



2022-  
2023

# Clarkson University

Graduate Catalog





# CLARKSON UNIVERSITY GRADUATE CATALOG

## 2022-2023

Clarkson University is a nationally ranked research university and the institution of choice for more than 4,000 enterprising, high-ability scholars from diverse backgrounds who embrace challenge and thrive in a rigorous, highly collaborative learning environment. We add value to our students' education by partnering with leading businesses, industries, and thought leaders to bring relevance to the challenges and needs of a modern world in which the boundaries of knowledge, discipline, nations, and cultures blur. We encourage students to question the status quo, push the limits of what is known, and to apply their ingenuity to develop fresh solutions to real-world challenges. For more than 100 years, our graduates have achieved extraordinary professional success, risen to societal challenges, and advanced the global economy ethically and responsibly. Among our 38,000 alumni, one in five is a CEO, senior executive or owner of a company.

Founded in 1896 to honor Thomas S. Clarkson, the University's main campus is located in the "college town" of Potsdam, NY on a historic 640-acre wooded homestead in the foothills of the Adirondack Park. With three other universities nearby, Clarkson community members enjoy a constantly changing social and intellectual quality of life largely influenced by our proximity to the north slope of the Adirondacks; easy drives to Lake Placid as well as Ottawa and Montreal, Canada; and a high level of regional camaraderie to encourage innovative partnerships in small business development, arts, tourism, recreation, agriculture and green energy.

The University also includes The Capital Region Campus for graduate education in Schenectady, New York, and The Beacon Institute for Rivers and Estuaries for environmental research and education in Beacon, New York.

Clarkson's educational strengths include:

- rigorous professional preparation
- dynamic, real-world learning
- highly collaborative community
- teamwork that spans disciplines

### **Changes in Curricula**

Information contained in this catalog is current at the time the catalog is posted on our Web site, but as courses and curricula undergo changes by official action of the University, occasionally such changes may supersede information found herein. The accuracy of any particular information can be checked through The Graduate School, Student Administrative Services, the Dean of the appropriate School, or academic departments.

Please be aware that the information concerning academic requirements, courses, and programs of study in the catalog does not establish an irrevocable contract between the student and the University. The University can change, discontinue, or add academic requirements, courses, and programs of study at any time, without notice. Although every effort is made to provide timely notice to students in order to help in the planning process, it is the responsibility of the student to confirm that all appropriate degree requirements are met.

All students are encouraged to read the catalog thoroughly. Failure to be familiar with the contents does not excuse a student from the requirements and regulations described herein.

## **Courses**

Typical courses for each department are listed in this catalog, but not all courses are offered each year. Descriptions of courses and terms in which specific course are offered are accessible in PeopleSoft. Viewing Clarkson's searchable course catalog will give up-to-date course descriptions, pre- or co-requisites, course attributes, and other information pertaining to all courses offered. Clarkson's browse course catalog can be viewed through Clarkson's website. There is no login required - just select the term and year that you are interested in viewing. Course credit is also available for Independent Study and Special Projects.

## **Accreditation**

Clarkson is accredited by the Middle States Commission on Higher Education, 3624 Market Street, Philadelphia, PA 19104-2680, 215-662-5606. The David D. Reh School of Business is accredited by the Association to Advance Collegiate Schools of Business (AACSB), and internationally recognized accrediting agency for graduate and undergraduate programs in business administration. The Healthcare Management MBA is accredited by the Commission on the Accreditation of Healthcare Management Education (CAHME). The entry level doctor of physical therapy program is accredited by the Commission on Accreditation in Physical Therapy Education (CAPTE) of the American Physical Therapy Association (APTA). The Accreditation Review Committee (ARC-PA) on Education for the Physician Assistant has granted continuing Accreditation to the Physician Assistant Studies Program. The Occupational Therapy Program is fully accredited by the Accreditation Council for Occupational Therapy Education (ACOTE) of the American Occupational Therapy Association (AOTA). The educator preparation programs are accredited by the Association for Advancing the Quality in Educator Preparation (AAQEP). Pursuant to §52.21 of the Regulations of the Commissioner of Education, the educator preparation programs offered by Clarkson University are considered to be continuously accredited for purposes of meeting the New York State requirement that all such programs maintain continuous accreditation. Additionally, the University's curricula are approved by the New York State Board of Regents. All Clarkson degree programs are approved by the New York State Division of Veterans Affairs for the training of veterans and other eligible persons.

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## **GRADUATE ADMISSIONS**

Clarkson University Graduate School Admissions

518-631-9831

[graduate@clarkson.edu](mailto:graduate@clarkson.edu)

School of Arts & Sciences Programs

315-268-3802

[sciencegrad@clarkson.edu](mailto:sciencegrad@clarkson.edu)

David D. Reh School of Business Programs

315-268-6613

[busgrad@clarkson.edu](mailto:busgrad@clarkson.edu)

Wallace H. Coulter School of Engineering Programs

315-268-7929

[enggrad@clarkson.edu](mailto:enggrad@clarkson.edu)

Institute for a Sustainable Environment (ISE) Programs

315-268-3856

[ise@clarkson.edu](mailto:ise@clarkson.edu)

Institute for STEM Education

315-268-2376

[kkavanag@clarkson.edu](mailto:kkavanag@clarkson.edu)

Physician Assistant Studies Program

315-268-2161

[athomps@clarkson.edu](mailto:athomps@clarkson.edu)

Physical Therapy Program

315-268-2161

[athomps@clarkson.edu](mailto:athomps@clarkson.edu)

Occupational Therapy Program

315-268-2161

[athomps@clarkson.edu](mailto:athomps@clarkson.edu)

## A BRIEF HISTORY OF CLARKSON

(The following summary has been excerpted largely from *A Clarkson Mosaic*, a history written by Professor Emeritus Bradford B. Broughton in conjunction with the institution's 1996 Centennial.) Two months after a highly successful Potsdam businessman, Thomas Streatfeild Clarkson, was crushed to death while trying to save one of his workers in his sandstone quarry on August 17, 1894, his family began planning a memorial to him: a school.

Choosing as their rationale a phrase which his sisters and nieces felt aptly described their brother- Thomas' favorite Biblical quotation, A workman that needeth not to be ashamed- the family opened the Thomas S. Clarkson Memorial School of Technology in September 1896, in the Main Building ("Old Main") which they commissioned to be built on Main Street. To the five young men in the preparatory class, eight men and four women in the freshman class, six courses of instruction were offered: electrical engineering, domestic science, art, machine work and smiting, woodwork and pattern making, and normal manual training. By 1907 the school was offering additional bachelor's degrees in mechanical, civil, and chemical engineering.

Recognizing the need for a gymnasium, the students began a fund-raising campaign for the \$11,000 needed to build one in town, spurred on by a \$5,000 gift from the Clarkson family. By 1912, this second school building had been erected. That building became the library in 1956 after the new Alumni Gymnasium opened. When the library moved to the Educational Resources Center in 1978, the original building became the Liberal Studies Center.

When the New York State Board of Regents offered scholarships to qualified students attending college within the state in 1913, Clarkson's Board of Trustees voted to change the school's name to the Thomas S. Clarkson Memorial College of Technology; the head of the college became president instead of director; and John Pascal Brooks, a Dartmouth graduate, and one of the men on Walter Camp's first All-American football team, became the first Clarkson director to bear the title of President.

Hockey began in 1919 on a rink behind Old Main, and soon moved to a bigger rink built by the students in Ives Park. Not until the hockey arena was completed on land across the river in 1938 did the team have a building in which to play. That facility was later named for the founding force behind Clarkson hockey, Murray Walker, owner of Weston's Bookstore. Walker Arena provided home ice for Clarkson teams, which have frequently achieved national ranking, until Cheel Arena was completed in 1991. The Women's Hockey Team is 3 time NCAA national champions in 2014, 2017, and 2018.

Thomas Clarkson's nieces, Miss Annie Clarkson and Miss Emily Moore, tried to have the entire school moved to a new campus on a hill outside of Potsdam (hence the nickname, the "hill campus"), with a gift of \$1.5 million in 1929. However, because that



money shrank to half a million within a year due to the stock market crash, the plans for the move had to be shelved for over 30 years. Since then, the campus has moved almost entirely to the hill, although some administrative offices and the programs in health sciences remain on the original downtown Potsdam campus.

Responding to a plea from New York Governor Thomas Dewey after World War II, Clarkson admitted hundreds of returning veterans. Having no space to house or teach them by 1946, Clarkson rented the New York State School for the Deaf in Malone, N.Y., 40 miles east of Potsdam. For the next five years, freshmen and many sophomores spent their first two years in Malone before moving to the Potsdam campus for the remainder of their Clarkson education. That branch closed in 1951.

With that flood of veterans came the Trustees' realization that the College would have to expand its facilities, and expand them it did over the next 20 years, adding not only facilities but graduate programs in engineering, science, and management, including PhD programs in most.

During that post-war period, and through the mid-1980s, Clarkson expanded both of its campuses, with many new residence halls on the hill campus, including Hamlin-Powers, the Quad, Moore House, Price and Graham Halls, Woodstock (originally planned for married student housing only), and the Townhouses. Beside them, it built the Educational Resources Center in 1978 and then added recreational facilities of the Indoor Recreation Center in 1980. The downtown campus also witnessed expansion during those years; Peyton Hall for chemical engineering, Damon Hall for civil engineering, Clarkson Hall for electrical engineering, and Lewis House for a student union. Clarkson also gradually took over Snell Hall from SUNY Potsdam for classrooms and office space.

In the fall of 1991, two significant developments occurred on the hill campus. Clarkson opened the CAMP (Center for Advanced Materials Processing) building, a research and teaching complex with state-of-the-art laboratories, designated a New York State Center of Advanced Technology. The building was connected to the existing Rowley Laboratories and, in the fall of 1996, all engineering departments were consolidated in the CAMP-Rowley complex.

Also in 1991, the University opened the Cheel Campus Center, a combination student union and hockey arena that includes dining areas, student government and activities rooms and offices, and a post office. In the fall of 1998, the University also completed a new Fitness Center, which connects the Indoor Recreation Center and Alumni Gymnasium.

In the spring of 1999, Clarkson Hall was renovated and rededicated as the Center for Health Sciences, now known as The Earl R. and Barbara D. Lewis School of Health Sciences. This downtown facility now houses the University's programs in Occupational Therapy, Physical Therapy, and Physician Assistant Studies. The newest academic

building, Bertrand H. Snell Hall, opened on the hill campus for the fall 2000 semester. A wing of biochemistry laboratories was added to the Cora and Bayard Clarkson Science Center and opened in fall 2005. The Technology Advancement Center (TAC), an 18,000-square-foot addition connecting the Schuler Educational Resources Center and the Cora and Bayard Clarkson Science Center, was completed in fall 2008. A new Student Center was completed in August 2010 and connects all academic buildings. In 2017, #ClarksonIgnite was introduced as a new approach and catalyst for exploring, creating and achieving what's next. Through a renovation to the Schuler Educational Resource Center, an Innovation Hub was created to ignite connections across academic disciplines, cultures and industries to create the entrepreneurial mindset, knowledge and intellectual curiosity needed to innovate world relevant solutions.

In 2016 The University welcomed a Graduate School campus in Schenectady, New York that takes advantage of all that New York's Capital Region has to offer. Like Potsdam, Schenectady has a large collegiate presence (Union College and Schenectady Community College in the same city) as well as many other educational institutions, research institutes and government think tanks.

## **GRADUATE DEGREE AND ADVANCED CERTIFICATE PROGRAMS**

The Higher Education General Information Survey (HEGIS) code designated by the New York State Education Department for classifying these academic programs may be found in the list of degree programs and HEGIS Codes near the end of the catalog.

Clarkson University offers the following:

Adolescence Education 7-12 MAT  
Applied Data Science MS  
Basic Science MS  
Bioethics MS  
Biomedical Engineering MS  
Business Administration MBA  
Business and Marketing Education MAT  
Business of Energy MS  
Chemical Engineering MS, PhD  
Chemistry MS, PhD  
Civil & Environmental Engineering MS, PhD  
Clinical Leadership in Healthcare Management MS  
Computer Science MS, PhD  
Curriculum and Instruction MA  
Cybersecurity MS  
Electrical and Computer Engineering PhD  
Electrical Engineering MS  
Energy Systems MS  
Engineering and Management Systems MS  
Engineering Management MS  
Engineering Science MS, PhD  
Environmental Policy MS  
Environmental Science & Engineering MS, PhD  
Healthcare Data Analytics MS  
Healthcare Management MBA  
Interdisciplinary Bioscience & Biotechnology MS, PhD  
Leadership in Medicine- Clinical Leadership in Healthcare Management MS  
Leadership in Medicine-Healthcare Management MBA  
Materials Science & Engineering PhD  
Mathematics MS, PhD  
Mechanical Engineering MS, PhD  
Occupational Therapy MS  
Physical Therapy DPT  
Physician Assistant Studies MS  
Physics MS, PhD  
Supply Chain Management MS

Systems Engineering MS  
Teaching of English to Speakers of Other Languages MAT  
Technology Education K-12 MAT  
World Language and ESOL MAT

**Certificates**

Bioethics Certificate  
Business Fundamentals Certificate  
Business of Energy Certificate  
Construction Engineering Management Certificate  
Curriculum and Instruction, CAS  
Environmental Management Certificate  
Global Supply Chain Management Certificate  
Healthcare Management Certificate  
Human Resource Management Certificate  
Innovation and New Venture Management Certificate  
Management and Leadership Certificate  
Middle Childhood Extension  
Power Systems Engineering Certificate  
Six Sigma Certificate  
Supply Chain Management  
Teaching English to Speakers of Other Languages Certificate  
Teacher Leadership and Service Learning  
Teacher Leadership and Mentoring

**Extension Certificates**

Middle Childhood  
Coordinator for Work Based Learning Program

## **THE GRADUATE SCHOOL**

*Michelle Crimi, Interim Dean of the Graduate School*

[mcrimi@clarkson.edu](mailto:mcrimi@clarkson.edu)

Clarkson offers programs of study during the regular academic year leading to the Master of Business Administration, Master of Arts, Master of Science, Master of Arts in Teaching, Doctor of Philosophy, and Doctor of Physical Therapy degrees. Interdisciplinary programs leading to Master of Science and Doctoral degrees offer a unique perspective on graduate study and are a key element in many of our programs.

### **Graduate School Admissions**

Admissions to graduate study is on a merit basis. Evidence of intellectual achievement, motivation, and aptitude are required for admission to graduate programs. Prospective Clarkson graduate students must have or be a candidate for an undergraduate degree from an accredited college before applying for graduate admission, excluding students applying through specific, official, joint program agreements. Candidates for joint programs should contact a member of the Graduate Admissions Team regarding requirements for admissions. Application materials may include: resume, personal statement, transcripts, test scores, and letters of recommendation. Please contact the Graduate Admissions at [graduate@clarkson.edu](mailto:graduate@clarkson.edu) or (518) 631-9831 for details on the program's specific set of requirements.

A Masters in an accredited engineering program can count as one year towards NYS professional engineering licensing requirements. Please refer to the NYS Office of Professions (<http://www.op.nysed.gov/prof/pels/>) for more information.

Applicants for many graduate programs in science, engineering and interdisciplinary programs are required to take the Graduate Record Examinations (GRE); some programs including those in the David D. Reh School of Business may require a Graduate Management Admission Test (GMAT) score. Please see program-specific requirements at [www.clarkson.edu/academics](http://www.clarkson.edu/academics).

All admission decisions must be approved by the applicant's departmental graduate representative, by the director of the program and/or the dean of the appropriate school. While there is a rolling admission policy, and all applications will be reviewed up to a reasonable time prior to the beginning of classes, it is recommended that students requesting financial aid apply by January 30 for the fall term and September 1 for the spring term. Students are encouraged to apply no later than five (5) months prior to the preferred term of entry to allow time for admissions processes. For students applying to the one-year MAT program, which begins in the summer, complete applications must be received no later than April 1<sup>st</sup>. For students applying for the two-year MAT program that begins in the Fall term, applications are due by June 1<sup>st</sup>. For applications and other inquiries about the status of an application, contact the specific department of interest or see Clarkson's Web site at <http://clarkson.edu/graduate>



## **Admission Graduate School Policy for Current Undergraduate Clarkson Students**

This policy is intended to encourage early consideration and preparation for graduate work at Clarkson by highly qualified students. Such students would likely participate in undergraduate research experiences and would have identified a graduate advisor prior to baccalaureate graduation. These students may accelerate their undergraduate course of study to graduate early and begin their graduate work as soon as possible. Please contact Graduate Admissions at [graduate@clarkson.edu](mailto:graduate@clarkson.edu) or (518) 631-9831 for further instructions. Superior Clarkson undergraduate students, with the permission of their department chair and the dean of the appropriate School, may enroll in graduate courses. Such courses may be allowed to count towards the graduate degree as specified in the Degree Requirements below.

## **International Applicant Language Verification Requirements**

Clarkson University must verify all international students' English language proficiency when English is not a first language. This requirement, as part of the application process, must be completed prior to the issuance of a 'Certificate of Eligibility' for student status. Once the university has verified this requirement, and the applicant is accepted, the 'Certificate of Eligibility' may be used to obtain a student visa.

Clarkson University requires one of the following language proficiency exams:

- TOEFL (Test of English as a Foreign Language): <http://www.toefl.org>
- IELTS (International English Language Testing System): <http://www.ielts.org>
- PTE (Pearson Test of English): <https://pearsonpte.com/>
- DET (Duolingo English Test): <https://englishtest.duolingo.com/>

Admission of international graduate students requires minimum test scores as below, in all programs excluding DPT, MS in PAS, and MS in OT:

- IBT TOEFL score of 80
- ELTS band score of 6.5
- PTE score of 56
- DET score of 115 (or 61 on pre-July 2019 exam scoring)

A TOEFL/IELTS/PTE/DET official score must be submitted as part of the application requirement. Admission Requirements to the language proficiency exam may be waived with evidence of documentation showing the student studied in a United States school or originated from a country with English as its official language. Students in graduate programs leading to professional certification/licensure also may have a requirement relating to language verification requirements as defined in their field. Details are in the handbooks for these programs. Additionally, a program may request a World Education Services (WES) evaluation be submitted by the applicant.

Lastly, all matriculated students for whom English is a second language are required to complete the ESL placement exam upon arrival on campus and complete any resulting requirements. Waivers of the requirement of the ESL placement exam will be determined at the program level by the appropriate designated administrator(s) who may consider documented exceptions based on reasonable student experience and/or prior education. Any language courses required as a result of the placement exam are not counted toward degree requirements. Applications to the MAT program may be required to complete an additional English language proficiency interview.

## **ACADEMIC AFFAIRS**

### **The Office of the Provost**

*Goodarz Ahmadhi, Interim Provost*

*Amanda Pickering, Associate Vice Provost of Academic Affairs & Student Achievement*

*Christopher Robinson, Associate Provost for Faculty Achievement*

Led by the Provost, faculty and staff within Academic Affairs work to ensure the implementation of university priorities and initiatives related to teaching, learning and research. Academic Affairs includes all the schools and institutes within the university in addition to offices, departments, and support units working in concert to support students, staff, and faculty at Clarkson University.

### **Clarkson Ignite**

*Ashley Sweeney, Director*

[asweeney@clarkson.edu](mailto:asweeney@clarkson.edu)

*Ann Barrett, Program Coordinator*

[abarrett@clarkson.edu](mailto:abarrett@clarkson.edu)

Clarkson Ignite serves the entire campus as an innovation ecosystem that connects students, faculty, staff, alumni, and community leaders to gain critical hands-on creative experience. How? Through shared spaces and programming aimed at stimulating intellectual curiosity, developing entrepreneurial mindsets and skillsets, expanding firsthand learning and making experiences, and forging social and professional connections.

Clarkson Ignite works to instill new ways of thinking and doing in all Clarkson students. The Ignite ecosystem encompasses five key elements: curriculum, extracurricular activities, research, making, and business incubation. The ecosystem includes the Innovation Hub located in the Andrew S. Schuler Education Resources Center, home of the Makerspace, the Media Production Center, many group collaboration spaces, and the Studio which is located in Bertrand H. Snell Hall.

## **The Associated Colleges Consortium**

The Associated Colleges of the St. Lawrence Valley was chartered in 1970 to stimulate a variety of cooperative activities among Clarkson University, St Lawrence University, SUNY Canton, and SUNY Potsdam. With only 10 miles separating the four campuses, a significant amount of social, cultural and academic cooperation is possible.

Clarkson students have ready access to most resources at the other colleges. Special events are publicized through joint calendars and other means. Each of the four libraries permits students from all of the colleges to draw upon the total holdings of approximately one million volumes (See Educational Resources Center).

Students may cross-register for courses within the consortium, and some sharing of faculty takes place. To be eligible to cross-register, undergraduate students must be enrolled in at least 12 credits at Clarkson, **including** the cross-registered course, **and** eligible students can take up to two courses (not available in their home institution) per academic year totaling no more than eight credits on a space-available basis at one or another of the campuses. An academic year for cross-registration includes the fall and spring semesters.

A form for cross-registration is available at

<https://associatedcolleges.org/services/cross-registration/>

Students will be enrolled as non-matriculated students at the host institution and the course(s) will be transcribed at the host institution. At the end of the semester, an official transcript will be sent to the student's home institution and credit will be posted as transfer credit on their Clarkson transcript. Graduate students must receive a grade equivalent to a **B (3.000)** or higher at Clarkson. Grades in such courses are not used in computing a student's GPA. If cross-registration credits results in a course load requiring additional tuition charges, the student is responsible for those additional charges.

## **University Libraries**

*Michelle L. Young, Dean of Libraries/ Associate Professor*  
[myoung@clarkson.edu](mailto:myoung@clarkson.edu) office 315-268-4268, mobile 315-323-7910

The University Libraries provide comprehensive knowledge resources and services to support research, scholarship, teaching, and learning. We are dedicated to offering collaborative support for exploration, discovery, and life-long learning skills to all Clarkson University faculty, staff, students, and to citizens of our local community no matter their location and with respect to diverse needs.

The Harriet Call Burnap Memorial Library is the main library located on the Potsdam Collins Hill Campus in the Educational Resources Center (ERC). Its collections offer materials in various formats including journals, books, audio visual materials, government documents and reports, Clarkson University dissertations, and archival materials. The Health Science Library (HSL) is the University Libraries' branch library and is located in the The Earl R. and Barbara D. Lewis School of Health Sciences (Clarkson Hall) on the downtown Potsdam campus. It provides a wide range of information resources focused on medicine and healthcare. Both locations offer a comfortable place for study as well space for collaborative work and learning.



## Student Achievement Services (SAS)

### Degree Requirements and Academic Policies for Graduate Students

#### Requirements for the Master's Degree

**Note:** This section does not apply to students in The Earl R. and Barbara D. Lewis School of Health Sciences Programs (MS in Physician Assistant Studies and MS in Occupational Therapy). Students in these degree programs should refer to the program sections of this catalog for degree requirements.

The minimum graduation requirements for students in Master's degree programs at Clarkson are listed below. Additional graduation requirements are set by each degree program. Consult the department office for details.

1. A minimum of 30 credit hours of graduate coursework, as follows
  - i. At least 20 credit hours of course and seminar work. The balance of coursework must be consistent with the research or professional experience component.
  - ii. Only courses numbered 500 and above are accepted for graduate credit.
  - iii. 10 credit hours of transfer credit (B grade or better) may be accepted, or with the Dean of The Graduate School's approval, a maximum of 12 credit hours of transfer credit from a post-baccalaureate certificate program (B grade or better) may be accepted.
2. Satisfactory completion of one of the research or professional experience components listed below. Please note all options may not be available in every program.
  - a. A written thesis based on independent research
    - i. A thesis submitted in partial fulfillment of the requirements for the Master of Science degree will be examined by a committee of at least three Clarkson faculty appointed by the student's department. After approval by the examining committee, a thesis requires signature approval by the Dean of The Graduate School, and two copies of the thesis will be deposited in the University Library.
  - b. A comprehensive examination
    - i. A comprehensive examination taken in partial fulfillment of the requirements for the Master of Science degree will be administered by a faculty member or faculty committee approved by the appropriate academic administrator.
  - c. An appropriate, professionally oriented special project
    - i. A project submitted in partial fulfillment of the requirements for the Master of Science degree will be examined by a faculty member, or

faculty-member committee, as approved by the appropriate academic administrator.

