482</td>
<td>Directed Study in Physiological Psychology</td>
<td>This is a directed study course that will allow the student the opportunity to pursue special interests in physiological psychology. Prerequisite: consent of the instructor Credits: (1-6), Graded, Semester Calendar Independent Study, Every Semester</td>
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<td>PY 483</td>
<td>Directed Study in Cognitive Psychology</td>
<td>This is a directed reading course that will allow the student the opportunity to pursue special interests in cognitive psychology. Credits: (1-6), Graded, Semester Calendar Independent Study, Every Semester</td>
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<td>PY 491</td>
<td>Directed Research in Health Psychology</td>
<td>The student works one-on-one with a faculty member on a health psychology research project. The student will learn about the major theories related to the research topic and gain first-hand experience with research methodology issues, data collection, and analysis. Does not count towards the directed research requirement for the psychology major. Instructor consent required to enroll Credits: (1-6), Graded, Semester Calendar Research, Every Term</td>
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<tr>
<td>PY 492</td>
<td>Directed Research in Psychophysiology</td>
<td>The student works one-on-one with a faculty member on a psychophysiological research project. The student will learn about the major theories related to the research topic and gain first-hand experience with research methodology issues, data collection, and analysis. Does not count towards the directed research requirement for the psychology major. Instructor consent required to enroll Credits: (1-6), Graded, Semester Calendar Research, Every Term</td>
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<td>PY 493</td>
<td>Directed Research in Cognitive Psychology</td>
<td>The student works one-on-one with a faculty member on a cognitive psychology research project. The student will learn about the major theories related to the research topic and gain first-hand experience with research methodology issues, data collection, and analysis. Does not count towards the directed research requirement for the psychology major. Instructor consent required to enroll Credits: (1-6), Graded, Semester Calendar Research, Every Term</td>
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<tr>
<td>PY 494</td>
<td>Directed Research in Social Psychology</td>
<td>The student works one-on-one with a faculty member on a social psychology research project. The student will learn about the major theories related to the research topic and gain first-hand experience with research methodology issues, data collection, and analysis. Does not count towards the directed research requirement for the psychology major. Prerequisite: consent of the instructor Credits: (1-6), Graded, Semester Calendar Research, Every Term</td>
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PY 495  Directed Research in Clinical Psychology
The student works one-on-one with a faculty member on a clinical psychology research project. The student will learn about the major theories related to the research topic, and gain first-hand experience with research methodology issues, data collection, and analysis. Does not count towards the directed research requirement for the psychology major.
Credits: (1-6), Graded, Semester Calendar
Independent Study, Every Term

PY 496  Directed Research in Psychology
The student works one-on-one with a faculty member on a cognitive psychology research project. The student will learn about the major theories related to the research topic and gain first-hand experience with research methodology issues, data collection, and analysis. The student will write an APA style research paper. Can be used to satisfy the directed research requirement for the psychology major.
Instructor consent required to enroll.
Credits: (1-6), Graded, Semester Calendar
Research, Every Term
Comm Points: 1

PY 498  Senior Thesis
Research under the direction of a faculty sponsor, who assists the student in the choice of a problem and in the planning and execution of the research. Prerequisites: senior psychology major and consent of the department faculty.
Credits: (1-10), Graded, Semester Calendar
Research, Fall Terms
Comm Points: 1

PY 499  Senior Thesis
Continuation of the research from PY498 leading to a written due at the end of the course. Can be used to satisfy the directed research requirement for the psychology major. Prerequisite: PY498.
Credits: (1-10), Graded, Semester Calendar
Research, Spring Terms
Comm Points: 1

Study Abroad

SA 300  Study Abroad
Indicates participation in the Study Abroad Program.
Credits: (12), P/NC, Semester Calendar
Independent Study,

School of Arts and Sciences

SA&S 1 (3, 5,...)  School of Arts and Science Elective
A college level course for which there is no comparable Clarkson course. Used for transfer credit only.
Credits: (2-4), Graded, Semester Calendar
Independent Study, Transfer Credit Only

SA&S 2 (4, 6,...)  School of Arts and Science Elective
A college level course for which there is no comparable Clarkson course. Used for transfer credit only.
Credits: (2-4), Graded, Semester Calendar
Independent Study, Transfer Credit Only

SA&S 100  Co-Writing
A writing workshop to be taken concurrently with UNIV190, Clarkson Seminar. Provides supplementary instruction and practice in critical analysis and in writing and editing techniques. Each week students have a group session and also meet one-to-one with the course instructor about work in progress in their UNIV190 classes.
Corequisite: UNIV190
Credits: (1), P/NC, Semester Calendar
Lecture, Fall Semesters

SA&S 300  Arts and Sciences Seminar
Students attend seminars by alumni, faculty, and guest speakers. Students will attend one seminar per week. The School of Arts and Sciences will typically sponsor most of these seminars. Students may also attend seminars sponsored by the various Departments comprising Arts and Sciences. Students will write responses to at least three of the colloquia they attend over the semester. Prerequisites: Major in the School of Arts and Sciences, and at least Sophomore standing
Credits: (1), P/NC, Semester Calendar
Seminar, Every Semester

SA&S 399  The Adirondack Speaker Series
In this weekly seminar, students will learn about our region. The purpose of the series is to give Clarkson students a sense of place. The weekly seminar will feature talks by researchers, community members, and storytellers who will discuss all things Adirondack, including geology, economy, history, agriculture, rivers, parks, animals, art, politics, and social issues. This seminar is open to all students, faculty, and community members.
Credits: (1), P/NC, Semester Calendar
Lecture, Fall Terms

SA&S 400  Internship
Students gain practical work experience by working with a professional outside their department on issues, projects that draw on concepts and methods from multiple fields. Students also prepare a report about their learning experiences in the internships. This course may be repeated for credit.
Credits: (1-3), Graded, Semester Calendar
Independent Study,

SA&S 410  Professional Experience
This course number is used to matriculate the Professional Experience requirement of the Clarkson Common Experience curriculum. The student must participate in a project-based professional experience such as a co-op, internship, other professional-level work experience, directed research, significant responsibility in an appropriate team project, or a community project clearly related to the student's professional goals. Enrollment requires approval by the Associate Dean or Dean of Arts and Sciences. Requirement: Pre-approval of the experience (contact the Office of the School of Arts & Sciences for details).
Credits: (0), P/NC, Semester Calendar
Independent Study, Every Term
SA&S 499 Biology, Behavior and Society Minor Portfolio

The student will provide a portfolio based on (a) term papers or equivalent products from the three major required courses in the BiBS minor, (b) representative course material that shows mastery of subject matter area, and (c) will use the portfolio and materials from other courses taken for the BiBS minor to prepare a 10 page self-reflective essay on what the student has learned about the biological, psychological, and socio-cultural influences on human behavior, human cultural evolution, and human social organization.

Prerequisites: HIST270, BY/PY340, and BY/PY357

Credits: (1), Graded, Semester Calendar

Independent Study

School of Business

SB 1 (3, 5...) Business Elective

A college level course for which there is no comparable Clarkson course. Used for transfer credit only.

Credits: (2-4), Graded, Semester Calendar

Lecture, Transfer Credit Only

SB 2 (4, 6...) Business Elective

A college level course for which there is no comparable Clarkson course. Used for transfer credit only. This course may be used to satisfy a Management/Business Foundation Curriculum Requirement.

Credits: (2-4), Graded, Semester Calendar

Lecture, Transfer Credit Only

SB 100 Quantitative Methods of Business and Economics

This course is restricted to the HEO Program for incoming students. It is designed to prepare students for the required courses in the School of Business at Clarkson, and will emphasize the understanding of mathematical methods and their application to the fundamentals of business and economics. Topics will include algebraic and functional interpretation, geometry, creating and using graphs to understand and communicate data, marginal analysis, and other mathematical concepts as they are used in selected topics in business and economics. This course may not be used to satisfy business major requirements. Prerequisite: For HEO students only.

Credits: (1-3), Graded, Semester Calendar

Lecture, Summer Terms

SB 113 Entrepreneurship and Business Innovation I

(CUSB Freshmen Only) SB113 provides you with exposure to a range of business theories and skills by applying and reinforcing this knowledge through actual management and entrepreneurial experience. This "learning-by-doing" approach is designed to provide you with a solid foundation for critical, analytical and lateral thinking about management and increase your confidence and competence as practicing managers, leaders, and entrepreneurs. Additionally, this course will serve as an introduction to familiarize you with the Clarkson University School of Business curriculum and introduce you to each of the business disciplines. You will be exposed to theories, applications, and skills relevant to creating an effective business plan. These include: innovation, decision making, leadership, team building, oral and written communication, market research, financial analysis, and working under conditions of uncertainty. Ultimately, the course is centered on helping you become aware of and able to manage risk, resources, and opportunities, while understanding the importance of adding values.

Restriction: Must be a CUSB Freshman.

SB 114 Business Elective

SB114 provides you with exposure to a wide range of business theory and skills. Using the experiences gained in SB113, students will learn about the various types of business structures and how individual and group behavior can positively or negatively impact an organization’s success. Students will be exposed to topics including financial analysis, asset management, human resource management, supply chain management, intellectual property, international business and group behavior. Specifically, students will study concepts associated with managing a start up venture or new product introduction, leadership, personal accountability, stress, tolerance for uncertainty, change management and organizational flexibility. This foundation of learning is also designed to support the student’s choice of emphasis in future course selection. Prerequisite: SB113.

Credits: (3), Graded, Semester Calendar

Lecture, Laboratory, Fall Semesters

Comm Points: 1

SB 115 Foundations of Innovation and Entrepreneurship

This course will expose the student to a wide range of business theories and skills and serves as an introduction to the curriculum of the School of Business. The course will provide the student with an introduction to each of the business disciplines and an introduction to the theories, application, and skills necessary to create an effective business plan. These skills and topics include: innovation, analytically thinking, decision making, leadership, team building, oral and written communication, market research, and financial analysis. This course is offered only to second semester freshmen students who have internally transferred to the School of Business. This course cannot be taken by a student who has taken SB113. The course will serve as a substitute for SB113 for those students who internally transfer into the School of Business. Restriction: This course cannot be taken by any student who has taken SB113.

Credits: (3), Graded, Semester Calendar

Lecture, Spring Semesters

Comm Points: 1

SB 236 Introduction to Customer-Focused Design

This introductory course looks at design and innovation through both the theories and practice of design thinking, creativity, and customer-centered innovation. Students taking this class will learn to look for opportunities to innovate and focus on customer needs relating to those opportunities. We will explore product, service, and process design. Students will learn multiple ways to design and choose one to focus on for a hands-on design project. This introductory class will give students design tools that should serve as a foundation for creativity and innovation throughout the curriculum at Clarkson, in extra-curricular activities on campus, and in non-university endeavors. Prerequisite: At least Sophomore standing.

Credits: (3), Graded, Semester Calendar

Lecture, Fall Term
SB 305  Cost Management
Introduces the concepts of cost management and strategic cost management. This course will present the principles involved in the determination of the cost of a product or service. A central focus is how cost management principles help managers make better decisions. Topics covered include cost-volume-profit analysis, value and supply chain analysis, operational budgeting and activity based costing, especially as they relate to cost management. Prerequisite: AC/EM 205 or junior standing.
Credits: (3), Graded, Semester Calendar
Lecture, Spring Semesters

SB 310  CUSB Professional Experience: Internship
Project-based professional internship experience in business, related to student career interests and/or field of study. Fulfills Clarkson Common Experience Professional Experience Requirement for School of Business students. Course registration requires CUSB approval of application. Completion of course requires CUSB approval of post-internship assessment by student and employer. Offered Pass/No Credit. Prerequisite: Sophomore standing, consent of the instructor.
Credits: (0), P/NC, Semester Calendar
Independent Study, Every Semester

SB 322  Designing and Leading Innovative Ventures
This course will provide students with opportunities to understand how the shifting business environment requires innovative ventures to adapt, change and respond to ensure competitiveness. Students will explore traditional organizational structures as well as cross-functional and virtual teams and networks, and will gain an understanding of the value of rewards and incentives in helping influence innovation and structural/organizational evolution. Students will also consider benchmark techniques and approaches used to inform and advocate innovation to key internal and external stakeholders. Prerequisite: At least Sophomore standing.
Credits: (3), Graded, Semester Calendar
Lecture, Every Semester

SB 356  Invention Development & Protection
[Cross-listed with EM356] In this course, students learn how to develop inventions and protect them. Students will work in small teams to develop and describe their inventions in a form suitable for filing provisional patent applications with the U.S. Patent and Trademark Office. Aspects of intellectual property laws in the US and other countries will be covered to guide the student inventing process. Not open to E&M students. Prerequisites: Junior Standing, not open to E&M majors.
Credits: (3), Graded, Semester Calendar
Lecture, Fall Terms

SB 361  Supply Chain Environmental Management
[Cross-listed with EM 361] In recent years, manufacturing organizations have increased their interest in environmental management through activities such as green purchasing, reverse logistics, product stewardship and design-for-the-environment. These activities, usually involving several organizations, are often part of what is known as supply chain environment management. This course aims to gain a greater understanding of supply chain environmental management by examining: (i) the advantages and business risks of adopting and implementing environmental practices and technologies in the supply chain, (ii) the role of suppliers and customers to facilitate the adoption/implementation of environmental practices and technologies, and (iii) the implications of such supply chain activities on an organization’s operations strategy. This course consists of a mix of lectures and class discussion and relies primarily on a set of readings and a series of cases that will be analyzed in class. Prerequisites: OM331.
Credits: (3), Graded, Semester Calendar
Lecture, Spring Semesters

SB 381  Logistics Management
[Cross-Listed EM381] Logistics involves planning, implementation and control of the forward and reverse flow and storage of goods, services, and information in the supply chain in order to effectively meet customer demand. Primary topics include management and location of facilities, management of channel networks, warehousing, transportation, management and design of integrated logistics networks, distribution strategies, third-party logistics, international logistics, and vehicle routing. In addition to lectures, case studies, numerical assignments and simulation of logistics systems may be utilized. Prerequisites: MK 320 and OM/EM 331.
Credits: (3), Graded, Semester Calendar
Lecture, Fall Terms

SB 396  Global Business Strategies
This course takes a transnational perspective on strategic management. It explores the integrative and cross-functional nature of organizational strategy and decision-making within a global environment. Students are exposed to a wide range of strategic problems, opportunities, challenges, dilemmas/puzzles and paradoxes involved in forming and implementing organizational strategies in an era of globalization. The aim is to develop the sophisticated, critical thinking skills and understanding necessary to manage effectively in an increasingly globalized world. Prerequisites: Must have junior or senior standing.
Credits: (3), Graded, Semester Calendar
Lecture,

SB 437  Commercializing Innovation
This course focuses on how to successfully commercialize an innovation. While it is important to come up with an innovative idea and develop a product concept, it is equally critical to effectively design and launch the product in the market and ensure its long-term success. This is where the innovation efforts of a large number of entrepreneurs and companies fail. The course provides an exposure to various product design approaches and strategies. Understanding commercialization activities such as pre-product launch planning, market testing, actual product launch, and post-launch follow-up is a major part of the course. These commercialization activities among other things involve developing a marketing plan for the product, carefully testing the plan, modifying the plan based on test market results, and crafting a long-term strategy for the product. The course also provides an exposure to how market data is generated and analyzed during these activities. Prerequisites: MK436, MK332.
Credits: (3), Graded, Semester Calendar
Lecture, Spring Semesters
**SB 440**  
Innovation and Entrepreneurship Strategy  
The employment of comprehensive case problems in the formulation of action programs and business policy is a major feature in this integrated course in innovation and entrepreneurship strategy. As a capstone course, it is designed to allow students to apply their knowledge in a complex case analysis environment. The hallmark of the course is the application of learned material to realistic, multifarious management issues. Thus, each case represents a complex web of managerial issues that must be resolved. The cases will cover many different content subjects that may vary from semester to semester. The course will also focus on the process of critical thinking in the context of management decision making. Prerequisites: MK320, MK321, MK332, MK436, and senior standing. Credits: (3), Graded, Semester Calendar  
Lecture, Spring Semesters

**SB 441**  
Advanced Topics in Global Supply Chain Management  
[Cross-listed with EM 441] This course introduces several emerging topics in supply chain management, including: demand management, revenue management, risk management, supply chain agility and flexibility, supply chain disruption management, and supply chain contracts. This course also provides students with the opportunity to gain experience dealing with complex supply chain issues by utilizing a simulation game. The simulation deals with both strategic and tactical aspects of management the supply chain. Prerequisite: OM341. Credits: (3), Graded, Semester Calendar  
Lecture, Spring Semesters

**SB 487**  
Special Project in Business  
An investigation of a problem or in-depth topic undertaken by the student under the guidance of a faculty member. Prerequisites: Permission of the instructor Credits: (1-3), Graded, Semester Calendar  
Research, Given When Needed

**SB 490**  
Internship  
An unpaid internship that is related to the student’s professional goals. Prerequisite: Permission of the Instructor Credits: (1-3), Graded, Semester Calendar  
Independent Study, Given When Needed

**SB 494**  
Directed Research  
A research project will be completed; research projects may include laboratory projects, literature research, or individual study of interdisciplinary engineering and management topics not available in other Clarkson courses. Restriction: Open to Engineering and Management majors only Credits: (1-3), Graded, Semester Calendar  
Research, Given When Needed

**Science Studies**

**SC 1 (3, 5...)**  
SC Elective  
A college level course for which there is no comparable Clarkson course. Used for transfer credit only. Credits: (2-4), Graded, Semester Calendar  
Lecture, Transfer Credit Only

**SC 2 (4, 6...)**  
SC Elective  
A college level course for which there is no comparable Clarkson course. Used for transfer credit only. This course may be used to satisfy a Science Foundation Curriculum Requirement. Credits: (2-4), Graded, Semester Calendar  
Lecture, Transfer Credit Only

**SC 31**  
Introduction to STEM  
How do scientists and engineers think as they approach a problem? Biologists, chemists and physicists have unique approaches to problems in their respective fields and classes. Introduction to STEM provides students the basic skills and concepts they need to succeed in their first year science courses. The class is composed of three modules of Biology, Chemistry and Physics led by first year faculty in the sciences. Intended for HEDP SPREE students. Check with major department to determine whether credits count toward graduation. Credits: (2), Graded, Semester Calendar  
Lecture,

**SC 110**  
Environmental Science Elective with a Lab  
Credit for this course is awarded only in the following cases: 1) receipt of a score of 4 or 5 on the AP Environmental Science Exam or 2) satisfactory completion of an approved college-level introductory environmental science course with a laboratory component. Biology, Bimolecular Science, and Environmental Science (EHS and ES&P) majors may not use credit for SC110 as one of their required biology or professional science electives. Credits: (4), Graded, Semester Calendar  
Independent Study, Transfer Credit Only

**SC 141**  
Introduction to Physics I  
College-level non-calculus based physics course with lab that covers topics in mechanics. Transfer credit for this course is awarded only in the following cases: 1) receipt of a score of 4 or 5 on the AP Physics B Exam, 2) receipt of a score of 5, 6, or 7 on the International Baccalaureate Physics Higher-Level Examination, or 3) satisfactory completion of an approved college-level non-calculus based physics course. Credits: (4), Graded, Semester Calendar  
Lecture, Transfer Credit Only

**SC 142**  
Intro to Physics II  
College-level non-calculus based physics course with lab that covers topics in electricity, magnetism, heat, and/or optics. Transfer credit for this course is awarded only in the following cases: 1) receipt of a score of 5 on the AP Physics B Exam, 2) receipt of a score of 7 on the International Baccalaureate Physics Higher-Level Examination, or 3) satisfactory completion of an approved college-level non-calculus based physics course. Credits: (4), Graded, Semester Calendar  
Lecture, Transfer Credit Only

**SC 301**  
Introduction to Geospatial Analysis and Geographic Information Systems  
[Cross-listed with CE 301] An introductory course in the concepts and uses of Geographic Information Systems (GIS) including analysis of GIS-based local and global geographic datasets. Provides basic knowledge of GIS theory and applications using existing state-of-the-art GIS software and current spatial data resources. Applications include: overlay analysis, spatial data query, map generation and
terrain surface analysis. Students will also learn the basics of GPS data collection, remote sensing, 3D visualization, probability, statistics, and error analysis.

Credits: (3), Graded, Semester Calendar
Lecture, Laboratory, Every Term
(TECH)

Social Documentation

SD 200 History of Social Documentation
This course will survey the history and ethics of photographic and time-based media in the representation of factual material commonly described as documentary media. From the earliest photographs of battles and other spectacles of the 19th century to the first documentary films of differing cultures of the early 20th century through the socially-charged and the propagandistic photography and films of the Soviet Union, the US Depression, and World War II and onto the networked and interactive social documentaries of today’s new media, this course will attempt to define the ever-moving boundaries of terms such as reality, nonfiction, documentary, and social action. Students will study the history of documentary media across all its types and movements, present their findings to the class and develop documents that help explain the new, digitally-mediated documentaries.

Credits: (3), Graded, Semester Calendar
Lecture, Odd Spring Semesters
UNIV/CSO/IA
Comm Points: 1

SD 332 Documenting Social Activism
The course explores social movements in Untied States after World War II and allows students to describe and interpret the complex nature of cultures and societies in historical context. The movements will focus on issues of racial civil rights, workers' rights, the women's movement, the gay rights movement, the American Indian Movement and the Students' Movements. Ranging from 1945 until the present day the course illustrates the process of social, cultural, and geopolitical change over time. This is a team taught course in which students will be required to create a documentary film. Therefore students will split their time between history lectures, seminar style discussion and documentary film production. The course has 3 hours of class and 3 hours of lab per week, and students should expect to do extensive out-of-class work. Limit of 20 students.

Permission of one of the instructors required.

Credits: (4), Graded, Semester Calendar
Lecture, Given When Needed
UNIV/CSO/IA, Comm Points: 1

SD 480 Major Research Seminar
Student will confer with the client to pick a topic and direction for her/his research, and coordinate this with the instructors for SD 480 and SD 490; students will do research and complete bibliographic assignments, working with both the instructor and client; each will produce a written proposal beginning with a review of research, and then outlining the project’s theoretical perspective and rhetorical strategy, concluding with an outline of how this project will translate into images (if relevant) as well as words; produce a practical plan of action for the project and present it to both client and instructor; and present the developing project in a professional context to faculty and majors from both departments. Prerequisites: Must be a social documentation major, and at least junior standing

Credits: (3), Graded, Semester Calendar
Seminar, Every Semester
Comm Points: 2

SD 490 Major Research Project
Using the proposal and plan of action developed in SD 480, student will work with her/his client and the course instructor to complete the project. As part of this process, student will document her/his ongoing work to keep both client and instructor informed of her/his progress, filing periodic reports and drafts of the project as required by the instructor. The semester should conclude with a presentation of the completed project to the client and to the instructor.

Credits: (3), Graded, Semester Calendar
Independent Study, Every Semester
Comm Points: 2

Semester in Industry

SI 1 (3, 5...)
Participates in Co-op
Credits: (0), P/NC, Semester Calendar
Independent Study, Transfer Credit Only

SI 300 Professional Internship
Practical, hands-on experience that focuses on an area directly related to the student's field of study. The internship course is an integral part of the curriculum. The student must develop all details for the internship under the supervision of the instructor and within the established course objectives; the latter will include a project that carries the course credit and is due after completion of the internship. Prerequisites: Permission from the course instructor/student's academic advisor, the Career Center, and the International Student Advisor (if applicable.)

Credits: (1-9), P/NC, Semester Calendar
Independent Study,

SI 333 Research for International Students
Practical, hands-on experience that focuses on an area directly related to the student's field of study. The student must develop all details for the research under the supervision of the instructor. Consent by the International Education Office is required.

Credits: (0), P/NC, Semester Calendar
Independent Study, Given When Needed

Sociology

SOC 1 (3, 5...)
SOC Elective
A college level course for which there is no comparable Clarkson course. Used for transfer credit only.

Credits: (2-4), Graded, Semester Calendar
Independent Study, Transfer Credit Only

SOC 2 (4, 6...)
SOC Elective
A college level course for which there is no comparable Clarkson course. Used for transfer credit only. This course may be used to satisfy a Humanities or Social Science Foundation Curriculum Requirement, depending on the specific designator.

Credits: (2-4), Graded, Semester Calendar
Independent Study, Transfer Credit Only
SOC 200  Introduction to Culture and Society

This course will introduce the student to the subject matter and basic concepts of cultural anthropology and sociology. It offers an explanation of the nature of human groups, their origin, development, change, and the process of social organization. Using various societies as case studies, it provides a framework for the systematic analysis of various sociological and anthropological questions pertaining to the human condition: sources of human conflicts, bases of sex roles, the causes of stratification, etc.

Credits: (3), Graded, Semester Calendar
Lecture, CGI

SOC 210  Sociology of the Family

This course will provide an opportunity to look at something familiar (the family) in a new way. We will focus on the family as a social institution—a set of structured social arrangements for meeting certain human needs—and we will examine the larger social forces that shape those structures. We will use a comparative approach to families, emphasizing their diversity both across time and space and within present-day U.S. society—paying particular attention to how social inequality shapes family experiences. By the end of the semester, you should be able to place your own personal experience of families in a larger social, cultural, and historical context.

STUDENT LEARNING OUTCOMES: 1. Understand the causes of social inequalities in family experiences. Students will learn how systems of privilege organized around gender, race, class, and sexual orientation structure family life. 2. Think critically about how family shapes social life at both individual and structural levels. 3. Effectively communicate what they have learned about the sociology of family in both written and oral form. 4. Read and evaluate scholarly research on family. 5. Take their sociological education outside of the classroom and into their everyday life and or clinical practices.

Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed
IG, Comm Points: 1

SOC 230  Introduction to Race and Ethnicity

Variations in phenotype—skin color—have always existed, but has ‘race’? What are the bases of racial identity in the contemporary United States? How have they changed? How are ‘race’ and ‘ethnicity’ related? In this course we will address broader questions about race by focusing on contemporary racial and ethnic divisions and by examining the history of these concepts in the Western Hemisphere.

Credits: (3), Graded, Semester Calendar
Lecture,
UNIV/CGI/STS
Comm Points: 1

SOC 310  Women and Religion

This course will examine the position of women in the major religious traditions of the world, with a special concentration on Christianity. Historically and cross-culturally women have largely been relegated to the status of the profane and passive other in the domain of the religious. This religious alienation has profound implications not only for the spiritual lives of women but for the personal, social, political, and economic aspects of their existence as well. This course will explore andocentric patterns of domination as they are grounded in and legitimated by religious systems of meaning. We will also explore transformative alternatives that exit within the worlds’ religious traditions themselves in an effort to identify sources of empowerment, mutuality and justice for women and men.

Credits: (3), Graded, Semester Calendar
Lecture, Spring Semesters
UNIV/CGI/CSO, Comm Points: 1

SOC 320  Medical Sociology

This course provides an introduction to the sociological study of health and the institution of medicine. This includes exploring questions such as: How is social inequality connected to our health? Is healthcare enough to remedy any health inequalities that might exist? Why is it that so many things are being classified as diseases these days, when we used to just think of them as eccentricities? Nowadays, people often think of themselves as customers as well as patients- how is this change related to broader social changes about the role of medicine? Through this course, you will develop a strong understanding of the contributions that sociology has made to the study of health and illness, as well as a mature perspective on many of our society’s pressing health issues.

NOTE: SOC201 (intro to society) or pre-health focus are recommended, but not required.

Credits: (3), Graded, Semester Calendar
Lecture, Spring Terms
IG
Comm Points: 1

SOC 330  Health, Wealth, Inequality and the Environment

This course will examine how social inequality impacts the relationship of people to their environment and how it affects their physical well being. We will look at how social and political structures perpetuate conditions of injustice for low-income communities and communities of color. One emphasis of this course will be on how social inequality impacts environmental factors involved in transmission of communicable diseases and hazards due to exposure to chemical and physical materials in our environment. We will examine sociological and public health literature pertaining to environmental health on a global level and also address public policies that may affect health and environmental justice.

Credits: (3), Graded, Semester Calendar
Lecture,
UNIV/CGI/STS
Comm Points: 1
SOC 335  Poverty in the Modern USA
This discussion based course provides an introductory sociological examination of the issue of poverty as it appears in present day America. Reading both popular trade books and peer reviewed research, you will develop a deep intersectional understanding of both the causes and consequences of living below "the line."
Prerequisites: SOC201 recommended but not required.
Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed
IG
Comm Points: 1

SOC 340  Global Advocacy for Women's Sexual Reproductive Health & Rights
[Cross Listed as SOCS40] Women are not waiting to be saved or 'given their rights.' They act on their own behalf, and advocate for others. In many cases, women--led movement. Victory is denied, delayed, or arrives disguised in unexpected packages. This course will examine advocacy for women's sexual and reproductive health and rights (SRHR). Students will identify, design and implement an advocacy project to address an SRHR concern on campus. Project outcomes will be presented in class.
Credits: (3), Graded, Semester Calendar
Lecture,

SOC 351  Globalization
[Cross-listed with POL 351] [Formerly LP371] This seminar style class addresses the economic, political and social change collectively referred to as 'globalization.' The concept of globalization will be analyzed from a number of perspectives. Macro-level changes are addressed as are local adaptation strategies of individuals, communities and organized groups. Special attention is paid to the role of institutions, such as corporations, national and subnational governments and non-governmental and multilateral organizations, in the globalization process. The class will work through and discuss books critical of, and sympathetic to, the globalization process.
Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed
CGI, Comm Points: 1

SOC 490  Independent Study
Designed primarily for an advanced student who wishes to pursue special interests in sociology for one or more semesters, this series allows students to design and conduct independent study projects under faculty guidance.
Prerequisite: consent of the instructor.
Credits: (1-10), Graded, Semester Calendar
Independent Study, Every Semester

SOC 498  Undergraduate TA
A student assists a faculty member in teaching a course. The student engages in substantial pedagogical work beyond mastery of the course material. Such activities may include mentoring students in course work, leading class discussions, designing and presenting course modules, etc. The primary objective is for the students to work with a faculty member to learn and practice pedagogical approaches in the discipline.
Credits: (1-3), Graded, Semester Calendar
Independent Study, Given When Needed

Social Sciences

SS 1 (3, 5...)  Social Science Elective
For transfer credit only.
Credits: (1-9), Graded, Semester Calendar
Lecture, Transfer Credit Only

SS 2 (4, 6...)  Social Science Elective
For transfer credit only.
Credits: (1-9), Graded, Semester Calendar
Lecture, Transfer Credit Only

SS 220  Introduction to Gender
This introductory course examines how being male or female translates into the social relationships of gender. It explores the ways gender roles, identities and institutions are constructed in relation to race, ethnicity, class, and sexuality. This course provides a general introduction to the wide array of historical, cultural, social, political, economic, and philosophical topics usually included within the boundaries of gender studies.
Instructors for this course come from various disciplinary backgrounds. Course content will vary among the sections as instructors draw on their diverse disciplinary backgrounds in order to instruct students in critical thought, intellectual empathy and global perspectives.
Credits: (3), Graded, Semester Calendar
Lecture,
UNIV/CGI/IG, Comm Points: 1

SS 221  Introduction to Sexuality
This introductory course examines how sexuality is constructed from a social perspective. It explores the ways sex acts, sexual roles, identities, relationships and institutions are constructed in relation to race, ethnicity, class, and sexuality. This course provides a general introduction to the wide array of historical, cultural, social, political, economic, and philosophical topics usually included within the boundaries of sexuality studies. Students will learn how the study of sexual intercourse and sexuality differ among disciplines and how the interdisciplinary approach differs from a singular disciplinary focus.
Credits: (3), Graded, Semester Calendar
Lecture,
UNIV/CSO/IG Comm Points: 1

SS 320  Social and Political Issues in the Adirondacks
[Cross-listed with EV 320] The historical, social, political, and environmental factors contributing to the fabric of the Adirondack Park is an evolving social experiment. The course readings will focus upon the New York State constitutional provisions that engendered the park, the policies that shaped the park, along with the political actions that influence the park today. The Adirondack State Park is extraordinary for its history and because it is a place where human residents live and recreate in sustainable ways that conserve resources and 'forever wild' regions of the park.
Enrollment is limited to those students participating in the Adirondack Semester Program.
Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed
CSO
Comm Points: 2
SS 380 Research Methods
This course provides an introductory survey of social science research methods. The course covers a variety of quantitative and qualitative methods. Course topics include sampling strategies, use of basic population statistics, testing differences between groups, conducting in-depth interviews and participate and non-participant observation. Students will understand different approaches to conducting research in the social sciences and which approaches to utilize to maximize the effectiveness and accuracy of social inquiry.
Credits: (3-4), Graded, Semester Calendar Lecture, Given When Needed (TECH)

SS 490 Independent Study
Designed primarily for an advanced student who wishes to pursue special interests in social sciences for one or more semesters, this series allows students to design and conduct independent study projects under faculty guidance.
Prerequisite: consent of the instructor.
Credits: (1-10), Graded, Semester Calendar Independent Study, Every Semester

SS 499 Minor Portfolio
In this course, students complete their Liberal Arts Minor Portfolios under the direction of their minor advisor. The course is graded on a Pass-No Entry Basis.
Credits: (0), P/NC, Semester Calendar Independent Study,

Statistics and Probability

STAT 1 (3, 5...)
A college level course for which there is no comparable Clarkson course. Used for transfer credit only.
Credits: (2-4), Graded, Semester Calendar Independent Study, Transfer Credit Only

STAT 2 (4, 6...)
A college level course for which there is no comparable Clarkson course. Used for transfer credit only.
Credits: (2-4), Graded, Semester Calendar Independent Study, Transfer Credit Only

STAT 282 General Statistics
(May be used to satisfy a CUSB MBA or MS foundation requirement.) Introduction to statistical methodology. Topics include descriptive statistics, probability distributions, use of computer packages for statistical data analysis, point and interval estimation, hypothesis testing, two-sample tests, comparisons, measuring and testing association, correlation, regression, and analysis of variance (ANOVA). Emphasis on applications to life sciences, social sciences, business. Restriction: Not open to mathematics, applied math and statistics, or computer science majors; not open to students who have taken or are taking MA 132.
Credits: (3), Graded, Semester Calendar Lecture, Discussion, Every Term

STAT 301 Statistics Elective
An upper-division statistics or probability course for which there is no comparable Clarkson course. Used for transfer credit only. This course may be used to satisfy the requirements of the Mathematics or Applied Mathematics and Statistics major or the Statistics minor.
Credits: (3-4), Graded, Semester Calendar Independent Study, Transfer Credit Only

STAT 318 Biostatistics
[Cross-listed with BY 318] This course introduces students to descriptive statistics, fundamentals of probability, probability distributions, and methods of statistical inference. Topics include correlation, regression, Bayes theorem, estimation, hypothesis testing, nonparametric methods, and categorical data analysis. A required 2 hour lab practicum will enable students to apply statistical concepts and analytical methods to data from a wide range of biology-related fields, such as ecology, evolution, environmental science, psychology, biotechnology, and biomedical sciences. The use of statistical software is required and data interpretation is emphasized. Prerequisites: BY140 or BY160 or equivalent; MA181 or equivalent; or consent of the instructor
Credits: (4), Graded, Semester Calendar Lecture, Laboratory, Spring Semesters

STAT 381 Probability
[Cross-listed with MA 381] Sample spaces; axioms of probability; basic theorems; random variables (discrete and continuous); combinatorial methods; Bayes' Theorem and conditional probability; expected values and variances; distribution functions, including: binomial and multinomial, Poisson, normal and bivariate normal distributions, and others such as geometric, hypergeometric, negative binomial, exponential, gamma and beta; joint distributions; covariance and correlation; central limit theorem; geometric probability; method of transformations; introduction to stochastic processes. Prerequisite: MA231 or MA230 (MA211 Recommended)
Credits: (3), Graded, Semester Calendar Lecture, Fall Terms

STAT 382 Mathematical Statistics
[Cross-listed with MA 382] A rigorous course in statistics. Topics include random variables and their distributions, data reduction, estimation, sampling distributions, testing, optimal tests, analysis of variance and nonparametric statistics. Prerequisites: MA/STAT381
Credits: (3), Graded, Semester Calendar Lecture, Odd Spring Semesters

STAT 383 Probability and Statistics
A calculus based introduction to topics in probability and statistics. Probability content includes events and sample spaces, the basic axioms of probability, discrete and continuous random variables (definitions and basic characterizations such as the means and variances) including binomial, Poisson, normal, exponential, student- t, and uniform distributions. Topics in statistics include the central limit theorem, statistical inference including confidence intervals and hypothesis testing for one and two sample data, and linear regression. Students will use statistical software to read data and interpret software generated output. Students may not receive credit for both STAT 383 and STAT 389. Prerequisites: MA132
Credits: (3), Graded, Semester Calendar Lecture, Every Term
STAT 384  Advanced Applied Statistics
(Continuation of STAT 383.) Review of basic concepts (estimation, testing and simple linear regression). Multiple regression, analysis of variance and experimental design. Additional topics may include nonparametric statistics, goodness of fit tests, analysis of covariance and quality control. This course will require use of statistical software. Interpretation of computer output and applications will be emphasized throughout. Prerequisites: MA230 or MA231, and STAT383 or STAT389 Credits: (3), Graded, Semester Calendar
Lecture, Even Spring Terms

STAT 385  Bayesian Data Analysis
This course will introduce both the principles and practice of Bayesian methods for data analysis. This is a hands-on course that will use MATLAB software. Students will learn to write their own Bayesian computer programs to solve problems relevant to engineering, biology, chemistry, physics, earth science, ecology, economics, signal processing and machine learning. Topics that will be included are parameter estimation, model selection, time series and error analysis. Prerequisites: STAT 383 or MA/STAT 381, or by instructor consent
Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed

STAT 389  Probability and Statistics with Multivariate Analysis
A multivariate-calculus based introduction to probability and statistics. Probability content includes sample spaces; axioms of probability; basic theorems; random variables (discrete and continuous); Bayes’ Theorem and conditional probability; expected values and variances; distribution functions, including: binomial, Poisson, normal and bivariate normal distributions; joint, marginal, and conditional distributions. Optional material includes and moment generating functions, characteristic functions, and distributions of sums of RVs. Topics in statistics include sampling distributions, likelihood functions, descriptive statistics, central limit theorem, hypothesis testing and parameter estimation for normally distributed data, and maximum likelihood estimators. Optional topics include analysis of type 1 and 2 errors and statistical approaches to minimizing error. Students will use statistical software to read data and interpret software-generated output.
Students may not receive credit for both STAT 383 and STAT 389.
Prerequisite: MA230 or MA231. Students may not enroll in STAT389 if they have credit for STAT383.
Credits: (3), Graded, Semester Calendar
Lecture, Fall Terms

STAT 409  Directed Study in Probability and Statistics
[Cross-listed with MA 409] A directed study in Probability and Statistics, intended to give a student the opportunity to further explore an area of interest to them under the supervision of a faculty member.
Credits: (1-10), Graded, Semester Calendar
Independent Study, Given When Needed

STAT 488  Statistics Projects
Students engage in statistical projects under the supervision of a faculty member. The topic will be determined by student interest and faculty research programs. This course may be repeated for a maximum total of three credits.
Prerequisite: consent of the instructor.
Credits: (1-3), Graded, Semester Calendar

Science, Technology, Engineering & Math

STEM 330  History and Philosophy of Science and Math
This course looks at teaching STEM-related content from historical and philosophical perspectives, as its title suggests. In this course you will not only assimilate the concepts presented but will also evaluate and create instructional strategies and materials that can infuse these concepts into your own secondary courses. This expectation is in many respects more demanding and time-consuming than expecting you to learn an abundance of historical detail and philosophical argument and regurgitate it back on an examination. This course will argue that historical and philosophical content can be used to enhance secondary students’ understanding of the STEM concepts and methods they are expected to attain and ask you to develop or restructure lessons and materials to illustrate that enhancement. Ideally, having science, mathematics, and technology students in the course this year will enhance the general knowledge of all participants and help them distinguish between the unique elements of each enterprise.
Credits: (3), Graded, Semester Calendar
Lecture, Fall Terms

Science, Technology, & Society

STS 2 (4, 6...)  Science, Technology & Society Elective
A college level course for which there is no comparable Clarkson course. Used for transfer credit only. This course may be used to satisfy the Science, Technology & Society Knowledge Area requirement.
Credits: (2-4), Graded, Semester Calendar
Independent Study, Transfer Credit Only
STS

STS 100  HEO Perspectives on Science & Technology
[Formerly LP100] This course is designed to be used in the HEO Summer Program for incoming students. It helps student develop their critical thinking and writing skills in preparation for their college courses. Offered Pass/No Credit. Prerequisite: For HEO students only.
Credits: (2.5), Graded, Semester Calendar
Lecture, Summer Terms
STS
Comm Points: 1

Technology

TECH 100  Design Technology
Credit for this course is awarded only in the following cases: 1) receipt of a score of 5 through 7 on the International Baccalaureate Design Technology Higher-Level Examination or 2) satisfactory completion of a college-level course that meets the criteria for a Technology Course but for which there is not an appropriate Clarkson course prefix.
Credits: (3), Graded, Semester Calendar
Independent Study, Transfer Credit Only
(TECH)
University

UNIV 100 The Success Seminar
This course is designed to provide strategies to help students succeed in classes and empower them to become active, responsible learners. During this course, students will learn several useful strategies regarding self-awareness, establishing goals, developing supportive relationships, identifying preferred learning styles, managing time, taking notes, and developing strategies for more effective reading of texts. Restriction: Freshman &/or Sophomore Standing
Credits: (0), P/NC, Semester Calendar
Lecture, Spring Terms

UNIV 102 Strategies for Becoming your Best-Balanced Self
This seminar-style course is an intentional and integrated effort to promote whole person wellness to maximize academic, professional and personal success. By exploring the areas of physical, financial, spiritual, professional, and emotional wellness, students will begin to develop an individualized definition of success. Students will learn about creating a work-life balance as their academic career becomes more rigorous with the goal of becoming better prepared for their professional job search, make confident academic major choices, and develop a greater understanding of post-graduate career options. Students will be encouraged to engage in decision making regarding curricular and co-curricular experiences from a wellness perspective. The course is a collaborative effort across multiple Clarkson University departments designed to provide a supportive mechanism, in addition to academic advising, for further soft-skill development and resilience habits. Throughout the course students will engage in activities designed to develop professional mindset, develop appropriate course schedules, and learn how to maximize academic advisor appointments. Students will also participate in multiple engagement opportunities with Alumni to encourage job shadowing, career research, and professional connections.
Credits: (0), No Grade, Semester Calendar
Seminar, Fall Terms

UNIV 190 The Clarkson Seminar
The Clarkson Seminar welcomes first year students into a world of cultures, histories, and the global forces that will shape their personal and professional lives beyond Clarkson. Students will learn to define issues within a broad cultural context and gain experience evaluating and interpreting literary and nonliterary texts. Seminar classes will be a small and thematically structured, with an emphasis on discussion, critical reading and thinking, extensive writing, and collaborative work.
Credits: (3), Graded, Semester Calendar
Lecture, Fall Terms

UNIV 267 Introduction to Canada
This course will introduce students to Canada and the US-Canada relationship. In particular, the course will cover a broad swath of topics across academic disciplines including: geography, history, sociology, politics/government, economics, and the arts. Particular emphasis will be placed on comparing and contrasting Canada and the United States, but will also cover important current events and other issues unique to Canada, including the Quebec question and the future of Canada. The course will be a blend of classroom lectures/discussions and experiential trips to major Canadian cities/regions, including Ottawa, Montreal, Quebec, and Toronto.

UNIV 299 Global Service
The focus of this course is a one-to-two week trip abroad for a service learning experience. Each section, centered on a unifying theme and geographic location, will include three components: experience, reflection and action. Through community connections and hands-on experience, students develop deeper global awareness and stronger critical thinking and problem solving skills. Students will return empowered to make positive change in their community and beyond. The travel group will spend quality time in a community, getting to know the people and their way of life. The course instructor works directly with the community to assure each group has a valuable, impactful visit. UNIV 299 is a repeatable course allowing a student to receive credit on completing two or more different Global Service experiences.
Credits: (1), P/NC, Semester Calendar
Independent Study, Spring Semesters

UNIV 349 International Service Learning
This course involves collaboration with non-governmental organization to develop appropriate technology and improve quality of life in a target community overseas. During a semester-long class that meets weekly, students develop an appreciation of the issues involved in international development and an understanding of the context of their project, while at the same time working in teams to solve technological problems according to the NGO’s specifications and community’s needs. Following the end of the semester, students will visit the community to present their solutions, provide necessary training, and assist in implementation of the technology. Through a combination of classroom and experiential learning in the community, students will gain global awareness, improve critical thinking and problem solving skills, and get to know a foreign place and people.
Credits: (3), Graded, Semester Calendar
Lecture, Spring Terms
CSO

UNIV 359 Doctors Without Borders Global Experience
This one-credit pass/fail course is designed for students chosen for the CU Doctors Without Borders out-of-country trip that occurs each summer. This course will provide an in-depth review of ethical volunteering practices, culture of the chosen country to prepare students for competency in language, values, beliefs/religions, clothing, and food. Preparation for medical volunteering will also be incorporated into this course through training on how to take vitals, as well as through the discussion of medical terminology and medical practices of the chosen country.
Credits: (1), P/NC, Semester Calendar
Lecture, Given When Needed

UNIV 399 Global Experience
This course includes intensive study of issues in a country or region outside of the United States followed by a two- to three-week trip abroad to that location. Each section, centered on a unifying theme and geographic location, will include three components: structured classes, practitioner presentations, and visits to companies, governmental agencies, and important cultural sites. Students successfully completing this course will gain a better perspective on
the economic, political, cultural issues as well as the business practices prevalent in another region of the world. Students should develop cultural awareness, an understanding of economic, cultural, and political differences between the US and other countries, and the role cultural, historical and political factors play in the conduct of business in a global economy. UNIV399 is a repeatable course allowing a student to receive credit on completing two or more different Global Study experiences. On approval from the Dean of the School of Business, this course can satisfy global business study requirement. 

Credits: (3), Graded, Semester Calendar
Lecture, UNIV/CGI/CSO
Financial Accounting

AC 603 Management Accounting

[Cross-listed with AC 604] The purpose of this module is to build on the students' knowledge of basic accounting concepts, to enhance their ability to properly evaluate and use accounting data for internal planning, control and decision making. Topics include financial statement analysis; management control; agency costs and organizational behavior; goals and strategies; information economics; responsibility center, profit center and investment center accounting; divisional control and transfer pricing; multinational corporations and foreign currency translation. Consideration is also given to usefulness of information contained in general purpose financial statements. Restriction: Admission to the MBA program required. Credits: (2), Graded, Semester Calendar; Lecture, Discussion, Fall Semesters.

AC 604 Financial and Managerial Accounting for Decision Making

[Cross-listed with AC 603] This course covers Financial and Managerial Accounting concepts for MBA students. The financial accounting portion; covers the fundamentals of the accounting cycle and the evaluation of the major financial statements for external reporting purpose. Furthermore, develop the ability to analyze the financial statements. The managerial cost accounting portion will cover job costing, process costing, cost-volume-profit analysis, budgeting and pro-forma financial statement development, flexible budgets and standard costing systems, cost allocation and responsibility accounting, and tools for short-term business decisions. The overall objective of the course is to develop students' ability to construct accounting reports, understand accounting reports and make decisions from such accounting information. Credits: (3), Graded, Quarter Calendar; Lecture, Summer Terms.

AC 604 Financial and Managerial Accounting for Decision Making

[Cross-listed with AC 603] This course covers Financial and Managerial Accounting concepts for MBA students. The financial accounting portion; covers the fundamentals of the accounting cycle and the evaluation of the major financial statements for external reporting purpose. Furthermore, develop the ability to analyze the financial statements. The managerial cost accounting portion will cover job costing, process costing, cost-volume-profit analysis, budgeting and pro-forma financial statement development, flexible budgets and standard costing systems, cost allocation and responsibility accounting, and tools for short-term business decisions. The overall objective of the course is to develop students' ability to construct accounting reports, understand accounting reports and make decisions from such accounting information. Credits: (3), Graded, Semester Calendar; Lecture, Given When Needed.

AC 608 Corporate and Fiduciary Taxes

Emphasis is placed on federal income tax responsibilities of large corporate businesses. Topics covered include tax planning, tax research, compliance, and trusts. A project or presentation approved by the instructor is required of each student. Prerequisites: Basic course in Financial Accounting or permission of instructor. Credits: (3), Graded, Semester Calendar; Lecture, Odd Spring Semesters.

AC 610 Fraud and Forensic Accounting

[Formerly MBA 610] This MBA course is designed as a seminar. The primary goal of this course is to assist students in recognizing fraud, which will aid in the prevention and detection of fraud. This course will focus on the professional responsibility of accountants to act ethically. The course materials will discuss what a fraud is, how frauds can be committed, how frauds can be uncovered, and what accountants and business executives can do to prevent frauds from occurring in their organizations. We will use a variety of materials that were provided by the Association of Certified Fraud Examiners. In addition, students will analyze fraud case studies. Credits: (3), Graded, Quarter Calendar; Lecture, Spring Terms.

AC 612 Advanced Management Accounting

[Formerly MBA 612] This course is designed for students who have completed an initial course in Cost Accounting at the undergraduate level, or Management Accounting at the graduate level. Topics include budgeting, product costing including activity-based costing, accounting-based managerial and divisional performance metrics, and transfer pricing. Credits: (3), Graded, Quarter Calendar; Lecture, Winter Terms.

AC 613 Advanced Auditing and Research

[Formerly MBA 613] This course is an advanced case and research-oriented study of topics in Auditing. Through a series of cases and related research, students will engage in the practice of auditing using real-world situations as the foundation for technical and theoretical discussions of issues facing the contemporary auditor. Cases will be chosen to reflect current and emerging topics in the practice of public accounting, financial auditing, fraud investigation, and forensic accounting. Auditing communications tools and software-based audit techniques will also be emphasized. Credits: (3), Graded, Quarter Calendar; Lecture, Fall Terms.

AC 620 Accounting Analytics

Understanding how to use data to formulate and solve business problems provides an opportunity for the accounting professional to become a forward-thinking strategic partner in the organization. This course is designed to prepare students with the necessary tools and skills needed to perform data analytics successfully. Based on case studies, students are required to think through the steps needed to provide data-driven insights and recommendations. Labs provide multiple datasets and tutorials. Students will conduct data analysis using Excel and Access (including SQL). The course will develop a student's data analytics mindset (critical thinking skills), that is the development of students' ability to ask questions that can be answered using data. Prerequisites: IA 530 or equivalent. Credits: (3), Graded, Semester Calendar; Lecture, Spring Terms.
AC 623  Financial Statement Analysis
This course helps students utilize the information contained in financial statements to make decisions. It specifically discusses (1) institutional forces underlying the provision of financial statement data, (2) properties of numbers derived from financial statements, (3) key aspects of decisions using financial statement information and the environment in which they are made, (4) design of information appropriate to these decisions. The objective is to allow the student to employ these factors to exploit fully the richness of the information contained in financial statements, while appreciating its limits. Prerequisites: AC205 or AC528 or equivalent. Credits: (3), Graded, Semester Calendar Lecture, Spring Semesters

AC 630  Cost Management
A graduate level course covering basic concepts and techniques of cost management. Topics include basic cost management concepts, cost-volume-profit analysis, strategy and the master budget, the role of costs in pricing decisions, job and activity based costing (ABC) costing systems, relevant costs for decision making, operational and management control systems, target costing, value engineering, theory of constraints, the Balanced Scorecard, and the management and control of quality. Explores the analysis and presentation of information from a behavioral as well as a quantitative perspective. Introduces basic financial and sustainability concepts and reporting issues. Credits: (2), Graded, Semester Calendar Lecture,

AC 636  Auditing
An examination of auditing standards and procedures currently followed by independent public accountants. Ethics, audit evidence and reporting standards are also considered. Credits: (3), Graded, Quarter Calendar Lecture, Given When Needed

AC 648  Seminar in Accounting Information Systems & Auditing
A graduate level introduction to accounting information systems. Coverage includes the basic systems methodology and terminology necessary to prepare students for any of the professional accounting examinations. Emphasis is on the design, internal control mechanisms, documentation and audit problems associated with specific accounting subsystems, i.e. payroll, general ledger, inventory-production or procurement-receivables. The course introduces students to three typical aspects of information technology (IT) systems and audits: audits of computerized information systems, the computer facility, and the process of developing and implementing accounting information systems. A major course segment involves a detailed study, including hands-on experience using commercial software of at least one specific subsystem. Credits: (3), Graded, Semester Calendar Seminar, Spring Semesters

AC 650  Accounting Research & Theory
Introduces graduate students to accounting research and theory. Focuses on how research can help address management, uniformity and disclosure issues that regularly arise in business. Investigates ethical perspectives and emerging issues. Evaluates policy formulation of accounting standards and their impact on financial reporting. Students research, analyze, develop and present proposed solutions to accounting and related business cases encountered in practice. Prerequisites: AC404 or equivalent Credits: (3), Graded, Semester Calendar Lecture, Spring Semesters

AC 687  Special Projects in Accounting
An investigation of a problem undertaken by the student which is acceptable to and under the guidance of the faculty member and chairperson. The course provides an opportunity for the student to investigate and analyze a problem area of accounting in depth on an independent study basis. Requirement: Instructor and Program Chair permission Credits: (1-3), Graded, Quarter Calendar Independent Study,

AC 687  Special Projects in Accounting
An investigation of a problem undertaken by the student which is acceptable to and under the guidance of the faculty member and chairperson. The course provides an opportunity for the student to investigate and analyze a problem area of accounting in depth on an independent study basis. Requirement: Instructor and Program Chair permission Credits: (1-3), Graded, Semester Calendar Independent Study, Given When Needed

Anthropology

ANTH 555  Culture and the Environment
[Cross-listed with ANTH255] This course will cover the same subject area and topics as ANTH 255. Additional materials at the graduate level will be expected of those who register under this catalog number. (The attached syllabus includes the additional requirements for graduate students.) Credits: (3), Graded, Semester Calendar Lecture, Given When Needed

ANTH 585  Food and Society or What to Think About What You Eat
This course will cover the same subject area and topics as ANTH 285. Additional materials at the graduate level will be expected of those who register under this catalog number. Credits: (3), Graded, Semester Calendar Lecture,
Bioethics

BIE 500 Proseminar in Health and Human Values

An intensive eight-day introduction to current topics in clinical ethics and bioethics, taught seminar style with a clinical visit to Mount Sinai School of Medicine in New York City. This overview of current issues in bioethics humanities involves four special pro-seminars, case conferences and ethics rounds. There will also be training in the computer skills (demonstrations, workshops) essential to mastering distance learning. Must be taken in the first fifteen months of enrollment.

Credits: (3), Graded, Quarter Calendar
Seminar, Summer Terms

BIE 510 Biomedical Ethics

An advanced introduction to bioethics and clinical ethics focusing on such formalizations of medical morality as the Hippocratic Oath, the AMA codes, the Belmont Report and Beauchamp and Childress Principles, and the idea of casuistry. Major cases in bioethics will also be reviewed and the evolution of the core concepts and infrastructure of medical ethics and bioethics will be examined.

Credits: (3), Graded, Quarter Calendar
Lecture, Fall Terms

BIE 510 Biomedical Ethics

An advanced introduction to bioethics and clinical ethics focusing on such formalizations of medical morality as the Hippocratic Oath, the AMA codes, the Belmont Report and Beauchamp and Childress Principles, and the idea of casuistry. Major cases in bioethics will also be reviewed and the evolution of the core concepts and infrastructure of medical ethics and bioethics will be examined.

Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed

BIE 520 Healthcare Policy

This course provides an understanding of the public policy-making process and the political and regulatory environment in which healthcare organizations function. It also provides an understanding of managerial processes, politics, and structure of the healthcare organizations where ethical policies and practices are implemented and carried out on an ongoing basis. Policies for consideration include resource allocation, end-of life decision-making, accountability and performance measurement, and conflict of interest.

Credits: (3), Graded, Quarter Calendar
Lecture, Winter Quarters

BIE 525 Public Health Ethics

In this course, students learn about ethics and public health and the ways in which these two fields interconnect. The course focuses on ethical theory and the discipline and history of public health, using case studies to illustrate the application of ethical theory to public health practice.

Credits: (3), Graded, Quarter Calendar
Lecture, Winter Quarters

BIE 530 Bioethics and the Law

This course provides an introduction to the major legal issues and concepts arising in the field of bioethics. Emphasis will be placed on (1) mastery of key legal concepts and rules that pertain to bioethics (i.e., what the law is) and (2) demonstration of ability to critically analyze the law from a normative bioethical perspective (i.e., argue for what the law ought to be).

Credits: (3), Graded, Quarter Calendar
Lecture, Spring Terms

BIE 531 Bioethics and the Law

The course will familiarize students with the most pertinent issues in Neuroethics, but will emphasize those issues which have some immediate application in clinical settings, such as criteria for brain death, the ethics of enhancement and justification of memory manipulation. The overall objective of the course is to demonstrate continuity between neuroethics and other areas of bioethics, and to identify the application of major ethical principles to this new branch of ethics.

Credits: (1.5), Graded, Quarter Calendar
Lecture, Every Other Spring Quarter

BIE 535 Medicine and Social Justice

This course examines issues of social justice in medicine, beginning with a review of classical (Aristotle) and contemporary (Rawls) works on political philosophy, ethics and justice. Students will also read some of the theoretical work of authors who focus their attention on justice in medicine (including Daniels and Menzel). Building on these philosophic underpinnings, students will then explore the issues that lie at the heart of justice in medicine: the right to health and healthcare, aggregation and utility, personal responsibility, prioritarianism, and the allocation of medical resources.

Credits: (3), Graded, Quarter Calendar
Lecture, Fall Terms

BIE 545 Reproductive Ethics

The course examines the philosophical, ethical, and legal problems arising from assisted reproductive technologies. We begin with the notion of procreative liberty. Procreative liberty is conceived as the right to make one’s own reproductive decisions, whether to have or to avoid having offspring. We will not be discussing the right to avoid reproduction by contraception or abortion, as these topics would require a longer course, or even a course of its own. Instead, this course focuses on the right to reproduce: its nature, scope, and limits.

Credits: (3), Graded, Quarter Calendar
Lecture, Every Other Summer Quarter
BIE 555 Research Ethics
This course is designed to teach students about the ethics of scientific research, particularly research involving human participants. Upon completion of the course, students should be able to: (a) discuss in depth the principles of bioethics and how these principles should be applied to the ethical design and conduct of research involving human participants or animal subjects; (b) identify, define, and analyze ethical issues in the context of novel and potentially problematic areas of scientific research; (c) identify, through case studies, ethical issues that arise in different contexts and begin to reason through an appropriate course of action. In addition, students will be taught basic practical skills in research, writing and reviewing articles, and providing training and education in bioethics.
Credits: (3), Graded, Quarter Calendar
Lecture, Fall Terms

BIE 555 Research Ethics
This course is designed to teach students about the ethics of scientific research, particularly research involving human participants. Upon completion of the course, students should be able to: (a) discuss in depth the principles of bioethics and how these principles should be applied to the ethical design and conduct of research involving human participants or animal subjects; (b) identify, define, and analyze ethical issues in the context of novel and potentially problematic areas of scientific research; (c) identify, through case studies, ethical issues that arise in different contexts and begin to reason through an appropriate course of action. In addition, students will be taught basic practical skills in research, writing and reviewing articles, and providing training and education in bioethics.
Credits: (3), Graded, Quarter Calendar
Lecture, Fall Terms

BIE 563 Pediatric Ethics
This course cover standards for surrogate decision making for children; ethical issues with respect to very premature neonates; withholding and withdrawing life sustaining care; genetic testing and screening; and adolescent confidentiality, truth-telling, and decision making. This course will include guest participation by members of the Icahn School of Medicine faculty, including experts in neonatology, adolescent health, genetics, and pediatric oncology.
Credits: (1.5), Graded, Quarter Calendar
Lecture, Every Other Spring Quarter

BIE 568 Empirical Methods in Healthcare Policy
This course is intended for those students that have prior background in reading empirical literature or in conducting empirical research. Methods will be presented that are more advanced than those found in standard undergraduate statistics courses.
Credits: (1.5), Graded, Quarter Calendar
Lecture, Fall Terms

BIE 569 Statistical Methods in Healthcare
The purpose of this course is to cover statistical topics applicable to healthcare settings, not typically covered in an introductory statistics course. These topics include study designs commonly applied in healthcare, measures of disease frequency and health risk, power analysis, and non-parametric statistics.
Credits: (1.5), Graded, Quarter Calendar
Lecture, Every Other Fall Quarter

BIE 570 Bioethics Policy: Foundations
This course will address prospective rules designed to govern populations and categories of cases. Often, bioethics policies have the force of law (e.g., statute, agency regulation, court precedent); at other times, however, they are voluntarily adopted by institutions or groups (e.g., hospitals, insurers, IRBs, research funders, the AMA).
Credits: (3), Graded, Quarter Calendar
Lecture, Fall Terms

BIE 573 Interpersonal Skills and Communication
This course will provide students with the opportunity to learn the basic components of communication, including active listening, effective vocal style, optimal elicitation of information and the ability to create partnerships with patients, research subjects, families, clinicians and researchers. Using a variety of formats and media, students will develop and practice the interpersonal skills necessary to communicate with clinical ethicists, research ethicists, policymakers and in our daily human interactions.
Credits: (1.5), Graded, Quarter Calendar
Lecture, Every Other Spring Quarter

BIE 574 Contemporary Issues in Bioethics
This course is designed to expose students to contemporary and breaking issues in bioethics. Topics covered will vary from year to year, as they will be drawn from acute issues spurring widespread discussion and assessment by the bioethics community.
Credits: (1.5), Graded, Quarter Calendar
Lecture, Odd Spring Terms

BIE 575 Bioethical Issues at the End of Life
This course examines some of the philosophical, ethical and policy programs arising at the end of life. It begins with a discussion of death itself, including what it means to say that someone is dead and the criteria for determining that death has occurred. Additional topics covered include advance directives, assisted death and whether or not people have a 'right to die.'
Credits: (3), Graded, Quarter Calendar
Lecture, Every Other Summer Quarter

BIE 576 Independent Study in Bioethics
This course will be used for independent study course when needed. This will be a 1/2 course elective.
Credits: (1.5), Graded, Quarter Calendar
Independent Study, Given When Needed

BIE 577 Managerial Epidemiology
[Cross listed with HC680] This 5-week online course focuses on applying basic epidemiological methodologies in healthcare management. The epidemiology life cycle begins with the identification of problems which are described in terms of person, place, and time. Health care planning relies on needs assessments to allocate resources to epidemiological and population health issues. A variety of study designs are used to generate data to analyze causes or patterns of disease frequency. The life cycle concludes with methods for decision making and to realize health care quality improvements.
Credits: (1.5), Graded, Quarter Calendar
Lecture, Spring Terms
### BIE 578  
**Special Topics in Bioethics**  
Advanced topics in specialized aspects of bioethics.  
Credits: (1.5), Graded, Quarter Calendar  
Lecture, Given When Needed  

### BIE 580  
**Research Ethics II**  
This course teaches students about the ethics and policies governing scientific research, particularly research involving human participants or animal subjects. This course builds upon the knowledge and themes introduced in BIE 555 (Research Ethics I). Research Ethics II covers these topics in greater depth and explores the key US and international laws and policies that regulate the design, conduct, and oversight of trials involving human participants or animal subjects. In addition, students examine in-depth specific areas or types of biomedical research that are potentially controversial or ethically problematic. Required for research ethics track, elective for clinical ethics track. Prerequisites: BIE 555  
Credits: (3), Graded, Quarter Calendar  
Lecture, Winter Quarters  

### BIE 590  
**Clinical Ethics**  
This course deals with the practical applications of clinical ethics, including clinical ethics consulting and its recording and documentation, the work of ethics committees and IRBs, and other practical ethics of clinical ethics.  
Credits: (3), Graded, Quarter Calendar  
Lecture, Winter Quarters  

### BIE 610  
**Online Practicum in Clinical Ethics**  
[Formerly BIE 610C]  
This course is designed to help students develop many of the competencies required to perform clinical ethics consultation (CEC) at a basic level. Upon completion of the course, students should be able to: (a) assess their own strengths and weaknesses with respect to CEC competencies; (b) apply a systematic method to analyze and document CEC cases; (c) practice techniques to help avoid common CEC quality gaps; and (d) recognize complex cases for which advanced-level CEC competencies are required. While the course emphasizes process skills for CEC, students will also gain experience that will augment their clinical ethics content knowledge, emotional intelligence, and critical thinking. Prerequisites: BIE 590  
Credits: (3), Graded, Quarter Calendar  
Practicum, Winter Quarters  

### BIE 611  
**Online Practicum in Research Ethics**  
[Formerly BIE 610R]  
This course is designed to teach skills in clinical ethics consultation. Helps students develop and refine the practical skills introduced in BIE 611 (Online Research Ethics Practicum) through hands-on experience. These skills include: teaching and education, review and oversight of institutional research projects involving human volunteers or animal subjects, and sound management of the research endeavor, including organizational management and policy analysis, arbitration, and mediation. Prerequisites: BIE 580  
Corequisites: BIE 611  
Credits: (3), Graded, Quarter Calendar  
Practicum, Spring Terms  

### BIE 612  
**Online Practicum in Policy**  
[Formerly BIE 610P]  
This course is designed as an opportunity for students to develop and refine the skills of policy analysis that they have learned in prior courses — in particular, in the prerequisites to this course — and to apply them to a range of current issues in bioethics policy. To be as relevant as possible to students with diverse interests and career aspirations in bioethics, the course covers a broad range of policy issues in the bio-sciences, including both public and 'private' bioethics policies.  
Credits: (3), Graded, Quarter Calendar  
Practicum, Winter and Spring Quarters  

### BIE 620  
**On-Site Practicum in Clinical Ethics**  
[Formerly BIE 620C]  
A supervised practical experience in clinical ethics designed to teach skills in clinical ethics consultation. Prerequisites: BIE 590  
Corequisites: BIE 610  
Credits: (3), Graded, Quarter Calendar  
Practicum, Spring Terms  

### BIE 621  
**On-Site Practicum in Research Ethics**  
[Formerly BIE 620R]  
A supervised practical experience. Helps students develop and refine the practical skills introduced in BIE 611 (Online Research Ethics Practicum) through hands-on experience. These skills include: teaching and education, review and oversight of institutional research projects involving human volunteers or animal subjects, and sound management of the research endeavor, including organizational management and policy analysis, arbitration, and mediation. Prerequisites: BIE 580  
Corequisites: BIE 611  
Credits: (3), Graded, Quarter Calendar  
Practicum, Spring Terms  

### BIE 630  
**Masters Project I**  
The Master's project in bioethics involves three terms of independent research (under the direction of a faculty supervisor) culminating in a written document that addresses some aspect of clinical ethics, research ethics, or bioethics policy.  
Credits: (3), Pass/Fail, Quarter Calendar  
Independent Study, Fall Terms  

### BIE 635  
**Masters Project II**  
The Master's project in bioethics involves three terms of independent research (under the direction of a faculty supervisor) culminating in a written document that addresses some aspect of clinical ethics, research ethics, or bioethics policy.  
Credits: (3), Graded, Quarter Calendar  
Independent Study, Winter Terms  

### BIE 640  
**Masters Project III**  
The Master's project in bioethics involves three terms of independent research (under the direction of a faculty supervisor) culminating in a written document that addresses some aspect of clinical ethics, research ethics, or bioethics policy.  
Credits: (3), Graded, Quarter Calendar  
Independent Study, Spring Terms
### BIE 650 Capstone

Capstone practicum in which students demonstrate their mastery of clinical ethics, research ethics or bioethics policy. Each student presents their Masters Project.