3. At least one academic year of study beyond the B.S.
4. A cumulative GPA of 3.000 in courses used to meet graduation requirements.
5. All work must be completed in 5 calendar years. Former Union Graduate College students active in their respective programs prior to Summer quarter 2016 must complete in 6 calendar years.

### **Requirements for the Doctoral Degree**

The minimum requirements for all students in Doctor of Philosophy (PhD) degree programs are described below. Please consult your departmental office for additional requirements.

1. A minimum of 90 credit hours, as follows
  1. A minimum of 24 credit hours coursework.
  2. A minimum of nine course credit hours taken in residence (includes distance learning courses offered by Clarkson University).
  3. A minimum of 6 credit hours of seminar.
  4. A maximum of 30 credits transferred from an MS degree towards PhD degree requirements (B grade or better).
2. A minimum of three academic years of full-time graduate study or the equivalent in part-time study. Two years of study must be in residence at Clarkson. Students matriculated in the off-campus PhD program are exempt from this residency requirement (see below section).
3. Satisfactory completion of the PhD comprehensive examination for admission to candidacy ("candidacy procedure") within two years of full-time study after admission to the PhD program or, for part-time students, before completing 66 credits (see below).
  1. After completion of the candidacy procedure, the student will be identified as a "PhD Candidate."
  2. Students who fail the candidacy procedure may make a second attempt according to department guidelines.
  3. A student who does not successfully complete the candidacy procedure within the time allowed may be dropped from the graduate program.
4. A written dissertation must be submitted by each candidate and defended orally as part of the final examination (see below section).

Requirements for students enrolled in the Doctor of Physical Therapy (DPT) program vary from those outlined here and are described in the General Requirements for DPT Curriculum.

Any changes in the student's degree program must be approved by the Academic Standards Committee.

## **Off-Campus PhD Program Policy**

The off-campus PhD program has been designed to allow Clarkson University doctoral degree candidates to conduct their dissertation research at their employer's research facilities. A Clarkson faculty advisor directs the dissertation research with the assistance of a co-advisor at the student's employer, and up to 50% of required coursework can be taken from Clarkson via online and distance learning.

1. The minimum credit- hour requirement after the bachelor's degree is 90 hours (current requirements). The normal course requirements for the student's department and the University must be met. Students may take up to 50% of required coursework through distance learning. Students who enter the program with an MS degree may transfer up to 30 credits toward the PhD from their master's program.
2. The student must satisfy all the entrance requirements of the academic department. This is beyond the basic University requirements already in place for admission to the PhD program. The experience and specialization of each candidate will be considered in the admission evaluation process.
3. It is essential that the dissertation committee includes one qualified representative from the student's employer. The representative will act as a co-advisor within the organization. Each department will decide if the representative should be appointed as an external committee member of the student's PhD Committee.
4. The student must fulfill all degree requirements according to each department's policy. It is considered essential that each candidate is carefully examined for both the depth and breadth of their knowledge in the chosen field of study.
5. The dissertation should be defended at Clarkson University in the normal manner and according to the University and department requirements and regulations. The candidate must demonstrate a sufficient fundamental knowledge in their field.
6. The department will specify the period of time the student spends on campus (at the department) and the number of visits (each semester).
7. The maximum duration of time allowed to finish the dissertation is eight years.
8. The relationship between the students' employing organization and Clarkson University must conform to the Clarkson Conflict of Interest Policy.

A listing of courses available through distance learning is published each semester. Off campus PhD students may choose from that list and enroll in those courses. These courses shall meet the matriculation requirements set forth in the University course catalog.

The courses for this program will be delivered using a video conference/classroom facility or through the internet. Graduate classes that include off-campus students are scheduled at a video conference facility at Clarkson. An appropriate faculty member is

assigned to oversee the courses, coordinate the examinations and evaluation of the student's performance. Courses may also be given through other means of delivery, provided they meet the University and department requirements. These courses shall meet the matriculation requirements set forth in the University catalog.

### **Comprehensive Examination for Admission to Candidacy**

A comprehensive examination based on general preparation in the major field must be taken within two years after admission to the PhD program. If the comprehensive examination is failed twice, the student will be dropped.

### **Time Limit**

After the comprehensive examination is passed; all work done specifically for the doctorate is to be completed within a period of seven calendar years.

### **Final Examination**

A final examination must be passed. This examination will include, as a minimum, an oral examination based on the dissertation. For the final oral examination, a committee will be selected by the faculty advisor and approved by the department chair and dean of the respective school. The committee will consist of a minimum of five members. The members should include at least four Clarkson faculty of assistant professor rank or higher and possessing an earned doctoral degree. At least one of the members must be from a department other than the candidate's major department. With the approval of the Provost, an external examiner with appropriate credentials from another University or industry may also be appointed to serve as one of the five committee members. This committee will judge the technical competence of the dissertation and the oral presentation. Final completion paperwork and an electronic copy of the accepted dissertation (on CD) must be received in the student's School office no later than 10 working days before commencement to confer degrees to qualify a student to receive a degree at the end of the spring semester. Before final submission of the PhD dissertation, each student will be responsible for submitting their dissertation for publication, and paying any associated fees.\*

\*For information and assistance, contact the Graduate Coordinator representing your discipline.

## Grading System

The grades A+, A, A-, B+, B, B-, C+, C, and P are acceptable for credit toward the degree. For graduation, an average of B or better must be earned in non-dissertation courses and seminar work. The grade of P will not affect the average. Students failing to perform satisfactorily will be separated from the University (see Graduate Student Academic Standing and Separation Policy).

## Graduate Grade Definitions

<b>A+</b>	Passed with 4.000 quality points per credit hour
<b>A</b>	Passed with 4.000 quality points per credit hour
<b>A-</b>	Passed with 3.667 quality points per credit hour
<b>B+</b>	Passed with 3.334 quality points per credit hour
<b>B</b>	Passed with 3.000 quality points per credit hour
<b>B-</b>	Passed with 2.667 quality points per credit hour
<b>C+</b>	Passed with 2.334 quality points per credit hour
<b>C</b>	Lowest passing grade with 2.000 quality points per credit hour
<b>F</b>	Failed with 0.000 quality points per credit hour
<b>P</b>	Passing: this grade may be employed for seminar courses and other courses for which P/NC grading has been designated. It may also be employed for special projects, and under limited circumstances for MS thesis credits. Approval for a P grade for project or thesis credit requires the approval of the department chair, (or comparable administrative unit), Dean of the school, and the Dean of the Graduate School or Provost.
<b>NC</b>	No credit. This grade is used in seminar courses and other cases for which P/NC grading has been designated. It indicates performance below the level required to maintain progress toward completion of degree requirements.
<b>S</b>	Satisfactory progress towards the completion of on-going project, thesis, or dissertation work for the semester. The S grade is removed and replaced with a P grade when the final report, thesis or dissertation is accepted by the Graduate School.
<b>U</b>	Unsatisfactory progress towards the completion of on-going project, thesis, or dissertation work for the semester. The U grade is removed and replaced with a P grade when the final report, thesis or dissertation is accepted by the Graduate School.
<b>I</b>	Incomplete grade: given only in cases described in the paragraph below. An I grade must be replaced by one of the above letter grades as required by the rules in the paragraph below.
<b>Z</b>	Course Audit. Audited courses carry no grade points or credits, and cannot be used to satisfy degree requirements.
<b>W</b>	Course withdrawal. A grade of W indicates the course was dropped during weeks 5 through 10 of the regular fall and spring semesters. The Registrar sets comparable dates for Summer school and other terms that are not a regular fall and spring semester.



**LW** Late Course Withdrawal. A grade of LW indicates the course was dropped during weeks 10 through 15 of the regular fall and spring semesters. The Registrar sets comparable dates for Summer school and other terms that are not a regular fall and spring semester.

**WA** Waived Course with credits

**WR** Waived with replacement, no credit or quality points

### **Incomplete Grades**

The grade of incomplete (I) is a temporary grade given when a student is unable to complete a course by the end of the academic term due to circumstances that are considered extenuating and beyond the student's control, and can be documented. Incomplete grades can only be given in all of the following conditions have been met:

1. The student has documented extenuating circumstances;
  2. The student has completed at least 75% of the course, and has no academic integrity violations for the current term;
3. The student's academic performance to date indicates an ability to pass the course, and;
  4. The student has submitted their request for an incomplete grade no later than the last day of the academic term in which they wish to take an incomplete.

Incomplete grades are contingent upon instructor approval, and instructors are under no obligation to grant them. In cases where an incomplete grade is to be considered, the following provisions apply:

1. The student must submit a request for an incomplete (I) grade to the course instructor no later than the last day of the term on an Incomplete Grade Request Form. If a student is unable to submit a request for an incomplete (I) grade, the Dean of Students may submit the request on the student's behalf.
  - a. In cases where normal practice requires extension of course requirements beyond the end of the term (such as travel, fieldwork, or professional experience), a grade of incomplete may be assigned without need for individual student request, with instructor and department chair approval.
2. Instructors who approve of the request for an incomplete grade must outline the work required to successfully complete the course, as well as designate a deadline for the work to be completed. Whenever possible, the deadline should be no later than two weeks into the following term.
  - a. If the faculty member disapproves the request, they shall submit the grade earned for the student at the end of the term.
3. All students seeking more than two incomplete (I) grades in the same semester must consult with the Dean of Students and, if directed to do so, with the Director of University Advising and/or their SAS Rep, prior to seeking faculty approval for their requests.

4. The assignment of an incomplete (I) grade will be made by the Registrar's office upon receipt of a complete and approved Incomplete Grade Request form. The form must be received by the Registrar's office before the grading due-date, otherwise the course instructor shall submit the grade earned by the student.

To remove an incomplete (I) grade, the instructor shall submit a completed Change of Grade form to their department chair (or comparable administrative officer), and upon approval, it is sent to Student Administrative Services. Then the specified grade shall replace the "I" grade in the term in which the student registered for the course.

1. If a Change of Grade form is not received within five (5) business days from the deadline specified on the Incomplete Grade Request form, then a grade of "F" is recorded.

If the student does not complete the work required to resolve the incomplete grade by the deadline specified on the Incomplete Grade Request form, then a grade of "F" is recorded.

## Graduate Student Academic Standing and Separation Policy

**Note:** This section applies to students in graduate Business, Engineering, and Interdisciplinary programs. Students in other degree programs should consult their program handbooks for the policy and procedures regarding academic standing and separation.

Clarkson graduate students are regarded as in “academic good standing” if they satisfy two conditions:

1. A minimum Cumulative Grade Point Average (GPA) (see below section) and,
2. Satisfactory progress toward the degree (see below section).

### Minimum Cumulative GPA Standards

<b>Academic good standing</b>	Students are in academic good standing if they have a minimum 3.000 Cumulative GPA. The Cumulative GPA is calculated at the end of each term.
<b>Academic warning</b>	Students in good academic standing whose Cumulative GPA falls below a 3.000 will be placed on academic warning. Students on academic warning whose Cumulative GPA is 3.000 or higher at the end of their next term will return to academic good standing. Students on academic warning whose Cumulative GPA falls between a 2.700 and 2.999 at the end of their next term will remain on academic warning.
<b>Academic separation</b>	Students on academic warning whose Cumulative GPA is below a 2.700 at the end of their next term will be separated from the University, and this separation will be recorded on the official transcript.

Academic standing status for past terms is not modified based on future GPA changes due to courses being repeated or omitted from the cumulative GPA.

### Continuance

Students who are separated from the University by the process described above, may not enroll in future terms until so approved by the Graduate School’s Readmission and Continuance Committee. Appeals to this committee for continuance must be made in writing by the student, following the guidelines and deadlines set forth in the Notice of Academic Separation sent to the student. The decision must be given to the student and the Registrar within the published time frame. If continued, students are placed on academic warning for the term into which they are continued.

### Satisfactory Progress

In addition, graduate students are required to maintain satisfactory academic progress. In order to maintain satisfactory academic progress, students must be able to complete

their degree within the published maximum timeframe allowed for that particular degree. Multiple factors determine this:

1. The courses and other academic requirements remaining to complete the degree program.
2. The time remaining to complete these.
3. Other program/ degree requirements.
4. The mathematical possibility of achieving the 3.000 Cumulative GPA required for graduation.

Academic progress is evaluated at the end of each term by the appropriate Graduate Coordinator and Program Administrator(s).

Students who are determined not to be maintaining satisfactory academic progress will be separated from the University.

Thesis-based students who have completed all coursework and received two consecutive terms of unsatisfactory progress may be dismissed following evaluation by the Graduate School's evaluation committee.

The designated responsible administrator shall notify the students and the Registrar of separations within 5 business days of the decision. Separation will be recorded on the official transcript.

## **Graduate Health Sciences Student Academic Standing and Separation Policy**

Academic standing in the The Earl R. and Barbara D. Lewis School of Health Sciences programs (MS in Occupational Therapy, DPT in Physical Therapy, MS Physician Assistant Studies) at Clarkson University encompasses academic course work, clinical skills, and professional behaviors.

Clarkson graduate students in the The Earl R. and Barbara D. Lewis School of Health Sciences program are regarded as in “academic good standing” if they satisfy two conditions:

1. A minimum Cumulative Grade Point Average (GPA) (see below section) and,
2. Satisfactory progress toward the degree (see below section).

### **Minimum Cumulative GPA Standards**

<b>Academic good standing</b>	Students are in academic good standing if they have a minimum 3.000 Cumulative GPA. The Cumulative GPA is calculated at the end of each term.
<b>Academic warning</b>	Students in good academic standing whose Cumulative GPA falls below a 3.000 will be placed on academic warning. Students may also be placed on academic warning for not meeting department professional behavior standards. Students on academic warning whose Cumulative GPA is 3.000 or higher at the end of their next term will return to academic good standing.
<b>Academic separation</b>	Students will be separated from the University for any one or more of the following: <ol style="list-style-type: none"><li>1. The student is on academic warning and has a Cumulative GPA below 2.700 at the end of the term following initial placement on academic warning.</li><li>2. The student receives a grade below a C in any course.<ol style="list-style-type: none"><li>1. Students in the Physician Assistant Studies program may receive a grade below a C on 1 full-time clinical education course. In this case, students must petition the department to continue in the program and will need to retake the full-time clinical education course.</li></ol></li><li>3. The student receives a grade of No Credit (NC) in a full time or integrated clinical education course.</li><li>4. The student demonstrates professional behaviors that violate the profession’s code of ethics.</li><li>5. The student is on academic warning for more than a total of 2 semesters.</li><li>6. The student withdraws from a course because he/she will not be able to satisfactorily pass the course.</li></ol>

### **Continuance**

Academic progress is evaluated at the end of each term and/ or course by the appropriate program faculty. Students are notified as to their academic standing within 5 business days of completion of the semester or course by the appropriate department.

Students who are determined not to be meeting minimum GPA requirements or not maintaining satisfactory academic progress will be separated from the University. Students and the Registrar will be notified within 5 business days of completion of the academic term or course by the appropriate department. Students who are separated from the University by the process described above may not enroll in future terms.

Students who are separated from the University may appeal the decision in writing to the Graduate School's Readmission and Continuance Committee within 3 business days of receiving notification of separation from the University. For students in the professional The Earl R. and Barbara D. Lewis School of Health Sciences programs, the committee shall consist of the Dean or Associate Dean of Arts and Sciences or Dean of Students (or his/ her designee), and one faculty member from each of the graduate professional Health Science programs. The chair of the program in which the student was enrolled will serve on the committee to provide information, but will not be a voting member. The committee will review all appropriate information and provide a decision to the student regarding the appeal within 5 business days of receipt of the appeal. If allowed to continue in the program, the student is placed on academic warning for the term into which they are continued and may need to develop an approved action plan to support their academic progress in subsequent terms.

Academic standing status for past terms is not modified based on future GPA changes due to courses being repeated or omitted from the Cumulative GPA.

### **Satisfactory Progress**

Graduate health science students are required to maintain satisfactory academic progress. In order to maintain satisfactory academic progress, students must be able to complete their degree within the published maximum timeframe allowed for that particular degree. Multiple factors determine this:

1. Professional behavior standards of the programs.
2. Safety with clinical skills.
3. The courses and other academic requirements remaining to complete the degree program.
4. The time remaining to complete these.
5. Other program/ degree requirements.
6. The feasibility of achieving the 3.000 Cumulative GPA required for graduation.

Students in the Physician Assistant Studies program must have a Cumulative GPA of 3.000 at the end of the didactic portion of the curriculum to proceed to clinical internships.

### **Graduate Student Degree Conferral and Commencement Policies**

In order for a graduate student to have their degree conferred, the following have to be met:

1. All coursework and seminar credits must be completed as specified by the degree requirements.
2. Master's theses or Doctoral dissertations must be approved by the student's research committee, department, school, and Dean of the Graduate School. All associated final and signed copies and paperwork must be submitted to the appropriate school office by the published deadline. This deadline is generally 10 working days before commencement.
3. Projects for non-thesis Master's students must be approved by the advisor and department. All associated paperwork must be submitted to the appropriate school office by the published deadline. This deadline is generally two working days before the faculty vote on degree candidates.

Students who do not meet these requirements and deadlines may be considered a conditional degree candidate if:

1. They are in the Reh MBA Program at Clarkson and are registered for up to three hours of coursework in the Clarkson international Summer program, OR
2. They are enrolled in the Doctor of Physical Therapy program for the final three hours of coursework that is not complete at the time of the faculty vote.

Requests for conditional degree status must be approved by the Dean of the appropriate school or comparable unit administrator and submitted to the Dean of the Graduate School at least 10 working days before the faculty vote on degree candidates.

For students voted "on condition," the degree will be conferred when the respective School receives a final grade for the remaining course(s), as appropriate. All conditions for graduation must be met prior to the reporting of graduates to the New York State Education Department; otherwise degrees will be conferred in the next semi-annual commencement ceremony.

### **Commencement Participation Policy**

A student may participate in commencement if:

1. The student is in good academic standing, and
2. The student has defended his or her dissertation, thesis or presented their project, yet has failed to meet the published deadline for the final signed copies and completed paperwork, OR

3. The student is in a research based Master's degree program, has submitted an approved and signed thesis or project report, and requires no more than 6 additional credits of coursework, OR
4. The student is in a course-based or project-based Master's degree program and is within 6 credits of completing their degree, OR
5. The student has completed all required classroom work and has Clarkson educational commitments that would preclude being on campus for the next scheduled graduation ceremony.

Students who have not completed all graduation requirements may request to participate in the graduation ceremony, which requires explicit approval by their Dean or Institute Director, with the approved request submitted to the Dean of the Graduate School at least 10 working days before the faculty votes to confer degrees at commencement.

In the case of an incomplete dissertation, thesis or project, the petition must be initiated by the thesis or project advisor and be approved by the department or program chair, and the Dean of the respective school or comparable unit administrator. This petition should:

1. Certify that a successful presentation or defense of thesis had occurred prior to the published deadlines, and
2. Carry the signatures of the thesis or project advisor, and all other members of the thesis examining committee indicating that they are confident that the remaining corrections to the thesis or dissertation can be completed by the student.

Students who are allowed to participate in the graduation ceremony under these conditions will receive their diploma and be counted as graduates at the next graduation ceremony following the completion of their degree requirement.



## **Expenses, Financial Assistance, Student Status**

### **Expenses**

Tuition and other charges at Clarkson are set at the minimum permissible for financially responsible operation of the University and are considerably less than actual costs. Gifts and grants received through the generosity of alumni, industry, foundations, and friends play an important part in reducing the difference. Although Clarkson will make every effort to maintain charges at current levels, the University reserves the right to revise or change financial requirements.

### **Tuition and Fees**

The COVID-19/coronavirus pandemic continues to create risks and uncertainties associated with on-campus educational programs of colleges and universities. The potential continuing impacts of the pandemic are not fully foreseeable, and may impact the feasibility and/or structure of on-campus learning. The tuition rates charged by the University are not dependent on the format of the educational programs for which they are payable. Accordingly, if the University is required to alter the structure of its on-campus educational programs or transition students to remote learning models (in whole or in part) due to restrictions imposed by federal, state or local governmental authorities or applicable law, or if the University determines such action to be warranted in light of continuing or potential impacts of the COVID-19/coronavirus pandemic, no reduction or refund of tuition or fees will be made based on the resulting changes to the programs in which students are enrolled.

Tuition costs for 2022-2023 graduate programs vary and are charged on a per credit hour basis. Residential program graduate students are subject to a Residential Program Resource Fee each term and a Residential Program CUGSA Activity Fee each term. Non-residential program graduate students are subject to a Non-Residential Program Resource Fee each term and a Non-residential Program CUGSA Activity Fee each term.

In order to remain a candidate for a graduate degree, a graduate student not on-campus who has not completed all degree requirements must continue to register for one credit hour each semester until all degree requirements have been completed. These students are not required to pay a Residential Program Resource Fee nor a Non-Residential Program Resource Fee, but may be required to begin re-payment of outstanding loans. Exception from payment of the tuition for this credit hour may be granted to the student (when circumstances warrant) by the Dean of the respective school upon written request or personal interview.

## University Graduate Program Charges

The summary of annual University charges for the 2022-2023 academic year follows:

Per Credit Hour	Program Type
\$1,706	Interdisciplinary
\$1,588	School of Arts & Sciences
\$1,588	School of Engineering
\$1,588	Residential MBA
\$1,588	Institute for Sustainable Environment
\$1,209	Hybrid MBA, Healthcare MBA, On-line MBA
\$1,028	Bioethics
\$990	Education
Varies	Non-Degree (determined by plan)

Flat Rate per term	Program
\$15,441	Physician's Assistant Program
\$16,349	Physical Therapy Program
\$15,441	Occupational Therapy Program

Other expenses, such as travel, books, and spending money, vary. An estimated figure is approximately \$3,694 for one academic year.

### Residential Program Resource Fee

The \$391 per term Residential Program Resource Fee is charged to each full-time residential program graduate student. The funds cover operations for recreational facilities, fitness facilities, health facilities & services, counseling facilities & services, computing facilities, services & related software, webinars, etc.

### Non-Residential Program Resource Fee

The \$75 per term Non-Residential Program Resource Fee covers operations for access to computing lab and online resources and related software, webinars, etc. Includes guest speakers and lecturers, the learning management system, Echo 360 which allows asynchronous learning sessions, voice thread and other online related services, library and database access and transcripts.

### **Residential Program CUGSA Activity Fee**

Assessed by CUGSA on full-time graduate students enrolled in a residential program and distributed to graduate clubs & organizations.

### **Non-Residential Program CUGSA Activity Fee**

Assessed by CUGSA on graduate students enrolled in a non-residential program and distributed to graduate clubs & organizations.

### **Health Insurance**

Student health insurance is mandatory at Clarkson University for residential program students. Students must either have adequate health insurance coverage through their own policy, be covered by their parent's policy or enroll in Clarkson's contracted insurance. The rate for 2022-2023 is \$3,714 for coverage from 8/1/22 – 7/31/23. To assure clearance for check-in, students need to complete an activity guide in their myCU account and secure an approved waiver if need be on a yearly basis.

### **Payment**

Payment in full for all tuition, fees, residence and dining expenses must be made on or before the financial clearance deadline. Check-in cannot be completed and the student cannot be admitted to class unless satisfactory payment is made. All accounts will be assessed a late fee charge of 1% of the unpaid balance. Enrollment indicates that the student agrees to pay all attorney's fees and other reasonable collection costs necessary for the collection of any amount not paid when due and will be added to the unpaid balance. It is the University's policy to withhold diplomas until the balance of the account is paid in full.

### **Tuition and Fees Refund Policy**

Adjustments are based on the last recorded day of the student's University attendance as determined by and attested to by the Student Achievement Services Office in conjunction with the following tables:

#### *Complete Withdrawal for students enrolled in Semester (Fall & Spring) based programs and Trimester (Fall, Spring & Summer) based programs:*

Prior to the start of the term	100%
1st week of the term	90%
2nd week of the term	75%
3rd week of the term	50%
4th week of the term	25%
5th week of the term until the end of the term	0%

\*A Complete Withdrawal consists of a student withdrawing from all of his/her enrolled credits within a term.