Credits: (3), Graded, Quarter Calendar

Lecture, Spring Terms

### BIE 670 Proseminar in Biomedical Ethics (Spanish)

Onsite introduction to biomedical ethics, methodology and history, as well as the responsible conduct of research. Designed to orient trainees, to serve as a springboard for the Caribbean Research Ethics Education Initiative, and to introduce trainees to the subsequent online courses and the faculty that teach them.

Credits: (3), Graded, Quarter Calendar

Lecture, Summer Terms

### BIE 671 Responsible Conduct of Research (Spanish)

This online course provides trainees with an introduction to the ethics of scientific research, starting with a discussion of responsible conduct of research (commonly referred to by the acronym RCR).

Credits: (3), Graded, Quarter Calendar

Lecture, Fall Terms

### BIE 672 Human Subjects Research (Spanish)

This online course builds upon some of the themes that were first introduced in Responsible Conduct of Research and provides trainees with additional experience in the design, conduct and oversight of trials involving human participants.

Credits: (3), Graded, Quarter Calendar

Lecture, Winter Terms

### BIE 673 Bioethics Policy and Pedagogy (Spanish)

The purpose of this online course is to provide students with basic skills in bioethics policy making and pedagogy. The first half of this course provides trainees with an understanding of the public policy making process and the political and regulatory environment in which researchers and research ethics committees function. The second half of the course is designed to give trainees practical experience in teaching bioethics and research ethics to adult learners, covering such topics as theories of active learning, knowledge taxonomies, course planning and development, assessment and grading, and observation and feedback.

Credits: (3), Graded, Quarter Calendar

Lecture, Summer Terms

### BIE 674 Online Practicum and Project (Spanish)

During this online course, trainees will carry out individual projects in their home countries and institutions, building off the knowledge and skills learned in Bioethics Policy and Pedagogy.

Credits: (3), Graded, Quarter Calendar

Lecture, Summer Terms

### BIE 675 Capstone (Spanish)

The purpose of this onsite course is to assess how well students have learned the knowledge and the practical skills necessary for functioning as policymakers and research ethics educators in their home countries, and in promoting institutional change.

Credits: (3), Graded, Quarter Calendar

Lecture, Summer Terms

### BIE 680 Proseminar in Biomedical Ethics (English)

Onsite introduction to biomedical ethics, methodology and history, as well as the responsible conduct of research. Designed to orient trainees, to serve as a springboard for the Caribbean Research Ethics Education Initiative, and to introduce trainees to the subsequent online courses and the faculty that teach them.

Credits: (3), Graded, Quarter Calendar

Lecture, Spring Terms

### BIE 681 Responsible Conduct of Research (English)

This online course provides trainees with an introduction to the ethics of scientific research, starting with a discussion of responsible conduct of research (commonly referred to by the acronym RCR).

Credits: (3), Graded, Quarter Calendar

Lecture, Summer Terms

### BIE 682 Human Subjects Research (English)

This online course builds upon some of the themes that were first introduced in Responsible Conduct of Research and provides trainees with additional experience in the design, conduct and oversight of trials involving human participants.

Credits: (3), Graded, Quarter Calendar

Lecture, Fall Terms

### BIE 683 Bioethics Policy and Pedagogy (English)

The purpose of this online course is to provide students with basic skills in bioethics policy making and pedagogy. The first half of this course provides trainees with an understanding of the public policy making process and the political and regulatory environment in which researchers and research ethics committees function. The second half of the course is designed to give trainees practical experience in teaching bioethics and research ethics to adult learners, covering such topics as theories of active learning, knowledge taxonomies, course planning and development, assessment and grading, and observation and feedback.

Credits: (3), Graded, Quarter Calendar

Laboratory, Winter Terms

### BIE 684 Online Practicum and Project (English)

During this online course, trainees will carry out individual projects in their home countries and institutions, building off the knowledge and skills learned in Bioethics Policy and Pedagogy.

Credits: (3), Graded, Quarter Calendar

Laboratory, Spring Terms

### BIE 685 Capstone (English)

The purpose of this onsite course is to assess how well students have learned the knowledge and the practical skills necessary for functioning as policymakers and research ethics educators in their home countries, and in promoting institutional change.

Credits: (3), Graded, Quarter Calendar

Independent Study, Spring Terms

### BIE 693 International Rsrch Ethics I

In this online course, fellows will be able to identify and explain the prominent ethical, social and legal issues in research ethics and apply ethical and professional principles to those issues.

Credits: (3), Graded, Quarter Calendar

Lecture, Winter Terms
BIE 694  
International Research Ethics II
In this online course, a continuation of Research Ethics I, fellows will master the knowledge base that will allow them to function as ethicists on research ethics committees. They will understand the legal and ethical complexities of contemporary research issues occurring in their home countries and how the local prevailing approaches and standards compare and contrast to international ones.
Credits: (3), Graded, Quarter Calendar
Lecture, Spring Terms

BIE 695  
Online Practicum and Project
The online practicum and project course is the key vehicle for preparing fellows to facilitate institutional and societal change with regard to ethical practices in international health research. Working with a faculty supervisor, fellows carry out projects in their home institutions including: developing and teaching short courses on research ethics, conducting empirical studies of research ethics practices, writing and implementing policies for research ethics committees, improving the management of research ethics committees, and influencing the public policy agenda of governmental bodies and non-governmental organizations.
Credits: (3), Graded, Quarter Calendar
Lecture, Spring and Summer Terms

BIE 696  
Online Project
The Online Project course is a key vehicle for preparing trainees to facilitate institutional and societal change with regard to ethical practices in international health research. During this course trainees will carry out independent projects in their home institutions, including: developing and teaching short courses on research ethics, conducting empirical studies of research ethics practices, writing and implementing policies for research ethics committees, and influencing the public policy agenda of governmental bodies and non-governmental agencies. Additional practical skills useful in completing the project are also taught.
Credits: (3), Graded, Quarter Calendar
Lecture, Fall Terms

BIE 699  
Online Practicum and Capstone
In the combination onsite practicum and capstone, fellows will acquire and demonstrate the practical skills necessary for functioning as independent research ethicists in their home countries and in promoting institutional change. It also provides an opportunity for fellows to demonstrate that they have mastered the essential knowledge base and practical skills necessary to function as a competent research ethicist in the CEE environment.
Credits: (3), Graded, Quarter Calendar
Lecture, Summer Terms

Educational Biology

BIO 556  
Biology Demonstrations
Students learn by doing! It is with this premise that BIO 556 encourages the development of independent thought and research by its participants. The design of this 3-credit course is to meet the needs of students currently conducting an internship or planning an internship in the Master of Arts in Teaching Program at Clarkson University. The students will research publications and internet sites in order to compile a usable resource binder. The laboratory activities they investigate will relate to all conceptual areas of biology. Particular attention will be given to the learning standards and required laboratory activities necessary for successful completion of The Living Environment course taken by New York State high school students. The laboratory activities they develop will not only be presented to our class at CU, but should also be used during their internships at local high schools. The students will 'self-evaluate' lab activities using a standard form provided by the instructor.
Restriction: This course is open only to students matriculated in the Master of Arts in Teaching program (or by instructor consent)
Credits: (3), Graded, Semester Calendar
Lecture,

BIO 580  
MAT Project in Biology (Content Area)
The MAT Project is a one-term research project whose purpose is to allow students time and supervision to develop breadth and/or depth of knowledge to become a better teacher in their certification field. What the project will entail varies greatly from student to student. The course is intended to be custom-tailored to meet the specific needs of an individual intern. MAT projects are well grounded in research and theory, but also include a strong and extensive applied aspect, directly addressing the question: What would this look like in the classroom? Restriction: This course is open only to students matriculated in the Master of Arts in Teaching program (or by instructor consent)
Credits: (3), Graded, Semester Calendar
Lecture, Spring Terms

Business of Energy

BOE 606  
MS-BOE Graduate Project - Studies
This non-credit Seminar project provides a capstone experience for Business of Energy MS students. The purpose is to further develop the student's communication, critical thinking, and interaction skills via a capstone experience on a Business of Energy topic that holds a special interest to the student. The candidate and faculty advisor agree on project scope and evaluation process. The candidate performs required analytical and/or experimental studies to complete a Graduate Project Paper and Presentation.
Credits: (0), P/NC, Quarter Calendar
Seminar, Given When Needed

BOE 610  
Fundamentals of the Business of Energy
An initial umbrella course designed to acquaint the student with the complexities of the present-day power system and how we arrived at this point. It will include a brief history of the industry evolution and will encompass various fuels, types of generation, regulatory authorities, power transmission, distribution, control & dispatch, planning, power markets and revenue flows.
Credits: (3), Graded, Quarter Calendar
Lecture,

BOE 610  
Fundamentals of the Business of Energy
An initial umbrella course designed to acquaint the student with the complexities of the present-day power system and how we arrived at this point. It will include a brief history of the industry evolution and will encompass various fuels, types of generation, regulatory authorities, power transmission, distribution, control & dispatch, planning, power markets and revenue flows.
Credits: (3), Graded, Semester Calendar
Lecture,
BOE 611 Planning and Operations of Power Systems
Operations and planning of power systems will introduce and discuss the decision process regarding generation types, fuels and transmission. Comparisons will be introduced establishing the difference between traditional vertically integrated utilities and unbundled resource suppliers. The principles of electric power systems will be studied along with the impact of deregulation.
Credits: (3), Graded, Quarter Calendar Lecture,

BOE 611 Planning and Operations of Power Systems
Operations and planning of power systems will introduce and discuss the decision process regarding generation types, fuels and transmission. Comparisons will be introduced establishing the difference between traditional vertically integrated utilities and unbundled resource suppliers. The principles of electric power systems will be studied along with the impact of deregulation.
Credits: (3), Graded, Quarter Calendar Lecture,

BOE 612 Power Markets
This course will deal with the intricacies of the workings of the power markets (including gas). It will introduce and discuss the evolution from regulated pricing to market pricing. It will introduce and discuss market-based products necessary for reliable operation; hedging principles; and out-of-market products necessary for a fair and reliable market.
Credits: (3), Graded, Quarter Calendar Lecture,

BOE 613 Regulation & Restructuring
This course will explore the history of legislation, regulation and regulatory authorities in the development of the power industry and its impact on the economy and consumers. The evolution of the relationships between regulators and the regulated; the restructuring of the natural gas and electric industry over the last three decades; and the current regulatory status of both the infrastructure and power markets will also be studied.
Credits: (3), Graded, Quarter Calendar Lecture,

BOE 615 Challenges to Upgrading Aging Infrastructure
This course will examine and evaluate the changing energy horizon as the industry embraces expanding technology, renewable energy, smart grid technology, etc.; to be exercised upon an aging infrastructure. The student will see the critical need for system knowledge and planning to continue to meet the needs and reliability of a sophisticated complex industry struggling to meet the needs of its customers and economic growth.
Credits: (3), Graded, Quarter Calendar Lecture,

BOE 616 MS-BOE Graduate Project - Defense
This non-credit Seminar project provides a capstone experience for Business of Energy MS students. The candidate will deliver and defend results from studies documented in a Graduate Project Paper and Presentation. The candidate receives a pass/fail grade which appears on the official transcript.
Credits: (0), P/NC, Quarter Calendar Independent Study, Given When Needed

BOE 623 Statistical Methods for Reliability and Life Data Analysis
[Cross-listed with EE603 and ME578] Reliability analysis is concerned with understanding the failure modes that affect an engineered product, estimating the expected life of the product under service conditions, and predicting the failure rate of the product as a function of time in service. The primary response variable in reliability analysis is time to failure which may be measured in controlled laboratory experiments, or observed empirically from post-introduction studies of products “in the field”. The analysis of data for which the primary variable of interest is time to failure requires specialized statistical concepts and tools; this course will cover some of the most useful approaches. Examples
will be included from materials, mechanical, and electrical engineering. The techniques covered will be implemented with modern statistical software (JMP). The course will endeavor to be very practical, allowing students to effectively analyze reliability data in real-world applications upon the completion of the course. Prerequisites: EE602, ME577, or CS506 or instructor consent. Credits: (3), Graded, Quarter Calendar Lecture, Winter Terms

Biomedical & Rehabilitation Engineering

BR 500 Biomedical Engineering Fundamentals

[Cross-listed with BY 540] This interdisciplinary course will introduce students to the fundamental and quantitative basics of biomedical rehabilitation engineering. The course will present principles of disability and the diverse roles of engineering in medical and rehabilitation. Students will use engineering methods to study anatomical and physiological systems including applications in rehabilitation engineering, bioinstrumentation, biosignal, and image processing, biomechanics and biomaterials. Graduate students will be required to additionally write a comprehensive paper and present that paper in a short talk to the class. Prerequisites: MA131/132, PH131/132, junior or senior standing. Credits: (3), Graded, Semester Calendar Lecture, Fall Semesters

Educational Business

BUS 527 Current Topics in Business and Marketing I

Students will investigate topics central to accounting, finance, and financial literacy for the preK-12 learner. Accounting and finance principles will be aligned to industry standards and New York state teaching and learning standards. The course is designed for MAT, Business and Marketing students. Restriction: This course is open only to students matriculated in the Master of Arts in Teaching program (or by instructor consent) Credits: (3), Graded, Semester Calendar Lecture, Given When Needed

BUS 562 Current Topics in Business and Marketing II

Current topics in the fields of business and marketing will be explored with attention paid to fundamental concepts as well as future trends. This course is designed for MAT, Business and Marketing students. Credits: (3), Graded, Semester Calendar Lecture, Given When Needed

BUS 574 Work Based Learning - Program Organization

This is the first of two courses that, when successfully completed, enable you to apply for an extension to your New York State Teacher Certification and allow you to place students in a variety of work based learning experiences including, internships, community based work experiences and cooperative work experiences. Credits: (3), Graded, Semester Calendar Field Studies, Given When Needed

BUS 575 Work Based Learning - Program Operation

This is the second of two courses that, when successfully completed, enable you to apply for an extension to your New York State Teacher Certification and allow you to place students in a variety of work based learning experiences including, internships, community based work experiences and cooperative work experiences. Credits: (3), Graded, Semester Calendar Field Studies, Given When Needed

Biography

BY 506 Biomedical Analysis and Instrumentation

[Cross-listed with CM 506] Biomedical Analysis and Instrumentation is a lecture course designed to provide advanced undergraduates and graduate students in basic sciences, biosciences and bioengineering disciplines with scientific and engineering aspects of instrumentation, sample analysis, measuring and processing signals from living organisms. Functioning and calibration of biomedical transducers and devices actually used in clinical practice for analyzing clinical biomarkers for disease diagnostics will be reviewed. Emerging research in bioinstrumentation, biomedical technologies, stand alone and wearable sensing devices, analytical method development and validation will be also be covered. Special emphasis will be placed on measurement principles of medical instrumentation used in health technologies ranging from laboratory scale to next generation wearables. Training in professional ethics, grant writing, patenting, innovation, entrepreneurial activities and FDA regulation for new device development, laboratory management, as well as communication skills will also be provided. Undergraduate assignments include a mid term exam, a research proposal and 2 short review papers. Graduate students will prepare a research proposal and 3 review papers in addition to a mid term exam. Graduate students will also participate in a research proposal panel and prepare short presentations featuring innovative emerging research in the development and prototyping of novel bioinstrumentation. Credits: (3), Graded, Semester Calendar Lecture, Even Spring Terms

BY 510 Developmental Biology

This course will cover the same subject area and topics as that of BY 310. Additional materials at the graduate level will be expected of those who register under this catalog number. Credits: (3), Graded, Semester Calendar Lecture, Odd Spring Semesters

BY 512 Molecular Biology Laboratory

This course will deal with the same subject area and topics as that of BY 412. Additional materials at the graduate level will be expected of those who register under this catalog number. Prerequisites: graduate standing. Credits: (4), Graded, Semester Calendar Laboratory, Fall Terms
course, we will examine how these forms of environmental change disturb biological systems by critically reading key research papers, and discussing their implications for future research and policy action. Credits: (3), Graded, Semester Calendar Lecture, Odd Spring Semesters

BY 527 Advanced Mass Spectrometry
Practical Applications will introduce the students to mass spectrometry and its applications within different fields, including pharmaceutical and biotech industry, academia, government, forensics, etc. Various types of instruments will be discussed, as well as their application within different fields. The course will then focus on different types of well-known "omics", such as proteomics, metabolomics, glycomics, or lipidomics, but also on specialized types of "omics" such as peptidomics, post-translational modification-omics (PTM-omics), interactomics, foodomics, microbiomics, venomics, DNA- RNA- & Protein-adductomics, genomics, proteogenomics or transcriptomics. Particular applications of all these kinds of "omics" in biotechnology & pharmaceutical industry, healthcare, biowarfare and forensics will also be discussed. Prerequisites: CM/BY460/560, or consent of the instructor Credits: (3), Graded, Semester Calendar Lecture, Spring Terms

BY 528 Conservation Biology
BY528 provides a graduate-level overview of the core theory of conservation biology, and how conservation biology is applied for environmental conservation and management. Major topics of this course will include conservation prioritization, the problems of small population size on the long-term persistence of a species, conservation genetics, habitat fragmentation and nature reserve design, invasive species, consequences of extinctions on an ecosystem processes and community structure, and the possible effects on biodiversity of global climate change. A course emphasis will be on the challenge of translating the core lessons of conservation biology to effective policy and environmental management. BY528 students will do additional readings, mathematical simulation exercises, and recitations beyond BY428 students. Prerequisite: Graduate Standing. Credits: (3), Graded, Semester Calendar Lecture,

BY 531 Limnology
Limnology (aquatic science) is the study of physical, chemical, and biological properties of fresh water bodies, e.g. lakes, rivers, reservoirs, and wetlands. This introductory course will provide an array of topics that will, by the multi-disciplinary nature of limnology, call upon students' knowledge of biology, chemistry and physics and place them within the context of aquatic science. The focus of the instruction will be aquatic ecology at all levels of biological organization. Upon completion of the course, the student will be able to characterize the physical, chemical and biological/ecological properties of freshwater through the selection and application of appropriate sampling methods. This course covers the same subject area as BY 431 and includes additional materials at the graduate level. Prerequisite: BY222 or CM132 or consent of the instructor. Corequisite: BY 532 Credits: (3), Graded, Semester Calendar Lecture, Even Fall Semesters

BY 514 Bioinformatics
This course and companion lab will cover the same subject area and topics as BY314. Additional materials at the graduate level will be expected of those who register under this catalog number. Prerequisite: Graduate standing. Credits: (4), Graded, Semester Calendar Lecture, Laboratory, Spring Semesters

BY 518 Principles of Toxicology and Epidemiology
(Cross-listed with IH 416, BY 416, IH 518) This course covers the same topics as IH416 (BY416) and includes additional material on the graduate level. Credits: (3), Graded, Semester Calendar Lecture, Fall Semesters

BY 519 Immunology
This course will cover the same subject area and topics as that of BY 419. Additional materials at the graduate level will be expected of those who register under this catalog number. Credits: (3), Graded, Semester Calendar Lecture, Fall Semesters

BY 520 Microbiology
This course will cover the same subject area and topics as that of BY 320. Additional materials at the graduate level will be expected of those who register under this catalog number. Credits: (3), Graded, Semester Calendar Lecture, Even Spring Semesters

BY 522 Advanced Evolutionary Biology
(Cross-Listed with BY420) An in-depth look into the mechanisms driving evolution at both the phenotypic and genomic level, and how an understanding of evolution is crucial for many applied problems in environmental science and human health. Topics include ecological drivers of evolution, how and why DNA sequences and genomes change, population genetics and evolutionary theory, the evolution of gene families and networks, and horizontal gene transfer. The processes driving evolution will also be explored using computer simulations and evolution experiments with microbes. Students registering in the graduate section of this course will be required to complete extended versions of assignments and exams. Credits: (3), Graded, Semester Calendar Lecture, Spring Terms

BY 524 Experimental Evolution Laboratory
(Cross-listed with BY424) An introduction to experimental approaches used in evolutionary biology. Students will conduct lab experiments using microbes to investigate a range of topics in experimental evolution, observing and exploring evolution as it happens in real time. Topics explored will include adaptive diversification, the evolution of fitness trade-offs, evolutionary loss of redundant traits, and evolutionary rescue. Prerequisites: BY522 Credits: (2), Graded, Semester Calendar Laboratory, Fall Terms

BY 525 Biological Systems and Environmental Change
Human activities are resulting in dramatic global environmental change, in the forms of biodiversity loss, altered biogeochemical cycles, introduced invasive species, chemical toxification of the environment, climate change, unsustainable exploitation of natural resources, and habitat loss, degradation, and fragmentation. In this
**BY 532**  **Limnology Laboratory**
This co-requisite of Limnology (aquatic science) will provide students the opportunity to engage in water sampling of regional lakes and rivers, analysis of samples in the laboratory, introduction to data synthesis, and report writing. Some fieldwork will be required.
Corequisite: BY 531
Credits: (2), Graded, Semester Calendar
Laboratory, Even Fall Semesters

**BY 540**  **Introduction to Biomedical Rehabilitation Engineering and Science**
(Cross-listed with BR 500) This interdisciplinary course will introduce students to basic principles of biomedical rehabilitation engineering. The course will present principles of disability and the diverse roles of engineering in medicine and rehabilitation. Students will use engineering methods to study anatomical and physiological systems including applications in rehabilitation engineering, bioinstrumentation, biosignal and image processing, biomechanics, and biomaterials.
Prerequisites: MA131/132, PH131/132, junior or senior standing.
Credits: (3), Graded, Semester Calendar
Lecture, Fall Semesters

**BY 548**  **Medical Microbiology**
This course will cover the same subject area and topics as that of BY 448. Additional materials at the graduate level will be expected of those who register under this catalog number.
Credits: (3), Graded, Semester Calendar
Lecture, Fall Semesters

**BY 552**  **Pharmacology**
This course will cover the same subject area and topics as that of BY 452. Graduate students will be required to do additional reading and submit a literature review concerning a topic of their choice, relating to the course material.
Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed

**BY 555**  **Cell and Molecular Biology of Cancer**
This course will deal with the same subject area and topics as that of BY 455. Additional materials at the graduate level will be expected of those who register under this catalog number.
Prerequisites: graduate standing.
Credits: (3), Graded, Semester Calendar
Lecture, Spring Terms

**BY 560**  **Comparative Physiology**
In this course, graduate students will be instructed in all the main branches of modern animal physiology with a strong emphasis on the integration of physiological knowledge, ecology, and evolutionary biology. In addition to an in-depth treatment of mammalian physiology, graduate students will be exposed to the various physiological systems that have evolved in other vertebrate, as well as invertebrate, animals. In addition to meeting the demands of the BY360 course, graduate students will be required to do additional reading and submit a literature review concerning a topic of their choice relating to the course material.
Prerequisite: Graduate Standing.
Credits: (3), Graded, Semester Calendar
Lecture, Spring Semesters

**BY 561**  **Neurobiology**
This course will cover the same subject area and topics as that of BY 460. Additional materials at the graduate level will be expected of students who register under this catalog number.
Prerequisites: graduate standing.
Credits: (3), Graded, Semester Calendar
Lecture, Fall Terms

**BY 565**  **Molecular and Genome Evolution**
(Cross-Listed with BY465) An overview of the molecular underpinnings of evolution, and how those molecular changes can be used to characterize and understand the evolutionary history of genes, proteins and organisms. Topics include how and why DNA sequences and genomes change, molecular phylogenetics and evolutionary models, gene duplication and the evolution of gene families, and horizontal gene transfer. For BY 565, additional readings and an additional written and oral report will be required.
Credits: (3), Graded, Semester Calendar
Lecture, Spring Terms

**BY 571**  **Anatomy & Physiology I**
This is the first semester of a two-semester sequence covering the basic principles of Human Anatomy and Physiology. The course will focus on the anatomical organization and physiology of the human body using a systems approach. Lectures will emphasize a basic understanding of how anatomical organization at the cell, tissue and organ level correlates with physiological processes. Clinical connections will be drawn wherever relevant. In addition to covering the same subject areas as that of BY471, some advanced topics will be discussed and the students will be given additional reading and writing assignments. This course can assist students in finding a relevant research question to pursue investigation in the field of biomedical science.
Prerequisite: Graduate standing, or permission of the instructor.
Credits: (3), Graded, Semester Calendar
Lecture, Fall Semesters

**BY 572**  **Anatomy & Physiology II**
This is the second semester of a two-semester sequence covering the basic principles of Human Anatomy and Physiology. The course will focus on the anatomical organization and physiology of the human body using a systems approach. Lectures will emphasize a basic understanding of how anatomical organization at the cell, tissue and organ level correlates with physiological processes. Clinical connections will be drawn wherever relevant. In addition to covering the same subject areas as that of BY472, some advanced topics will be discussed and the students will be given additional reading and writing assignments. This course can assist students in finding a relevant research question to pursue investigation in the field of biomedical science.
Prerequisites: Graduate standing, or permission of the instructor.
Credits: (3), Graded, Semester Calendar
Lecture, Spring Terms
BY 573  Anatomy & Physiology I Laboratory
This is the first semester of a two-semester sequence covering the basic principles of Human Anatomy and Physiology. This is the corresponding laboratory for BY571 and will involve anatomical study using a computer-assisted methodology and demonstrations of anatomical models and specimens. In addition to covering the same subject areas as that of BY473, some advanced topics will be discussed and the students will be given additional reading and writing assignments. Corequisite: BY 571
Credits: (2), Graded, Semester Calendar
Laboratory, Fall Semesters

BY 574  Anatomy & Physiology II Laboratory
This is the corresponding laboratory for BY572. The laboratory exercises will focus on physiology and will involve study using a computer-assisted methodology. The students will learn the principles and methodologies of various physiological measurements including bioelectric signals, pulmonary function tests and nerve reflexes. The course will require students to submit a written project and give an oral presentation for successful completion. In addition to covering the same subject areas as that of BY474, some advanced topics will be discussed and the students will be given additional reading and writing assignments. Corequisite: BY 572
Credits: (2), Graded, Semester Calendar
Laboratory, Spring Terms

BY 576  Current Topics in Biology and Medicine
[Cross-listed with BY476] This course will cover the same subject area and topics as that of BY476. Additional materials at the graduate level will be expected of students who register under this catalog.
Prerequisites: graduate standing.
Credits: (3), Graded, Semester Calendar
Lecture, Spring Semesters

BY 580  Advanced Cell Biology
This course will cover the same subject area and topics as that of BY 480. Additional materials at the graduate level will be expected of those who register under this catalog number.
Credits: (3), Graded, Semester Calendar
Lecture, Fall Terms

BY 582  Molecular Genetics
This course will provide students with detailed information on the structure, packaging, and expression of genes within the genome of both prokaryotes and eukaryotes. Topics will include chromatin packaging and structure; DNA replication mutation and repair; transcription; RNA splicing; translation; and control of gene expression. Included with each of these topics will be primary research papers, which will be discussed during class. During discussions, experiments in the papers will be analyzed as to how they work (focusing on current biotechnology) and critical analysis of the conclusions. Evaluation will involve exams based on material presented during the course as well as participation in discussions and written analysis of presented research papers. This course contains advanced topics and is designed primarily for graduate or advanced undergraduate students. Graduate students will do additional course work.
Credits: (3), Graded, Semester Calendar
Lecture, Spring Terms

BY 586  Molecular Biotechnology
Molecular biotechnology is a rapidly evolving scientific discipline impacting on many aspects of our daily life. This course will review basic concepts and methodologies in recombinant DNA technology, cover the use of molecular biotechnology for the production of useful products in areas of microbial, plant and animal biotechnology and address social and economic issues rising with the availability of these technologies. Additional materials will be expected at the graduate level.
Credits: (3), Graded, Semester Calendar
Lecture, Fall Semesters

BY 588  Stem Cells and Regenerative Medicine
This course will cover biological and medical perspectives of stem cells from their fundamental basic biology and mechanisms of organ regeneration through the use of induced-pluripotent stem cells (iPSCs) for therapeutic benefit. It will deal with mammalian and human embryonic stem cells (hESCs) and focus on how iPSCs generate distinct fates during human development and how this can be used for regenerative therapy of common human diseases. Additional materials expected at the graduate level.
Credits: (3), Graded, Semester Calendar
Lecture, Fall Semesters

BY 600  Directed Study in Bioscience
Students study advanced topics in bioscience not otherwise available in formal graduate courses. Under supervision of a faculty member, a semester-long course of study is designed based on readings from appropriate texts and primary literature.
Prerequisites: Graduate standing and consent of the instructor.
Credits: (1-4), Graded, Semester Calendar
Independent Study, Given When Needed

BY 604  Molecular Pharmacology
In this course, students will be introduced to the techniques used to study the structure and function of membrane receptor proteins, in particular those of two families that together comprise over 80% of pharmaceutical drug targets: ion channels and G protein-coupled receptors. Specifically, students will see how knowledge of a receptor’s 3-dimensional structure and signal transduction mechanism aids understanding of drug action and can assist in the design of newer, better therapeutic agents.
Credits: (3), Graded, Semester Calendar
Lecture, Fall Semesters

BY 608  Teaching in Biosciences
This course is intended to improve bioscience teaching training for graduate students. Graduate students will read literature based on the current state of biology education at the university level (e.g. AAAS Vision and Change in Undergraduate Biology Education). Students will also learn how to design undergraduate bioscience teaching labs, and effectively teach the labs. Activities will include writing a course syllabus, and designing and conducting an original lab activity with resources available on the Clarkson campus. The designed lab can be at the level of a freshman lab, or an upper level biology course. Students will need to consider how the lab will be conducted, what is expected for pre-lab and post-lab assignments, and how lab students will be evaluated. Other activities will include how to write effective laboratory protocols and learning to manage a bioscience laboratory.
Credits: (2), Graded, Semester Calendar
Lecture, Spring Semesters
The course will cover ecological statistics and experimental design, covering a broad and eclectic area of applied statistics used in data description, exploratory data analysis, and statistical hypothesis testing used in environmental science. This course also introduces R as a powerful application for doing experimental design and statistics.

Credits: (3), Graded, Semester Calendar
Lecture, Laboratory, Every Semester

BY 622 Graduate Seminar
Weekly meetings to discuss topics of current research interest and attendance of research seminars presented in the biology department. Each candidate for the IBB M.S. or IBB Ph.D. must enroll and participate in BY622 every semester of their degree and present at least one seminar or more for each calendar year that they are in the program. Prerequisite: graduate standing.
Credits: (1), P/NC, Semester Calendar
Seminar, Every Term

BY 650 Biochemistry I
This course covers the same topics as BY 450 and includes additional material on the graduate level.
Credits: (3), Graded, Semester Calendar
Lecture, Fall Semesters

BY 651 Biochemistry II
This course will cover the same subject area and topics as that of BY 451. Additional materials at the graduate level will be expected of those who register under this catalog number.
Prerequisites: graduate standing.
Credits: (3), Graded, Semester Calendar
Lecture, Spring Semesters

BY 690 Critical Thinking and Research Proposal Development in Biology
This course provides a thorough coverage of the essential elements of research proposal writing, a skill that is required throughout one’s scientific career but for which formal training is frequently lacking. After an introductory lecture that provides a general overview of the conceptualization and writing of a research proposal, students will be guided through a series of exercises designed to develop these critical skills. Subsequent meetings will be in the form of small tutorial groups with a faculty member leading discussion of primary literature and the outstanding questions in a particular field of research. Students will exchange their written reports with their peers to get feedback from their peers at different stages of draft preparation before submitting them to the faculty instructor for grading. Students will be encouraged to meet with their peers outside of class hours to discuss their reports/proposals. This course aims at preparing IB&B PhD students for their pre-proposal and full proposal writing, which are the written requirements for their qualifying examination at the end of their second year. It will also help these students prepare for their oral examination. Other graduate students (MS, PhD in life-science related disciplines) may also benefit from this course.
Credits: (2), P/NC, Semester Calendar
Lecture, Odd Spring Terms

BY 900 Thesis, Dissertation or Special Project in Bioscience
Student performs independent research toward a masters or doctorate degree under the guidance of a faculty thesis advisor. A graduate thesis committee monitors student progress and provides guidance toward completion of the project. Work done in satisfaction of the requirements for a degree will be assigned a grade when the thesis is submitted and approved.
Prerequisites: Graduate standing.
Credits: (1-15), Thesis, Semester Calendar
Thesis Research, Every Semester

BY 999 Special Graduate Topics
A graduate level course for which there is no comparable Clarkson course. This course may be used to satisfy course requirements for a graduate degree.
Credits: (1-10), Graded, Semester Calendar
Independent Study, Transfer Credit Only

Civil and Environmental Engineering

CE 501 Fracture Mechanics of Concrete Structures
Credits: (3), Graded, Semester Calendar
Lecture, Fall Semesters

CE 502 Applications in Geospatial Analytics, Science, & Engineering
This course will use techniques in geospatial analytics, science, and engineering to address applied challenges in various contextual situations. Geotagging, network analysis, spatial visualization, geospatial data manipulation, cartographic presentations, and other similar methods will be studied and applied to real-world or research applications. Students will develop a set of tools that enable completion of projects in the major field using geospatial capabilities.
Prerequisites: Graduate standing, CE 301, or consent of the instructor.
Credits: (3), Graded, Semester Calendar
Lecture, Spring Terms

CE 505 Project Controls and Lean Methods in Construction
This course will cover the use of construction project management controls typical in varying scales of projects. Using the Lean Construction model, the course will cover Lean as both a system and culture, while emphasizing the central place of project delivery processes. Topics in project controls will include: Goal Setting, Scheduling, Budgeting, Problem Solving, and Decision-Making.
Prerequisites: Graduate standing, CE 305, or consent of the instructor.
Credits: (3), Graded, Semester Calendar
Lecture, Spring Terms
CE 506  Advanced Construction Engineering
A study of emerging technologies, trend setting techniques, and new means and methods in construction engineering management. Topics include: emerging technologies which are intended to enhance the analysis, design, construction, performance, and asset management for construction engineering projects; lessons learned from construction sites covering infrastructure and building projects; construction equipment management and selection for construction applications; composite, hybrid, or new materials for construction applications, emerging trends in project delivery, project cost control, and procurement of construction services. Restriction: Graduate standing required. Credits: (3), Graded, Semester Calendar Lecture, Given When Needed

CE 508Building Information Modeling for Construction Prefabrication
This course goes beyond the basics of Building Information Modelling (BIM) moving models from conceptual into application, specifically in order to be able to prefabricate building elements. Students will work to create virtual elements that are then printed via 3D printer or shop prefabricated during the course. The course will cover advance and emerging techniques and methods to the use of current/state of the art computer aided design software including Autodesk Revit.
Prerequisites: Graduate standing, CE 408, or consent of the instructor
Credits: (3), Graded, Semester Calendar Lecture, Spring Terms

CE 510  Sustainable Infrastructure and Building
An application of the use of sustainability rating systems for infrastructure and building projects. Students will use the USGBC LEED and the ISI Envision systems to execute an analysis of a real or realistic project. Focusing on fundamentals of sustainable construction, this course will acquaint students with the processes required to certify/verify projects to meet an independent rating standard. This course will prepare students to take the LEED GA and/or Envision ENV PV exams
Credits: (3), Graded, Semester Calendar Lecture, Fall Terms

CE 512  Structural Dynamics
Response of discrete/continuous systems to dynamic loading. Formulation/solution of problems of one or more degrees of freedom. Modal analysis. Numerical integration and transform techniques. Response of dynamic systems to base motion using response spectrum methods. Credits: (3), Graded, Semester Calendar Lecture, Odd Spring Terms

CE 513  Elastic Waves and Non-Destructive Tests
The course will include 3 modules: elastic waves, inversion, and applications to real-world problems. The module of elastic waves will cover stress propagation problems in elastic solids and waveguides. The module of inversion will include (i) the fundamentals on inverse theory, experimental data and signal processing, (ii) basic inversion methods (global and deterministic optimizations, simulated annealing and genetic algorithm, Gauss-Newton and gradient methods, etc.). Lastly, the module of real-world problems will consist of applications in site characterization, sinkhole detection, unknown foundation, bridge deck evaluation.
Prerequisites: Numerical Methods, Partial Differential Equations
Credits: (3), Graded, Semester Calendar Lecture, Given When Needed

CE 515  Foundations, Stability, and Retaining Structures
Application of principles of soil mechanics to the design of shallow and deep foundations, retaining structures and slope stability. Interpretation of soil boring logs as related to geotechnical engineering design. Preparation of design templates using spreadsheets. (3 credits of design)
Prerequisite: CE310.
Credits: (3), Graded, Semester Calendar Lecture, Fall Semesters

CE 516  Advanced Soil Mechanics
This course presents the following topics: stress-strain behavior of sands and clays, theory and practice of in-situ and laboratory testing, total and effective stress analysis, three-dimensional failure criterion, and basic soil models.
Prerequisite: CE415 or consent of the instructor.
Credits: (3), Graded, Semester Calendar Lecture, Given When Needed

CE 518  Soil Structure Interaction
Application of soil mechanics and foundation engineering to analyze load transfer of deep foundations. Produce p-y curves of laterally loaded piles and T-z and Q-z curves for axially loaded piles. Understand behaviors of grouped piles subjected to lateral and vertical loads. Calculate vertical stiffness of pile foundation and natural frequency. Long-term performance prediction. Prerequisite: CE310 or consent of the instructor
Credits: (3), Graded, Semester Calendar Lecture, Given When Needed

CE 520  Computational Methods of Structural Analysis
The matrix stiffness method, theory and implementation in MATLAB, for the analysis for trusses, beams, frames, and grids. Discussion of thermal effects, support settlements, nonlinear effects, and other modeling considerations.
Credits: (3), Graded, Semester Calendar Lecture, Spring Terms

CE 521  Advanced Mechanics of Composite Materials
Prerequisite: ES222 and ES260.
Credits: (3), Graded, Semester Calendar Lecture, Given When Needed

CE 527  Advanced Fluid Mechanics
An introductory level graduate course in fluid mechanics. Spatial and material coordinates, kinematics of fluid motion, continuity and momentum equations, constitutive relations, simple solutions, potential flows, boundary layer theory, creeping flow, flow through porous media, particle motion, interfacial phenomena, turbulence.
Prerequisite: CH301 or ES330 or equivalents. Prerequisites: CH301 or ES330 or equivalent
Credits: (3), Graded, Semester Calendar Lecture, Laboratory, Fall Terms
CE 533 Human Exposure Analysis
Credits: (3), Graded, Semester Calendar
Lecture, Even Fall Terms

CE 534 Sustainable Development Engineering
This course outlines the principles of sustainable engineering for improving sanitation and environmental health in developing communities both internationally and nationally. Topics include sustainable development and appropriate technologies for water and wastewater treatment, water storage and delivery, watershed management, solid waste management, and indoor air quality. The course highlights the importance of community participation and relationship building throughout the development and implementation of engineering projects. At least 2/3 of the course is dedicated to a team-based, sustainable development design project. (2 credits of design)
Credits: (3), Graded, Semester Calendar
Lecture, Spring Semesters

CE 535 Groundwater Hydrology and Geochemistry
This class provides fundamental understanding of the key physical and chemical processes impacting groundwater resources and quality. Emphasis is on groundwater geology, physical characteristics of flow, and geochemical properties of groundwater. Groundwater contamination and contaminant transport and modeling will be introduced. The course will prepare students to qualitatively and quantitatively analyze fluid and contaminant flow in varied geologic systems.
Credits: (3), Graded, Semester Calendar
Lecture, Odd Fall Terms

CE 538 Finite Element Methods
This course is an introduction to the finite element method, from a mathematical as well as a modeling and applications point of view. The basic theory and implementation will be discussed in the context of continuum problems in linear elasticity, potential flow and plate modeling. If time permits, additional applications such as structures, electromagnetics, fluid mechanics, ground water and geotechnics will also be discussed. Topics include: weak formulations and the principle of virtual work, discretization and interpolation-function selection, assembly and solution of the system equations, error estimates and accuracy assessment. When taught in conjunction with CE 438/ME 453 the course requires additional independent work for those registered for the graduate course. Prerequisite: MA232, MA339, or MA330, ES222, ES330 and the ability to program. Consent of the instructor may be used to replace some prerequisites.
Credits: (3), Graded, Semester Calendar
Lecture, Fall Semesters

CE 541 Bridge Engineering
An introduction to bridge engineering. Topics will focus on highway bridge planning, design, construction and management with emphasis on structural engineering, hydraulic engineering, geotechnical engineering and economics. Bridge projects also are influenced heavily by issues such as maintenance of traffic, environmental considerations, public input, construction methods, materials, estimating and scheduling all of which will be covered in various degrees. Prerequisite: CE320
Credits: (3), Graded, Semester Calendar
Lecture, Fall Terms

CE 549 Experimental Methods in Structures
This course will introduce fundamental principles, procedures, and applications of experimental methods in structures. Topics covered in this course include sensors, data acquisition, vibration measurement, signal processing, similitude law, system identification, and structural modeling. Students will learn Labview programming to design a simple experiment. If time allows, state-of-the-art experimental methods such as hybrid simulation will be presented. The course consists of lectures and hands-on laboratory sessions.
Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed

CE 551 Theory of Elasticity
This course explores the materials science aspects of properties and behavior of Portland Cement Concrete, including the properties of raw materials in concrete such as cement, aggregates, mineral and chemical admixtures, and fibers. Topics include: physical and chemical aspects of cement hydration and the role of binder types, the influence of type and morphology of hydrates, fresh and hardened concrete properties, introduction to fracture behavior of concrete, and concrete durability issues such as freezing and thawing, sulfate attack, and corrosion of reinforcing steel. Prerequisite: ES260.
Credits: (3), Graded, Semester Calendar
Lecture, Spring Terms

CE 552 Advanced Strength of Materials
This course involves the analysis of stress and deformation at a point and the derivation of the fundamental equations by applying the basic laws of conservation of mass, energy, and momentum and those of thermodynamics. Vector and cartesian tensors are reviewed. Relationships (constitutive laws) are then developed between stress, strain, and strain rate. The basic equations governing the behavior of any continuum and applications to solids and fluids are covered.
Credits: (3), Graded, Semester Calendar
Lecture, Fall Semesters

CE 554 Continuum Mechanics
This course outlines the principles of sustainable engineering for improving sanitation and environmental health in developing communities both internationally and nationally. Topics include sustainable development and appropriate technologies for water and wastewater treatment, water storage and delivery, watershed management, solid waste management, and indoor air quality. The course highlights the importance of community participation and relationship building throughout the development and implementation of engineering projects. At least 2/3 of the course is dedicated to a team-based, sustainable development design project. (2 credits of design)
Credits: (3), Graded, Semester Calendar
Lecture, Spring Semesters

CE 555 Structural Damage Assessment, Rehabilitation, and Repair
An investigation of structural damage and methods applicable for assessing their capacity, durability, and future use. Additionally, evaluation and design of methods of practicable rehabilitation and/or repair of structural elements using traditional and non-traditional
methods and materials. Case studies will often be used to assess structural damage. (1 credit of design)
Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed

CE 556  Engineering Analysis
Topics will include limit processes, infinite series, singular integrals, mathematical representation of periodic phenomena, complex variable methods, vector and tensor algebra, linear analysis, integral equations, Green’s functions, transform methods, engineering applications drawn from mechanics.
Credits: (3), Graded, Semester Calendar
Lecture, Fall Terms

CE 563  Railroad Engineering
[Cross Listed with CE463]This course is designed to help students gain knowledge in following topics: Railroad engineering efficiency, economics, and energy; Cost-benefit analyses of rail transportation systems; Geometric design of railroad alignment; Train speed, power, and acceleration requirements; Railroad engineering materials characterization (rail, crosstie, ballast, sub-ballast, and subgrade); Subgrade design and construction and drainage; and High Speed Rail (HSR) design and construction. Graduate students are required to do an independent term project which allows them to study a particular area of railway engineering in more depth, and gives the students experience with the railroad engineering literature as well as more experience in technical communications (the term paper).
Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed

CE 569  Watershed Analysis
Conceptual and quantitative analysis of watershed processes will be introduced with an emphasis on modeling surface water hydrology and water resources management. Watershed modeling concepts including analysis of time series, spatially variable data, model calibration, and uncertainty analysis will be studied and demonstrated. The course will emphasize critical analysis of current hydrologic computational methods through literature review and hands-on use of watershed models.
Prerequisites: Hydrology/Water Resources Engineering
Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed

CE 570  River Restoration
This course provides fundamental understanding of hydrologic, hydraulic, and geomorphic processes of river restoration systems and their ecological impacts. Topics include river hydraulics, sediment transport, fluvial geomorphology, aquatic habitats, channel design, reservoir sedimentation, dam removal/decommission, and fish passage. Emphasis will be given to fluvial geomorphology and hydraulic design of river restoration projects. Computer modeling of river hydraulics and morphodynamics with applications to river restoration design will be introduced. Prerequisites: CE330; or permission of the instructor.
Credits: (3), Graded, Semester Calendar
Lecture,

CE 571  Computational River Dynamics
This course covers basic principles and numerical methods for modeling free-surface turbulent flow, sediment transport and contaminant transport. Topics include mathematical description of free-surface flow and sediment transport, fundamentals of sediment transport, advanced numerical methods, one-, two- and three-dimensional models, domain decomposition and model integration, simulation of dam-break fluvial processes, simulation of vegetation effects on flow and sediment transport, cohesive sediment transport modeling, and contaminant transport modeling.
Prerequisites: Hydraulics, Numerical Methods, Sediment Transport
Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed

CE 572  Advanced Open Channel Hydraulics
Introduction to open channel flows, uniform flow and flow resistance, energy and momentum principles, critical depth, gradually varied flow and water surface profiles, rapidly varied flow and channel controls, unsteady flow and translator waves, boundary layers theory, water waves, turbulence in artificial and natural channels and measurements, and shallow water equations and numerical solutions. Application of 1D/2D/3D hydraulic models to engineering problem solving.
Prerequisites: Undergraduate Fluid Mechanics, Water Resources Engineering I or equivalent or consent of the instructor.
Credits: (3), Graded, Semester Calendar
Lecture, Even Fall Terms

CE 573  Sediment Transport
Incipient motion, bed forms, depth-discharge relation for alluvial streams, transport of bed load and suspended load, natural river and coastal processes.
Prerequisite: CE430 or CE572 or consent of the instructor.
Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed

CE 574  Ecohydraulics
Introduction to ecohydraulics: Instream flow requirements and fish habitat suitability; River connectivity and fishpasses; Fishpass hydraulics and design optimization; Fish hydrodynamics; Effect of turbulence on fish stability; Mixing and dispersion in rivers and its effect to fish (fickian diffusion, turbulent shear flows, advective diffusion, turbulent dispersion and mixing); Transport and reaction of water pollutants; and Stream water temperature modeling with a case study.
Prerequisites: Undergraduate Fluid Mechanics, Water Resources Engineering I or equivalent or consent of the instructor.
Credits: (3), Graded, Semester Calendar
Lecture, Odd Fall Terms

CE 575  Coastal Engineering
Theory of water waves; tides and harbor oscillations; wave forces on coastal structures; wind wave analysis; beach erosion and shore protection; off-shore pipelines and outfall diffusers.
Prerequisite: CE572 or consent of the instructor.
Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed

CE 576  Hydraulic Engineering in Cold Regions
Ice engineering for rivers, lakes and coastal zones. Topics to be covered include thermal regimes in surface water bodies; frazil ice; river ice hydraulics; transport of ice in lakes and coastal zones and ice force on structures.
Prerequisite: CE430 or CE572 or consent of the instructor.
Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed
CE 577  Atmospheric Chemistry

The course will cover the evolution of the atmosphere from its initial formation to its natural background condition to its current state perturbed by human activities; detailed descriptions of the chemistry of the carbon, nitrogen and sulfur cycles; characterization of the atmospheric aerosol and its role in heterogeneous reactions and materials transport; stratospheric ozone and problems with its depletion; airborne radioactivity and its role in atmospheric ion chemistry. This course covers the same topics as CE 477 and includes additional material on the graduate level.

Prerequisites: CM370 or CM371 or ES340.
Credits: (3), Graded, Semester Calendar
Lecture, Spring Semesters

CE 579  Water and Wastewater Treatment Design

A study of the physical, chemical and biological operations and processes utilized in the treatment of water and wastewater for both municipalities and industries. The course emphasizes both theoretical and design aspects of these processes, and includes appropriate laboratory demonstrations. Preparation of an individual design report will be required. (2 credits of design)

Prerequisites: ES330 or consent of the instructor. No credit if credit given for CE479 or similar course.
Credits: (3), Graded, Semester Calendar
Lecture, Laboratory, Fall Terms

CE 580  Environmental Chemistry

The fundamentals of inorganic, organic, and physical chemistry with particular emphasis on those topics having application to environmental engineering practice. Chemical equilibria among gaseous, aqueous and solid phases are stressed with a strong mathematical approach. This course provides a basis for the understanding of chemical phenomena in aquatic environments.

Prerequisite: consent of the instructor.
Credits: (3), Graded, Semester Calendar
Lecture, Fall Semesters

CE 581  Hazardous Waste Management Engineering

This course is an introduction to the emerging field of hazardous waste management. This course provides an understanding of environmental regulations, management, techniques to minimize the generation and disposal of hazardous wastes, and technologies to treat wastes and remediate disposal site. (1.5 credits of design)

Prerequisites: CE340 or CE579 or equivalent course, or consent of instructor.
Credits: (3), Graded, Semester Calendar
Lecture, Odd Spring Semesters

CE 582  Environmental Systems Analysis and Design

This course presents the basic principles of systems analysis as applied to resource allocation and design problems commonly encountered in the field of environmental engineering. Central to the material covered is the concept of optimal problem solution and its use in choosing among alternative designs or policies. All students will complete a semester project; a greater level of quantitative analysis will be expected from students taking the course for graduate credit.

(2 credits of design)
Prerequisites: CE340 or CE579 or equivalent course, EC350, or consent of instructor.
Credits: (3), Graded, Semester Calendar
Lecture, Odd Fall Terms

CE 584  Chemodynamics

This course investigates what happens to a chemical when it is introduced into the environment and the factors that determine and influence its distribution. The dynamics of pollutant transfer in the environment, the relationship between their physical-chemical properties and transport, their persistence in the biosphere and their partitioning in biota are studied. Quantitative models of pollutant transfer between air-water, air-soil and water-sediment are developed. (1 credit of design)

Prerequisite: consent of the instructor.
Credits: (3), Graded, Semester Calendar
Lecture, Fall Semesters

CE 586  Industrial Ecology

An exploration of the methods necessary for designing and implementing changes in manufacturing processes to increase sustainability. This course will identify the impacts associated with resource consumption and environmental pollution, and present the quantitative tools necessary for assessing environmental impacts and to design for sustainability. Topics include: industrial ecology, life cycle analysis and the integration of the environment into economic activities. (1 credit of design)

Prerequisites: prior college level exposure to the concepts of mass and energy conservation, one of the following: CE340, CH250, ES330, ES340, CH301, CH271 or consent of the instructor.
Credits: (3), Graded, Semester Calendar
Lecture, Even Fall Terms

CE 590  Graduate Degree Completion Project

A project in civil and environmental engineering under the direction of a faculty advisor or program director. Credit for this work is given when the requirements for the degree are completed including the presentation of a project as appropriate to the degree program.

Credits: (1-6), Graded, Semester Calendar
Lecture, Every Term

CE 591  Special Topics in Construction Engineering Management

This course includes lectures and seminars covering emerging topics in civil and environmental engineering. Topics will include, but are not limited to: emerging technologies, including both software and hardware systems, which are intended to enhance the analysis, design construction, performance, and asset management for civil and environmental engineering projects; lessons learned from construction, civil, and environmental engineering sites covering infrastructure and building projects; and construction, civil and environmental engineering equipment management and selection for site applications. Presentations are given by subject area experts with complement lectures by the instructor. Case studies will be reviewed and researched for further development and discussion within the course. Restriction: Graduate standing required.

Credits: (3), Graded, Semester Calendar
Lecture,

CE 595  Special Topics in Civil and Environmental Engineering

Advanced study of selected topics in the area of civil and environmental engineering.

Credits: (1-3), Graded, Semester Calendar
Independent Study, Given When Needed
CE 610  Civil and Environmental Engineering Seminar
Students, staff and visiting lecturers present research results and topics of current interest.
Credits: (1-2), P/NC, Semester Calendar
Seminar, Every Semester

CE 612  Thesis, Dissertation Credits
Analytical or experimental studies in civil and environmental engineering under the direction of a faculty adviser. Credit for this work is given when the requirements for the degree are completed including the presentation of a thesis or dissertation as appropriate to the degree program.
Credits: (1-15), Thesis, Semester Calendar
Thesis Research, Every Semester

CE 621  Advanced Structural Dynamics
This course provides fundamental and advanced theories of structural dynamics and their applications to natural hazards engineering. Topics covered in the course include numerical integration methods for dynamic analysis; nonlinear hysteresis models; nonlinear time history analysis; soil-foundation-structure/fluid-structure interactions; state-of-the-art simulation methods for civil infrastructure systems. Prerequisite: CE512 or permission of instructor
Credits: (3), Graded, Semester Calendar
Lecture, Odd Spring Terms

CE 622  Uncertainty Quantification and Optimization in Computational Mechanics
Uncertainty Quantification plays an essential role in the validation of the predictive content of computational engineering and science models. Uncertainty in the simulation-based paradigm is typically manifested either in the form of variability of model parameters or in the stochastic external effects to which this system is subjected. In this course, students will be introduced to the mathematical foundations, numerical algorithms, and computational tools necessary for: (1) the propagation of parametric uncertainty in computational mechanics simulations; (2) the analysis of the response of simulation-based models to random inputs; and (3) the rational treatment of uncertainty in design optimization problems. The course will involve a term project. Prerequisites: CE383/ME515 and CE529/ME529
Credits: (3), Graded, Semester Calendar
Lecture, Even Spring Terms

CE 631  Cement Chemistry
This is an advanced graduate level course. It covers materials science aspects of conventional and modified portland cement concrete including (i) dry and wet cement chemistry (ii) hydration mechanisms, and microstructure modification (iii) techniques to characterize cementitious systems (SEM, TEM, MIP, NMR, BET, Pore Solution Analysis etc.) and (iv) materials science based discussions on mechanical and durability performance of concrete . Prerequisites: CE 553, Properties and Performance of Concrete Materials
Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed

CE 633  Plasticity
This course provides an introduction to the subject of plasticity. The physical background of inelastic deformation in metals and geological materials is discussed. Continuum constitutive theory is presented including yield criteria, flow rules, and plastic hardening. Extension to the rate-dependent (viscoplastic) material is discussed. Uniqueness and extremum theorems are derived and discussed and field equations for general, two-dimensional and axisymmetric problems are presented. Selected problems from metal and soil/rock plasticity are presented and solved using various techniques, including slip-line theory, limit analysis and 'exact' methods. Other topics such as localization and diffuse instability in plastic deformation and application of FEM in plasticity are presented as time allows.
Prerequisite: CE554 or ME554; recommended CE551 or ME551.
Credits: (3), Graded, Semester Calendar
Lecture,

CE 681  Environmental Physico-Chemical Processes
This class provides fundamental understanding of the chemical and physical processes that govern the migration and fate of pollutants in environmental systems. Emphasis will be placed on the application of these concepts to water treatment processes. Topics include: mass transfer and kinetics, coagulation, precipitation, adsorption, ion exchange, chemical oxidation, sedimentation, filtration and related processes.
Prerequisites: CE340 or CE379 or equivalent course, CE580, or consent of the instructor.
Credits: (3), Graded, Semester Calendar
Lecture, Spring Semesters

CE 682  Environmental Biological Processes
Principles and applications of biological phenomena and processes in relation to environmental engineering practice. Emphasis is given to biokinetic analysis and design of biological treatment processes applicable to the treatment of water, municipal and industrial wastewater and hazardous wastes. Topics include: microbial growth kinetics and bioenergetics; aerobic, anaerobic fixed-film, nitrification, denitrification and phosphorus removal biological processes; sludge treatment and disposal; advanced wastewater treatment processes.
Prerequisites: CE340 or CE379 or equivalent course, CE580, CE584, and BY323, or consent of instructor.
Credits: (3), Graded, Semester Calendar
Lecture, Spring Semesters

CE 684  Special Topics in Environmental Engineering
Advanced topics in specialized aspects of environmental engineering.
Credits: (1-3), Graded, Semester Calendar
Independent Study, Given When Needed

CE 686  Environmental Engineering Design
Emphasis will be on water and wastewater treatment plant design, hazardous waste site remediation, groundwater remediation and solid waste disposal.
Prerequisites: CE681 and CE682 or consent of the instructor.
Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed

CE 999  Civil and Environmental Engineering Elective
A graduate level course for which there is no comparable Clarkson course. Used for transfer credit only. (Not offered at Clarkson, for transfer credit only.)
Credits: (1-10), Graded, Semester Calendar
Independent Study, Transfer Credit Only
Chemical Engineering

CH 501 Directed Study in Chemical Engineering Principles I
For graduate students with a baccalaureate degree in a field other than chemical engineering.
Credits: (1-4), Graded, Semester Calendar
Independent Study,

CH 502 Directed Study in Chemical Engineering Principles II
For graduate students with a baccalaureate degree in a field other than chemical engineering.
Credits: (1-4), Graded, Semester Calendar
Independent Study, Spring Semesters

CH 503 Directed Study in Chemical Engineering III
For graduate students with a baccalaureate degree in a field other than chemical engineering.
Credits: (1-4), Graded, Semester Calendar
Independent Study, Given When Needed

CH 530 Chemical Process Safety
Applications of chemical process principles to process safety and hazards analysis, mitigation and prevention, with emphasis on the chemical process industries.
Credits: (3), Graded, Semester Calendar
Lecture, Fall Terms

CH 540 Plasma Engineering
[Cross Listed with CH440] This course will focus on the fundamentals of plasma science and engineering with particular emphasis on non-equilibrium plasmas and plasma in water environments. Focus areas addressed include material processing, chemical synthesis and conversion, environmental remediation, disinfection and biomedical applications. Credits: (3), Graded, Semester Calendar
Lecture

CH 541 Introduction to Nanophotonics
This course introduces the principles of nanophotonics-an emerging frontier at the nexus of nanotechnology and photonics. Nanophotonics deals with light-matter interactions on the nanometer length scale, and provides enormous opportunities for fundamental research and new applications. The course will cover the theoretical foundations of nanoscale optical interactions, growth and characterization of optical nanomaterials, nanolithography, plasmonics, metamaterials, manipulation and integration of nanostructured architectures, nanoscale optical microscopy, nanophotonic devices and systems, as well as a review of applications of nanophotonics, especially in biotechnology and nanomedicine. The students will be exposed to various new concepts, properties and phenomena in a bright nanoworld.
Credits: (3), Graded, Semester Calendar
Lecture, Fall Terms

CH 546 Chemical Reactor Analysis II
Advanced topics in chemical reactor analysis, including residence time distributions, reactor stability, fixed and fluidized bed reactors and advanced design methods.
Prerequisites: CH445.
Credits: (3), Graded, Semester Calendar
Lecture, Spring Semesters

CH 547 Advanced Hydrocarbon Thermodynamics
This course will provide a consistent approach to the use of thermodynamics for the solution of practical process engineering problems encountered during the design and simulation of chemical processing plants with special emphasis on gas plants and refineries. Topics such as industrial equations of state, pressure-temperature diagrams, modeling with water, high pressure thermodynamic equilibrium, critical phenomena and inclusion of solids in the understanding of phase diagrams will be studied.
Credits: (3), Graded, Semester Calendar
Lecture, Odd Fall Semesters

CH 551 Multicomponent Mass Transfer
Principles of mass transfer in multicomponent mixtures. Models of multicomponent diffusion, interaction effects, and applications to processes such as distillation and condensation.
Prerequisites: CH330
Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed

CH 560 Transport Phenomena
A study of fluid mechanics, heat, and mass transport, identifying analogies where appropriate, with emphasis on physical understanding. Topics include conservation equations and constitutive relations, boundary conditions, solutions in simple situations, boundary layers, forced and natural convection, phase change phenomena, multicomponent mass transport, film and penetration models, mass transport with chemical reaction, simultaneous heat and mass transport, and experimental techniques.
Prerequisite: CH330 and CH370 or equivalent
Co-requisite: CH561
Credits: (3), Graded, Semester Calendar
Lecture, Fall Semesters

CH 561 Chemical Engineering Analysis
Analysis of chemical engineering problems in transport phenomena, reactor engineering and engineering thermodynamics.
Prerequisites: MA331 or equivalent. Corequisites: CH330 or ES330.
Credits: (3), Graded, Semester Calendar
Lecture, Fall Semesters

CH 571 Advanced Chemical Engineering Thermodynamics
Laws, principles and concepts of classical thermodynamics, including the properties of pure fluids and of solutions, the thermodynamics of flow processes, chemical reaction equilibria, etc. Prerequisite: CH260 and CH320
Credits: (3), Graded, Semester Calendar
Lecture, Spring Terms

CH 576 Atmospheric Chemistry
[Cross-listed with CE 577, CM 576] The course will cover the evolution of the atmosphere from its initial formation to its natural background condition to its current state perturbed by human activities; detailed descriptions of the chemistry of the carbon, nitrogen and sulfur cycles; characterization of the atmospheric aerosol and its role in heterogeneous reactions and materials transport; stratospheric ozone and problems with its depletion; airborne radioactivity and its role in atmospheric ion chemistry. This course covers the same topics as CE 477 and includes additional material on the graduate level.
Prerequisite: CM370 or CM371 or ES340.
Credits: (3), Graded, Semester Calendar
Lecture, Spring Semesters
CH 582  Design Project
A comprehensive design is performed independently. When possible, the work will be done in a team.
Credits: (3), Graded, Semester Calendar
Lecture, Spring Terms

CH 586  Industrial Chemistry
[Cross-Listed with CH486/CM486/586] This course will benefit junior and senior undergrads plus grads in chemistry and chemical engineering, and allow them to learn of real ways such talents are used in the professional world. It will involve different industrial chemists and chemical engineers to come to Clarkson University for each of 12 of the 14 weeks of a semester and give two lectures of about 1 hour 15 min each - one on an afternoon and the other following morning. The first lecture will relate the areas of chemistry their company was known for; the second lecture an in-depth discussion on how one project was carried out at the bench and the pitfalls that had to be resolved along the way to achieve success. The intent is to select lecturers from Clarkson Chemistry and Chemical Engineering major alumni at various lengths of time they have been professionals.
Credits: (1), Graded, Semester Calendar
Lecture, Spring Terms

CH 590  Elementary Transport Phenomena
[Cannot be taken by MS or PhD students in Chemical Engineering]. Principles of transport of momentum, energy, and mass will be covered from a fundamental perspective, pointing out analogies where appropriate. Topics include the Navier-Stokes and continuity equations, analysis of one dimensional flows, boundary layer theory, the energy and species conservation equations, energy transport by conduction and convection, steady two-dimensional problems, and unsteady one-dimensional problems.
Prerequisites: CH 330 and a 3.5 GPA, or instructor consent
Credits: (3), Graded, Semester Calendar
Lecture, Spring Semesters

CH 610  Chemical Engineering Seminar
Students, staff and visiting lecturers present research results and topics of current interest. Attendance is required.
Credits: (1-2), P/NC, Semester Calendar
Seminar, Every Semester

CH 611  Thesis, Dissertation Credits
Analytical or experimental studies in chemical engineering under the direction of a faculty adviser. Credit for this work is given when the requirements for the degree are completed including the presentation of a thesis or dissertation as appropriate to the degree program.
Credits: (1-15), Thesis, Semester Calendar
Thesis Research, Every Semester

CH 612  Directed Study
Special reading or laboratory study of a specific problem under the direction of a member of the faculty.
Credits: (1-4), Graded, Semester Calendar
Independent Study, Every Semester

CH 665  Selected Topics in Polymers and Soft Materials
An advanced graduate course in science and engineering of polymers and soft materials. Topics of special interest will be selected to conform to the mutual interests and needs of students and faculty.
Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed

CH 999  Special Topics in Chemical Engineering
Used for awarding transfer credits for graduate courses completed elsewhere for which no equivalent Clarkson university graduate course can be identified.
Credits: (1-4), Graded, Semester Calendar
Independent Study, Transfer Credit Only

Educational Chemistry

CHM 580  MAT Project in Chemistry (Content Area)
The MAT Project is a one-term research project whose purpose is to allow students time and supervision to develop breadth and/or depth of knowledge to become a better teacher in their certification field. What the project will entail varies greatly from student to student. The course is intended to be custom-tailored to meet the specific needs of an individual intern. MAT projects are well-grounded in research and theory, but also include a strong and extensive applied aspect, directly addressing the question: What would this look like in the classroom? Restriction: This course is open only to students matriculated in the Master of Arts in Teaching program (or by instructor consent)
Credits: (3), Graded, Semester Calendar
Lecture,

CHM 988  Independent Study in Chemistry
A graduate level course for which there is no comparable Clarkson course. This course may be used to satisfy course requirements for a graduate degree. Restriction: This course is open only to students matriculated in the Master of Arts in Teaching program (or by instructor consent)
Credits: (3), Graded, Semester Calendar
Independent Study, Given When Needed

Chinese Language

CHN 515  Teaching Chinese in American Schools
Students will become familiar with American public secondary education through reading, discussion, writing, and onsite school observation. A strong emphasis will be on professional writing, reading, and professional communication skills as required by American teachers. Students will be prepared professionally and culturally to enter the public school classroom. Restriction: This course is open only to students matriculated in the Master of Arts in Teaching program (or by instructor consent)
Credits: (3), Graded, Semester Calendar
Lecture, Fall Terms

CHN 517  Chinese Language and Linguistics I
[Formerly CHN 517A] This course is designed to strengthen students’ understanding of second language acquisition theory and teaching strategies. Its primary focus is on Chinese as a second language at the K-12 level. The course assumes that students in the course are already teaching in a Chinese language program with some or minimal CFL
training. The course emphasizes instructional strategies, planning, and assessment common to most methods courses. In addition, this course introduces students to program development and assessment since most K-12 programs require their Chinese teachers to build out the language program over a series of several years. The course will address students' real time issues and concerns in the classroom as well as learn to see the "bigger picture" of the CFL program and curriculum. Restriction: This course is open only to students matriculated in the Master of Arts in Teaching program (or by instructor consent) 
Credits: (3), Graded, Semester Calendar 
Lecture, Fall Terms

CHN 530 Chinese Language and Linguistics II 
This 3-credit course is designed for students who contemplate a career teaching Chinese at the secondary or college level. The purpose of the class is to provide students with a general overview of the basic issues in Chinese linguistics from phonetics, morphology to syntax. Teaching strategies related to these issues will also be briefly discussed. Restriction: This course is open only to students matriculated in the Master of Arts in Teaching program (or by instructor consent) 
Credits: (3), Graded, Semester Calendar 
Lecture, Spring Terms

CHN 580 MAT Project in Chinese (Content Area) 
The MAT Project is a one-term research project whose purpose is to allow students time and supervision to develop breadth and/or depth of knowledge to become a better teacher in their certification field. What the project will entail varies greatly from student to student. The course is intended to be custom-tailored to meet the specific needs of an individual intern. MAT projects are well-grounded in research and theory, but also include a strong and extensive applied aspect, directly addressing the question: What would this look like in the classroom? Restriction: This course is open only to students matriculated in the Master of Arts in Teaching program (or by instructor consent) 
Credits: (3), Graded, Semester Calendar 
Lecture, Spring Terms

Chemistry

CM 506 Biomedical Analysis and Instrumentation 
[Cross-listed with BY 506] Biomedical Analysis and Instrumentation is a lecture course designed to provide advanced undergraduates and graduate students in basic sciences, biosciences and bioengineering disciplines with scientific and engineering aspects of instrumentation, sample analysis, measuring and processing signals from living organisms. Functioning and calibration of biomedical transducers and devices actually used in clinical practice for analyzing clinical biomarkers for disease diagnostics will be reviewed. Emerging research in bioinstrumentation, biomedical technologies, stand alone and wearable sensing devices, analytical method development and validation will be also be covered. Special emphasis will be placed on measurement principles of medical instrumentation used in health technologies ranging from laboratory scale to next generation wearables. Training in professional ethics, grant writing, patenting, innovation, entrepreneurial activities and FDA regulation for new device development, laboratory management, as well as communication skills will also be provided. Undergraduate assignments include a mid term exam, a research proposal and 2 short review papers. Graduate students will prepare a research proposal and 3 review papers in addition to a mid term exam. Graduate students will also participate in a research proposal panel and prepare short presentations featuring innovative emerging research in the development and prototyping of novel bioinstrumentation. 
Credits: (3), Graded, Semester Calendar 
Lecture, Even Spring Terms

CM 513 Carbon Capture and Sequestration 
[Cross-listed with CH 513] Sustainable energy generation is seen as one of the largest challenges of our generation. All long-term solutions rely on the direct or indirect conversion of solar energy, yet these solutions appear to be years from implementation. In the coming decades then, while the relative importance of fossil fuels will decrease, absolute use of fossil fuels will not. Carbon Capture and Sequestration (CCS) employed on a global scale can sustain the world’s energy use and help mitigate alarmingly high carbon dioxide levels in the atmosphere. The goal of this course is to provide students with a modern view of current and emerging research in CCS. Topics will include our current understanding of carbon dioxide in and around the planet, the geological storage of carbon dioxide, and the science and technology of capturing carbon dioxide with focus on material chemistry aspects. Development of analytical methods and characterization tools for assessing CCS properties and materials will also be discussed. Through this series of lectures, students will learn about the contemporary research related to CCS, as well as learn to develop, analyze, and compare various CCS solutions. 
Credits: (3), Graded, Semester Calendar 
Lecture, Spring Terms

CM 520 Separations and Electrochemistry 
This course covers the same topics as CM 320 and includes additional material on the graduate level. Prerequisites: Non-chemistry majors only. 
Credits: (3), Graded, Semester Calendar 
Lecture, Fall Terms

CM 522 Advanced Mass Spectrometry: Practical Applications 
Practical Applications will introduce the students to mass spectrometry and its applications within different fields, including pharmaceutical and biotech industry, academia, government, forensics, etc. Various types of instruments will be discussed, as well as their application within different fields. The course will then focus on different types of well-known “omics”, such as proteomics, metabolomics, glycomics, or lipidomics, but also on specialized types of “omics” such as peptidomics, post-translational modification-omics (PTM-omics), interactomics, foodomics, microbiomics, venomics, DNA- RNA- & Protein- adductomics, genomics, proteogenomics or transcriptomics. Particular applications of all these kinds of “omics” in biotechnology & pharmaceutical industry, healthcare, biowarfare and forensics will also be discussed. Prerequisites: CM/BY460/560, or consent of the instructor 
Credits: (3), Graded, Semester Calendar 
Lecture, Spring Terms

CM 530 Colloid and Interfaces 
Physico-chemical principles and experimental techniques related to the characterization and investigation of colloidal systems and interfaces are covered on an introductory level. From the many areas of application, the emphasis will be on those situations that are
encountered in everyday life such as environmental problems (aerosols, water treatment), biological aspects (transport and absorption of fat, biological membranes), foods and cosmetics (emulsions), detergency and various technological processes. This course covers the same topics as CM 430 and includes additional material on the graduate level.
Credits: (3), Graded, Semester Calendar
Lecture, Fall Terms

CM 532 Fine Particle Characterization
This course is intended to familiarize the students with the analytic techniques routinely used to characterize the size, size distribution, shape, composition, structure, and surface properties (composition, charge, topography) of individual particles as well as the properties of dispersion particles. In conjunction with the latter, the course will discuss many concepts covered by colloids and surface science courses. Graduate students will do additional work.
Credits: (3), Graded, Semester Calendar
Lecture, Fall Terms

CM 535 Better Materials through Chemistry
[Cross-Listed with CM435]Our physical world relies on a broad spectrum of materials of different properties around us to fulfill their functions to serve our daily life. It is one of the missions of chemists to improve and optimize materials chemically to make them more efficient and effective in diverse processes and devices. In this course, subsequent to a brief survey of the fundamental chemistry and physics of polymers, ionic liquids, carbon nanomaterials and composite materials their potential and current applications will be treated. Particularly, preparations, characterizations and applications of porous polymers and carbons, membranes and “smart” materials will be delineated.
Credits: (3), Graded, Semester Calendar
Lecture, Odd Fall Terms

CM 541 Physical Organic Chemistry
This course covers the same topics as CM 441 and includes additional material on the graduate level.
Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed

CM 542 Advanced Organic Chemistry
The course will cover essential topics of organic chemistry including dynamic stereochemistry, conformational analysis, photochemistry, pericyclic reactions, and chemistry of free radicals.
This course covers the same topics as CM 442 and includes additional material on the graduate level.
Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed

CM 544 Medicinal Chemistry
This course covers the same topics as CM 444 and includes additional material on the graduate level.
Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed

CM 545 Organometallic Chemistry
[Cross-Listed with CM445]The course will provide introduction into structure and properties of compounds possessing metal-carbon bonds and their reactions with emphasis on homogeneous catalysis. Graduate students will do additional course work.
Credits: (3), Graded, Semester Calendar
Lecture, Odd Fall Terms

CM 546 Modern Spectroscopic Methods in Organic Chemistry
No prerequisites. This course covers the same topics as CM 446 and includes additional material on the graduate level.
Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed

CM 550 Introduction to Polymer Chemistry
This course covers the same topics as CM 450 and includes additional material on the graduate level.
Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed

CM 551 Manufacturing Implications of Advanced Materials Processing
The processing of materials into manufactured goods requires an understanding of the chemical composition of the starting substrates, the nature of intermediates, and the properties of final products. This course focuses on the preparation, modification, characterization, and the applications of fine, ultra-fine, and nanosize metallic particles. The objectives are to: a) provide an overview of the relevant theoretical and practical aspects related to the preparation, characterization, and modification of fine particles in general and metallic particles in particular, b) familiarize students with the industrial approaches for developing and manufacturing fine particles on large scale, and c) teach students how the properties of the resulting particles/colloids can be tailored in order to ensure optimal performance in specific applications. During the semester the students will also participate in several practical sessions in which metal colloids will be prepared and characterized.
Graduate students will do additional work, such as a term paper or review presentation.
Prerequisites: consent of the instructor.
Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed

CM 553 Introduction to Biomaterials
This course deals with biomaterials in medical and pharmaceutical applications. Basic concepts and requirements of biomaterials will be introduced. Classification and properties of a wide range of biomaterials will be discussed according to their particular applications such as drug delivery, artificial organs, implants and devices. In addition, standard testing and evaluation aspects of the biomaterials will also be addressed.
Credits: (3), Graded, Semester Calendar
Lecture, Fall Terms

CM 560 Biochemistry I
[Cross-listed with BY 650] This course covers the same topics as CM 460 and includes additional material on the graduate level.
Credits: (3), Graded, Semester Calendar
Lecture, Fall Semesters

CM 561 Biochemistry II
[Cross-listed with BY 651] This course covers the same topics as CM 461 and includes additional material on the graduate level.
Credits: (3), Graded, Semester Calendar
Lecture, Fall Semesters
CM 566  Bioelectronics & Bionanotechnology
This course covers novel areas in science and technology that have high importance for fundamental science and practical applications. Bioelectronics is a scientific and technological area that includes electronic coupling of biomaterials (enzymes, DNA, recognition proteins, biological cells) with electronic devices. The bioelectronic systems can be used to develop sensing devices (enzyme-based biosensors, DNA sensors, immunosensors, etc.) and to develop biofuel cells (implantable biofuel cells for biomedical applications, self-powered biosensors, autonomously operated devices). New methods and new materials (functionalized nanoparticles, quantum dots, carbon nanotubes, etc.) developed due to the tremendous recent success in nanotechnology pave the way for the novel possibilities to couple biomaterials and electronic transducers, thus resulting in the new technological field named Bionanotechnology. The students will be introduced into the most important areas of Bioelectronics and Bionanotechnology.  
Prerequisites: CM372, CM460.  
Credits: (3), Graded, Semester Calendar  
Lecture, Given When Needed

CM 567  Biofuel Cells – Design and Applications
This is a lecture course designed to provide graduate students with a working knowledge in the highly multidisciplinary research area of biofuel cells (including microbial, enzyme-based and “abiotic” biofuel cells, their construction, operation and various applications). The course will include a brief overview of microbial fuel cells. The “abiotic” biofuel cells based on the use of inorganic catalytic species (mostly catalytic nanoparticles) will be studied in connection with the general information on nanoparticles and their immobilization on electrodes. The main part of the course will be devoted to the enzyme-based biofuel cells and their biomedical applications, particularly as a potential power source for implantable biomedical devices (e.g., pacemakers). The scientific advances and technical problems will be discussed. The course is addressed to graduate students with different backgrounds, including students from chemistry and biomolecular science, biology, chemical engineering and electrical engineering. Since the attending students can have very different backgrounds, not necessarily with deep knowledge of chemistry, biochemistry and electrochemistry, the course will be started with a short basic introduction to the enzyme catalysis and electrocatalysis. In addition to the lectures, the course will provide homework with reading of important publications in the research area followed by the class discussions. At the end of the course the students will be asked to prepare short talks delivered to the class on selected topics related to the biofuel cells studied. Overall, the course will provide general introduction to the important areas of electrochemical and bioelectrochemical catalysis, enzyme-based electrocatalytic electrodes, biofuel cells and their various applications.  
Credits: (1), Graded, Semester Calendar  
Lecture, Odd Spring Terms

CM 569  Implantable and Wearable Bioelectronics
Chemistry CM469/569 is a lecture course designed to provide graduate students and advanced undergraduates with a working knowledge in the multidisciplinary research area of bioelectronics, giving particular information about implantable and wearable bioelectronics. The course will concentrate on concepts, experimental realizations and practical applications. This course covers novel areas in science and technology that have high importance for fundamental science and practical applications. Major science areas covered by the course will be in chemistry, particularly biochemistry and electrochemistry. Minor sub-areas studied in the course will be related to biomedical applications and electrical/electronic engineering. All studies in the course will not require any background knowledge except general chemistry and basics of biochemistry. The major topics covered by the class will be related, but not limited, to biosensors, biofuel cells, bioelectronic devices concentrating on the concepts rather than technical details. The course work for the graduate students will include oral presentations based on the provided books (electronic pdf file given to the students). The undergraduate students will be involved in the discussions on the topics covered by the graduate students and by the instructor. Overall, the oral presentations will be performed by graduate students only, while both categories (graduate and undergraduate students) will participate in the discussions on the topics.  
Credits: (3), Graded, Semester Calendar  
Lecture, Spring Terms

CM 570  Biochemistry & Biotechnology Laboratory
This course is a one semester course in the fundamental laboratory approaches for biochemistry and biotechnology. While largely a hands-on course, laboratory experiments will be supplemented with lectures that integrate the theoretical and practical principals covered in the exercises. Topics include protein purification, characterization and analysis, enzyme kinetics and molecular modeling.  
Prerequisites: BY312 or CY450 or CM460 or consent of the instructor.  
Credits: (3), Graded, Semester Calendar  
Laboratory, Spring Semesters

CM 571  Fundamental Chemical Kinetics
Credits: (3), Graded, Semester Calendar  
Lecture, Given When Needed

CM 572  Chemistry at Surfaces: Structure and Catalysis
This senior undergraduate and graduate course will survey the field of surface chemistry, with specific attention dedicated to the structure of solid surfaces and chemical processes at solid interfaces. This course will cover the basics of the structure of periodic solids, relate that understanding to solid interfaces, and finally address how structure surface and reduced dimensionality impact chemical reactions (i.e. heterogeneous catalysis). Analytical techniques common to this discipline will also be discussed. Graduate students will be assessed differently than undergraduates in this course. Graduate students will have the additional responsibility of delivering a presentation discussing one of several primary research articles germane to the field that were selected by the instructor, while undergraduate students will submit a paper describing one of these articles in detail.  
Credits: (3), Graded, Semester Calendar  
Lecture

CM 575  Sustainable Nanotechnology
[Cross-listed with MSE 575, and ES 575] This course covers the same topics as CM 475 and includes additional coursework on the graduate level.  
Credits: (3), Graded, Semester Calendar  
Lecture
forms and can have multicomponents, including surfactants, fillers, etc. The role of the interfacial phenomena in controlling specific functions and materials performance is strongly emphasized in the course through the fundamentals of polymer and colloid science. Main modern tendencies in polymer advanced materials (nanocomposites, smart polymer materials, (nano)porous materials, membranes, biocompatible polymeric materials, applications of polymers in electrochemical energy devices, sensor design and actuator fabrication) are covered in the course. Students are encouraged to take CM483/CM583 before participation of this course. Graduate students will do additional work.

Credits: (3), Graded, Semester Calendar Lecture, Odd Spring Semesters

**CM 585 Nanostructured Materials**

[Cross-listed with PH 585] This course reviews the methods to make nanoscale building blocks and approaches to arrange the building blocks into functional architectures for advanced materials. The list of topics includes: chemical patterning and lithography, layer-by-layer self assembly, synthesis and self assembly of nanoparticles, nanotubes and nanowires, properties of nanoclusters and self assembled structures (photonic crystals, plasmonic effects, quantum dots, porous materials, biomimetics).

Credits: (3), Graded, Semester Calendar Lecture, Odd Spring Semesters

**CM 586 Industrial Chemistry**

[Cross-Listed with CM486/CH486/586] This course will benefit junior and senior undergrads plus grads in chemistry and chemical engineering, and allow them to learn of real ways such talents are used in the professional world. It will involve different industrial chemists and chemical engineers to come to Clarkson University for each of 12 of the 14 weeks of a semester and give two lectures of about 1 hour 15 min each - one on an afternoon and the other following morning. The first lecture will relate the areas of chemistry their company was known for; the second lecture an in-depth discussion on how one project was carried out at the bench and the pitfalls that had to be resolved along the way to achieve success. The intent is to select lecturers from Clarkson Chemistry and Chemical Engineering major alumni at various lengths of time they have been professionals.

Credits: (1), Graded, Semester Calendar Lecture, Spring Terms

**CM 587 Applications of Synchrotron and Electron Based Techniques**

The purpose of the course is to familiarize all students with the x-ray and electron based experimental techniques available at Brookhaven National Lab and other similar facilities. Students will be cognizant of the applications of these cutting edge facilities, and well positioned to use them in their own research. This course is suitable for graduate students, postdocs, and advanced undergrads in physical sciences and engineering, as well as students in biological, environmental, and chemical sciences who may have the interest to learn more about the techniques they may use for their research.

Credits: (3), Graded, Semester Calendar Lecture, Spring Terms

**CM 576 Atmospheric Chemistry**

[Cross-listed with CE 577, CH 576] The course will cover the evolution of the atmosphere from its initial formation to its natural background condition to its current state perturbed by human activities; detailed descriptions of the chemistry of the carbon, nitrogen and sulfur cycles; characterization of the atmospheric aerosol and its role in heterogeneous reactions and materials transport; stratospheric ozone and problems with its depletion; airborne radioactivity and its role in atmospheric ion chemistry. This course covers the same topics as CE 477 and includes additional material on the graduate level.

Prerequisite: CM370 or CM371 or ES340.

Credits: (3), Graded, Semester Calendar Lecture, Spring Semesters

**CM 581 Computational Chemistry**

[Cross Listed with CM481] Computational Chemistry is senior undergraduate and graduate course which will discuss theoretical and computational methods in chemistry and their applications. This course will include both lectures and computer lab. The lectures will introduce the fundamental theories and methods in chemistry and their applications in the cutting-edge research. The computer lab will be hands on tutorials on calculating the structures and properties of chemicals, exploring the reaction mechanisms, reactivities, and selectivities. The objectives of this course are: (1) to provide students with the basic background of computational methodologies and their applications. (2) to enhance their experiences with common computational methods by class project. (3) to encourage their creativity, critical thinking and problem-solving ability. Graduate students will have additional course work.

Credits: (3), Graded, Semester Calendar Lecture, Even Fall Terms

**CM 582 Information Processing by Chemistry**

The course is composed of lectures and student presentations on signal-switchable chemical and electrochemical systems. These systems perform Boolean logic operations, memory function and control of bioelectronic devices, e.g., biofuel cells.

Students will gain knowledge on chemical/biochemical systems of various complexity logically processing different input signals. Preparation of sensing switchable interfaces will be explained. Finally, bioelectronic systems processing information and operating as signal-switchable devices will be discussed.

Credits: (3), Graded, Semester Calendar Lecture, Given When Needed

**CM 583 Introduction to Polymer Science**

[Cross-listed with PH 583] This course is about fundamental aspects of polymer science. It introduces the world of chain molecules from synthesis and properties to applications. Basic knowledge from polymer chemistry and physics are combined in the one course in a form appropriate for undergraduates and graduates in chemistry, physics and engineering to develop the understanding of polymeric behavior in synthetic materials and natures.

Credits: (3), Graded, Semester Calendar Lecture, Spring Semesters

**CM 584 Functional Polymer Systems**

[Cross listed with CM484] This senior undergraduate and graduate course will introduce students to the world of polymer materials, which deliver concrete functions and may serve our daily life in our modern society. These polymer systems exist in different structural
### CM 715 Special Topics in Inorganic Chemistry
Topics in transition-metal chemistry and related areas (e.g., homogeneous catalysis, mechanisms of inorganic reactions, organometallic chemistry, and spectroscopic and physical methods in inorganic chemistry) selected to meet the needs of the class.
Credits: (3), Graded, Semester Calendar
Independent Study, Every Term

### CM 725 Special Topics in Analytical Chemistry
Topics in analytical chemistry and related areas selected to meet the needs of the class.
Prerequisites: consent of the instructor.
Credits: (1-3), Graded, Semester Calendar
Independent Study, Every Term

### CM 735 Special Topics in Colloid and Surface Chemistry
Topics in colloid and surface chemistry and related areas selected to meet the needs of the class.
Credits: (1-3), Graded, Semester Calendar
Independent Study, Every Semester

### CM 755 Special Topics in Polymer Chemistry
Topics in polymer chemistry and related areas selected to meet the needs of the class.
Credits: (1-3), Graded, Semester Calendar
Independent Study, Every Semester

### CM 765 Special Topics in Biochemistry
Topics in biochemistry and related areas selected to meet the needs of the class.
Credits: (1-3), Graded, Semester Calendar
Independent Study, Every Semester

### CM 775 Special Topics in Physical Chemistry
Topics in physical chemistry and related areas selected to meet the needs of the class.
Credits: (1-3), Graded, Semester Calendar
Independent Study, Every Semester

### CM 890 Directed Study
The study, on the graduate level, of a subject not otherwise available in formal courses may be undertaken under the supervision of a faculty member.
Credits: (1-3), Graded, Semester Calendar
Independent Study, Every Semester

### CM 900 Seminar
Reports are made by students on topics from the current literature, or by students, faculty members or outside speakers on their own research.
Credits: (1-2), P/NC, Semester Calendar
Seminar, Every Semester

### CM 990 Thesis, Dissertation or Special Project
Each student does independent, original work on a project under the guidance and supervision of an instructor. A grade on all of the credits for this work presented in satisfaction of the requirements for a degree is given when those requirements are completed.
Credits: (1-15), Thesis, Semester Calendar
Thesis Research, Every Semester

### CM 999 Special Graduate Topics
A graduate level course for which there is no comparable Clarkson course. This course may be used to satisfy course requirements for a graduate degree.
Credits: (1-10), Graded, Semester Calendar
Independent Study, Transfer Credit Only

### Communications

### COMM 999 Special Graduate Topics
A graduate level course for which there is no comparable Clarkson course. This course may be used to satisfy course requirements for a graduate degree.
Credits: (1-10), Graded, Semester Calendar
Independent Study, Transfer Credit Only

### Computer Science

#### CS 500 Network and Security Systems
[Formerly CSC 560] This course explores critical business challenges: how to protect an organization’s computer networks, systems, applications and information. Students learn how to design procedures, protocols, and policies that address both engineering and human issues. Engineered security is examined through the application or cryptography, digital signatures and certificates, authentication protocol, firewalls, and intrusion detection. Also considered are security issues related to people’s use of organization’s networks and systems including policies and practices for password management and protecting privacy rights. Students also study options for maintaining business continuity in the event of a disruption of business operations. Specific case studies are used to highlight the choices that must be made to balance operational efficiency of business functions with protecting the business from the onslaught of security threats. Prerequisite expertise: Networking protocols. The student should have taken a course in computer communications/networking and have programming experience such as C/C++, or JAVA or PHP. (The programming experience will allow the course to include hands on security project).
Credits: (3), Graded, Quarter Calendar
Lecture,

#### CS 501 Software Quality Management
[Formerly CSC 561] This course prepares students to apply a quality mindset to both the development process and the developed software. Students learn the theory and practice of quality assurance and testing computer software. Topics of study include the use of metrics to measure quality, software quality standards as a baseline for establishing and assessing quality, the effects of the economics on product reliability, and software testing practices (including test design, coverage, and tools). Students will study specific cases that highlight practical techniques and reveal the relationship between software quality management and meeting an organization’s business objectives
Credits: (3), Graded, Quarter Calendar
Lecture,
and testing computer software. Topics of study include the use of metrics to measure quality, software quality standards as a baseline for establishing and assessing quality, the effects of the economics on product reliability, and software testing practices (including test design, coverage, and tools). Students will study specific cases that highlight practical techniques and reveal the relationship between software quality management and meeting an organization’s business objectives.

Credits: (3), Graded, Semester Calendar

Lecture,

CS 502 Business Intelligence
[Formerly CSC 562] This course offers an interdisciplinary look at computing technologies in support of forming valuable business insights and making effective decisions. Students acquire knowledge of the conceptual basis for data warehousing (collection and organization of data in database management systems) and data mining (detecting of patterns in business data). Students then build the skills to extract business intelligence from collected and analyzed data and present it for use in business decision-making activities. Various practical applications are studies such as customer segmentation, Customer Relationship Management (CRM), Group Decision Support Systems (GDSS), and Executive Information Systems (EIS). Students will learn about trends in the use of business intelligence software and techniques and examine specific case studies. There will be an opportunity for students to develop their own application project. Prerequisite expertise: database management systems.

Credits: (3), Graded, Quarter Calendar

Lecture,

CS 503 Systems Analysis and Design Methods
[Formerly CSC 564] The application of information technology has extended to all quarters of the business world. While the nature and the scope of information systems vary widely depending on the business context, the fundamental knowledge underlying their development remains the same. This course aims to provide technology students with a solid understanding of the important methodologies and tools & techniques related to the development of information systems in a variety of contexts.

Credits: (3), Graded, Quarter Calendar

Lecture,

CS 504 Enterprise Architecture
[Formerly CSC 570] This course provides students with an understanding of the basic concepts and practices of Enterprise Architecture (EA). This is not a course on information systems development, web/application programming, database development, or network design. The course focuses on understanding how information technology resources can best be leveraged to support an organization’s strategic goals and business requirements. Basic proficiency is developed in the understanding of several EA methodologies, number of governments and major corporations around the world, as well as the U.S. Federal Government’s approach to EA. Students learn the theory and practice of EA through a combination of lectures, student-led class instructions, analysis papers, exams, and a written project with a verbal presentation.

Credits: (3), Graded, Quarter Calendar

Lecture,

CS 505 Business Data & Communications & Networking
[Formerly CSC 583B] This course is designed to convey the essentials of data communication networks. It will cover concepts, technologies and architectures. There will be practical lessons built into the semester’s topics and assignments whenever possible. A single course cannot cover all possible networking topics and issues, so we will cover the major conceptual areas balanced with practical discussions and exercises. We will also discuss important network management topics such as domain management and security. Specifically, the following topics will be covered: Fundamentals of Networking Technologies, OSI Model, Physical Layer, Data Link Layer, Local Area Networks, Wireless Local Area Networks, Network/Transport Layers TCP/IP, Backbone Networks, Wide Area Networks, Application Layer, The Internet, Network Design, Network Management and Network Troubleshooting, Network Security, Voice over IP.

Credits: (3), Graded, Quarter Calendar

Lecture,

CS 506 Engineering Statistics
[Cross-listed with EE 602, ME 577] [Formerly CSC 572] Modern engineering practice makes extensive use of statistical methods for the efficient collection and analysis of engineering data, and to support data-based decision making. This course will introduce the statistical tools that are of greatest importance for practicing engineers. Core topics to be covered will include probability and distribution theory, the construction and interpretation of statistical intervals, statistical hypothesis testing, regression analysis and empirical modeling, statistical experimental design, and statistical quality/process control. Additional specialized topics may also be covered, depending upon the interests of the class; possible topics include system reliability analysis, measurement system analysis, process capability analysis (and “six-sigma”), accelerated life testing, and acceptance sampling.

Credits: (3), Graded, Quarter Calendar

Lecture,

CS 511 Foundations of Computer Science
This course covers a variety of topics fundamental to Computer Science. Topics will vary from year to year to accommodate the background and interests of the participants. Possible topics include: mathematical foundations, analysis of algorithms, data abstraction, elementary data structures and algorithms such as lists, stacks and sorting, advanced data structures and algorithms such as heaps, hashing, dynamic programming, and graph algorithms, object-oriented programming, and basic automata theory.

Prerequisites: programming experience.

Credits: (3), Graded, Semester Calendar

Lecture, Fall Semesters

CS 541 Introduction to Automata Theory and Formal Languages
This course covers an introduction to formal languages and their relation to automata. Topics include: regular languages, deterministic and nondeterministic finite automata, closure properties for regular sets, context free grammars, normal forms, ambiguity, pushdown automata, a treatment of closure properties and decision algorithms for context free languages. Also included are a treatment of recursive and recursively enumerable sets, Turing machines, decidability and undecidability. Prerequisites: MA211, MA346 or equivalent.

Credits: (3), Graded, Semester Calendar

Lecture, Fall Semesters
CS 542  Computational Complexity
The complexity of a computational problem is the amount of computer resources it requires. Computational complexity theory studies the complexity of computational problems as well as relationships between different types of resources. This course will cover both classical and research-related topics in computational complexity, such as: complexity measures and complexity classes for sequential machines and Boolean circuits, reductions and completeness, hierarchy theorems, relativization, circuit complexity, and proof complexity. Students will be expected to independently explore some of the course material.
Prerequisites: CS345 or CS541, or consent of the instructor.
Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed

CS 544  Operating Systems
This course is an introduction to the concepts of operating systems, their structures and organization. Major topics include process management (asynchronous processes, interprocess communication and synchronization, multithreading), storage management (paging/segmentation, virtual memory, file systems), protection and security issues, and distributed systems. To demonstrate these concepts, case studies of operating systems will be presented, and a programming project will be an integral part of the course.
Prerequisites: CS344, EE264 or equivalent, or consent of the instructor.
Credits: (3), Graded, Semester Calendar
Lecture, Laboratory, Spring Semesters

CS 545  Compiler Construction I
A graduate-level study of compiler design. Overview of the compilation process. Formal definition of syntax, lexical scanning, parsing including LL and LR grammars, run-time structures, intermediate code generation, and storage allocation. Students develop a compiler for a substantial subset of a high-level language using compiler tools such as lex and yacc.
Prerequisites: CS241, CS341, or consent of the instructor.
Credits: (3), Graded, Semester Calendar
Lecture, Spring Terms

CS 547  Computer Algorithms
[Cross-listed with EE 667] This course will study and contrast a variety of computational algorithms and develop tools for algorithm analysis. Methods and topics such as dynamic programming, greedy algorithms, graph algorithms, circuits, parallel algorithms, matrix and polynomial algorithms, string matching, and geometrical algorithms will be explored. The theory of NP-completeness and methods of managing NP-complete problems will also be covered.
Prerequisites: CS344, MA211 or MA346.
Credits: (3), Graded, Semester Calendar
Lecture, Fall Terms

CS 549  Computational Learning
Computational learning studies algorithmic problems for inferring patterns and relations from data. This course describes the mathematical foundations of learning and explores the important connections and applications to areas such as artificial intelligence, cryptography, statistics, and bioinformatics. A list of relevant topics may include perceptron and online learning, graphical models and probabilistic inference, decision tree induction and boosting, analysis of Boolean functions, sample complexity bounds, cryptographic and complexity hardness, and reinforcement learning. Basic ideas from computer science and mathematics are employed to describe the main ideas and major developments in computational learning. Students are expected to learn and explore recent research ideas in the area. Prerequisite: CS 345 or consent of instructor; Corequisite: CS 547 or consent of instructor. Corequisite: CS547 or consent of the instructor.
Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed

CS 550  Software Design and Development
Working in teams, students will learn tools and strategies for designing and implementing medium/large software projects. Suitable project ideas will be solicited from the community in order to match student teams with real users where possible. Students will learn to elicit requirements from users and to work in an effective team. Students will learn and practice techniques for software testing including black-box testing, stress testing, performance testing, code reviews, and code coverage tools. Students will produce documentation that is appropriate at various stages in the software life cycle including for example, requirements documents, project plans and user manuals. The work will include oral presentations and written reports. Students will be expected to independently explore some aspects of the course material. Students taking the course for graduate credit Students taking this course for graduate credit are required to do additional work beyond students in CS 350.
Prerequisites: CS242 or CS344, or permission of the instructor.
Credits: (3), Graded, Quarter Calendar
Lecture,

CS 551  Artificial Intelligence
[Cross-listed with EE 565] This course is an introduction to the computational study of intelligent systems. Topics include heuristic search, knowledge representation, automated reasoning, knowledge-based systems, reasoning under uncertainty, planning, and intelligent agents. Additional topics may be drawn from machine learning, neural networks, computer vision, and natural language understanding. AI programming techniques and methods will also be covered throughout the course. Prerequisites: CS344 or equivalent or consent of the instructor.
Credits: (3), Graded, Semester Calendar
Lecture, Spring Semesters
CS 552  Computer Graphics
[Cross-listed with EE 505] An introduction to computer graphics. Graphics hardware, algorithms for generating and displaying two and three-dimensional geometric figures, animation, interactive displays. Programming projects using OpenGL will be assigned. Students will be expected to independently explore some aspects of the course material. Prerequisites: Programming experience in C/C++ family language, basic concepts in linear algebra and matrices. Credits: (3), Graded, Semester Calendar Lecture, Spring Semesters

CS 555  Computer Networks
[Cross-listed with EE 507] This course covers layered protocols, network architectures, OSI, digital networks, local area networks, metropolitan networks, wide area networks, and interconnection of local area networks and non-uniform networks. Students will be expected to explore independently advanced aspects of the subject area. Prerequisites: One of course in computer architecture (EE264, CS241 or IT502 or equivalent). One course in computer programming (EE261, CS141 or equivalent.) Note: IT501 also satisfies the programming requirement. Credits: (3), Graded, Semester Calendar Lecture, Laboratory, Fall Semesters

CS 556  Cryptography
Cryptography is the discipline which studies the making of 'secret' codes. This course will examine some of the methods of cryptography together with many surprising applications. The language of modern cryptography is primarily number theory, and various tools of number theory will be developed as needed. No background in number theory or cryptography will be necessary, but some mathematical sophistication and familiarity with proofs will be assumed. Topics will include: one-way functions, public-key cryptosystems, digital signatures, probabilistic encryption, primality testing, interactive proof systems, and methods of secret sharing. Prerequisites: MA211, MA346, or equivalent. Credits: (3), Graded, Semester Calendar Lecture

CS 557  Computer and Network Security
[Cross-listed with EE 510] Attacks on networked computer systems are an increasingly important problem. This course covers the types of vulnerabilities that are present in modern computer systems and the types of malicious software that exploit these vulnerabilities. It also covers best practices for preventing, detecting and responding to such attacks including anti-virus software, defensive programming techniques, intrusion detection systems, honeypots and firewalls. Prerequisites: A general course in computer networking such as CS455/555 or EE407/507. Programming experience to the level of CS142 or EE361. Credits: (3), Graded, Semester Calendar Lecture, Given When Needed

CS 558  Formal Methods for Program Verification
Formal methods are algorithms and techniques that actually prove that a program meets its design criteria, and are the only way to guarantee that a program works correctly. As computer software increases in size and complexity, formal methods are becoming an essential part of software engineering. This is especially true of safety critical and life critical systems, where software errors can have life threatening consequences. Until recently, formal methods have had limited application because they were difficult to use. This is changing, and they are receiving greater acceptance from software engineers in industry and government. This course introduces students to the basic concepts and methods of program verification. A variety of techniques and tools will be covered, and students will gain experience in applying the tools to actual programs. After completing the course, students will have sufficient expertise to learn new methods as they become available. Prerequisites: MA211 or MA346, CS344. Credits: (3), Graded, Semester Calendar Lecture, Spring Semesters

CS 559  Human-Computer Interaction
This course provides an introduction to the field of human-computer interaction (HCI). This discipline focuses on the design, evaluation and implementation of interactive computing systems from a user's point of view. The course will give a broad overview of the ideas, techniques, and tools in the subject, with a systematic approach to designing visual interfaces and evaluating their effectiveness. Case studies of existing interfaces, technologies, and data display methods will be discussed and critiqued. Topics include: programming and command languages; menus and forms graphical user interfaces, computer-supported cooperative work, information search and visualization; input/output devices; and display design. A collaborative course project will explore issues in HCI and design. Prerequisites: proficiency in C++, Java or C. Prerequisites: CS242 or EE408 Credits: (3), Graded, Semester Calendar Lecture, Fall Terms

CS 560  Database Systems
[Cross-listed with EE 568] An introduction to database systems. The entity-relationship and relational models are presented and applied to the design of typical databases. New developments in object-oriented and multimedia databases are presented. Emphasis will be placed on database design for applications in the context of an existing database management system such as ORACLE or ACCESS. Substantial independent investigation of advanced topics will be required. Prerequisites: programming experience in a high level language. Credits: (3), Graded, Semester Calendar Lecture, Spring Semesters

CS 561  Mixed Reality
[Cross-Listed with CS461] This course provides an introduction to the mathematics and computing underlying virtual reality (VR) and augmented reality (AR). Students will learn stereo camera geometry for VR, recovery of 3D scene structure from images for content manipulation in AR, acquiring of illumination maps for photorealistic AR, and capture of human interaction for virtual environments. Students will perform several short and long projects as part of the course. Students will also analyze seminal papers in supporting fields such as graphics, vision, and computational photography. Credits: (3), Graded, Semester Calendar Lecture, Spring Terms

CS 566  Blockchain Technologies
Blockchain technologies are the underlying technological foundation of almost all digital currencies, such as Bitcoin and Ethereum. Without the need of a trusted authority or central server, Blockchain technologies can securely archive and are inherently resistant to modification of data. The course will cover the basics and advanced topics of Blockchain technologies. The basics include public key
cryptocurrency, hashing algorithms, mining process, proof of work, block structures, transactions and wallets.

Advanced topics may include consensus algorithms, smart contracts, blockchain network security and applications. We will discuss the limitations of current applications and explore new systems and proposals that overcome them. The course will offer many hands-on lab components and a blockchain-based course project. Students should already have had solid programming skills, such as C, C++ or Python, to take the course. Students will be expected to independently explore some of the course material.

Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed

CS 569 Quantum Information and Computation

[Cross-listed with CS469 and MA469] This course studies information and computation based on quantum mechanical laws. The first part of the course will cover the relevant background in quantum information theory. A brief discussion of several universal quantum computational models will be given. The second part will cover algorithmic techniques important for developing quantum algorithms. Topics to be covered include amplitude amplification, quantum walks, phase estimation, hidden subgroup problems, and quantum protocols. Background in physics would be helpful but is not required. As part of a research project, students are expected to explore topics of interest from the literature.

Prerequisites: CS344, and MA232 or MA339, or consent of the instructor.
Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed

CS 570 Deep Learning

This course will cover the principles of modern deep learning architectures from a theoretical and practical perspective. Course topics covered will include an introduction to machine learning and basic neural network architectures, and in-depth discussions on convolutional neural networks, recurrent neural networks based on units such as LSTMs and GRUs, and, if time permits, GANs. Students will be required to implement programming assignments and projects that apply deep learning architectures to solve classification and regression problems. Students will read and assess papers on current evolutions to these architectures. Graduate students will do additional work.

Prerequisites: CS142, EE262 or EE361, and MA339, or consent of instructor.
Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed

CS 571 System Administration and Network Operations

This course is designed to give students the basic skills and knowledge to administer Unix/Linux machines as standalone workstations or in a network environment. For example, students will learn to install and configure the Linux operating system, create and maintain system users and groups, maintain and administer a file system, configure and maintain network services, troubleshoot system and network problems, and secure the system and network environment. Comprehensive hands-on labs throughout the course will reinforce learning and develop skills and competency. Graduate students will be expected to explore independently advanced aspects of the subject area.

Prerequisite: CS241 or equivalent
Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed

CS 572 Image Understanding

This course is an introduction to image processing and computer vision algorithms. Students will learn concepts such as image formation, how to store a digital image on a computer, how to use it in a program, different image features and their importance in computer vision, as well as some advanced computer vision topics such as object classification. Students will implement these concepts as part of the programming assignments. They will also do some theoretical assignments and a project. Students enrolled in CS572 will study a research paper on related topics and present it to the class.

Prerequisites: CS142 or EE262 or EE361, and MA232 or MA239 or MA339, or equivalent.
Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed

CS 573 Computer Vision

[Cross-Listed CS473/EE573] This course will cover an overview of basic theoretical underpinnings and practical applications of computer vision, with particular emphasis on geometrical techniques underlying 2D and 3D vision. Topics covered include, but are not restricted to, estimation of image transformations, image formation, pose estimation, camera calibration, epipolar geometry, structure-from-motion, stereo reconstruction, filtering, interest point detection, motion estimation, image segmentation, and object recognition. Students enrolled in CS573 will be expected to read and implement research papers on seminal and modern techniques in computer vision. Prerequisites: CS142 or EE262, and MA339 (or equivalent, with consent from the instructor).

Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed

CS 575 Computing, Ethics and Society

[Cross-Listed CS475] This course focuses on the increasing ubiquitous nature of computing, its impact on society and the ethical issues related to the design, implementation and deployment of computing technologies. We will examine case studies of the impact of computing technology on society and reflect on issues such as privacy, equality, justice, security, accountability, transparency, safety and reliability. Students enrolled in CS575 will become familiar with venues where computer science research regarding fairness, accountability, transparency and ethics is published and the types of topics and themes commonly covered in this literature today. They will gain skills in reading research literature and apply this to some pieces of recently published work. Prerequisites: CS141, or equivalent.

Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed

CS 607 Topics in Computer Science

A graduate course in the field of Computer Science. Areas of coverage will be selected to conform to the mutual interests and needs of students and faculty.

Credits: (1-15), Graded, Semester Calendar
Independent Study, Given When Needed

CS 608 Topics in Computer Science

A graduate course in the field of Computer Science. Areas of coverage will be selected to conform to the mutual interests and needs of students and faculty.

Credits: (1-15), Graded, Semester Calendar
Independent Study, Given When Needed
### CS 611  Topics in Applied Computer Science
A graduate course in the field of Applied Computer Science. Areas of coverage will be selected to conform to the mutual interests and needs of students and faculty.

Credits: (1-15), Graded, Semester Calendar
Independent Study, Given When Needed

### CS 612  Topics in Applied Computer Science
A graduate course in the field of Applied Computer Science. Areas of coverage will be selected to conform to the mutual interests and needs of students and faculty.

Credits: (1-15), Graded, Semester Calendar
Independent Study, Given When Needed

### CS 634  Thesis
Each student does independent, original work on a project under the guidance and supervision of an instructor. A grade on all of the credits for this work presented in satisfaction of the requirements for a degree is given when those requirements are completed.

MS in Computer Science.

Credits: (1-15), Thesis, Semester Calendar
Thesis Research, Given When Needed

### CS 647  Advanced Algorithms
This course covers advanced topics in computer algorithms. Topics covered include, but are not restricted to, linear programming and combinatorial optimization, randomized algorithms and probabilistic methods, competitive analysis and online algorithms, algorithms for algebraic and geometric problems, and space-efficient algorithms. The emphasis will be on methods and techniques instead of specific applications. As part of a research project, students are to explore specific topics of interest from the literature. Prerequisite: CS 547
Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed

### CS 649  Current Issues In Machine Learning
In this course, we will read current publications of machine learning research. Students will gain experience reading and critiquing research papers. Class times will be devoted to discussing the papers and possible extensions of the work. Projects may consist of a small piece of research.

Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed

### CS 653  Automated Reasoning
This course will cover advanced topics in Automated Reasoning research. Students will gain experience reading and discussing research papers. Students will be expected to conduct research-related work in Automated Reasoning.

Prerequisites: CS541 and CS547, or consent of the instructor.
Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed

### CS 654  Current Issues in Computer Networking Research
In this course we will read both classic and current publications of networking research. Students will gain experience reading and critiquing research papers. Class times will be devoted to discussing the papers and possible extensions of the work. Projects will consist of a small piece of research.

Prerequisites: CS454/554 or consent of the instructor.
Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed

### CS 657  Advanced Topics in Computer Security
This course will cover advanced topics in computer security research. Students will gain experience reading and discussing research papers. Students will be expected to conduct research-related work in computer security.

Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed

### CS 662  Advanced Techniques in Virtual Reality and 3D User Interfaces
Topics taught will include, but are not limited to, the design of human subject studies for virtual reality (VR)/augmented reality (AR), statistical and learning-based techniques for evaluating VR/AR human subject studies, shared and multi-person VR/AR spaces, cognition in VR/AR, emotion in VR/AR, simulating physical characteristics of everyday objects in VR/AR, attention and engagement in VR/AR. In addition to material related to advanced topics, students will be engaged in understanding the evolution of modern VR through the assessment of relevant research literature, and will work on a comprehensive research project on an advanced VR topic.

Prerequisites: CS552,CS559,CS561,CS572, or CS573 or permission from the instructor.
Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed

### CS 668  Natural Language Processing
This course introduces students to the fundamental concepts and ideas in natural language processing (NLP). In this course students will learn how to create systems that are able to understand and produce language for applications ranging from plagiarism detection to information extraction to automated summarization. The course will focus on four key areas: understanding and recognizing words; syntax (i.e. structure of language); semantics (i.e. meaning of language); pragmatics/discourse (i.e. interpretation of language in context).

Students will be introduced to document similarity techniques using frequency and sequence based techniques; n-gram models; parts of speech tagging; named entity recognition; word sense disambiguation; machine translation; use of deep learning in NLP.

Students will work with large scale datasets spanning from open source repositories to news articles. As part of the course students will read the latest literature in NLP and provide oral and written summaries.

Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed

### CS 673  Advanced Techniques in Computer Vision
Topics taught will include, but are not limited to, linear and non-linear optimization techniques in computer vision, bundle adjustment, non-rigid structure from motion, multi-view sparse and dense reconstruction, and advanced techniques in image synthesis and
representation using deep generative models. In addition to material related to advanced topics, students will be engaged in understanding the evolution of modern computer vision through the assessment of relevant research papers, and will work on a comprehensive research project on an advanced computer vision topic. Prerequisite: CS573
Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed

CS 675  Fairness, Accountability and Transparency in AI and Automated Systems

This course focuses on the important and emerging area of Fairness, Accountability and Transparency across all areas of computing with a focus on applications in Artificial Intelligence, Machine Learning and Automated Decision Making Systems. Lectures and class discussions will draw on classic and current research literature. Students are expected to complete a research project and present the results of their work. Prerequisites: CS475 or CS575, or permission of instructor.
Prerequisite: CS575, or instructor permission.
Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed

CS 707  Seminar in Computer Science
Credits: (1-15), P/NC, Semester Calendar, Seminar, Given When Needed

CS 708  Seminar in Computer Science
Credits: (1-15), P/NC, Semester Calendar, Seminar, Given When Needed

Educational Computer Science

CST 528  Current Topics in Computer Science I

Students will investigate topics central to computer science for the preK-12 learner. Computer science principles will be aligned to industry standards and New York state teaching and learning standards. This course is designed for MAT, Computer Science students. Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed

CST 563  Current Topics in Computer Science II

Current topics in the field of computer science will be explored with attention paid to fundamental concepts as well as future trends. This course is designed for MAT, Computer Science students. Restriction: This course is open only to students matriculated in the Master of Arts in Teaching program (or by instructor consent)
Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed

CST 580  MAT Project in Computer Science

The MAT Project is a one-term research project whose purpose is to allow students time and supervision to develop breadth and/or depth of knowledge to become a better teacher in their certification field. The course is intended to be custom-tailored to meet the specific needs of an individual intern. MAT projects are well-grounded in research and theory, and include a strong and extensive applied aspect, directly addressing the question: What would this look like in the classroom? Restriction: This course is open only to students matriculated in the Master of Arts in Teaching program (or by instructor consent)
Credits: (3), Graded, Semester Calendar
Research, Given When Needed

Digital Arts

DA 500  Directed Study & Collaborative Projects

DA500 will involve the creation of advanced projects under the guidance of the instructor. Topics may include but are not limited to: data visualization, scientific visualization, UI/UX interface design & app development, outreach projects structured around STEM Education, and STEM based virtual reality experiences.
Credits: (3), Pass/Fail, Semester Calendar
Independent Study, Fall and Spring Terms

English for Academic Purposes

EAP 550  Academic Writing for Graduates I
[Formerly ESL550] This course, designed for non-native speakers of English at a low-advanced level of proficiency in written English, focuses on reading and writing for the academic context. Students read material from a variety of fields and develop their writing skills in definition, description, comparison and contrast, and analysis. The course also includes vocabulary-building techniques and a review of grammatical structures needed for effective writing.
Prerequisite: placement test.
Credits: (3), P/NC, Semester Calendar
Lecture, Fall Semesters

EAP 552  Academic Writing for Graduates II
[Formerly ESL552] This course integrates academic reading, writing, and critical thinking for non-native speakers of English who are at an advanced level of proficiency in written English. Students read short academic articles on various topics by a variety of authors, discuss and evaluate ideas, and write a number of analytical and argumentative papers, including a documented paper based on outside sources. Attention is given to key academic writing skills, e.g., summary, paraphrase, use of citations, and effective support of ideas.
Credits: (3), P/NC, Semester Calendar
Lecture, Spring Semesters

EAP 554  Academic Writing Seminar for Graduates II
[Formerly ESL554] This writing seminar will provide high advanced non-native speakers of English with tools and teacher feedback to shape their writing skills for university level writing requirements. This seminar will focus primarily on the American cultural expectations/conventional structures for successful academic writing courses; students will enhance their tone, form, and structure of texts. Prerequisites: Placement test or permission of the instructor.
Credits: (2), P/NC, Semester Calendar
Lecture, Spring Semesters

EAP 555  Academic Spoken Communication Skills for TAs and other International Graduate Students
[Formerly ESL555] This course is intended for international TAs and other international graduate students who need to improve their spoken English skills in order to interact effectively with students and faculty. The course focuses on development of effective communication skills (including appropriate grammar and vocabulary) for various academic purposes (e.g., leading discussions, making presentations, answering questions). As a group and individually, students also work on pronunciation, intonation patterns, and other features of fluent American English.
Credits: (3), P/NC, Semester Calendar
Lecture, Fall Semesters
EAP 580  Independent Study in EAP
For EAP interest or need. Consent of Instructor required.
Credits: (1-3), P/NC, Semester Calendar
Independent Study, Given When Needed

Economics

EC 604  Applied Economics (MBA Module)
[Cross-listed with EC 605] A graduate course in applied economics. An investigation of economic concepts and models likely to be useful for managers involved in financial, economic and strategic decision-making at various levels. Quantitative techniques and selected econometric procedures are emphasized. This course is designed for MBA students and meets five hours per week for five weeks.
Restriction: Admission to the MBA program required
Credits: (2), Graded, Semester Calendar
Lecture, Fall Semesters

EC 605  Managerial Economics
[Cross-listed with EC 604] This is an advanced and applied course in managerial economics, with introductory material in microeconomic principles. The course starts with selected principles topics such as demand and supply analysis, market equilibrium, household behavior, production and costs, and firm behavior. We then move on to more sophisticated theories of consumption and production such as demand elasticity measures, profit maximization and sensitivity analysis, price discrimination, demand estimation, theories of risk and uncertainty, market structures, and game theory. Students participate in economics games and experiments throughout the course, and examples drawn from the business and financial worlds are used to illustrate the key concepts.
Credits: (3), Graded, Quarter Calendar
Lecture, Spring Terms

EC 605  Managerial Economics
[Cross-listed with EC 604] This is an advanced and applied course in managerial economics, with introductory material in microeconomic principles. The course starts with selected principles topics such as demand and supply analysis, market equilibrium, household behavior, production and costs, and firm behavior. We then move on to more sophisticated theories of consumption and production such as demand elasticity measures, profit maximization and sensitivity analysis, price discrimination, demand estimation, theories of risk and uncertainty, market structures, and game theory. Students participate in economics games and experiments throughout the course, and examples drawn from the business and financial worlds are used to illustrate the key concepts.
Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed

EC 611  Econometrics
This course is an introductory-level graduate econometrics course, focusing mainly on time-series and panel data techniques. It is entry-level in the sense that students are not presumed to have any prior acquaintance with econometrics, although they should have sufficient statistical and computing background and coursework in calculus including some optimization. Students also need to be somewhat familiar with some statistical software such as R or SAS or Python. The course attempts to serve two types of audiences. For those who wish to pursue applied data analysis in the real world, it presents a wide array of problem instances and tools appropriate for those instances. The course also serves as a stepping stone for those interested in knowing the field more intimately, introducing them to a fair amount of theory and a selection of classic and contemporary econometrics papers.
Credits: (3), Graded, Semester Calendar
Lecture, Spring Terms

EC 651  Industrial Organization in the Supply Chain
[Cross-listed with EC 652] This is an industrial organization course that focuses on the strategic interactions within the supply chain under various market conditions. Models of industry structures are explored along with the discussion of business clusters and networks. Topics include horizontal and vertical integration, outsourcing, contract negotiations and incentives, logistics issues, capacity constraints, pricing strategies and network issues all from the perspective of the supply chain. Students apply the models covered in class through several case studies to evolve in the art of strategic thinking.
Prerequisites: EC604 or EC605
Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed

EC 652  Industrial Organization in the Supply Chain
[Cross-listed with EC 651] This is an industrial organization course that focuses on the strategic interactions within the supply chain under various market conditions. Models of industry structures are explored along with the discussion of business clusters and networks. Starting with a review of basic microeconomics principles: other topics include horizontal and vertical integration, outsourcing, contract negotiations and incentives, logistics issues, capacity constraints, pricing strategies and network issues all from the perspective of the supply chain. Students apply the models covered in class through several case studies to evolve in the art of strategic thinking.
Credits: (3), Graded, Quarter Calendar
Lecture, Given When Needed

EC 660  Environmental Economics
This course considers environmental problems from an economic perspective. Topics include the theoretical foundations of environmental economics, measuring the costs and benefits of environmental policies, environmental policy issues, and special topics including risk and uncertainty in environmental regulation, sustainable development, and issues in natural resource damage assessment. Prerequisites: EC150 or EC350 or EC151 or equivalent.
Credits: (3), Graded, Semester Calendar
Lecture, Spring Semesters

EC 687  Special Projects in Economics
An investigation of a problem undertaken by the student which is acceptable to and under the guidance of the faculty member and chairperson. The course provides an opportunity for the student to investigate and analyze a problem area of economics in depth on an independent study basis.
Prerequisites: permission of the Department of Economics Chair, and the faculty member involved.
Credits: (1-6), Graded, Semester Calendar
Independent Study, Every Semester
ED 501  Teaching Practicum
Formerly EDS 500F] MAT interns must complete 75 hours total (12 full school days) of observation and/or teaching either before the residency or at the beginning of the residency. 30 hours of the practicum should be completed with the mentor and with other department members assigned by the mentor and/or supervisor. The Practicum must include at least 15 hours in each of the following settings: students with disabilities, low socio-economic, and English as a New Language (ENL). Half of the total Practicum must be in grades 7-9, and the other half in grades 10-12. Residency supervisors must meet with the intern and mentor during the first weeks of school to review the Practicum requirements for the individual intern. The supervisor will help facilitate each intern’s Practicum in collaboration with the mentor and intern and arrange observations in other schools, if needed. During the Practicum, the intern will understand the differences in adolescents’ learning challenges, cognitive abilities, emotional and physical needs (CAEP InTASC 1.1); interpret students’ behaviors, diverse cultures, and communities to gain a broader understanding of adolescents (CAEP InTASC 1.2); analyze observed learning environments that support individual and collaborative learning, productive behavior, positive social interaction, and engagement in learning (CAEP InTASC 1.3); analyze how experienced teachers structure their discipline and make their teaching accessible and meaningful for learners (CAEP InTASC 1.4); identify and analyze various observed instructional strategies that encourage learners to develop an understanding of the content area (CAEP InTASC 1.8). Restriction: This course is open only to students matriculated in the Master of Arts in Teaching program (or by instructor consent) Credits: (3), Pass/Fail, Semester Calendar Practicum, Fall Terms

ED 502  NYS Requirements
[Formerly EDS 500G] This course provides the NYS requirements for teacher certification. This course covers the prevention and intervention of school violence, child abuse identification and reporting, prevention of child abduction, drug, alcohol and tobacco abuse prevention and dignity for all students. Restriction: This course is open only to students matriculated in the Master of Arts in Teaching program (or by instructor consent) Credits: (0), Pass/Fail, Semester Calendar Lecture, Fall Terms

ED 503  Professionalism in Teaching I
Coursework in diversity and inclusion, career preparation, New York State Certification Exam preparation, and residency seminar. Credits: (1), P/NC, Semester Calendar Lecture, Given When Needed

ED 504  Professionalism in Teaching II
Coursework in diversity and inclusion, career preparation, New York State Certification Exam preparation, and residency seminar. This is a continuation of ED 503 Professionalism in Teaching I. Credits: (1), P/NC, Semester Calendar Lecture, Given When Needed

ED 511  Curriculum and Methods of Teaching English
[Formerly EDS 511] Curricular Planning and Instruction for the Teaching of English at the secondary level includes an analysis of secondary language arts curricula including New York State Frameworks for language arts, the Common Core State Standards, instructional techniques and strategies, designing and locating instructional materials, planning, implementing, and evaluating lessons and units. Restriction: This course is open only to students matriculated in the Master of Arts in Teaching program (or by instructor consent) Credits: (3), Graded, Semester Calendar Lecture, Summer Terms

ED 512  Curriculum and Methods of Teaching Mathematics
[Formerly EDS 512] Curricular Planning and Instruction for the Teaching of Mathematics at the secondary school level will include an analysis of classic and current secondary mathematics curricula including New York State Frameworks for mathematics, the Common Core State Standards, instructional techniques and strategies, designing and locating instructional materials, planning, implementing, and evaluating lessons and units. Restriction: This course is open only to students matriculated in the Master of Arts in Teaching program (or by instructor consent) Credits: (3), Graded, Semester Calendar Lecture, Summer Terms

ED 513  Curriculum and Methods of Teaching Languages
[Formerly EDS 513] Curricular Planning and Instruction for the Teaching of Second Languages at the secondary school level will include an analysis of secondary language curricula including New York State Frameworks for languages; instructional techniques; the teaching of speaking, listening, reading, and writing; designing and locating instructional materials; planning, implementing, and evaluating lessons and units. This course is based on a view of teaching and learning as facilitated by social interaction and that each individual brings unique background knowledge and beliefs to their learning. Restriction: This course is open only to students matriculated in the Master of Arts in Teaching program (or by instructor consent) Credits: (3), Graded, Semester Calendar Lecture, Summer Terms

ED 514  Curriculum and Methods of Teaching Sciences
[Formerly EDS 514] Curricular Planning and Instruction for the Teaching of Science at the secondary school level will include an analysis of secondary science curricula including New York State Frameworks for sciences; instructional techniques and strategies for teaching scientific concepts; laboratory methods and safety, designing and locating instructional materials; planning, implementing, and evaluating lessons and units. Restriction: This course is open only to students matriculated in the Master of Arts in Teaching program (or by instructor consent) Credits: (3), Graded, Semester Calendar Lecture, Laboratory, Summer Terms

ED 515  Curriculum and Methods of Teaching Social Studies
[Formerly EDS 515] Curricular Planning and Instruction for the Teaching of Social Studies at the secondary school level will include an analysis of secondary social studies curricula including the New York State Frameworks for social studies; models and techniques for teaching and integrating the various social sciences; designing and
ED 516  Curriculum and Methods of Teaching Technology

[Formerly EDS 516] Designed for those with a technology or engineering background, this course will help prepare technology educators to promote students’ learning by the use of multiple instructional models. The course builds teacher skills in lesson planning, content organization, and hard and software evaluation and use. New York State Standards for technology and evolving approaches to integration of technology in the teaching/learning process will also be explored. Restriction: This course is open only to students matriculated in the Master of Arts in Teaching program (or by instructor consent)
Credits: (3), Graded, Semester Calendar
Lecture, Summer Terms

ED 517  Curriculum and Methods of Teaching Business and Marketing

The primary objective of this class is to prepare you to teach business and marketing subjects at the 7th - 12th grade levels. This field includes, but is not limited to, accounting, marketing, finance, information systems, data analysis, and keyboarding. The class emphasizes methodology, curriculum planning, unit and lesson planning, and classroom management. It is assumed that students will be able to apply business and marketing subject matter knowledge to their new learning in the field of pedagogy.
Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed

ED 518  Curriculum and Methods of Teaching Computer Science

Designed for those with a computer science background, this course will help prepare computer science educators to promote students’ learning by the use of multiple instructional models. The course builds teacher skills in lesson planning, content organization, and hard and software evaluation and use. New York State Standards for technology and evolving approaches to integration of technology in the teaching/learning process will also be explored.
Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed

ED 526  Teaching in American Schools

Students will become familiar with American public secondary education through reading, discussion, writing, and on-site school observation. A strong emphasis will be on professional writing, reading, and professional communication skills as required by American teachers. Students will be prepared professionally and culturally to enter the public school classroom.
Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed

ED 540  Psychology of Teaching

[Formerly EDS 540] The Psychology of Teaching is a foundational introduction to teaching: audience, planning, instruction, basic concepts, standards, classroom management, assessment, motivation, discipline, and ethical and professional considerations.