\*\*The corresponding percentages above will be applied to tuition, CUSA Activity Fee, CUGSA Activity Fee, CUSA Campus Improvements Fund Fee, Resource Fee, Room and Meals (consumption is not taken into consideration). There will be no prorating of the Student Health Insurance Premium if the coverage is in force.

Complete Withdrawal for students enrolled in a Quarter (Summer, Fall, Winter & Spring) based program:

Prior to the start of the term	100%
1st week of the term	90%
2nd week of the term	65%
3rd week of the term until the end of the term	0%

\*A Complete Withdrawal consists of a student withdrawing from all of his/her enrolled credits within a term.

\*\*The corresponding percentages above will be applied to Tuition and the Resource Fee. There will be no prorating of the Student Health Insurance Premium if the coverage is in force.

Partial Withdrawal for students enrolled in a Quarter (Summer, Fall, Winter & Spring) based programs:

Prior to the start of the term through the 2nd week of the term	100%
3rd week of the term until the end of the term	0%

\*A Partial Withdrawal consists of a student withdrawing from one or more of his/her enrolled credits within a term, but still remains enrolled in at least one credit for the term.

\*\*Adjustments will be made only to the tuition cost associated with the withdrawn credit(s).

**Official Date of Withdrawal**

The official date of withdrawal is established upon receipt of written notice of withdrawal from the academic department.

**Financial Assistance**

Graduate students enrolled in Master's and PhD level programs may finance their education through a combination of university awards (assistantships, fellowships, and scholarships) and student loans. University awards are granted by each graduate school. US students and permanent residents who are enrolled on at least a half-time basis are eligible to apply for federal student loans. Students must file a FAFSA annually. Refer to the Student Administrative Services website for more information on federal loan programs and application procedures.

University aid is awarded by each academic department. Not all types of University awards are available in all programs. University awards currently available include the following:

<p><b>Teaching Assistantships</b></p>	<p>Teaching Assistantships (TA) provide a stipend plus full tuition. Instructional requirements are up to 20 hours of service per week in laboratory or other designated work for the University during the academic year, or 12 hours of service per week in the above designations during the calendar year.</p>
<p><b>Research Assistantships</b></p>	<p>Research Assistantships (RA) permit concentration in the student's research field during the period of study, do not require teaching responsibilities, and provide a standard stipend plus full tuition. Forty hours of service per week, inclusive of classroom work and research duties, are required.</p>
<p><b>Industrial and Governmental Fellowships</b></p>	<p>Fellowships permit concentration on the student's research problem during the entire period of study. Funding may cover full or partial tuition and/ or a stipend. The stipend must be at least minimum wage and duties may not exceed 40 hours per week including time to attend classes.</p>
<p><b>Graduate Assistant</b></p>	<p>Funding may cover full or partial tuition and/ or a stipend. The stipend must be at least minimum wage and duties may not exceed 40 hours per week including time to attend classes.</p>
<p><b>Partial Tuition Scholarships/ Assistantships (PTS/PTA)</b></p>	<p>A number of partial tuition scholarships/ assistantships are made available each year. These scholarships may be awarded to deserving students on a merit basis, and may be in addition to other types of financial assistance.</p>

## Financial Aid Types and Work Hours Restriction

<b>Full Teaching/ Research Assistantship (TA/RA)</b>	<ol style="list-style-type: none"> <li>1. <b>20 Hours per week work; 20 hours per week study (total 40 hours).</b></li> <li>2. <b>May NOT accept work in any other department.</b></li> </ol>
<b>Graduate Assistantship (GA)</b>	<ol style="list-style-type: none"> <li>1. Up to 20 hours per week work (stated in contract); 20 hours per week study (total variable).</li> <li>2. May work in other departments- total work hours can NOT exceed 20 hours.</li> </ol>
<b>Partial Tuition Scholarship (PTS)</b>	<ol style="list-style-type: none"> <li>1. No work hours; 20 hours per week study (total 20 hours).</li> <li>2. May work in other departments up to 20 hours per week.</li> </ol>
<b>Partial Tuition Assistantship (PTA)</b>	<ol style="list-style-type: none"> <li>1. Up to 4 hours per week (stated in contract); 20 hours per week study (total variable).</li> <li>2. May work in other departments- total work hours can NOT exceed 20 hours.</li> </ol>

### Vacation

All graduate students, appointed for one year under a Research Assistantship, Teaching Assistantship, or Fellowship are entitled to receive two weeks of vacation plus all holidays when the University is officially closed.

### Satisfactory Academic Progress for Federal Financial Aid

Federal regulations require that schools monitor the academic progress of every federal financial aid recipient and certify that the student is making satisfactory academic progress towards earning his/her degree. This policy governs federal financial aid only. Institutional awards, scholarships and assistantships may have other requirements. Students may only receive federal aid for courses that are required for degree completion.

Satisfactory academic progress is evaluated at the conclusion of each term and include, per federal regulation both quantitative and qualitative measures. These measures include:

1. Cumulative Grade Point Average (GPA).
  - a. A Cumulative GPA of 3.000 is required. Students with a Cumulative GPA less than 2.700 are not eligible for federal aid (see section below).
2. PACE.
  - a. A minimum percentage of attempted credit hours must be earned every semester. PACE is determined by:
    - i. Cumulative number of earned hours
    - ii. Cumulative number of attempted hours
  - b. Students must maintain a minimum PACE of 50%.
3. The maximum time frame for meeting degree requirements.
  - a. Students must complete their degree within 150% of the published length of the program. All graduate credits attempted at Clarkson are applied to the maximum time frame. There is no appeal of the maximum time-frame standard.
  - b. Attempted credits for PACE and the maximum time frame include:
    - i. Earned hours - Passed (A-D), Pass (P)
    - ii. Repeated courses- All attempts (see repeated course section below).
    - iii. Withdrawal- Maximum time frame regulations do not allow for the exclusion of courses in which a student has remained past the drop period and earned a grade of "W" or "LW".
    - iv. Failure – F
    - v. Incomplete- I
    - vi. All accepted transfer – T
    - vii. All graduate courses attempted at Clarkson, even if they are not used to meet degree requirements.
  - c. Earned credit hours for PACE:
    - i. Grades of A,B,C or P (with credit)
    - ii. All accepted transfer credits (T)
    - ii.

### **Financial Aid Warning**

A student whose cumulative GPA is between 2.700 and 2.999 and/or whose PACE is less than 50% is not making Satisfactory Academic Progress for Federal Financial Aid. The student is notified by the Financial Aid Office via email to the student's Clarkson email address that he/she is on Financial Aid Warning for the subsequent term of attendance. During the Financial Aid Warning term, the student retains eligibility for federal financial aid.

A student who meets both the PACE and GPA standards at the conclusion of the Financial Aid Warning term is again meeting Satisfactory Academic Progress for

Federal Financial Aid and is eligible for federal aid for the subsequent term of attendance.

A student who does not meet both the PACE and GPA standards at the conclusion of the Financial Aid Warning term is notified by the Financial Aid Office via email to the student's Clarkson email address that he/she is not making Satisfactory Academic Progress for Federal Financial Aid and is ineligible for federal aid for subsequent terms. A student may not have two consecutive Financial Aid Warning terms.

### **Financial Aid Appeal Process**

A student who does not meet the federal financial aid satisfactory academic progress standards at the conclusion of the warning term or a student whose GPA is less than 2.7 may file an appeal based on catastrophic or extraordinary circumstances "beyond the student's control," such as personal illness or injury, or the death, illness or injury of a family member, relative or close personal friend or other situations specific to the individual student.

There are four required elements of an appeal:

1. A completed and signed appeal form.
2. A written statement from the student.
  - a. Federal regulations require a student who is requesting an appeal to submit a written statement explaining:
    - i. Why the student was not able to meet the satisfactory academic progress standards.
    - ii. What has changed that will allow the student to meet the standards at the conclusion of the academic plan and the supporting (see below).
3. Supporting documentation.
  - a. A student requesting an appeal must submit supporting documentation such as:
    - i. A physician's written statement to substantiate illness or accident
    - ii. A copy of a death certificate or newspaper obituary
    - iii. A written statement from clergy, family member(s), or other third party familiar with the student's situation, OR
    - iv. A written statement from an academic advisor, professor or counselor.
4. Development of an academic plan.
  - a. As part of the appeal, the student must work with the Financial Aid Office and their Department to develop an academic plan. The academic plan is designed to enable the student to meet both PACE and GPA standards at the conclusion of the plan.
  - b. An academic plan may entail one to four terms and includes specific requirements the student must achieve. Although the student is not



making satisfactory academic progress, federal aid is reinstated on a term by term basis.

Students eligible to submit an appeal are notified via email at the conclusion of the SAP evaluation that occurs at the end of each term or at the time of readmission to the University. Appeals must be submitted at least two weeks prior to the beginning of the term he/she wishes to receive federal financial aid. A student filing an appeal must authorize the release of pertinent information as part of an investigation of the facts concerning the failure to meet satisfactory academic progress standards.

Each appeal will be investigated and reviewed by the Assistant/Associate Director of Financial Aid and the Graduate Student Services Representative in conjunction with faculty members and advisors from the student's program of study as well as other Clarkson University personnel as necessary.

The Office of Financial Aid will notify the student by e-mail of the final decision. If the appeal is approved the student will work with the Financial Aid Office and their Department to create an academic plan. Once the Academic Plan has been designed and required signatures have been obtained the student will be placed on Financial Aid Probation and federal aid eligibility will be reinstated for the term.

At the end of the Financial Aid Probationary term, the student will be evaluated according to the requirements specified in the academic plan. Provided that the student is successfully meeting the conditions of the plan, the student may continue to receive federal aid for the subsequent term. In cases in which an academic plan includes more than one term, the student will be evaluated at the end of each term. If the student continues to meet the requirements of the plan, the student remains eligible for federal financial aid.

A student who does not meet the conditions of the **academic plan** or whose appeal is denied is no longer eligible for federal and aid at Clarkson until both standards are met. Students who are ineligible for aid may regain eligibility by taking courses at Clarkson without receiving federal aid that raises their GPA to the minimum standards and/or increases earned hours to the minimum PACE requirements

### **Financial Aid with Repeated Courses**

Courses in which a grade of F, W or LW is recorded on a student's transcript may be repeated a maximum of 2 times. The earned hours are counted once. The attempted hours are counted each time and may be used to establish full-time enrollment status. The student may receive financial aid for these course repeats.

Additionally, federal regulations allow a student to repeat a course once if the student previously earned credit for the course (A, B, or C). The repeated course(s) will be used toward full-time enrollment status and are eligible for financial aid. Courses repeated more than once will not count toward enrollment status and are ineligible for financial

aid. More than one course may be repeated per term. The attempted hours are counted each time. The earned hours are counted once. The grade from the prior completion(s) is excluded from the GPA calculation.

### **Academic Grade Changes and Incompletes for Federal Financial Aid**

For purposes of determining satisfactory academic progress for federal and institutional financial aid, all grade changes including incompletes must be submitted to Student Administrative Services prior to the 10th day of the subsequent term. This deadline may differ from academic departmental guidelines.

### **Readmitted Students and Financial Aid**

A student who has left the University for one or more terms and has been readmitted will have satisfactory progress for financial aid reviewed at the time of readmission. Transfer credits must be received prior to the 10th day of the term to be included in the satisfactory progress determination.

If the student is determined to meet satisfactory progress, federal aid will be offered provided the student meets all other eligibility requirements. If it is determined that the student is not meeting satisfactory progress, the student will be notified by email to the student's Clarkson email address of his/ her status and the appeal process.

### **Enrollment Status**

A graduate student will be classified as full-time in any term in which he or she is enrolled in at least nine credit hours per semester or six credit hours per quarter. When such degree requirements have been met, the student will be required to register for at least one credit hour of project/thesis, be in residence, and be actively engaged full-time in completing the project/thesis in order to be classified as a full-time student.

A graduate student will be classified as half-time in any term in which he or she is re-enrolled in at least 4.5 credits hours per semester or 3 credit hours per quarter.

### **Student Leave**

Graduate students planning to exit the University, whether permanently or for a leave of absence, must initiate the process in the appropriate academic school or institute.

A leave of absence for a graduate student is permitted at the discretion of the graduate coordinator, department chair, or Dean of the school. The University may require a written statement from the student, and other documentation as may be appropriate, to support a leave of absence or withdrawal request.

If a student's intent is to permanently leave the University or the student is not in good academic standing, the student will be withdrawn from the University. The effect of a withdrawal on a student's transcript and finances is based on the date of the withdrawal. For information on grading policies relating to withdrawal, contact the

Student Administrative Services office at [sas@clarkson.edu](mailto:sas@clarkson.edu) or refer to the Clarkson Regulations. Refund policies for withdrawals may be located in this catalog and can also be found in the Clarkson Regulations.

### **Veterans Benefits**

In addition to participation in various GI Bill educational programs, Clarkson University is partners with the VA in the Post-9/11 GI Bill Yellow Ribbon Program, which provides full tuition benefits to qualified veterans.

In accordance with Title 38 US Code 3679 subsection (e), Clarkson University adopts the following additional provisions for any students using U.S. Department of Veterans Affairs (VA) Post 9/11 G.I. Bill (Ch. 33) or Vocational Rehabilitation and Employment (Ch. 31) benefits, while payment to the institution is pending from the VA. Clarkson will not:

- Prevent, nor delay the student's enrollment;
- Assess a late penalty fee to the student;
- Require the student to secure alternative or additional funding;
- Deny the student access to any resources available to other students who have satisfied their tuition and fee bills to the institution, including but not limited to access to classes, libraries, or other institutional facilities.

However, to qualify for this provision, such students are required to provide a Certificate of Eligibility to the School Certifying Official no later than the first day of class.

## **DIVERSITY, EQUITY, AND INCLUSION OFFICE**

*Jennifer Ball, Chief Inclusion Office Title VI, IX, ADA/504 Coordinator, Associate Professor of History and Social Documentation/*

[jball@clarkson.edu](mailto:jball@clarkson.edu)

The Diversity, Equity, and Inclusion Office oversees strategic planning for diversity, equity, and inclusion and provides dynamic programs and training for Clarkson's students, faculty, and staff. These include ongoing opportunities to learn with and from our team through a range of methods including speakers, open dialogues, cultural festivities, workshops and more.

The Diversity, Equity, and Inclusion Office oversees several lounges, organizations, and committees at Clarkson. Our team members aim to create and support an inclusive campus community for employees and students. It is our goal to cultivate an environment that educates, empowers, and celebrates all of our students and employees.

Working in partnership with other departments, offices, institutions, and the surrounding community, it is our responsibility to recognize and support the diversity represented on our campus. We believe that continuously advocating for diversity, equity, and inclusion is necessary to achieve academic and institutional success and to prepare our students to be leaders in a diverse world.

## **GRADUATE STUDENT AFFAIRS**

Student affairs is a catalyst for bridging diverse academic, cultural, professional, and social experiences. Graduate students are provided with a variety of support services dedicated to meeting the needs of those pursuing advanced education.

Student affairs staff and services are available for all graduate students, including online programs.

### **Clarkson Regulations**

Each student is responsible for knowing the contents of the Clarkson Regulations. The Regulations contain information on student rights and responsibilities, course policies, academic regulations, academic integrity, student conduct, grievance procedures, and policy statements. For a link to the Clarkson Student Regulations, please visit: <https://www.clarkson.edu/student-administrative-services-sas/clarkson-regulations>.

### **Orientation**

Students know that they have been accepted to an academically selective institution, yet the atmosphere at the University is friendly and supportive, one in which students go out of their way to help each other succeed. Our students learn the importance of an individual's contribution to successful teamwork in the completion of any project. This provides the Clarkson graduate with experience and insight into the significance of developing intellectual and interpersonal skills simultaneously.

Clarkson's concern for new students begins even before they arrive on campus. From acceptance to arrival (for campus-based programs), students will receive relevant information pertaining to their experience, including access to an online platform to ease assimilation prior to matriculation that shares important information before students begin, their first few days, and navigating Clarkson University prior to your program's specific orientation. Program coordinators and staff are available throughout the year to assist students.

### **Clarkson University Graduate Student Association (CUGSA)**

The CUGSA is an organization that directly represents the interests of the graduate student body and provides a variety of social and professional development programs during the entire year for students on all campuses. Sample events from past years include recognition dinners, social hours, athletic events, grant writing seminars, and much more. This group works closely with the Graduate School to ensure the needs and interests of graduate students are met.

### **Graduate Housing and Dining**

A wide range of housing accommodations are available near Clarkson campuses. For detailed information or for copies of the listings of off-campus private rentals of rooms, apartments, or houses, contact the graduate coordinators for each program or visit the

online orientation portal. CUGSA is also a great resource for students seeking accommodations.

Residence halls at the Potsdam campus are primarily for undergraduate students; however, graduate housing is available on a limited basis. Potsdam campus graduate students may contract for meals in any of the University dining halls on a term basis even though they do not reside on-campus. They may also elect to eat on a cash basis in any of the dining areas on the Potsdam campus.

### **Extracurricular Activities, Cultural, and Recreational Opportunities**

There are many opportunities to enhance the educational experience through participation in a range of extracurricular activities. The Clarkson community has easy access to many cultural and recreational facilities throughout New York State, New England, and Canada, as well as on each campus.

### **Religious and Spiritual Life**

Although it is not a religious-affiliated university, Clarkson acknowledges the moral and spiritual development of its students. Some students pursue their spiritual development in personalized ways, while others attend services of organized religious groups near our respective campuses.

### **Student Center & Graduate Student Lounge/Atriums**

The Student Center is the focal point of activities on the Potsdam Hill campus. Students in the Earl R. and Barbara D. Lewis School of Health Sciences Programs have an open atrium to socialize, study, and eat meals in an open atrium as students enter the main building. Similarly, the Capital Region Campus offers the student atrium at the entrance of the Main Building. The Student Center and atriums are places where students can come to spend time between classes, study, and hold meetings and evening events. There are a variety of lounges and spaces with comfortable chairs and tables for studying and relaxing. In addition, meeting rooms are available for group meetings and other activities at all campuses.

### **Cheel Arena on the Potsdam Campus**

Cheel Campus Center boasts a 3,000 seat multipurpose arena. The Arena, home of men's and women's Golden Knights Hockey, is also the place to attend University Convocation, University Recognition Day, Commencement, and other large-scale events.

### **Academic Support & Student Engagement**

The Student Success Center facilitates and supports student educational, personal and professional growth with provision of Academic Support and Preparation, Student Engagement and Enrichment, Access and Opportunity, Retention Initiatives, and Graduation School Awareness and Planning. For graduate students specifically, Academic Skills and Student Retention Specialists are on staff to assist with needs

related to academic preparedness. Also, the English Language Corner provides students with an appropriate framework for English grammar, vocabulary, basic sentence structures, idioms, and cultural elements that allow students to communicate more effectively and confidently in an English speaking work environment.

### **Health & Counseling Center**

Personal counseling is provided by full-time professional counselors who are prepared to deal with a variety of concerns including stress, alcohol abuse, eating disorders, depression and sexual issues. However, students not only seek help for specific problems, but make use of counseling to explore feelings, values and life directions. The counseling staff offer a variety of modalities and assessments that can help increase self-awareness and clarify goals. In addition to counseling, the staff is prepared to make appropriate medical referrals.

### **Health Services – Potsdam Campus**

The University has forged a partnership with Canton-Potsdam Hospital (CPH) who provides professional staffing and services at the University's Student Health Center located on the Potsdam campus. Through this partnership, students enjoy a comprehensive health care program and the broad professional capacities provided by the hospital and its highly trained staff. At the Student Health Center (centrally located in the Educational Resources Center), CPH provides clinical services to include basic medical care, preventative care, general physicals for student-related activities and limited urgent care. Students also have access to CPH's lab services.

Most visits to Health Services and many of its services are free of charge. Health Services is open weekdays from 8:00 a.m. – 4:30 p.m. during the academic year. After hours emergencies are handled at CPH, which is located approximately one mile from campus. There is also an Urgent Care Center on Lawrence Avenue in Potsdam.

### **Health Services – Capital Regional Campus and Beacon Institute**

Students attending classes at our CRC or Beacon campuses should consult their graduate program coordinators for questions pertaining to local health services.

### **Office of AccessABILITY Services**

This is the initial point of contact for students with documented disabilities seeking accommodations or services. The office is responsible for maintaining disability-related documentation, certifying eligibility for receipt of services, determining reasonable accommodations, and ensuring the provision of those services. Students are asked to contact the Office of Accessibility Services prior to the beginning of each term at Clarkson in order to ensure that accommodations will be available in a timely fashion. The student will meet with the staff of Accessibility Services to review documentation and determine reasonable accommodations. The Office of Accessibility Services will provide instructions to the student for faculty and staff notifications requesting reasonable accommodations. Reasonable accommodations will be provided to eligible students who have followed the procedures as developed by the Office of Accessibility

Services. Services may include short-term arrangements for students who have become temporarily disabled. Office staff is available for consultation via conferencing software for students enrolled at CRC, Beacon, or in an online program.



## **CAREER CENTER & EXPERIENTIAL LEARNING**

The Career Center assists all Clarkson students in career preparation, providing options for entry level and mid-level employment, with experiential learning opportunities available. Assistance with pursuing post-college employment and furthering graduate study is also central to the mission of the Center. It is also a primary focus of the Center to develop relationships with business and industry that recruit or could potentially recruit our graduates, assuring that these organizations include Clarkson among their primary college relations and recruiting universities.

### **Career Center and Job Search Services**

Individual career coaching appointments are available through the Career Center to discuss topics such as career direction and choice, skills identification, employment opportunities, and job search techniques. A dedicated graduate student career specialist is available to help students develop strategies to address career-related concerns. The Center facilitates a wide number of career-oriented workshops and programs for graduate-level students including career fair, alumni connections, resume and interview preparation techniques, and job-search strategies.

Among the many benefits of a Clarkson education is the alumni network. Alumni serve as a critical link to the Center. The Center also reaches out to the community by planning programs with any campus organization or academic program. The Career Center provides access to internship and permanent job opportunities through the following means: employer access at both Capital Region and Potsdam campuses, recruiting program with business, industry and government; Career Fairs; a web-based resume database system that enables the Center to provide students' resumes to employers; a job-listing online platform called Handshake;; and a network of thousands of Clarkson alumni who can be accessed at any point in the students' time at the University and beyond.

Clarkson's reputation with hundreds of companies across the country, combined with a comprehensive Career Center, has resulted in positive outcomes for the graduates consistently over the years. Specific employment and salary statistics for recent classes are available upon request from the Center.

### **Experiential Education Program**

#### **Internship Program**

As part of the professional experience component, the Career Center also offers assistance in identifying and applying for internships. Students from all academic majors can pursue internships during any summer of their graduate program, as well as some unique study/internship programs that are offered during the semesters. Most

internships are paid; in some cases, students receive a stipend and may receive academic credit, and some internships are for credit only.

Internships are available with business and industry across the country; with local, state, and federal government agencies; and with other agencies, non-profits, and educational institutions. Students work closely with the Center and their academic advisors to select an internship that best suits their needs.

# **INTERNATIONAL CENTER**

The International Center is a hub of activity providing the Clarkson community with a multitude of global opportunities – experiences – and advisement.

## **Go Abroad**

One of the best ways to prepare for the global workforce is to immerse yourself in another culture. The International Center provides students with numerous global experiences, such as: traditional semester/year exchange with many universities around the globe – short-term/faculty led programs – or – international internships.

Study Abroad provides an excellent opportunity for undergraduate students to enhance their academic background and prepare for the global marketplace through exposure to another educational system and culture. The primary program open to all students offered by the International Center is the Student Exchange Program. The program is designed for students to spend a semester or a year abroad usually during their junior year. Students go through a competitive application process during the sophomore year to be considered for the program. Clarkson University has articulated exchange agreements with many universities around the world Please see the Clarkson International Center website for a listing of Clarkson's Exchange Partners by Country.