Theories of learning and memory applied to instruction; models and research on teaching in secondary schools. Includes thematic analysis of relevant teaching topics such as special needs, differentiated instruction, human development, and foundations of education. In Psychology of Teaching Microteaching Laboratory graduate students prepare and present several lessons using a variety of instructional models. Models include anticipatory sets, discussion concepts, skills and inquiry with attention paid to themes such as special needs, differentiated instruction, literacy, second language, learners and service learning. Lessons are digitally recorded and critiqued by peer-coaches and laboratory faculty. Restriction: This course is open only to students matriculated in the Master of Arts in Teaching program (or by instructor consent)
Credits: (3), Graded, Semester Calendar
Lecture, Laboratory, Summer Terms

ED 541  Essential Reading Literacy

[Formerly EDS 541] Essential Reading Literacy focuses on a teacher-centered exposure to the basic concepts, skills, and contexts for teaching reading in secondary classrooms. Teachers of the 21st century face many challenges, including the large spectrum of reading abilities in their classrooms. Graduate students will be exposed to the concept of adolescent literacy and basic principles of teaching it, including reading habits, skills, extensive knowledge of the reading process, and the development of a repertoire of strategies and skills to help influence and improve the teaching of reading in all classrooms across all disciplines.
Credits: (3), Graded, Semester Calendar
Lecture, Summer Terms

ED 544  Literacy for the Content Classroom

[Formerly EDS 544] This course familiarizes MAT students with the necessity for and techniques of increasing student literacy (skills, attitudes, and dispositions) in each content area. Participants read background information, explore their own literacy skills, and practice applying reading and writing activities in lesson plans. Students will recognize the importance of literacy in all content areas; expand their definitions of literacy, exploring the skills and dispositions which make it possible for students to read and write for meaning for a wide variety of academic and personal purposes; explore and develop their own skills as proficient readers and writers in general and in their chosen content areas; become aware of issues of literacy through readings and discussions; become aware of how the kinds of writing assigned to students shape their thinking; develop, analyze, and integrate literacy skills in classroom lessons; integrate writing into classroom lessons in a variety of ways to stimulate and shape thinking; address NYS standards and CCSS in their content area.
Restriction: This course is open only to students matriculated in the Master of Arts in Teaching program (or by instructor consent)
Credits: (3), Graded, Semester Calendar
Lecture, Fall Terms

ED 545  STEM Methods with Lab

This course is to introduce graduate teaching assistants in STEM fields to the latest methods in instructional science. No familiarity with educational pedagogy is assumed. Emphasis is on applying instructional techniques in settings with undergraduates that teaching assistants are expected to encounter. The course includes a Teaching Lab component during which students will apply what they are learning to an authentic classroom setting. Restriction: This course is open only to students matriculated in the Department of
ED 546  STEM Literacy
This course raises awareness of literacies specific to the disciplines of science, technology, engineering, and math. It will help TAs think critically about the many data sources and promote higher-order thinking skills among their students. Strategies for decoding unfamiliar terms, recognizing advanced vocabulary, and making sense of increasingly complex texts and interrelated ideas will be taught. Problem-solving skills and cognitive training will be emphasized to improve student learning. Restriction: This course is open only to students matriculated in the Department of Education Summer Institute for Graduate Teaching Assistants (or by instructor consent)
Credits: (4), Graded, Semester Calendar
Lecture, Summer Terms

ED 547  Professional Communication
This course is designed to help graduate students, particularly graduate TAs, develop the communications skills necessary to be successful in their graduate programs. Students will work on improving their oral comprehensibility, impromptu speaking skills and interactions with undergraduates. The course also addresses intercultural communication in the classroom and common pedagogical approaches in the United States. Students will be able to improve their cultural and sociolinguistic competence. Some parts of the course are designed for international students but is open to anyone interested in developing intercultural competence. The course will help TAs form their identity in the classroom. Restriction: This course is open only to students matriculated in the Department of Education Summer Institute for Graduate Teaching Assistants (or by instructor consent)
Credits: (1), Graded, Semester Calendar
Lecture, Summer Terms

ED 550  Effective Teaching for All Learners
[Formerly EDS 550A] Effective Teaching for All Learners at the secondary level will explore teaching and assessment for the full range of students a teacher encounters: at-risk students, special needs populations, English as a new language learners, struggling readers, disaffected learners, etc. The resources and strategies available to assist classroom teachers will be discussed and implemented. Graduate students will learn how to evaluate the effectiveness of their teaching as it relates to all their students' progress. In order to gain this understanding, graduate students will evaluate various learning assessments through the lens of different student populations, and design and evaluate a range of assessments. Awareness, empathy, and empowerment are the goals for both teachers and their students. Restriction: This course is open only to students matriculated in the Master of Arts in Teaching program (or by instructor consent)
Credits: (3), Graded, Semester Calendar
Lecture, Fall Terms

ED 551  Teaching Residency I
[Formerly EDS 551] The 4-credit internship begins after the Intern completes the New York State required Field Experience or Practicum. The Intern will have been observing and co-teaching with his/her Mentor since the beginning of the school year to fulfill part of the requirements of the Practicum. Once the requirements of the Practicum are completed, the Intern is expected to gradually assume responsibility for two of the mentor’s classes, at first co-teaching with the Mentor, but independently by mid-November if prepared to do so. A full-year intern is in school for a minimum of half of the school day. Restriction: This course is open only to students matriculated in the Master of Arts in Teaching program (or by instructor consent)
Credits: (4), Graded, Semester Calendar
Independent Study, Every Term

ED 552  Teaching Residency II
[Formerly EDS 552] The 4-credit internship begins after the Intern completes the New York State required Field Experience or Practicum. The Intern will have been observing and co-teaching with his/her Mentor since the beginning of the school year to fulfill part of the requirements of the Practicum. Once the requirements of the Practicum are completed, the Intern is expected to gradually assume responsibility for two of the mentor’s classes, at first co-teaching with the Mentor, but independently by mid-November if prepared to do so. A full-year intern is in school for a minimum of half of the school day. Restriction: This course is open only to students matriculated in the Master of Arts in Teaching program (or by instructor consent)
Credits: (4), Graded, Semester Calendar
Independent Study, Spring Terms

ED 553  Teaching Residency III
This 4-credit residency is intended for an MAT student seeking additional certification. The Resident will be observing and co-teaching with their Mentor for half of a school year to fulfill the requirements of the Residency. The Resident is expected to gradually assume responsibility for two of the Mentor’s classes, and will be evaluated using the residency pre-service assessment (RPA).
Credits: (4), Graded, Semester Calendar
Field Studies, Given When Needed

ED 560  The Modern Teacher
[Formerly EDS 550C] This course is designed to acquaint students with current school reform issues while exposing students to the large number of digital resources, websites, strategies, software and hardware that will help them in their classroom today. Students will be able to:
- Analyze and evaluate the school reform movement from a historical perspective.
- Communicate more productively with students, parents and colleagues by streamlining their digital workflow.
- Differentiate instruction within their class using digital means and modern pedagogy.
- Work cooperatively to teach their classmates about school reform and technology.
- Design a school reform proposal using digital means.
Credits: (3), Graded, Semester Calendar
Lecture, Spring Terms

ED 570  Middle School Students, Structures and Standards
[Formerly EDS 570] This course is designed to prepare students for the teaching of grades 5 and 6. It is designed to offer students a chance to explore topics and methodology that are most appropriate for the teaching of students at the middle adolescence level. It is a course based on the theoretical and practical aspects of the teaching experience and on helping develop students into what we need today: competent, energetic and dedicated teachers at the middle...
level. This is a professional course which demands professional responsibility, a regular commitment, initiative and attentiveness. It is not in any way an exploratory course but one in which a commitment to teaching is assumed. This course and ED 571 qualify students with a grade 7-12 teaching certificate to be also certified to teach grades 5 and 6 in New York State. Prerequisites: Adolescent 7 – 12 Teacher Certification in a content area.
Credits: (3), Graded, Semester Calendar Lecture, Summer Terms

ED 571  Middle Adolescence Literacy
[Formerly EDS 571] This course is designed to prepare you to teach and develop literacy skills across the curriculum in grades 5 and 6. Completion of this course and ED 570 will qualify you with a grade 7-12 teaching certificate for additional certification in your content area in grades 5-6 in New York state. This course is based on both theoretical and practical aspects of the teaching experience. Students will review research, policy briefs and position statements on developing reading, writing, listening, speaking, viewing, and thinking as it applies to the middle adolescent level. The overall goals of this course will require you to connect, collaborate, and create to expand your concept of literacy; to understand the elements of effective literacy instructions in your content area for grades 5 and 6; and to acknowledge your role as a “reading teacher” no matter what your content area specialty is.
Credits: (3), Graded, Semester Calendar Lecture, Summer Terms

ED 572  Teaching Foreign Language to Elementary School Children
This course aims to prepare participating teachers for elementary school foreign language classrooms in light of the ACTFL National Foreign Language Standards. Through discussion, practice and the development of thematic units, participants will become familiar with the process of curriculum development and lesson planning, and will develop strategies for instruction and assessment. Participants will also gain understanding of the working environment and classroom culture of the elementary school setting and build up skills for effective teaching. Multiple modes of learning, methods, instructional strategies, language and literacy development, and resources for teaching foreign languages to elementary school children will be covered. Emphasis is on the development of literacy and communicative skills. Participants will build knowledge and understanding of this grade range through the viewing and analysis of classroom video.
Credits: (3), Graded, Semester Calendar Lecture, Summer Terms

ED 573  Virtual Learning in the P-12 Classroom
In this online class, educators will learn how to shift course interaction and materials from the classroom to an online setting. We will explore elements that create quality online instruction including personalization, communication options and processes, student interactions, and a variety of learning experiences. The course will empower educators to build opportunities for their students to actively interact with each other, with their teacher(s), and with the content of the course.
Credits: (3), Graded, Semester Calendar Lecture, Given When Needed

ED 580  Action Research Project
The MAT Action Research Project is a one-term research project whose purpose is to allow students time and supervision to develop breadth and/or depth of knowledge to become a better teacher in their certification field. What the project will entail varies greatly from student to student. The course is intended to be custom-tailored to meet the specific needs of an individual intern. MAT projects are well-grounded in research and theory, but also include a strong and extensive applied aspect, directly addressing the question: What would this look like in the classroom?
Credits: (3), Graded, Semester Calendar Independent Study, Given When Needed

ED 590  Inquiry Research and Methods
Students will engage in inquiry through the investigation of documents and research-based methodologies. Focus will be placed on practical applications of materials in the full-year residency.
Credits: (1), P/NC, Semester Calendar Lecture, Every Term

ED 610  Reflective Teaching Practices
Reflective Teaching Practices is designed to teach participants how to become reflective practitioners of their own teaching. Participants will be immersed in an exercise in evaluating their own professional practice with the goal of improving student learning. This will be accomplished by creating a supportive learning environment with teacher colleagues who wish to accomplish the same goal. Participants will critically discuss their teaching practice, and critique each other’s practice through the use of videotapes. Participants will demonstrate an embodiment of the National Board for Professional Teaching Standards through the work they bring to the seminar and the manner in which they critique their own and other participants’ work.
Credits: (3), P/NC, Quarter Calendar Lecture, Given When Needed

ED 611  Learning to Teach to the Highest Standards
Students in this class will focus on reflective teaching practices by analyzing specific teaching episodes within the context of their own teaching. Students will incorporate those teaching episodes into a professional portfolio. Students will learn how to write clearly and concisely about how they teach and how their students learn. Course work will reflect the principles of the National Board for Professional Teaching Standards.
While the work in this class mirrors the skills required to achieve National Board Certification, this course does not result in National Board Certification. Completion of this course does not result in National Board certification.
Credits: (3), P/NC, Semester Calendar Lecture, Given When Needed

ED 622  Seminar in Teacher Leadership
The purpose of this course is to teach educators how to apply their reflective practice skills to helping other teachers improve their teaching. Study topics will include adult learning theory and the creation of learning communities, communication and presentation skills, mediation and crisis management, grant writing, education law and policy, research and program evaluation.
Credits: (3), P/NC, Semester Calendar Lecture, Given When Needed
ED 624  School Law
This course is designed to teach the basic tenets of education law – state and federal. Constitutional principles will be explored and debated. The Socratic Method will engage students, creating a learning community in each class. Given the seminar nature of the class, it is expected the professor will explain a concept and engage students in-depth discussions every day. Real life experiences will bring the law to a practical, manageable level. This course will allow students to challenge presumptions, question reasoning and debate ideas to grasp longstanding and newly formed legal concepts. Students will hone critical thinking and writing skills completing the course equipped to analyze problems and synthesize solutions in practical ways, with the law as their guide.
Credits: (3), P/NC, Semester Calendar
Lecture, Given When Needed

ED 649  Research in Curriculum & Instruction
This course is an introductory course on research methods, designed to prepare students for graduate level research. The course examines the full scope of the research process from the literature review, to research questions, and writing a research proposal. Different data collection methods will be discussed including qualitative, quantitative, mixed-method, meta-analysis, ethnography, case study, survey, interview and focus group, and document analysis. The course culminates with presentations by students which demonstrate an understanding of the research proposal process.
Credits: (3), Graded, Semester Calendar
Seminar, Given When Needed

ED 650  Master’s Thesis I
Candidates will work toward completing a master’s thesis in the Spring semester, individually with guidance from a thesis advisor. The thesis will include an Introduction (Chapter I) and Literature Review (Chapter II). This course will provide guidance to complete a systematic exploration. Candidates will produce Chapters I and II by developing a research question, investigating current research, developing an informed hypothesis in response to their question, and reviewing and synthesizing related research. Candidates will begin to draft their Methodology or Application Plan (Chapter III) by creating a plan to test their hypothesis or engage in further inquiry into their topic.
Credits: (3), Graded, Semester Calendar
Thesis Research, Given When Needed

ED 651  Master’s Thesis II
In this course and its predecessor, ED 650, candidates will work toward completing a master’s thesis. Work will be completed individually with guidance from a thesis advisor. Candidates will continue work begun in ED 650 by creating the final chapters of their thesis and presenting their completed work to their advisors/thesis committee. Coursework will focus on creating a Methodology or Methods of Inquiry (Chapter III), Results (Chapter IV), Discussion and Conclusion (Chapter V) and preparing a presentation of the Master’s thesis.
Credits: (3), Graded, Semester Calendar
Thesis Research, Given When Needed

ED 988  Independent Study in Education II
A graduate level course for which there is no comparable Clarkson course. This course may be used to satisfy course requirements for a graduate degree.

ED 989  Independent Study in Education
A graduate level course for which there is no comparable Clarkson course. This course may be used to satisfy course requirements for a graduate degree.
Credits: (2), Graded, Semester Calendar
Independent Study, Given When Needed

Electrical & Computer Engineering

EE 501  Digital Signal Processing
Credits: (3), Graded, Semester Calendar
Lecture, Fall Terms

EE 502  Machine Learning on Biomedical Signals
[Cross listed with EE402] Machine learning methods and their application to the analysis and processing of biomedical signals. Topics include a review of ECG, EMG, EEG, and other biomedical signals. Acquisition of biomedical signals and filtering, spectral analysis, characteristic feature extraction and selection, and dimensionality reduction. In addition, basic classification methods such as LDA, Decision tree, Naïve Bayes, KNN and Support Vector Machines will be studied. Basic regression analysis on biomedical signals for the prediction task will be covered. (Odd Fall)
Credits: (3), Graded, Semester Calendar
Lecture,

EE 503  Advanced Topics in Neuromorphic Computing
Neuromorphic Computing was originally referred to as the hardware that mimics neuro-biological architectures, and was then extended to the computing systems that can run bio-inspired computing models such as neural networks and deep learning networks. In this course, students will learn the basic knowledge of artificial neural networks and the advanced hardware architectures/systems for efficient neural network computing. We will emphasize both the basic knowledge and practical tricks through a series of hand-on practices including paper readings and projects.
Credits: (3), Graded, Semester Calendar
Lecture,

EE 505  Computer Graphics
[Cross-listed with CS 552] An introduction to computer graphics. Graphics hardware, algorithms for generating and displaying two and three-dimensional geometric figures, animation, interactive displays. Programming projects using OpenGL will be assigned. Students will be expected to independently explore some aspects of the course material.
Prerequisites: Programming experience in C/C++ family language, basic concepts in linear algebra and matrices.
Credits: (3), Graded, Semester Calendar
Lecture, Spring Semesters
EE 507  Computer Networks

[Cross-listed with CS 555] This course covers layered networking protocols with an emphasis on common Internet protocols such as TCP, IP, HTTP, and SMTP. It also covers local area networking, focusing on link layer standards such as the IEEE standards for Ethernet and wireless. Additional topics such as security and congestion control will also be covered. EE407 and CS455 are offered each fall as one course with multiple listings.

Prerequisites: One of course in computer architecture (EE264, CS241 or IT502 or equivalent). One course in computer programming (EE261, CS141 or equivalent.) Note: IT501 also satisfies the programming requirement.

Credits: (3), Graded, Semester Calendar
Lecture, Laboratory, Fall Semesters

EE 510  Computer and Network Security

[Cross-listed with CS 557] Attacks on networked computer systems are an increasingly important problem. This course covers the types of vulnerabilities that are present in modern computer systems and the types of malicious software that exploit these vulnerabilities. It also covers best practices for preventing, detecting and responding to such attacks including anti-virus software, defensive programming techniques, intrusion detection systems, honeypots and firewalls.

Prerequisites: A general course in computer networking (CS 556 or EE 407/507) and computer science majors.

Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed

EE 511  Wireless Sensor Networks

This course will present state-of-the-art wireless sensor networks. Both hardware and operating system considerations based on the OSI protocol stack will be covered. Clustering and localization techniques will be presented along with security threats and solutions. Various wireless sensor network applications will be presented.

Prerequisites: EE408/CS455 Computer Networks or permission of the instructor.

Credits: (3), Graded, Semester Calendar
Lecture, Even Fall Semesters

EE 519  High Performance Computing

Principles and practices of high-performance computing (HPC) programming, associated computer architectures, and techniques for computing performance optimization. Topics include concepts of parallel and distributed computing, multithreaded CPU architecture, POSIX threads programming, OpenMP (Open Multi-Processing), GPGPU (General purpose GPU) architecture, NVIDIA CUDA programming, computer cluster management system, MPI (Message Passing Interface) programming, and case studies regarding large-scale engineering applications through HPC and computing performance improvement. Hands-on assignments utilizing Linux based open source tools and compilers will be assigned. Students must have basic C/C++ programming skills to enroll. Suitable for junior and senior undergraduate and graduate students in all engineering and computer science majors.

Prerequisites: EE262 or CS142, or consent of instructor.

Credits: (3), Graded, Semester Calendar
Lecture, Given When When Needed

EE 520  Data Driven Analysis of Complex Systems

The goal of this course will be an integration of concepts of complex systems with big data analysis. Methodology will be drawn from statistical and Bayesian analysis, time-frequency analysis, image processing, linear algebra and principal component analysis, machine learning and image recognition, dimensionality reduction for dynamical systems, system identification, data assimilation, compressed sensing, and equation free modeling. Applications may include PDEs such as advection diffusion from atmospheric data and also steady flow, networked and social data-sets, feature identification in neurological applications, music analysis and identification, and image denoising.

Credits: (3), Graded, Semester Calendar, Lecture, Fall Terms

EE 522  Advanced Signal Processing with Biomedical and Other Applications

Statistical aspects of signal processing that includes such topics as: autocorrelation/crosscorrelation, autoregressive, moving average models, linear prediction, power spectral density, adaptive filters. Each student will utilize real data for an application from his/her research or data from a biomedical application can be provided. Each subject will be approached in three states: fundamental, advanced, and application. Class participation is critical through presentations which include: (1) journal papers for Advanced section, (2) results from their data for Application section, and (3) semester project results.

Prerequisites: Programming experience in C/C++ or Matlab, basic understanding of signal processing and probability.

Credits: (3), Graded, Semester Calendar
Lecture, Odd Fall Terms

EE 523  Introduction to Biometrics

Biometrics is the automated recognition of an individual based on their physiological or behavioral characteristics. This course is an introduction of fingerprint, face, voice, and iris recognition, as well as related aspects of system design, security, privacy, performance evaluation, and novel biometric modalities.

Credits: (3), Graded, Semester Calendar
Lecture, Discussion, Spring Semesters

EE 526  Detection and Estimation Theory

Combines the classical techniques of statistical inference and the random process characterization of communication, radar, and other modern data processing systems. Prerequisites: EE529 or equivalent, or instructor approval. Restriction: Admission to the graduate Electrical Engineering program.

Credits: (3), Graded, Semester Calendar
Lecture, Even Spring Terms

EE 529  Stochastic Processes in Engineering


Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed
EE 530  High-Voltage Techniques and Measurements
Credits: (3), Graded, Semester Calendar
Lecture, Even Fall Semesters

EE 531  Power System Planning
Long-term planning will identify a financially viable and physically feasible mix of resources, including traditional generation and transmission sources as well as advanced techniques such as renewable generation, demand response, and the microgrid, to enhance the overall reliability of power systems. This course will introduce the students generation and transmission expansion planning of a vertically integrated utility and in a competitive market.
Credits: (3), Graded, Quarter Calendar
Lecture, Given When Needed

EE 532  Advanced Electric Machines and Drives
Development of state models of conventional and electronically controlled electric machinery and drive systems. Use of linear transformations in the development of dynamic models of synchronous, induction, permanent magnet, and other rotating machinery, as well as electronically controlled drive systems. Study of the dynamic and transient characteristics of these machinery and drive systems by computer-aided methods. Study of the effects of electronic power conditioning and associated harmonics on the design of these machinery systems, including nonlinearities.
Prerequisite: EE 331 (Energy Conversion) or equivalent
Credits: (3), Graded, Semester Calendar
Lecture,

EE 533  Operation and Control of Electric Power Systems
Course topics include: modeling of generators and transmission networks; security-constrained economic dispatch and security-constrained unit commitment formulations (linear programming and mixed-integer programming) and methodologies (dynamic programming, Lagrangian relaxation, and Benders decomposition); market clearing under different time scales; locational marginal price.
Prerequisite: EE 333 or equivalent.
Credits: (3), Graded, Semester Calendar
Lecture,

EE 535  Power System Reliability
Power system reliability will take a close look at modern electrical power systems from the generation/transmission/distribution capacity planning ("adequacy") point of view. The main topics will include the application of probability theory to power systems including generating capacity, loss of load expectation, expected energy not supplied, interruption frequency indices, interruption duration indices, and service availability indices. This course will cover the computational techniques for the above probabilistic metrics of power system reliability. Commercial reliability software will be introduced into the class to help students get hands-on experiences on industry power system reliability studies.
Credits: (3), Graded, Semester Calendar
Lecture, Even Fall Semesters

EE 537  Power System Protection
Power system fault performance, protective system goals, fault sensing and protection algorithms. Applications to generator, transformer, bus transmission line, and distribution line protection. Distributed generation and the connection to the grid.
Prerequisite: EE333, or knowledge of symmetrical components and fault current calculations
Credits: (3), Graded, Quarter Calendar
Lecture,

EE 538  Alternate Energy Systems
The basic technology of emerging renewable or non-carbon based energy sources will be considered, and contrasted with traditional sources of energy. Topics will include photovoltaic, wind and others. The impacts of energy storage and electrified transportation will be discussed. The capability of these technologies will be assessed, and barriers to implementation will be explored. The role of the electric power grid in enabling alternate energy technologies will be covered.
Credits: (3), Graded, Semester Calendar
Lecture, Even Spring Semesters

EE 539  Dielectrics
Dielectric properties of materials and polarization models. Complex permittivity and relaxation spectra. Electrical breakdown in gases, liquids and solids.
Credits: (3), Graded, Semester Calendar
Lecture, Odd Fall Semesters

EE 541  Electronic Devices
[Cross listed with EE441] Study of modern electronic devices, p-n junctions, bipolar junction transistors (BJTs) and metal-oxide-semiconductor field-effect transistors (MOSFETs), for integrated circuit applications. SPICE device models are introduced, and several SPICE simulation projects are given for integrated circuit design and analysis. This course provides a foundation for understanding SPICE device models and the basics of the microelectronic technology.
Prerequisites: ES260 and EE341, or consent of the instructor.
Prerequisites: ES241 or EE341, or equivalent
Credits: (3), Graded, Semester Calendar
Lecture, Even Fall Semesters
An introduction to CMOS integrated circuit design and simulation. Students will learn CMOS device models and study design, simulation and layout of digital CMOS integrated circuit blocks. Prerequisites: EE264 and EE341, or consent of the instructor. Prerequisites: EE264 and EE341, or consent of the instructor.
Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed

**EE 544  Semiconductor Material and Devices for Engineers**

(Cross-listed with EE443) Fundamentals of quantum mechanics, energy band concept in crystalline materials, band structure modeling, band structure modification, semiconductor device physics, carrier recombination processes, carrier transport phenomena, lattice vibrations, advanced concepts in quantum device technology.
Credits: (3), Graded, Semester Calendar
Lecture, Spring Terms

**EE 550  Control Systems**

Introduction to the analysis and design of continuous-time feedback control systems. Topics include: mathematical representation of physical systems with linear differential equations, Laplace transforms, transfer functions, block diagrams and signal flow graphs, feedback, sensitivity, transient specifications, steady-state tracking errors, stability, root locus plots, compensator design, simulation.
Prerequisite: EE321.
Credits: (3), Graded, Semester Calendar
Lecture, Fall Semesters

**EE 551  Digital Control**

Introduction to the analysis and design of discrete-time feedback control systems. Topics include: mathematical representation of physical systems with linear difference equations, z-transforms, transfer functions, sampling, A/D and D/A converters, sampled-data systems, discrete equivalent systems, transient specifications, steady-state tracking errors, stability, controller design, quantization effects. Significant independent investigation of advanced topics will be required.
Prerequisite: EE321.
Credits: (3), Graded, Semester Calendar
Lecture, Spring Semesters

**EE 552  Optimization Techniques in Engineering**

Introduction to optimization techniques in engineering. Topics include: engineering applications of optimization, types of optimization problems, linear programming and the simplex method, one-dimensional optimization, unconstrained nonlinear programming, nonlinear programming with equality and inequality constraints, advanced optimization techniques, practical aspects of optimization. Prerequisites: MA339 or equivalent or consent of instructor.
Credits: (3), Graded, Semester Calendar
Lecture, Fall Semesters

**EE 555  Robotics I**

(Cross-Listed EE445) The course presents an introduction to the fundamentals of mobile robotic systems including common mechanical configurations with sensors and actuators, as well as the typical sensory, perceptual, and cognitive layers that comprise the field of study. Topics explored will include: Mobile Robot Locomotion (e.g., Legged, Wheeled, and Aerial), Mobile Robot Perception (e.g., Exploration of Sensors, Fundamentals of Computer Vision, Fundamentals of Image Processing, Feature Extraction, and Place Recognition), Mobile Robot Localization (e.g., Noise and Aliasing, Localization-Based Navigation, Map Representations, Probabilistic Map-Based Localization and Autonomous Map Building), and Planning and Navigation (Path Planning, Obstacle Avoidance, and Navigation Architectures). Throughout the course, students will work in teams with a supplied robotics kit of parts to design and implement a mobile robot system that demonstrates various aspects of the course applied to a real-world problem.
Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed

**EE 556  Robotics II**

The course presents an introduction to the fundamentals of industrial robotics. Topics explored will include: Robotic manipulation, direct kinematics, inverse kinematics, workspace analysis and trajectory planning, differential motion and statics, manipulator dynamics, robot control, robot vision and task planning. Throughout the course, students will work in teams with a supplied robotics kit of parts and appropriate software tools to design and implement a robot manipulator that demonstrates various aspects of the course applied to a real-world problem.
Credits: (3), Graded, Semester Calendar
Lecture, Fall Terms

**EE 559  Microgrid Design and Control**

The focus of the course will be microgrid design with PV, Wind, and Energy Storage, and their control and integration into the power systems using power electronics devices. Various topics will be covered in this course to provide students with cutting-edge knowledge in microgrid applications, design, and control. In this course, students will have a chance to 1) learn power converters (DC/DC, DC/AC, and AC/DC) and utilize the converters to create an AC or DC Microgrid with PV, Wind, or Batteries, 2) learn how to control the power quality (voltage, frequency) in islanded and grid-connected modes, 3) learn how to regulate the power flow in islanded and grid-connected modes, and 4) learn about anti-islanding controls and low voltage ride through requirements.
Credits: (3), Graded, Quarter Calendar
Lecture, Given When Needed

**EE 559  Microgrid Design and Control**

The focus of the course will be microgrid design with PV, Wind, and Energy Storage, and their control and integration into the power systems using power electronics devices. Various topics will be covered in this course to provide students with cutting-edge knowledge in microgrid applications, design, and control. In this course, students will have a chance to 1) learn power converters (DC/DC, DC/AC, and AC/DC) and utilize the converters to create an AC or DC Microgrid with PV, Wind, or Batteries, 2) learn how to control the power quality (voltage, frequency) in islanded and grid-connected modes, 3) learn how to regulate the power flow in islanded and grid-connected modes, and 4) learn about anti-islanding controls and low voltage ride through requirements.
Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed
EE 561  Many-Core Architecture and Programming Model
This course will introduce students with the concepts of the state-of-the-art many-core processors. It intends to provide students with deep understandings of hardware architecture as well as the software programming model of such processors. The advanced dynamic power management features will also be covered. The students will have the opportunity to gain hands-on experience through programming a real many-core processor. Prerequisites: EE446 or equivalent or consent of instructor.
Credits: (3), Graded, Semester Calendar
Lecture, Fall Terms

EE 562  Field Programmable Gate Arrays for Digital Signal Processing
This is an advanced project based graduate level course on embedded digital signal processing (DSP) system design using Field Programmable Gate Arrays (FPGAs). FPGAs provide a highly reliable and high performance alternative to the ubiquitous microprocessor based DSP platforms. This course introduces advanced DSP theory and algorithms and applications that can be implemented using MATLAB/Simulink blocks from leading FPGA vendors. The course will have a strong lab component. Students will use tools to design DSP systems using demo FPGA boards.
Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed

EE 563  Advanced Software Engineering
Study of the principles and practices of software engineering. Topics include software quality concepts, process models, software requirements analysis, design methodologies, software testing, and software maintenance. Hands-on experience building a software system using the waterfall life cycle model and CASE tools. Students working in teams develop all life cycle deliverables: requirements documentation, specification and design documents, system codes, and user manuals. Students will learn theoretical concepts from research, such as APFD and PORT for test case prioritization, and apply these concepts to their project. Credits: (3), Graded, Semester Calendar
Lecture, Spring Terms

EE 564  Enterprise Software Development
This course will examine the design, implementation, and deployment of distributed applications in the J2EE environment. Common J2EE architectures, models, technologies, and components will be discussed including RMI, SOAP, JDBC, servlets, JSP, MVC, EJB, and JMS. Students will be required to design and develop a multi-tier, enterprise application using the J2EE and a state-of-the-art J2EE application development tool. Prerequisites: EE408, CS242 or equivalent. Credits: (3), Graded, Semester Calendar
Lecture, Odd Spring Semesters

EE 565  Artificial Intelligence: Theory and Practice
[Cross-listed with CS 551] This course is an introduction to the computational study of intelligent systems. Topics include heuristic search, knowledge representation, automated reasoning, knowledge-based systems, reasoning under uncertainty, planning, and intelligent agents. Additional topics may be drawn from machine learning, neural networks, computer vision, and natural language understanding. AI programming techniques and methods will also be covered throughout the course. Prerequisites: CS344 or equivalent or consent of the instructor.
Credits: (3), Graded, Semester Calendar
Lecture, Spring Semesters

EE 566  Computer Architecture
A study of computer system design. Topics include system structure, instruction sets and addressing modes, software control structures, microprogramming, cache memory and different replacement policies, memory hierarchies, paging, vector processing, pipeline techniques, parallel architectures and interconnection networks. Independent investigation of advanced topics is required. Prerequisite: EE264.
Credits: (3), Graded, Semester Calendar
Lecture, Fall Semesters

EE 567  Software System Architecture
A study of system software components in the context of a modern operating system such as UNIX, together with the necessary tools and utilities for software development. Topics will include software development tools, operating system interfaces and utilities, and network access methods. Emphasis will be placed on conceptual understanding and practical use of system software components rather than on detailed implementation. Independent investigation of advanced topics will be required. Prerequisite: EE261 or equivalent programming experience in C.
Credits: (3), Graded, Semester Calendar
Lecture, Laboratory, Spring Semesters

EE 568  Database Systems
[Cross-listed with CS 560] An introduction to database systems. The entity-relationship and relational models are presented and applied to the design of typical databases. New developments in object-oriented and multimedia databases are presented. Emphasis will be placed on database design for applications in the context of an existing database management system such as ORACLE or ACCESS. Substantial independent investigation of advanced topics will be required. Prerequisite: programming experience in a high level language.
Credits: (3), Graded, Semester Calendar
Lecture, Spring Semesters

EE 570  Coding and Information Transmission
Error detecting and error correcting codes. Encoding of sources and data compression. Huffman codes. Concepts of entropy. Limits on attainable data compression. Limits on data rates for reliable or errorless transmission. Selected advanced topics from rate distortion theory, channel capacity theorem, and the asymptotic equipartition property. Corequisite: MA/STAT381 or MA/STAT383 (MA/STAT381 is preferred.) Prerequisites: STAT383 or STAT381 or equivalent, or instructor approval
Credits: (3), Graded, Semester Calendar
Lecture, Fall Terms

EE 572  Digital Communications
A graduate course covering the foundations of digital communications. Topics covered include EM propagation, multipath and antennas for wireless communications. Communication standards for 3G, WiFi and LTE. Advanced topics include channel capacity, digital modulation techniques, and error correcting codes for data communications. Prerequisites: EE321, and STAT383 or STAT381 or equivalent, or instructor approval
Credits: (3), Graded, Semester Calendar
Lecture, Odd Fall Terms
**EE 573 Computer Vision**

[Cross-Listed CS473/CS573] This course will cover an overview of basic theoretical underpinnings and practical applications of computer vision, with particular emphasis on geometrical techniques underlying 2D and 3D vision. Topics covered include, but are not restricted to, estimation of image transformations, image formation, pose estimation, camera calibration, epipolar geometry, structure-from-motion, stereo reconstruction, filtering, interest point detection, motion estimation, image segmentation, and object recognition. Prerequisites: CS142 or EE262, and MA339 (or equivalent, with consent from the instructor)

Credits: (3), Graded, Quarter Calendar Lecture, Spring Terms

**EE 574 Pattern Recognition and Neural Networks**


Prerequisite: MA/STAT381 or equivalent. Prerequisites: MA/STAT383, or MA/STAT381, or EE529 or equivalent Credits: (3), Graded, Semester Calendar Lecture, Even Fall Terms

**EE 576 Secure Computer System Design**

An advanced course on cybersecurity with focus on hardware security. Roles that computer hardware plays in cybersecurity which include: implementing cryptography primitives in hardware, security threats from hardware and their countermeasures, and enhancement of system security and trust by hardware.

Credits: (3), Graded, Semester Calendar Lecture, Odd Fall Terms

**EE 579 Distributed Algorithms for Wireless Sensor Networks**

This research-driven course involves the study of state-of-the-art distributed algorithms for wireless sensor networks. We will study algorithms for inference. We will also examine the algorithms that are fully distributed, specifically, algorithms in the family of consensus methods. Prerequisites: EE529 or instructor approval. A graduate course in detection and estimation theory and a strong grounding in linear algebra is recommended.

Credits: (3), Graded, Semester Calendar Research, Even Fall Terms

**EE 582 Advanced Electromagnetics**

Study of time-varying electromagnetic fields and applications. Fundamental electromagnetic theory will be covered in order to analyze the solutions of time-varying Maxwell's equations in problems involving wave propagation, radiation and guidance.

Credits: (3), Graded, Semester Calendar Lecture, Given When Needed

**EE 583 Modeling and Design of Electromagnetic Structures**

This course will teach the theory and application on metamaterials. The different types of metamaterials that are covered include materials that operate in the ultraviolet, visible, infrared and microwave spectral ranges. Acoustic metamaterials are also covered. Negative index of refraction, hyperbolic metamaterials, near-zero metamaterials, cloaking materials, and light trapping structures will be studied. Prerequisite: EE583 or permission of the instructor Credits: (3), Graded, Semester Calendar Lecture, Spring Terms

**EE 584 Metamaterials**

This course will cover the theory, analytical and numerical modeling and design of various composite engineered structures that operate in different spectral ranges, including devices that operate in the optical region, others that operate in the IR, and others in microwave spectral range. Devices and structures that will be studied include: surface plasmonic structures, photonic crystals, metamaterials, diffraction grating, antennas. The modeling tools HFSS and Lumerical FDTD will be covered.

Credits: (3), Graded, Quarter Calendar

**EE 585 Neural Engineering**

This course applies engineering principles to the study of neuroscience and to the design of devices or techniques intended to replace missing or augment existing functions such as seeing, hearing, speaking, and walking. The course provides a detailed overview of sensorimotor systems, neurophysiology, neuroanatomy, neuropathology and clinical neurology. The class sequences through the various sensory and movement systems, providing a quantitative basis for how the nervous systems works for these systems, for how it dysfunctions, for the disability produced, and finally for how function can be restored by neuroprostheses. Students will prepare and present a paper on a neural engineering topic.

Prerequisites: MA132 and PH132 or PH142.

Credits: (3), Graded, Semester Calendar

**EE 586 Advanced Electromagnetics II**

This course will cover the second half of Balanis's book Advanced Engineering Electromagnetics. The topics covered will be waveguides and cavities, transmission lines, scattering, integral equations and method of moments, the geometrical theory of diffraction, diffraction by wedges and Green's functions. Prerequisites: EE582 and PH580

Credits: (3), Graded, Semester Calendar

**EE 591 Blockchain Technology: Cryptocurrencies and Beyond**

Blockchains, the basis of the foundational technology underpinning cryptocurrencies, offer many desirable features to end users such as anonymity, immutability, and direct, peer-to-peer transactions. There is immense interest in applying this technology to disrupt and reshape other areas such as cybersecurity, supply chains, health-care, finance
Goals of adopting this technology include minimizing fraud, providing decentralization, and maximizing efficiency, security, and transparency. This course will introduce blockchain design, including the blockchain data structure, distributed systems, consensus management, public key cryptography, hashing, transactions, smart contracts, proofs of work, and wallets. Based on this groundwork, the course will explore political, economic and social implications of blockchain technology in the context of course projects. Basic knowledge of computer programming is expected. Students from different disciplines are welcome to enroll and encouraged to work in teams to define & implement blockchain-based projects. 

Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed

**EE 600** Disruptive Technology
[Cross-listed with ME 600] [Formerly EER 600] This course is designed to prepare the student to be able to efficiently evaluate potential disruptive technologies and their potential for application/commercialization. The course will cover such topics as the CO2 Mitigation, Solid state Energy Systems, Bio Energy and Fusion that have potential to impact the future. In order to cover this broad range of technical topics, the course will utilize multiple instructors that have technical depths as well as experience in the field.

Credits: (3), Graded, Semester Calendar
Lecture,

**EE 600** Disruptive Technology
[Cross-listed with ME 600] [Formerly EER 600] This course is designed to prepare the student to be able to efficiently evaluate potential disruptive technologies and their potential for application/commercialization. The course will cover such topics as the CO2 Mitigation, Solid state Energy Systems, Bio Energy and Fusion that have potential to impact the future. In order to cover this broad range of technical topics, the course will utilize multiple instructors that have technical depths as well as experience in the field.

Credits: (3), Graded, Semester Calendar
Lecture,

**EE 602** Engineering Statistics
[Cross-listed with CS 506, ME 577] [Formerly EER 572] Modern engineering practice makes extensive use of statistical methods for the efficient collection and analysis of engineering data, and to support data-based decision making. This course will introduce the statistical tools that are of greatest importance for practicing engineers. Core topics to be covered will include probability and distribution theory, the construction and interpretation of statistical intervals, statistical hypothesis testing, regression analysis and empirical modeling, statistical experimental design, and statistical quality/process control. Additional specialized topics may also be covered, depending upon the interests of the class; possible topics include system reliability analysis, measurement system analysis, process capability analysis (and “six-sigma”), accelerated life testing, and acceptance sampling.

Credits: (3), Graded, Quarter Calendar
Lecture,

**EE 603** Statistical Methods for Reliability and Life Data Analysis
[Cross-listed with ME578 and BOE623] Reliability analysis is concerned with understanding the failure modes that affect an engineered product, estimating the expected life of the product under service conditions, and predicting the failure rate of the product as a function of time in service. The primary response variable in reliability analysis is time to failure, which may be measured in controlled laboratory experiments, or observed empirically from post-introduction studies of products “in the field”. The analysis of data for which the primary variable of interest is time to failure requires specialized statistical concepts and tools; this course will cover some of the most useful approaches. Examples will be included from materials, mechanical, and electrical engineering. The techniques covered will be implemented with modern statistical software (JMP). The course will endeavor to be very practical, allowing students to effectively analyze reliability data in real-world applications upon the completion of the course.

Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed

**EE 610** ECE Seminar
Credits: (1-10), P/NC, Quarter Calendar
Seminar, Given When Needed

**EE 610** ECE Seminar
Credits: (1-10), P/NC, Semester Calendar
Seminar, Given When Needed

**EE 613** Thesis, Dissertation Credits
Analytical or experimental studies in electrical and computer engineering under the direction of a faculty adviser. Credit for this work is given when the requirements for the degree are completed including the presentation of a thesis or dissertation as appropriate to the degree program.

Credits: (1-15), Thesis, Quarter Calendar
Thesis Research, Given When Needed

**EE 613** Thesis, Dissertation Credits
Analytical or experimental studies in electrical and computer engineering under the direction of a faculty adviser. Credit for this work is given when the requirements for the degree are completed including the presentation of a thesis or dissertation as appropriate to the degree program. 

Credits: (1-15), Thesis, Semester Calendar
Thesis Research, Every Term
**EE 616**  
**Special Project Credits**  
Engineering project credits associated with a Masters of Engineering degree under the direction of a faculty advisor.  
Credits: (1-7), Pass/Fail, Semester Calendar  
Project Team, Every Semester

**EE 622**  
**Advanced Biometrics**  
This special topics graduate level course will focus on the field of biometrics. With increasing reliance on the cyber-domain, knowledge of the individual plays a vital role in trusted electronic transactions, whether they be social, professional or financial. The course will be driven by in-depth review and discussion of journal papers, as well as a semester long project. Students will explore a variety of topics within biometrics including various modalities (fingerprint, iris, face, voice, keystroke, ECG), multi-modal fusion, image processing, pattern recognition, quality assessment, vulnerabilities, social implications, and performance evaluation. Prerequisites: EES23 or equivalent  
Credits: (3), Graded, Semester Calendar  
Lecture, Given When Needed

**EE 628**  
**Adaptive Signal Processing**  
An introduction to adaptive signal processing. Topics include; Applications of adaptive systems, adaptive linear combiner, Wiener least-squares solution, gradient search, the LMS/RLS algorithms, block time/frequency domain LMS, system identification. Prerequisites: EE401/501 or equivalent, and EE529 or equivalent, or instructor approval.  
Credits: (3), Graded, Semester Calendar  
Lecture, Odd Spring Terms

**EE 630**  
**Data Analytics for Power System Applications**  
A graduate level course on data analytics for power system applications with selected topics covering: 1) remote terminal unit data and its application for state estimation; 2) PMU data and its application for event detection and linear state estimation; 3) Electricity data for load forecasting (including multi-variable linear regression & Artificial Neural Network (ANN) methodology, Singular Value Machine based load forecasting, and recent development of probabilistic load forecasting technologies); 4) Wind generation forecasting and wind resource assessment; 5) Solar generation forecasting. Prerequisite: EE333 or equivalent  
Credits: (3), Graded, Quarter Calendar  
Lecture,

**EE 637**  
**Interconnection of Distributed Energy Resources to the Power System**  
This is a graduate level course on the topic interconnection of Distributed Energy Resources (DER) to the power system. It covers DER technology types such as PV, fuel cell, battery storage, wind, ICE, combustion turbines and others. The course shows students how to evaluate and analyze the power system impacts of DER, and determine the allowable penetration limits of DER. It deals with various interconnection issues such as voltage regulation, ground fault overvoltage, system grounding, load rejection overvoltage, overcurrent protection coordination, islanding protection, synchronization, voltage flicker, harmonics and other factors. Solutions to common problems are explained and addressed. Includes many examples and methodologies. Also covers various industry interconnection standards such as IEEE1547 and the application of various utility, federal and state interconnection protocols. Future DER trends in interconnection technology and emerging solutions are discussed as well. Prerequisite: EE681 or equivalent.  
Credits: (3), Graded, Quarter Calendar  
Lecture, Given When Needed

**EE 638**  
**Grid Connected Renewable Energy Systems**  
Power grid energy resources. The solar resource, photovoltaic cell characteristics, solar array performance. Wind energy principles, wind turbine characteristics. Maximum power point operation. Energy storage systems. Grid integration issues. Prerequisites: EE681 or equivalent.  
Credits: (3), Graded, Quarter Calendar  
Lecture, Given When Needed

**EE 639**  
**Electric Power Distribution Systems**  
A graduate level course on modern electric power distribution systems, with topics selected from: overhead and underground lines, voltage regulation, distribution faults and protection, reliability and power quality, lightning protection, grounding, interconnection of distributed generation, and distribution system control and communications. Prerequisites: EE681 or equivalent.  
Credits: (3), Graded, Quarter Calendar  
Lecture, Given When Needed

**EE 640**  
**Fuel Cell Science and Hydrogen Engineering**  
[Cross-listed with ME 581] [Formerly EER 580] Introduce the student to the science and engineering of fuel cell technology. Emphasis will be on developing an understanding of different types of fuel cells, their applications, and the engineering of complete fuel cell systems. Elements of the class will include: electrochemistry; polymer materials science for proton exchange membrane (PEM) based systems; ceramics for solid oxide fuel cells; liquid-electrolytes for phosphoric acid and alkaline fuel cells; and other methods of generating power directly from a fuel and an oxidant. They system
requirements of the fuel cell stack will be introduced to provide a complete picture of the technology. Other elements addressed during the course will include thermochromy; electrochemistry; fuel processing or reforming; electrical & power management; polymer science and systems engineering. Developing an understanding of the proton exchange membrane fuel cell will be the primary objective. After completing this course, the student is expected to have an understanding of the technical needs, challenges, and opportunities of fuel cell systems. The overall essence of the class will be to address the essentials of fuel cells and fuel cell systems and related electrochemical systems. Elements of the entrepreneurial aspects of the industry will also be covered. Hydrogen will be discussed throughout the semester as it relates to fuel cells and the emerging changes in power generation models.

Credits: (3), Graded, Quarter Calendar Lecture,

EE 642 Electronic Power Conversion
[Formerly EER 542] This course examines the application of power semiconductor devices to the efficient conversion of electrical energy. Circuit analysis, signal analysis, and energy concepts are integrated to develop steady-state and dynamic models of generic power converters. Specific topics include AC/DC conversion, DC/DC conversion, DC/AC conversion, and AC/AC conversion. These generic converters are applied as controlled rectifiers, switching power supplies, motor drives, HVDC transmission, induction heating, and others. Ancillary circuits needed for the proper operation and control of power semiconductor devices are also discussed. Prerequisites: Courses in circuit analysis, signals and systems.

Credits: (3), Graded, Quarter Calendar Lecture,

EE 643 Photovoltaic Engineering
[Cross-listed with ME 582] [Formerly EER 580A] The course focuses on the physical principles, technology, and design of efficient semiconductor photovoltaics. Course goals equip students with the concepts and analytical skills to understand efficiency limitations, to assess the viability of various solar and thermophotovoltaic technologies, and to introduce the physics required for understanding photovoltaic energy conversion. The course will focus on three primary aspects of photovoltaic energy conversion, (i) the transfer and conversion of solar (i.e. thermal) radiation to electronic energy, (ii) the theory and design of the semiconductor photovoltaic cell and (iii) photovoltaic systems and applications.

Credits: (3), Graded, Quarter Calendar Lecture,

EE 644 Solid State Electronics
[Formerly EER 574] Course reviews the physics and technology of semiconductor electronic devices and their dynamic behavior. Emphasis will be placed on semiconductor devices used in high-power and high frequency applications such as power electronic switching elements and microwave power amplifiers. Course emphasizes physical understanding of device operation and limitations through energy band diagrams, electron carrier statistics and transport, charge control equations, and equivalent circuit models. Derivation of electrical characteristics and dynamic limitations will be presented for (1) power diodes, (2) bipolar devices such as the power bipolar junction transistor and thyristors, (3) unipolar devices such as the microwave field effect devices and (4) new classes of controlled power electronic devices such as the insulated gate bipolar transistor.

Issues such as reduction of parasitic electrical losses, high band-gap semiconductor material development, and thermal management will be discussed.

Credits: (3), Graded, Quarter Calendar Lecture,

EE 652 Computer Vision
[Cross-listed with CS 652] This course will cover both classical and recent progress in the field of computer vision, both on the theory and practice. Material covered will be from both the textbook and relevant research papers in the area. After taking this course, students will achieve the necessary knowledge to solve various practical computer-vision problems and build a solid background for further computer-vision research. Topics covered include: Early vision on one and multiple images (linear filters, edge detection, stereopsis), mid-level vision (segmentation, object tracking), high-level vision (model-based vision, graph-based image segmentation) and applications (medical image analysis, image-based rendering).

Prerequisites: CS344 and MA339 (or equivalent, with consent from the instructor)

Credits: (3), Graded, Semester Calendar Lecture, Given When Needed,

EE 653 Modeling and Control of Energy Conversion
[Formerly EER 542A] This course examines modeling and control techniques appropriate for application to power electronic and electric machine systems. The course will involve examination of the appropriate theory, followed by application through examples and small design projects. Simulation will be used to evaluate the merits of various techniques.

Credits: (3), Graded, Quarter Calendar Lecture,

EE 657 Linear Control Systems
[Cross-listed with ME 560] [Formerly EER 522] This course addresses practical control system design primarily from a classical perspective. Beginning with transfer function modeling of dynamic systems, the course moves through transient, root locus, and frequency response analysis to end with frequency domain techniques for controller design.

Credits: (3), Graded, Quarter Calendar Lecture,

EE 658 Digital Control Systems
[Formerly EER 528] The course begins with a brief review of continuous-time control methods before transitioning to the theory and implementation techniques for control of dynamic processes by digital computers. Topics covered include discrete system analysis, sampled data systems, quantization effects, state space representation of digital control systems, and the design of digital control algorithms.

Credits: (3), Graded, Quarter Calendar Lecture,

EE 667 Computer Algorithms
[Cross-listed with CS 547] This course will study and contrast a variety of computational algorithms and develop tools for algorithm analysis. Methods and topics such as dynamic programming, greedy algorithms, graph algorithms, circuits, parallel algorithms, matrix and polynomial algorithms, string matching, and geometrical algorithms.
will be explored. The theory of NP-completeness and methods of managing NP-complete problems will also be covered.
Prerequisites: CS344, MA211 or MA346.
Credits: (3), Graded, Semester Calendar
Lecture, Fall Semesters

EE 680 Power System Analysis I
Prerequisite: Electric Circuits or equivalent.
Credits: (3), Graded, Quarter Calendar
Lecture,

EE 681 Power System Analysis II
Prerequisites: Electric Circuits or equivalent.
Credits: (3), Graded, Quarter Calendar
Lecture,

EE 682 Electromechanical Energy Conversion
[Formerly EER 542B] This course is designed to introduce the student to the inside of AC electric machinery. It begins with a review of computing inductance using the integral form of Maxwell’s equations.
Next, the energy method for computing the forces of electrical origin is introduced. These forces are then combined with circuit equations and the equations of mechanics to obtain dynamic models of electromechanical systems. The methodology developed is applied to simple electromechanical structures and then to various types of synchronous machines; induction machines are also considered. Consideration will be given to the electronic control of electric machines.
Prerequisite: A undergraduate course in electromagnetics.
Credits: (3), Graded, Quarter Calendar
Lecture,

EE 683 Turbine Engineering
[Cross-listed as ME 583] [Formerly EER 580B] Course on fundamentals of design, analysis, and technology of turbo machinery – jet engines, gas turbines, steam turbines, water turbines, and wind turbines. The course will provide an understanding of all aspects of system development: thermodynamic cycles, design-point and off-design performance; function and design of components (inlets, compressors, combustors, turbines, outlets), operational limits, and environmental concerns; structural analysis, lifting, and materials; rotor dynamics and blade aeromechanics; clearance analysis, sealing, and packing; heat transfer, blade and component cooling; starting and control; power and thrust generation; testing and instrumentation. The student is expected to develop a broad understanding of the state-of-the-art, challenges, and future of turbine systems.
Credits: (3), Graded, Quarter Calendar
Lecture,

EE 684 Wind Energy Engineering
[Cross-listed with ME 588] [Formerly EER 580D] The course focuses on 'Wind Farm Project Design and Development' and 'Wind Turbine Technology.' Part 1: Teams will demonstrate understanding of complete wind farm design/development process inclusive of site selection, wind resource evaluating target land area, turbine choice, location, energy projection, cost, transmission. Part 2: Focuses on technical understanding of Wind Turbine attributes such as structural, blade system, Nacelle system, electrical system, performance, and future opportunities.
Credits: (3), Graded, Quarter Calendar
Lecture,

EE 685 Solar Energy Engineering
[Cross-listed as ME 587] [Formerly EER 580E] This course is designed to enable the student to effectively grasp the complex and quickly changing solar industry. The course will cover such topics as the economy of solar, photovoltaic devices, systems and applications. In order to cover this broad range of technical topics, the course will utilize multiple instructors. Each instructor has significant expertise and depth in the given field and the student will be able to draw from their experience. Students completing this course will develop knowledge of the solar industry, looking at the past, present and future of this technology area. Students will gain key technical background in every aspect of the industry and will be able to assess new technologies as they are developed. Understanding of the economics of solar and its future will also be obtained.
Credits: (3), Graded, Quarter Calendar
Lecture,

EE 686 Synchronous Electrical Generators
[Cross-listed with ME 589] [Formerly EER 580G] Course on fundamentals of design and analysis of power generators, such as those used in thermal power plants and wind turbines. The course will address the basic operating principles of the synchronous machine and consider configurations such as wound field, permanent magnet, and double fed generators. Key topics will include understanding and analysis of the magnetics within the machine, losses and efficiency, thermal performance, mechanical behavior, operation on the power system, and key IEEE and IEC standards. Further topics will include the duty imposed on the machine during service as well as the duty it imposes on the turbine. The student is expected to develop a broad functional understanding of the current engineering technology, challenges, and future of generator technology.
Credits: (3), Graded, Quarter Calendar
Lecture,

EE 687 Nuclear Engineering
[Cross-listed with ME 575] [Formerly EER 570] The purpose of this course is provide students of various engineering disciplines a functional knowledge of nuclear engineering principles and those most important to the design of nuclear power generation systems. The course will focus both on the nuclear reactor core as well as plant systems. The intent is that students will gain a physical understanding of nuclear engineering principles as they relate to their own field of interest. Class participation will be highly encouraged and focused through the discussion of current events in the nuclear industry as well as proposed future nuclear technologies.
Credits: (3), Graded, Quarter Calendar
Lecture,
EE 690 Independent Study
[Formerly EER 590] Advanced graduate course in the field of engineering sciences. Topics of special interest will be selected for current needs. A description of the course content in any particular term will be announced in advance.
Credits: (3), Graded, Quarter Calendar
Independent Study, Given When Needed

EE 690 Independent Study
[Formerly EER 590] Advanced graduate course in the field of engineering sciences. Topics of special interest will be selected for current needs. A description of the course content in any particular term will be announced in advance.
Credits: (3), Graded, Semester Calendar
Independent Study, Given When Needed

EE 691 Special Topics in Electrical Engineering
[Formerly EER 581] Topics chosen from the current literature according to faculty and student interest. Possible topics include new developments in the major areas of electrical engineering such as electromagnetic fields, communications, controls, circuits, power, devices, electronics, and computer design. Topics may include but not be limited to image processing, machine vision, speech synthesis, integrated optics, antenna systems, adaptive filtering, variational methods, stochastic processes, optical communications, space and satellite communications, and computer networks. Each of these special topics courses has a variable content addressing specific current areas of interest to students.
Credits: (3), Graded, Quarter Calendar
Lecture, Given When Needed

EE 691 Special Topics in Electrical Engineering
[Formerly EER 581] Topics chosen from the current literature according to faculty and student interest. Possible topics include new developments in the major areas of electrical engineering such as electromagnetic fields, communications, controls, circuits, power, devices, electronics, and computer design. Topics may include but not be limited to image processing, machine vision, speech synthesis, integrated optics, antenna systems, adaptive filtering, variational methods, stochastic processes, optical communications, space and satellite communications, and computer networks. Each of these special topics courses has a variable content addressing specific current areas of interest to students.
Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed

EE 693 Directed Study in Electrical and Computer Engineering
Investigation of topics of current interest in selected areas of electrical and computer engineering.
Credits: (1-3), Graded, Semester Calendar
Independent Study, Every Semester

EE 694 Directed Study in Electrical & Computer Engineering
Investigation of topics of current interest in selected areas of electrical and computer engineering.
Credits: (1-3), Graded, Semester Calendar
Independent Study,

EE 698 MS-EE Graduate Project - Studies
This non-credit Seminar project provides a capstone experience for Electrical Engineering graduate students not completing a thesis or independent study (i.e., all course work). The candidate and faculty advisor agree on project scope and evaluation process. The candidate performs required analytical and/or experimental studies to complete a Graduate Project Paper and Presentation.
Credits: (0), P/NC, Quarter Calendar
Seminar, Given When Needed

EE 699 MS-EE Graduate Project - Defense
[Formerly EER 599] This non-credit Seminar project provides a capstone experience for Electrical Engineering graduate students not completing a thesis or independent study (i.e., all course work). The candidate will deliver and defend results from studies documented in a Graduate Project Paper and Presentation. The candidate receives a pass/fail grade which appears on the official transcript.
Credits: (0), Pass/Fail, Quarter Calendar
Seminar, Given When Needed

EE 739 Seminar in Nonlinear Processes
Seminar in Nonlinear Processes
Credits: (1-10), P/NC, Semester Calendar
Seminar, Given When Needed

EE 999 Special Topics in Electrical Engineering
Used for graduate transfer credit for which Clarkson does not have an equivalent EE course number.
Credits: (1-10), Graded, Semester Calendar
Independent Study, Transfer Credit Only

English

EGL 575 Interdisciplinary Connections of History and Multicultural Literature
Framed around universal concepts of humanity (change, diversity, intolerance, ethics, creativity, freedom, and legacy), this course is designed to illustrate the interdisciplinary connections between secondary social studies and English language arts. Recognition that these key concepts span time and place, and are applicable to every period in history, will help to develop a broad understanding of the human experience, and the unity of humanity, through the study of history and multicultural literature. In addition to the historic and literature specific content of the course, other goals include development of empathy and a respect for diversity, as well as learning how to guide discussions that value different points of view.
Restriction: This course is open only to students matriculated in the Master of Arts in Teaching program (or by instructor consent)
Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed

EGL 580 MAT Project in English (Content Area)
The MAT Project is a one-term research project whose purpose is to allow students time and supervision to develop breadth and/or depth of knowledge to become a better teacher in their certification field. What the project will entail varies greatly from student to student. The course is intended to be custom-tailored to meet the specific needs of an individual intern. MAT projects are well grounded in research and theory, but also include a strong and extensive applied aspect, directly addressing the question: What would this look like in the classroom? Restriction: This course is open only to students matriculated in the Master of Arts in Teaching program (or by instructor consent)
Credits: (3), Graded, Semester Calendar, Lecture
EGL 585 Nonfiction in the English Classroom

The Common Core Standards for ELA mandate a shift in the English classroom towards the use of more nonfiction/informational texts. The precise nature of this mandate and its impact on the practices of English teachers continues to be a source of controversy and confusion. In this 3-credit course, we will come to terms with this controversy, and articulate a vision for using nonfiction texts in the English classroom. Additionally, we will explore reading and writing in the literary genres that comprise the category of nonfiction, including memoir, the essay, argumentative writing, and literary journalism. Restriction: This course is open only to students matriculated in the Master of Arts in Teaching program (or by instructor consent)
Credits: (3), Graded, Semester Calendar
Lecture,

Environmental Health Science

EHS 505 Methods and Analysis

This course covers the same topics as IH405 and includes additional material on the graduate level.
Prerequisites: two years' college chemistry and major Industrial Hygiene, IH309.
Credits: (4), Graded, Semester Calendar
Lecture, Laboratory,

EHS 506 Industrial Hygiene Control Methods

This course covers the same topics as IH406 and includes additional material on the graduate level.
Prerequisites: IH309 or consent of the instructor.
Credits: (3), Graded, Semester Calendar
Lecture, Odd Spring Semesters

EHS 518 Principles of Toxicology and Epidemiology

[Cross-listed with BY 518] This course covers the same topics as EHS 416 and includes additional material on the graduate level.
Credits: (3), Graded, Semester Calendar
Lecture, Fall Semesters

EHS 581 Advanced Topics in Environmental and Occupational Health

This course covers the same topics as IH481 and includes additional material on the graduate level.
Credits: (3), Graded, Semester Calendar
Lecture, Spring Semesters

EHS 999 Special Graduate Topics

A graduate level course for which there is no comparable Clarkson course. This course may be used to satisfy course requirements for a graduate degree.
Credits: (1-10), Graded, Semester Calendar
Independent Study, Transfer Credit Only

Engineering & Management

EM 505 Project Controls and Lean Methods in Construction

[Cross-listed with CE 505] This course will cover the use of construction project management controls typical in varying scales of projects. Using the Lean Construction model, the course will cover Lean as both a system and culture, while emphasizing the central place of project delivery processes. Topics in project controls will include: Goal Setting, Scheduling, Budgeting, Problem Solving, and Decision-Making.
Prerequisites: Graduate standing, CE 305, or consent of the instructor
Credits: (3), Graded, Semester Calendar
Lecture, Spring Terms

EM 610 Operations Management and Factory Physics

This course introduces the principles of manufacturing and service management while taking a cursory and scientific look at the processes and operations that impact an organization. The course exposes the student to a wide range of management terms and theories as they relate to strategic and tactical decision making. As such, it provides a basis on which to assess, evaluate, and recommend corrective management actions. In addition, focus is placed on developing an understanding of the relationship between operations and other business functions, such as marketing, finance, accounting, and human resources. Another aspect of the course is Factory Dynamics. This is the study of the factory interactions between people, equipment, raw materials and operations. It is the scientific study of how best to manage these complex interactions so the factory or operations as a whole will work effectively. Restriction: This course requires admission to the Engineering Management MS program.
Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed

EM 620 Introduction to Artificial Intelligence: Principles and Techniques

This course will explore and discuss various theories, models, techniques and practical applications revolving around the topics of Artificial Intelligence and Machine Learning. In a rapidly changing and increasingly global economy, AI or Artificial Intelligence has become the all-powerful and an omnipresent tool/solution and is being used in some form or fashion by every industry. Artificial Intelligence is the machines which are designed and programmed in such a manner that they think and act like humans. The greatest advantage of artificial intelligence is that machines do not require sleep or breaks and are able to function without stopping. They can continuously perform the same task without getting bored or tired. When employed to carry out dangerous tasks, the risk to human health and safety is reduced. AI systems have the ability to execute tasks naturally associated with human intelligence, like speech recognition, decision-making, visual perception, and translating languages. AI would have a lower error rate compared to humans, if coded properly. They would have incredible precision, accuracy, and speed. They won’t be affected by hostile environments, thus able to complete dangerous tasks, explore in space, and endure problems that would injure or kill us.
This course will specifically teach the basics of the following: "Big Data"; "Expert Systems"; "Neural Networks"; "Natural Language Processing"; "Machine Learning"; "Deep Learning"; "Computer Vision and VR/AR".
Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed

EM 630 Law for Engineers

This course provides engineers the legal background and introductory knowledge they need to successfully navigate the many different areas of law they will encounter throughout their careers. Students will learn critical aspects of corporate law, tort (liability/accident) law, intellectual property (IP) law, and contract law during the course.
They will also become familiar with, and learn to recognize, key areas of constitutional law, comparative/international law, environmental law, administrative law, and computer network/cyber law which often affect technical work on a daily basis. Restriction: This course requires admission to the Engineering Management MS program.

Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed

EM 640  Leading and Managing Organizations
Success in leading people and managing performance demands that you have an understanding of how work groups operate and what motivates employees, as well as a candid assessment of your own personality and style. The purpose of this course is to help you understand the general principles and processes of effective leadership so that you can lead in a wide variety of organizational situations. Leadership development is relevant for any student pursuing a managerial career, and is particularly relevant to students who already hold leadership positions in their organizations. Topics covered in the on-campus sessions will focus on aspects of interpersonal behavior, including personality, leadership, teamwork, and conflict management. During the online sessions we will take a more macro perspective, examining firm-level issues such as power and influence, culture, and organizational congruence.

Within these broad categories, we will examine specific theories and models that have been used to describe and predict behavior in organizations, as well as examples of successful and unsuccessful behavior in organizations. We will use readings from the business and academic press as our primary resources, and I expect each of you to bring additional examples to the classroom, either from personal experience or your reading of the business press.

The course will be conducted as a seminar. This means that each of you will contribute to class discussion on a regular basis. I expect you to prepare thoroughly for each class - read the materials, identify and analyze the issues, and think about what you want to say. We will also be engaging in a number of experiential activities including a business simulation, case analyses, and in-class exercises. Restriction: This course requires admission to the Engineering Management MS program.

Credits: (3), Graded, Semester Calendar
Seminar, Given When Needed

EM 650  Enterprise Sustainability
There is a growing sense of urgency around climate change and resource scarcity, and a lack of trust in the ability of global economic and political systems to solve large-scale societal environmental and social problems. Increasingly, the general public expects business to proactively contribute to solving these societal problems, striving towards making a net positive environmental and social impact on the world. Sustainability managers need to know how to lead projects, and more importantly how to help bring about a cultural change within their organizations so that ultimately sustainability is fully integrated into every function. The goal of this course is to empower managers in any function (not just sustainability managers) to lead in sustainability.

This course will provide an introduction to corporate sustainability in manufacturing companies. We will explore some of the critical issues - such as climate change, water scarcity, and forced labor in the supply chain - that corporations need to address, and dig into concrete problems that may arise within a company and their potential solutions. The course will run through the basics of sustainability management, from stakeholder engagement to materiality assessment to reporting, and discuss investor interest in sustainability and environmental, social and governance (ESG) ratings and rankings. We will also look at supply chain issues, including traceability, human rights, and environmental and reputational risk. There will be short lectures, but the course will mainly engage students in developing the business case to address real-life sustainability issues and emerging trends. Restriction: This course requires admission to the Engineering Management MS program.

Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed

EM 660  Cost Management and Financial Analysis
The overall course objective is to increase the student’s ability to deliver a project within cost expectations and to make decisions within the corporate financial perspective. This objective is met by understanding the technical underpinning of engineering economic and simulation based costing analysis, understanding how project decisions impact the organization’s profit/financial health, and understanding the role of life cycle costing.

Credits: (3), Graded, Quarter Calendar
Lecture, Given When Needed

EM 670  Optimization Methods (Decision Analysis)
Students will learn to develop and apply mathematical models to improve management decision making. Optimization involves the automatic consideration of decision alternatives and their ramifications in terms of goals and constraints expressed mathematically. Accordingly, a major focus of the course will be the application of nonlinear, linear, network, and integer optimization methods. The course will also cover other decision technologies such as analysis, regression, and stochastic simulation. These decision making and analysis methods are applicable for solving problems across a wide variety of industries: manufacturing, distribution, health care, finance, marketing, etc.

Credits: (3), Graded, Semester Calendar
Lecture,

EM 680  Decision Analysis and Risk Management
A successful manager needs to be equipped with the techniques and tools of decision analysis in today’s competitive business environment. The primary goal of this course is to develop the student’s ability to define business problems, construct quantitative models and effectively utilize decision making tools (such as MS Excel Solver, Analytic Solver Platform, and decision trees). This course introduces decision modeling techniques by focusing on the development and analysis of models for a variety of business management problems. Topics include supply chain network design, transshipment and logistics management, capital budgeting and fixed charge problems, and decision making under uncertainty and risk.

Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed

EM 690  Capstone Project
Students complete a semester-long project which applies engineering management problem-solving skills to a real-world problem. Students demonstrate the application of engineering problem-solving methodology and project management. Students must demonstrate the ability to engage with a client, define a problem, derive specifications for a successful solution, generate and evaluate appropriate solutions, generate the optimal solution, successfully
complete the process and present the result professionally in both oral and written format.
Credits: (3), Graded, Semester Calendar
Lecture,

Engineering Science

ES 500  Numerical and Engineering Computing
Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed

ES 505  Design of Experiments and Analysis of Data
Modern techniques for the analysis of data and for the planning of experiments in research and in manufacturing. Includes use of software to design factorial and response surface method experiments, interpret the results, and fit data to equations.
Prerequisites: MA232 or MA239 or MA339
Credits: (3), Graded, Semester Calendar
Lecture, Spring Semesters

ES 510  Strategic Project Management
A project is a one-time or infrequently occurring operation with a unique goal, a limited lifespan and limited resources. This course will focus on project management from a decision-making perspective and how projects can be used to implement organizational strategy. The course follows the project life cycle model from project initiation to implementation to termination. Topics covered include such things as project scope development, project selection, organizational strategy, leadership, team building, planning, conflict resolution, budgeting, resource allocation, information management, control, auditing, and termination procedures. Computer applications such as MS Project, case studies, project simulations and student project teams will be an integral part of the course. This course satisfies the educational prerequisite for the Project Management Institute’s (PMI) Certified Associate in Project Management (CAPM) and Project Management Professional (PMP) certifications.
Credits: (3), Graded, Semester Calendar
Lecture, Fall Terms

ES 522  Signal Processing and Applications
This project-driven course involves qualitative and quantitative descriptions of DSP algorithms, software, and applications. The class covers applications in engineering, computing, music, and the arts, with MATLAB, Java, and mobile simulations. Prerequisites: EE321 Signals and Systems, or equivalent, or instructor approval.
Credits: (3), Graded, Semester Calendar
Lecture,

ES 530  Environmental Sustainability and Risk Analysis
This course will consider the general principles and practices of human health and ecological risk assessment in industrial environments. Understanding the key elements of risk assessment, risk management and risk communication allow one to consider a systems approach to addressing complex environmental issues. Concepts of sustainability, life-cycle assessment and environmental management strategies will be examined in the context of an organization's long-term goals. Sustainability is a new approach to environmental management that employs systems thinking/analysis to solve multiple problems with integrated solutions. To set sustainability as a goal for our industrial society we must identify targets and metrics to measure our progress. Using case studies we will examine liabilities an risk management approaches in manufacturing and service organizations.
Credits: (3), Graded, Semester Calendar
Lecture, Spring Semesters

ES 542  Fundamentals of Research and Graduate Study
Students learn basic research and technical communication skills, including literature reviews, technical writing (research proposals and papers), technical presentations, ethics, experimental methods and an introduction to research-related career paths. Each student prepares a portfolio of written materials and gives technical presentation(s). (Undergraduates should register for ES 442).
Credits: (1), Graded, Semester Calendar
Lecture, Fall Semesters

ES 552  Biomaterials and Biomedical Engineering Applications
This course will examine the biomaterials, biomolecular engineering, and tissue engineering aspects of biomedical engineering. Topics covered will include metallic, ceramic, and polymeric biomaterials; manufacturing technologies; sterilization and degradation; the characterization of bulk and surface properties; mechanical and electrical properties of tissues; the interactions between biomaterials and the physiological environment; orthopedic, neural, and cardiovascular biomaterials; and biomaterials for drug delivery and medical imaging. Students enrolled in ES552 will be expected to
**ES 559**  **Electrochemical Processes for Sustainability**  
[Cross-listed with ES459] This course introduces the fundamentals of electrochemistry and applications of electrochemical technologies for sustainability. General theory, electroanalytical techniques, and interfacial structure are discussed. These principles are then used to describe and quantify the controlling features in electrochemical separations, electrochemical water treatment, and electrochemical energy systems. The topics are the same as ES459 but there are additional assignments required of graduate students. Prerequisites: CM132 (or CM104), ES340 (CH260 or CM371). Credits: (3), Graded, Semester Calendar. Lecture, Even Spring Terms.

**ES 564**  **Corrosion of Metals**  

**ES 575**  **Sustainable Nanotechnology**  
[Cross-listed with CM 575, and MSE 575] The goal of this course is to provide graduate students and advanced undergraduates with a modern view of current and emerging research in nanotechnology. Topics will include: fundamental nanoscale properties and applications, green manufacturing and assembly in functional devices, interaction of nanomaterials with biological systems, the physical and chemical phenomena at nano-bio interfaces, fate, transport and transformation of engineered nanomaterials, environmental and health impact, nanometry, nanotoxicology, and hazard identification of nano-based products. Development of analytical methods and characterization tools for assessing nanoscale properties and materials will also be discussed. Students will be exposed to interdisciplinary topics and an integrated training bridging material and environmental sciences with biology and analytical chemistry. Students will be able to demonstrate a basic awareness of risks and benefits of emerging technologies and evaluate overall environmental and societal impact. Credits: (3), Graded, Semester Calendar. Lecture, Spring Semesters.

**ES 580**  **Foundations of Teaching College Engineering Courses**  
The course introduces students to the foundations of engineering education. It couples pedagogical theory and best practices with practical approaches to provide a basis for teaching college level engineering courses. Topics to be covered include: theories of student learning, educational research and best practices, design of courses, delivery of course material, and developing, delivering, and assessing college level engineering courses. Credits: (3), Graded, Semester Calendar. Lecture, Fall Semesters.

**ES 581**  **Selected Topics in Engineering Science**  
An advanced graduate course in the field of engineering sciences. Topics of special interest will be selected for current needs. A description of the course content in any particular term will be announced in advance. Credits: (3), Graded, Semester Calendar. Lecture, Even When Needed.

**ES 587**  **Applications of Synchrotron and Electron Based Techniques**  
The purpose of the course is to familiarize all students with the x-ray and electron based experimental techniques available at Brookhaven National Lab and other similar facilities. Students will be cognizant of the applications of these cutting edge facilities, and well positioned to use them in their own research. This course is suitable for graduate students, postdocs, and advanced undergrads in physical sciences and engineering, as well as students in biological, environmental, and chemical sciences who may have the interest to learn more about the techniques they may use for their research. Credits: (3), Graded, Semester Calendar. Lecture, Spring Terms.

**ES 601**  **Mechanics of Fracture I**  

**ES 610**  **Engineering Science Seminar**  
Students, staff and visiting lecturers present research results and topics of current interest. Credits: (1-2), P/NC, Semester Calendar. Seminar, Every Semester.

**ES 612**  **Directed Study in Engineering Science**  
For graduate students with baccalaureate degree in an engineering field. Credits: (1-4), Graded, Semester Calendar. Independent Study, Given When Needed.

**ES 615**  **Thesis, Dissertation Credits**  
Analytical or experimental studies in interdisciplinary engineering science under the direction of a faculty adviser. Credit for this work is given when the requirements for the degree are completed including the presentation of a thesis or dissertation as appropriate to the degree program. Credits: (1-15), Thesis, Semester Calendar. Thesis Research, Every Semester.

**ES 999**  **Special Topics in Engineering Science**  
Used for graduate transfer credit for which Clarkson does not have an equivalent course number. Credits: (1-10), Graded, Semester Calendar. Independent Study, Transfer Credit Only.
Engineering Science

EV 502 Applications in Geospatial Analytics, Science, and Engineering

[Cross-listed with CE 502, SC 502] This course will use techniques in geospatial analytics, science, and engineering to address applied challenges in various contextual situations. Geotagging, network analysis, spatial visualization, geospatial data manipulation, cartographic presentations, and other similar methods will be studied and applied to real-world or research applications. Students will develop a set of tools that enable completion of projects in the major field using geospatial capabilities.

Prerequisites: Graduate standing, CE 301, or consent of the instructor
Credits: (3), Graded, Semester Calendar
Lecture, Spring Terms

EV 510 Where the Wild Things Are: Environmental Philosophy and the Emergence of the Ecosphere

[Cross-listed with PHIL 510] This course takes Henry David Thoreau’s claim “In Wildness is the Preservation of the World” as the philosophical starting point of the American environmental movement and its attempts to conceptualize nature as a collection of ecosystems and as an ecosphere; along with the ontological, epistemological and ethical implications that result. Authors include Thoreau, Emerson, Muir, Leopold, Stan Rowe, Wes Jackson and Stuart Kauffman. Special emphasis will be given to applications to, and issues and challenges confronting, the Adirondack Park. Graduate students are required to perform additional assignments above those required by undergraduates. Prerequisites: Must have junior or senior standing.
Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed

EV 532 Risk Analysis

Risk assessment entails the evaluation of the hazardous properties of substances, the extent of human exposure to them and the characterization of resulting risk. It is a systematic approach to organizing and analyzing the scientific knowledge regarding potentially hazardous activities or substances. Variability and uncertainty are used to estimate the level of confidence in the risk assessment. The general approach to risk assessment including the use of default assumptions and uncertainty analysis will be presented along with illustrative examples.
Prerequisites: graduate standing or senior with >B average.
Credits: (3), Graded, Semester Calendar
Lecture, Spring Terms

EV 533 Groundwater Hydrology and Geochemistry

[Cross-listed with CE 535] This class provides fundamental understanding of the key physical and chemical processes impacting groundwater resources and quality. Emphasis is on groundwater geology, physical characteristics of flow, and geochemical properties of groundwater. Groundwater contamination and contaminant transport and modeling will be introduced. The course will prepare students to qualitatively and quantitatively analyze fluid and contaminant flow in varied geologic systems.
Credits: (3), Graded, Semester Calendar
Lecture, Odd Fall Terms

EV 536 Global Climate Change: Science, Engineering & Policy

The primary objective of the course is to provide the necessary background that will permit students to understand and accurately describe the workings of the Earth’s climate system, the interactions between the atmosphere, ocean, and climate, and human’s involvement in altering these processes. The course is broken into four components covering earth science, energy, policy, and database access/programming. This highly quantitative course will use project-based experiences to allow each student an opportunity to complete a data acquisition/modeling project of their own design to show correlations between human activities, current atmospheric concentrations, and resulting ecosystem change. For example, the global spatial and temporal distributions of greenhouse gases, clouds, aerosols, radiation, etc. Students will use computational programming tools (Matlab, Excel) in combination with mapping tools (Google Maps, API) to quantify, analyze, and display geographical variations of integrated and averaged values of quantities studied. The project will have separate expectations for graduate and undergraduate students.
Prerequisites: quantitative and modeling skills (Matlab, Excel)
Credits: (3), Graded, Semester Calendar
Lecture, Odd Spring Semesters

EV 590 Special Topics in Environmental Science and Engineering

Advanced study of special topics in the area of environmental science and engineering.
Credits: (1-3), Graded, Semester Calendar
Independent Study, Given When Needed

EV 591 Special Topics in Environmental Politics and Governance

Advanced study of special topics in the area of environmental politics and governance. With approval, students may take this class up to three times as long as the topical area is substantially different and the course is not repeated in the same semester.
Credits: (1-3), Graded, Semester Calendar
Lecture, Given When Needed

EV 610 ISE Graduate Seminar

Seminar course for ISE graduate students in the Environmental Science and Engineering and the Environmental Politics and Governance (EPG) programs.
Credits: (1), P/NC, Semester Calendar
Seminar, Every Semester

EV 612 Thesis, Dissertation or Special Project

Analytical or experimental studies in civil and environmental engineering under the direction of a faculty adviser. Credit for this work is given when the requirements for the degree are completed including the presentation of a thesis, dissertation, or project report as appropriate to the degree program.
Credits: (1-15), Thesis, Semester Calendar
Thesis Research, Every Semester

EV 999 Special Graduate Topics

A graduate level course for which there is no comparable Clarkson course. This course may be used to satisfy course requirements for a graduate degree.
Credits: (1-10), Graded, Semester Calendar
Independent Study, Transfer Credit Only
Finance

FN 540  Finance for Engineers
The goal of this course is to develop a working understanding of finance issues important to engineering managers and to apply this understanding to develop the skills necessary for a career in a business organization. The course includes the concepts of engineering economy, including the time value of money and net present value calculations, additional capital budgeting processes and techniques, the role of short-term finance in project management as well as international corporate finance. Prerequisites: Acceptance in the Engineering and Management MS program. Credits: (2), Graded, Semester Calendar, Lecture

FN 575  Professional Fund Management I
Professional fund management involves two principal topic areas: Portfolio management and security analysis. Portfolio management involves establishing an investment strategy and constructing a portfolio of financial assets consistent with said strategy. Security analysis on the other hand involves the evaluation of individual financial securities. While we address both areas throughout the semester, the focus of this class is security analysis. The primary structure of this course is an application of fund management with a focus on a rotating investment style. Each semester, students will be directed to follow different investment styles such as, sector rotation, growth, or quantitative analysis. Furthermore the class will be responsible for managing a designated portion of the Clarkson University endowment. This student managed investment fund (SMIF) will be primarily invested in equity securities; security selection within the equity assets class will be made by the current class members. Credits: (1-3), Graded, Semester Calendar Lecture, Fall Semesters

FN 576  Professional Fund Management II
Professional fund management involves two principal topic areas: Portfolio management and security analysis. Portfolio management involves establishing an investment strategy and constructing a portfolio of financial assets consistent with said strategy. Security analysis on the other hand involves the evaluation of individual financial securities. While we address both areas throughout the semester, the focus of this class is security analysis. The primary structure of this course is an application of fund management with a focus on a rotating investment style. Each semester, students will be directed to follow different investment styles such as, sector rotation, growth, or quantitative analysis. Furthermore the class will be responsible for managing a designated portion of the Clarkson University endowment. This student managed investment fund (SMIF) will be primarily invested in equity securities; security selection within the equity assets class will be made by the current class members. Credits: (1-3), Graded, Semester Calendar Lecture, Spring Semesters

FN 607  Financial Management (MBA Module)
(Cross-listed with FN 608, FN 610) An application of the tools and models that produce better decisions for the firm in short and long term. Asset selection, risk management, inventory management, credit and capital acquisition, and overall value enhancement are covered. Emphasis is put on the quantitative tools, the practices of existing corporations, and the international environment. Restriction: Admission to the MBA program required Credits: (2), Graded, Semester Calendar Lecture, Discussion, Spring Semesters

FN 608  Financial Management
(Cross-listed with FN 607, FN 610) This course introduces students to the complexities of financial valuation and decision-making while providing a comprehensive overview of the major issues in Corporate Finance. Specific topics will include: valuation of financial instruments, capital budgeting, an introduction to capital markets, the assessment and pricing of risk, capital structure issues, dividend policy, and working capital considerations. The course will integrate concepts from Accounting (Income Statement and Balance Sheet Analysis as well as pro forma statements), Decision Sciences (Excel, modeling and sensitivity analysis), and Economics (wealth maximization, demand estimation and forecasting). Credits: (3), Graded, Quarter Calendar Lecture, Summer Terms

FN 609  Financial Management
(Cross-listed with FN 607, FN 610) This course introduces students to the complexities of financial valuation and decision-making while providing a comprehensive overview of the major issues in Corporate Finance. Specific topics will include: valuation of financial instruments, capital budgeting, an introduction to capital markets, the assessment and pricing of risk, capital structure issues, dividend policy, and working capital considerations. The course will integrate concepts from Accounting (Income Statement and Balance Sheet Analysis as well as pro forma statements), Decision Sciences (Excel, modeling and sensitivity analysis), and Economics (wealth maximization, demand estimation and forecasting). Credits: (3), Graded, Semester Calendar Lecture, Spring Semesters

FN 610  Financial Analytics
This course introduces methods and tools for financial data analysis in SAS and Python, focusing on analyzing financial information data and stock return data. Topics covered in this course include, but are not limited to, univariate analysis, regression analysis, panel data models, event studies, stock return anomalies, high-frequency data analysis, and Monte Carlo simulations. A variety of data sources are used: financial websites, government sites, and finance research databases such as WRDS. Students will become proficient in financial data analysis, which will prepare them for careers in the financial industry. Prerequisites: IA 530 or equivalent. Credits: (3), Graded, Semester Calendar Lecture, Fall Terms

FN 615  Financial Modeling and Analysis
The objective for this course is to develop the financial modeling skills used in the application of financial theory to practical problems in investment analysis, portfolio management, and valuation. Financial models have become increasingly complicated over the years, and this course is intended as an introduction to some of the modeling techniques used by professionals in the finance field. Topics covered include construction of free cash flows, forecasting cash flows, capital budgeting, risk measurement, and portfolio choice subject to constraints. The course is suitable for students seeking a career in finance, but also for students with broader interests who wish to strengthen their general modeling skills. Prerequisite: FN608 Credits: (3), Graded, Quarter Calendar Lecture, Fall Terms
FN 619 Investments
[Formerly MBA 619] This course provides an in-depth analysis of modern investment strategies and portfolio management techniques. Current theory, empirical evidence, and institutional practices are considered. Topics covered include portfolio theory and asset pricing models, market efficiency, fixed-income portfolio management and immunization, equity valuation models, the valuation of options and option strategies, and portfolio management and performance evaluation.
Credits: (3), Graded, Quarter Calendar, Lecture, Spring Semesters

FN 629 Money, Markets, and Banking
[Formerly MBA 629] The course covers the nature and functions of money and finance in the economy. Commercial and central banking, monetary theory, and monetary policy are also considered.
Credits: (3), Graded, Quarter Calendar, Lecture, Winter and Summer Quarters

FN 661 International Finance
[Formerly MBA 661] An analysis is made of international financial markets and the special problems and opportunities associated with the financial management of multinational firms. The international monetary and banking system (including the World Bank and IMF), balance of payments, and economic relationships are also examined. Foreign exchange and interest rate risk management, arbitrage, international equity and debt financing activities, derivatives, multinational capital budgeting, political risk, international taxation and accounting issues are considered. Coursework involves an intensive team research project focused on a specific country and the international financial exposures of select global corporations.
Credits: (3), Graded, Quarter Calendar, Lecture, Winter and Summer Quarters

FN 672 Investments
This course presents the investment decision-making process based on both theory and practice. In addition to the coverage of the standard investment securities and contracts, active investment based upon market inefficiency determination is examined. Related topics may include initial public offerings, risk arbitrage, and speculation with derivatives. Prerequisites: FN607 or equivalent.
Credits: (3), Graded, Semester Calendar, Lecture, Fall Semesters

FN 680 Strategic Financial Management
This course examines in depth (1) financing courses for entrepreneurs and business developers, as well as (2) risk management methods. Besides the capital markets, the sources for operating and fixed asset financing for firms in development or with strategic alliances include venture capital, vendor and customer financing, bank and insurance company loans, and leasing. In addition to financing topics, commodity price risk management, as achieved with forward contracting, futures contracts, over-the-counter options and swaps, is examined as means to control price uncertainty. Prerequisites: FN607 or consent of the instructor.
Credits: (3), Graded, Semester Calendar, Lecture, Fall Semesters

FN 687 Special Project in Finance
Individual study under the guidance of a staff member. Provides an opportunity for the student to investigate a specific problem area of finance, that is acceptable and under the guidance of the faculty member and chairperson. Prerequisites: permission of the Department of Finance Chair and faculty member involved.
Credits: (1-3), Graded, Semester Calendar, Independent Study, Every Semester

French Language

FRN 580 MAT Project in French (Content Area)
The MAT Project is a one-term research project whose purpose is to allow students time and supervision to develop breadth and/or depth of knowledge to become a better teacher in their certification field. What the project will entail varies greatly from student to student. The course is intended to be custom-tailored to meet the specific needs of an individual intern. MAT projects are well-grounded in research and theory, but also include a strong and extensive applied aspect, directly addressing the question: What would this look like in the classroom? Restriction: This course is open only to students matriculated in the Master of Arts in Teaching program (or by instructor consent).
Credits: (3), Graded, Semester Calendar, Lecture,

FRN 585 Advanced French Grammar
This course is designed to give students who already have a deep understanding of the French language and French and francophone cultures the opportunity to more fully develop grammatical knowledge and accuracy in French. Emphasis will be placed on listening, speaking, reading, and writing in French using complex grammatical structures. Students will complete a systematic exploration of functional and stylistic features and gain a firmer grasp on grammar, understanding what grammar is and what purposes it serves, in addition to knowing grammatical rules.
Credits: (3), Graded, Semester Calendar, Lecture, Given When Needed

FRN 988 Independent Study in French
A graduate level course for which there is no comparable Clarkson course. This course may be used to satisfy course requirements for a graduate degree. Restriction: This course is open only to students matriculated in the Master of Arts in Teaching program (or by instructor consent).
Credits: (3), Graded, Quarter Calendar, Independent Study, Given When Needed
**FRN 989 Independent Study in French**

A graduate level course for which there is no comparable Clarkson course. This course may be used to satisfy course requirements for a graduate degree. Restriction: This course is open only to students matriculated in the Master of Arts in Teaching program (or by instructor consent)
Credits: (3), Graded, Quarter Calendar
Independent Study, Given When Needed

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**GER 989 Independent Study in German**

A graduate level course for which there is no comparable Clarkson course. This course may be used to satisfy course requirements for a graduate degree. Restriction: This course is open only to students matriculated in the Master of Arts in Teaching program (or by instructor consent)
Credits: (3), Graded, Semester Calendar
Independent Study, Given When Needed

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**Geology**

**GEO 580 MAT Project in Earth Science (Content Area)**

The MAT Project is a one-term research project whose purpose is to allow students time and supervision to develop breadth and/or depth of knowledge to become a better teacher in their certification field. What the project will entail varies greatly from student to student. The course is intended to be custom-tailored to meet the specific needs of an individual intern. MAT projects are well-grounded in research and theory, but also include a strong and extensive applied aspect, directly addressing the question: What would this look like in the classroom? Restriction: This course is open only to students matriculated in the Master of Arts in Teaching program (or by instructor consent)
Credits: (3), Graded, Semester Calendar
Lecture,

**GEO 988 Independent Study in Earth Science**

A graduate level course for which there is no comparable Clarkson course. This course may be used to satisfy course requirements for a graduate degree. Restriction: This course is open only to students matriculated in the Master of Arts in Teaching program (or by instructor consent)
Credits: (3), Graded, Semester Calendar
Independent Study, Given When Needed

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**Healthcare Management**

**HC 600 Introduction to Health Systems**

[Formerly HCM 500] This course examines the determinants of health, illness, and medical care utilization, institutional arrangements and settings for the delivery of acute and chronic care, the doctor-patient relationship, resource allocation and financing, and measuring and evaluating system performance.
Credits: (3), Graded, Quarter Calendar
Lecture, Fall Terms

**HC 601 Swiss Healthcare Study Tour**

[Formerly HCM 601] This Study tour will give Healthcare MBA students a better understanding of the healthcare delivery system in Switzerland. Students will have an opportunity to visit research hospitals, R&D centers, and pharmaceutical companies and learn firsthand about the unique characteristics of the system. We will also have seminars where experts in the field will discuss current issues in terms of healthcare delivery.
Credits: (3), Graded, Quarter Calendar
Lecture,

**HC 602 Advanced Statistics and Data Visualization**

[Formerly MBA 606] This is an applied course on advanced statistical techniques that are commonly used in health care and business settings. The course will be based on case studies that incorporate typical challenges of a real-life application: Large data sets with mixed types of variables (e.g., qualitative and quantitative), missing data, lurking variables, correlated variables and uncontrolled variation. The course objective is to enable students to become effective users of advanced statistical techniques in support of business decision making. The topics covered will include logistic regression, multivariate analysis (principal components, clustering, discriminant analysis), partitioning analysis, and time series modeling. Students will learn to identify high impact application opportunities for each technique, plan and execute their own data-based investigations, apply the appropriate statistical modeling technique, and report their findings and recommendations. The role of effective data visualization as a key element in modern data analysis and presentation will be emphasized throughout the course.
Prerequisites: IS647
Credits: (3), Graded, Quarter Calendar
Lecture, Winter Terms

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**German Language**

**GER 580 MAT Project in German (Content Area)**

The MAT Project is a one-term research project whose purpose is to allow students time and supervision to develop breadth and/or depth of knowledge to become a better teacher in their certification field. What the project will entail varies greatly from student to student. The course is intended to be custom-tailored to meet the specific needs of an individual intern. MAT projects are well-grounded in research and theory, but also include a strong and extensive applied aspect, directly addressing the question: What would this look like in the classroom? Restriction: This course is open only to students matriculated in the Master of Arts in Teaching program (or by instructor consent)
Credits: (3), Graded, Semester Calendar
Lecture,

**GER 988 Independent Study in German**

A graduate level course for which there is no comparable Clarkson course. This course may be used to satisfy course requirements for a graduate degree. Restriction: This course is open only to students matriculated in the Master of Arts in Teaching program (or by instructor consent)
Credits: (3), Graded, Semester Calendar
Independent Study, Given When Needed
systems and provides students with the knowledge of the current enhancements to relational database systems, distributed database systems (e.g. Hadoop) object oriented database and XML database systems. The course will also include an introduction into SQL to query relational databases. Prerequisites: HC468 or IS606
Credits: (3), Graded, Quarter Calendar
Lecture, Winter Terms

HC 604 Hospital Analytics
Formerly HCM 604] An application of principles of analytics to hospital settings, problems, and strategic issues. Students will learn the array of alternative platforms hospitals use for collecting, storing, and distributing data within the hospital-health system setting, including data displays, analytical modules, and user interfaces. Students will also work with hospital data to answer clinical and strategic questions that senior leaders pose, and understand the promise and limitations of the data. Finally, students will be exposed to issues related to data communication and sharing among internal constituencies including owned physician practices and subsidiaries, related parties (e.g., PHO’s and voluntary physicians), and Health Information Exchanges through RHIO’s. Prerequisites: HC602, HC603, and HC642. Credits: (3), Graded, Quarter Calendar
Lecture, Summer Terms

HC 605 Health Operations
Formerly HCM 505] This course instructs the students in quantitative methods useful for analysis, improvement, and design of efficient and effective organizational processes within a health-care organization. Operations management (OM) is concerned with evaluating the performance of operating units, understanding why they perform as they do, designing new or improved operating procedures and systems for competitive advantage, making short-run and long-run decisions that affect operations, and managing the work force. Health systems OM is the analysis, design, planning, and control of all steps necessary to provide a service for a client. The course will involve readings from a selected text, review of published studies, exercises in internal and external benchmarking, and exploration of the tools and methods promoted at the national level. Credits: (3), Graded, Quarter Calendar
Lecture, Winter and Spring Terms

HC 606 Payer Analytics
Formerly HCM 606] Health insurers and healthcare providers share a common mission of improving health however their means to achieving their mission vary materially. This course will focus on the analytics health insurers utilize to facilitate affordable, quality healthcare. We will discuss and analyze the approaches health insurers take to discover and communicate meaningful patterns in data from historical information reporting to future predictive modeling. Upon completion of this course, the student ill have been exposed to key payer analytic frameworks and tool sets used to drive success within a health insurer. Prerequisites: HC602, HC603, and HC642, Credits: (3), Graded, Quarter Calendar
Lecture, Fall Terms

HC 607 Healthcare Operations Research
Formerly HCM 607] Health Care Operations Research examines several of the Operations Research models most widely used in the Health Care industry. The primary goal is to enable students to become productive consumers of Operations Research for the support of Health Care Management decision making. Students will learn to recognize opportunities for Operations Research analyses, perform basic analyses, report their findings in non-technical terms, and direct or interact with more complex analyses. Operations Research methodologies covered will include Linear Programming, Queuing Theory, Simulation, and Decision Analysis. Applications to staffing, scheduling, capacity planning, facility layout, facility location, and inventory management will be covered. Prerequisites: IS502
Credits: (3), Graded, Quarter Calendar
Lecture, Spring Terms

HC 609 Healthcare CRM
Formerly HCM 609] This course provides a practical overview of how to design and implement modern digital customer relationship marketing. Topics to include: customer insight mining, social media and search analyses, segmentation, customer database design, promotional media selection, campaign operations, sales force automation, digital engagement analytics, and ROI measurement. Textbook and other readings will be supplemented by a small-group case study project that students develop throughout the term. Prerequisites: (IS647 or HC647), and (HC648 or IS606)
Credits: (3), Graded, Quarter Calendar
Lecture, Summer Terms

HC 610 Healthcare Accounting and Finance
Formerly HCM 510] The course covers use of financial statements and financial management in a regulated environment for taxable and tax exempt healthcare entities. Topics covered include: reading, interpreting and analyzing healthcare entity financial statements, time value analysis, valuing healthcare entities and assets, financial decision making and capital budgeting. Credits: (3), Graded, Quarter Calendar
Lecture, Fall Terms

HC 617 Healthcare Finance
Formerly HCM 617] This course covers financial management in a regulated healthcare environment. Topics include cost-finding and third-party reimbursement, contemporary issues in healthcare financing, sources of capital, capital budgeting, financial planning and analysis, cost accounting, and managed care issues. Prerequisites: AC604
Credits: (3), Graded, Quarter Calendar
Lecture, Winter and Spring Terms

HC 620 Health Economics
Formerly HCM 620] This course is intended for students entering the health field and investigates economic approaches to problems and solutions. Students obtain an understanding of how economics contributes to public and private decision-making in healthcare, and learn to properly interpret economic research results and apply them to work performed by health planners and administrators. Prerequisites: HC600 and IS647
Credits: (3), Graded, Quarter Calendar
Lecture, Fall Terms

HC 626 Health Systems Marketing
Formerly HCM 526] This course introduces students to the principles of marketing and their application to healthcare settings. At the end of this course, students should a.) Understand what marketing can do for the healthcare organization in terms of contribution to strategic planning, building business, strengthening relationships between the organization and its constituents, and achieving competitive
advantage. b.) Clearly understand how to use health data in marketing planning and implementation. c.) Appreciate the challenges of evaluating the effectiveness of marketing communications investments made by healthcare organizations. d.) Understand the relationship between patient/customer satisfaction and service quality in health organizations. e.) Understand how to judge marketing communications quality, both qualitatively and quantitatively. f.) Demonstrate effective communications skills through in-class participation, writing assignments, and class presentations. g.) Analyze marketing problems and select effective strategies for solving them. h.) Understand key marketing concepts and their applications to business and healthcare organizations.

Credits: (3), Graded, Quarter Calendar
Lecture, Fall and Winter Terms

HC 630  LIM Introduction to Health Systems
[Formerly LIM 500] This course examines the determinants of health, illness, and medical care utilization, institutional arrangements and settings for the delivery of acute and chronic care, the doctor-patient relationship, resource allocation and financing, and measuring and evaluating system performance. Restriction: Open to LIM students only. Credits: (3), Graded, Quarter Calendar
Lecture, Fall Quarters

HC 633  LIM Healthcare Leadership
[Formerly LIM 503] This course examines managerial roles and processes within health service organizations - organization design, managerial epidemiology, governance, total quality management, human resource management, labor relations and ethics. Restriction: Open to LIM Students only
Prerequisites: HC630
Credits: (3), Graded, Quarter Calendar
Lecture, Winter Quarters

HC 634  LIM Health and Human Values
[Formerly LIM 544] An intensive 8 day introduction to current topics in clinical ethics and bioethics, taught seminar style, with a clinical visit to Mount Sinai School of Medicine in New York City. This overview of current issues in bioethics humanities involves four special pro-seminars, case conferences and ethics rounds. There will also be training in the computer skills (demonstrations, workshops) essential to mastering distance learning. Restriction: Open to LIM students only
Credits: (3), Graded, Quarter Calendar
Seminar, Summer Terms

HC 635  LIM Health Economics
[Formerly LIM 553] This course is intended for LIM students entering the medical profession and investigates economic approaches to problems and solutions. Students obtain an understanding of how economics contributes to public and private decision-making in healthcare, and learn to properly interpret economic research results and apply them to work performed by Physicians, health planners and administrators. Restriction: Open to LIM students only
Credits: (3), Graded, Quarter Calendar
Lecture, Given When Needed

HC 637  LIM Clinical Leadership Practicum
[Formerly LIM 571] Students will work in the field with a preceptor in a clinical leadership role. Students may be placed in a variety of healthcare settings including: hospitals, physician offices, health maintenance organizations, etc. Classes meet every other week to discuss students' field experiences and selected readings. Restriction: Open to LIM students only
Credits: (3), Graded, Quarter Calendar
Practicum, Spring Terms

HC 642  Data Analytics and Business Intelligence
[Formerly HCM 642] This course provide an introduction to Data Analytics and examines a set of information systems, which specifically support managerial decision makers: Decision Support Systems, Group Decision Support Systems, Executive Information Systems, Data Warehouses, Expert Systems, and Neural Networks. The focus in this course is on data and text mining, using an appropriate software application for the organization, retrieval, and modeling of large structured and unstructured data sets.
Prerequisites: HC602 and HC603
Credits: (3), Graded, Quarter Calendar
Lecture, Spring Terms

HC 643  Advanced Applications in Data Analytics
The objective of this course is to introduce students to advanced data analytics applications, using a set of structured and unstructured data (historical and real-time) from various business sectors. The course will build upon concepts and methodologies, which students have learned from previous classes in the data analytics program, but extend the scope and complexity by using a combination of analytic tools (e.g. R, SPSS, RapidMiner, Tableau, and SQL). While some of the 3 day course involves lecturing and hearing guest sessions, students will spend most of their time working in a team to analyze data and prepare presentations to visualize and communicate the insights obtained from the data. This course will be focused on key-concepts in data analytics and provide students with a better understanding of how to analyze and communicate ‘big data’ and will provide the students in the MS Healthcare Data Analytics program a “capstone” style experience.
Prerequisites: HC602, HC603, HC642, HC647, HC648
Credits: (3), Graded, Quarter Calendar
Lecture, Given When Needed

HC 647  Statistical Foundations of Data Analytics
[Formerly HCM 647] [Cross Listed with IS647] This course covers fundamental methods in statistical analysis and data visualization as applied in healthcare. A holistic problem-solving approach is taken covering problem formulation, data acquisition and preparation, selection of appropriate statistical methods, and effective communication of analytic results. Topics covered include data visualization, data description methods, statistical inference, and model building. Examples are drawn from a variety of healthcare applications. Data visualization and analysis will be performed using statistical software. Credits: (3), Graded, Quarter Calendar
Lecture,

HC 648  Health Informatics
This course will introduce students to the concepts and practices of health informatics. Topics include: a) an introduction to information systems and specifically to the health informatics field; b) major applications and commercial vendors; c) decision support methods and technologies; d) system analysis, design, implementation, and evaluation of healthcare information systems; and e) new opportunities and emerging trends.
Credits: (3), Graded, Quarter Calendar
Lecture, Winter and Summer Terms
HC 650 Health Policy Dynamics
Through the application of public policymaking process and organization theory, this course examines topics associated with health policymaking process and external competitiveness of modern health care organizations. Course topics include policy formulation, agenda-setting, policy implementation, policy modification, organizational design & structure, organizational environment, strategic planning, and managerial ethics. The course covers theoretical, conceptual, and practical foundations of the macro aspects of health policymaking process and healthcare management. Prerequisites: HC600
Credits: (3), Graded, Quarter Calendar
Lecture, Fall and Winter Terms

HC 651 Health Systems Management
[Formerly HCM 501] This course examines the various aspects of managing in the modern health care environment. A variety of methods including lectures, case studies, in-class exercises, and student presentations will be used. Topics covered include quality improvement, ethical management, managing diversity, communications, leadership, motivation, team building, and conflict resolution. Prerequisites: HC600
Credits: (3), Graded, Quarter Calendar
Lecture, Fall and Winter Quarters

HC 655 Group Practice Administration
The objective of this course is to introduce students to the organization and management of private group practice through seminar and practical experience. It is intended that this course will prepare students for employment in private group practices and/or other ambulatory care organizations. Prerequisites: HC600 and HC651
Credits: (3), Graded, Quarter Calendar
Lecture, Winter and Summer Terms

HC 657 Healthcare Leadership Proseminar
[Formerly HCM 507] This Proseminar will provide students with an introduction to the role of management and leadership in healthcare. It includes a preliminary overview of the U.S. health system and changes occurring in the healthcare environment, as well as an introduction to ethical reasoning and ethics as they apply to the healthcare industry. Students will also learn communications concepts and skills required of leaders. The course will involve an intensive three-day on-campus residency, in which students will receive classroom lectures, participate in exercises, hear guest speakers from healthcare organizations, and complete projects as assigned. After completing the 3-day on-campus residency, students will continue the course independently and online, completing an assignment by the end of the Fall term. The Proseminar is designed to provide students with a framework with which they can interpret material to be covered in successive courses. In addition, they will have a unique opportunity to meet and network with healthcare leaders, faculty members, and student colleagues. The course will require some online work beyond the 3-day intensive on-campus residence to be completed during the subsequent term. Credits: (3), Graded, Quarter Calendar
Lecture, Fall Terms

HC 674 Legal Aspects of Healthcare
[Formerly HCM 674] This course is designed to familiarize students with basic legal issues involved in managing healthcare systems. Antitrust, consent, labor law, malpractice, professional rights and other problems are explored using actual and hypothetical case studies.
Credits: (3), Graded, Quarter Calendar
Lecture, Spring and Summer Terms

HC 680 Health Policy and Managerial Epidemiology
[Cross listed with BIE577] [Formerly HCM 680] This 10-week course focuses on applying basic epidemiological methodologies in healthcare management. Epidemiological problems are formulated and described in terms of person, place, and time. Health care planning relies on needs assessments to allocate resources to epidemiological and population health issues. A variety of study designs are used to generate data to analyze causes or patterns of disease frequency. Epidemiological methods employed in infectious disease and disaster are examined. Data collection systems specific to public health applications are reviewed. The ethical principles applied in public and population health settings are covered. Prerequisites: HC 600. For students in the LIM program, HC 630, and HC 633.
Credits: (3), Graded, Quarter Calendar
Lecture, Spring Terms

HC 681 Strategic Issues for Healthcare Organizations (Health Care Capstone)
[Formerly HCM 681] This course is designed to integrate the concepts and skills associated with managerial problem-solving learned throughout the MBA in Healthcare Management program. Students analyze case studies addressing the strategic realignment of health service organizations in today’s healthcare environment. A variety of expert practitioners present their views on this topic. Prerequisites: HC600, HC605, HC651, and HC657.
Credits: (3), Graded, Quarter Calendar
Lecture, Spring Terms

HC 683 MBA Internship
[Formerly HCM 683] An Internship for the MBA or Healthcare MBA program. Provides practical, hands-on experience that focuses on an area directly related to the student’s field of study. Credits: (0), Pass/Fail, Quarter Calendar
Independent Study, Given When Needed

HC 684 LIM Strategic Issues in Healthcare (Capstone)
[Formerly HCM 684] A capstone course designed to integrate the concepts and skills associated with healthcare research-based managerial problem solving learned throughout the LIM program in Healthcare Management. The objective of this course is to assist students with a level of professional maturity, confidence and strategic thinking to become a successful physician leader. Restriction: Open to LIM students only
Credits: (3), Graded, Quarter Calendar
Lecture

HC 999 Special Graduate Topics
A graduate level course for which there is no comparable Clarkson course. This course may be used to satisfy course requirements for a graduate degree.
Credits: (0-10), Graded, Quarter Calendar
Independent Study, Transfer Credit Only
Hist 527 History of Women and Gender in America

This course will cover the same subject area and topics as HIST 327. Additional materials at the graduate level will be expected of those who register under this catalog number.
Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed

Hist 588 Themes and Concepts in Chinese History

[Cross Listed with HIST288] This course is an examination of themes and concepts related to the study of Chinese history. Topics include early China during the Shang, the dynastic cycle, philosophies, the Silk Road, urbanization, gender and society, revolution and change. Students will utilize a variety of source and literature to examine these topics. Note: this course will be jointly offered at the undergraduate and graduate level. Graduate students will do additional work; the syllabus will specifically delineate the course requirement at each level. Undergraduate students with a History major cannot apply HIST288 toward their required Major Concentration in History.
Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed

Educational History

Hist 575 Interdisciplinary Connections of History and Multicultural Literature

Framed around universal concepts of humanity (change, diversity, intolerance, ethics, creativity, freedom, and legacy), this course is designed to illustrate the interdisciplinary connections between secondary social studies and English language arts. Recognition that these key concepts span time and place, and are applicable to every period in history, will help to develop a broad understanding of the human experience, and the unity of humanity, through the study of history and multicultural literature. In addition to the historic and literature specific content of the course, other goals include development of empathy and a respect for diversity, as well as learning how to guide discussions that value different points of view.
Restriction: This course is open only to students matriculated in the Master of Arts in Teaching program (or by instructor consent)
Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed

Hist 580 MAT Project in History (Content Area)

The MAT Project is a one-term research project whose purpose is to allow students time and supervision to develop breadth and/or depth of knowledge to become a better teacher in their certification field. What the project will entail varies greatly from student to student. The course is intended to be custom-tailored to meet the specific needs of an individual intern. MAT projects are well-grounded in research and theory, but also include a strong and extensive applied aspect, directly addressing the question: What would this look like in the classroom? Restriction: This course is open only to students matriculated in the Master of Arts in Teaching program (or by instructor consent)
Credits: (3), Graded, Semester Calendar
Lecture,

Hist 587 Reel History

Reel History is an examination of themes and concepts related to the study of history. A range of historical topics across the New York state 1790-12 social studies curriculum will be examined. Students will view and research films to analyze and evaluate the historical accuracy portrayed in film. Emphasis will be placed on determining the degree to which film can be used as a source for understanding history. Student research, presentations, and the development of curricular materials related to the use of film as a documentary evidence will be the basis of course assessments. Restriction: This course is open only to students matriculated in the Master of Arts in Teaching program (or by instructor consent)
Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed

Hist 988 Independent Study in History

A graduate level course for which there is no comparable Clarkson course. This course may be used to satisfy course requirements for a graduate degree. Restriction: This course is open only to students matriculated in the Master of Arts in Teaching program (or by instructor consent)
Credits: (3), Graded, Semester Calendar
Independent Study, Given When Needed

Hist 989 Independent Study in History

A graduate level course for which there is no comparable Clarkson course. This course may be used to satisfy course requirements for a graduate degree. Restriction: This course is open only to students matriculated in the Master of Arts in Teaching program (or by instructor consent)
Credits: (3), Graded, Semester Calendar
Independent Study, Given When Needed

Interdisciplinary Analytics

IA 501 Calculus

This course serves as a prerequisite course for MS Data Analytics students who do not have calculus background. Functions and graphs; derivative concept and formulas, including chain rule and implicit differentiation; integral concept; the Fundamental Theorem of Calculus; properties and applications of the derivative, including max-min problems and graph sketching; exponential, logarithmic, and inverse trigonometric functions.
Credits: (2), P/NC, Semester Calendar
Lecture, Given When Needed

IA 502 Probability and Statistics

Prerequisite course for MS Data Analytics students who do not have calculus-based statistics and probability background. A calculus based introduction to topics in probability and statistics. Probability content includes events and sample spaces, the basic axioms of probability, discrete and continuous random variables (definitions and basic characterizations such as the means and variances) including binomial, Poisson, normal, exponential, student-t, and uniform distributions. Topics in statistics include the central limit theorem, statistical inference including confidence intervals and hypothesis testing for one and two sample data, and linear regression. Students will use statistical software to read data and interpret software generated output.
Credits: (2), P/NC, Semester Calendar
Lecture, Given When Needed
IA 503  Introduction to Programming
Prerequisite course for MS Data Analytics students who do not programming background. This course introduces students to programming fundamentals and standard components, features and practices. Main programming concepts are introduced in an applied context. Practical emphasis is on sound programming practices and development methods.
Credits: (2), P/NC, Semester Calendar
Lecture, Given When Needed

IA 507  Spreadsheet Analytics
The main purpose of this course is to enable students to acquire understanding and applicable knowledge of conducting exploratory analysis across different disciplinary fields using modern spreadsheet based tools and techniques. This course focuses on critical skills and tools for using the spreadsheet software packages for the purpose of conducting a variety of analytics tasks and operations to improve gathering, generation and presentation of organizational intelligence.
Credits: (1), Graded, Semester Calendar
Lecture, Spring Terms

IA 510  Database Modeling, Design & Implementation
This course is focused on key concepts of database modeling, design, and management, utilizing a variety of relational database management systems. Students will acquire understanding of proper data modeling approaches, grounded in underlying rationale for creating well-designed and efficient data repositories. They will be introduced to the variety of modeling and implementation approaches, and will gain understanding of unique advantages leading to the prevalence of the relational database model in today's systems. Students will learn to properly utilize basic methods and techniques for conceptually envisioning as well as designing databases which include Entity-Relationship (ER) modeling, relational modeling, normalization, and Structured Query Language (SQL).
Credits: (3), Graded, Quarter Calendar
Lecture, Given When Needed

IA 510  Data Warehousing
This course examines how data warehouses are used to successfully gather, structure, analyze, understand, and act on information. The components and design issues related to data warehouses and business intelligence techniques for extracting meaningful information from data warehouses are emphasized. The emphasis is on proper modeling techniques as well as the techniques for Extraction, Transformation and Loading (ETL) process. Various software tools will be used to demonstrate design, implementation, and utilization of data warehouses.
Credits: (3), Graded, Semester Calendar
Lecture, Fall Terms

IA 520  Optimization Methods for Analytics
Optimization is a structured approach to determining the best values for a set of decision possibilities given constraints and an objective expressed as a function of these decision variables. This course focuses on the design, development, and analysis of optimization models while using canned software to solve them. The students will solve a wide variety of optimization problems applicable to a wide variety of industries: manufacturing, distribution, health care, finance, marketing, etc. Students will develop optimization models using Microsoft Excel.
Prerequisites: An undergraduate course in probability and statistics, and an undergraduate course in introductory computer science or programming.
Credits: (3), Graded, Semester Calendar
Lecture, Fall Terms

IA 530  Probability & Statistics for Analytics
Probability theory is presented as a mathematical foundation for statistical inference. Axiomatic probability is introduced; standard discrete and continuous probability distributions are presented. Joint distributions and transformations are discussed. Probabilistic convergence concepts are introduced. The key objectives of this course are to formulate statistical models and find optimal solutions for statistical problems in economics, business, engineering, and science, have a global overview of the interplay between probability and statistics as well as master the art of writing statistical proofs well, consistent with the written tradition of the discipline, and have the skills to communicate statistical ideas effectively.
Credits: (3), Graded, Semester Calendar
Lecture, Fall Terms

IA 626  Big Data Processing and Cloud Services
This course will enable students to gain understanding of critical components and the processes of Big Data architecture. The course will take a hands on approach, enabling students to develop critical skills by creating data processing pipelines and procedures to transform and integrate structured, semi-structured and unstructured data. The course will provide students with understanding of web service based systems architecture and best practices for deployment of scalable applications for data analytics. This class will also teach students practical fundamentals of Cloud Computing and how it relates to Big Data. The class will cover both
Apache Hadoop implementation as well as usage of leading industry solutions such as Elastic MapReduce. Throughout the class students will be taught how to recognize opportunities in big data analytics and how to match those opportunities with the most appropriate big data software. Students will learn the various data formats and be taught when to utilize each one. The course will take an applied approach but also relate this application to general design theories of abstraction and architecture. Prerequisites: IA 503, or IS 237, or CS 141, or equivalent
Credits: (3), Graded, Semester Calendar
Lecture, Fall Terms

**IA 628 Introduction to Big Data Architecture and Applications**

The objective for this course is to provide an in-depth discussion of the big data architecture and its applications. The following topics will be covered: big data architecture from a data pipeline perspective; distributed file systems; massively scalable processing of big data, using the map and reduce model; access to big data via SQL-like interface; running search engines over big data; scripting over big data; and real-time access to big data. The course will be taught using the Hadoop ecosystem as a reference platform. The course will use a projects-driven approach where students will have ample opportunities to practice essential skills needed by a big data analyst, from cluster planning, through the development of data analytics, to the designing and building of big data applications. Prerequisites: IA 503, IA 510, and IA 626 (or equivalent)
Credits: (3), Graded, Semester Calendar
Lecture, Summer Terms

**IA 630 Modeling for Insight**

Although mathematical models have a long and compelling history of application in science and engineering, they are becoming increasingly important in the world of business. Some problems are well described by statistical (curve fitting models), but analyzing a business problem generates significant complexities that are often not well described by simply analyzing the historical data. In particular, to be able to answer questions of ‘what if...?’ often requires an understanding of system behaviors when we specifically to to depart from previous (historical) practices. The critical contribution of these models is that they may allow the analyst to arrive at compelling insights to contribute to development of a reasoned action plan. This class will enable students to develop familiarity and facility in generating insightful models via modeling in realistic situations. Key skills to be developed include recognizing the key problem, developing a model structure for an unstructured problem, and intelligent analysis and interpretation of model results. Additionally, students will gain experience in the iterative process that is required to develop useful models for unstructured problems. This course will make extensive use of Excel for building and analysis of models and will leverage skills developed in prerequisite courses in spreadsheet modeling. Students will be expected to use Excel and Risk Solver Platform. This course will be delivered primarily in the style of a studio with minimal theory, but with repeated practical exercises. Each exercise will require a written report, and every second exercise will require a presentation. Prerequisites: IA 505, IA 510, IA 520, and IA 530 (or equivalents)
Credits: (3), Graded, Semester Calendar
Lecture, Spring Terms

**IA 640 Information Visualization**

The science of Information Visualization (InfoVis) seeks to understand the best way to achieve synergistic interaction of the human visual perception system and data. Data visualizations focus on two general application areas: (1) Enhancing the ability of the visual system to discover structure in the data leading to new insight and knowledge, and (2) Taking advantage of the visual display to support rapid diffusion of complex information throughout the organization achievable by the visualization applications. This class will study the techniques, systems, software, algorithms, and design principles that allow for maximal information transmission and knowledge discovery when working with complex data sets. Students will learn the key principles involved in information visualization through a project driven course, with students gaining background skills in design and application of innovative visualizations.
Credits: (3), Graded, Quarter Calendar
Lecture, Given When Needed

**IA 650 Data Mining**

Recent advances in information technology, together with the growth of the Internet have resulted in an explosion of data collected, stored, and disseminated. Because of its massive size, it is difficult for analysts to sift through the data even though it may contain useful information. Data mining holds great promise to address this problem by providing efficient techniques to uncover useful information hidden in large data repositories. Awareness of the importance of data mining is becoming widespread. Industry is creating more job opportunities for people who have interdisciplinary data analytic skills. They key objectives of this course are to teach the fundamental concepts of data mining and provide extensive hands-on experience in apply the concepts to real-world applications. Students will have opportunities to learn both domain and technical knowledge to face the big data challenges in industry. The core topics to be covered include classification, clustering, association analysis, and anomaly/novelty detection. This course consists of about 13 weeks of lecture, followed by 2 weeks of project presentations by students who will be responsible for developing and/or apply data mining techniques to applications such as intrusion detection, Web usage analysis, financial data analysis, text mining, bioinformatics, systems management, Earth Science, and other scientific and engineering areas. At the end of this course, students are expected to possess the fundamental skills needed to conduct their own research
in data mining or to apply data mining techniques to their own research fields. Prerequisite: IA 530 or equivalent
Credits: (3), Graded, Semester Calendar
Lecture, Summer Terms

IA 651 Applied Machine Learning
The objective of this course is to provide in-depth coverage of major supervised machine learning algorithms from an applied perspective, using a case studies approach. The following topics will be covered: machine learning paradigms; process and measurement of supervised learning; support vector machines; neural networks; other selected machine learning algorithms; feature engineering; case studies selected from different domains, such as text and natural language processing, electrical engineering, business, and vision and image processing. The course will be taught using an industry accepted language, such as Python or R, and associated machine learning packages. The course will use a projects-driven approach where students will have ample opportunities to practice essential skills needed by a machine learning practitioner, from the preparation and planning of data for training and testing, through feature selection, to the deployment of machine learning based applications. Credits: (3), Graded, Quarter Calendar
Lecture, Given When Needed

IS 501 Mathematics of Management
[Formerly MBA 1] This course focuses on mathematics useful in modeling management processes. Fundamental concepts of differential and integral calculus and their applications to management are addressed. Credits: (0), Pass/Fail, Quarter Calendar
Lecture, Given When Needed

IS 502 Introduction to Probability
[Formerly MBA 2] This course covers marginal, joint and conditional probability; random variables, expected value and variance; selected probability distributions and their uses in management; and sampling distributions and the Central Limit Theorem. Credits: (0), Pass/Fail, Quarter Calendar
Lecture, Given When Needed

IS 605 Information Systems (MBA Module)
[Cross-listed with IS 606] In this course the role of information systems and information technology in managing modern information age enterprises is explored. The focus of the course is on (a) establishing the basic knowledge of information systems (b) strategic significance of information systems to various businesses and industries (c) role of information systems as a strategic weapon to compete in the global marketplace and (d) role of information systems in transforming modern business organizations. Advanced topics of enterprise resources planning and emergent visions and practices such as electronic commerce, web-based information systems, and corporate intranets and extranets are reviewed in a framework of strategic information planning. Real life cases of information systems are analyzed and discussed to reinforce the understanding of concepts introduced in the course.
Prerequisites: completion of all CUSB MBA foundation requirements admission to the MBA program.
Credits: (2), Graded, Semester Calendar
Lecture, Fall Semesters

IS 606 Business Information Systems
[Cross-listed with IS 605] This course explores the role of information technology and systems (IT/IS) in today’s organizations. The focus of this course is on the fundamentals of information systems and investigating the strategic importance of information systems to various businesses and industries as well as the role of information systems in transforming modern business organizations. Topics will include: Planning an IT application portfolio, system implementation, IT driven process redesign, IT governance and IT/IS as a source of competitive advantage. We will examine specific information technologies and applications such as: enterprise systems, cloud computing, social media, and business intelligence. The structure of the course will include readings, group work / discussions and case studies highlighting the IT/IS related issues faced by organizations. Credits: (3), Graded, Quarter Calendar
Lecture, Winter Terms
systems in transforming modern business organizations. Topics will include: Planning an IT application portfolio, system implementation, IT driven process redesign, IT governance and IT/IS as a source of competitive advantage. We will examine specific information technologies and applications such as: enterprise systems, cloud computing, social media, and business intelligence. The structure of the course will include readings, group work / discussions and case studies highlighting the IT/IS related issues faced by organizations.

Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed

IS 642 Applications in Business Analytics
This course provides an introduction to Big Data and Analytics and examines a set of systems and applications, which specifically are supporting the Big Data World. Students will learn the basic concepts behind data retrieval and analytics, explore and discuss the development of these systems. Data analytics applications will be applied to current business problems, to illustrate how organizations can gain a competitive advantage with the implementation and usage of such applications. Students will gain the conceptual knowledge for business analytics concepts as well as practical experience with the structural dimension for data analytics. The main focus of this course will be to collect, preprocess, analyze and present structured and unstructured data, using advanced Data Analytics software.

Credits: (3), Graded, Quarter Calendar
Lecture, Fall Terms

IS 647 Statistical Methods for Data Analytics
This course covers the analytic process that supports data-driven decision-making in business. Emphasis is placed on problem formulation, data acquisition, selection of appropriate statistical approaches, and effective communication of analytic results. Topics covered include data visualization, data description methods, statistical inference, and model building. Examples are drawn from quality management, finance, operations, supply chain management, marketing and healthcare. Data visualization and analysis will be performed using statistical software.

Credits: (3), Graded, Quarter Calendar
Lecture, Fall, Winter, and Summer Terms

IS 647 Statistical Methods for Data Analytics
This course covers the analytic process that supports data-driven decision-making in business. Emphasis is placed on problem formulation, data acquisition, selection of appropriate statistical approaches, and effective communication of analytic results. Topics covered include data visualization, data description methods, statistical inference, and model building. Examples are drawn from quality management, finance, operations, supply chain management, marketing and healthcare. Data visualization and analysis will be performed using statistical software.

Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed

IS 687 Independent Project in Information Systems
Practical application of information systems concepts in an independent research or development project conducted under the guidance of a CUSB faculty member.

Credits: (1-3), Graded, Semester Calendar
Independent Study, Every Semester

Information Technology

IT 501 Software Systems
This course is an introduction to software design and implementation. After a review of basic programming concepts, students will be introduced to procedural and data abstraction, object-oriented design, recursion and dynamic data structures. Abstract data types such as lists, stacks, queues, and trees will be studied. Algorithms for searching and sorting will be explored along with methods for comparative analysis. Programming concepts will be demonstrated in a language like C++. The course will also include an introduction to the Unix operating system.

Prerequisite: programming experience.