In addition to the semester or year-long exchange opportunities, Clarkson offers students the option to participate in short-term programs or faculty led trips. The short-term programs are 2-3 weeks in duration and are ideal for those students who do not wish to be gone for a full semester or year. Faculty led trips usually occur immediately following the spring semester while enrolled in a course during the spring semester. The International Center works with all disciplines to ensure all students in all majors that require or want a global experience have the opportunity.

## **Exchange**

### **Financial Policies**

Exchange Programs: Students who participate in the Study Abroad/Exchange Program through Clarkson must attend one of our exchange partner universities in order to receive financial aid. During the exchange semester(s) students pay their tuition to Clarkson; there is no tuition paid to the exchange university. Room, board, and other fees are paid directly to the exchange university by the student. The financial assistance package is applied to the participant's account as if that student were attending Clarkson University. Any credit balance may be requested through the Director of Financial Aid in SAS after tuition is applied and all required financial aid documentation (i.e. loan promissory notes, signed summary, etc.) are processed. This credit can be used toward the room, board, and other fees at the exchange partner university. It is an important step in the application process for the student to consult with the Director of

Financial Aid in order to understand how their financial assistance package will be applied to the study abroad/exchange experience.

Non-exchange Programs: Should a student decide to attend a non-exchange university, he or she must take a leave of absence from Clarkson for the semester involved. The student should work with the International Center for approval of these non-exchange programs. No tuition is paid to Clarkson and financial assistance may not be utilized.

### **Academic Policies**

Exchange Programs: All courses must be pre-approved through completion of Off-Campus Coursework Permission Forms prior to leaving campus. All credit is transferred back to Clarkson for those courses that students complete satisfactorily. Course credit will be transferred as transfer credit on a pass/fail system. It should be noted that the credit hour and grading system differ from country to country and school to school. Participants should request to have their grades sent to the International Center at Clarkson prior to leaving their exchange program. It may take several weeks after a student returns to receive these grades.

Non-exchange Programs: The student is responsible for assuring that the courses to be taken through the non-exchange program have been pre-approved by the faculty at Clarkson using the Off-Campus Coursework Permission Forms. The International Center will assist these students with any questions regarding passports, visas, and travel, but non-exchange students will not be included in the official study abroad rosters. Course credit will be transferred as transfer credit on a pass/fail system.

### **Work Abroad**

Imagine working for an organization or company abroad, and learning what it is like to work in another culture. You will increase your marketability and be better prepared for the global workplace upon graduation. Students interested in an internship abroad can work with the International Center staff to identify the opportunities available across the globe. Some of these jobs are paid and some are for academic credit. Visit the International Center website for more information.

### **International Student and Scholar Services**

This part of the International Center informs and educates the international population as well as the University community on immigration regulations that govern international students, scholars and the University. In addition, International Center staff coordinates services and benefits available to the international population and facilitates international cultural events within the Clarkson community to promote global diversity.

## **CLARKSON ALUMNI ASSOCIATION**

The Clarkson Alumni Association was organized on Founder's Day, November 30, 1904, and has existed since that time to benefit both the University and its alumni. The administration of the Association is vested in the Clarkson Alumni Association Leadership Board in partnership with the Alumni Office. The mission of the Clarkson Alumni Association is to engage and empower alumni as partners in the Clarkson community, nurturing their pride in their alma mater and promoting the interests of Clarkson University and its alumni. Alumni are actively involved in identifying and recruiting quality high school students, and assisting the Career Center in providing career opportunities for our graduates. Alumni are also involved in supporting fundraising efforts, mentoring undergraduates, serving as speakers on campus, serving on advisory councils, and providing opportunities to learn the value of being engaged alumni. There are nearly 30 regional chapters located in almost every major U.S. city. These regional chapters host approximately 120 events each year to engage alumni and keep them connected to Clarkson.

## **ATHLETICS**

*Scott Smalling, Director of Athletics* [ssmallin@clarkson.edu](mailto:ssmallin@clarkson.edu)

*Laurel Kane, Associate Director of Athletics* [lkane@clarkson.edu](mailto:lkane@clarkson.edu)

### **Recreation and Intramural Activities**

All students are encouraged to participate in intramural and recreational activities. Clarkson's location provides students with a wide array of outdoor sporting opportunities including individual and team challenges. Intramural contests include both regular leagues and weekend tournaments. Recreational activities included both outdoor and indoor activities.

### **Varsity Sports**

The Clarkson Golden Knights compete in 20 intercollegiate varsity sports, at the NCAA Division I level in men's and women's hockey and with the other 18 at the NCAA Division III/USCSA level. Additional information on Clarkson Athletics may be found on the Clarkson website.

### **Facilities**

The Henry R. Hodge Sports and Recreation Complex is located on the Potsdam campus, adjacent to the residence halls and easily accessible to all students. Facilities include The Deneka Family Fitness Center, Alumni Gymnasium, Schuler Recreation Building (which houses the Stephenson Field House and the Fuller Pool), the Denny Brown Adirondack Lodge, and the Snell Athletic Fields. Additional facilities include Walker Center, Hantz Turf Field, Bagdad Field, Scott Field, Neugold Field, and the Cheel Campus Center, which is home to The Munter Family Climbing Wall, Steven J. Yianoukos Fitness Center and Hockey Arena.

# **OFFICE OF INFORMATION TECHNOLOGY**

*Joshua Fiske, Chief Information Officer*

[jfiske@clarkson.edu](mailto:jfiske@clarkson.edu)

Clarkson University is wholly committed to providing high-quality computer resources, services and support to meet the diverse needs of its students and faculty. The mission of the Office of Information Technology (OIT) is to provide access to teaching, learning, research, administrative and communication technologies through a commitment to excellence in customer support and technical leadership in fulfillment of the institutional mission. This involves leveraging the University's corporate partnerships to provide high-performance hardware and software, while employing a distributed user support structure. As a result, Clarkson students receive access to up-to-date technology, backed by direct assistance from easily accessible and highly skilled OIT support staff.

Access to campus IT resources is provided by a high-speed, fiber-optic network "backbone" connecting University classrooms, laboratories, on-campus housing, and faculty offices. Students are able to connect to this network via high-speed wired and wireless connections in buildings across campus. The campus network is connected to the Internet via several multi-gigabit connections.

All students have access to a broad range of computing and information technology resources, including: high-tech, multimedia classrooms and collaborative spaces; email; web conferencing; digital publishing; online teaching and learning; and campus computer labs equipped with the latest software.

OIT supports Clarkson's commitment to integrating technology into the classroom through its instructional technology operation. Instructional Technology supports both students and faculty by providing and maintaining software, equipment and facilities for the production, dissemination, and utilization of learning resource materials.

## **Student Personal Computers**

Because information technology is such an integral part of today's marketplace, it is strongly recommended that every Clarkson student have an appropriate personal computer. High-speed network access is available for all students residing on campus. In addition, students can also access the network at any one of the numerous computer labs found in the academic buildings.

## **CAMPUS SAFETY AND SECURITY**

The Office of Campus Safety & Security consists of a team of people working with the University community to meet the specialized safety and security needs of the University. Responsibilities include the maintenance of public order, vehicle registration, emergency first aid treatment, issuing I.D. cards, room key distribution, educational programs (including crime prevention and fire safety), and other related programs.

Campus Safety & Security officers are responsible for the enforcement of the rules and regulations of the University. Officers do not have police jurisdiction over public streets, public property, or private property. Arrests and apprehension are referred to the Village Police and/or the local Police Department in proximity to Clarkson's geographic footprint. Statistics concerning campus safety and campus crime are available upon request from the Office of Campus Safety & Security or can be accessed at <http://www.clarkson.edu/campus-safety> .

The department's ability to function as an independent agency enables it to preserve the tradition of Clarkson in which security, safety, and adherence to the Code of Student Conduct are both an individual responsibility and a collective behavior. In emergencies, Local Police are called as first-line, back-up support, along with appropriate University officials and the University Emergency Response Team.



## **SCHOOL OF ARTS & SCIENCES**

*Darryl Scriven, Dean*

[dscriven@clarkson.edu](mailto:dscriven@clarkson.edu)

*Jerry W. Gravander, Associate Dean*

[jgravand@clarkson.edu](mailto:jgravand@clarkson.edu)

Jason Schmitt, Associate Dean of Strategic Development & Recruitment

[jschmitt@clarkson.edu](mailto:jschmitt@clarkson.edu)

The School of Arts & Sciences has graduate programs in the disciplines of Biology, Chemistry, Computer Science, Mathematics, and Physics. Faculty and students also participate in the interdisciplinary Data Analytics, Engineering Science, Environmental Science and Engineering, Environmental Policy and Governance, and Materials Science and Engineering graduate programs. More information can be found in the Institute for a Sustainable Environment and the Interdisciplinary Program sections of the catalog.

### **Basic Science Program**

Biology option: Thomas Lufkin, Professor and Bayard and Virginia Clarkson Endowed Chair of Biology [tlufkin@clarkson.edu](mailto:tlufkin@clarkson.edu)

Clarkson offers a Master's degree in Basic Science for qualified students who desire graduate study within the sciences, with a focus that does not fit within one of the degree programs already established.

The standard requirements for all Clarkson Master's degrees must be met: see "Degree Requirements and Academic Policies for Graduate Students: Requirements for the Master's Degree".

### **MS degree in Basic Science (thesis and non-thesis options)**

#### **Biology Option**

#### **Prerequisites for Admission**

Applicants must possess a baccalaureate (4-year) degree in biology or a relevant science major (e.g., biochemistry, biophysics, environmental science) and must have completed the following minimum college course preparation:

1. 3 semesters of biology including genetics
2. 4 semesters of chemistry including organic chemistry
3. 2 semesters of physics, and
4. 2 semesters of mathematics including calculus

#### **Degree Requirements for the Basic Science MS**

1. A minimum of 30 credit hours of graduate coursework, as follows:
  - a. At least 20 hours of course and seminar work. The balance of coursework

- must be consistent with the research or professional experience component.
- b. Only courses numbered 500 and above are accepted for graduate credit.
  - c. 10 credit hours of transfer credit (B grade or better) may be accepted.
2. Satisfactory completion of a research or comparable professional experience, as follows:
    - a. A written thesis based on independent research;
    - b. A comprehensive examination; or,
    - c. An appropriate, professionally oriented special project.
  3. At least one academic year of study beyond the BS
  4. A cumulative GPA of 3.0 in courses used to meet graduation requirements.

### **Program Length**

All work done for the master's degree in basic science is to be completed within five calendar years, although it is normative to complete this degree in 2 years.

One requirement for the Master in Basic Science (MBS) degree is either a *thesis* or else a *special project*. A special project can consist of writing a scholarly review, completing an experiment, or assembling a substantial data set. Before initiating a special project, a written proposal must be approved by the student's advisor and the Biology Graduate Program Chair. As a rule of thumb, the special project must be substantial enough to warrant a co-authorship on a paper. In the case of an experiment or data set, all deliverables (e.g. a written description of the full methods, orderly annotated lab notebook, computer data files with complete metadata) must be submitted to the advisor and subject to evaluation before project completion is approved. A completed project must be evaluated and approved by a committee of three: the student's advisor, a second faculty member, and the Biology Graduate Program Chair. All project deliverables must be submitted at least one month before the expected date of graduation, so that the committee has sufficient time to evaluate the deliverables and request any needed changes.

### **Faculty**

*Professors Tom Langen, Thomas Lufkin, Ken Wallace; Associate Professors, Stefanie Kring, Damien Samways, Shantanu Sur; Assistant Professors Susan Bailey, Ginger Hunter, Petra Kraus, Michelle Yoo.*

## Chemistry Programs

*Silvana Andreescu, Egon Matijevic Endowed Chair and Chair of Chemistry & Biomolecular Science*

[eandrees@clarkson.edu](mailto:eandrees@clarkson.edu)

For specific questions regarding the Chemistry, MS, PhD programs,

[chemgrad@clarkson.edu](mailto:chemgrad@clarkson.edu)

The Chemistry & Biomolecular Science department offers a graduate program leading to MS and PhD degrees in Chemistry and has provided a first class education to students of chemistry, material science and biomolecular science for more than 50 years. The diverse, yet complementary, research interests of our faculty researchers provide incoming students with a broad variety of research topics to choose from, such as: bio-nanotechnology, smart surfaces and interfaces, functional and stimuli responsive materials, nano-therapeutics, diagnostics and biosensors. Advanced study through coursework and independent research under the guidance of a faculty adviser will prepare students for leading positions in industry or academia. Graduate researchers will work on projects that address many of today's most pressing problems related to the environment, advanced manufacturing, sustainable energy and healthcare. Departmental research is supported by federal grants, primarily from the National Science Foundation (NSF), as well as New York State and private industry.

### MS Prerequisites

Applicants must possess a baccalaureate (BS) degree in chemistry or a related major (e.g. material science, biochemistry, biophysics, environmental science) and must have completed the following minimum college course preparation:

1. Introductory chemistry courses including general chemistry as well as specialized classes in organic chemistry, analytical chemistry, physical chemistry, inorganic chemistry, and biochemistry
2. Basic training in mathematics and physics

### Requirements for a MS Degree in Chemistry

1. A minimum of 30 credit hours of graduate coursework, with a minimum of 18 credit hours of graduate chemistry courses.
2. Satisfactory completion of a research project or comparable professional experience.
3. A minimum cumulative GPA of 3.0 in courses used to meet graduate requirements.
4. At least one year of academic study beyond the undergraduate degree. All work must be completed in five calendar years.
5. A thesis must be prepared and orally defended to a committee consisting of a minimum of three committee members.
6. Candidates in chemistry must complete a minimum of two credit hours of seminar (CM900) and present one seminar as part of their degree requirements.

### **Additional Program Requirements for a MS in Chemistry**

1. Placement Exams; Placement exams are administered to permit the evaluation of a student's preparation for graduate work. The results of the placement exams have an advisory function in determining possible remedial coursework to support the student's success in the program and/or will assist the student/advisor team in selecting graduate courses. Every chemistry graduate student must take four out of five placement examinations before registering and attending classes for the first semester as a graduate student. A student is required to show satisfactory preparation for graduate work in at least three areas of examination. These exams are administered prior to the beginning of fall semester, and as needed. The placement examinations will be at a level corresponding to a good undergraduate background in chemistry.
2. The required minimum credit hours (30) are in addition to any undergraduate courses or remedial study required for those students who fail the placement examinations. To successfully complete an MS degree in chemistry a student must take a minimum of 18 credit hours of graduate courses, excluding seminar (CM900). Research credit hours (CM990), Thesis, Dissertation or Special Project credits accepted towards the degree cannot exceed ten. No more than two of the six required courses for the MS degree can be directed study or special topics courses. The student who plans to continue working toward the PhD degree in chemistry after receiving the MS degree should take the PhD regulations into account when planning their MS program. All of the courses used in the fulfillment of course requirements must have catalog numbers of 500 and above.
3. A candidate for the MS degree in chemistry must perform research satisfactory to the advisor and must submit a written report/thesis on the results of their work and orally defend their thesis to a committee of three committee members.

### **Program Length**

All work required for the **master's degree in chemistry** is to be completed within five calendar years, although it is normal to complete this degree in 2 years.

### **PhD Prerequisites**

Applicants must possess a baccalaureate (BS) or a master (MS) degree in chemistry or a related major (e.g., material science, biochemistry, biophysics, environmental science) and must have completed the following minimum college course preparation:

1. Introductory chemistry courses including general chemistry as well as specialized classes in organic chemistry, analytical chemistry, physical chemistry, inorganic chemistry, and biochemistry
2. Basic training in mathematics and physics

### **Requirements for a PhD Degree in Chemistry**

1. A minimum of 90 credit hours, including at least 24 credit hours coursework and a minimum of six credit hours of seminar.
2. A minimum of three academic years of full-time graduate study or the equivalent in part time study.
3. Satisfactory completion of the PhD comprehensive examination for admission to candidacy ("candidacy procedure") within two years of full-time study after admission to the PhD program. After completion of the candidacy procedure, the student will be identified as a "PhD Candidate."
4. A written dissertation must be submitted by each candidate and defended orally as part of the final examination.
5. Any changes in the student's degree program must be approved by the Department Chair and Dean of the School of Arts and Sciences.

### **Additional Program Requirements for a PhD in Chemistry**

1. Placement Exams; Placement exams are administered to permit the evaluation of a student's preparation for graduate work. The results of the placement exams have an advisory function in determining possible remedial coursework to support the student's success in the program and/or will assist the student/advisor team in selecting graduate courses. Every chemistry graduate student must take four out of five placement examinations before registering and attending classes for the first semester as a graduate student. A student is required to show satisfactory preparation for graduate work in at least three areas of examination. These exams are administered prior to the beginning of every semester, as needed. The placement examinations will be at a level corresponding to a good undergraduate background in chemistry.
2. The required minimum credit hours (90) are in addition to any undergraduate courses or remedial work required for those students who fail the placement examinations. No more than two directed study or special topics courses are acceptable toward the PhD degree. All of the courses used in the fulfillment of course requirements must have catalog numbers of 500 and above and must meet all established requirements. Selection of courses will be made in consultation with student's advisor and influenced by student's area of interest.
3. A candidate for the PhD degree in Chemistry must complete all seminar requirements, a minimum of 6 credit hours of seminar (CM900) and presentation of 3 seminars. The candidate can transfer an external oral presentation at a national or regional meeting which has been selected in consultation with the PhD advisor as the equivalent of 1 of the 3 required seminars. The topic of the final seminar for a PhD candidate is expected to be the student's own doctoral research. Students will pass or fail the course (CM900) on the basis of their performance as speakers, participants and assistants, and also on the basis of their attendance. At least 60% seminar attendance during each semester is required.

**Program Length**

After required comprehensive examinations are passed, all work done for the doctorate degree in chemistry is to be completed within a period of seven calendar years, although it is normal to complete this degree in 5 years.

Additional information about the Chemistry Graduate Program can be found at <https://www.clarkson.edu/graduate/chemistry>

**Chemistry Faculty**

*Professors Silvana Andreescu, Costel Darie, Evgeny Katz, Devon Shipp; Associate Professors , Daniel Andreescu,, Galina Melman, James Peploski, Mario Wriedt; Assistant Professors Ryan Brown, Melissa King, Ka Ho Leung, Xiaocun Lu*

## **Computer Science Program**

*Alexis Maciel, Interim Chair, Department of Computer Science*

[alexis@clarkson.edu](mailto:alexis@clarkson.edu)

*Christopher A. Lynch, Graduate Committee Chair, Department of Computer Science*

[clynch@clarkson.edu](mailto:clynch@clarkson.edu)

The Department of Computer Science offers graduate programs leading to degrees of Master of Science (offered interdisciplinary with the Department of Electrical and Computer Engineering) and Doctor of Philosophy in Computer Science. These programs are designed to increase the student's fundamental knowledge and to give the student guidance and experience in research. A graduate student pursues these objectives by taking advanced courses, participating in seminars, and carrying out and reporting on a research project. The department provides the advantage of close personal association between graduate students and faculty, giving special attention to individual needs and interests. The department has strengths in theory, artificial intelligence, software, graphics & visualization, security, systems, and networks. An overview of research areas in which department members perform research can be found [here](#). Please see requirements for MS in Computer Science in the Interdisciplinary Programs Section of the Catalog.

### **Requirements for PhD in Computer Science**

1. A minimum of 90 credit hours earned for graduate courses numbered 500 and higher including at least 36 credit hours of classroom and instructional laboratory coursework (this is above the university minimum of 24); a minimum of 6 credit hours of research seminar. A maximum of 30 credit hours of graduate transfer credit from an MS degree with grades of B or higher may be accepted toward the PhD degree.
2. At least three full academic years of study beyond the baccalaureate degree with at least two years in residence in Clarkson.
3. A cumulative GPA of 3.000 in courses used to meet graduation requirements.
4. Graduate students must complete the PhD candidacy procedure within two years of full time study after admission to the PhD program.
5. Doctoral candidates must complete an original research project submitted as a written thesis to be orally presented and approved before a committee of at least five faculty members. At least four members must be Clarkson faculty of assistant professor rank or higher and possessing a doctoral degree. At least one committee member must be from a department other than the candidate's major department. An external examiner with appropriate credentials from outside the university may serve as one of the five committee members. The thesis must also be approved by the Dean of the Graduate School and a copy deposited in the university library.

### **Additional Program Requirements and Procedures**

Students must complete a minimum of 36 credits of computer science related coursework including:

1. 4 required courses across 3 areas:
  1. CS 541 (Theory)
  2. CS 547 (Theory)
  3. CS 544 (Systems)
  4. CS 545 (Languages)

A grade of B+ or better is required in each of these courses. A written exam option is offered for students who have taken equivalent courses at other institutions and for students who did not receive a B+ in the Clarkson course. Students who have taken equivalent courses at other institutions and pass the exam with a grade of B+ or better can replace the corresponding course by another CS course. A minimum of four 3-credit research-oriented 600-level CS courses. Research-oriented courses include substantial research literature review and a research project/presentation component.

The Computer Science PhD Committee will maintain a list of acceptable by permission of the Computer Science PhD Committee only when they satisfy the same standards as regular 600-level CS courses and include substantial research literature review and a research project/presentation component. A grade of B+ or higher is required in two 600-level CS courses in order to advance to candidacy and one of these must be a research-oriented 600-level course.

Beyond the 4 required courses listed above, students must take 1 course from each of the following 4 groups:

1. Group A (Theory and Algorithms)
2. Group B (Computer Systems and Networks)
3. Group C (Languages and Software Development)
4. Group D (Artificial Intelligence and Applications)

Students are recommended to consult with the Graduate Committee of the Department of Computer Science as well as their thesis advisor on specific courses that fulfill the requirements for each of the four breadth groups A, B, C, and D. Courses used to satisfy this breadth requirement may also be used to satisfy the requirements in research. The specific lists of courses may change, and students may petition the Computer Science PhD Committee to accept additional courses, including courses outside the department, in these groups.

Additional courses as necessary to reach 36 course credits. Students are expected to take at least one graduate course in computer science or a related field each semester that they are enrolled in the Computer Science PhD Program. This requirement may be waived if in consultation with the student's advisor, the Computer Science PhD Committee decides it is in the student's best interest to focus on completion of their thesis work.



Students are required to attend and participate in the CS 707 or 708 Seminar in Computer Science (1 credit) series during at least 6 semesters in residence in the PhD program. Participation is recommended during each semester in residence in the PhD program.

The doctoral candidacy procedure for the Computer Science program is portfolio-based.

Before advancing to candidacy, students must have completed the 4 required courses (CS 541, CS 547, CS 544 and CS 545) and two of the 600-level CS courses at least one of which must be a research-oriented course. A grade of B+ or higher is required in each course. Students prepare a portfolio consisting of a written statement of research interest and representative work from courses and seminar (e.g. exams, research papers, presentation materials). The student appears before the Computer Science PhD Committee for an oral defense of their portfolio. This oral defense and portfolio examination constitutes the comprehensive exam for candidacy in Computer Science.

To advance to candidacy, the student must have also chosen a faculty advisor who believes he or she is prepared to begin original research in a mutually acceptable field of specialization. Students must advance to candidacy within two years of full-time study after admission to the PhD program or be granted an extension by the Computer Science PhD Committee. The doctoral candidacy procedure for the Computer Science program is portfolio-based.

The student must write a thesis proposal outlining his or her research plan and discussing related work and defend this proposal in an oral exam before his or her thesis committee. In addition to the university requirements, at least three members of the committee must be from the Computer Science Department. Students must form their committee and pass the thesis proposal defense exam by the end of their third year of full-time study after admission to the PhD program or be granted an extension by the Computer Science PhD Committee.

The final step in completion of the doctoral program is the submission of a written thesis in conjunction with an oral thesis defense. The candidate will normally present a 50-minute oral presentation of the thesis work at an advertised campus event followed by at least 10 minutes of public questions. After the end of the public session, the candidate and their 5-member thesis committee will gather in closed session for final questions and presentation of corrections to thesis. The candidate will be then asked to leave the room for a final vote of approval. Following approval, the candidate must complete the requested corrections to the written thesis and obtain final signatures. The candidate must provide all five thesis committee members with a copy of the thesis at least four full weeks before the public defense. The thesis committee for the final defense is the same as for the proposal defense. Any changes must be approved by the Computer Science PhD Committee in advance of the final defense.