Credits: (3), Graded, Semester Calendar
Lecture, Every Term

IT 502 Computing and Telecommunications Systems
A study of the concepts of computer system design and organization needed for effective information system implementation and management. Topics in computer hardware design, processor design, computer peripherals and interfacing techniques, networking components, and survey of commercially available computers. Also included are the basic concepts of telecommunications including data communication protocols and related topics.

Credits: (3), Graded, Semester Calendar
Lecture, Spring Terms

IT 520 Information Technology Independent Project
Independent project under the direction of a Clarkson professor.

Credits: (1-10), Graded, Semester Calendar
Independent Study, Every Term

IT 521 Information Technology Independent Project
Independent project under the direction of a Clarkson professor.

Credits: (1-10), Graded, Semester Calendar
Independent Study, Given When Needed

IT 522 Information Technology Independent Project
Independent project under the direction of a Clarkson professor.

Credits: (1-4), Graded, Semester Calendar
Independent Study, Given When Needed

IT 620 Information Technology Project
Independent project work in IT under the supervision of a Clarkson professor.

Credits: (1-9), Graded, Semester Calendar
Independent Study, Every Term

IT 621 Information Technology Project
Independent project work in IT under the supervision of a Clarkson professor.

Credits: (1-9), Graded, Semester Calendar
Independent Study, Spring Terms

IT 699 IT Project Consultant
For students who have filled all unit requirements for the IT MS degree, but are staying to oversee an ongoing project.

Credits: (1), Graded, Semester Calendar
Independent Study, Given When Needed
Special Graduate Topics

A graduate level course for which there is no comparable Clarkson course. This course may be used to satisfy course requirements for a graduate degree.
Credits: (1-10), Graded, Semester Calendar
Independent Study, Transfer Credit Only

Latin Language

MAT Project in Latin (Content Area)

The MAT Project is a one-term research project whose purpose is to allow students time and supervision to develop breadth and/or depth of knowledge to become a better teacher in their certification field. What the project will entail varies greatly from student to student. The course is intended to be custom-tailored to meet the specific needs of an individual intern. MAT projects are well-grounded in research and theory, but also include a strong and extensive applied aspect, directly addressing the question: What would this look like in the classroom? Restriction: This course is open only to students matriculated in the Master of Arts in Teaching program (or by instructor consent)
Credits: (3), Graded, Semester Calendar
Lecture,

Independent Study in Latin

A graduate level course for which there is no comparable Clarkson course. This course may be used to satisfy course requirements for a graduate degree. Restriction: This course is open only to students matriculated in the Master of Arts in Teaching program (or by instructor consent)
Credits: (3), Graded, Semester Calendar
Independent Study, Given When Needed

Independent Study in Latin

A graduate level course for which there is no comparable Clarkson course. This course may be used to satisfy course requirements for a graduate degree. Restriction: This course is open only to students matriculated in the Master of Arts in Teaching program (or by instructor consent)
Credits: (3), Graded, Semester Calendar
Independent Study, Given When Needed

Law

Environmental Law and Policy

This course considers the principal legal approaches used to deal with environmental problems, including, common-law, statutory, regulatory, and economic-incentive systems. This course addresses procedural and substantive issues of law and regulation affecting environmental and natural resources. Further, the course will review and consider the policy implications of actions (or inaction) that impact the environment and to see environmental issues from multiple perspectives.
Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed

Mathematics

Abstract Linear Algebra

A proof-oriented introduction to linear algebra. Vector spaces, linear transformations, determinants, eigenvalues, canonical forms, and inner-product spaces. Notions of null spaces, spectral decomposition theorem, positive definiteness, and also Penrose pseudo-inverse and singular value decomposition will be included. Students will be expected to independently investigate some aspects of the course material.
Prerequisite: Linear Algebra
Credits: (3), Graded, Semester Calendar
Lecture,

Sets and Topology

Prerequisite: linear algebra.
Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed

Classical Complex Analysis

Complex series and power series. Analytic functions and basic mapping properties. Cauchy's theorem and its consequences. Residue theorem and applications.
Prerequisite: advanced calculus.
Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed

Classical Real Analysis

Prerequisite: advanced calculus.
Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed

Functional Analysis

This course introduces the students to the fundamental aspects of applied functional analysis. This field builds upon the concepts of real and complex analysis, developing the general theories of Banach spaces, bounded linear operators, and linear functionals. The primary focus of the course will be applications of functional analysis to other fields of mathematics, including such topics as dual spaces, weak topologies and weak convergence, approximation theory, and the applications of operator theory to the solutions of partial differential equations. Recommended prerequisites: courses in Real Analysis and Complex Analysis or consent of the instructor.
Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed

Convex Optimization and Analysis

Convex sets, functions, and optimization problems. Basics of convex analysis. Least-squares, linear and quadratic programs, semidefinite programming, minimax and extremal volume problems. Optimality conditions, Lagrange multipliers and KKT conditions, duality theory, primal and dual decomposition theorems of alternative interior point methods. Possible applications to come from signal processing, physics, control theory, mechanical engineering, image processing.
This course will emphasize differential equations, such as models for population dynamics may be covered routinely in most applications. The motivation for this course is that optimization problems arise routinely in most applications -- from designing an airline schedule to minimize cost to designing a remediation strategy for a contaminated ground water site. In this course we will focus on numerical techniques to solve applied optimization problems of various formulations. Topics will include solutions to linear and nonlinear equations, nonlinear programming, unconstrained and constrained

Complex analysis with applications

This course will emphasize applied dynamical systems, nonlinear science, and chaos theory. The dynamical systems approach emphasizes the study of long-term evolution through geometrical and topological considerations. We will emphasize applications from mechanics, engineering, physics, biology, medicine and chemistry.

Numerical solution of boundary value problems in ordinary differential equations, finite difference methods for elliptic, parabolic, and hyperbolic partial differential equations. Additional topics may include introduction to finite element and spectral methods.

Separation of variables and boundary value problems will be presented. Nonlinear equations shall be discussed, including reaction diffusion and reaction diffusion advection. Method of characteristics will be presented and shocks and singularities shall be included, and so will Burger's equation be included.

Topics include: weak formulations and the principle of virtual work, discretization and interpolation-function selection, assembly and solution of the system equations, error estimates and accuracy assessment. When taught in conjunction with CE 438/ME 453 the course requires additional independent work for those registered for the graduate course.

Additional topics may include applications to least squares and optimization.

This course is an introduction to manifold learning. Other topics may include epigraphs, subdifferentials and cone convexity, and multiobjective optimization. 

Prerequisites: MA578; MA513 or MA573; and MA522

Credits: (3), Graded, Semester Calendar Lecture, Given When Needed

Solution techniques for ordinary differential equations. Series solutions. Boundary value problems and special functions. Classification of partial differential equations. Linear problems shall include heat equation, wave equation, and Laplace's equation. Separation of variables and boundary value problems will be presented. Nonlinear equations shall be discussed, including reaction diffusion and reaction diffusion advection. Method of characteristics will be presented and shocks and singularities shall be included, and so will Burger's equation be included.

Credits: (3), Graded, Semester Calendar Lecture, Given When Needed

Please check with the math department for a course description

Credits: (3), Graded, Semester Calendar Lecture,

This course introduces the analysis of Partial Differential Equations, (PDE's). Topics include linear PDE's such as transport, Laplace, heat and wave equations. Necessary functional analysis such as L^p spaces, Hilbert spaces, linear operator theory, dual spaces and weak convergence and the theory of Sobolev spaces will be included. Methods will include classical maximum principles, Galerkin truncation methods for global existence of weak solutions, and finite time blow up. The application of Sobolev spaces for existence theory of elliptic and parabolic PDE, and certain nonlinear reaction diffusion equations, such as models for population dynamics may be covered as time allows.

Prerequisites: Basic PDE, Advanced Calculus. Real and/or functional analysis is recommended but not required.

Credits: (3), Graded, Semester Calendar Lecture, Given When Needed

Complex numbers and functions, conformal mapping and applications, derivative, Cauchy-Riemann equations, real and complex line integrals, Fundamental Theorem, Cauchy and Poisson formulas, Taylor series, analytic continuation, special functions, Laurent series, residues. Applications to partial differential equations.

Prerequisite: MA231.

Credits: (3), Graded, Semester Calendar Lecture, Given When Needed

This course will emphasize applied dynamical systems, nonlinear science, and chaos theory. The dynamical systems approach emphasizes the study of long-term evolution through geometrical and topological considerations. We will emphasize applications from mechanics, engineering, physics, biology, medicine and chemistry.

Credits: (3), Graded, Semester Calendar Lecture, Given When Needed

Numerical solution of initial and boundary value problems in ordinary differential equations, finite difference methods for elliptic, parabolic, and hyperbolic partial differential equations. Additional topics may include introduction to finite element and spectral methods.

Prerequisites: MA377 or consent of the instructor and the ability to program.

Credits: (3), Graded, Semester Calendar Lecture, Given When Needed

[Cross-listed with CE 538, ME 515] This course is an introduction to the finite element method, from a mathematical as well as a modeling and applications point of view. The basic theory and implementation will be discussed in the context of continuum problems in linear elasticity, potential flow and plate modeling. If time permits, additional applications such as structures, electromagnetics, fluid mechanics, ground water and geotechnics will also be discussed. Topics include: weak formulations and the principle of virtual work, discretization and interpolation-function selection, assembly and solution of the system equations, error estimates and accuracy assessment. When taught in conjunction with CE 438/ME 453 the course requires additional independent work for those registered for the graduate course.

Prerequisites: MA232, MA339 or MA330, ES222, ES330, and the ability to program. Consent of the instructor may be used to replace some prerequisites.

Credits: (3), Graded, Semester Calendar Lecture, Fall Semesters

This course presents topics in matrix theory that are useful in applications to engineering, science and other branches of mathematics. Review of linear algebra, including vector and matrix norms and canonical forms, numerical methods for linear systems (direct and iterative methods), eigenvalue problems, singular value decomposition, orthogonal projections, matrix decompositions, generalized inverses. Additional topics may include applications to least squares and optimization.

Credits: (3), Graded, Semester Calendar Lecture, Given When Needed

Review of linear algebra and systems, solution of nonlinear equations and systems, interpolation, approximation of functions, orthogonal polynomials, numerical differentiation and integration. Additional topics may include eigenvalue problems, iterative methods for linear systems and topics from optimization.

Prerequisites: linear algebra.

Credits: (3), Graded, Semester Calendar Lecture, Given When Needed

The motivation for this course is that optimization problems arise routinely in most applications -- from designing an airline schedule to minimize cost to designing a remediation strategy for a contaminated ground water site. In this course we will focus on numerical techniques to solve applied optimization problems of various formulations. Topics will include solutions to linear and nonlinear equations, nonlinear programming, unconstrained and constrained
optimization, black-box formulations and a glance at sampling methods, an if time allows, extra topics may include multi-objective optimization, mixed integer programming methods, and evolutionary algorithms. This course will include a computing component with MATLAB and possibly some off-the-shelf optimization packages. The objectives are (a) to become familiar with a range of optimal design formulations and techniques appropriate for those formulations, (b) to motivate the need for efficient numerical methods for optimization problems, (c) to study these methods through implementation and analysis, (d) to become familiar with some existing software for optimization as well as write our own codes, and (e) to obtain a better understanding and appreciation for scientific computing in optimization. Credits: (3), Graded, Semester Calendar Lecture, Given When Needed

MA 581 Probability
[Cross-listed with STAT 581] Sample spaces; axioms of probability; basic theorems; random variables (discrete and continuous); combinatorial methods; Bayes’ Theorem and conditional probability; expected values and variances; distribution functions, including: binomial and multinomial, Poisson, normal and bivariate normal distributions, and others such as geometric, hypergeometric, negative binomial, exponential, gamma and beta; joint distributions; covariance and correlation; central limit theorem; geometric probability; method of transformations; introduction to stochastic processes. Credits: (3), Graded, Semester Calendar Lecture, Fall Terms

MA 601 Topics in Mathematics
Prerequisites: consent of the instructor. Credits: (1-10), Graded, Semester Calendar Independent Study, Given When Needed

MA 701 Directed Study in Mathematics
Prerequisites: consent of the instructor. Credits: (1-10), Graded, Semester Calendar Independent Study, Given When Needed

MA 705 Directed Study in Applied Mathematics
Directed Study in Applied Mathematics Credits: (1-10), Graded, Semester Calendar Independent Study, Given When Needed

MA 707 Directed Study in Numerical Analysis
A directed study in Numerical Analysis, intended to give a student the opportunity to further explore an area of interest to them under the supervision of a faculty member. Credits: (1-10), Graded, Semester Calendar Independent Study, Given When Needed

MA 710 Department of Mathematics Colloquium
The colloquium is the sequence of talks given to the Department of Mathematics by local and visiting researchers in mathematics, statistics, and other fields of interest. This course serves to expose graduate students in mathematics to a broader range of research topics. All graduate students are expected to attend the colloquium as a part of the education toward their degree. The course does not carry a credit load, but serves to document grad student participation and avoid scheduling overlap. Credits: (0), P/NC, Semester Calendar Seminar, Every Term

MA 719 Directed Study in Nonlinear Processes
A directed study in Nonlinear Processes, intended to give a student the opportunity to further explore an area of interest to them under the supervision of a faculty member. Credits: (1-10), Graded, Semester Calendar Independent Study, Given When Needed

MA 725 Seminar in Applied Mathematics
Prerequisites: consent of the instructor. Credits: (1-10), P/NC, Semester Calendar Seminar, Given When Needed

MA 739 Seminar in Nonlinear Processes
[Cross-Listed with EE739] Prerequisites: consent of the instructor. Credits: (1-10), P/NC, Semester Calendar Seminar, Given When Needed

MA 810 Thesis Dissertation or Special Projects
Credits: (1-15), Thesis, Semester Calendar Thesis Research, Given When Needed

MA 999 Special Graduate Topics
A graduate level course for which there is no comparable Clarkson course. This course may be used to satisfy course requirements for a graduate degree. Credits: (1-10), Graded, Semester Calendar Independent Study, Transfer Credit Only

Mechanical Engineering

ME 500 Elasticity
[Formerly MER 500] The behavior of substances that possess the property of recovering their size and shape when forces producing deformation are removed. Review of stress and strain; study of two-dimensional problems in rectangular, polar, and curvilinear coordinates; introduction to three-dimensional problems; torsion and bending. Prerequisites: Calculus IV, Linear Algebra and Differential Equations, and Mechanics of Materials or equivalent Credits: (3), Graded, Quarter Calendar Lecture, Winter Quarters

ME 501 Transport Phenomena
[Formerly MER 501] The fundamentals of momentum, energy, and mass transfer and their analogous transport mechanisms. One-dimensional transport, transport properties, transport with internal generation, transfer coefficients, convective and turbulent transport. Prerequisites: Linear Algebra and Differential Equations, Heat Transfer Analysis and Design or equivalents Credits: (3), Graded, Quarter Calendar Lecture, Spring Terms

ME 502 Engineering Analysis
[Formerly MER 502] Topics in applied mathematics needed to analyze and model engineering problems by constructing mathematical models for a physical situation and the reduction of the ensuing mathematical problems to numerical procedures. Matrices, linear algebra, vector and tensor calculus, partial differential equations, calculus of variations, finite element and difference techniques, Fourier series and integrals.
Prerequisites: Calculus, Linear Algebra and Differential Equations or equivalents
Credits: (3), Graded, Quarter Calendar
Lecture, Fall Semesters

ME 503 Advanced Manufacturing Processes
Brief introduction to the traditional manufacturing processes such as bulk deformation, extrusion, forging/forming, cold & hot working, and joining/welding. Emphasis will be on advanced near net shape forming/processes of engineering materials known as Additive Manufacturing/3D Materials Processing, including 3D processing for Polymers as well as metals. 
Credits: (3), Graded, Semester Calendar
Lecture,

ME 506 Mechanical Behavior of Materials
Prerequisites: Calculus, Linear Algebra, Differential Equations, and Mechanics of Materials or equivalents
Credits: (3), Graded, Quarter Calendar
Lecture,

ME 507 Design for Manufacturing
[Formerly MER 507] This course will introduce the student to the principles of design for manufacturing. The course will begin by examining modern manufacturing operations including machining, casting, forging, welding, brazing, soldering, finishing, heat treating, assembly, plastic materials processing, powder metallurgy, and specialized manufacturing processes. This section will also include electronics manufacturing, covering both through-hole technology and surface mount devices. For each manufacturing process, capabilities and limitations will be discussed and how they relate to part design and cost. Design for manufacturing principles will be examined, including how the designer affects manufacturing cost, lean manufacturing, six sigma, value stream analysis, manufacturing rate, the cost of quality, process flexibility, process simulation, and process economics. 
Prerequisites: Strength of Materials, Mechanics or equivalent
Credits: (3), Graded, Quarter Calendar
Lecture,

ME 508 Fracture Mechanics
[Formerly MER 508] Modern theory of fracture in design. The ability to apply fracture mechanics principles to the design and analysis of engineering structures. Subjects treated include occurrence of fracture, fracture toughness, fracture resistance, and fatigue. 
Prerequisites: Mechanics of Materials or equivalent
Credits: (3), Graded, Quarter Calendar
Lecture,

ME 509 Current Approaches to Fatigue in Design
[Formerly MER 509] To provide engineering students with an understanding of fatigue mechanisms, design criteria and realistic examples to avoid and predict fatigue/durability failures in structures and components. The major emphasis of the course is fatigue of metals as applied to a variety of engineering structures and components, including both fatigue mechanisms and design applications. The course material is applicable to ground vehicles, buildings/bridges, aerospace vehicles, ships, nuclear pressure vessels, metal implants/prostheses and others. Both constant amplitude and variable amplitude fatigue life situations are considered. 
Prerequisites: Calculus, Differential Equations, Strengths of Materials
Credits: (3), Graded, Quarter Calendar
Lecture,

ME 510 Advanced Dynamics
[Formerly MER 510] Analytical dynamics with engineering applications to particles and rigid bodies. Topics include three-dimensional kinematics and dynamics, Lagrangian dynamics. 
Prerequisites: Advanced Mechanics, Rigid Body Mechanics or equivalent
Credits: (3), Graded, Quarter Calendar

ME 511 Introduction to Acoustics
This course covers the basic concepts of acoustical analysis for engineers. Topics covered included wave propagation, and sound radiation, absorption, and transmission. Treatment of the material is considered from the viewpoint of harmonic oscillators, and builds upon the foundation of frequency domain analysis. 
Prerequisites: ME455 or Instructor Permission
Credits: (3), Graded, Semester Calendar
Independent Study, Spring Terms

ME 513 Processing and Selection of Engineering Materials
[Formerly MER 513] A comprehensive examination of processing technologies for engineering materials, and the effects of selected processing routes and materials to meet and satisfy design and applications criteria. 
Prerequisites: Mechanics of Materials or equivalent
Credits: (3), Graded, Quarter Calendar
Lecture,

ME 515 Finite Element Methods
[Cross-listed with CE 538, MA 572] This course is an introduction to the finite element method, from a mathematical as well as a modeling and applications point of view. The basic theory and implementation will be discussed in the context of continuum problems in linear elasticity, potential flow and plate modeling. If time permits, additional applications such as structures, electromagnetics, fluid mechanics, ground water and geotechnics will also be discussed. 
Topics include: weak formulations and the principle of virtual work, discretization and interpolation-function selection, assembly and solution of the system equations, error estimates and accuracy assessment. When taught in conjunction with CE 438/ME 453 the course requires additional independent work for those registered for the graduate course. Prerequisites: MA232, MA339 or MA330, ES222, ES330, and the ability to program. Consent of the instructor may be used to replace some prerequisites. 
Credits: (3), Graded, Semester Calendar
Lecture, Fall Semesters
ME 516  Finite Element Methods in Engineering
[Formerly MER 516] This course provides an introduction to the finite element method with an emphasis on solving structural engineering problems. It will cover a review of matrix algebra and the solution to simultaneous linear equations. It will then lead to an introduction of the stiffness method, which will include a review of the equations from elasticity. The method will then be applied to bar and beam equations, followed by 2D plane strain equations. Modeling guidelines will then be covered, along with axisymmetric analysis and isoparametric formulations; finishing up with three dimensional analysis. Prerequisites: Calculus, Differential Equations, Strength of Materials or Equivalent.
Credits: (3), Graded, Quarter Calendar Lecture,

ME 517  Advanced Thermal Systems
Advanced treatment of steady and transient conduction, convection and radiation heat transfer with applications to various thermal systems such as electronic circuits and HVAC.
Credits: (3), Graded, Quarter Calendar Lecture, Given When Needed

ME 524  Advanced Biomechanics
[Cross-listed with ME424] Solid biomechanics including structure, function, and mechanical properties of biological tissues. Emphasis will be placed on cell mechanics and signalling, mechanobiology, and remodeling. Current literature topics will be covered.
Credits: (3), Graded, Semester Calendar Lecture,

ME 527  Advanced Fluid Mechanics
An introductory level graduate course in fluid mechanics. Spatial and material coordinates, kinematics of fluid motion, continuity and momentum equations, constitutive relations, simple solutions, potential flows, boundary layer theory, creeping flow, flow through porous media, particle motion, interfacial phenomena, turbulence. Prerequisites: CH301 or ES330 or equivalent.
Credits: (3), Graded, Quarter Calendar, Lecture, Laboratory, Fall Terms

ME 527  Advanced Fluid Mechanics
An introductory level graduate course in fluid mechanics. Spatial and material coordinates, kinematics of fluid motion, continuity and momentum equations, constitutive relations, simple solutions, potential flows, boundary layer theory, creeping flow, flow through porous media, particle motion, interfacial phenomena, turbulence. Prerequisites: CH301 or ES330 or equivalent.
Credits: (3), Graded, Semester Calendar Lecture, Laboratory, Fall Terms

ME 529  Stochastic Processes in Engineering
Credits: (3), Graded, Semester Calendar Lecture, Given When Needed

ME 530  Holistic Structural Integrity Process (HoISIP)
This course discusses a Holistic Structural Integrity Process (HoISIP) founded upon the primary idea that all failure mechanisms involved in the degradation of the structure are interconnected and should not be analyzed as merely the sum of individual mechanisms. In reality many failure mechanisms interact synergistically and are much more complex and challenging to understand, and thus the requirement for a holistic physics based analysis and design approach to structural integrity problems. The final goal of this holistic approach is to more accurately assess the reliability and structural integrity of aerospace and wind energy structures while maintaining and achieving higher safety conditions.
Credits: (3), Graded, Semester Calendar Lecture, Spring Terms

ME 531  Computational Fluid Dynamics
The course will present advanced computational methods for solutions of transient and steady-state problems in fluid mechanics and in transport phenomena, including incompressible flows, compressible flows, heat transfer, transport of suspended particles, etc. The course will require programming in Fortran or other languages. Post processing of data will include the use of computer graphics. Special projects in application of the course material to research-oriented problems in engineering will be emphasized.
Credits: (3), Graded, Semester Calendar Lecture, Spring Semesters

ME 533  Additive Manufacturing: Materials and Applications
This course offers a broad introduction to history, current status and future trends of Additive Manufacturing process, while also comparing with other conventional manufacturing techniques. Various aspects of successful AM production process will be discussed, from raw materials to machines and techniques. While 3D printing of metallic materials will be emphasized, brief introductions to Ceramic and Polymer AM will also be provided.
Credits: (3), Graded, Quarter Calendar Lecture, Even Spring Terms

ME 537  Fluid Mechanics of Aerosol Dispersion
Prerequisites: Consent of the instructor
Credits: (3), Graded, Semester Calendar Lecture, Laboratory, Given When Needed
ME 538  Experimental Aerosol Mechanics and Instrumentation


Prerequisites: consent of the instructor.

Credits: (3), Graded, Semester Calendar

Lecture, Given When Needed

ME 543  Advanced Optimal Design

The optimal design of mechanical systems is studied. The optimization methods discussed in the course include: unconstrained optimization in several variables (e.g. gradient search, random search), constrained optimization in several variables (e.g. linear programming, nonlinear programming, Lagrange multipliers, geometric programming) and problems structured for multistage decision (e.g. dynamic programming). Emphasis is placed on the formulation of problems which can be solved by these techniques. A project involving the application of the methods introduced is required.

Prerequisites: ES222.

Credits: (3), Graded, Semester Calendar

Lecture, Fall Semesters

ME 544  Advanced CAD (Computer Aided Design)

This course deals with the use of commercially available CAD hardware and software for product development and design. Lectures cover the underlying theories upon which such software is based, the ways in which these theories are implemented and software limitations. Hands-on experience is emphasized. Students entering the course are assumed to have some knowledge of general computer usage and computer graphics.

Credits: (3), Graded, Semester Calendar

Lecture, Spring Semesters

ME 551  Theory of Elasticity

[Cross-listed with CE 551] A study of the mathematical theory of elasticity and its application to engineering problems; development of general stress-strain relationships, equations of equilibrium and compatibility; plane stress and plane strain; stress functions; applications to beam bending and torsion.

Prerequisites: ES222 or equivalent, ME554 or consent of the instructor.

Credits: (3), Graded, Semester Calendar

Lecture, Spring Semesters

ME 552  Advanced Strength of Materials

Discussion and theory concerning properties of materials, general stress-strain relationships, modern strength theories, unsymmetrical bending, curved beams, beams on elastic foundations, the equations of elasticity and plasticity (1 credit of design)

Credits: (3), Graded, Semester Calendar

Lecture,

ME 554  Continuum Mechanics

[Cross-listed with CE 554] The course involves the analysis of stress and deformation at a point, and the derivation of the fundamental equations by applying the basic laws of conservation of mass, energy and momentum and those of thermodynamics. Vector and cartesian tensors are reviewed. Relationships are then developed between stress, strain and strain rate and constitutive laws affecting stress-strain relationships. These are used to formulate the basic equations governing the behavior of any continuum with applications to solids and fluids.

Credits: (3), Graded, Semester Calendar

Lecture, Fall Semesters

ME 555  Advanced Mechanical Vibrations

A review of discrete multiple degree-of-freedom systems is presented. The equations of motion of continuous systems such as strings, rods, beams and torsion bars are studied using both classical and approximate solution methods. Hamilton's principle and nonlinear vibrating systems are also covered.

Credits: (3), Graded, Semester Calendar

Lecture, Given When Needed

ME 556  Advanced Finite Element Methods in Engineering

This course builds on basic concepts of spring and bar type elements, two-dimensional truss analysis, beam bending, plane stress & plane strain analysis, axisymmetric stress analysis, and isoparametric formulation of the finite element method. This course will examine topics in three-dimensional stress analysis, plate bending, heat transfer, fluid flow, electrostatics, thermal stress analysis, structural dynamics, and time-dependent stress analysis. Topics like the direct approach, the principle of minimum potential energy, and Galerkin's residual method will continue to be applied as required in developing required governing equations. This course will examine practical applications including the ability to use and apply the ABAQUS software package. This course will expand on the topics presented in a Fundamentals of Finite Element Methods course and requires knowledge in Mechanical Behavior of Materials, Linear Algebra and Differential Equations. Prerequisite: ME516

Credits: (3), Graded, Quarter Calendar

Lecture, Given When Needed

ME 557  Advanced Mechanics of Composite Materials


Prerequisites: ES222 and ES260.

Credits: (3), Graded, Semester Calendar

Lecture, Spring Semesters

ME 560  Linear Control Systems

[Cross-listed as EE 657] [Formerly MER 522] This course addresses practical control system design primarily from a classical perspective. Beginning with transfer function modeling of dynamic systems, the course moves through transient, root locus, and frequency response analysis to end with frequency domain techniques for controller design.
Prerequisites: System Modeling and Analysis (Circuits and Systems or Dynamics of Physical Systems), Mat Lab/Simulink helpful
Credits: (3), Graded, Quarter Calendar
Lecture,

ME 565 Engineering Optimization
[Formerly MER 537] This course in engineering optimization studies techniques with applications in various aspects of engineering design and other disciplines including: concepts of design variables, constraints, objective functions, penalty functions, and Lagrange multipliers. Techniques for solving constrained and unconstrained optimization problems: classical approaches steepest descent, conjugate gradient, modified Newton, controlled random searches, etc. Applications and examples in the design of engineering components and systems will be presented.
Prerequisites: Calculus, Differential Equations, Mat Lab helpful
Credits: (3), Graded, Quarter Calendar
Lecture,

ME 567 Thermodynamic Analysis
[Formerly MER 540] Consideration of various particulate and continuum bases for structuring thermodynamic principles and their application to the solution of current and prospective engineering problems.
Prerequisites: Basic Thermodynamics, Heat Transfer or equivalent
Credits: (3), Graded, Quarter Calendar
Lecture,

ME 568 Thermal Energy Processes
[Formerly MER 541] This course focuses on the analysis of thermal processes relevant to the renewable energy priorities of today's green economy. The underlying engineering principles of thermal processes, which make the best use of sustainable energy sources through proper acquisition, storage and conversion, will be considered. The course incorporates the fundamentals of thermodynamics and heat exchange necessary to understand the components and cycles that enable these thermal energy processes.
Prerequisites: Fluid Mechanics, Thermodynamics, Heat Transfer
Credits: (3), Graded, Quarter Calendar
Lecture,

ME 570 Orbital Mechanics
[Cross-Listed AE470] This course provides an overview of the fundamentals of orbital mechanics. Beginning from kinematics and rigid body dynamics, students are introduced to topics in orbital and attitude dynamics and control. In orbital dynamics and control, core topics covered include: the two-body problem, orbital motion, Kepler's Laws, orbital elements, orbital perturbations, orbital maneuvers, interplanetary trajectories, and the restricted three-body problem. In attitude dynamics and control, core topics covered include: attitude stabilization, torques on a spacecraft, torque-free motion, spin and dual-spin stabilization, gravity-gradient stabilization, and active attitude control.
Credits: (3), Graded, Semester Calendar
Lecture, Spring Terms

ME 571 Convection Heat Transfer
[Formerly MER 552] Analysis of laminar and turbulent heat transfer processes. Approximate solutions of the energy equation according to boundary layer theory.
Prerequisites: Fluid Mechanics, Heat Transfer
Credits: (3), Graded, Quarter Calendar
Lecture,
ME 573  Flow and Heat Transfer in Multiphase Systems
[Formerly MER 554] Analytical and empirical methods for evaluation of flow characteristics, particularly in liquid vapor systems and boiling and condensing of heat transfer.
Prerequisites: Fluid Mechanics, Heat Transfer
Credits: (3), Graded, Quarter Calendar
Lecture,

ME 574  Numerical Heat Transfer and Fluids Flow (CFD)
[Formerly MER 555] Fluids Mechanics, Heat Transfer, and Numerical Methods concurrently applied to solve problems of applied engineering. Topics include: derivation, classification, and discretization of the General Transport equations pertaining to unsteady multi-dimensional physics. Computational theory and solution methods include: explicit, implicit, Crank-Nicolson, upwinding, as well as higher order approaches. Scheme stabilities and numerical results are addressed using the von Neumann stability assessment and examination of corresponding Modified equations. The coupling of pressure and velocity for incompressible flow is considered using the SIMPLE algorithm.
Credits: (3), Graded, Quarter Calendar
Lecture,

ME 575  Nuclear Engineering & Technology
[Cross-listed with EE 687] [Formerly MER 560] The purpose of this course is provide students of various engineering disciplines a functional knowledge of nuclear engineering principles and those most important to the design of nuclear power generation systems. The course will focus both on the nuclear reactor core as well as plant systems. The intent is that students will gain a physical understanding of nuclear engineering principles as they relate to their own field of interest. Class participation will be highly encouraged and focused through the discussion of current events in the nuclear industry as well as proposed future nuclear technologies.
Credits: (3), Graded, Quarter Calendar
Lecture,

ME 577  Engineering Statistics
[Cross-listed with EE 602, CS 506] [Formerly MER 572] Modern engineering practice makes extensive use of statistical methods for the efficient collection and analysis of engineering data, and to support data-based decision making. This course will introduce the statistical tools that are of greatest importance for practicing engineers. Core topics to be covered will include probability and distribution theory, the construction and interpretation of statistical intervals, statistical hypothesis testing, regression analysis and empirical modeling, statistical experimental design, and statistical quality/process control. Additional specialized topics may also be covered, depending upon the interests of the class; possible topics include system reliability analysis, measurement system analysis, process capability analysis (and “six-sigma”), accelerated life testing, and acceptance sampling.
Credits: (3), Graded, Quarter Calendar
Lecture,

ME 578  Statistical Methods for Reliability and Life Data Analysis
[Cross-listed with EE603 and BOE623] Reliability analysis is concerned with understanding the failure modes that affect an engineered product, estimating the expected life of the product under service conditions, and predicting the failure rate of the product as a function of time in service. The primary response variable in reliability analysis is time to failure, which may be measured in controlled laboratory experiments, or observed empirically from post-introduction studies of products “in the field”. The analysis of data for which the primary variable of interest is time to failure requires specialized statistical concepts and tools; this course will cover some of the most useful approaches. Examples will be included from materials, mechanical, and electrical engineering. The techniques covered will be implemented with modern statistical software (JMP). The course will endeavor to be very practical, allowing students to effectively analyze reliability data in real-world applications upon the completion of the course.
Prerequisites: EE602, ME577, or CS506 or instructor consent.
Credits: (3), Graded, Quarter Calendar
Lecture, Winter Terms

ME 578  Statistical Methods for Reliability and Life Data Analysis
[Cross-listed with EE603 and BOE623] Reliability analysis is concerned with understanding the failure modes that affect an engineered product, estimating the expected life of the product under service conditions, and predicting the failure rate of the product as a function of time in service. The primary response variable in reliability analysis is time to failure, which may be measured in controlled laboratory experiments, or observed empirically from post-introduction studies of products “in the field”. The analysis of data for which the primary variable of interest is time to failure requires specialized statistical concepts and tools; this course will cover some of the most useful approaches. Examples will be included from materials, mechanical, and electrical engineering. The techniques covered will be implemented with modern statistical software (JMP). The course will endeavor to be very practical, allowing students to effectively analyze reliability data in real-world applications upon the completion of the course.
Prerequisites: EE602, ME577, or CS506 or instructor consent.
Credits: (3), Graded, Quarter Calendar
Lecture, Winter Terms

ME 580  Advanced Modeling and Simulation of Dynamic Systems
This course will incorporate techniques of bond graph theory in the energy-based lumped parameter modeling of electrical, mechanical, hydraulic, magnetic, and thermal energy domains. Bond graph theory offers a unified approach to modeling dynamic energy systems and provides the tools necessary for the analysis of complex systems involving a variety of energy domains. Rather than attempt to cover all of the available analysis techniques, this course will serve to provide an underlying foundation on which to develop a thorough understanding of the interactions of energetic systems. Emphasis of the course will focus on multi-domain interaction.
Credits: (3), Graded, Semester Calendar
Lecture, Odd Spring Semesters

ME 581  Fuel Cell Science and Hydrogen Engineering
[Cross-listed with EE 640] [Formerly MER 580] Introduce the student to the science and engineering of fuel cell technology. Emphasis will be on developing an understanding of different types of fuel cells, their applications, and the engineering of complete fuel cell systems. Elements of that class will include: electrochemistry; polymer materials science for proton exchange membrane (PEM) based systems; ceramics for solid oxide fuel cells; liquid-electrolytes for phosphoric acid and alkaline fuel cells; and other methods of generating power directly from a fuel and an oxidant. The system requirements of the fuel cell stack will be introduced to provide a complete picture of the technology. Other elements addressed during the course will include thermochemistry; electrochemistry; fuel...
processing or reforming; electrical & power management; and polymer science and systems engineering. Developing an understanding of the proton exchange membrane fuel cell will be the primary objective. After completing this course, the student is expected to have an understanding of the technical needs, challenges, and opportunities of fuel cell systems. The overall essence of the class will be to address the essentials of fuel cells and fuel cell systems and related electrochemical systems. Elements of the entrepreneurial aspects of the industry will also be covered. Hydrogen will be discussed throughout the semester as it relates to fuel cells and the emerging changes in power generation models.

Credits: (3), Graded, Quarter Calendar
Lecture,

ME 582 Photovoltaic Engineering
[Cross-listed with EE 643] [Formerly MER 580A] The course focuses on the physical principles, technology, and design of efficient semiconductor photovoltaics. Course goals equip students with the concepts and analytical skills to understand efficiency limitations, to assess the viability of various solar and thermophotovoltaic technologies, and to introduce the physics required for understanding photovoltaic energy conversion. The course will focus on three primary aspects of photovoltaic energy conversion, (i) the transfer and conversion of solar (i.e. thermal) radiation to electronic energy, (ii) the theory and design of the semiconductor photovoltaic cell and (iii) photovoltaic systems and applications.

Credits: (3), Graded, Quarter Calendar, Lecture,

ME 583 Turbine Engineering
[Cross-listed with EE 683] [Formerly MER 580B] Course on fundamentals of design, analysis, and technology of turbo machinery – jet engines, gas turbines, steam turbines, water turbines, and wind turbines. The course will provide an understanding of all aspects of system development: thermodynamic cycles, design-point and off-design performance; function and design of components (inlets, compressors, combustors, turbines, outlets), operational limits, and environmental concerns; structural analysis, lifting, and materials; rotor dynamics and blade aeromechanics; clearance analysis, sealing, and packing; heat transfer, blade and component cooling; starting and control; power and thrust generation; testing and instrumentation. The student is expected to develop a broad understanding of the state-of-the-art, challenges, and future of turbine systems. Prerequisites: Basic Structures, Thermodynamics, Fluids.

Credits: (3), Graded, Quarter Calendar
Lecture,

ME 586 Welding
[Formerly MER 580D] Welding metallurgy is a technologically important field that covers a wide range of scientific disciplines. This course uses welding metallurgy as a vehicle to introduce basic and broadly applicable concepts in solid state physics, chemistry, materials science, fluid mechanics, and solid mechanics. Topics covered include welding processes, heat and fluid flow, chemical reactions, residual stresses, solidification phenomena, phase transformations, and welding defects. Special emphasis will be placed on applied engineering problems and on the behavior of structural engineering materials. Real life examples will be used to illustrate the fundamental concepts of the course. Homework assignments and a final project are required. Prerequisites: Materials Science, Strength of Materials or equivalent.

Credits: (3), Graded, Quarter Calendar, Lecture,

ME 587 Solar Energy Engineering
[Cross-listed with EE 685] [Formerly MER 580E] This course is designed to enable the student to effectively grasp the complex and quickly changing solar industry. The course will cover such topics as the economy of solar, photovoltaic devices, systems and applications. In order to cover this broad range of technical topics, the course will utilize multiple instructors. Each instructor has significant expertise and depth in the given field and the student will be able to draw from their experience. Students completing this course will develop knowledge of the solar industry, looking at the past, present and future of this technology area. Students will gain key technical background in every aspect of the industry and will be able to assess new technologies as they are developed. Understanding of the economics of solar and its future will also be obtained.

Credits: (3), Graded, Quarter Calendar
Lecture,

ME 588 Wind Energy Engineering
[Cross-listed with EE 684] [Formerly MER 580F] The course focuses on 'Wind Farm Project Design and Development' and 'Wind Turbine Technology.' Part I: Teams will demonstrate understanding of complete wind farm design/development process inclusive of site selection, wind resource evaluating target land area, turbine choice, location, energy projection, cost and transmission. Part 2: Focuses on technical understanding of Wind Turbine attributes such as structural, blade system, Uacelle system, electrical system, performance, and future opportunities.

Credits: (3), Graded, Quarter Calendar
Lecture,

ME 589 Synchronous Electrical Generators
[Cross Listed EE686][Formerly MER 580G] This course covers fundamentals of design and analysis of power generators, such as those used in thermal power plants and wind turbines. The course will address the basic operating principles of the synchronous machine and consider configurations such as wound field, permanent magnet, and doubly fed generators. Key topics will include understanding and analysis of the magnets within the machine, losses and efficiency, thermal performance, mechanical behavior, operation on the power system, and key IEEE and IEC standards. Further topics will include the duty imposed on the machine during service, as well as the duty it imposes on the turbine. The student is expected to develop a broad functional understanding of the current engineering technology, challenges, and future of generator technology. Cross Listed EE686
Credits: (3), Graded, Quarter Calendar
Lecture,

ME 590 Advanced Welding Metallurgy
Introduction to various aspects of welding processes. Weldability problems in ferrous, non-ferrous and metal-matrix composite materials will be discussed in detail. Solidification modes and their effects on the mechanical properties of austenitic and duplex stainless steel weldments will be examined.
Prerequisites: consent of the instructor.
Credits: (3), Graded, Semester Calendar
Lecture, Laboratory, Given When Needed

ME 591 Selected Topics in Materials Engineering
An advanced graduate course in the field of materials engineering. Topics to be covered will be selected to conform to the mutual interests and needs of students and faculty.
Prerequisites: consent of the instructor.
Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed

ME 594 Selected Topics in Manufacturing
An advanced graduate course in the field of manufacturing. Topics to be covered will be selected to conform to the mutual interests and needs of students and faculty.
Prerequisites: consent of the instructor.
Credits: (3), Graded, Semester Calendar
Independent Study, Every Semester

ME 595 Principles of Physical Metallurgy
Topics include: structure of metals, diffraction techniques (X-Ray, SEM-TEM), dislocation phenomena, diffusion in solids, precipitation hardening, nucleation and growth, solidification and phase transformation in solids.
Prerequisites: consent of the instructor.
Credits: (3), Graded, Semester Calendar
Lecture, Spring Terms

ME 598 MS-ME Graduate Project - Studies
This non-credit Seminar project provides a capstone experience for Mechanical Engineering graduate students not completing a thesis or independent study (i.e., all course work). The candidate and faculty advisor agree on project scope and evaluation process. The candidate performs required analytical and/or experimental studies to complete a Graduate Project Paper and Presentation.
Credits: (0), P/NC, Quarter Calendar
Seminar, Given When Needed

ME 599 MS-ME Graduate Project - Defense
[Formerly MER 599] This non-credit Seminar project provides a capstone experience for Mechanical Engineering graduate students not completing a thesis or independent study (i.e., all course work). The candidate will deliver and defend results from studies documented in a Graduate Project Paper and Presentation. The candidate receives a pass/fail grade which appears on the official transcript. Credits: (0), Pass/Fail, Quarter Calendar
Seminar,

ME 600 Disruptive Technology
[Cross-listed with EE 600] [Formerly MER 600] The future of energy is cleaner, distributed, and customer centric. The objective of this course is to introduce students to disruptive technology that will shape the future of power grid. Students will evaluate disruptive technologies and their potential applications. The course will review the following technologies: distributed energy resources and prosumer industry, smart grid, Inverter-Based Resources and Grid Forming technology, offshore renewable industry, electric vehicles and cloud-based energy storage, hydrogen economy and decarbonization, turning coal plants to energy storage, and thorium-based nuclear power. Key technology enablers and game-changers that would lead to disruptive technology growth will be discussed. Examples of revisiting old concepts to solve new problems will be given. Credits: (3), Graded, Quarter Calendar
Lecture,

ME 610 Mechanical Engineering Seminar
Students, staff and visiting lecturers present research results and topics of current interest.
Credits: (1-2), P/NC, Semester Calendar
Seminar, Every Semester

ME 614 Thesis, Dissertation Credits
Analytical or experimental studies in mechanical and aeronautical engineering under the direction of a faculty adviser. Credit for this work is given when the requirements for the degree are completed including the presentation of a thesis or dissertation as appropriate to the degree program.
Credits: (1-15), Thesis, Semester Calendar
Thesis Research, Every Semester

ME 616 Special Project Credits
Engineering project credits associated with a Masters of Engineering degree under the direction of a faculty advisor.
Credits: (1-7), Pass/Fail, Semester Calendar
Project Team, Every Semester

ME 618 Selected Topics in Heat Transfer
An upper level graduate course in the field of heat transfer. Areas of coverage will be selected to conform to the mutual interests and needs of students and faculty.
Prerequisites: consent of the instructor.
Credits: (3), Graded, Semester Calendar
Lecture, Every Semester

ME 621 Computational Mechanics of Materials
The objective of this class is to teach the nonlinear finite element analysis for modeling various advanced solid mechanics problems. Both geometric and material nonlinearities will be covered. A wide range of constitutive models, hyper-/hypo-elasticity, viscoelasticity, classical plasticity, crystal plasticity and piezoelectricity will be introduced. Variational formulation will be developed under both the Lagrangian and Eulerian description. Explicit and implicit integration schemes will be covered, and the stability will be discussed. Students will then learn to implement finite element models that can capture geometric and material nonlinearities that represent a wide range of material behavior. The course is expected to make a student comfortable using Abaqus package for advanced problems including developing their own constitutive models and linking these models to the Abaqus package. Prerequisites: ME554 or CE554, and ME515 or MA572, or by instructor consent
Credits: (3), Graded, Semester Calendar
Lecture, Fall Semesters

ME 628 Selected Topics in Fluid Mechanics
An advanced graduate course in fluid mechanics. Topics of special interest will be chosen to coincide with current needs. Description of the course content in any particular term will be announced in advance.
Credits: (3), Graded, Semester Calendar
Independent Study, Every Semester

ME 633 Plasticity
This course provides an introduction to the subject of plasticity. The physical background of inelastic deformation in metals and geological materials is discussed. Continuum constitutive theory is presented including yield criteria, flow rules, and plastic hardening. Extension to
the rate-dependent (viscoplastic) material is discussed. Uniqueness and extremum theorems are derived and discussed and field equations for general, two-dimensional and axisymmetric problems are presented. Selected problems from metal and soil/rock plasticity are presented and solved using various techniques, including slip-line theory, limit analysis and exact methods. Other topics such as localization and diffuse instability in plastic deformation and application of FEM in plasticity are presented as time allows.

Prerequisite: CE554 or ME554; recommended CE551 or ME551.
Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed

ME 637  Particle Transport, Deposition and Removal II
Introduction to turbulent flows and turbulent modeling. One and several equation models. Drag, lift, virtual mass, and Basset forces acting on particles. Wall effects and nonspherical particles. Aerosol transport and dispersion in turbulent flows. Turbulent diffusion and wall deposition of aerosols. Particle charging mechanics and electrostatic forces. Thermophoretic and electrophoretic effects. Introduction to colloids and electrokinetic phenomena. Computational aspects of aerosol dispersion and deposition in turbulent flows. Sublayer model approach. Approximate simulation of turbulence and turbulence transport. DNS simulation methods. Nonspherical particle transport in turbulent flows. Coagulation of aerosols due to shear and turbulence. Experimental techniques for turbulent flow measurements. Hot-wire anemometry, Isookinetic sampling. Particle concentration and velocity measurements with phase-doppler, and PIV. Applications to microcontamination control, air pollution, combustor, spray, and particle deposition in human lung. Prerequisite: ME537
Credits: (3), Graded, Semester Calendar
Lecture, Laboratory, Spring Semesters

ME 639  Advanced Turbulence
Prerequisite: ME527 and ME629 or consent of the instructor.
Credits: (3), Graded, Semester Calendar
Lecture, Laboratory, Spring Semesters

ME 654  Elastic Waves in Solids
The course concerns with stress propagation problems in elastic solids and waveguides. Following the derivation of governing elasto-dynamics equations, formal mathematical issues, such as uniqueness, reciprocal identity, and completeness theorem, are addressed. The most commonly used solution techniques (e.g. Green's functions, integral transforms, normal mode expansions, and series analysis) with examples are provided. Problems considered include propagation in half spaces (reflections and transmissions), approximate rod and plate theories, and classes of composite materials (e.g. laminated bars, and plates). Well-known experimental techniques are also covered. Assignments consist of mathematical derivations, computer simulations and presentations.

Prerequisites: ME551/CE551 and ME554/CE554 or consent of the instructor.
Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed

ME 657  Selected Topics in Solid Mechanics
An advanced graduate course in solid mechanics. Topics of special interest will be selected to conform to the mutual interests and needs of students and faculty.
Prerequisite: consent of the instructor.
Credits: (1-3), Graded, Semester Calendar
Independent Study, Every Semester

ME 690  Independent Study
[Formerly MER 590] Advance graduate course in the field of engineering sciences. Topics of special interest will be selected for current needs. A description of the course content in any particular term will be announced in advance.
Credits: (3), Graded, Quarter Calendar
Independent Study, Given When Needed

ME 696  Structural Dynamics
Prerequisites: Knowledgeable background in Dynamics, Linear/Matric Algebra, Ordinary and Partial Differential Equations. MATLAB Experience useful
Credits: (3), Graded, Quarter Calendar
Lecture, Given When Needed

ME 999  Special Topics in Mechanical Engineering
Used for graduate transfer credit for which Clarkson does not have an equivalent ME course number.
Credits: (1-10), Graded, Semester Calendar
Independent Study, Transfer Credit Only

Marketing

MK 609  Marketing Management (MBA Module)
[Cross-listed with MK 610] The problems, decisions and decision-making processes of marketing managers as they seek to increase the effectiveness of performing marketing activities. The objectives are: to update the discussion of marketing principles and practices in the light of recent national and international events; to deepen the discussion of business environmental factors of increased importance, such as energy, inflation, changing consumer life style, government regulation, consumerism and environmentalism; and to aid students in experiencing real-life business situations through the discussion of marketing cases.
Prerequisites: completion of all CUSB MBA foundation requirements and admission to the MBA program.
Credits: (2), Graded, Semester Calendar
Lecture, Discussion, Spring Semesters
MK 610 Marketing Management

[Cross-listed with MK 609] This course provides graduate students with a fundamental command of marketing concepts, processes, and management, as well as creating an understanding of the critical strategic role marketing plays in the management of organizations. The objectives are two-fold. The first objective is to provide the student with an introduction to the fundamental concepts of marketing and their role in effective marketing management. Thus students will explore central topics including product, price, place, and promotion decisions, examine the roles of consumer behavior and market research, and investigate how organizations blend these inter-related components to create and sustain value. The second objective is to allow students to apply that knowledge in the context of strategic marketing management. Here, strategic elements associated with marketing are integrated into strategic marketing framework to understand and develop marketing strategy and to illustrate how marketing can assist the firm in arriving at a competitive advantage.

Credits: (3), Graded, Quarter Calendar
Lecture, Fall Terms

MK 610 Marketing Management

[Cross-listed with MK 609] This course provides graduate students with a fundamental command of marketing concepts, processes, and management, as well as creating an understanding of the critical strategic role marketing plays in the management of organizations. The objectives are two-fold. The first objective is to provide the student with an introduction to the fundamental concepts of marketing and their role in effective marketing management. Thus students will explore central topics including product, price, place, and promotion decisions, examine the roles of consumer behavior and market research, and investigate how organizations blend these inter-related components to create and sustain value. The second objective is to allow students to apply that knowledge in the context of strategic marketing management. Here, strategic elements associated with marketing are integrated into strategic marketing framework to understand and develop marketing strategy and to illustrate how marketing can assist the firm in arriving at a competitive advantage.

Credits: (3), Graded, Semester Calendar
Lecture,

MK 626 Marketing Research Techniques

[Formerly MBA 626] Marketing research is primarily conducted to reduce the amount of uncertainty managers would otherwise face in their decision-making. This course is designed to develop students' knowledge of marketing research by both exposing them to many major important issues involved with marketing research and requiring them to complete a marketing research report from start to finish. Topics discussed include research designs, data collection methods, survey development, measurement, sampling methods and sample size determination, descriptive statistics, parameter estimation, independent samples t-test analysis, correlation analysis, chi-square analysis, code sheet development, non-sampling errors, and ethics in marketing research.

Credits: (3), Graded, Quarter Calendar
Lecture, Fall and Spring Quarters

MK 628 Consumer Behavior

[Formerly MBA 628] This course is designed to enhance students' understanding of consumers. Topics explored involve the many, many influences that may shape an individual's behaviors in the marketplace, including the impact of these influences on managerial decision-making situations. Observational research methods are also covered.

Credits: (3), Graded, Quarter Calendar
Lecture, Winter Quarters

MK 630 Marketing and Social Media Analytics

The course will provide you with an introduction to marketing and social media analytics. We will study how to conceptualize and apply decision modeling to derive marketing insights from empirical data in areas such as pricing, segmentation, customer lifetime analysis, targeting and positioning, and branding. This will be a hands-on course based on the analytic approach, in which you will acquire skills to translate conceptual understanding into specific marketing plans in various decision contexts. Prerequisites: IA 530 or equivalent.

Credits: (3), Graded, Semester Calendar
Lecture, Spring Terms

MK 640 Marketing Management for Innovation

This course introduces students to the fundamentals of marketing management including consumer behavior, market research, professional selling, and marketing strategy all with a focus on managing the innovation process. The course is designed for graduate students who have undergraduate training in a technical field, most likely engineering and need exposure to the theory and practice of marketing and thus, integrates the concept and practice of innovation throughout the topics covered.

Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed

MK 665 International Marketing Management

[Formerly MBA 665] This course examines development of international marketing strategies, from determining objectives and evaluating international market opportunities through coordinating strategies in world markets. Particular emphasis is placed on application of marketing principles in the multinational environment.

Credits: (3), Graded, Quarter Calendar
Lecture, Spring Terms

MK 687 Independent Project in Marketing

Practical application of marketing theory in an independent research project conducted under the guidance of a Marketing faculty member.

Credits: (1-3), Graded, Semester Calendar
Independent Study, Every Semester

MK 689 New Product Marketing

Accepted analytical models are used to analyze current data obtained from major companies regarding new products which have been test marketed. The objective is to introduce students to a new and crucial aspect of product management: the ability to use computers and analytical tools in brand decisions. Prerequisite: MK 609 (Marketing Management)

Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed
MK 694  Supply Chain Distribution Management
Effective management of the distributive networks that constitute a key component of supply chain networks is increasingly being recognized as a critical corporate activity. This is especially true in contemporary supply chain networks as firms strive to survive in today's competitive marketplace that demands quality product and service offerings at minimal transaction costs. Moreover, technological advances like the internet have significantly altered the rules of the game, and hence the practices associated with distribution management. This course will identify the chief decision areas associated with supply chain distribution management, and subsequently examine the latest distribution network design models and activities based on the principles of agency theory, transaction cost economics, and relational exchange theory. Other topics to be covered include crafting and coordinating strategic alliances with distributive intermediaries, conflict management, role of customer service audits in channel design decisions, performance appraisal systems, strategic sourcing, and benchmarking.
Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed

MK 696  Marketing Methods
Intended to equip the student with a thorough knowledge of an arsenal of research methods, including the assumptions, methodology, and limitations of these methods. Enhances students' ability to conceptualize and operationalize a research question. Some statistical content is included as an introduction to data analysis. Applications of these methods are discussed within the context of research problems faced by both academic researchers and practitioners (e.g., managers, engineers, economists, marketing researchers, information system designers). A research project will be an integral part of the course.
Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed

Multidisciplinary Courses

MP 518  Project-Based Learning Program
See MP 318 for course description.
Prerequisite: consent of the instructor.
Credits: (3), Graded, Semester Calendar
Lecture, Every Semester

MP 525  Multidisciplinary Course - Sustainable Housing Solution
(Cross-listed with MP425] A team of Clarkson students from multiple majors will collaborate to design, optimize, and build a prototype of a housing solution. Principles of sustainable design, alternatives assessment, resource management, multidisciplinary teamwork, and communication will be emphasized.
Credits: (3), Graded, Semester Calendar
Lecture, Spring Terms

MP 551  Open Source Software Projects
Student teams will engage in projects in the following areas: administer, create, modify, test, or document Open Source Software (OSS); analyze business and policy issues involving OSS; and create and run outreach/tutorial programs that introduce interested persons to OSS or enhance the skill of persons already using OSS. Project status will be reported during regularly scheduled weekly meetings. Students will document projects on the Clarkson Open Source Institute (COSI) web site and will construct individual, web-based portfolios of their work. Students are expected to have some experience or course preparation in their project areas. Given Pass/No Credit.
Credits: (0-3), P/NC, Semester Calendar
Project Team, Given When Needed

MP 552  Internet Teaching Laboratory Projects Course
In conjunction with Clarkson's Internet Teaching Laboratory, students will participate in projects related to computer networking such as implementing network software, configuring networking hardware, simulating large-scale networks, evaluating and testing computer security, administering the Internet Teaching Laboratory, deploying networked solutions for community members or developing network tutorials for other students. Students will construct web-based portfolios and give oral presentations of their work. Given Pass/No Credit. By permission of instructor.
Credits: (0-3), P/NC, Semester Calendar
Project Team, Every Semester

Materials Science and Engineering

MSE 551  Advanced Materials Characterization
Advanced methods for characterizing materials, such as scattering methods, including laser light scattering and x-ray diffraction (powder patterns & Laue patterns); microscopy, including optical microscopy; scanning electron microscopy (including EDX), transmission electron microscopy, and atomic force microscopy; and spectroscopy, including nuclear magnetic resonance, surface plasmon resonance, and scanning confocal Raman microscopy.
The following undergraduate courses should be completed prior to taking this course: CM371 (Physical Chemistry I); PH132 (Physics II); and ES260 (Materials Science and Engineering I)
Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed

MSE 560  Advanced Materials Science and Engineering I
Atomic and molecular structure of solids (crystalline and glassy); atomic and molecular bonding; thermodynamics of materials (condensed matter); kinetics, diffusion and phase transformation; properties of bulk solids compared to thin films, and nano-sized materials; methods for forming solids and thin films (solidification, crystallization, precipitation, evaporation, physical vapor deposition, chemical vapor deposition, etc.); materials chemistry; defects (point, line, surface); mechanical, thermal, electrical, and optical properties; relationship between materials processing and materials properties.
The following undergraduate courses should be completed prior to taking this course: CM371 (Physical Chemistry I); PH132 (Physics II); and ES260 (Materials Science and Engineering I)
Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed

MSE 575  Sustainable Nanotechnology
(Cross-listed with CM 575, and ES 575) The goal of this course is to provide graduate students and advanced undergraduates with a modern view of current and emerging research in nanotechnology. Topics will include: fundamental nanoscale properties and applications, green manufacturing and assembly in functional devices, interaction of nanomaterials with biological systems, the physical and chemical phenomena at nano-bio interfaces, fate, transport and transformation of engineered nanomaterials,
environmental and health impact, nanometrology, nanotoxicology and hazard identification of nano-based products. Development of analytical methods and characterization tools for assessing nanoscale properties and materials will also be discussed. Students will be exposed to interdisciplinary topics and an integrated training bridging material and environmental sciences with biology and analytical chemistry. Students will be able to demonstrate a basic awareness of risks and benefits of emerging technologies and evaluate overall environmental and societal impact.

Credits: (3), Graded, Semester Calendar
Lecture, Spring Semesters

MSE 587 Applications of Synchrotron and Electron Based Techniques
The purpose of the course is to familiarize all students with the x-ray and electron based experimental techniques available at Brookhaven National Lab and other similar facilities. Students will be cognizant of the applications of these cutting edge facilities, and well positioned to use them in their own research. This course is suitable for graduate students, postdocs, and advanced undergrads in physical sciences and engineering, as well as students in biological, environmental, and chemical sciences who may have the interest to learn more about the techniques they may use for their research.

Credits: (3), Graded, Semester Calendar
Lecture, Spring Terms

MSE 614 Thesis, Dissertation
Analytic or experimental studies in materials science & engineering under the direction of a faculty adviser. Credit for this work is given when the requirements for the degree are completed including the presentation of a thesis or dissertation as appropriate to the degree program.

Credits: (1-15), Thesis, Semester Calendar
Thesis Research, Given When Needed

MSE 999 Material Science and Engineering Elective
Used for awarding transfer credits for graduate courses completed elsewhere for which no equivalent Clarkson University graduate course can be identified. (Not offered at Clarkson, for transfer credit only). Credits: (1-4), Transfer, Semester Calendar
Lecture, Transfer Credit Only

Educational Mathematics

MTH 524 Geometry for Math Teachers
This geometry course will focus primarily on content in the new high school Common Core geometry course. The main domains in this course are congruency, similarity, circle properties, measurement and modeling, and coordinate geometry. Emphasis will be on changes in the high school course especially in the areas of transformations, geometric constructions, trigonometric concepts, and modeling with geometry. Students will develop strong proof and reasoning skills throughout this course.

Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed

MTH 560 Common Core Math Standards for Teachers
Common Core Mathematics is a 3-credit course that focuses on the changes in teaching mathematics in the present day classroom. Teachers in the Common Core classroom faces changes in curriculum, modeling, assessments and APPR. This class prepares teachers by analyzing pedagogical shifts, discussing the eight mathematical practices, and examining the new rigorous curriculum. Students will be able to demonstrate models in class and will show the progression from concrete, pictorial and finally abstract representations. Restriction: This course is open only to students matriculated in the Master of Arts in Teaching program (or by instructor consent)
Credits: (3), Graded, Semester Calendar
Lecture,

MTH 580 MAT Project in Mathematics (Content Area)
The MAT Project is a one-term research project whose purpose is to allow students time and supervision to develop breadth and/or depth of knowledge to become a better teacher in their certification field. What the project will entail varies greatly from student to student. The course is intended to be custom-tailored to meet the specific needs of an individual intern. MAT projects are well-grounded in research and theory, but also include a strong and extensive applied aspect, directly addressing the question: What would this look like in the classroom? Restriction: This course is open only to students matriculated in the Master of Arts in Teaching program (or by instructor consent)
Credits: (3), Graded, Semester Calendar
Lecture,

MTH 988 Independent Study in Mathematics
A graduate level course for which there is no comparable Clarkson course. This course may be used to satisfy course requirements for a graduate degree. Restriction: This course is open only to students matriculated in the Master of Arts in Teaching program (or by instructor consent)
Credits: (3), Graded, Semester Calendar
Independent Study, Given When Needed

MTH 989 Independent Study in Mathematics
A graduate level course for which there is no comparable Clarkson course. This course may be used to satisfy course requirements for a graduate degree. Restriction: This course is open only to students matriculated in the Master of Arts in Teaching program (or by instructor consent)
Credits: (3), Graded, Semester Calendar
Independent Study, Given When Needed

Operations Management

OM 602 Decision Analysis and Supply Chain Modeling (MBA Module)
In today's fast-paced competitive environment, successful managers need the ability to define business problems, construct quantitative models and effectively utilize decision making tools. This course will introduce students to decision analysis techniques by focusing on the development and analysis of models for a variety of business management problems. Topics include supply chain network design, project management, decision making under uncertainty and risk, business process management, and simulation modeling of supply chain systems. Microsoft Excel will be used as a modeling and analysis environment to investigate a variety of analytic techniques.
Prerequisites: completion of all CUSB MBA foundation requirements and admission to the MBA program.
Credits: (2), Graded, Semester Calendar
Lecture, Fall Semesters
OM 603 Decision Analysis & Supply Chain Modeling
This course introduces students to different approaches, support tools, and analytical methods for decision making in various business management situations. The objective is to develop the students' ability to define business problems, construct quantitative models and effectively utilize decision making application software. Topics such as linear programming, network modeling, project management, decision making under uncertainty and risk, queueing theory, business process simulation, and Monte Carlo simulation will be explored. Special attention will be given to supply chain modeling and applications. Microsoft Excel will be used as a spreadsheet modeling and analysis environment to investigate a variety of analytic techniques. Prerequisites: OM607
Credits: (3), Graded, Quarter Calendar
Lecture, Spring Terms

OM 603 Decision Analysis & Supply Chain Modeling
This course introduces students to different approaches, support tools, and analytical methods for decision making in various business management situations. The objective is to develop the students' ability to define business problems, construct quantitative models and effectively utilize decision making application software. Topics such as linear programming, network modeling, project management, decision making under uncertainty and risk, queueing theory, business process simulation, and Monte Carlo simulation will be explored. Special attention will be given to supply chain modeling and applications. Microsoft Excel will be used as a spreadsheet modeling and analysis environment to investigate a variety of analytic techniques. Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed

OM 606 Supply Chain Management (MBA Module)
[Cross-listed with OM 607] Global supply chains are networks of facilities around the globe that procure raw materials, transform them into intermediate and final products, and subsequently deliver the products to customers worldwide through distribution systems. Rapid advances in information technology are accelerating productivity by providing a multitude of new, lower-cost options for integrating supply chains. In this course we review and discuss state-of-the-art concepts and practical tools to effectively design and management the supply chain. Topics covered include a strategic framework for supply chain management, supply chain design and operation, logistics strategies and design for logistics, inventory management and risk pooling, warehousing and material handling systems, supplier relations, and new and future trends in supply chain management. Prerequisites: completion of all CUSB MBA foundation requirements and admission to the MBA program.
Credits: (2), Graded, Semester Calendar
Lecture, Fall Semesters

OM 607 Global Supply Chain Management
[Cross-listed with OM 606] Intense global competition has forced business enterprises to redesign and integrate their supply chains to effectively meet rising customer expectations at a reasonable cost. This course will start with selected introductory topics before covering the state-of-the-art concepts and practical tools to effectively design and manage the supply chain. Topics covered include a strategic framework for supply chain management, supply chain design, managing inventories in the supply chain, global logistics and distribution strategies, design for logistics, global sourcing, managing supply chain risk/disruptions, and new and future trends in supply chain management. Some combination of team projects, case studies, simulation games, and consulting experiences will be utilized to demonstrate real world issues, challenges and applications.
Credits: (3), Graded, Semester Calendar
Lecture, Fall Terms

OM 620 Supply Chain and Operations Analytics
Data-driven decision making is essential to drive performance and growth in modern supply chain management. This course showcases real-life applications of data analytics (descriptive, predictive and prescriptive) in various fields of supply chain management. Students learn to define the right data set, ask the right questions to drive supply chain excellence and business value, and use the right models and tools to develop data-driven decisions. Topics include demand forecasting, retail analytics, transportation analytics fulfillment diagnostic in logistic systems, sales and operations analytics in production, and inventory and resource management. Prerequisites: IA 530 or equivalent.
Credits: (3), Graded, Semester Calendar
Lecture, Fall Terms

OM 650 Operations Strategy and International Competitiveness
The emphasis of the course is the operations and logistics function in firms that source, produce, distribute and market in multiple nations. The management of logistics in such firms differs from its domestic counterpart along several key dimensions. First, there is the need to be able to identify and analyze factors that differ across nations that influence the effectiveness of this function. These include worker productivity, process adaptability, governmental concerns, transportation availability, culture, and so on. In addition, because of the distances involved, transportation and distribution are of greater significance. Finally, these geographically dispersed set of facilities and markets must be integrated and managed to enhance the strategy of the business unity.
Credits: (3), Graded, Semester Calendar
Lecture,

OM 671 Supply Chain Environmental Management
Manufacturing organizations have increased their interest in environmental management through activities such as green purchasing, reverse logistics, product stewardship and design-for-the-environment. These activities, usually involving several organizations,
OM 672
Supply Management Strategy and Analysis
Effective supply management strategies and management enhances efficiency, customer service, and innovations, ultimately contributing to the profitability and competitive advantages of the entire organization and its supply chain. This course equips you with analytical methods and theoretical strategies to develop and implement an effective supply management strategy for your company. Specific topics include global sourcing and supply chain management strategy alignment, pricing and cost strategy, supplier network evaluation and development, contract management, and sustainable sourcing. Highly interactive format features student-led discussions and staged debates. Includes assignments on case studies and sourcing analysis, as well as projects and a final exam.
Credits: (3), Graded, Semester Calendar
Lecture, Spring Semesters

OM 676
Developing and Managing Technology
This course covers the creation, design, development, implementation, diffusion and transfer of product and process innovation. The course covers the full range of activities from laying a foundation of technical knowledge in research, through the creation of new products and processes, to the integration of marketing, manufacturing and engineering, to commercialization. Topics include innovation management, managing R&D, product and process development, concurrent engineering, project selection, initiating new ventures, and technology transfer. Lectures, cases, reading, and projects focus on managing technology in companies. Corequisite: OS610 (or equivalent)
Credits: (3), Graded, Semester Calendar
Lecture, Spring Semesters

OM 680
Strategic Project Management
(Cross-listed with ES 510, OM 681] A project is a one-time or infrequently occurring operation with a unique goal, a limited lifespan and limited resources. This course will focus on project management from a decision-making perspective and how projects can be used to implement organizational strategy. The course follows the project life cycle model from project initiation to implementation to termination. Topics covered include such things as project scope development, project selection, organizational strategy, leadership, team building, planning, conflict resolution, budgeting, resource allocation, information management, control, auditing, and termination procedures. Computer applications such as MS Project, case studies, project simulations and student project teams will be an integral part of the course. This course satisfies the educational prerequisite for the Project Management Institute’s (PMI) Certified Associate in Project Management (CAPM) and Project Management Professional (PMP) certifications.
Credits: (3), Graded, Semester Calendar
Lecture, Spring Semesters

OM 681
Strategic Project Management
(Cross-listed with ES 510, OM 680] A project is a one-time or infrequently occurring operation with a unique goal, a limited lifespan and limited resources. This course will focus on project management from a decision-making perspective and how projects can be used to implement organizational strategy. The course follows the project life cycle model from project initiation to implementation to termination. Topics covered include such things as project scope development, project selection, organizational strategy, leadership, team building, planning, conflict resolution, budgeting, resource allocation, information management, control, auditing, and termination procedures. Computer applications such as MS Project, case studies, project simulations and student project teams will be an integral part of the course. This course satisfies the educational prerequisite for the Project Management Institute’s (PMI) Certified Associate in Project Management (CAPM) and Project Management Professional (PMP) certifications.
Credits: (3), Graded, Quarter Calendar
Lecture, Summer Terms

OM 685
Quality Management and Process Improvement
(Cross-listed with ES 572, OM 686] This course will introduce the students to both the managerial and technical aspects of quality improvement techniques. The discussion of statistical topics will be tied to the Six Sigma methodology for the improvement of quality, productivity, and competitive position. A systemic and strategic approach to quality management will be provided, with emphasis on process improvement tools and methodologies. The course is designed to expose students to the integral elements of a total quality management system within both manufacturing and service organizations. Several individual and team projects involving class presentations, discussion of supplemental articles and case studies are utilized to demonstrate real world issues and applications.
Prerequisites: SR284 or consent of the instructor.
Credits: (3), Graded, Semester Calendar
Lecture, Fall Semesters

OM 686
Quality Management and Process Improvement
(Cross-listed with ES 572, OM 685] This course will introduce the students to both the managerial and technical aspects of quality improvement techniques. The discussion of statistical topics will be tied to the Six Sigma methodology for the improvement of quality, productivity, and competitive position. A systemic and strategic approach to quality management will be provided, with emphasis on process improvement tools and methodologies. The course is designed to expose students to the integral elements of a total quality management system within both manufacturing and service organizations. Several individual and team projects involving class presentations, discussion of supplemental articles and case studies are utilized to demonstrate real world issues and applications.
Credits: (3), Graded, Quarter Calendar
Lecture, Fall Terms
The course uses business cases, videos, lectures, and articles from the academic and popular press, as well as in-class exercises.

Organizational Studies

OS 602 Leadership Development I - Foundations of Leadership & Organizational Behavior
The purpose of this course is to help students understand the general principles and processes of organizational behavior and effective leadership so that they can lead in a wide variety of situations. Course concepts include personality, motivation, decision making, power, team dynamics, and leadership styles. This course proceeds from the premise that leadership skills supplement the technical and diagnostic skills learned in other Clarkson MBA courses. Students in this course will develop an understanding of the course topics through hands-on experience, using a business simulation and a number of team exercises.

Credits: (1.5), Graded, Quarter Calendar

OS 603 Leadership and Organizational Behavior
This course builds upon the lessons learned in OS 602 and other MBA classes to allow students to further develop their leadership skills and understanding of behavior within an organizational setting. Specific topics to be covered include organizational culture and structure, influencing others through formal and informal means, negotiations, and analysis of organizational congruence. The course uses business cases, videos, articles from the academic and popular press, as well as in-class exercises.

Credits: (3), Graded, Quarter Calendar

OS 608 Organizational Behavior and Performance Management
This course provides an integrative approach to recognition, analysis and solution of strategic issues or challenges facing business executives in their quest to gain and sustain strategic advantage in the world marketplace. Through case analyses, as well as other instructional methods, students will also develop an ethical/moral understanding of the dynamics involved in the creation and distribution of value among organizational stakeholders.

Prerequisites: completion of all CUSB MBA foundation requirements and admission to the MBA program. Prerequisites: AC603, EC604, FN607, MK609, OM606, OS608, and SB609.

Credits: (2), Graded, Quarter Calendar

OS 650 Competing By Design
This course emphasizes cognitive skills and experiential practicum learning applied to ongoing leadership and organizational problems. Students learn about leadership roles and competencies essential for building and supporting organizational capabilities and business strategies in global markets. The course also enables students to learn a method to diagnose their strengths and weaknesses in leadership capacities and measure their proficiency against bench-marked models of high performance leadership.

Credits: (3), Graded, Quarter Calendar

OS 651 High Performance Leadership
This comprehensive course ties together the history of modern labor movements in the United States with issues facing workers in the Twenty-First Century, including the impact of globalization and international outsourcing. Subtopics include negotiation, conflict resolution, and workforce diversity. In addition, a comparative study on international unions will be examined. Each week, current events and their implications for labor relations will be discussed.

Credits: (3), Graded, Quarter Calendar

OS 654 Labor Relations
This comprehensive course ties together the history of modern labor movements in the United States with issues facing workers in the Twenty-First Century, including the impact of globalization and international outsourcing. Subtopics include negotiation, conflict resolution, and workforce diversity. In addition, a comparative study on international unions will be examined. Each week, current events and their implications for labor relations will be discussed.

Credits: (3), Graded, Quarter Calendar
OS 656  Leading Organizational Change

[Cross-listed with OS 657] This course examines the processes of organizational change in dynamic technological and global business environments to enhance organizational quality, productivity, and overall operation. The course focuses on leadership approaches that facilitate stakeholder acceptance of change and employee contribution to the management of change. Topics include: change models and theories, the various types of organizational change, planned organizational change, resistance to change, the role of change management consultants, and human resource management practices that facilitate change. The types of change considered range from minor change interventions to transformational change, including technological, cultural, and work design changes. The course utilizes case studies, skills development exercises, and group projects in the study of organizational change. Prerequisite: OS 608 (Organizational Behavior and Performance Management), or OS 603 (Leadership Development II)
Credits: (3), Graded, Quarter Calendar
Lecture, Fall Terms

OS 657  Leading Organizational Change

[Cross-listed with OS 656] This course examines the processes of organizational change in dynamic technological and global business environments to enhance organizational quality, productivity, and overall operation. The course focuses on leadership approaches that facilitate stakeholder acceptance of change and employee contribution to the management of change. Topics include: change models and theories, the various types of organizational change, planned organizational change, resistance to change, the role of change management consultants, and human resource management practices that facilitate change. The types of change considered range from minor change interventions to transformational change, including technological, cultural, and work design changes. The course utilizes case studies, skills development exercises, and group projects in the study of organizational change. Prerequisite: OS 608 (Organizational Behavior and Performance Management), or OS 603 (Leadership Development II)
Credits: (3), Graded, Semester Calendar
Lecture, Summer Semesters

OS 666  Negotiations and Relationship Management

[Cross-listed with OS 667] This course examines the complex problems associated with the management of stakeholder relationships under conditions of rapid economic change and intense global competition. The course emphasizes on the establishing, negotiating, building, sustaining, and repairing of both workplace and external relationships, including relationships with employees, management, customers, suppliers, manufacturers, shareholders, society, and other key stakeholders. This course provides an in-depth understanding of the theories of negotiation, conflict, complaint handling, and norms and ethics of fairness. The course also provides a foundation on labor relations, collective bargaining, and U.S. labor and employment laws, with an emphasis on the corresponding implications for union and nonunion workplaces. The course is intended to be applicable to a broad spectrum of workplace-related relationship issues faces by managers and professionals. Prerequisites: OS603 or OS602
Credits: (3), Graded, Quarter Calendar
Lecture, Summer Terms

OS 667  Negotiations and Relationship Management

[Cross-listed with OS 666] This course examines the complex problems associated with the management of stakeholder relationships under conditions of rapid economic change and intense global competition. The course emphasizes on the establishing, negotiating, building, sustaining, and repairing of both workplace and external relationships, including relationships with employees, management, customers, suppliers, manufacturers, shareholders, society, and other key stakeholders. This course provides an in-depth understanding of the theories of negotiation, conflict, complaint handling, and norms and ethics of fairness. The course also provides a foundation on labor relations, collective bargaining, and U.S. labor and employment laws, with an emphasis on the corresponding implications for union and nonunion workplaces. The course is intended to be applicable to a broad spectrum of workplace-related relationship issues faces by managers and professionals. Prerequisites: OS603 or OS602
Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed

OS 675  Human Resource Management Systems

[Formerly MBA 675] This course covers theories, empirical research and practical applications relevant to strategic human resource management from three major perspectives: legal, management and social science. The course will provide foundational knowledge in human resource and anti-discrimination law, job analysis, and strategic human resource planning processes. Four functional areas of human resource management will be addressed: recruitment/selection, training/development, motivation (e.g., performance management, compensation/benefits) and maintenance (e.g., communications, health and safety, labor relations, corrective action/discipline).
Credits: (3), Graded, Quarter Calendar
Lecture, Winter Quarters
OS 676  Current Issues in Human Resource Management
[Formerly MBA 676] This course addresses the strategic practice of human resource management from the perspective of an organizational leader striving to work strategically, ethically, and effectively with people. Current topics of importance in human resources (such as employee engagement, diversity/inclusion, work-life integration strategies, shifting employment relationships) will be addressed, discussing ways to manage human resources effectively in organizations’ dynamic legal, social and economic environments. Course topics will be examined using a problem solving approach, through analyses of case studies and court cases, social science research, and federal/state/local legislation.
Credits: (3), Graded, Quarter Calendar
Lecture, Spring Terms

OS 677  International Human Resources
[Formerly MBA 677] International Human Resource Management will focus on how effective human resource policy and practice contributes to a global company’s competitiveness. This course will be considered within the context of strategic business objectives, culture, and resource management constraints given by the various national entities. Special focus will be placed on understanding the unifying human resource policies that support the strategic objectives of a global organization. This course will draw on practical examples from companies that have experienced challenges of international human resource management.
Credits: (3), Graded, Quarter Calendar
Lecture, Summer Terms

OS 681  Strategic Management
[Formerly MBA 681] This capstone course provides an integrative approach to the recognition, analysis, and action that managers need as part of the effective strategic management process. Critical thinking, creative thinking, and analytical skills applicable to strategy formulation and implementation are developed across a variety of organizational contexts. Concepts including multiple strategic frameworks, competitor analysis, and competitive advantage are applied to real organizations. Enhanced written and oral communications skills are developed to persuasively and credibly present strategic conclusions and recommendations. Different types of data are analyzed and tools and models from core MBA coursework are integrated. A strategic assessment is conducted, including relevant recommendations that consider ethical practices and corporate social responsibilities.
Credits: (3), Graded, Semester Calendar
Lecture,

OS 687  Project in Organizational Studies
An investigation of an problem undertaken by the student under the guidance of an individual faculty member. The course provides an opportunity for the student to explore an area of organizational research in depth on an independent study basis. To register students must receive approval of the faculty member.
Prerequisites: consent of the instructor.
Credits: (1-6), Graded, Semester Calendar
Independent Study, Every Semester

OS 688  Project in Organizational Studies
An investigation of an problem undertaken by the student under the guidance of an individual faculty member. The course provides an opportunity for the student to explore an area of organizational research in depth on an independent study basis. To register students must receive approval of the faculty member.
Prerequisites: consent of the instructor.
Credits: (1-6), Graded, Quarter Calendar
Independent Study, Given When Needed

OT 501  Gross Anatomy
This course will provide students with a sound working knowledge of the structure of the human body with a strong emphasis on the musculoskeletal and nervous systems through the study of clinical anatomy. The relationship between structure and function will be addressed and the integration of these body systems during normal and abnormal function will be reviewed. Course structure will focus on regional anatomy and therefore will emphasize the relationship between various structures including muscles, nerves and arteries. The laboratory is designed to facilitate the study of human anatomy through the dissection of human cadavers and examination of skeletal materials and anatomical models. In addition, dissection provides students a unique opportunity to consider and discuss issues of professionalism, team-building, ethics, and death and dying.
Prerequisite: Students must be admitted into the OT-MS program
Credits: (4), Graded, Semester Calendar
Lecture, Odd Fall Terms

OT 503  Neuroscience
This course will focus on the application of neuroscience theory and clinical principles of nervous system function to behavioral outcomes in sensation, movement, perception and cognition as typically seen by rehabilitation professionals. Anatomy and function of the human nervous systems will be taught with emphasis placed on their role in development, movement and motor learning, the sensory system, cognition, perception and behavior for the purpose of understanding rehabilitation principles and intervention. Components of normal function and dysfunction of the peripheral and central nervous systems will be reviewed from the perspective of the rehabilitation specialist. Nervous system components including the spinal cord, brainstem, cerebrum and the auditory, visual and vestibular systems will be reviewed. Primary roles and functions, knowledge of the physical structures involved and the neural pathways that link systems will be reviewed. Examination of human brain specimens
and anatomical models will be used both in this course and the experiential learning component of this course.
Prerequisites: Successful completion of all previous semester courses.
Credits: (4), Graded, Semester Calendar
Lecture, Odd Spring Terms

OT 507  Basic Science: Cognition and Occupational Performance
In this basic science course, students are introduced to the tenets of cognitive and perceptual rehabilitation in occupational therapy. Students will explore how cognitive and perceptual deficits impact occupational performance and health related quality of life. Neurocognitive disorders will be reviewed, along with current assessments, evidence-based interventions, and practice models. Competency will be assessed with two simulation practical examinations. Prerequisite: Students must be admitted into the OT-MS program
Credits: (4), Graded, Semester Calendar
Lecture, Even Spring Terms

OT 511  Development and Occupational Performance Across the Lifespan
In this course, students will explore motor, cognitive and psychosocial development and age-related changes that occur from birth through older adulthood in typical individuals. Students will gain an appreciation for, and understanding of, individual and contextual factors that influence development and aging, including but not limited to biologic, social, environmental and health-related factors. They will examine the relationship between development and aging on performance skills, and apply this knowledge to gain a deeper understanding of activity demands. Students will be able to recognize the challenges that are presented when typical development does not occur or when age-related conditions negatively impact occupational performance. Prerequisite: Students must be admitted into the OT-MS program
Credits: (2), Graded, Semester Calendar
Lecture, Fall Terms

OT 521  Basic Science: Mental Health and Occupational Performance
This basic science course provides students the opportunity to revisit the roots of occupational therapy, as students explore the role of the profession as it relates to mental health issues. Students will compare the traditional role of OT practice in this field with current trends and emerging practice as they explore the impact of mental health and psychosocial issues on occupational performance across a lifespan. Additionally, students will explore how mental health and psychosocial issues can impact all areas of practice, from pediatrics, to adult physical dysfunction, to non-traditional practice areas.
Credits: (2), Graded, Semester Calendar
Lecture, Odd Fall Terms

OT 531  Foundations in Occupation Based Practice
In this foundational course, students are introduced to the profession of occupational therapy through history, theory, and current practice and professional affiliations. Overview of the value of occupational therapy in society is presented as students examine professional terminology, historical constructs of occupation, and the use of activities as therapeutic and healing practices. Students will be introduced to professional behaviors, ethical codes of behavior, professional documentation and the global community of the profession. Prerequisite: Students must be admitted into the OT-MS program. Credits: (3), Graded, Semester Calendar
Lecture, Odd Fall Terms

OT 533  Basic Science: Applied Kinesiology for OT's
Kinesiology is the study of human motion. Students will demonstrate knowledge and understanding of the structure and function of the human body as it relates to human movement and occupation. This course is designed to establish a basis of general biomechanical principles as it relates to Occupational Therapy practice. The course consists of both lecture and laboratory sessions. Laboratory sessions will provide the student with practical applications of principles discussed in lectures. In addition, the laboratory sessions will allow the student to become proficient in the areas of surface anatomy and palpation, manual muscle testing, and goniometry. The student will study normal and pathological movements. Students will employ logical thinking, critical analysis, problem solving, and creativity throughout this course. The influence of the environment on occupational performance will be explored. Cases will invite the exploration of the learned concepts to subjective experiences of meaningful engagement in work and play.
The focus will included but not be limited to, level of arousal, orientation, recognition, attention span, initiation of activity, termination of activity, memory, sequencing, categorization, concept formation, spatial operations, problem solving, learning, and generalization, as they are manifested across the lifespan, or resultant from disease process/effects. Students will develop entry level skills of the student occupational therapist sufficient for treatment planning, note writing, patient safety, and student safety in clinical practice.
Prerequisites: Successful completion of all previous semester courses.
Credits: (2), Graded, Semester Calendar
Lecture, Odd Spring Terms

OT 537  Bridging Science to Pediatric Assessment
In this course, students will develop skills in obtaining, interpreting and reporting evaluative information and data through both standardized and non-standardized methods. They will gain the ability to utilize comprehensive evaluation results to identify meaningful and realistic intervention goals that are relevant to the practice setting, and reflect client/family needs and priorities. Students will gain an ability to accurately and professionally report the results of an evaluation both orally and in a formal evaluation report. Prerequisites: Successful completion of all semester 3 courses.
Credits: (2), Graded, Semester Calendar
Lecture, Summer Terms

OT 539  Experiential Learning Lab 4: Professional Practice, Leadership, Management and Activism
What is OT the unique solution for? How can occupational engagement and participation be core components to an abundant world? This course begins with an exploration of theories related to management and leadership and ends investigating the concept of social entrepreneurs and change agents. Students will explore aspects of the OT profession as they learn what it takes to practice as an OT from a business and leadership perspective. Prerequisites: Successful completion of all semester 4 courses.
Credits: (3), Graded, Semester Calendar
Lecture, Even Spring Terms
Students will refine their ability to locate, evaluate, and incorporate research evidence into the practice of occupational therapy. Students will build upon research analysis and information literacy skills from prior coursework as they develop clinical questions, conduct database searches to obtain evidence, critically analyze available evidence, and determine relevancy to clinical practice. Students will review quantitative and qualitative research methodologies and designs, analyze scholarly works and assess both role established and role emergent concerns in occupational therapy profession. Students will identify an over-arching research question derived from their own area of interest and begin to examine the current body of knowledge related to their variables of interest, identify appropriate methodologies for the question. Students will work with faculty to develop a proposal from which their scholarly activity and propose a plan for their scholarly study will evolve. This course will include the development of a Critically Appraised Paper (CAP). Prerequisite: Students must be admitted into the OT-MS program. Credits: (3), Graded, Semester Calendar Lecture, Even Fall Terms

OT 549 Synthesizing Evidence and Practice to Become an Evidence-Based Practitioner

This experiential learning course is the final course in the occupational therapy research sequence. The course provides an in-depth examination of research and its relationship to multiple areas of practice and practice assumptions. Students will obtain an advanced understanding of theory-based research, selecting appropriate methodology and units of analysis in the design of research, ways of evaluating practice, and approaches to analyzing data. They will learn how to carry out and complete a scholarly activity. At the conclusion of this course, students will produce a scholarly report and participate in the dissemination of their work. Prerequisites: Successful completion of all previous semester courses. Credits: (3), Graded, Semester Calendar Lecture, Even Spring Terms

OT 551 Foundations in Defining and Understanding Occupational Performance

This course will incorporate a combination of lecture, video, guest lectures and collaborative group learning activities to reinforce the connection between the Occupational Therapy Practice Framework and real-life. Students will apply knowledge of human development, behavior, and newly acquired knowledge of occupational performance to observations of humans engaged in daily routines and activities. They will employ critical thinking skills to explore the relationships between client factors, context and environment, and occupation, and how this impacts health and disability. Through active learning assignments, students will apply concepts of occupation and activity to therapeutic intervention, and become familiar with various service delivery models. Throughout the course, core competencies of interpersonal skills, oral and written communication, critical thinking and scientific reasoning will be reinforced. Students can expect to gain an understanding of the role and process of occupational therapy in promoting health among individuals with and without disabilities. This class is delivered in a flipped format; students will be expected to complete preparatory activities (posted on Moodle) prior to class so they can participate fully in the hands-on application activities during class time. Prerequisite: Students must be admitted into the OT-MS program. Credits: (3), Graded, Semester Calendar Lecture, Odd Fall Terms

OT 553 Basic Science: Cognition and Occupational Performance

In this basic science course, students are introduced to the tenets of cognitive and perceptual rehabilitation in occupational therapy. Students will explore how cognitive and perceptual deficits impact occupational performance and health related quality of life. Neurocognitive disorders will be reviewed, along with current assessments, evidence-based interventions, and practice models. Competency will be assessed with two simulation practical examinations. Prerequisites: Successful completion of all previous semester courses. Credits: (2), Graded, Semester Calendar Lecture, Odd Spring Terms

OT 557 Bridging Science to Upper Extremity Rehabilitation

In this hands-on, highly interactive course, students will link learned science concepts from anatomy, neuroanatomy, kinesiology, and occupational science to the art and science of upper extremity rehabilitation. Upper extremity assessment and intervention, and the link to meaningful occupational engagement, will be explored through cases. The importance of the hand in everyday functioning will be explored through an anthropology, biological, and occupational science perspective. Experiential learning component of the course will require students to create orthotic devices aimed toward the client’s social and cultural adaptation to disabilities and to maximize health and participation. Prerequisites: Successful completion of all semester 3 courses. Credits: (2), Graded, Semester Calendar Lecture, Even Fall Terms

OT 563 Bridging Science to Adult Conditions and Assessment

This course links concepts learned in gross anatomy (OT 500) to the first experiential learning lab (OT 583). Clinical correlations covered in lectures as well as laboratory will present the fundamentals of human anatomy in a clinical context. Material covered will provide students with a rich foundation in which they will develop clinical reasoning that guides occupational therapy practice, professional inquiry and evidence based decision-making. Corequisite: OT583 Credits: (2), Graded, Semester Calendar Lecture,

OT 567 Bridging Science to Adult Neuro Conditions and Assessment

This course links concepts learned in Neuroscience (OT 503) to the second experiential learning (OT 587). Clinical correlations covered in lectures as well as laboratory will present the fundamentals of understanding and identifying neuroscience related health conditions in a clinical context. Material covered will provide students with a rich foundation in which they will develop clinical reasoning that guides occupational therapy practice, professional inquiry and evidence based decision-making. Credits: (2), Graded, Semester Calendar Lecture, Given When Needed
This seminar provides students the opportunity to examine and discuss specialty topics related to practice. Topics are taught in modules, allowing students to explore each topic in depth. During each module, students will explore research as it applies to occupational therapy best practices and the related impact on client factors and performance skills and patterns. Students will develop critical thinking skills, design and implement theoretically sound, evidence-based interventions through goal setting, treatment planning, and the use of a variety of intervention techniques incorporating innovation and technology to allow the client to engage in meaningful occupations. Students must achieve competence in assessment, intervention and documentation of the OT process for all conditions covered in this course. Prerequisite: OT583.
Credits: (3), Graded, Semester Calendar Laboratory, Odd Spring Terms

OT 597  Professional Seminar C: Clinical Scholarship
This seminar provides students the opportunity to examine and discuss specialty topics related to practice. Topics are taught in modules, allowing students to explore each topic in depth. During each module, students will explore research as it applies to occupational therapy best practice, learn ways to disseminate this information to peers, colleagues, and clients, and advocate for change. Examples of

Graduate Level Courses  Page 213
 concepts covered in this class may include, death and dying, cancer, social determinants of health, and driving. The course will remain fluid to allow for educational changes as the profession changes. This class is the third of four professional seminar classes.

Prerequisites: Successful completion of all semester 3 courses.
Credits: (2), Graded, Semester Calendar
Seminar, Even Fall Terms

**OT 599 Professional Seminar D: Innovation and Advanced Cases**

This seminar provides students with the opportunity to synthesize and integrate core concepts throughout the entire academic program through the utilization of advanced cases. Concepts related to OT practice, client assessment and treatment, pharmacology, research and evidence-based practice, and management/leadership will be intricately linked together as students examine advanced cases and begin preparation for the NBCOT exam and Level II fieldwork. This is the final professional seminar class.

Prerequisites: Successful completion of all semester 4 courses
Credits: (2), Graded, Semester Calendar
Seminar, Even Spring Terms

**OT 603 Engineering Health through Creativity, Craft and Analysis of Occupation**

Students will explore both historic and present-day relevance of Mary Reilly’s quote: “Man, through the use of his hands as they are energized by mind and will, can influence the state of his own health.” Students will examine the relationship between creativity, activity, and occupation through personal involvement in creative endeavors and analysis. This course explores how creative expression plays a vital role in health and personal transformations. Students will learn to gather occupational history, analyze tasks and skills, identify necessary performance skills, and explore current and innovative adaptations and modifications to foster participation.

Prerequisites: Successful completion of all previous semester courses.
Credits: (3), Graded, Semester Calendar
Lecture,

**OT 605 Engineering Pathways to Participation through Technology**

In this course, students will explore the role that modifications and adaptations have in maximizing independence, functional capabilities, and occupational performance and engagement for individuals with a variety of health conditions. They will gain an understanding of concepts of Universal Design as a proactive means of supporting participation among all individuals. They will also acquire an understanding of the no-tech, low-tech, mid-tech and high-tech interventions that can be implemented to address specific functional areas. Students will gain an understanding of the process of selecting appropriate strategies, adaptive equipment or assistive technologies, while ensuring a good fit between client needs and intervention/tool characteristics.

Prerequisites: Successful completion of all semester 2 courses.
Credits: (2), Graded, Semester Calendar
Lecture, Summer Terms

**OT 630 Engineering Pathways to Clinical Practice: Technology for Health-Related Quality of Life I**

Students who elect to participate in the Technology for HRQOL track will have the opportunity to capitalize on the entrepreneurial spirit that is inherent in a Clarkson education and leverage Clarkson’s expertise through cross disciplinary collaborations. Faculty will assist students to identify a need, formulate a plan to action, and develop a well thought out solution.

Credits: (2), Graded, Semester Calendar
Lecture, Fall Terms

**OT 631 Engineering Pathway to Clinical Practice: Occupational Therapist as a Researcher I**

In this first course of the Research Track, students will take what they learned in Foundations in Research a step further, focusing on becoming practitioners of research methods. Students will begin by completing critically appraised papers for quantitative and qualitative research, conducting a brief needs assessment, and engaging with topics in research ethics. At the same time, students will decide on their capstone research topics and begin to develop the research. For some, this may involve working on an Institutional Review Board proposal; for others, it may involve specialized training to conduct specific assessments or design a program. During the final three didactic semesters, all students in the Research Track will receive advanced training in qualitative interviewing, ethnomethodology, and grounded theory. Classic texts on advanced research methods will be assigned as appropriate. All students will complete a research paper and poster for presentation at the end of the spring semester.

Credits: (2), Graded, Semester Calendar
Lecture, Even Fall Terms

**OT 632 Engineering Pathway to Clinical Practice: Innovative Practitioner I**

Students who elect to participate in the Innovation track will have the opportunity to capitalize on the entrepreneurial spirit that is inherent in a Clarkson education and leverage Clarkson’s expertise through cross-disciplinary collaborations. Faculty will assist students to identify a need, formulate a plan to action, and develop a well thought-out solution.

Credits: (2), Graded, Semester Calendar
Lecture, Even Fall Terms

**OT 640 Engineering Pathway to Clinical Practice: Technology for Health-Related Quality of Life II**

In the second track courses, students will develop their own learning project or research under the tutelage of the course instructor and/or a mentor advisor. Students remain in their chosen track course, and by doing so, have an opportunity to immerse themselves in their specialty area of interest, expand their knowledge and skills, and apply their knowledge and skills to produce a scholarly project that contributes to the profession. Throughout this process students will be encouraged to engage in activities to promote personal and professional growth while developing the critical skills of a life-long learner.

Prerequisites: Successful completion of all semester 3 courses.
Credits: (2), Graded, Semester Calendar
Lecture, Fall Terms

**OT 641 Engineering Pathway to Clinical Practice: Occupational Therapist as a Researcher II**

In the second track courses, students will develop their own learning project or research under the tutelage of the course instructor and/or a mentor advisor. Students remain in their chosen track course, and by doing so, have an opportunity to immerse themselves in their specialty area of interest, expand their knowledge and skills, and apply their knowledge and skills to produce a scholarly project that contributes to the profession. Throughout this process students will...
OT 642  Engineering Pathway to Clinical Practice: Innovative Practitioner II

In the second track courses, students will develop their own learning project or research under the tutelage of the course instructor and/or a mentor advisor. Students remain in their chosen track course, and by doing so, have an opportunity to immerse themselves in their specialty area of interest, expand their knowledge and skills, and apply their knowledge and skills to produce a scholarly project that contributes to the profession. Throughout this process students will be encouraged to engage in activities to promote personal and professional growth while developing the critical skills of a life-long learner. Prerequisites: Successful completion of all semester 3 courses. Credits: (2), Graded, Semester Calendar Lecture, Fall Terms

OT 650  Engineering Pathways to Clinical Practice: Technology for Health-Related Quality of Life III

In the third and final track courses, students will finalize their own learning project or research. Students continue to immerse themselves in their specialty area of interest as they remain in their chosen track course. The final scholarship project results in disseminating the outcomes of the project to the greater community. Throughout this process students will be encouraged to engage in activities to promote personal and professional growth while developing the critical skills of a life-long learner. Prerequisites: Successful completion of all semester 4 courses. Credits: (2), Graded, Semester Calendar Lecture, Fall Terms

OT 651  Engineering Pathways to Clinical Practice: Occupational Therapist as a Researcher III

In the third and final track courses, students will finalize their own learning project or research. Students continue to immerse themselves in their specialty area of interest as they remain in their chosen track course. The final scholarship project results in disseminating the outcomes of the project to the greater community. Throughout this process students will be encouraged to engage in activities to promote personal and professional growth while developing the critical skills of a life-long learner. Prerequisites: Successful completion of all semester 4 courses. Credits: (2), Graded, Semester Calendar Lecture, Spring Terms

OT 652  Engineering Pathways to Clinical Practice: Innovative Practitioner III

In the third and final track courses, students will finalize their own learning project or research. Students continue to immerse themselves in their specialty area of interest as they remain in their chosen track course. The final scholarship project results in disseminating the outcomes of the project to the greater community. Throughout this process students will be encouraged to engage in activities to promote personal and professional growth while developing the critical skills of a life-long learner. Prerequisites: Successful completion of all semester 4 courses. Credits: (2), Graded, Semester Calendar Lecture, Spring Terms

OT 700A  Fieldwork Level I

OT 700 provides the student with an introduction to the fieldwork experience and the opportunity to develop a basic comfort level with and understanding of client needs. Students will develop professional and ethical behaviors while exploring current and emerging roles of occupational therapy with a variety of populations across the lifespan, in a variety of settings. While assisting in service delivery and intervention, students engage in an exploration of efficacy, therapeutic use of self, empathy and mindfulness and the development of self-awareness to support the art, craft and skill of effective therapeutic relationships. Students will reflect on the role of innovation and technology in meeting the needs of clients in a rural context. Students will begin to develop a deeper understanding of how psycho-social factors influence engagement in occupation. Students also participate in an accompanying seminar that offers the opportunity for peer interaction, mentoring and feedback as professional competence begins to emerge.

Level IIA fieldwork experiences begin following the students first full academic year with a 2 week full-time rotation. Level IIB Fieldwork is embedded during the fall or spring semester of the second academic year to allow simultaneous classroom and clinical education opportunities. This fieldwork experience runs 1 day per week for 12 weeks. Level I fieldwork cannot be substituted for any part of the Level II fieldwork requirement.
Prerequisites: Successful completion of all previous semester courses.
Credits: (2), Graded, Semester Calendar Lecture, Fall and Spring Terms

OT 700B  Fieldwork Level I

OT 700 provides the student with an introduction to the fieldwork experience and the opportunity to develop a basic comfort level with and understanding of client needs. Students will develop professional and ethical behaviors while exploring current and emerging roles of occupational therapy with a variety of populations across the lifespan, in a variety of settings. While assisting in service delivery and intervention, students engage in an exploration of efficacy, therapeutic use of self, empathy and mindfulness and the development of self-awareness to support the art, craft and skill of effective therapeutic relationships. Students will reflect on the role of innovation and technology in meeting the needs of clients in a rural context. Students will begin to develop a deeper understanding of how psycho-social factors influence engagement in occupation. Students also participate in an accompanying seminar that offers the opportunity for peer interaction, mentoring and feedback as professional competence begins to emerge.

Level IIB fieldwork is embedded during the fall or spring semester of the second academic year to allow simultaneous classroom and clinical education opportunities. This fieldwork experience runs 1 day per week for 12 weeks. Level I fieldwork cannot be substituted for any part of the Level II fieldwork requirement.
Prerequisite: Successful completion of all previous semester courses.
Credits: (2), Graded, Semester Calendar Lecture, Fall and Spring Terms

OT 705  Fieldwork Level II A

This is the first 12-week placement which will allow the student to begin their transition from an OT academic role to that of entry-level therapist. Potential placements will encompass the lifespan, a variety of client populations and service delivery models, and will allow the student to apply skills in their area of specialty interest. Fieldwork is highly individualized and may span from local to global, traditional to
emerging and innovative roles. Students will have opportunities to utilize critical thinking and clinical reasoning to apply curricular theories and concepts to practice in the evaluation process, intervention planning, and the use of occupation as intervention and outcome. Prerequisites: OT 507, OT 517, OT 527, OT 547, and (OT 640 or OT 641 or OT 642)
Credits: (9), Pass/Fail, Semester Calendar
Field Studies, Summer Terms

OT 710 Fieldwork Level II B
This second 12-week placement will allow the student to complete their transition from an OT academic role to that of entry-level therapist. Potential placements will encompass the lifespan, a variety of client populations and service delivery models, and will allow the student to apply skills in their area of specialty interest. Fieldwork is highly individualized and may span from local to global, traditional to emerging and innovative roles. Students will have opportunities to utilize critical thinking and clinical reasoning to apply curricular theories and concepts to practice in the evaluation process, intervention planning, and the use of occupation as intervention and outcome.
Prerequisites: Successful completion of all previous semester courses. Credits: (9), Pass/Fail, Semester Calendar
Field Studies, Fall Terms

**Physician Assistant Studies**

PA 501 Clinical Medicine I
This is the first in a series of courses designed to provide an intensive study of human diseases and disorders, using a lifespan approach from pediatrics to geriatrics, in the areas of clinical medicine including epidemiology, etiology, historical data, clinical manifestations, progression, therapeutic management, prevention, laboratory medicine, imaging, and prognosis. Emphasis will be on disease processes common to primary care practices and the emergency department following the NCCPA Blueprint, and the development of differential diagnoses and plans based upon the patient’s clinical presentation. This course will be facilitated through lecture and problem-based learning.
Prerequisite: Admission to the PA program
Credits: (6), Graded, Semester Calendar
Lecture, Spring Semesters

PA 502 Clinical Medicine II
This is the second in a series of courses designed to provide an intensive study of human diseases and disorders, using a lifespan approach from pediatrics to geriatrics, in the areas of clinical medicine including epidemiology, etiology, historical data, clinical manifestations, progression, therapeutic management, prevention, laboratory medicine, imaging, and prognosis. Emphasis will be on disease processes common to primary care practices and the emergency department following the NCCPA Blueprint, and the development of differential diagnoses and plans based upon the patient’s clinical presentation. This course will be facilitated through lecture and problem-based learning.
Prerequisite: Successful completion of prior semester of PA course work or program permission
Credits: (6), Graded, Semester Calendar
Lecture, Summer Semesters

PA 503 Clinical Medicine III
This is the third in a series of courses designed to provide an intensive study of human diseases and disorders, using a lifespan approach from pediatrics to geriatrics, in the areas of clinical medicine including epidemiology, etiology, historical data, clinical manifestations, progression, therapeutic management, prevention, laboratory medicine, imaging, and prognosis. Emphasis will be on disease processes common to primary care practices and the emergency department following the NCCPA Blueprint, and the development of differential diagnoses and plans based upon the patient’s clinical presentation. This course will be facilitated through lecture and problem-based learning.
Prerequisite: Successful completion of prior semester of PA course work or program permission
Credits: (6), Graded, Semester Calendar
Lecture, Fall Semesters

PA 504 Basic Science I
This is the first in a series of courses designed to develop an understanding of normal physiology, genetics, pathologic, and pathophysiologic concepts of diseases per organ system, and clinical anatomy with an emphasis on important anatomical landmarks required in physical evaluation of patients, anatomical relationships of structures to each other, and anatomical components of body systems.
Prerequisite: Admission to the PA program
Credits: (2), Graded, Semester Calendar
Lecture, Spring Semesters

PA 505 Basic Science II
This is the first in a series of courses designed to develop an understanding of normal physiology, genetics, pathologic, and pathophysiologic concepts of diseases per organ system, and clinical anatomy with an emphasis on important anatomical landmarks required in physical evaluation of patients, anatomical relationships of structures to each other, and anatomical components of body systems. Prerequisite: Successful completion of previous semester of PA course work or program permission
Credits: (2), Graded, Semester Calendar
Lecture, Summer Semesters

PA 506 Basic Science III
This is the third in a series of courses designed to provide skills related to the principles of pharmacology as they pertain to therapeutic agents, prescription, and non-prescription medications. Discussion will include the principal mechanisms of action of the major classes of therapeutic agents, understanding of pharmacodynamics, uses, side effects, and toxicities.

PA 507 Pharmacotherapeutics I
This is the first in a series of courses designed to develop skills related to the principles of pharmacology as they pertain to therapeutic agents, prescription, and non-prescription medications. Discussion will include the principal mechanisms of action of the major classes of therapeutic agents, understanding of pharmacodynamics, uses, side effects, and toxicities.
Prerequisite: Admission to the PA program
Credits: (3), Graded, Semester Calendar
Lecture, Spring Semesters

PA 508  Pharmacotherapeutics II
This is the second in a series of courses designed to develop skills related to the principles of pharmacology as they pertain to therapeutic agents, prescription, and non-prescription medications. Discussion will include the principal mechanisms of action of the major classes of therapeutic agents, understanding of pharmacodynamics, uses, side effects, and toxicities.
Prerequisite: Successful completion of prior semester of PA course work or program permission
Credits: (3), Graded, Semester Calendar
Lecture, Summer Semesters

PA 509  Pharmacotherapeutics III
This is the third in a series of courses designed to develop skills related to the principles of pharmacology as they pertain to therapeutic agents, prescription, and non-prescription medications. Discussion will include the principal mechanisms of action of the major classes of therapeutic agents, understanding of pharmacodynamics, uses, side effects, and toxicities.
Prerequisite: Successful completion of prior semester of PA course work or program permission
Credits: (3), Graded, Semester Calendar
Lecture, Fall Semesters

PA 510  Patient Assessment I
This is the first in a series of courses designed to develop the knowledge and skills required to obtain and record the complete medical history, use of appropriate equipment, proper techniques, and accurate medical terminology to document findings. This course will provide an overview of the medical record as well as development of writing and organizational skills for medical record keeping and oral presentation skills. Skills will be developed through lecture and structured laboratory exercises.
Prerequisite: Admission to the PA program
Credits: (3), Graded, Semester Calendar
Lecture, Spring Semesters

PA 511  Patient Assessment II
This is the second in a series of courses designed to develop the knowledge and skills required to obtain and record the complete medical history, use of appropriate equipment, proper techniques, and accurate medical terminology to document findings. This course will provide an overview of the medical record as well as development of writing and organizational skills for medical record keeping and oral presentation skills. Skills will be developed through lecture and structured laboratory exercises.
Prerequisite: Successful completion of prior semester of PA course work or program permission
Credits: (3), Graded, Semester Calendar
Lecture, Summer Semesters

PA 512  Patient Assessment III
This is the third in a series of courses designed to develop the knowledge and skills required to obtain and record the complete medical history, use of appropriate equipment, proper techniques, and accurate medical terminology to document findings. This course will provide an overview of the medical record as well as development of writing and organizational skills for medical record keeping and oral presentation skills. Skills will be developed through lecture and structured laboratory exercises.
Prerequisite: Successful completion of prior semester of PA course work or program permission
Credits: (3), Graded, Semester Calendar
Lecture, Summer Semesters

PA 513  The Patient and the PA I
This is the first in a series of courses designed to develop skills in the area of patient communication, patient counseling, patient education, and cultural diversity and how they influence all aspects of medical practice. Instruction is focused on the detection and application of preventive measures and treatment of health risk behaviors including stress, abuse and violence, substance abuse, sexuality, end of life issues, and reaction to illness. The course will also include discussions on medical ethics.
Prerequisite: Admission to the PA program
Credits: (1), Graded, Semester Calendar
Lecture, Spring Semesters

PA 514  The Patient and the PA II
This is the second in a series of courses designed to develop skills in the area of patient communication, patient counseling, patient education, and cultural diversity and how they influence all aspects of medical practice. Instruction is focused on the detection and application of preventive measures and treatment of health risk behaviors including stress, abuse and violence, substance abuse, sexuality, end of life issues, and reaction to illness. The course will also include discussions on medical ethics.
Prerequisite: Successful completion of prior semester of PA course work or program permission
Credits: (1), Graded, Semester Calendar
Lecture, Summer Semesters

PA 515  The Patient and the PA III
This is the third in a series of courses designed to develop skills in the area of patient communication, patient counseling, patient education, and cultural diversity and how they influence all aspects of medical practice. Instruction is focused on the detection and application of preventive measures and treatment of health risk behaviors including stress, abuse and violence, substance abuse, sexuality, end of life issues, and reaction to illness. The course will also include discussions on medical ethics.
Prerequisite: Successful completion of prior semester of PA course work or program permission
Credits: (1), Graded, Semester Calendar
Lecture, Fall Semesters

PA 516  Medical Informatics
This course will cover the importance of evidence-based medicine and review basic statistics, research methods, and ethical standards in research. It will also cover the interpretation of medical literature and application of various types of clinical articles in answering clinical questions. It will also include the basics of medical writing to provide added guidance for upcoming projects.
Prerequisite: Successful completion of prior semester of PA course work or program permission
Credits: (1), Graded, Semester Calendar
Lecture, Summer Semesters
PA 517  Clinical Procedures
This course will prepare the student for the upcoming clinical year. The focus will be on procedures, such as bedside and surgical procedures including aseptic technique, air and blood-borne pathogen transmission prevention, phlebotomy, IV placement, foley catheter insertion, lumbar puncture, injections, surgical techniques, and casting.
Prerequisite: Successful completion of prior semester of PA course work or program permission
Credits: (2), Graded, Semester Calendar
Clinical, Fall Semesters

PA 518  Laboratory and Diagnostics I
Introduction to basic laboratory and diagnostic testing/studies as it applies to physician assistant studies. Prerequisites as required for entry into the didactic phase of Clarkson PA education
Credits: (1), Graded, Semester Calendar
Laboratory, Spring Terms

PA 600  Supervised Practice - Ambulatory Medicine
This 5 week clinical course will be within a Family Medicine clinic setting. This course provides the PA student with experience in the outpatient evaluation and treatment of pediatric and adult patients, including preventive medicine, acute and chronic illness, and patient education.
Prerequisite: Completion of the preclinical year of the physician assistant program or program permission.
Credits: (3), Graded, Semester Calendar
Field Studies, Every Term

PA 601  Supervised Practice - Internal Medicine
This 5 week clinical course will be within an Internal Medicine practice. It will include a substantial inpatient experience for the PA student to gain knowledge of the evaluation and treatment of the multiple diseases and conditions of the adult population requiring hospitalization.
Prerequisite: Completion of the preclinical year of the physician assistant program or program permission.
Credits: (3), Graded, Semester Calendar
Field Studies, Every Term

PA 602  Supervised Practice - General Surgery
This 5 week clinical course will be within a surgical practice. PA students will participate in Operating Room (OR) cases and hospital consultations as well as clinic based cases and visits in caring for conditions that require surgical management. This will include preoperative, intra-operative, and post-operative care.
Prerequisite: Completion of the preclinical year of the physician assistant program or program permission.
Credits: (3), Graded, Semester Calendar
Field Studies, Every Term

PA 603  Supervised Practice - Emergency Medicine
This 5 week clinical course will be within a hospital Emergency Department. PA students will gain knowledge and learn skills relevant to the triage, stabilization, diagnosis, and management of acute, lifethreatening injuries and illnesses as well as the care of less threatening conditions.
Prerequisite: Completion of the preclinical year of the physician assistant program or program permission.
Credits: (3), Graded, Semester Calendar

PA 604  Supervised Practice - Pediatrics
This 5 week clinical course will provide the PA student with experience in outpatient and/or inpatient management of pediatric patients. The student will have the opportunity to perform well child exams, problem oriented exams, evaluate common pediatric illnesses, and the care of the newborn and children.
Prerequisite: Completion of the preclinical year of the physician assistant program or program permission.
Credits: (3), Graded, Semester Calendar
Field Studies, Every Term

PA 605  Supervised Practice - Women's Health
This 5 week clinical course provides the PA student with experience in managing common gynecologic disorders. The obstetric experience will include routine prenatal and postpartum care. It will include labor & delivery when possible. Prerequisite: Completion of the preclinical year of the physician assistant program or program permission.
Credits: (3), Graded, Semester Calendar
Field Studies, Every Term

PA 606  Supervised Practice - Behavioral Health
This 5 week clinical course will provide the PA student with a behavioral medicine experience in caring for ambulatory and/or hospitalized patients with psychiatric disorders. The student will perform basic psychiatric evaluations, monitor medications, and support the clinical management plan for patients after psychiatric evaluation and treatment. Prerequisite: Completion of the preclinical year of the physician assistant program or program permission.
Credits: (3), Graded, Semester Calendar
Field Studies, Every Term

PA 607  Supervised Practice - Elective I
This 5 week clinical course will provide the PA student the opportunity to practice in any available medical setting of the student’s choice. This may be used to augment a previous clinical experience or explore an area of interest or potential future employment. Prerequisite: Completion of the preclinical year of the physician assistant program or program permission
Credits: (3), Graded, Semester Calendar
Field Studies, Every Term

PA 608  Supervised Practice - Elective II
This 5 week clinical course will provide the PA student the opportunity to practice in any available medical setting of the student’s choice. This may be used to augment a previous clinical experience or explore an area of interest or potential future employment. Prerequisite: Completion of the preclinical year of the physician assistant program or program permission
Credits: (3), Graded, Semester Calendar
Field Studies, Every Term

PA 609  Clinical Research Elective
This 5 week course allows the PA student to participate in research in any medical area of interest in preparation for the student’s Master’s Project. The student may engage the multiple academic departments of Clarkson University outside of PA Studies for this research. Topics for research must be approved by the Department Chair and must be approved by the appropriate university review board. As an alternative, the student may perform a service learning project during
this time as part of the Master’s Project. Prerequisite: Completion of the preclinical year of the physician assistant program or program permission. 
Credits: (3), Graded, Semester Calendar

PA 610 Summative Review
This course, presented near the end of the clinical year, will include intensive board review in preparation for the PANCE, review for clinical skills testing, CV preparation, and interviewing skills. It also include a final clinical skills exam as well as a cumulative written test, both of which must be successfully passed to graduate from the program. Prerequisite: Successful completion of the preclinical year and all supervised practice rotations
Credits: (1), Graded, Semester Calendar
Lecture, Spring Semesters

PA 611 Master Project
This course is a follow up to Medical Informatics and the Research elective. It is designed to allow the PA student to complete a master’s degree project under the guidance of Clarkson faculty or a community advisor. Students may identify an area of medicine, disease process or condition, conduct research, and produce a paper worthy of publication. The student may also perform a learning service project resulting in a publishable paper or product for use in the community. The student will prepare and present an oral presentation on their topic at the conclusion of the year. Prerequisite: Completion of the preclinical year of the physician assistant program or program permission. Credits: (2), Graded, Semester Calendar
Research, Spring Semesters

PA 900 PA Clinical Placeholder
This course is a clinical rotation placeholder until final clinical assignments have been finalized. Once finalized, students will be placed into the correct clinical assignment course number.
Credits: (1-12), Graded, Semester Calendar
Independent Study,

Physics

PH 520 Physical Models of Living Systems
This course focuses on modeling essential processes in living systems using the tools and techniques of physics, including computer modeling. Using case studies in virus dynamics, bacterial genetics and naturally evolved cellular circuits, the course will explore how living organisms use physical mechanisms to gain information about their surroundings, process information and make decisions. It will also examine some of the cutting edge techniques used by scientists at the forefront of biophysical and life sciences research to study living organisms and understand their behavior. This course is broadly aimed at students studying in physics, chemistry, mathematics, computer science, chemical engineering, and biomedical engineering, in addition to biology majors with advanced math classes.
Credits: (3), Graded, Semester Calendar
Lecture, Even Fall Terms

PH 523 Optics
Geometrical optics: reflection and refraction at plane and spherical surfaces, lenses, lens aberrations. Physical optics: interference, diffraction, polarization, photons, absorption, scattering, electrooptics. Prerequisite: PH132 or consent of the instructor.
Credits: (3), Graded, Semester Calendar
Lecture, Even Fall Semesters

PH 525 Thermal Physics
Temperature, heat, thermodynamics and applications. Introduction to kinetic theory and classical and quantum statistical mechanics. 
Prerequisites: PH231 and MA231 or consent of the instructor.
Credits: (3), Graded, Semester Calendar
Lecture, Fall Semesters

PH 526 Introduction to Biophysics
[Cross-listed by BY 526] This course concentrates on the fundamental physical processes that occur within living organisms, particularly the cell. Topics include the structure and physics of macromolecules, biological membranes, the thermodynamics of living systems, muscle contraction and the propagation of signals in nerve cells.
Prerequisite: consent of the instructor.
Credits: (3), Graded, Semester Calendar
Lecture,
two-nucleon forces, complex nuclei, interaction of radiation with matter, accelerators, nuclear reactions, elementary particles and their classification. Prerequisites: PH331 or PH531, or consent of the instructor.
Credits: (3), Graded, Semester Calendar
Lecture, Odd Spring Semesters

PH 551  Statistical Mechanics I
Prerequisites: PH325 or PH525, or consent of the instructor.
Credits: (3), Graded, Semester Calendar
Lecture, Spring Semesters

PH 555  Mathematical Methods in Physics
Mathematics methods used in theoretical physics. Topics covered include complex variables, Fourier transforms, special functions, eigenfunction expansions, Green's functions, differential equations, linear algebra and linear spaces, with physical applications.
Prerequisite: consent of the instructor.
Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed

PH 557  Introduction to Astrophysics
Radiation from astrophysical sources and measurement of position, mass, temperature, velocity, density, composition and age. Emphasis will be on recent discoveries and interpretations. Prerequisite: consent of the instructor.
Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed

PH 560  Physics of Fluids
Discussion of the mechanics of fluids based on the Navier-Stokes equation. Laminar and turbulent flows, dimensional analysis. Special topics with applications.
Prerequisite: consent of the instructor.
Credits: (3), Graded, Semester Calendar
Lecture, Odd Spring Semesters

PH 563  Computer Simulation Methods in Physics
[Cross-listed with PH463] This is a computer laboratory course that explores physical concepts using computer simulations. Topics include: Euler method and its applications in classical mechanics an thermodynamics; the cooling of coffee, motion of falling objects, planetary motion with and without the solar wind, simple harmonic oscillator, damped oscillations, Molecular Dynamics, Boltzmann distribution, random walk and Brownian Dynamics, percolation model, and Monte Carlo Method. Prerequisites: PH132, MA232; PH325 or ES340 and PH380 or EE381 or instructor consent.
Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed

PH 570  Directed Study Experimental
A course of study of subjects not otherwise available in formal courses may be undertaken under the supervision of a faculty member.
Prerequisite: consent of the instructor.
Credits: (1-3), Graded, Semester Calendar
Lecture, Given When Needed

PH 574  Directed Study Theoretical
A course of study of subjects not otherwise available in formal courses may be undertaken under the supervision of a faculty member.
Prerequisite: consent of the instructor.
Credits: (1-3), Graded, Semester Calendar
Independent Study, Given When Needed

PH 580  Electromagnetic Theory I
Fundamental properties of electric and magnetic fields. Gauss law, Poisson equation, dielectrics, boundary value problems, vector potential, inductance, Maxwell equations, electromagnetic waves.
Prerequisites: PH132 and MA231, or consent of the instructor.
Credits: (3), Graded, Semester Calendar
Lecture, Fall Semesters

PH 587  Applications of Synchrotron and Electron Based Techniques
The purpose of the course is to familiarize all students with the x-ray and electron based experimental techniques available at Brookhaven National Lab and other similar facilities. Students will be cognizant of the applications of these cutting edge facilities, and well positioned to use them in their own research. This course is suitable for graduate students, postdocs, and advanced undergrads in physical sciences and engineering, as well as students in biological, environmental, and chemical sciences who may have the interest to learn more about the techniques they may use for their research.
Credits: (3), Graded, Quarter Calendar
Lecture, Spring Terms

PH 624  Advanced Topics in Statistical Mechanics I
Selected topics in statistical and many-body physics, both equilibrium and nonequilibrium.
Credits: (1-3), Graded, Semester Calendar
Lecture,

PH 625  Computer Modeling in Physics
Physical concepts using computer simulations: Euler method and its applications in classical mechanics and thermodynamics (cooling of coffee, Styrofoam ball fall, motion of planets, pendulum), random walks (Brownian dynamics), percolation, Monte Carlo method.
Pre-requisites: PH325, MA232 and knowledge of any programming language (Java, Fortran, C, C++, Matlab, etc.) or consent of the instructor. (Optional PH231/PH331 and PH380/PH381.)
Credits: (1-3), Graded, Semester Calendar
Independent Study,

PH 626  Electroanalytical Methods
This course explores fundamental principles and selected applications of modern electroanalytical methods. Topics include: ions in electrolytes; transport numbers, specific conductivity, Walden's rule, ionic strength; Laplace transform and diffusion problems. Electrode potentials and kinetics; Nernst equation, Butler-Volmer formulation. Voltammetry, chronoamperometry, and chronopotentiometry. Mixed potential effects, corrosion and Pourbaix diagram. Double layer models, specific adsorption and isotherms. Electrochemical impedance spectroscopy (EIS); analyses of EIS data; complex impedance elements; nonlinear least square method, circuit models of interfacial reactions; Kramers Kronig transform, statistical analyses, F-test and t-test. Applications of electroanalysis; fuel cells, electrocatalysis, corrosion protection, chemical mechanical planarization, batteries and supercapacitors. The course requires a strong undergraduate background in mathematics.
Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed

PH 661  Classical Mechanics
Basic concepts of classical mechanics. The two body central force problem, Lagrange's equations, kinematics and dynamics of a rigid body, many particle systems, variational principles, Hamilton's equations, canonical transformations, Hamilton-Jacobi theory, perturbation theory, small oscillations, and continuous systems and fields.
Prerequisite: consent of the instructor.
Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed

PH 663  Electromagnetic Theory I
This course includes theoretical treatment of static electric and magnetic fields, time-dependent fields, electromagnetic waves in a vacuum, in homogeneous isotropic media, and at boundaries. Also included are selected topics from special relativity, wave guides and resonant cavities, radiation and magnetohydrodynamics.
Prerequisite: consent of the instructor.
Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed

PH 669  Quantum Mechanics I
General formulation of quantum mechanics and its interpretation, matrix formulation, advanced perturbation and variational methods, scattering theory, atomic structure, radiative transitions and applications to atoms, nuclei, molecules and solids.
Prerequisite: consent of the instructor.
Credits: (3), Graded, Semester Calendar
Independent Study, Given When Needed

PH 680  Selected Topics in Physics I
An advanced treatment of selected topics in fields of current interest not presently covered in other courses.
Prerequisite: consent of the instructor.
Credits: (1-3), Graded, Semester Calendar
Independent Study, Given When Needed

PH 682  Selected Topics in Physics II
An advanced treatment of selected topics in fields of current interest not presently covered in other courses.
Prerequisite: consent of the instructor.
Credits: (1-3), Graded, Semester Calendar
Independent Study, Given When Needed

PH 683  Graduate Seminar I
Faculty, distinguished visiting speakers, and graduate students report on current research. An important objective is to encourage the graduate students to keep informed of current developments in physics and closely related fields, and practice presentation techniques of research results. Professional development of graduate students, including resume development, practicing in written article reviews, training in research ethics, and other relevant training.
Prerequisite: consent of the instructor.
Credits: (1), P/NC, Semester Calendar
Seminar, Given When Needed

PH 684  Graduate Seminar II
Continuation of PH 683.
Prerequisite: consent of the instructor.