## **Program Length**

All work done for the master's degree in computer science is to be completed within 5 calendar years, although it is normative to complete this degree in 2 years. All work for the PhD degree must be completed within 7 years after admission to candidacy.

## **Computer Science Faculty**

*Professors Daqing Hou, Christopher Lynch, Jeanna Matthews, Christino Tamon, Chuck Thorpe; Associate Professors Natasha Banerjee, Sean Banerjee, Alexis Maciel; Assistant Professors Shafique Chaudhry, Soumyabrata Dey, Faraz Hussain*

## **Mathematics Programs**

*Joseph Skufca, Chair*

[jskufca@clarkson.edu](mailto:jskufca@clarkson.edu)

*Marko Budisic, Graduate Program Director and Graduate Committee Chair*

[mbudisic@clarkson.edu](mailto:mbudisic@clarkson.edu)

The Department of Mathematics offers graduate programs leading to the Master of Science and Doctor of Philosophy degrees in Mathematics. These programs are designed to increase the student's fundamental knowledge and to give the student guidance and experience in research. A graduate student pursues these objectives by taking advanced courses, participating in seminars, and carrying out and reporting on a research project. The department provides the advantage of close personal association between graduate students and faculty, giving special attention to individual needs and interests.

Faculty members are engaged in research over a wide range of subjects in the mathematical sciences. Current research interests include: dynamical systems, chaos, nonlinear dynamics, complex networks, critical phenomena and statistical mechanics, imaging science, functional analysis, numerical analysis, computational applied mathematics, reaction-diffusion equations, population dynamics, inverse problems, optimization, hybrid and derivative-free optimization, sensitivity analysis, finite-element and multigrid methods, fluid dynamics, atmospheric models, regional climate dynamics, computational geosciences, applied probability and statistics, multivariate and inferential statistics, application of nonparametric statistics, and biostatistics and biomathematics.

## **Prerequisites**

Applicants must possess an undergraduate BS degree in mathematics, statistics, or a related field, with sufficient preparation to engage with both theoretical and computational mathematics. Submitted application materials must include:

1. An official undergraduate transcript
2. Statement of purpose
3. 3 letters of recommendation, and

#### 4. Score results of the Graduate Records Examination (GRE) aptitude test

The GRE requirement may be waived for students with a Clarkson BS degree at the discretion of the Graduate Program Director. All international students must complete an English proficiency examination score (TOEFL, IELTS, or Duolingo) unless waived by the Graduate School Director of International Recruitment. The admissions committee will select candidates on the basis of aptitude, programmatic needs, research interest fit, and overall excellence of academic qualifications.

#### **Requirements for MS in Mathematics**

Students entering with a BS degree are required to take a minimum of 18 credit hours of course-work (6 three-credit graduate courses) and 6 to 10 credit hours of thesis. A minimum total of 30 credits is required for the MS degree. The program for research assistants and teaching assistants during each semester of the academic year is a minimum of 9 credit hours, at least 1 credit hour of which is thesis. The thesis advisor will set up the program within this framework and the department will approve it or recommend changes.

The MS thesis is normally written during the summer and orally presented and defended in late summer or fall before a committee of three or four department faculty. In lieu of a thesis, a student may do a special project. The student receives the MS degree at the next commencement after the thesis is accepted.

#### **Additional Program Requirements and Procedures for MS in Mathematics**

1. Students must complete 30 credit hours subject to the following restrictions:
  - a. At least 20 credit hours of course and seminar work must be earned in residence at Clarkson University
  - b. At least 16 hours must be earned in the Department of Mathematics as courses and seminars numbered above MA 505, with at most one of these credits coming from seminar. Among the courses, 1 course must be MA 521 Classical Complex Analysis, MA 522 Classical Real Analysis, or MA 578 Numerical Analysis, and 2 other courses must be at the 500 or 600 level. The remainder of the students' coursework must be approved by their advisor in collaboration with the Graduate Committee Chair
  - c. Have a Cumulative Grade Point Average (GPA) of at least 3.000 in their course work
2. Students must fulfill one of the following:
3. Write a thesis under the guidance of a faculty member. The thesis is to be an original or expository study of some area or problem and shall represent 6 to 10 credit hours (MA810). The topic of the thesis must be approved by the Graduate Committee and thesis advisor in advance. As required by University regulations, the thesis must be examined by a committee of at least 3 Clarkson faculty appointed by the chair of the department
4. Successfully complete any 2 components (GCE, Subject Cat 1, Subject Cat 2)

components of the comprehensive exams described under the requirements for the PhD degree. The choices must be approved by the student's advisor and the Graduate Committee.

5. Successfully complete 1 Subject Exam (described in the PhD requirements below) and complete a special project. A description of the proposed project must be approved in advance by the student's advisor and the Graduate Committee. When the project is completed, it must be approved by the Graduate Committee. Completion will carry 3 to 9 hours of thesis work (MA810) at the discretion of the student's advisor.

### **Requirements for PhD in Mathematics**

A minimum of 90 credit hours are required for the PhD. This corresponds to a minimum of 3 academic years of full-time study, of which 2 must be in residence at Clarkson. The MS degree may be accepted in lieu of a maximum of 30 credit hours. Of these 90 credit hours, a *minimum* of 39 credit hours must be in coursework, apportioned as explained below. Prior to advancing to Candidacy, PhD students must complete three comprehensive exams, at least one of which should be chosen in consultation with the faculty advisor to align with the student's research topic. There is no foreign language requirement for the PhD. Candidates for the PhD are required to prepare an original dissertation in an advanced research area and defend it in an oral examination.

### **Additional Program Requirements and Procedures for PhD in Mathematics**

The satisfaction of these requirements will be certified by the thesis committee. Students must:

1. Complete at least a total of 90 hours graduate credit, distributed as below.
  - a. Complete a minimum of 39 credit hours of approved course work (30 of which may be those taken for the MS degree). At least 24 credit hours have to be in the "Core Curriculum" course list, which includes all MA/STAT 505+ courses and an additional list of non-MA/STAT courses with sufficient mathematical content, approved by the Graduate Committee. At least 6 credit hours have to be from graduate out-of-department courses. Any completed course that is both a part of the Core Curriculum and out-of-department can be used to satisfy either the 24 credits requirement or 6 credits requirement, but not both simultaneously.
  - b. Complete at least 6 hours of seminar credit. A seminar is a course in which the student is expected to make presentations to the class. This is in addition to the minimum of 39 credit hours of approved coursework above. 1 hour of seminar credit may be earned by either attending a regular scheduled seminar and making 1 presentation, or attending all colloquia for 1 semester and giving 1 presentation at a Department of Mathematics seminar (which would be scheduled during the regular colloquium time)
  - c. Complete at least 21, but no more than 45, hours of thesis credit (MA810)

related to the dissertation topic.

2. Have a Cumulative Grade Point Average (GPA) of at least 3.000 in their course work
3. By the beginning of their 3rd regular semester, every PhD student must pass a General Comprehensive Examination. The purpose of this exam is to determine whether a student possesses the fundamental knowledge and skills to pursue PhD level course content. The exam is offered in August, January, and May. The topics covered on this exam are the undergraduate-level contents of: Calculus; Ordinary Differential Equations; Matrix Analysis and Linear Algebra; Advanced Calculus/Real Analysis; Probability and Statistics.
4. By the beginning of their 5th regular semester, every PhD student must pass two Comprehensive Subject Examinations ("Subject Exams"), demonstrating knowledge and skills sufficient to pursue original PhD-level research. 1 exam will be from Category I, and 1 from Category II. The choices must be approved by the student's advisor and the Graduate Committee. The categories and subjects are:
  - a. Category I: Real Analysis; Complex Analysis; Sets and Topology; Numerical Analysis
  - b. Category II: Matrix Theory and Computations; Partial Differential Equations and Boundary Value Problems; Ordinary Differential Equations and Dynamical Systems; Probability and Statistics
    - i. If an unsuccessful attempt is made, the student may choose to change the topic within the category, but each category can be attempted at most twice. In the event that a student has not satisfied these conditions within the time limit allowed, they must petition the Graduate Committee in order to continue their studies.
5. Successfully complete the Proposal Examination, consisting of a formal presentation of the proposed thesis topic to their thesis committee within 1 year of passing all components (GCE and Subject) of the comprehensive exam. The thesis committee consists of at least 4 Clarkson faculty in the Department of Mathematics, at least 1 faculty member from another department, and no less than 5 committee members in total. The topic and the breadth of the proposed work must be acceptable to the committee.
6. Complete a doctoral dissertation, present it in a public formal seminar, and defend it to the doctoral thesis committee during an examination period. The dissertation embodies the results of the student's original research.

### **Program Length**

The typical length of the Mathematics MS program is 2 years and between 5 and 6 years for the PhD program for students entering the program with a BS-equivalent degree.

### **Mathematics Faculty**

Professors Daniel ben-Avraham, Brian Helenbrook, Kathleen Kavanagh, Chris Lynch, Joseph Skufca, Christino Tamon; Associate Professors Sumona Mondal, Diana White,

Guangming Yao; Assistant Professors Kumudu Arachchi, Emmanuel Asante-Asamani, Prashant Athavale, Marko Budišić, James Greene, Olaniyi Samuel Iyiola, Jonathan Martin, Mohammad Meysami, Jiaqi Yang, Bin Xu; Instructors, Christopher Martin, Sara Morrison. Emeritus Professors Scott Fulton, Lawrence Glasser, Abdul Jerri, David Powers, Peter Turner

## **Physics Programs**

*TBD, Chair, Physics Department*

### **MS and PhD Prerequisites**

A BS degree in physics or closely related subject is required, with undergraduate preparation in the following subjects (at the levels of the textbooks indicated): :

1. Classical Mechanics (Symon or Becker)
2. Quantum Mechanics (Anderson or Griffiths)
3. Modern Physics (Krane)
4. Thermal Physics (Baierlein or Kittel)
5. Electricity and Magnetism (Griffiths, or Reitz, Milford and Christy);
6. Optics (Bennett or Hecht).

Applicants are expected to have fluency in data analysis and computer programming. A minimum overall undergraduate GPA of 3.0/4.0 is generally required, and an overall GPA of 3.2 or above is recommended for financial aid considerations. An overall GPA of at least 3.4 is recommended for physics and math subjects. All new graduate students in the physics program take a two-part Placement Survey in their first fall semester, which is largely designed in the framework of Physics GRE. This survey provides a basis to determine initial course selections for incoming graduate students

### **Requirements for MS in Physics**

1. A cumulative GPA of 3.000 is required for graduation. Students with GPA falling below 3.000 will be placed on academic warning. These students will return to academic good standing if their cumulative GPA is 3.000 or higher at the end of the next term.
2. The Master's program has a non-thesis option and a thesis option. Students must identify a research topic and a research advisor by the end of the second semester of study. This requirement applies to both thesis and non-thesis options.
3. At least 30 credit hours of graduate coursework, with no less than 18 credits of courses (including the core subjects, PH661, PH663 and PH669), 6 credits of thesis (PH699) and 2 credits of seminar (must include at least 1 credit of PH683 or PH684). Only 500 and upper-level courses are accepted. A maximum of 10 credit hours (B grade or better) may be transferred from a post-baccalaureate

certificate program. A minimum of 19 credit hours out of the total 30 must be taken in physics (coursework, seminars and thesis credits).

4. Satisfactory progress toward the degree: Academic progress is evaluated at the end of each term by the Physics Graduate Committee Chair in collaboration with the student's advisor.

### **Additional Requirements and Procedures for MS in Physics**

1. **Thesis Option:** Students complete at least one of the core courses, PH661, PH663 or PH669 with no less than a B grade; *AND* defend a submitted thesis written on independent research. The thesis examination committee, composed of at least three Clarkson faculty, is appointed by the student's department. A thesis approved by the examining committee requires signature approval by the Dean of The Graduate School.
2. **Non-thesis option A:** Coursework component – Students take all three PH661, PH663 and PH669 courses and obtain a grade of at least B in each. The student's advisor may authorize, with the approval of the department chair, replacement of at most one of these courses with another appropriate advanced course for the student's program (the B minimal grade requirement still applies). Project component – The student's research (PH699) will focus on a professionally oriented special project. The written Project Report is examined by a faculty member (usually the student's advisor), or by a faculty committee, as approved by the appropriate academic administrator.
3. The completion of this project will be certified by their academic advisor in a notice to the Department Chair, and the student's final report will be submitted to the Graduate School.
4. **Non-thesis option B:** Coursework component – same as that of Non-Thesis Option A. The Project Component of Option A will be replaced in Option B by successful completion of the Physics Comprehensive Examination within two years of graduate study. Non-thesis option B is reserved for graduate students currently enrolled in Physics PhD program who wish to receive a Master of Science degree while they work on their PhD thesis.

### **Program Length**

While a typical program length is 2 years, all work must be completed in 5 calendar years.

### **Requirements for PhD in Physics**

1. A minimum of 90 credit hours beyond BS. Minimum 3 academic years' full-time graduate study (or the part-time equivalent); 2 years in residence at Clarkson. A four-part Physics Survey Test is used to determine initial coursework.
2. A maximum of 30 credits (with B or higher grade) can be transferred from an MS degree. Coursework - no less than 33 credits, including at least 6 credits taken outside the department and at least 6 credits of seminar. Each semester prior to the completion of 78 credits, full-time students in residence at Clarkson must successfully complete PH683 or PH684. Maximum credit hours per year - 30 (12 in fall, 12 in spring and 6 in summer; or, 15 in fall and 15 in spring). Only 500 and upper-level courses are accepted.
3. A full-time student status requires 9 credits per semester until <9 credits remain to complete 90 credits. After completing 90 credits, students will register for 1 credit hour of project/thesis, be in residence, and be actively engaged full-time in completing the project/thesis.
4. A minimum average grade of B, and at least a B grade in each of the core courses (PH661, PH663, PH664, PH670 and PH669). The requirement for PH664 and PH670 can be fulfilled any time during the study, and the student's advisor can approve replacements of these two courses by other advanced graduate courses in the student's chosen research field.
5. Satisfactory progress toward the degree: Academic progress is evaluated at the end of each term by the Physics Graduate Committee Chair in collaboration with the student's advisor.

### **Additional Program Requirements and Procedures for PhD in Physics**

1. Students must select a thesis topic and be assigned to a research advisor no later than the second semester of graduate study. The Physics Chair approves the appointment of a research advisor. Research projects primarily guided by faculty outside the physics department requires a physics co-advisor approved by the Physics Chair.
2. Satisfactory completion of the Comprehensive Exam is required within two years of full-time study after admission to the PhD program or, for part-time students, before completing 66 credits (the "candidacy procedure" mentioned in Clarkson Graduate Catalog). If the comprehensive exam is failed twice, the student will be dropped from the PhD program.
3. The Physics Comprehensive Examination has two parts, each part four hours long, usually given during the first two weeks of each spring semester. The topical coverages are based on those of upper-level undergraduate physics courses offered at Clarkson, and include: Part I: Classical Mechanics, Electricity & Magnetism (may include Optics topics); Part II: Thermal Physics, Quantum Mechanics, Modern Physics (relativity, nuclear, solid state).
4. By the end of the third year of study, the student writes a PhD research proposal and defends a doctoral topic before a thesis committee composed of at least 5



members. The proposal must be submitted to the thesis committee at least 10 working days before the oral defense. This exam should demonstrate that the thesis topic is of doctoral quality and that the student's background is adequate to carry out the proposed research. A unanimous decision of the committee is required for passing. The thesis committee (selected by the student's advisor and approved by the Physics Chair and the Dean of A&S) should include no less than 4 Clarkson faculty (at least 3 from physics) of assistant professor rank or higher and possessing an earned doctoral degree. At least one member must be from a department other than physics. With the provost's approval, the thesis committee may include an external examiner with appropriate credentials from another university or industry.

5. The final PhD examination involves an oral defense of the written doctoral dissertation before the thesis committee. The exam committee must receive thesis copies at least 10 working days before the oral defense.
6. Each semester of full-time study in residence at Clarkson prior to the completion of 78 credits, the student must register for and obtain a passing grade in PH 683 or PH 684 (Graduate Seminar).

### **Program Length**

Typical program length for a PhD is 5 years. All work for the PhD degree must be completed within 7 years after passing the Physics Comprehensive Examination.

### **Physics Faculty**

*Professors Daniel ben-Avraham, Lawrence Glasser (Emeritus), Michael Ramsdell, Dipankar Roy, Lawrence Schulman (Emeritus); Associate Professors Maria Gracheva, Jan Scrimgeour, Joshua Thomas; Assistant Professors Arzu Çolak, Dmitriy Melnikov,, Dhara Trivedi.*

## **DAVID D. REH SCHOOL OF BUSINESS GRADUATE PROGRAMS**

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The David D. Reh School of Business offers the following graduate programs:

1. Master of Business Administration (MBA)
2. Master of Business Administration-Healthcare Management (MBA)
3. Master of Science in Clinical Leadership (MS)
4. Master of Science in Supply Chain Management (MS)
5. Joint Programs
6. Certificates of Advanced Study

The programs offer a variety of options in terms of both mode of delivery (classroom, online, or a mix of classroom and online chosen by the student) and time of completion (full time or part time).

No specific undergraduate major is required for admission; however, applicants must demonstrate high promise for success as indicated by several components of the student's application profile which include (but is not limited to) undergraduate grade point average, score on GMAT or the GRE (or equivalent), work experience, and references. Exemptions and waivers are possible. Candidates are encouraged to consult the graduate admissions policies for detailed information. Qualified students may also follow the Certificate Pathway to admission by completing the Business Fundamentals Certificate (for admission to the Online MBA) or the Healthcare Management Certificate (for admission to the Healthcare MBA). The Certificate Pathway allows students to gain admission based on performance in certificate courses..

A typical graduate class includes recent college graduates, people with work experience, and individuals from many geographic regions of the world. The breadth and diversity of the student body serve to enrich the educational experience. Merit based scholarships

are awarded on a competitive basis. Full time residential MBA students are also eligible to apply for a graduate assistant position working with a faculty/staff member.

Faculty and students also participate in the interdisciplinary Applied Data Science and Environmental Policy graduate programs. More information can be found in the section for Institute for a Sustainable Environment and the Interdisciplinary Program sections of the catalog.

The David D. Reh School of Business at Clarkson is accredited by the Association to Advance Collegiate Schools of Business (AACSB), an internationally recognized accrediting agency for graduate and undergraduate programs in business administration. In addition, the Healthcare Management MBA is accredited by the Commission on the Accreditation of Healthcare Management Education (CAHME).

## 1. Master of Business Administration (MBA)

The MBA degree is meant to provide students with the skills to be effective business leaders. At Clarkson, there are two MBA programs to choose from:

- A. Residential MBA at the Potsdam campus
- B. Online MBA

Although the MBA programs offer distinct choices, all programs share the hallmarks of a Clarkson MBA which include small class sizes and close student interaction with renowned faculty.

### **A. Residential MBA**

The Residential MBA consists of foundation courses in ten specified areas and 38 credit hours of advanced graduate work. The foundation includes courses from the following subjects: financial and managerial accounting, information technology, corporate finance, microeconomics, macroeconomics, ethics, organizational behavior, marketing, operations and production management, quantitative methods/statistics. Students with undergraduate business majors will be able to waive most or all of these foundations. Through careful planning, students with backgrounds in engineering, liberal arts, or science may complete the foundation courses as part of an undergraduate minor or through pursuing the Summer Business Concepts program offered online in the summer, preceding the start of the regular Fall semester. Articulation agreements, which specify acceptable foundation courses, exist for Clarkson's engineering and science programs and a number of universities in the United States and Canada.

Beyond the foundation, the 38 credits of the Residential MBA degree program consist of ten two-credit interrelated core modules, five three-credit graduate elective courses, and a three credit experiential course. The core modules stress business functions, emphasizing the development of communication, interpersonal, and managerial skills.

The Residential MBA is offered at the Potsdam campus. All classes are taken in the classroom and follow the semester calendar.

The core module titles are:

<b>AC 603</b>	Management Accounting
<b>OM 606</b>	Supply Chain Management
<b>EC 604</b>	Applied Economics
<b>OS 608</b>	Organizational Behavior and Performance Management
<b>FN 607</b>	Financial Management
<b>OS 610</b>	Strategic Planning

<b>IS 605</b>	Information Systems
<b>MK 609</b>	Marketing Management
<b>OM 602</b>	Decision Analysis and Supply Chain Modeling
<b>SB 609</b>	Corporate Ethical Decision Making

A Strategic Planning module (2 credits) is offered as a 12 week course during the Spring term or as an accelerated interim term on-line course. The other modules are taught for 7 weeks each during the Fall term.

Below is a list as a sample of some of the graduate elective courses students can take in the Residential MBA program. This list is subject to change from the time this version of the catalog is published:

<b>AC 623</b>	Financial Statement Analysis
<b>EC 660</b>	Environmental Economics
<b>EC 651</b>	Industrial Organization in Supply Chain
<b>FN 680</b>	Strategic Financial Management
<b>MK 689</b>	New Product Marketing
<b>MK 696</b>	Marketing Methods
<b>OM 676</b>	Developing and Managing Technology
<b>OM 680</b>	Strategic Project Management
<b>OM 685</b>	Quality Management and Process Improvement
<b>OM 671</b>	Supply Chain Environmental Management
<b>OS 657</b>	Leading Organizational Change
<b>OS 666</b>	Negotiations and Relationship Management
<b>SB 613</b>	Innovation and New Venture Management
<b>SB 641</b>	Advanced Topics in Supply Chain Management
<b>SB 681</b>	Logistics Strategies
<b>SB 693</b>	Seminar in International Business
<b>SB 696</b>	Global Business Strategies

In the course of their Residential MBA program of study, students may earn a certificate by taking a certain set of electives as determined by the requirements of each certificate. Please contact the Reh School for additional information.

Experiential learning is a strong part of Clarkson's culture so each student participating in the Residential MBA program is required to take a three credit hour experiential course. Currently, the experiential requirement can be satisfied by completing the Seminar in International Business (part of the Reh School's Global Business Program), or by taking the SB 696 Global Business Strategies course. The Seminar in International Business is designed to give you knowledge and new perspectives regarding international business, helping you develop critical skills necessary to compete and succeed in the global market. This trip includes a 2-3 week trip to an international destination, often led by the faculty from that area. This trip also helps students explore the global management issues facing business leaders and organizations in different parts of the world.

### **Length of Program**

There are 3 length-of-study options for the Residential MBA program:

1. The Accelerated One-Year study plan, with all 38 credits completed over the course of 2 consecutive semesters
2. One and one half years study plan with core modules and electives completed over the 3 consecutive semesters
3. Two years, with core modules and electives completed over the 4 consecutive semesters

While most students begin the Residential MBA program in the Fall semester, Spring starts can be accommodated. Students starting in the Spring have their choices of elective courses in that first semester limited to those that do not have core modules as prerequisites and the Strategic Planning module cannot be taken during the first spring semester.

### **The Residential Master of Business Administration**

#### **Global Specialty Track with one semester abroad at one of the partner AACSB accredited schools**

The Global Specialty Track residential MBA follows the same curriculum structure and has the same foundation requirements as the regular Residential MBA program, with students completing up to six courses over the spring semester at one of the partner institutions. The courses taken at the partner institutions need to be approved by the Graduate David D. Reh School of Business as elective courses and/or a substitute course for the Strategic Management core module. Students are allowed to participate in the Global track if they achieve satisfactory performance in the first set of core MBA modules as determined by the Graduate David D. Reh School of Business.

The current choices of AACSB accredited partner institutions include the Bordeaux School of Management, in Bordeaux, France and Griffith University, in Brisbane, Australia. These elective classes meet the elective requirement and experiential unit requirement of the Residential MBA program. Students starting in the Spring semester cannot participate in the Global Track program in their first semester.

### **B. Online MBA Program**

The online MBA program is a 42 credit hour program (a total of 14 three credit courses). This program is designed to be completed part time, taking up to 2/3 courses during each of the four 11 week periods. Maximum time to complete the program will be 5 years. All students are required to take 10 (three credit hours each) online MBA core courses. The remaining 12 credits comprises 4 elective courses.