PH 699  Thesis, Dissertation or Special Project
An investigation of a problem undertaken by the student under the guidance of a faculty member.
Prerequisite: consent of the instructor.
Credits: (1-15), Thesis, Semester Calendar
Thesis Research, Every Semester

Independent Study

PHIL 590  Independent Study
Working under the direction of a faculty member, this course allows a graduate student to pursue topics of interest in philosophy.
Credits: (1-10), Graded, Semester Calendar
Independent Study, Given When Needed

Educational Physics

PHY 580  MAT Project in Physics (Content Area)
The MAT Project is a one-semester research project whose purpose is to allow students time and supervision to develop breadth and/or depth of knowledge to become a better teacher in their certification field. What the project will entail varies greatly from student to student. The course is intended to be custom-tailored to meet the specific needs of an individual intern. MAT projects are well-grounded in research and theory, but also include a strong and extensive applied aspect, directly addressing the question: What would this look like in the classroom? Restriction: This course is open only to students matriculated in the Master of Arts in Teaching program (or by instructor consent)
Credits: (3), Graded, Semester Calendar
Lecture,

PHY 590  Physics Demonstrations
Physics Demonstrations are an important part of helping students experience events that illustrate the concepts that are studied. They can appear to be magic tricks to students who are first studying the principles they illustrate. The purpose of this course is to have prospective teachers identify appropriate demonstrations for all parts of the curriculum in an introductory physics survey course. The identification of an appropriate demonstration where the teacher fully understands the physics behind the event and that has physics that the students can understand or learn is an important skill for teachers to learn. This is a very detailed task. In order for introductory physics students to not see the event as a magic trick certain principles must first be understood. The teacher who chooses a demonstration has to understand all the principles that allow the event to take place, which ones the students have already studied and what new principles it is illustrating. The teacher also has to determine if the students understand the underlying principles necessary to have a learning experience that have already been
studied. Activities need to be developed to determine this. If the principles are not understood activities need to be prepared, and ready to use, to reinforce these principles. Students will be required to identify 12 demonstrations for an introductory physics course. Each one will be done in class with the student teachers in the class acting as the 'students.' The 'students' and the professor will evaluate the demonstration and a class discussion will take place about the visibility, the teacher presentation, the relationship of the demonstration to the curriculum and the effectiveness of illustrating the physics principle it is targeting. Restriction: This course is open only to students matriculated in the Master of Arts in Teaching program (or by instructor consent)
Credits: (3), Graded, Semester Calendar
Lecture,

**Political Science**

**POL 500**  Constitutional Law
[Cross-listed with POL400] This course will cover the same subject area and topics as POL 400. Additional materials at the graduate level will be expected of those who register under this catalog number. (The attached syllabus includes the additional requirements for graduate students.)
Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed

**POL 545**  Happiness: Politics, Policy and More
[Cross-listed with POL345] This course will cover the same subject area and topics as POL 345. Additional materials at the graduate level will be expected of those who register under this catalog number.
Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed

**POL 550**  Development and Public-Private Partnerships
This course introduces students to the challenges and opportunities of economic liberalization and public-private partnerships in the delivery of public goods and services. We will study public procurement, or the mechanisms through which governments buy goods and services from private vendors to fulfill their public mission. We frame procurement politics within the literature on development economics and political accountability. We study the interactions between four actors: government, law, private vendors, and civil society. We survey the linkages and tensions between economic, social, and political goals.
Credits: (3), Graded, Semester Calendar
Lecture, Even Spring Semesters

**POL 570**  Environmental Policy
A course description has not been provided for this course. Please check with the Humanities & Social Science department for a description.
Credits: (3), Graded, Semester Calendar
Lecture,

**POL 571**  Energy Policy
Energy policy is a critical component of state and national public policy. Issues surrounding the reliability and security of energy supplies directly affect national domestic and foreign policy, as well as state level environmental, economic development, and land use concerns. Via emphasis on specific issues unique to North American energy policy (US and Canada), the class will introduce students to the major theoretical frameworks used by political scientists, sociologists, economists, and other intellectual disciplines to understand how societies design and implement public policies related to energy, and how the energy industry responds. Topics covered will include theories of the state, monopoly and regulation, public choice, organizational behavior, international agreements, and innovation. The class will apply these theories to major current and historical issues in energy policy, such as ethanol, climate change, and renewable energy systems, nuclear power, energy efficiency, energy security, the world oil market, and OPEC, electricity production and markets and the California electricity crisis. Graduate students will do additional coursework.
Credits: (3), Graded, Semester Calendar
Lecture, Spring Semesters

**POL 575**  Environmental Law
[Cross-listed with EV 575] In this course we will be examining the relationship between the Courts and various policies, laws, and regulations pertaining to the restoration and management of the environment. The central issues in the cases we will be examining emerge from the tension between property rights and what has been conceived as a constitutional right to a clean, healthy environment. Areas where this tension plays out include: the Clean Air Act, the Clean Water Act, The Superfund Law, and the National Environmental Policy Act. In general, the course is designed to help students assess whether environmental laws provide us with a route for attaining ecological goals, and to think critically about the role of the Courts as a defender of the environment. Graduate students are required to perform additional assignments above those required by undergraduates.
Credits: (3), Graded, Semester Calendar
Lecture, Spring Terms

**POL 580**  The Law and Bioethics
This course explores the relation between law, ethics, and new technologies. In particular, we will be exploring issues of the right to privacy, abortion, state sterilization programs, cloning, rights of surrogate parents, doctor/patient confidentiality, the right to die, new definitions of death, the human genome project and intellectual property rights, and organ transplantation. This inquiry will be guided by the question: “Who Owns Life?” There is no definitive answer to this question offered by the American court system. Through readings and discussions students will gain political and ethical perspective on how legal standards are formed in response to new demands by the public and government, and how new ethical questions are inspired by innovations in germline bioengineering, medical and rehabilitative technology, robotics, virtual reality, and nanotechnology. The material for the course will be case law and articles by leading scientists, physicians, ethicists, and legal scholars in this young field. Additional materials at the graduate level will be expected of those who register under this catalog number.
Credits: (3), Graded, Semester Calendar
Lecture,
Physical Therapy

PT 505  Foundation Sciences for Physical Therapy
Using a Problem-Based Learning (PBL) format in small tutorial groups, clinical lab, gross anatomy lab, inquiry seminars, and self-directed learning students will develop the early cognitive, psychomotor, and affective skills necessary to be physical therapists. Cases related to the foundation sciences of anatomy (musculoskeletal and neurological) and kinesiology are covered in the different learning environments. Students will gain an appreciation for, and ability to implement physical therapy professional practice core values, in addition to skills in communication, cultural competence, clinical reasoning, evidence-based practice, and education. Students also will gain inductor clinical skills that relate to patients with all types of movement disorders who require physical therapy services.

Corequisites: PT506 and PT508.
Credits: (9), Graded, Semester Calendar
Lecture, Discussion, Laboratory, Clinical, Fall Semesters

PT 506  Professional Foundation for Physical Therapy
This course assists the student in an exploration of the structure of the health care system and the evolving role of the physical therapy profession as a primary participant. The course integrates topics such as history, ethics, politics, sociology, and economics, using seminal articles from a variety of healthcare fields to broaden the learning experience. Utilizing a largely discussion-based format, each student and faculty member will have the opportunity to facilitate interaction by drawing from assigned readings, clinical examples, and students’ life experiences. This course will be integrated with case discussions in PT 505 and will provide the foundation for growth as a professional throughout the physical therapy curriculum and beyond.

Prerequisite: Admission to graduate physical therapy professional curriculum (DPT). Corequisites: PT505 and PT508.
Credits: (2), Graded, Semester Calendar
Lecture, Fall Semesters

PT 508  Literature Critique and Review
This course provides students with foundational concepts of evidence-based practice (EBP), and skills for critical evaluation of physical therapy research literature related to both background questions (e.g., risk factors) and foreground questions (e.g., interventions). Students will contrast and critique different types of intervention research and relate to levels of evidence. Students learn how to search for, identify, obtain, analyze and summarize appropriate literature using appropriate tools such as PubMed, PEDro, PTNow, and clinical practice guidelines. The capstone project is a literature review poster presentation. Corequisites: PT505 and PT506.
Credits: (1), Graded, Semester Calendar
Lecture, Fall Terms

PT 515  Cardiopulmonary-Exercise Science
Using a Problem-Based Learning (PBL) format in small tutorial groups, clinical lab, anatomy lab using cadavers, inquiry seminars and self-directed learning students will develop the cognitive, psychomotor and affective skills necessary to be physical therapists and provide services to individuals with cardiorespiratory disorders, acute conditions found in hospital settings, and exercise and fitness environments. Foundational sciences, behavioral sciences, and clinical science related to cardiorespiratory disorders are covered in different learning environments. Students will gain an appreciation for and ability to implement physical therapy professional practice core values, in addition to skills in communication, cultural competence, clinical reasoning, evidence-based practice, and education. In the different learning environments, the skills and knowledge related to the...
management (screening, examination, evaluation, diagnosis, prognosis, plan of care, intervention and outcomes assessment) of patients/clients with musculoskeletal disorders are covered. Students also will gain skills in practice management for individuals with musculoskeletal disorders who require physical therapy services. Prerequisites: PT515, PT517, PT518. Good standing in the graduate physical therapy professional curriculum (DPT).

Corequisites: PT527 and PT528.

Credits: (9), Graded, Semester Calendar

Lecture, Discussion, Laboratory, Clinical, Fall and Summer Terms

PT 527  Professional Practice Preparation

PT527 is the capstone course for preparation of upcoming internship courses throughout the curriculum. This course includes both scheduled course and individual meeting sessions. Students will discuss clinical education objectives, professional issues, select upcoming clinical internship sites, develop interview and daily organization skills, and learn how to utilize the full-time PT CPI website. Corequisites: PT515, PT517 and PT518

Credits: (2), P/NC, Semester Calendar

Lecture, Summer Semesters

PT 528  Analytical Methods for Evidence Based Practice

Students will learn about various analytical methods used in evidence based practice, with an emphasis on statistical methods. Students will learn to select, apply, and interpret statistical methods commonly used in physical therapy research, and will critique analytical methods used in research. Prerequisites: PT515, PT517 and PT518

Corequisites: PT525, PT527 and PT528

Credits: (1), Graded, Semester Calendar

Lecture, Summer Terms

PT 527  Professional Practice II

The first full-time internship course within the DPT curriculum, students participate in eight weeks of full-time internship at an orthopedic or acute care/cardiopulmonary setting following the third semester. Students synthesize their knowledge of musculoskeletal and/or cardiopulmonary disorders and gain an appreciation for managing multiple patients and responsibilities. The focus of this internship is on the patient/client management process—examination, evaluation, diagnosis, prognosis, intervention, and outcomes -- for patients within these settings with a variety of impairments leading to activity and participation limitations. Prerequisites: PT525, PT527, PT528. Good standing in the graduate physical therapy professional curriculum (DPT).

Corequisite: PT604

Credits: (6), P/NC, Semester Calendar

Lecture, Fall and Summer Terms

PT 528  Physical Therapy for Multiple System Disorders I

Using a Problem-Based Learning (PBL) format in small tutorial groups, clinical lab, neuroanatomy lab, inquiry seminars and self-directed learning students will develop the cognitive, psychomotor, and affective skills necessary to be physical therapists and provide services to individuals with disorders of multiple systems. Foundational sciences, behavioral sciences, and clinical science related to disorders of multiple system disorders are covered in the different learning environments. Students will gain an appreciation for and ability to implement physical therapy professional practice, and education. In the different learning environments, the skills and knowledge related to the management (screening, examination, evaluation, diagnosis, prognosis, plan of care, intervention and outcome assessment) of patients/clients with multiple system disorders are covered. Students also will gain skills in practice management for individuals with multiple systems disorders who require physical therapy services. Prerequisites: PT525, PT527, PT528, PT537. Good standing in the graduate physical therapy professional curriculum (DPT).

Corequisites: PT537, PT608.

Credits: (5), Graded, Semester Calendar

Lecture, Discussion, Clinical, Fall Terms

PT 605  Neuromuscular Physical Therapy I

Using a Problem-Based Learning (PBL) format in small tutorial groups, clinical lab, neuroanatomy lab, inquiry seminars and self-directed learning, students will develop the cognitive, psychomotor, and affective skills necessary to be physical therapists and provide services to individuals with neuromuscular disorders. Foundational sciences, behavioral sciences, and clinical science related to neuromuscular disorders are covered in the different learning environments. Students will gain an appreciation for and ability to implement physical therapy professional practice core values, in addition to skills in communication, cultural competence, clinical reasoning, evidence-based practice, and education. In the different learning environments, the skills and knowledge related to the management (screening, examination, evaluation, diagnosis and prognosis, plan of care, intervention, and outcomes assessment) of patients/clients with neuromuscular disorders are covered. Students will also gain skills in practice management for individuals with neuromuscular disorders who require physical therapy services. Prerequisites: PT525, PT527, PT528. Good standing in the graduate physical therapy professional curriculum (DPT).

Corequisites: PT537.

Credits: (4), Graded, Semester Calendar

Lecture, Discussion, Laboratory, Clinical, Fall Semesters

PT 604A  Professional Practice III-A

Students will participate in the first 8 weeks of a part-time clinical experience integrating clinical skills and practice management related to individuals with neurological impairments and disorders. Students will have the opportunity to practice patient interaction and management skills, clinical skills, and increase their knowledge of this complex patient population. Students will work with patients similar in diagnosis as discussed within tutorial cases and study concepts related to case management and policies that govern the clinical setting. The clinic portion of this course is highly integrated with PT 605 and PT 606, Neuromuscular Physical Therapy. Prerequisites: PT525, PT527, PT528. Good standing in the graduate physical therapy professional curriculum (DPT).

Corequisites: PT537.

Credits: (1), Graded, Semester Calendar

Clinical, Fall Terms

PT 608  Research Methods

Students will examine and contrast a variety of research methods, including both primary and secondary research (i.e. original data collection vs. systematic review/meta-analysis). Students will learn to integrate critique of multiple research articles and apply to clinical situations. This course will address a variety of ethical issues associated with research. By the end of the semester, students will have selected and developed a plan for their capstone research
PT 613 Professional Practice III
Students will participate in a part-time clinical education experience integrating clinical skills and practice management related to individuals with neurological impairments and disorders. Students will have the opportunity to practice patient interaction and management skills, clinical skills, and increase their knowledge of this complex patient population. Students will work with patients similar in diagnosis as discussed within tutorial cases and study concepts related to case management and policies that govern the clinical setting. The clinic portion of this course is highly integrated with PT 614 Neuromuscular Physical Therapy. Prerequisites: PT537, PT604, PT608. Good standing in the graduate physical therapy professional curriculum (DPT). Corequisites: PT614, PT617A, PT618 Credits: (2), Graded, Semester Calendar Clinical, Spring Terms

PT 614 Neuromuscular Physical Therapy
Using a Problem-Based Learning (PBL) format in small tutorial groups, clinical lab, neuroanatomy lab, inquiry seminars and self-directed learning, students will develop the cognitive, psychomotor, and affective skills necessary to be physical therapists and provide services to individuals with neuromuscular disorders. Foundational sciences, behavioral sciences, and clinical science related to neuromuscular disorders are covered in the different learning environments. Students will gain an appreciation for and ability to implement physical therapy professional practice core values, in addition to skills in communication, cultural competence, clinical reasoning, evidence-based practice, and education. In the different learning environments, the skills and knowledge related to the management (screening, examination, evaluation, diagnosis and prognosis, plan of care, intervention, and outcomes assessment) of patients/clients with neuromuscular disorders are covered. Students will also gain skills in practice management for individuals with neuromuscular disorders who require physical therapy services. Prerequisite: Good standing in MPT program, PT604, PT608. Good standing in the graduate physical therapy professional curriculum (DPT). Corequisites: PT614, PT617A, PT618. Credits: (8), Graded, Semester Calendar Lecture,Discussion, Clinical, Summer Terms

PT 616 Physical Therapy for Multiple System Disorders II
Using a Problem-Based Learning (PBL) format in small tutorial groups, clinical lab, neuroanatomy lab, inquiry seminars, and self-directed learning students will develop the cognitive, psychomotor, and affective skills necessary to be physical therapists and provide services to individuals with disorders of multiple systems. Foundational sciences, behavioral sciences, and clinical science related to disorders of multiple system disorders are covered in the different learning environments. Students will gain an appreciation for and ability to implement physical therapy professional practice, and education. In the different learning environments, the skills and knowledge related to the management (screening, examination, evaluation, diagnosis, prognosis, plan of care, intervention and outcome assessment) of patients/clients with multiple system disorders are covered. Students also will gain skills in practice management for individuals with multiple systems disorders who require physical therapy services. Prerequisites: PT613, PT614, PT617, PT618. Good standing in the graduate physical therapy professional curriculum (DPT). Corequisites: PT627. Credits: (6), Graded, Semester Calendar Lecture,Discussion, Clinical, Summer Terms

PT 617A Professional Practice IV-A
Students will develop and implement a community-based health and wellness project during PT 617A, with continuation in PT 617B. Each student will participate in at least six hours of wellness/prevention activities and/or education by developing and implementing a project selected by the faculty (4-6 hours estimated per session based on preparation, performance, analysis of outcomes, and program changes for future sessions). Throughout the project, each student will need to attend to his or her established program goals in order to prepare and implement an effective wellness session. The students, working with peers, are also expected to assess outcomes on an ongoing basis in order to modify methodologies to most effectively obtain the desired behavioral response from the participants. Through this project, it is expected that students will develop independent thinking and problem solving skills by utilizing available resources to meet the needs of their assigned facility and through continuous self-reflection. The format of this course is seminar-based for learning wellness and health promotion concepts for developing a community program, develop skills for consultation practice, and successfully execute a community wellness program. Prerequisites: PT537, PT604, PT608. Good standing in the graduate physical therapy professional curriculum (DPT). Corequisites: PT614, PT617A, PT618. Credits: (1), P/NC, Semester Calendar Seminar, Spring Terms

PT 617B Professional Practice IV-B
Students will develop and implement a community-based health and wellness project during PT 617A, with continuation in PT 617B. Each student will participate in at least six hours of wellness/prevention activities and/or education by developing and implementing a project selected by the faculty (4-6 hours estimated per session based on preparation, performance, analysis of outcomes, and program changes for future sessions). Throughout the project, each student will need to attend to his or her established program goals in order to prepare and implement an effective wellness session. The students, working with peers, are also expected to assess outcomes on an ongoing basis in order to modify methodologies to most effectively obtain the desired behavioral response from the participants. Through this project, it is expected that students will develop independent thinking and problem solving skills by utilizing available resources to meet the needs of their assigned facility and through continuous self-reflection. The format of this course is seminar-based for learning wellness and health promotion concepts for developing a community program, develop skills for consultation practice, and successfully execute a community wellness program. Prerequisites: PT 537, PT 605, PT 607A, PT 613, PT 614, PT 617A and good standing in the graduate physical therapy professional curriculum. Credits: (1), P/NC, Semester Calendar Seminar, Summer Terms

PT 618 Research Practicum
Students work in small groups to implement their research plans from the previous semester. Students will either collaborate with faculty on primary research, or conduct a systematic review of literature

Graduate Level Courses
related to a clinical question. By the end of this semester, students should have completed most or all components of their projects except for writing. Prerequisites: PT537, PT604, PT608. Good standing in the graduate physical therapy professional curriculum (DPT). Corequisites: PT 613, PT614, and PT617A
Credits: (1), Graded, Semester Calendar
Independent Study, Spring Terms

PT 627A  Professional Practice V-A
PT627A is the second full-time internship course within the curriculum. Students will participate in the first 7 weeks of a total 10 weeks of full-time clinical internship (remaining 3 weeks through PT627B). This is scheduled during the summer semester of their second year at designated clinical education sites. Prior to this internship, students have completed five semesters of academic coursework covering the cardiopulmonary, musculoskeletal, neurologic, and integumentary systems throughout the lifespan, a 10-week full-time clinical internship, and multiple part-time clinical experiences. The focus of this internship will be on the examination, evaluation, diagnosis, prognosis, intervention, and outcomes for complex patients with a variety of impairments leading to activity and participation limitations. The financial aspects of patient care, supervision of support personnel, communication and education of patients, their families, peers, and interdisciplinary team members, and professional behavior development will be emphasized and progressed during this experience. Prerequisites: PT613, PT614, PT617, PT618. Good standing in the graduate physical therapy professional curriculum (DPT).
Credits: (5), P/NC, Semester Calendar
Clinical, Summer Terms

PT 627B  Professional Practice V-B
PT627B is the second full-time internship course within the curriculum. Students will participate in the final 3 weeks of a total 10 weeks of full-time clinical internship (first seven weeks in PT627A). This is scheduled during the fall semester of their second year at designated clinical education sites. Prior to this internship, students have completed five semesters of academic coursework covering the cardiopulmonary, musculoskeletal, neurologic, and integumentary systems throughout the lifespan, an eight week full-time clinical internship, and multiple part-time clinical experiences. The focus of this internship will be on the examination, evaluation, diagnosis, prognosis, intervention, and outcomes for complex patients with a variety of impairments leading to activity and participation limitations. The financial aspects of patient care, supervision of support personnel, communication and education of patients, their families, peers, and interdisciplinary team members, and professional behavior development will be emphasized and progressed during this experience. Prerequisites: PT613, PT614, PT616, PT617. Good standing in the graduate physical therapy professional curriculum (DPT).
Credits: (2), P/NC, Semester Calendar
Clinical, Fall Semesters

PT 645  Practice Management in the Autonomous Environment
Using a Problem-Based Learning (PBL) format in small tutorial groups, clinical lab, administrative workshops, inquiry seminars and self-directed learning students will develop the cognitive, psychomotor, and affective skills necessary to be physical therapists and provide services to individuals with varied complex disorders. Foundational sciences, behavioral sciences, and clinical science related to neuromuscular, musculoskeletal, cardiopulmonary, practice management, and women’s health are covered in the different learning environments. Students will gain an appreciation for and ability to implement physical therapy professional practice core values, in addition to skills in communication, cultural competence, clinical reasoning, evidence-based practice, and education. In the different learning environments screening, examination, evaluation, diagnosis, prognosis, plan of care, intervention and outcomes assessment are covered. Prerequisites: PT616, PT627. Good standing in the graduate physical therapy professional curriculum (DPT).
Corequisites: PT648 & PT657
Credits: (8), Graded, Semester Calendar
Lecture, Discussion, Clinical, Fall Semesters

PT 648  Writing and Presenting Research
Students work in small groups to write up their systematic review or primary research as an abstract and full manuscript and will give a platform presentation. During the process, students will participate in a peer review process within the class to improve their scientific writing and to become familiar with the publication process. Prerequisites: Good standing in the graduate physical therapy professional curriculum (DPT).
Corequisites: PT645, and PT657
Credits: (2), Graded, Semester Calendar
Lecture, Fall Terms

PT 657  Advanced Clinical Skills
Emphasis is placed on advanced clinical skills that progress, refine, and expand skills previously acquired. Includes topics such as: pediatrics, geriatrics, neurological treatment, exercise progression, post-surgical care, alternative modalities, manual therapy. Didactic presentations of evidence-based practice literature and clinical laboratory skills. Presentations by students who have had the opportunity to develop advanced clinical skills under mentorship during their clinical experiences. Application of principles of professional practice education through planning, supervising and assessing peers clinical skills practice. Integration of professional practice experiences with case studies used in PT 645 Practice Management in the Autonomous Environment. Prerequisites: PT616, PT627. Good standing in the graduate physical therapy professional curriculum (DPT).
Corequisites: PT645 & PT648
Credits: (2), Graded, Semester Calendar
Lecture, Fall Semesters

PT 667  Professional Practice VI
The third full-time internship course within the curriculum, students will participate in a 10-week, full-time clinical internship scheduled during the first half of the final spring semester at selected clinical education sites. The focus of this internship is on the application and refinement of the PT patient/client management process for complex patients with a variety of impairments leading to activity and participation limitations. The administrative and financial aspects of patient care; consultation; communication and education of patients, their families, peers and interdisciplinary team members; and continued professional development will be emphasized and progressed during this experience. Prerequisites: PT645, PT648, PT657. Good standing in the graduate physical therapy professional curriculum (DPT).
Credits: (8), P/NC, Semester Calendar
Clinical,
Professional Practice VII
The fourth and final full-time internship course within the curriculum, students will participate in a 10-week, clinical internship scheduled during the second half of the final spring semester at selected clinical education sites. The focus of this internship is on the application and refinement of the patient/client management process for complex patients with a variety of impairments leading to activity and participation limitations. Continued professional development, administrative and financial aspects of patient care; promotion of the profession, pro bono opportunities, and communication and education of patients, their families, peers and interdisciplinary team members will be emphasized and progressed during this experience. Corequisites: PT667. Good standing in the graduate physical therapy professional curriculum (DPT).
Credits: (8), P/NC, Semester Calendar
Clinical, Spring Semesters

Advanced Topics in Social Psychology
In this course, students will engage in an in-depth examination of several classic and cutting-edge topics in social psychology, including social motivation, self-esteem, social identity and intergroup relations, the psychology of meaning, embodied social cognition, and social neuroscience. Students will develop their understanding and communication of social psychological concepts, theories, and research by engaging in class debate and discussion, giving oral presentations, and writing scientific literature reviews. To increase the intensity of the learning experience, graduate students enrolled in this course will be required to complete 50% more in-class presentations and written assignments.
Credits: (3), Graded, Semester Calendar
Lecture, Spring Semesters

Thesis, Dissertation or Special Project in Psychology
Student performs research toward a masters degree under the guidance of a faculty thesis advisor. A graduate thesis committee monitors student progress and provides guidance toward completion of the project. Work done in satisfaction of the requirements for a degree will be assigned a grade when the thesis is submitted and approved.
Credits: (1-15), Thesis, Semester Calendar
Thesis Research, Every Semester

Graduate Student Study Abroad
Credits: (19), Graded, Semester Calendar
Independent Study

Pre-MBA Module: Information Systems
This course provides students with a broad overview of information systems and their uses in organizations. The course will examine basic components of organizational IT infrastructure, such as standard hardware and software components, network and the Internet technologies, as well as databases and business applications. In addition, students will understand the roles these components play in an organizational information system.
Prerequisite: graduate standing (admitted to the MBA program).
Credits: (0), P/NC, Semester Calendar
Lecture, Summer Terms

Pre-MBA Module: Management Communications
This course is intended to improve the student’s ability to communicate using standard English in social, academic, and professional venues. Students will learn to improve speaking skills, written expression, and listening for comprehension to prepare for the upcoming academic year. The course will consist of classroom sessions with public speaking exercises, role playing, group work etc. During this course, students will also have exposure to and interaction with the local business community. This course is designed as a prerequisite course for International students planning to attend the MBA program.
Credits: (0), P/NC, Semester Calendar
Lecture, Summer Terms

Pre-MBA Module: Macroeconomics
An introduction to macroeconomics including the analysis of national income determination, interest rate determination, and economic growth. Monetary and fiscal policy and selected issues in international macroeconomics are also covered.
Prerequisite: graduate standing (admitted to the MBA program).
Credits: (0), P/NC, Semester Calendar
Lecture, Summer Terms

Pre-MBA Module: Microeconomics
An introduction to microeconomics covering the role of the price system in, and public policies toward, the allocation of goods and resources. Topics include supply and demand, market structures, analysis of firm behavior, household behavior, and the gains from international trade.
Prerequisite: graduate standing (admitted to the MBA program).
Credits: (0), P/NC, Semester Calendar
Lecture, Summer Terms

Pre-MBA Module: Accounting
An introduction to accounting concepts necessary for an understanding of financial reporting, and managerial planning and control. Basic elements of the balance sheet, the income statement and the statement of cash flows are introduced. Cost concepts important for business decision making are also covered.
Prerequisite: graduate standing (admitted to the MBA program).
Credits: (0), P/NC, Semester Calendar
Lecture, Summer Terms

Pre-MBA Module: Law and Society
A course designed to provide a basic understanding of (1) the nature, functions and limitations of law and legal systems; (2) the basic relationship among justice, ethics, legal systems and social structure; and (3) the relationship among society, law and business activity. In addition, this course is designed to enlighten with respect to rules, principles, standards and doctrines of law fundamental to a free enterprise system. The course covers the substantive areas of constitutional law, torts and contracts.
Prerequisite: graduate standing (admitted to the MBA program).
Credits: (0), P/NC, Semester Calendar
Lecture, Summer Terms
SB 550 Pre-MBA Module: Statistics
Introduction to statistical methodology. Topics include descriptive statistics, probability distributions, point and interval estimation, hypothesis testing, two-sample tests, comparisons, measuring and testing association, correlation, regression. Emphasis on business applications, intuitive development, and problem solving technique using a statistical software.
Prerequisite: graduate standing (admitted to the MBA program).
Credits: (0), P/NC, Semester Calendar
Lecture, Summer Terms

SB 560 Pre-MBA Module: Marketing
This course provides a basic understanding of management of marketing activities in contemporary organizations. The course is based on the premise that the purpose of a firm is to satisfy the needs and desires of its customers. Topics covered include: segmentation and target market selection, buyer behavior, market research, and marketing strategy (including product planning, pricing, distribution, and promotion.) the changing nature of marketing and the trends in domestic and international marketing are also examined.
Prerequisite: graduate standing (admitted to the MBA program).
Credits: (0), P/NC, Semester Calendar
Lecture, Summer Terms

SB 570 Pre-MBA Module: Organizational Behavior
An introduction of the fundamental theories and concepts required to manage contemporary organizations. This course focuses on individual behaviors as they relate to the functions of planning, organizing, controlling, and leading. Critical concepts and theories in behavioral science related to the practice of management are presented and discussed to assist the student in developing understanding of the pervasiveness of the discipline in all types of organizations and processes. Topics include motivation, leadership, perceptions, personality theory, team processes and group behavior, and decision making. Prerequisite: graduate standing (admitted to the MBA program).
Credits: (0), P/NC, Semester Calendar
Lecture, Summer Terms

SB 580 Pre-MBA Module: Operations/Production Management
An introduction to the planning, analysis and control of production systems. Topics include, inventory management models, materials requirements planning, manufacturing process types, supply chain management, lean concepts, and quality management tools including statistical process control. Prerequisite: graduate standing (admitted to the MBA program).
Credits: (0), P/NC, Semester Calendar
Lecture, Summer Terms

SB 590 Pre-MBA Module: Finance
A study of the problems associated with the financial management of business organizations. Topics include: a review of time value of money, analysis of capital investments, valuation, capital structure, short and long term financing, and business failure.
Prerequisite: graduate standing (admitted to the MBA program).
Credits: (0), P/NC, Semester Calendar
Lecture, Summer Terms

SB 609 Corporate Ethical Decision Making
[Cross-listed with SB 610] This course provides a basis for integrating the MBA curriculum, and enable students to develop the ethical awareness and understanding needed to cope with ongoing problems and challenges in corporate and industrial contexts. Students will acquire a basic understanding of moral theories and principles, become familiar with well known case studies, understand the role of business in society (including the influences of various macro-environmental forces, such as technological, social/cultural, political, that influence corporate decision making), and become adept at applying sound ethical reasoning and decision making in their daily professional lives. Prerequisites: completion of all CUSB MBA foundation requirements and admission to the MBA program.
Credits: (2), Graded, Semester Calendar
Lecture, Fall Semesters

SB 610 Corporate Ethical and Social Responsibility
[Cross-listed with SB 609] The central goal of the course is to give students an intellectual foundation to frame a wide range of ethical/moral issues/dilemmas facing contemporary business organizations operating within a global environment. As the business environment grows increasingly complex, managers are confronted with important questions that have ethical ramifications. These questions include: Does a company have any obligation to help solve social problems such as poverty, corruption, pollution, unemployment, and income inequality? What are the ethical responsibilities of a multinational corporation operating in foreign countries, especially those characterized as corrupt? What obligation does a manufacturer have to the consumer with respect to product defects and safety? A wide selection of case studies provides students with the opportunity to hone their skills for applying ethical principles and decision making approaches to address complex, 'real-world' business problems within the context of an evolving political, economic, social, technological and global environment.
Credits: (3), Graded, Quarter Calendar
Lecture, Fall Terms

SB 611 Supply Chain Ethics
Students work as members of the Clarkson Consulting Group as actual consultants studying real and current issues for clients. Students are expected to make formal recommendations to the client at the conclusion of the course based on the semester's efforts. Issues fall into one of four distinct categories; technical or information systems based, small business based, corporate or broad based and innovative product development based. Students should have a basic understanding of project management and communication skills. Students will leave the program with a better understanding of the consulting practice, teamwork, leadership and the importance of effective communication as they apply to real world business issues.
Prerequisites: senior standing and consent of the instructor.
Credits: (1.5), Graded, Quarter Calendar
Lecture, Every Term

SB 613 Entrepreneurship and New Venture Creation
In this course, students will execute the 'entrepreneurial process,' a sequence of activities related to the creation of a new business venture. As such, this course is intended for students whose personal and near-term objectives involve entrepreneurship. The major components of the entrepreneurial process include idea creation and opportunity assessment, industry research and analysis, strategic and operational planning, and resource mobilization and implementation. These process components will be discussed and implemented throughout the semester; as such, this course is very experiential in nature. Fulfillment of these activities will include extensive out-of-class research, in-class peer reviews and brainstorming sessions, and the development of formal business plan proposals. Students are
required to sign non-disclosure agreements, and may elect to present their finished proposals to a panel of small business executives for review. Prerequisite: consent of the instructor.
Credits: (3), Graded, Semester Calendar
Lecture, Spring Semesters

**SB 620:** Business Process Analysis
This course introduces the fundamentals of business process analysis and its role in driving efficient and innovative organizations. Students examine business process mapping, workflow, change initiatives, process improvements with particular emphasis on effective change initiatives, and adoption of IT solutions that solve specific business needs. Requirement: Admission to the MGMTD-MBA program
Credits: (3), Graded, Quarter Calendar
Lecture, Winter Terms

**SB 640:** Advanced Topics in Supply Chain Management: Simulation & Analysis
[Cross-listed with SB 641] This course provides a theoretical and analytical framework for managing critical supply chain components. Topics include revenue management, dynamic pricing, supply chain risk and disruption management, supply chain agility and flexibility, supply chain network design under uncertainty, and supply chain contracts. Hands-on simulation provides an opportunity to gain experience dealing with complex strategic and tactical global supply chain issues.
Credits: (3), Graded, Quarter Calendar
Lecture, Fall Terms

**SB 641:** Advanced Topics in Supply Chain Management: Simulation & Analysis
[Cross-listed with SB 640] This course provides a theoretical and analytical framework for managing critical supply chain components. Topics include revenue management, dynamic pricing, supply chain risk and disruption management, supply chain agility and flexibility, supply chain network design under uncertainty, and supply chain contracts. Hands-on simulation provides an opportunity to gain experience dealing with complex strategic and tactical global supply chain issues. Prerequisite: OM606 or OM607.
Credits: (3), Graded, Semester Calendar
Lecture, Spring Semesters

**SB 651:** Communicating Globally
[Formerly MBA 651] An increasingly global marketplace affords organizations all over the globe the opportunity to conduct business and distribute goods and services to new customer bases with unique needs and interests. At the same time, globalization presents company leaders, corporate communicators, and organizational gatekeepers with the challenges inherent in intercultural communication. The course: "Communicating Globally" introduces a way of thinking that enables students to acquire cultural competence and function effectively in diverse cultural situations. It presents essential concepts of corporate and national cultures and examines key differences in communication, decision making styles, and pattern of interactions in multi-cultural teams and cross-cultural negotiations - laying the foundation for necessary behavioral adaptations. The course begins with a discussion of the major facets of international business with the cultural aspect presented as the most challenging dimension. Students discover the reasons that cultures form and persist, as well as the variation and interdependence of cultures across the world. In addition, students are exposed to a variety of ideas about cultural values in different nations, and how those values influence management decisions and organizational practices. The readings build upon students’ existing knowledge of the functioning of American and Western European business organizations, and help them develop an understanding of how organizations function in a wide variety of cultures. The course puts a strong emphasis on interactions and practical applications in real world business and professional situations. This practical dimension is enhanced through cases, interviews, and field studies.
Credits: (3), Graded, Quarter Calendar
Lecture,

**SB 658:** Bridging the Innovation Gap
"Bridging the Innovation Gap" is an MBA course for the Innovation and New Venture track. The "innovation gap" refers to the hard-to-navigate space between invention and innovation/commercialization. The course examines successful and unsuccessful "bridging the gap" practices across a range of industries, including communicating and translating inventions to diverse stakeholders, engaging stakeholders, gaining commitment, resourcing, and managing gaps over time and across different settings (e.g., solo startups, not-for-profits, and corporate environments). Students will become more adept at managing the various stakeholders and processes within a given invention-innovation space, and at choosing between bridging strategies for different settings. The course uses a studio-based, make-to-learn pedagogy, where learning happens through creative experimentation with live problems.
Credits: (3), Graded, Semester Calendar
Lecture, Spring Terms
SB 662  International Business

[Formerly MBA 662] This course examines international business management as influenced by the important economic, political and cultural environment within which businesses must conduct international trade and investment. The problems and issues confronting international managers are evaluated related to a firm’s strategy, organizational structure, manufacturing, material management, marketing, R&D, human resources and finance. Competitive strategies are examined that have been successful in leading international companies. Case studies are used extensively to illustrate the relevance of these topics in the practice of international business.

Credits: (3), Graded, Quarter Calendar
Lecture, Fall Terms

SB 664  Entrepreneurship

[Formerly MBA 664] The primary objective of this course is to develop an awareness of the process of new venture creation, whether it is an intrapreneurial or entrepreneurial event. The skills, knowledge and attitudes important for creating new ventures, and the complex tasks faced by individuals who start and manage new and growing businesses as well as corporate ventures and franchises will be addressed. The course is designed to provide a broad overview of management and financial issues. We will pay particular attention to: entrepreneurial decision-making, techniques entrepreneurs and investors use for evaluating and testing the feasibility of business opportunities, understanding the impact of market and industry forces on start up, performance and survival of new ventures, financing a business opportunity, etc.

Credits: (3), Graded, Quarter Calendar
Lecture, Fall Terms

SB 664  Entrepreneurship

[Formerly MBA 664] The primary objective of this course is to develop an awareness of the process of new venture creation, whether it is an intrapreneurial or entrepreneurial event. The skills, knowledge and attitudes important for creating new ventures, and the complex tasks faced by individuals who start and manage new and growing businesses as well as corporate ventures and franchises will be addressed. The course is designed to provide a broad overview of management and financial issues. We will pay particular attention to: entrepreneurial decision-making, techniques entrepreneurs and investors use for evaluating and testing the feasibility of business opportunities, understanding the impact of market and industry forces on start up, performance and survival of new ventures, financing a business opportunity, etc.

Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed

SB 668  MBA Global Study

[Formerly MBA 668] This course includes intensive study of issues in a country or region outside of the United States followed by a one-to-two-week trip abroad to that location. Each section, centered on a unifying theme and geographic location, will include these components: case studies and research work prior to and following the trip, practitioner presentations, in-country university lectures and visits to companies, governmental agencies, and important cultural sites. Students successfully completing this course will gain a better perspective on the economic, political, cultural issues as well as the business practices prevalent in another region of the world. Students should develop cultural awareness, an understanding of economic, cultural, and political differences between the US and other countries, and the role cultural, historical and political factors play in the conduct of business in a global economy.

Credits: (3), Graded, Semester Calendar
Lecture, Spring Semesters

SB 674  Growing an Entrepreneurial Business

[Formerly MBA 674] This course will focus on the challenges in growing a small to medium size business. The issues facing an entrepreneur when starting a new venture are very different than those he/she faces when growing an existing company or business. The course focuses on the unique issues an entrepreneurial leader faces as he/she looks to grow and scale their business. We will discuss and analyze the issues surrounding effectively scaling a business, and the impact that various decisions and initiatives have on the chance of success. How issues such as strategic marketing, team building and top-grading, financing, partnerships and leadership impact the growing business will be presented and discussed from the perspective of the business leader or entrepreneur. The course will include case studies, lectures, guest speakers, and discussions.

Credits: (3), Graded, Quarter Calendar
Lecture, Winter Quarters

SB 678  Inventive Practices

This interdisciplinary graduate course focuses on 1) the practices of exemplary inventors around the world, 2) students’ current invention practices, and 3) considers how student practices might be improved via applied, in-course projects and the use of exemplary inventor’s practices. Students will gain a fine-grained understanding of the strengths and weaknesses of their invention practices, acquire new invention tools, and improve their abilities to inventively tackle and reframe difficult problems across a variety of disciplines. The course is deliberately open to graduate students throughout CU, particularly Master of Science and PhD students.

Credits: (3), Graded, Semester Calendar
Lecture, Spring Terms

SB 681  Logistics Strategies

This course will examine effective strategies to manage forward and reverse flow of goods in a supply chain. Students will develop the skills to perform logistical functions within an organization, as well as assess and design the overall logistics strategy of the organization. Primary topics covered include management and design of integrated logistics networks, supply chain distribution management, coordinating strategic alliances with distributive intermediaries, warehousing, transportation, international logistics and the current trends and impact of technology on contemporary supply chain channels. Case studies, articles, numerical assignments, and simulation exercises may be utilized.

Credits: (3), Graded, Semester Calendar
Lecture, Spring Semesters

SB 682  Logistics Strategies

Never in the history of business, customers have found it easier to order and suppliers have found it more difficult to fulfill the order than it is today. Logistics management aims to address this critical challenge in supply chains. Specifically, it concerns with cost-effective storage and movement of goods and information. Although logistics is one of the oldest commercial activity, today, it faces numerous challenges due to continuous changes in the market and technology. Effective and efficient planning, organizing, and execution of logistic
activities involve appropriate material and information flows through a vast network of warehouses, transportation fleet and routes. This course covers strategic, tactical, and operational aspects of logistics planning and execution. The topics aim to impart decision-making skills with respect to multiple logistical operations that impact the corporate performance. The pedagogical approach will encourage students to develop some strong mental models relating to logistical decision-making so that they can build strong intuition regarding cost-effective logistics. Credits: (3), Graded, Quarter Calendar Lecture, Given When Needed

SB 684 Venture Capital and Private Equity
The course will focus on the venture capital and private equity industries. The course will introduce students to the concepts of private equity and its various forms with a focus on venture capital. The course will explore the impact of Venture Capital and Private Equity on the US and global economy. The course will also cover the corporate and organizational structures, decision making processes, and the transactions common in the Venture Capital and Private Equity industry. The course will have examples of investment criteria, term sheets, due diligence, and investment agreements taking into account both the investor and the entrepreneurs.
Credits: (3), Graded, Quarter Calendar Lecture, Given When Needed

SB 687 Special Graduate Topics
An investigation of a problem undertaken by the student which is acceptable to and under the guidance of the faculty member and chairperson. The course provides an opportunity for the student to investigate and analyze a problem in depth on an independent study basis.
Requirement: Instructor and Program Chair permission
Credits: (1-3), Graded, Quarter Calendar Independent Study, Given When Needed

SB 689 Business Analytics Capstone Project
This course is a capstone project for students who have completed a foundation business analytics education. The purpose of this course is to prepare students for a career in the quantitative analysis by developing their ability to solve complex analytical business problems in real-world settings. Primarily designed for the Master of Science in Business Analytics (MSBA) program, this course provides students with an experience that allows them to demonstrate the application of the business knowledge aimed at addressing a data-driven decision-making problem in students' chosen disciplines. This class requires both written reports and oral presentations. Prerequisites: AC620, FN610, MK630, and OM620
Credits: (6), Graded, Semester Calendar Independent Study, Fall and Summer Terms

SB 691 Business Analytics Thesis
This course is required for the Master of Science degree in Business Analytics (MSBA), as an alternative to the capstone project. The purpose of this course is to complete a research project in students' chosen disciplines, culminating their experiences in the MSBA Program and validating them as master practitioners. This course requires individual effort that is overseen by the course instructor, the Thesis Advisor. Weekly or bi-weekly meetings will be held to discuss progress and review submitted documents. Based upon the thesis proposal and with the approval of the Thesis Committee, students should undertake the writing of the thesis, which involves the literature review, data collection and analysis, result compilation and iterative thesis chapter revisions before the document is ready for submission to the Thesis Committee. With the approval of the Thesis Committee, a defense of the thesis will be held. Following successful completion of the Defense, the manuscript is revised a final time and once approved, can be submitted officially. Prerequisites: AC620, FN610, MK630, and OM620
Credits: (6), Thesis, Semester Calendar Thesis Research, Fall and Summer Terms

SB 693 Seminar in International Business I
This course includes intensive study of business that represents an international experience for the students followed by a two-week trip to the area of study. Each section, centered on a unifying theme and geographic location, will include three components: structured classes, practitioner presentations, and visits to companies, governmental agencies, and important cultural sites. Students successfully completing this course will gain an understanding of the economic, political, cultural issues as well as the business practices prevalent in a region of the world that is foreign to them.
Credits: (3), Graded, Semester Calendar Seminar, Given When Needed

SB 694 Seminar in International Business I
This course includes intensive study of business that represents an international experience for the students followed by a two-week trip to the area of study. Each section, centered on a unifying theme and geographic location, will include three components: structured classes, practitioner presentations, and visits to companies, governmental agencies, and important cultural sites. Students successfully completing this course will gain an understanding of the economic, political, cultural issues as well as the business practices prevalent in a region of the world that is foreign to them. Prerequisite: consent of the director of Graduate Business Programs.
Credits: (3), Graded, Quarter Calendar Seminar, Given When Needed

SB 696 Global Business Strategies
This course attempts to familiarize and sensitize students to current issues and practices relating to the globalization of markets. Topics include global manufacturing and international competitiveness, international marketing, international finance and international management strategies. The case study approach is used to introduce a diversity of perspectives into the classroom. This course is team-taught by faculty from the Production/Operations Management, Marketing, Finance and Organizational Studies areas.
Credits: (3), Graded, Semester Calendar Lecture, Given When Needed
A graduate level course for which there is no comparable Clarkson course. Used for transfer credit only.
Credits: (1-10), Graded, Semester Calendar
Lecture, Transfer Credit Only

Science Studies

SC 502 Applications in Geospatial Analytics, Science, and Engineering
[Cross-listed with CE 502, EV 502] This course will use techniques in geospatial analytics, science, and engineering to address applied challenges in various contextual situations. Geotagging, network analysis, spatial visualization, geospatial data manipulation, cartographic presentations, and other similar methods will be studied and applied to real-world or research applications. Students will develop a set of tools that enable completion of projects in the major field using geospatial capabilities.
Prerequisites: Graduate standing, CE 301, or consent of the instructor
Credits: (3), Graded, Semester Calendar
Lecture, Spring Terms

SC 575 Science Demonstrations
Science is more than just a body of knowledge, it is way of thinking and a process to be experienced. Students best learn science by engaging in its practices as they investigate observable phenomena. They must also think deeply about the concepts that cross science disciplines in order to explain those phenomena. This is the premise of the Next Generation Science Standards and the New York State Science Learning Standards modeled from them. Yet many traditional secondary science courses focus mainly on the topics or core ideas without adequately addressing the other dimensions of the course. The design of this 3-credit course is to meet the needs of students currently conducting their internship or anticipating an internship as they prepare to teach three dimensionally. Students will research publications and internet sites in order to compile a usable resource binder of activities that promote a deep understanding of science for themselves and for their adolescent students. The activities they investigate will relate to all conceptual areas of biology, chemistry, physics, and earth science. Laboratory activities necessary for students' successful completion of the New York State Regents science courses will be addressed. The activities that students develop will not only be presented to the class, but should also be used during their internships at local high schools. Students will evaluate their own and others' activities using a standard form provided by the instructor. Restriction: This course is open only to students matriculated in the Master of Arts in Teaching program (or by instructor consent) Credits: (3), Graded, Semester Calendar
Lecture, Spring Terms

Semester in Industry

SI 500 Professional Internship
Practical, hands-on experience that focuses on an area directly related to the student's field of study, the internship course is an integral part of the curriculum. The student must develop all details for the internship under the supervision of the instructor and within the established course objectives; the latter will include a project that carries the course credit and is due after completion of the internship.
Prerequisites: Permission from the course instructor/student's academic advisor, the Career Center, and the International Student Advisor (if applicable.)
Credits: (1-9), P/NC, Semester Calendar
Independent Study, Given When Needed

SI 533 Research for International Students
Practical, hands-on experience that focuses on an area directly related to the student's field of study. The student must develop all details for the research under the supervision of the instructor. Consent by the International Education Office is required.
Credits: (0), P/NC, Semester Calendar
Independent Study, Given When Needed

Sociology

SOC 530 Health, Wealth, Inequality and the Environment
[Cross-listed with SOC330/EV530] This course will examine how social inequality impacts the relationship of people to their environment and how it affects their physical well being. We will look at how social and political structures perpetuate conditions of injustice for low-income communities and communities of color. One emphasis of this course will be on how social inequality impacts environmental factors involved in transmission of communicable diseases and hazards due to exposure to chemical and physical materials in our environment. We will examine sociological and public health literature pertaining to environmental health on a global level and also address public policies that may affect health and environmental justice. Graduate students will have additional work as stated on syllabus.
Credits: (3), Graded, Semester Calendar, Lecture, Spring Terms

Spanish Language

SPN 545 Building Cultural Competency
The course centers on the role, selection, and assessment of authentic cultural materials in the Spanish classroom at the 9-12 level. Students will learn, read, and discuss about the viability of employing cultural artifacts - literature and media, digital art, advertisements, music, etc. - to complement or supplement classroom lessons. As part of the course, students will create a portfolio of culture modules that can be adapted for various classroom contexts and needs, including the possibility of connecting these short lessons with grammar-based content. Restriction: This course is open only to students matriculated in the Master of Arts in Teaching program (or by instructor consent)
Credits: (3), Graded, Semester Calendar, Lecture, Fall Terms

SPN 580 MAT Project in Spanish (Content Area)
The MAT Project is a one-term research project whose purpose is to allow students time and supervision to develop breadth and/or depth of knowledge to become a better teacher in their certification field. What the project will entail varies greatly from student to student. The course is intended to be custom-tailored to meet the specific needs of an individual intern. MAT projects are well-grounded in research and theory, but also include a strong and extensive applied aspect, directly addressing the question: What would this look like in the classroom? Restriction: This course is open only to students matriculated in the Master of Arts in Teaching program (or by instructor consent)
Credits: (3), Graded, Semester Calendar
Lecture,
SPN 988  Independent Study in Spanish
A graduate level course for which there is no comparable Clarkson course. This course may be used to satisfy course requirements for a graduate degree. Restriction: This course is open only to students matriculated in the Master of Arts in Teaching program (or by instructor consent)
Credits: (3), Graded, Semester Calendar
Independent Study, Given When Needed

SPN 989  Independent Study in Spanish
A graduate level course for which there is no comparable Clarkson course. This course may be used to satisfy course requirements for a graduate degree. Restriction: This course is open only to students matriculated in the Master of Arts in Teaching program (or by instructor consent)
Credits: (3), Graded, Semester Calendar
Independent Study, Given When Needed

Social Sciences

SS 580  Graduate Research Methods in the Social Sciences
In addition to all of the requirements of SS 380, graduate students will engage in additional readings and techniques determined by the instructor to enrich the specific research agenda and/or project of those students. These materials may include survey design, additional statistical training for Stata or other software packages, embedded approaches for mixed method design, implementation of semi-structured interviews, etc.
Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed

Statistics and Probability

STAT 581  Probability
[Cross-listed with MA 581] Sample spaces; axioms of probability; basic theorems; random variables (discrete and continuous); combinatorial methods; Bayes' Theorem and conditional probability; expected values and variances; distribution functions, including: binomial and multinomial, Poisson, normal and bivariate normal distributions, and others such as geometric, hypergeometric, negative binomial, exponential, gamma and beta; joint distributions; covariance and correlation; central limit theorem; geometric probability; method of transformations; introduction to stochastic processes.
Credits: (3), Graded, Semester Calendar
Lecture, Fall Terms

STAT 582  Mathematical Statistics I
[Cross-listed with MA 582] A rigorous course in statistics. Topics include random variables and their distributions, data reduction, estimation, sampling distributions, testing, optimal tests, analysis of variance and nonparametric statistics. A large project is required.
Prerequisites: STAT381.
Credits: (3), Graded, Semester Calendar
Lecture, Odd Spring Semesters

STAT 584  Advanced Applied Statistics
Review of basic concepts (estimation, testing and simple linear regression). Multiple regression, analysis of variance and experimental design. Additional topics may include nonparametric statistics, goodness of fit tests, analysis of covariance and quality control. This course will require use of statistical software. Interpretation of computer output and applications will be emphasized throughout.
Prerequisites: STAT383 or equivalent.
Credits: (3), Graded, Semester Calendar
Lecture, Even Spring Semesters

STAT 585  Bayesian Data Analysis
This course will introduce both the principles and practice of Bayesian methods for data analysis. This is a hands-on course that will use MATLAB software. Students will learn to write their own Bayesian computer programs to solve problems relevant to engineering, biology, chemistry, physics, earth science, ecology, economics, signal processing and machine learning. Topics that will be included are parameter estimation, model selection, time series and error analysis.
Credits: (3), Graded, Semester Calendar
Lecture,

STAT 709  Directed Study in Probability and Statistics
A directed study in Probability and Statistics, intended to give a student the opportunity to further explore an area of interest to them under the supervision of a faculty member.
Credits: (1-10), Graded, Semester Calendar
Independent Study, Given When Needed

Science, Technology, Engineering & Math

STEM 501  STEM Pedagogy and Professionalism
STEM Pedagogy and Professionalism is designed to help graduate students, particularly graduate TAs, develop the skills necessary to be successful in their graduate programs as instructors and in their future roles as academics. The course will highlight methods for developing and enhancing the pedagogical content knowledge and instructional skill set of graduate STEM teaching assistants. Within the context of STEM learning; audience, environment, nature of science, formative assessment, models of instruction, learning theory, and reflective practice will be studied. A focus on STEM literacy, will help TAs think critically about multiple data sources in order to promote higher-order thinking skills among their students. The course also addresses intercultural communication in the classroom; providing an opportunity for students to improve their cultural and sociolinguistic competence. In particular, students will work on developing their professional communication skill set including oral comprehensibility, impromptu speaking skills and interactions with undergraduates. Daily lessons will model instructional strategies and habits of mind that students will evaluate with their own students’ needs in mind.
Credits: (4), Graded, Semester Calendar
Lecture, Summer Terms
### STEM 530 Analyzing Scientific and Math Theories from Philosophical & Historical Perspectives

This 3-credit course is neither a history of STEM disciplines course nor a philosophy of STEM disciplines course. Rather, it is a course that looks at teaching STEM-related content from historical and philosophical perspectives, as its title suggests. This is an important distinction for several reasons. First, we believe that you will be best served by an introduction to history and philosophy of STEM disciplines and nature of STEM core concepts which are taught in a manner and at a level that models effective teaching. Modeling the teaching of these concepts in the course will provide you with strategies you might use with your own middle and high school students. Second, we are hoping that you will not only assimilate the concepts presented but will also evaluate and create instructional strategies and materials that can infuse these concepts into your own secondary courses. This expectation is in many respects more demanding and time-consuming than expecting you to learn an abundance of historical detail and philosophical argument and regurgitate it back on an examination. Third, the research has revealed that teachers who complete traditional courses in the history or philosophy of STEM disciplines typically do not use this content in their own secondary school teaching. That is, understanding concepts and methods does not ensure that they are applied to classroom practice. This course will argue that historical and philosophical content can be used to enhance secondary students’ understanding of the STEM concepts and methods they are expected to attain and ask you to develop or restructure lessons and materials to illustrate that enhancement. The course developers and instructors should also be forthright in saying that the course was originally planned and executed to focus on the history and philosophy of science and science education is the primary expertise of the instructors. However, we tried to create an approach and assignments that could also incorporate the history and philosophy of mathematics and technology and show the interactions existing among science, mathematics, and technology. Ideally, having science, mathematics, and technology students in the course this year will enhance the general knowledge of all participants and help them distinguish between the unique elements of each enterprise.

Restriction: This course is open only to students matriculated in the Master of Arts in Teaching program (or by instructor consent)

Credits: (3), Graded, Semester Calendar

### TE 502 MAT ESOL Practicum

The TESOL Teaching Practicum course (1 credit) provides an opportunity for students to apply the skills learned concurrently in Foundations of Teaching TESOL (TES540), and Curriculum and Methods of Teaching ESOL (TES513) in a classroom setting. The practicum provides TESOL students with an opportunity to observe ESOL instruction and practice instructional techniques in preparation for the first ENL Residency. TESOL students will be placed in local settings for at least 6 hours a week and will participate in this online course to share and reflect upon classroom experiences. Students will be placed in summer school ENL classes, community-based English language classes, or local community college/university English language classes as a volunteer, first observing and then assisting in instruction. The goal of the practicum is to give the TESOL student practical experience in all areas of teaching ELLS through observation and participation. 35 hours of filed experience in K-12 ENL are required in this 6 week course (6 hours per week).

Credits: (2), Graded, Semester Calendar Practicum, Every Term

### TE 513 Curriculum and Methods of Teaching ESOL

This course serves as an introduction to the theory and practice of ESOL teaching. We will examine key aspects of current theories, methods of instruction, and assessment in TESOL education. This course is based on a view of teaching and learning as facilitated by social interaction and that each individual brings unique background knowledge and beliefs to their learning.

Credits: (3), Graded, Semester Calendar

Lecture, Given When Needed

### TE 517 Teaching & Assessment Methods for TESOL

TESOL Teaching Methods will introduce students to the NYS New Language Arts Progressions (part of the Bilingual Common Core Initiative), TESOL and WIDA National Standards, formative and summative assessments (including NYSITELL and NYSESLAT), and methodology for integrated, stand-alone, and content-based instruction for ELLs. Students will gain expertise in lesson planning, delivery and assessment; collaboration and co-teaching; state regulations; culturally relevant instruction; advocating for ELLs; and practical pedagogy for English Language Learners, pre k-12.

Credits: (3), Graded, Semester Calendar Lecture, Given When Needed

### TE 530 English Grammar for the ENL Teacher

English Grammar is a course on the structure, analysis, and methods of teaching American English grammar to English language learners. The dual purpose of this course is to develop a thorough understanding of the forms and use of English grammar systems as well as develop instructional strategies for teaching English grammar to speakers of other languages in a communicative and meaningful way.

Credits: (3), Graded, Semester Calendar Lecture, Summer Terms

### TE 531 TESOL English Linguistics

English Linguistics is an introduction to linguistics for Teachers of English to Speakers of Other Languages. It presupposes little or no formal linguistic knowledge. We will study the rudiments of phonetics, phonology, syntax, morphology, semantics, sociolinguistics and language acquisition. We will study linguistics both as an end in itself and as it informs classroom teaching. This
course will prepare students to teach English as a New/Second Language, with a firm knowledge of the linguistic challenges English presents to language learners. Discussions and connections between theory and practice are a significant component of this course.
Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed

TE 540  Foundations of Teaching TESOL
Foundation of Teaching TESOL serves as an introduction to the theory and practice of second language (SL) teaching. In an intensive 6 week online format, students will be immersed in activities to create a strong foundation of knowledge on language development, standards and policy, and pedagogy. We will examine key aspects of historical and current theories of second language acquisition, as well as methods of instruction and assessment in SL education. Language modalities, language functions, content and context-based instruction will be introduced. This course is based on a view of teaching and learning as facilitated by social interaction in which each individual brings unique background knowledge and beliefs to their learning. It is expected that students will make connections between the readings and learning activities of the Foundations course to their experiences in the Teaching Practicum (TESOL501).
Credits: (3), Graded, Semester Calendar
Lecture, Summer Terms

TE 542  TESOL Literacy (Online and In School Settings)
TESOL Literacy introduces students to issues in reading, writing and new literacies for students who are learning a new or second language. We will review current instructional practices in light of theoretical foundations, educational policy, and culture forces that shape acquisition and development of a new/second language. In addition, we will dissect practical strategies for teaching English language learners. Your understanding of course ideas and issues will be assessed frequently through a variety of on-line discussions, assignments, activities, and a final project. This course includes 20 hours of required field experience.
Credits: (3), Graded, Semester Calendar
Lecture, Given When Needed

TE 551  TESOL Teaching Residency I
The 5-credit Residency I begins after the resident completes the New York State required Field Practicum, TE 501, during the summer semester. The Resident will first observe and co-teach with his/her Mentor at the beginning of the school year. The Resident is expected to gradually assume responsibility for two of the mentor’s classes, at first co-teaching with the Mentor, but independently teaching within 5 weeks, if prepared to do so. After successful completion of the first teaching residency in the fall (either K-6 or 7-12), the Resident will complete a second residency in the spring semester to fulfill the K-12 residency requirement. A full-year internship is in school for a minimum of half of the school day. Which half of the day depends on the schedule assigned to the Mentor by the school district. During the spring semester, the resident will complete the requirements of edTPA. Restriction: This course is open only to students matriculated in the Master of Arts in Teaching program (or by instructor consent)
Credits: (5), P/NC, Semester Calendar
Field Studies, Every Term

TE 552  TESOL Teaching Residency II
The 5-credit residency (either grade K-6 or 7-12) begins in the second semester. The Resident is expected to gradually assume responsibility for two of the mentor’s classes, at first co-teaching with the Mentor, but independently within 6 weeks, if prepared to do so. Teaching Residency II fulfills the second half of a full year K-12 experience and follows the successful completion of a fall semester residency. A full-year resident is in school for a minimum of half of the school day. Which half of the day depends on the schedule assigned to the Mentor by the school district. During the spring semester the Resident will complete the requirements of edTPA. Restriction: This course is open only to students matriculated in the Master of Arts in Teaching program (or by instructor consent)
Credits: (5), Graded, Semester Calendar
Field Studies, Every Term

TE 553  TESOL: Teaching Residency for Initially Certified Teachers I
This course is open only to students matriculated in the Master of Arts in Teaching ESOL program who have been initially certified as teachers in NYS. The 5-credit residency begins after the resident student completes the New York State required Field Practicum, TE 501. The resident will first observe and co-teach with his/her mentor teacher. The resident is expected to gradually assume responsibility for some of the mentor’s classes, at first co-teaching with the mentor, and then independently teaching when prepared to do so. After successful completion of the first teaching residency (TE 553), the resident will complete a second residency (TE 554). Students will complete a minimum of 20 full days at the secondary level to reflect the NYS requirement. Restriction: This course is open only to students matriculated in the Master of Arts in Teaching program (or by instructor consent)
Credits: (5), P/NC, Semester Calendar
Field Studies, Given When Needed

TE 554  TESOL: Teaching Residency for Initially Certified Teachers II
This course is open only to students matriculated in the Master of Arts in Teaching ESOL program who have been initially certified as teachers in NYS. The 5-credit residency begins after the resident student completes TE 553 - TESOL Teaching Residency for Initially Certified Teachers I. The resident is expected to gradually assume responsibility for two of the mentor teacher’s classes, at first co-teaching with the mentor, and then independently teaching when prepared to do so. This ENL residency fulfills the second half of the residency experience. Students will complete a minimum of 20 full days at the secondary level to reflect the NYS requirement. Restriction: This course is open only to students matriculated in the Master of Arts in Teaching program (or by instructor consent)
Credits: (5), P/NC, Semester Calendar
Field Studies, Every Term

TE 580  TESOL Project
The TESOL Project is a one semester, online research project class whose purpose is to allow students time and supervision to develop breadth and/or depth of knowledge to become a better teacher in the field of TESOL. What the project will entail varies greatly from student to student. The course is intended to be custom-tailored to meet the specific needs of an individual intern and their teaching setting. TESOL projects are well-grounded in research and theory, but also include a strong and extensive applied aspect, directly addressing the question: What would this look like in the classroom? Corequisites: ED550, TE517, TE531, TE551, ED502
Credits: (3), Graded, Quarter Calendar
Research,
Technology

**TECH 580 MAT Project in Technology (Content Area)**

[Formerly TEC 580] The MAT Project is a one-term research project whose purpose is to allow students time and supervision to develop breadth and/or depth of knowledge to become a better teacher in their certification field. What the project will entail varies greatly from student to student. The course is intended to be custom-tailored to meet the specific needs of an individual intern. MAT projects are well-grounded in research and theory, but also include a strong and extensive applied aspect, directly addressing the question: What would this look like in the classroom? Restriction: This course is open only to students matriculated in the Master of Arts in Teaching program (or by instructor consent)

Credits: (3), Graded, Semester Calendar

Lecture,

**TECH 988 Independent Study in Technology**

[Formerly TEC 988] A graduate level course for which there is no comparable Clarkson course. This course may be used to satisfy course requirements for a graduate degree. Restriction: This course is open only to students matriculated in the Master of Arts in Teaching program (or by instructor consent)

Credits: (3), Graded, Semester Calendar

Independent Study, Given When Needed

**TECH 989 Independent Study in Technology**

[Formerly TEC 989] A graduate level course for which there is no comparable Clarkson course. This course may be used to satisfy course requirements for a graduate degree. Restriction: This course is open only to students matriculated in the Master of Arts in Teaching program (or by instructor consent)

Credits: (3), Graded, Semester Calendar

Independent Study, Given When Needed
Clarkson University Non-Discrimination Policy

Clarkson University does not discriminate on the basis of race, color, creed, religion, sex, sexual orientation, gender identity, gender expression, national or ethnic origin, age, disability, military or veteran status, predisposing genetic characteristics, domestic violence victim status, familial status, marital status, parental status, ancestry, source of income, or other classes protected by law in provision of educational opportunity or employment opportunities.

Clarkson University does not discriminate on the basis of sex or disability in its educational programs and activities, pursuant to the requirements of Title IX of the Educational Amendments of 1972, and Section 504 of the Rehabilitation Act of 1973, and the American Disabilities Act of 1990 respectively. This policy extends to both employment by and admission to the University.

Inquiries concerning Section 504, and the Americans with Disabilities Act of 1990 should be directed to ADA504@clarkson.edu.

Inquiries concerning the Age Discrimination Act, or other discrimination concerns should be directed to the Chief Human Resources Officer/Affirmative Action Officer at (315) 268-3788, Room 102 Graham Hall, Clarkson University, Box 5542, Potsdam NY 13699-5542 and/or Title IX to the Title IX Coordinator, Room 1003a ERC, Clarkson University, Box 5750, Potsdam, NY 13699-5750; or telephone (315) 268-4208, titleix@clarkson.edu.

Information on the processing of grievances and charges relating to the above policies can be obtained from the Human Resources/ Affirmative Action Office

Clarkson University is making a special effort to identify for employment opportunities and participation in its educational programs a broad spectrum of candidates including women, minorities, and people with disabilities.

This document was prepared by: Krista Larock Wells, Associate Registrar
Student Administrative Services (SAS)
Clarkson University
Box 5575
Potsdam, NY 13699-5575

If you have any comments or questions, please direct them to the above office.

Clarkson University reserves the right to amend this entire document from time to time as deemed necessary.