Students with extensive prior academic work in specific subjects may reduce the number of courses required by transferring courses. Transfers must be graduate courses not used as part of another degree and may apply to required or elective courses. Program requirements may be reduced by up to 9 credit hours (from 42 to 33) with course transfers.

The Online MBA is offered fully online and follows the quarter calendar (four terms per year).

The course numbers and titles for the required courses in the online program are:

<b>AC 604</b>	Financial and Managerial Accounting for Decision Making
<b>OM 607</b>	Global Supply Chain Management
<b>EC 605</b>	Managerial Economics
<b>FN 608</b>	Financial Management
<b>OS 681</b>	Strategic Management
<b>IS 606</b>	Business Information Systems
<b>MK 610</b>	Marketing Management
<b>OM 603</b>	Decision Analysis and Supply Chain Modeling
<b>SB 610</b>	Corporate Ethical and Social Responsibility
<b>OS 603</b>	Leadership and Organizational Behavior

Below is a list as a sample of some of the graduate elective courses students can take in the online MBA program. This list is subject to change from the time this version of the catalog is published:

<b>EC 652</b>	Industrial Organization in Supply Chain
<b>FN 615</b>	Financial Modeling and Analysis
<b>OM 681</b>	Strategic Project Management
<b>MK626</b>	Market Research Methods
<b>OM 686</b>	Quality Management and Process Improvement
<b>OS 656</b>	Leading Organizational Change
<b>OS 667</b>	Negotiations and Relationship Management
<b>SB 640</b>	Advanced Topics in Supply Chain Management
<b>OS651</b>	High Performance Leadership
<b>SB 620</b>	Business Process Analysis
<b>SB 651</b>	Communicating Globally

In the course of their online MBA program of study, students may complete an advanced certificate or concentration by taking a certain set of electives as determined by the requirements of each certificate. Please contact the Reh School for additional information.

### **Program Length**

Full time students can complete the program in as little as 1 calendar year; part-time students complete in 2 to 5 years with most choosing to complete in 2 years.



## 2. MBA – Healthcare Management

The primary purpose of the MBA Program in Healthcare Management is to prepare its graduates for management positions in health service delivery organizations (e.g., hospitals, managed care organizations, group practice, long-term care) and in related organizations (e.g., consulting, government, corporate benefits). A successfully prepared graduate will be able to obtain a professional management position in a healthcare organization, competently perform the duties of that position, and advance and grow professionally in a career.

The program serves students with diverse educational backgrounds and work experiences fully supporting and encouraging those with limited or no clinical and managerial experience who matriculate on both a part-time and full-time basis. The program provides education in an environment that fosters a high level of interaction among and between students and faculty, both in and out of the classroom. Faculty and students value this small-class environment.

The MBA–Healthcare Management program is a 48 credit hour program (a total of 16 3-credit hour courses). Students with extensive prior academic work in specific subjects may reduce the number of courses required by waiving or transferring courses. Course waivers may be based on undergraduate work and apply only to required courses. Transfers must be graduate courses and may apply to required or elective courses. Program requirements may be reduced by up to nine credit hours (from 48 to 39) with course waivers alone. Program requirements may be reduced by up to twelve credit hours (from 48 to 36) with a combination of course waivers and transfers.

The Healthcare MBA has a strong internship program and an internship is required. However, this requirement may be waived for students with relevant healthcare or professional business experience.

The Healthcare MBA program follows the quarter calendar and can be completed online, in the classroom, or utilizing any mix to meet the individual student's needs. The classroom classes are offered in the evening at the Capital Region Campus (CRC) in Schenectady.

The course numbers and titles for the fourteen required courses in the Healthcare MBA program are:

<b>AC 604</b>	Financial and Managerial Accounting for Decision Making
<b>HC 600</b>	Introduction to Health Systems
<b>HC 605</b>	Healthcare Operations
<b>HC 617</b>	Healthcare Finance

<b>HC 620</b>	Healthcare Economics
<b>HC 626</b>	Healthcare Marketing
<b>HC 647</b>	Statistical Methods for Data Analytics
<b>HC 648</b>	Health Informatics
<b>HC 650</b>	Health Policy Dynamics
<b>HC 651</b>	Health Systems Management
<b>HC 657</b>	Healthcare Leadership Proseminar
<b>HC 674</b>	Legal Aspects of Healthcare
<b>HC 680</b>	Managerial Epidemiology
<b>HC 681</b>	Strategic Issues for Healthcare Organizations (Health Capstone)

Two electives can be chosen from:

<b>HC 604</b>	Hospital Analytics
<b>HC 606</b>	Payer Analytics
<b>HC 643</b>	Advanced Applications of Healthcare Data Analytics
<b>HC 656</b>	Group Practice Administration

Alternatively, any non-parallel course offered as part of the Online MBA program or selected electives from the MS Bioethics program could be used as an elective.

### **Program Length**

Full time students may complete the program in 1 year, and part-time students usually complete the program in 2 to 5 years with an average completion of 3 years.

### 3. Clinical Leadership MS

The MS in Clinical Leadership degree is designed for current and future clinical practitioners: physicians, nurses, pharmacists, therapists, and other healthcare professionals who wish to better understand the healthcare industry and the environment in which it exists, or who aspire to clinically-related leadership roles. The goal of the program is to broaden the horizons of students by providing them with knowledge and skills in health policy and health management.

The Master of Science in Clinical Leadership follows the quarter calendar and can be completed online, in the classroom, or utilizing any mix to meet the individual student's needs. The classroom courses are offered in the evening at the CRC.

The MS in Clinical Leadership is a 36 credit program (a total of 12 3-credit courses). Like the Healthcare MBA, students with extensive prior academic work in specific subjects may reduce the number of courses required by waiving or transferring courses. Course waivers may be based on undergraduate work and apply only to required courses. Transfers must be graduate courses and may apply to required or elective courses. Program requirements may be reduced by up to 6 credit hours (from 36 to 30) with any combination of course waivers and transfers.

The course numbers and titles for the eleven required courses in the Clinical Leadership MS are:

<b>AC 604</b>	Financial and Managerial Accounting for Decision Making
<b>HC 600</b>	Introduction to Health Systems
<b>HC 605</b>	Healthcare Operations
<b>HC 617</b>	Healthcare Finance
<b>HC 620</b>	Healthcare Economics
<b>HC 651</b>	Health Systems Management
<b>HC 656</b>	Group Practice Administration
<b>HC 674</b>	Legal Aspects of Healthcare
<b>HC 680</b>	Managerial Epidemiology
<b>HC 681</b>	Strategic Issues for Healthcare Organizations (Capstone)
<b>HC 647</b>	Statistical Methods for Data Analytics

The one elective may be selected from those non-parallel courses offered as part of the Online MBA program, MS in Bioethics program, or any other course that is part of the Healthcare MBA program.

**Program Length**

Part-time students may complete the program in 2 to 3 years.

## 4. Healthcare Data Analytics MS

The purpose of the Healthcare Data Analytics MS program is to prepare students with the skills to acquire, interpret and communicate healthcare data to shape the direction of the healthcare industry. Graduates will be prepared to take positions in healthcare organizations that require them to analyze high volumes of clinical, administrative and financial data. The program is fully online with two weekends onsite component required for two of the required courses.

The MS in Healthcare Data Analytics program is a 36 credit hour program (a total of 12 3-credit hour courses). The program includes 9 required core courses and 3 electives. As with the Healthcare MBA program, students with extensive prior academic work in specific subjects may reduce the number of courses required by waiving or transferring courses. Course waivers may be based on undergraduate work and apply only to required courses. Transfers must be graduate courses and may apply to required or elective courses. Program requirements may be reduced by up to 6 credit hours (from 36 to 30) with any combination of course waivers and transfers.

The MS in Healthcare Data Analytics is an online program and follows the quarter calendar.

The course numbers and titles for the nine required core courses in the Healthcare Data Analytics MS are:

<b>HC 600</b>	Introduction to Health Systems
<b>HC 602</b>	Advanced Statistics and Data Visualization <i>(Cross-listed with IA640 - Information Visualization)</i>
<b>HC 603</b>	Data Architecture <i>(Cross-listed with IA510 - Database Modeling, Design, and Implementation)</i>
<b>HC 610</b>	Healthcare Accounting and Finance
<b>HC 642</b>	Data Analytics and Business Intelligence <i>(Cross-listed with IA605 - Data Warehousing)</i>
<b>HC 647</b>	Statistical Foundations of Data Analytics
<b>HC 648</b>	Health Informatics
<b>HC 657</b>	Healthcare Leadership Proseminar
<b>HC 643</b>	Advanced Applications in Data Analytics

Three electives can be chosen from:

<b>HC 604</b>	Hospital Analytics
<b>HC 606</b>	Payer Analytics

Additional electives may be selected from courses in the Healthcare MBA program.

### **Program Length**

Part- time students may complete the program in 1 to 2 years.

### **Completing both the Healthcare Management MBA and the MS in Healthcare Data Analytics**

Students may complete both the MBA-Healthcare Management and the MS-Healthcare Data Analytics programs by taking a total of 21-3 credit courses rather than the aggregate total of 28 courses for the two programs taken separately. This is made possible by shared courses and synergies between the programs.

## 5. Supply Chain Management MS

The Master of Science in Supply Chain Management is an interdisciplinary program designed for high-performing professionals who have an established track record of success in one or more of the functions included in supply chain management. The Master of Science in Supply Chain Management prepares professionals who strive to gain advanced expertise needed to lead companies to world class supply chain management status. The program provides an integrated set of learning opportunities for those interested in becoming proficient in effectively managing complex supply chains, and prepares them to be purchasing managers, supply managers, or directors of materials management.

The Master of Science in Supply Chain Management is an online program and follows the quarter calendar.

Applicants must have earned a Bachelor of Science degree in an engineering or business field or show the equivalent thereof.

The course numbers and titles for the eleven required core courses in the MS in Supply Chain Management are:

<b>OS 602</b>	Leadership Development 1
<b>IA 505</b>	Applied Data Analytics
<b>OM 607</b>	Global Supply Chain Management
<b>OM 672</b>	Supply Management Strategy and Analysis
<b>OM 603</b>	Decision Analysis & Supply Chain Modeling
<b>OS 667</b>	Negotiations & Relationship Management
<b>SB 611</b>	Supply Chain Ethics
<b>EC 652</b>	Industrial Organization in the Supply Chain
<b>OM 686</b>	Quality Management & Process Improvement
<b>SB 682</b>	Logistics Strategies
<b>SB 640</b>	Advanced Topics in Supply Chain Management

### Program Length

Expected program length is one calendar year, however many will extend their studies to 1.5 - 2 years.

## **6. Joint Programs**

The Clarkson University David D. Reh School of Business Capital Region Campus has several joint programs with organizations located in the Capital Region. These programs are described in the following sections.

### **Accelerated BA or BS at Union College and MBA Program (with Union College)**

Union College students considering entrance into the accelerated Bachelor's/MBA program should consult with an MBA program advisor and apply for admission during the sophomore, junior, or first term of the senior year. Joint degree students must complete 16 graduate courses, 3 of which may, with undergraduate advisor approval, count toward Bachelor's degree requirements. Graduate courses may not be taken until the junior year and are typically completed during the senior and fifth years. Students may choose either the MBA or the MBA in Healthcare Management degree.

### **Four-Year JD/MBA Program (with Albany Law School)**

This program is designed to meet the management development goals of students enrolled at Albany Law School (ALS). Students spend their first year in law studies, their second year in management studies, and their third and fourth years in law and management studies. Three designated law courses transfer into the MBA degree. Students are required to complete their MBA the winter term of the year they petition to graduate at ALS. Students may choose either the MBA or the MBA in Healthcare Management degree.

### **Joint PharmD/MBA in Healthcare Management, or Joint PharmD/MS in Clinical Leadership (with Albany College of Pharmacy and Health Sciences, ACPHS)**

This program is designed to meet the management development goals of students enrolled at Albany College of Pharmacy and Health Sciences. Three designated Pharmacy courses transfer into the MBA degree, reducing the number of MBA courses in the PharmD/MBA joint program from 16 to 13. In addition, PharmD students may meet the MBA Internship Requirement with the selected practicum experiences which are part of the PharmD program 6th year curriculum at ACPHS. Most joint program students complete the MBA course requirements on a part-time basis over a 3 year period (years 4-6 at ACPHS).

Similar to the joint PharmD/MBA, the PharmD/MS program is designed to meet the clinical leadership goals of students enrolled at Albany College of Pharmacy and Health Sciences. Up to three required courses from the MBA curriculum are waived based on courses taken in the PharmD program at ACPHS. Therefore, the PharmD/MS joint program reduces the number of required MS courses to 9.



**Joint BS Pharmaceutical Science/MBA in Healthcare Management, or  
Joint BS Pharmaceutical Science/MS in Clinical Leadership  
(with Albany College of Pharmacy and Health Sciences)**

This program is designed to meet the management development goals of students enrolled at the bachelor's level at Albany College of Pharmacy and Health Sciences. The BS/MBA in Healthcare Management joint program reduces the number of MBA courses needed from 16 to 13. Up to three required courses from the MBA curriculum are waived based on courses taken in the BS program at ACPHS. The remaining courses are usually completed on a full-time basis the year following graduation from ACPHS. In addition to coursework, all BS/MBA students are required to complete an administrative internship.

Alternatively, the BS/MS joint program reduces the number of required MS courses to 9. Up to three required courses from the MBA curriculum are waived based on courses taken in the BS program at ACPHS. All BS/MS students are required to complete an administrative internship.

**Leadership in Medicine (LIM)/MBA in Healthcare Management, or  
Leadership in Medicine (LIM)/MS in Clinical Leadership  
(with Union College and Albany Medical College)**

Students in the eight-year LIM program jointly offered by Union College, Albany Medical College and Clarkson University earn a BS from Union College, an MBA in Healthcare Management or an MS in Clinical Leadership from Clarkson University, and an MD from Albany Medical College. Students take graduate-level MBA or MS courses while fulfilling all other requirements of their undergraduate degree at Union College. They then go on to pursue their MD at Albany Medical College. . During the 4 years in residence at Union College, students pay tuition based on degree requirements for a BS degree from Union College and an MS degree in Clinical Leadership from Clarkson. Students choosing the BS/MBA/MD option pay for four additional MBA courses they take at Clarkson University at the graduate tuition rate in effect in the student's spring term of senior year of undergraduate study. Students in this program must meet admission requirements of Union College, Clarkson University, and Albany Medical College.

**Joint MD/MBA in Healthcare Management  
(with Albany Medical College)**

The MD/MBA is designed to provide students with a business understanding specific to healthcare and move them on to their medical education quickly. Students learn how to manage a medical practice, deliver quality care in a cost-containment environment, market a practice, and lead other healthcare professionals.

Joint degree students are first admitted to Albany Medical College and then apply separately to Clarkson University. Once admitted to both institutions, they defer the start

of medical school by one year and spend one year at Clarkson University working on Healthcare MBA courses. The second through fifth years are spent completing the MD degree requirements at Albany Medical College. The combined programs allow students to “double count” courses which reduces the total time and cost associated with completing the two degrees separately. 4 courses taken at Albany Medical College are transferred back to Clarkson University to meet MBA requirements. The combined degree is typically completed in 5 years.

It is possible to join the joint degree program after the start of medical school. Students using this option apply for leave from medical school at the end of their third year and spend 13 months at Clarkson University completing MBA course requirements. They return to medical school for their final year.

## **7. Certificates of Advanced Study**

The purpose of the Clarkson University Certificate Programs is to allow professionals currently working in a field or wanting to enter a field to conduct intensive study in that field in an efficient and focused manner. Upon completion, students should be able to function more effectively in their specific fields. The Certificate Programs are not designed to provide the broad management background of an MBA. If students wish to expand their management skills they may apply all of the courses taken in any certificate program toward the MBA. All Certificates are approved by the NYS Education Department.

### **Certificate Pathway to MBA Admission**

Qualified students may follow the Certificate Pathway to admission by completing the Business Fundamentals Certificate (for admission to the Online MBA) or the Healthcare Management Certificate (for admission to the Healthcare MBA). The Certificate Pathway provides automatic admission based on performance in Certificate courses and does not require a GMAT or GRE test.

### **Certificate in Global Supply Chain Management**

The principles behind supply chain management focus on developing seamless flows of raw materials, products/services, information, and financial capital. The supply chain starts at the initial design process, and includes raw material sourcing, logistics, and continues through the delivery of that product or service to the end customer, with a goal of creating customer satisfaction at optimal cost. The Certificate requires 4 courses. Completion of these courses allows individuals to be productive in this important area and can provide a strong concentration should the individual decide to continue on for an MBA.

#### **Required Courses**

<b>OM 607</b>	Global Supply Chain Management
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<b>SB 640</b>	Advanced Topics in Supply Chain Management
<b>Specialty Courses (2)</b>	
<b>OM 686</b>	Quality Management and Process Improvement
<b>OS 667</b>	Negotiations and Relationship Management
<b>EC 652</b>	Industrialization Organization in the Supply Chain

### **Certificate in Human Resource Management**

The Certificate Program in Human Resource Management will provide the educational background necessary to make informed decisions in management as related to human resource issues. The certificate holder will have the resources for strategic critical thinking necessary to optimize the human resources of an organization.

<b>Required Courses</b>	
<b>OS 603</b>	Leadership and Organizational Behavior
<b>OS 676</b>	Current Issues in Human Resource Management
<b>Specialty Courses (2)</b>	
<b>SB655</b>	Building and Leading Effective Teams
<b>SB 651</b>	Communicating Globally
<b>OS 667</b>	Negotiations and Relationship Management

### **Certificate in Management and Leadership**

The Certificate in Management and Leadership is designed to give entry and middle level managers the core business skills in organizational processes, change management, resource management and leadership. It is focused on assisting managers and executives in enhancing their management and leadership skills in order to positively affect their current organization and provide them career advancement potential.

<b>Required Courses</b>	
<b>OS 603</b>	Leadership and Organizational Behavior
<b>OS 651</b>	High Performance Leadership

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### Specialty Courses (2)

<b>OS 667</b>	Negotiations and Relationship Management
<b>SB 620</b>	Business Process Analysis
<b>OS 656</b>	Leading Organizational Change

### Certificate in Healthcare Management

Healthcare has become one of the fastest growing industries in the US economy, characterized by rapid change and a need for management that will extend into the foreseeable future. The Certificate in Healthcare Management prepares individuals to take advantage of the opportunities in this field by introducing them to important business concepts applied to healthcare. Students may complete this certificate following the Certificate Pathway to gain automatic admission to the Healthcare MBA.

### Required Courses

<b>HC 600</b>	Introduction to Health Systems
<b>HC 651</b>	Health Systems Management

### Specialty Courses (Select 4)

<b>HC 605</b>	Health Operations Management
<b>HC 657</b>	Proseminar in Healthcare Leadership
<b>HC 626</b>	Health Systems Marketing
<b>HC 617</b>	Healthcare Finance
<b>HC 620</b>	Health Economics
<b>HC 648</b>	Health Informatics
<b>HC 650</b>	Health Policy Dynamics
<b>HC 656</b>	Group Practice Administration
<b>HC 674</b>	Legal Aspects of Healthcare
<b>HC 680</b>	Managerial Epidemiology
<b>HC 647</b>	Statistical Methods for Data Analytics
<b>AC 604</b>	Financial and Managerial Accounting for Decision Making

## **Certificate in Business Fundamentals**

The Certificate in Business Fundamentals is designed to provide non-business undergraduate majors working in businesses with an opportunity to develop a broad background in the fundamental areas of business without committing to a full MBA. This certificate may be completed entirely online or entirely in classes at the Schenectady campus or students may mix online and on campus evening classes. Students may complete this certificate following the Certificate Pathway to gain automatic admission to the MBA.

<b>Required Courses</b>	
<b>AC 604</b>	Financial and Managerial Accounting for Decision Making
<b>FN 608</b>	Financial Management
<b>IS 606</b>	Business Information Systems
<b>MK 610</b>	Marketing Management
<b>OM 607</b>	Global Supply Chain Management
<b>OS 603</b>	Leadership and Organizational Behavior

Most candidates complete their certificate program in 9 months to 1.5 years.

## **The Reh Center for Innovation and Entrepreneurship**

A resource center located within the Clarkson University David D. Reh School of Business, the Entrepreneurship Center helps small business owners and entrepreneurs develop and manage sustainable micro enterprises through partnerships with universities and government support programs.

The Center builds upon the University's nationally recognized expertise in entrepreneurial education and long-standing commitment to boost regional economies through small business development.

The goal of the Center is to serve as a national model for enhancing regional economic development by focusing on micro enterprises. Additionally, increased hands-on learning opportunities provide students with tremendous learning opportunities in marketing, management and finance.

## **Faculty for the David D. Reh School of Business**

### **Consumer and Organizational Studies**

*Professor Augustine A. Lado; Associate Professor Jay Carlson; Assistant Professors Floyd Ormsbee, Ty Mackey, Iman Paul, Rohan Crichton, Alison Mackey Participating Faculty Alan Belasen; and Instructor Marc Compeau*

### **Economics and Financial Studies**

*Professor Diego Nocetti; Associate Professors Bebonchu Atems, John DeJoy, Zhilan Feng, Allan Zebedee; Assistant Professors Anna Brown Eller, Guoyu Lin, Zhilu Lin, Qingran Li, Michael Sacks, Wentao Wu, Amanda Geary; Instructors Gasper Sekelj, Zhujin Guo; Visiting Assistant Professor Jehu Mette*

### **Engineering & Management**

*Associate Professors R. John Milne, Seyedamirabbas Mousavian; Assistant Professors Golshan Madraki, Rosemonde Ausseil; Professor of Practice, Marshall Issen;*

### **Operations and Information Systems**

*Professors R. Alan Bowman, Boris Jukic, Santosh Mahapatra, Farzad Mahmoodi; Associate Professors Santosh Mahapatra, Dennis Yu; Assistant Professors William MacKinnon, Chen Xiang, Shafique Chaudhry, Yuan Zhang, Ajinkya Nandkumar Tanksale; Participating Faculty Bret Kauffman, Carl Strang*

### **Healthcare Management**

*Associate Professor Amber Stephenson; Assistant Professor Ohbet Cheon; Instructor Evan Brooksby*

## **WALLACE H. COULTER SCHOOL OF ENGINEERING**

***“Technology Serving Humanity”***

*William Jemison, Dean of the Wallace H. Coulter School of Engineering*

[wjemison@clarkson.edu](mailto:wjemison@clarkson.edu)

In our modern technological society, engineers and scientists must work together with a variety of other professionals in seeking solutions to complex problems. Revolutionary advances in applied science and technology have broadened the horizons of engineering. At the same time, these advances have created a multitude of challenging multidisciplinary problems in virtually every sphere of human activity.

The role of engineers in today’s society has become more and more critical. Engineers require not only a knowledge of fundamentals for finding solutions to problems, but they must be aware of the broad social, economic, political, and environmental implications of their ventures. The engineering programs at Clarkson are designed to provide students with a foundation in science, engineering, humanities, and management. Our goal is to make sure Clarkson graduates are highly competent in their chosen fields while at the same time they are alert to their responsibilities to society and truly practice “technology serving humanity.”

Clarkson’s School of Engineering has been named the Wallace H. Coulter School of Engineering in recognition of the Foundation’s generous gift and the late Wallace Coulter’s dedication to the University as a trustee. Wallace H. Coulter was a renowned inventor and entrepreneur. He became acquainted with Clarkson through his collaboration with colloid scientists on the faculty. In 1979 he received an honorary doctorate, and he served as a trustee of the University from 1983 to 1989. Through the years he maintained close connections with Clarkson, supporting research projects and establishing an endowed scholarship.

The grant funded 5 key areas: team project-based learning activities; endowed chairs and endowed fellowships; new programs in biomedical engineering; upgrades of laboratory facilities; and scholarships for both minority students and women pursuing a degree in engineering. Growth in these evolving areas will complement and reinforce the programs and curricula described in this catalog.

The Coulter School of Engineering comprises the Departments of Chemical and Biomolecular, Civil and Environmental, Electrical and Computer, and Mechanical and Aeronautical Engineering

### **Graduate Programs in Engineering**

The Coulter School of Engineering offers Master of Science and Doctor of Philosophy degrees in each department. There is also an interdisciplinary Engineering Science graduate program managed by the Dean of the School of Engineering.

Faculty and students also participate in the interdisciplinary Data Analytics, Environmental Science and Engineering, and Materials Science and Engineering graduate programs. More information can be found in the section on the Institute for a Sustainable Environment and the Interdisciplinary Programs section of the catalog.

The graduate programs are designed to prepare students for careers in research, development, design, and education. Admission to graduate study will be granted to qualified applicants who hold a baccalaureate degree in engineering from an accredited institution or who have equivalent qualifications.

**Program Length in School of Engineering**

1. PhD program students complete up to 7 years after they pass the qualifying exam
2. MS Students complete within 5 years



## **Biomedical Engineering Masters of Science**

*William D. Jemison, Dean of Engineering*

[graduate@clarkson.edu](mailto:graduate@clarkson.edu)

The Wallace H. Coulter School of Engineering offers a graduate program leading to the MS degree in Biomedical Engineering. Biomedical engineering is an interdisciplinary field that is experiencing rapid growth and having a significant impact on the quality and delivery of healthcare. The MS in Biomedical Engineering leverages university expertise in engineering, health sciences, and entrepreneurship. In addition to introducing important biomedical engineering courses, the program has a clinical experience, and an entrepreneurial element consistent with Clarkson's focus on innovation, and a team-based capstone design experience. Capstone experience projects may be carried out in conjunction with students and faculty in the graduate-level Biology, OT, PT, and PA programs or via industrial sponsorship. The capstone design process will follow FDA best practices, and projects may lead to a potentially viable marketable idea, complete with a business plan. The program will prepare students to enter the field of biomedical engineering.

### **Program Objectives and Learning Outcomes:**

**Program Objectives**—the goals of the MS Biomedical Engineering Program include:

- Provide a compelling reason for talented students interested in Biomedical Engineering to select Clarkson
- Provide a strong linkage to Clarkson Ignite to foster innovation in areas related to the clinical expertise of the health care faculty and the research expertise at the university
- Provide students with an introductory exposure to the clinical practices and with an opportunity to work with Clarkson's clinical faculty and students to design relevant and needed devices, concepts, or techniques
- Prepare students for advanced study or careers in the biomedical field

**Learning Outcomes**—upon completion of the MS in Biomedical Engineering students will:

- Understand human physiology from a systems biology perspective
- Understand the FDA clearance required for medical device clearance
- Be able to make sound ethical decisions related to bioengineering challenges
- Be able to work effectively in a clinical environment and understand the roles of different members of the healthcare delivery team
- Have a biomedical design and innovation experience

### **Prerequisite Courses**

Prerequisites include the completion of an ABET accredited BS engineering degree. Completion of Clarkson's Biomedical Engineering Minor is required for students who received their BS engineering degree at Clarkson. Students who have not completed the

biomedical engineering minor or who did not complete their BS engineering degree at Clarkson may be admitted to the program with permission of the Program Chair. Appropriate remedial courses may be recommended, as appropriate.

### **Degree Requirements**

Thirty credits are required for the MS in Biomedical Engineering. The program is built upon one quantitative human physiology laboratory course and two CORE biomedical engineering courses. A biomedical engineering “depth” elective and a graduate-level “breadth” elective build on these courses. The program includes a course on bio-entrepreneurship & FDA fundamentals that is compatible with Clarkson’s Ignite initiative and is designed to equip students with an “entrepreneurial mindset” in preparation for their capstone experience.

<b>Program Requirements</b>	
<b>Area of Study</b>	<b>Credit Hours</b>
Quantitative Human Physiology & Lab	4
Pick 2 of: (CORE) EE 585 Neural Engineering (CORE) BME 587 Advanced Biomechanics (CORE) ES 552 Biomaterials and Biomedical Engineering Applications	6
(Depth Electives) Two biomedical electives from an approved list *	6
(Breadth Elective) Any 500 or 600 level math, science, engineering, or business graduate course with technical content	3
Bio-entrepreneurship & FDA Fundamentals	3
Clinical Immersion & Bioethics	2
Capstone Experience I, II, and III***:	6
<b>TOTAL</b>	<b>30</b>

\*Approved biomedical breadth elective courses - see attached list

## **REQUIRED COURSES**

BME 500 CLINICAL IMMERSION & BIOETHICS

BME 510 QUANTITATIVE HUMAN PHYSIOLOGY & LAB

**CORE** - Pick two of:

EE 585 NEURAL ENGINEERING

BME 587 ADVANCED BIOMECHANICS (NEW)

ES 552 - BIOMATERIALS & BIOMEDICAL ENGINEERING APPLICATIONS

BME 520 BIO-ENTREPRENEURSHIP AND FDA

BME 530, 531, 532 BIOMEDICAL ENGINEERING CAPSTONE EXPERIENCE I, II, and III

## **DEPTH ELECTIVES - BIOMED. ENGINEERING**

BME 600 -- SELECTED TOPICS IN BIOMEDICAL ENGINEERING

BR500-- BIOMEDICAL ENGINEERING FUNDAMENTALS

ES 533 - HUMAN EXPOSURE ANALYSIS

EE 523 - INTRODUCTION TO BIOMETRICS

EE 622 - ADVANCED BIOMETRICS

EHS 518 - PRINCIPLES OF TOXICOLOGY AND EPIDEMIOLOGY

BY 514 BIOINFORMATICS

PH 520 PHYSICAL MODELS OF LIVING SYSTEMS

PH 526 INTRODUCTION TO BIOPHYSICS

CM 560 BIOCHEMISTRY I

CM 561 BIOCHEMISTRY II

CM 544 MEDICINAL CHEMISTRY

CM 566 BIOELECTRONICS AND BIONANOTECHNOLOGY

## **Program Length**

Expected program length is two semesters and two summer terms.

## Chemical and Biomolecular Engineering Graduate Programs

Professor Elizabeth Podlaha-Murphy, Department Chair

[epodlaha@clarkson.edu](mailto:epodlaha@clarkson.edu)

Graduate education in Chemical and Biomolecular Engineering (ChBE) concentrates in the following specialties:

- Biomaterials
- Chemical Mechanical Planarization
- Chemical Reaction Engineering and Catalysis
- Electrochemical Processing
- Energy Technologies
- Functional Polymers and Nanocomposites
- Modeling and Control of Biomedical Systems
- Molecular Simulations
- Multi-component Mass Transfer Separations
- Plasma Processing
- Thermochemical processes and non-equilibrium reactions
- Water Desalination
- Water Treatment of Legacy and Emerging Contaminants

### MS Prerequisites

A prerequisite of BS or BE in chemical engineering. Those with degrees in other science or engineering disciplines may also be admitted, but will be required to make up undergraduate course deficiencies. The following are prerequisite courses for MS in Chemical Engineering: CH 210, 220, 260, 320, 330, 350, 360, 370, 430, 460, or their equivalent.

Students with a BS or BE in Chemical Engineering may complete this program in 2 calendar years (24 months).

### Requirements for MS in Chemical Engineering:

1. Required courses are:
  - a. CH 546 Chemical Reactor Analysis
  - b. CH 560 Transport Phenomena
  - c. CH 561 Chemical Engineering Analysis
  - d. CH 571 Advanced Chemical Engineering ThermodynamicsThe student must obtain a Cumulative Grade Point Average (GPA) of 3.000 or better in the required CH courses.
2. Two additional 3-credit hour technical graduate courses selected in consultation with the student's advisor. David D. Reh School of Business courses cannot be taken to satisfy this requirement.
3. 2 credit hours of CH 610 (Seminar). (While in residence, all students are required to attend seminar, even if they are not enrolled in CH 610).

4. 10 credit hours of CH 611 Thesis. All students are expected to start their thesis research at the beginning of their first semester in residence.
5. The MS thesis must be orally presented and defended before a committee of three or more faculty members, at least two of whom are from the Department. A typical curriculum schedule follows. Individuals with an undergraduate degree in chemistry or physics have a different schedule - refer to "Requirements for the MS degree in Chemical Engineering for BS Chemists and Physicists."

<b>First Semester</b>	<b>Second Semester</b>
3 Three-credit courses (typically CH 560, CH 561 and an elective)	3 Three-credit courses (typically CH 546, CH 571 and an elective)
Five credits of thesis	Five credits of thesis
One credit of seminar	One credit of seminar
<b>Third Semester</b>	<b>Fourth Semester</b>
One credit of thesis	One credit of thesis

The Master of Science is a thesis-based degree; each student is required to complete and defend a research-based thesis.

#### **Requirements for MS in Chemical Engineering for BS Chemists or Physicists**

A program is available for qualified BS chemists and physicists that will permit them to earn an MS in Chemical Engineering in 4 semesters. During the course of study, the student will take almost all the required courses in the chemical engineering undergraduate curriculum, as well as the chemical engineering graduate level courses required for the MS program.

A typical program, which may be altered depending on the background of the student, is illustrated below:

<b>First Semester</b>	<b>Credits</b>	<b>Second Semester</b>	<b>Credits</b>
CH 501 Directed Study in Chemical Engineering Principles I (CH 220, 320, 330)	3	CH 502 Directed Study in Chemical Engineering Principles II (CH 260, 360, 370, 430)	3
CH 561 (or CH 611)	3	CH 571 (or CH 611)	3
Graduate Elective	3	Graduate Elective	3
CH 610 Seminar	1	CH 610 Seminar	1
Total	10	Total	10
<b>Third Semester</b>	<b>Credits</b>	<b>Fourth Semester</b>	<b>Credits</b>
CH 560	3	CH 546	3
CH 611 (or CH561)	3	CH 611, 1 cr. (or CH 571, 3 cr.)	1 or 3
CH611 Thesis	4		
Total	10	Total	4 or 6

### **PhD Prerequisites**

A prerequisite of BS (or BE) or MS (or ME) in chemical engineering, materials science, chemistry, or other areas. The following are prerequisite courses for a PhD in chemical engineering: CH 210, 220, 260, 320, 330, 350, 360, 370, 430, 460, or their equivalent.

Students with a BS (or BE) or MS (or ME) in chemical engineering, materials science, chemistry, or other areas may complete the program in 5 calendar years (60 months).

### **Requirements for PhD in Chemical Engineering:**

The following requirements apply exclusively to chemical engineering PhD students. The student must take the 4 courses required for the MS degree program or their equivalent:

1. CH 546 Chemical Reactor Analysis
2. CH 560 Transport Phenomena
3. CH 561 Chemical Engineering Analysis
4. CH 571 Advanced Chemical Engineering Thermodynamics

### **Additional Program Requirements and Procedures for PhD in Chemical Engineering:**

1. The student must obtain a Cumulative Grade Point Average (GPA) of 3.000 or better in the required CH courses
2. Students entering the PhD program should register for a minimum of 10 credit hours each semester until they satisfy the 90 credit hour requirement
3. The student must take a minimum of 15 credit hours in the major field, a minimum of 9 credit hours in the minor field, and a minimum of 6 credit hours taken from a department other than chemical engineering
4. The student must take a qualifying examination and adhere to the guidelines described in the section "*PhD Qualifying Examination and Research Proposal Review*"
5. The student must take the PhD qualifying examination no later than 18 months after completing the MS requirements. Students given direct entry into the PhD program must take the qualifying exam no later than 18 months after being invited into the PhD program. Students entering with a MS degree must take the qualifying exam no later than 18 months from the time when they enter the graduate program.
6. Minimum course work is 30 credit hours (this is equivalent to 4 three-credit courses beyond MS). David D. Reh School of Business courses cannot be taken to satisfy this requirement
7. 6 credit hours of seminar (CH610)
8. 54 credit hours of thesis
9. A maximum of 30 credit hours including research credits may be transferred from a Master's degree towards the PhD requirements (B grade or better). To transfer credits for the required CH courses, student's faculty adviser should determine the eligibility for credit transfer. It is recommended that students take at least 2 of the 4 required CH courses even if they completed all the courses in their previous institutions
10. While in residence, all students are required to attend all seminars

### **Direct Entry into PhD Program**

First-year graduate students whose past academic and first-semester records at Clarkson indicate outstanding research potential will be invited to enter directly into the PhD program. The thesis required in the regular MS program will be bypassed.

The department will decide which students will be invited into this program at the beginning of the second semester of the student's residence on campus. The MS degree is awarded to the student upon completion of 40 credit hours and after passing the PhD qualifying examination.

### **Financial Assistance**

Financial support for students enrolled in the PhD program is usually in the form of research assistantships, and not teaching assistantships. Continuation of support is based on academic standing and research accomplishments, and may be terminated after written notification by the Graduate Committee for lack of acceptable progress in either area. Support will continue for no more than 5 years beyond the BS or 3 years beyond the MS. Requests for continued support must be made in writing to the Graduate Committee.

### **PhD qualifying examination and research proposal review**

Within 18 months following completion of requirements for the Master of Science degree or arrival at Clarkson (whichever is later), the student must complete a "Doctoral Research Proposal" and submit this proposal to the Examining Committee. For students with a BS degree who, because of demonstrated exceptional abilities, are permitted to seek direct entry into the PhD program, the proposal must be completed within 18 months of entry into the PhD program. The student must meet with the Examining Committee as early as possible after being admitted to the PhD program to discuss plans for the Research Proposal. No earlier than 1 full week subsequent to submission of the Research Proposal, the committee members and the student will meet to conduct a PhD qualifying examination. The student will formally present the contents of the proposal to the committee in the form of a seminar of approximately 30 minutes duration. The presentation will be followed by an oral defense of the proposed research and related topics.

The Examining Committee, which will also serve as the student's Doctoral Committee, will consist of a minimum of five members, including the student's thesis advisor and at least one faculty member from a department other than Chemical and Biomolecular Engineering. At least three of the committee members must be from Chemical and Biomolecular Engineering. At least four of the committee members must be on the Clarkson faculty. One or more external examiners, holding the PhD degree, may also serve on the Committee. The thesis advisor will recommend the names of prospective committee members to the Graduate Committee. The Graduate Committee, with the approval of the Graduate School, will appoint the Examining Committee. While the thesis advisor will serve as



the Chair of the Doctoral Committee, the advisor will not be the Chair of the Examining Committee. Hence, the advisor should also recommend a Chair to the Graduate Committee. The research proposal itself should represent eighteen months effort in defining a problem, reading pertinent literature, specifying plans for theoretical and/or experimental work and writing the report. A Master's Thesis does not constitute a Doctoral Research Proposal, for which a suggested outline can be found in the Chemical & Biomolecular Engineering Department Graduate Handbook. In particular, the proposal should stress the definition, importance and uniqueness of the problem. Based on each committee member's preference, either a hard or an electronic copy of the proposal should be provided to each member at least one week prior to the qualifying exam.

If, subsequent to the qualifying examination and during the course of the doctoral research, the student or thesis advisor decides that a significant change in the direction of the research project is warranted, the student's Doctoral Committee should be so informed. A re-examination of the student will not be involved. In any event, it is recommended that annual meetings be held with the Doctoral Committee to review the student's progress and to agree on work remaining to be completed.

#### **ChBE Faculty**

*Elizabeth Podlaha-Murphy Chair; Professors: Sitaraman Krishnan, Richard J. '50 and Helen March Endowed Professor Selma Mededovic; Liya Regel and Bill Wilcox Distinguished Professor of Engineering Ross Taylor; Assistant Professors: Bethany Almeida, Yuncheng Du, Taeyoung Kim, Simona Liguori, Ian McCrum, Jihoon Seo; Emeritus Professors: S. V. Babu, Ruth Baltus, Richard McClusky, John McLaughlin, Shankar Subramanian*

## **Civil and Environmental Engineering (CEE) Programs**

*Steven Wojtkiewicz, Chair*

[swojtkie@clarkson.edu](mailto:swojtkie@clarkson.edu)

Graduate education in civil and environmental engineering concentrates in the following specialties:

1. Environmental Engineering
2. Infrastructure Systems and Materials (ISM)
3. Water Resources Engineering
4. Construction Engineering Management

### **MS Prerequisites**

BS, BE, or equivalent degree from an accredited program in Civil and Environmental Engineering or other engineering discipline is required. Applicants with degrees in disciplines other than engineering may be required to demonstrate proficiency through additional undergraduate coursework as determined by the departmental Graduate Committee. This may comprise an additional semester of study for which graduate credit cannot be granted.

No minimum grade point average is required for admission; however, a superior record of academic achievement is expected of all applicants.

### **Requirements for MS in Civil and Environmental Engineering Program (except Construction Engineering Management)**

1. 30 total credit hours with all coursework approved at the graduate level, which must include:
  - a. 18 credit hours of graduate coursework (500-600 level courses)
  - b. 2 credit hours of seminar work
  - c. Maximum of 10 course credit hours of transfer credit (grade of B or better).
2. Satisfactory completion of one of the following (a or b) for 10 credits.
  - a. A written thesis based on independent research;
    - i. All students must complete a thesis and defend it orally to a committee consisting of a minimum of three faculty members. The committee will be appointed by the student's advisor and approved by the graduate committee and the department chair. After approval by the examining committee, a thesis requires signature approval by the Dean of the Graduate School, and two copies of the thesis will be deposited in the University library.
  - b. An appropriate, professionally oriented special project and project supporting coursework;
    - i. All students must complete 2-3 project related 500 or 600 CEE level courses (totaling 6-9 credit hours) from Environmental, ISM, or Water Resources. All students must also complete a

Master of Science Project (totaling 1- 4 credit hours of work) under a project advisor. The project advisor will be selected through mutual agreement between the student, and the project advisor. At the completion of the project work, the student will prepare a formal report and submit it to the project advisor. When the report is approved by the advisor, the project credits will be formally granted.

3. Pass a group of core courses in one of the following professional specialties comprising a minimum of 15 credit hours: Environmental, Infrastructure Systems and Materials (ISM), or Water Resources Engineering.
4. All MS work to be completed within 5 years.

### **Requirements for MS in Civil and Environmental Engineering with focus in Construction Engineering Management**

*Erik Backus, Director of CEM*

[ebackus@clarkson.edu](mailto:ebackus@clarkson.edu)

1. 30 credit hours
2. Completion of three (3) core Construction Engineering Management Courses (totaling 9 credit hours):
  1. CE 506 Advanced Construction Engineering Management
  2. CE 510 Sustainable Infrastructure and Building
  3. CE 591 Special Topics in Construction Engineering Management
3. Completion of three (3) Civil Engineering electives (totaling 9 credit hours) from any CE coded course other than CE590, CE595, CE610, CE612, and/or CE684.
4. Completion of three (3) courses (totaling 9 credit hours) offered by the Reh School of Business through their MBA program(s).
5. Completion of a Master's Project (totaling 3 credit hours of work) under the oversight of the Director of the CEM Program. The CEM project advisor will be selected through mutual agreement between the Director of CEM, the student, and project advisor. At the completion of the project work, the student will prepare a formal report and submit it to the project advisor. When the report is approved by the advisor, the project credits will be formally granted.

### **Length of Program**

Full-time students may complete the degree in one year. Part-time students may complete the MS degree in CEM within three years.

## **Advanced Certificate in Construction Engineering Management (CEM)**

*Erik Backus, Director of CEM*

*ebackus@clarkson.edu*

The Certificate Program in Construction Engineering Management (CEM) provides a post undergraduate sequence of courses and subjects that deepen understanding in key construction engineering topics. Using a variety of methods, students engage with professionals, subject matter experts, and practitioners in the field, providing current working knowledge of the state of the industry.

<b>Required courses (9 credits)</b>	
CE 506	Advanced Construction Engineering
CE 510	Sustainable Infrastructure and Building
CE 591	Special topics in Construction Engineering Management

### **Program Length**

Most candidates complete their certificate program in 9 months to 1.5 years.

### **PhD prerequisites**

A MS degree from a program in Civil and Environmental Engineering or other engineering discipline is required for admission. Applicants with degrees in disciplines other than engineering may be required to demonstrate proficiency through additional undergraduate coursework as determined by the departmental Graduate Committee. This may comprise an additional semester of study for which graduate credit cannot be granted. No minimum grade point average is required for admission; however, a superior record of academic achievement is expected of all applicants.

### **Requirements for PhD in Civil and Environmental Engineering**

1. The following are minimum requirements:
  - a. 90 credit hours beyond the B.S.
  - b. 39 credit hours of coursework
  - c. 15 credit hours in the major field
  - d. 9 credit hours in the minor field
  - e. 6 credit hours from a department other than the one in which the student is housed (courses double listed in CE and another department do not count in these 6 credit hours)
  - f. 6 credit hours of seminar
  - g. At least half of the total credit hours (45) used to satisfy degree requirements, including Thesis credit, must be earned (while registered for PhD study) on Clarkson campus where the degree is to be granted.
2. Credit Transfer

- a. A maximum of 30 credit hours of transfer credit is allowed. These can be graduate-level coursework and/or research credits. Up to 10 research credits can be transferred towards a PhD. Transfer credits cannot fulfill the graduate seminar credit requirement.
  - b. Only graduate-level courses with a grade of B or better can be transferred towards program degree requirements. With the exception of research credits, pass/fail/satisfactory courses cannot be transferred to satisfy program degree requirements.
  - c. All courses/research hours that are being transferred must be verifiable with transcripts and must have credit hours associated with them. An official transcript showing the completion of courses must be on file with the Graduate School. There must be demonstrated credit equivalency between programs, and the transfer evaluator should be able to determine the course content equivalency based on the course description.
  - d. The advisor should serve as the official course transfer evaluator with endorsements from the graduate committee chair and the chair of the department, respectively.
3. All work to be completed within 7 years after the candidacy procedure is completed
  4. Pass a group of core courses in one of the following professional specialties comprising a minimum of 15 credit hours:
    - a. Environmental
    - b. Infrastructure Systems and Materials (ISM)
    - c. Water Resources

### **Advisory Committee, Preliminary Exam, Research Proposal, and Dissertation Defense**

Additional requirements in CEE for PhD students follow.

#### **PhD Advisory Committee**

The Research Advisor recommends the membership of the PhD Advisory Committee to the Department Chair and the Dean of Engineering for their approval. The committee must be appointed prior to the comprehensive examination. The Advisory Committee and the Research Advisor will approve the courses required to satisfy the students' minor. This committee must consist of five members qualified to sit on such a committee, at least one of which must be from outside the candidate's department. Normally, the Research Advisor will not act as Chair of the committee. The purpose of the committee is to provide guidance to the student for the coursework and research.

#### **PhD Comprehensive Examination**

Satisfactory completion of this examination must be done within two years of full-time study after admission to the PhD program. In CEE, the PhD Comprehensive

Examination consists of two parts: a comprehensive examination and a research proposal defense. The comprehensive examination should be taken within 18 months after entry into the PhD program. It will have a written portion consisting of a one-week take-home exam with access to research materials, and an oral portion to be administered by the Advisory Committee within one month after the conclusion of the written exam. In the event of failure of the written exam, the Advisory Committee may, at its discretion, elect not to administer the oral portion. The outcome of the exam is determined by a vote of the committee, with no more than one dissenting vote permitted for passage. Failure to pass the comprehensive examination twice is grounds for dismissal from the program.

The second part of the PhD Comprehensive Examination is the Research Proposal Defense Presentation. Within six months after the successful completion of the comprehensive examination or 24 months from matriculation, the Ph.D. student must submit and orally present and defend a research proposal to the Ph.D. Advisory Committee. This presentation may be administered simultaneously with the oral portion of the comprehensive examination. Upon successful completion of the Engineering PhD Candidacy Exam, the student is admitted to Candidacy for the Ph.D. degree.

**Core Courses in Professional Specialties**

Professional concentrations require a minimum of 15 credit hours of relevant coursework. The following core courses are required for each of the professional concentrations. Additional relevant courses may be necessary to complete 15 credit hours:

<b>Environmental Engineering</b>	
CE 579	Water and Wastewater Treatment Design or satisfied by an appropriate course as an undergraduate
CE 580 OR CE 577/CH 576/CM 576	Environmental Chemistry  Atmospheric Chemistry
CE 584	Chemodynamics
CE 582 OR CE 586	Environmental Systems Analysis and Design  Industrial Ecology

and one of the following:

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CE 681	Environmental Physico-Chemical Processes
CE 682	Environmental Biological Processes

**Infrastructure Systems and Materials**

**Choose 4 or 5 (depending on degree type) from the following:**

CE 501	Fracture Mechanics of Concrete Structures
CS 512	Structural Dynamics
CE 513	Elastic Waves and Non-Destructive Tests
CE 515	Foundations, Stability, and Retaining Structures
CE 516	Advanced oil Mechanics
CE 518	Soil Structure Interaction
CE 520	Computational Methods of Structural Analysis
CE 521	Advanced Mechanics of Composite Structures
CE/ME 527	Advanced Fluid Mechanics
CE 538	Introduction to Finite Element Method
CE 541	Bridge Engineering
CE 549	Experimental Methods in Structures
CE 551	Theory of Elasticity
CE 552	Advanced Strength of Materials
CE 553	Properties and Performance of Concrete Materials
CE 554	Continuum Mechanics
CE 556	Engineering Analysis
CE 563	Railroad Engineering
CE 622	Uncertainty Quantification and Optimization in Computational Mechanics
CE 631	Cement Chemistry

CE 633	Plasticity
ME 531	Computational Fluid Dynamics

### **Water Resources Engineering**

**Choose 4 from the following list:**

<b>CE/ME 527</b>	Advanced Fluid Mechanics
<b>CE 554</b>	Continuum Mechanics
<b>CE 569</b>	Watershed Analysis
<b>CE 570</b>	River Restoration
<b>CE 571</b>	Computational River Dynamics
<b>CE 572</b>	Advanced Open Channel Hydraulics
<b>CE 573</b>	Sediment Transport
<b>CE 574</b>	Ecohydraulics
<b>CE 575</b>	Coastal Engineering
<b>CE 576</b>	Hydraulic Engineering in Cold Regions
<b>ME 531</b>	Computational Fluid Dynamics

## **Faculty**

### **Environmental Faculty**

*Professors Michelle Crimi, Andrea Ferro, Stefan Grimberg, Thomas Holsen, Susan Powers, Shane Rogers; Assistant Professors Siwen Wang, Yang Yang*

### **Infrastructure Systems and Materials Faculty**

*Professors John Dempsey, Allen Gontz, Sulapha Peethamparan, Steven Wojtkiewicz; Assistant Professors Behzad Behnia, Lissette Fernandez, Xianda Shen, Robert Thomas, Suguang Xiao*

### **Water Resources Faculty**

*Professor Weiming Wu, Associate Professor Tyler Smith, Assistant Professor Abul Baki*



## **Construction Engineering Management (CEM) Programs**

*Erik Backus, Director of CEM*

[ebackus@clarkson.edu](mailto:ebackus@clarkson.edu)

### **MSCEM Prerequisites**

A Bachelor's Degree in the following or allied fields: Civil Engineering, Mechanical Engineering, Electrical Engineering, Construction Engineering, Construction Management, Engineering Management, Civil Engineering Technology, Construction Engineering Technology, Management, Business.

No minimum grade point average is required for admission; however, a superior record of academic achievement is expected of all applicants.

### **Requirements for MS in Construction Engineering Management**

*Erik Backus, Director of CEM*

[ebackus@clarkson.edu](mailto:ebackus@clarkson.edu)

The program requires the completion of 30 credit hours.

The masters core courses include (12 credit hours):

- Three CEM Courses (9 credit hours) that represent core topical areas. The following are presently those courses (subject to change based on current market conditions and/or research):
  - CE 506 Advanced Construction Engineering
  - CE 510 Sustainable Building & Infrastructure
  - CE 591 Special Topics in Construction Engineering Management
- CE590 Graduate Degree Completion Project (3 credit hours) under the oversight of the Director of the CEM Program. The CEM project advisor will be selected through mutual agreement between the Director of CEM, the student, and project advisor. At the completion of the project work, the student will prepare a formal report and submit it to the project advisor. When the report is approved by the advisor, the project credits will be formally granted.

Construction Engineering Management Elective Courses (18 Credit Hours). These include any CE coded course other than CE590, CE595, CE610, CE612, and/or CE684 and courses offered by the Reh School of Business through their MBA or MSEM program(s). An initial list of CEM elective courses includes:

- CE 502 Applications of Geospatial Analysis
- CE 505 Project Controls and Lean Methods in Construction
- CE 508 BIM for Prefab
- CE 541 Bridge Engineering
- EM 660 Financial Analysis & Cost Management
- EM 650 Operations Strategy & International Competitiveness
- OM 680 Strategic Project Management
- EM 640 Leading and Managing Organizations
- OS 657 Leading Organizational Change

- OS 666 Negotiations & Relationship Management
- EM 630 Law for Engineers
- EM 620 Enterprise Sustainability

### **Length of Program**

Full-time students may complete the degree in one calendar year. Part-time students may complete the MSCEM degree in CEM within three years.

### **Advanced Certificate in Construction Engineering Management (CEM)**

*Erik Backus, Director of CEM*

[ebackus@clarkson.edu](mailto:ebackus@clarkson.edu)

The Certificate Program in Construction Engineering Management (CEM) provides a post undergraduate sequence of courses and subjects that deepen understanding in key construction engineering topics. Using a variety of methods, students engage with professionals, subject matter experts, and practitioners in the field, providing current working knowledge of the state of the industry.

<b>Required courses (9 credits)</b>	
CE 506	Advanced Construction Engineering
CE 510	Sustainable Infrastructure and Building
CE 591	Special topics in Construction Engineering Management

### **Program Length**

Most candidates complete their certificate program in 9 months to 1.5 years.

### **Electrical and Computer Engineering (ECE) Programs**

*Paul McGrath, Chair of Electrical & Computer Engineering*

[pmgrath@clarkson.edu](mailto:pmgrath@clarkson.edu)

The Electrical and Computer Engineering department offers programs of study leading to the degree of Master of Science (MS) in Electrical Engineering on the Potsdam campus, and a professional Electrical Engineering Master of Science (MS) through the Capital Region Campus. The Potsdam campus offers a Doctor of Philosophy (PhD) in Electrical and Computer Engineering and an off-campus PhD option designed to assist qualified non-resident candidates.

Graduate courses cover a range of specialty areas which may be found in the University Course Catalog on the Student Administrative Services website. The specialty areas include: Power, Communications and Signal Processing, Data

Communications and Networks, Electronics, Computer Hardware, Computer Software, Biomedical Engineering, and Biometrics

### **MS Degree in Electrical Engineering Prerequisites (Potsdam Campus)**

BS or equivalent degree from an accredited program in Electrical, Computer or Software Engineering, or other engineering discipline is required. Applicants with degrees in disciplines other than engineering may be required to demonstrate proficiency through additional undergraduate coursework as determined by the departmental Graduate Committee. This may comprise an additional semester of study for which graduate credit cannot be granted. While no minimum grade point average is required for admission, a superior record of academic achievement is expected of all applicants. The MS degree is available on-campus or through online delivery.

### **MS Degree in Electrical Engineering Requirements (Potsdam Campus)**

1. 30 credit hours that include:
  - a. A minimum of 18 credit hours of graduate coursework (500-600 level courses)
  - b. A major portion (more than 50%) of the course work will be in the chosen research area
  - c. 2 credit hours of seminar work
  - d. Maximum of 10 credit hours transfer credit (grade of B or better)
2. Satisfactory completion of one of the research or professional experience components listed below. Please note all options may not be available in every program.
  - a. A written thesis based on independent research
    - i. A thesis submitted in partial fulfillment of the requirements for the Master of Science degree will be examined by a committee of at least three Clarkson faculty appointed by the student's department.
  - b. Passing a comprehensive examination
    - i. Exceptional students who have completed at least 40 credit hours of graduate coursework may take a comprehensive examination in partial fulfillment of the requirements for the Master of Science degree.
  - c. An appropriate, professionally-oriented special project
    - i. A project submitted in partial fulfillment of the requirements for the Master of Science degree that will be examined by a faculty member, or faculty-member committee, as approved by the appropriate academic administrator.

### **MS Degree in Electrical Engineering Prerequisites (Capital Region Campus)**

A BS in engineering or equivalent. Students applying from other disciplines will be handled on a case-by-case basis. Those students who are not fully prepared to

pursue graduate work in engineering may be required to take additional courses for which graduate credit will not be given. Admission to the MS program will be given only after the required prerequisite coursework has been completed

### **Additional Program Requirements and Procedures for MS in Electrical Engineering (Capital Region Campus)**

Students must complete 30 credits of course work and MS Graduate Project EE 699 (see below).

The Master of Science in Electrical Engineering Program requires a total of ten courses. Each student's program should include at least seven Electrical Engineering courses and up to three electives. The elective courses are selected from Engineering (Mechanical or Electrical), Computer Science, School of Business MBA Program, or the Business of Energy Program. A list of these courses may be found on the Capital Region Campus website. Not all courses from these areas are applicable; therefore all course selections must be approved by the graduate advisor before course registration. Each student must submit a program plan of study that is acceptable to the advisor before completion of the first course taken for graduate credit.

An option of replacing two of the ten courses with Research and Thesis courses requires departmental approval prior to beginning the program. Students not completing Research and Thesis courses are required to complete the MS Graduate Project in Electrical Engineering (EE 699). This is a non-credit, no-fee project that serves as the culminating experience of the MS in Electrical Engineering degree.

### **PHD Degree in Electrical and Computer Engineering Prerequisites (Potsdam Campus)**

An MS or ME degree from a program in Electrical Engineering or other engineering discipline is required for admission. Applicants with degrees in disciplines other than engineering may be required to demonstrate proficiency through additional undergraduate coursework as determined by the departmental Graduate Committee. This may comprise an additional semester of study for which graduate credit cannot be granted.

While no minimum grade point average is required for admission, a superior record of academic achievement is expected of all applicants.

### **PHD Degree in Electrical and Computer Engineering Requirements**

1. The following are minimum requirements:
  - a. 90 credit hours beyond the BS
  - b. 39 credit hours of coursework
  - c. 15 credit hours in the major field
  - d. 9 credit hours in the minor field

- e. 6 credit hours from a department other than the one in which the student is housed (courses double listed in ECE and another department do not count in these 6 credit hours)
- f. 6 credit hours of seminar
- g. 2 years of residency for on-campus students
  1. Students who matriculate in the off-campus PhD program are exempt from this residency requirement (see graduate catalog for details of the off-campus PhD program policy).
  2. A maximum of 30 credit hours transfer credit (grade of B or better).
  3. A minimum of 3 academic years of full-time study or the equivalent in part-time study.
  4. Must pass a PhD Comprehensive examination.
  5. Must pass a Candidacy examination.
  6. Must successfully defend a written PhD dissertation in front of the Research Committee.

### **PhD Research Committee**

Each PhD degree student must have a research committee of at least 5 committee members. The student's research advisor acts as the committee chair. At least 3 members must hold primary appointments at the rank of Assistant Professor or higher in the ECE Department, and at least 1 member must be a Clarkson faculty member from outside the ECE Department. Off-campus students may have a co-advisor, who holds a PhD in a relevant area, at the student's place of employment. The co-advisor can serve as the fifth member of the committee. On the recommendation of the faculty advisor, the ECE Graduate Committee, with the approval of the Graduate School, will appoint the Research Committee. The research committee must be appointed before the PhD comprehensive exam (see below) and is responsible for ensuring that the student has sufficient preparation appropriate for the degree.

The research committee members will:

1. Serve as members of the PhD comprehensive exam
2. Serve as members of the dissertation proposal defense committee
3. Serve on the final dissertation committee.

The student's committee has the responsibility to certify that the major field, minor field, and overall coursework is appropriate to the student's field of study. This must be done by the time of the approval of the student's research proposal.

### **PhD Comprehensive Examination**

All students must pass a comprehensive examination within one year of entering the PhD program or after the completion of 30 graduate credits, whichever comes later.

The comprehensive examination will provide students with an opportunity to demonstrate familiarity with their field of specialization required for the PhD study and their critical thinking skills.

The comprehensive examination will consist of a written research paper and an oral presentation of the research. The research paper must include a comprehensive and pertinent literature review and a broad overview of possible research topics. The student should demonstrate an ability to

1. Identify a number of relevant research papers,
2. Grasp key ideas in the papers, and
3. Replicate important results (derivation of equations, developing computer models, etc.).
4. The research committee will be responsible for organizing and administering the comprehensive examination.

At the conclusion of the comprehensive exam, the research committee renders one of the following decisions:

1. Pass
2. Fail

The research committee must inform the Graduate Committee chair, in writing, of the results of the comprehensive exam, by completing and submitting the ECE comprehensive Exam results form.

In case of a fail, the student will have a second opportunity to take the examination within six months of the first attempt.

If the student does not complete the comprehensive exam requirements within the time limits specified, the student will be required to withdraw from the program. In this case, the student can be granted the option of pursuing a Master of Science degree.

If a student does not wish to take the exam according to the above schedule but wishes to continue in the program, the student must petition the Graduate Committee for permission to take the exam at a later date. Petitions must be received well in advance of the required exam date. There is no guarantee that the Graduate Committee will approve such requests.

Students completing a Master of Science degree in the ECE Department at Clarkson University can combine the MS oral defense with the comprehensive exam.

### **Transfer of credits**

Within one year of entering the PhD program, any transfer of credits from other institutions must be completed, including the transfer of credits resulting from a Master's degree program. Any coursework must be noted as major, minor, or out of the department, as appropriate.

### **Candidacy Examination**

All students must satisfactorily complete the PhD candidacy procedure by defending a PhD research proposal within six months after the successful completion of the comprehensive examination or two years after entering the PhD Program, whichever comes later. Part-time students should complete the candidacy exam before completing 66 credits. Students will have two opportunities to get approval from the research committee.

The research proposal is intended to demonstrate that the student's research topic is suitable for the successful completion of dissertation research, and that there is a reasonable likelihood that the student can successfully complete the research. The research proposal is a written document that is examined by the committee and orally defended in front of the committee. At the conclusion of the oral exam, the committee will determine the exam results, either:

- i. Pass
- ii. Fail

The committee will inform the ECE Dept. Chair, in writing, of the results of the exam. A copy of this memo will be inserted into the student's file.

In the event that this exam is failed, the student will be required to withdraw from the program. In this case, the student can be granted the option of pursuing a Master's of Science degree.

If subsequent to passing the candidacy examination, the student or the thesis advisor decides to make a significant change in the research topic, the research committee should be informed in writing.

Exceptions to the departmental requirements must be approved by the Department's graduate committee and the department chair. This approval must be in writing and inserted into the student's file.

### **ECE Faculty**

*Professors: Erik Bollt, Ming-Cheng Cheng, David Crouse, William Jemison, Paul McGrath, Stephanie Schuckers, Daqing Hou; Associate Professors: Mahesh Banavar, James Carroll, Abul Khondker, Jack Koplowitz, Chen Liu; Assistant Professors: Faraz Hussain, Tuyen Vu, Yu Liu, Jianhua Zhang, Yazhou Jiang, and Masudul Imtiaz.*

## Mechanical Engineering Programs

*Dr. Brian Helenbrook, Chair*

[bhelenbr@clarkson.edu](mailto:bhelenbr@clarkson.edu)

The departmental graduate program in Mechanical Engineering is structured to provide the student with a series of goals to be attained in an orderly fashion throughout the course of study. The ultimate goal in this sequence is the granting of the Master of Science (M.S.) or Doctor of Philosophy (Ph.D.) degree, following a successful completion of the program. The general requirements of the Graduate School are described in the university catalog. The formal requirements for the M.S. and Ph.D. in Mechanical Engineering are set forth as follows:

### Requirements for the M.S. Degree

All requirements satisfy University requirements:

<https://www.clarkson.edu/graduate/mechanical-engineering> (Consult Clarkson Catalog for complete details)

### MECHANICAL ENGINEERING DEPARTMENT REQUIREMENTS

1. Prerequisites:
  - a. BS in engineering or equivalent. Students applying from other disciplines will be handled on a case-by-case basis. Those students who are not fully prepared to pursue graduate work in engineering may be required to take additional courses for which graduate credit will not be given. Admission to the M.S. program will be given only after the required prerequisite coursework has been completed.
2. Requirements:
  - a. Course work
    - i. 18 credits of course work. Clarkson may grant permission to transfer up to 10 graduate credit hours from an undergraduate degree. With approval of the Dean of the Graduate School, a maximum of 12 credit hours may be granted. The student must have passed the graduate course(s) with a minimum grade of B (or equivalent).
    - ii. 2 credits of seminar
    - iii. One credit of ME614 or ME616 may be replaced by ES 542 – Fundamentals of Research and Graduate Study
    - iv. At least two of the courses must have an ME designation.
    - v. At least one course must be a mathematics course. The following is a list of suggested courses:
      1. Any 500 level or higher math course (MA designator)
      2. CH561 Chemical Engineering Analysis
      3. ME515 Finite Element Methods
      4. ME529 Stochastic Processes in Engineering



- 5. ME554 Continuum Mechanics
    - 6. A good first class to take is CH561 Chemical Engineering Analysis. Other courses may also be acceptable with the written approval of the MAE Graduate Committee
  - vi. No more than two courses may be selected from the following group
    - 1. ME591 Selected Topics in Materials Engineering
    - 2. ME594 Selected Topics in Manufacturing
    - 3. ME618 Selected Topics in Heat Transfer
    - 4. ME628 Special Topics in Fluid Mechanics
    - 5. ME657 Selected Topics in Solid Mechanics
  - vii. At least 3 courses with a consistent theme that support study decided on between the student and faculty advisor for graduate credit [BH1]
- 3. Research/Project credits
  - a. Either:
    - i. 10 credits of ME 614 – Thesis/Dissertation with a MAE faculty advisor
    - ii. All students must complete a thesis and defend it orally to a committee consisting of a minimum of three Clarkson faculty members. The committee must be approved by the MAE Chair and CSOE Dean using the CSOE Graduate Committee Appointment form. The committee should be approved before the second semester of graduate study.
    - iii. Or
    - iv. 4 credits of ME 616 – Special Projects with a MAE faculty advisor
    - v. 6 credits of additional course work
    - vi. All students must complete a project with a written report approved by the Chair of the graduate committee. With the faculty advisor’s approval, students enrolled in industrially sponsored distance learning programs may accomplish 7 credits of project work and 21 credits of course work.
    - vii. Or
    - viii. By permission of the graduate committee chair, exceptional students may be allowed to proceed directly to the Ph.D.; such students will be awarded the M.S. upon completing 40 credit hours and passing the doctoral candidacy procedure (qualifying exam and proposal defense). The M.S. student has the option of continuing towards a Ph.D. degree if accepted into the Ph.D. program by the MAE Graduate Committee.

### **MS Prerequisites (Capital Region Campus)**

The objective of the Mechanical Engineering (ME) Program is to expand graduates' understanding and applications of solid mechanics, thermal-fluid systems, materials, and manufacturability to advance career opportunities in power systems, emerging energy technologies, and product design evolution. Students are encouraged to consider MBA and Business of Energy courses as electives to integrate business skills and complement technical expertise.

### **Requirements for MS in Mechanical Engineering**

30 credits of course work and MS Graduate Project ME 599 (see below)

The Master of Science in Mechanical Engineering Program requires a total of ten courses. Two of three core courses must be taken by all ME students: ME 502 (Engineering Analysis) is required by all students and one or both of the following: ME 501 (Transport Phenomena) or ME 500 (Elasticity). Of the remaining courses, six must be in the technical Mechanical Engineering major. The remaining courses are selected from Engineering (Mechanical or Electrical), Computer Science, School of Business MBA program, or from the Business of Energy Program. Not all courses from these areas are satisfactory selections; therefore all course selections must be approved by the graduate advisor before course registration. Each student must submit a program plan of study (to be approved by the advisor) before completion of the first course taken for graduate credit.

An option of replacing two of the ten courses with Master's Project or Research and Thesis courses requires departmental (Associate Dean) approval prior to beginning the program (as these opportunities are limited). Students not completing Master's Project or Research and Thesis courses are required to complete an MS Graduate Project in Mechanical Engineering (ME 599). This is a non-credit, no-fee project that serves as the culminating experience of the MS in Mechanical Engineering degree.

<b>ME Courses</b>	
<b>ME 599</b>	Master of Science Graduate Project in Mechanical Engineering
<b>Core</b>	
<b>ME 500</b>	Elasticity
<b>ME 501</b>	Transport Phenomena
<b>ME 502</b>	Engineering Analysis
<b>Material</b>	
<b>ME 506</b>	Mechanical Behavior of Materials

<b>ME 508</b>	Fracture Mechanics
<b>ME 513</b>	Processing and Selection of Engineering Materials
<b>Structural</b>	
<b>ME 509</b>	Current Approach to Fatigue in Design
<b>ME 516</b>	Finite Element Methods in Engineering
<b>ME 510</b>	Advanced Dynamics
<b>ME 512</b>	Vibrations of Discrete Systems
<b>Me 561</b>	Engineering Optimization
<b>Me 562</b>	Composites
<b>Fluids</b>	
<b>ME 563</b>	Dynamics of a Viscous Fluid
<b>ME 564</b>	Compressible Fluid Flow
<b>ME 565</b>	Combustion Fundamentals
<b>ME 566</b>	Fluid Dynamics of Turbo Machinery
<b>ME 572</b>	Advanced Fluid Dynamics
<b>ME 573</b>	Flow and Heat Transfer in Multiphase Systems
<b>ME 574</b>	Computational Fluid Dynamics
<b>Thermal</b>	
<b>ME 567</b>	Thermodynamic Analysis
<b>ME 568</b>	Thermal Energy Processes (Energy-Related)
<b>ME 569</b>	Conduction Heat Transfer
<b>ME 570</b>	Superconductivity (Energy-Related)
<b>ME 571</b>	Convection Heat Transfer
<b>ME 584</b>	Principles of Thermal Systems (Energy-Related)
<b>Misc.</b>	

<b>ME 560</b>	Linear Control Systems (Energy Related)
<b>ME 577</b>	Engineering Statistics
<b>ME 579</b>	Motor Acoustics
<b>ME 586</b>	Welding

### **Energy**

<b>ME 575</b>	Nuclear Engineering and Technology
<b>ME 581</b>	Fuel Cell Science and Hydrogen Engineering
<b>ME 582</b>	Photovoltaic Engineering
<b>ME 583</b>	Turbine Engineering
<b>ME 587</b>	Solar Energy Engineering
<b>ME 588</b>	Wind Energy Engineering
<b>ME 589</b>	Synchronous Generator Engineering
<b>ME 600</b>	Disruptive Technology (As elective only)
<b>ME 601</b>	Sustainability (As elective only)

### **Sample Electives**

<b>BOE 610, 611, 612, 613, 614, 615</b>	
<b>OM 607</b>	Global Supply Chain Management
<b>OS 603</b>	Leadership and Organizational Behavior

### **Additional School of Business MBA Core Courses and Electives**

#### **Program Length**

One and one-half – Two years (Full-time)

Two and one half – Three years (Part-time)

#### **Requirements for PhD in Mechanical Engineering (Potsdam Campus)**

##### 1. Prerequisites

- a. MS in engineering or equivalent. Students applying from other disciplines will be handled on a case by case basis.

2. Requirements;
  - a. Course work
    - i. A minimum of 39 credit hours of course work. Students may transfer in up to 30 credits of research and course work from an MS degree, with a grade of B or better. A graduate transfer credit/waiver request form must be approved by the graduate committee chair and department chair. For instances where no equivalent Clarkson University course exists, but the advisor deems the course worthy of transfer, a Special Graduate Topics course number may be used; e.g., ES 999, CM 999, CH 999, etc.
    - ii. No more than two courses may be selected from the following list. Previous Selected Topics courses taken to satisfy the MS degree requirements do not count against this restriction.
      1. ME591 Selected Topics in Materials Engineering
      2. ME594 Selected Topics in Manufacturing
      3. ME618 Selected Topics in Heat Transfer
      4. ME628 Special Topics in Fluid Mechanics
      5. ME657 Selected Topics in Solid Mechanics
    - iii. 6 credits of seminar
    - iv. At least two additional ME courses beyond the M.S. degree course requirements (part of the 39 course credit hours required).
3. Ph.D. Course Selection
  - a. Courses that a Ph.D. student takes to complete course requirements must be mutually agreed upon by the student and advisor. Students and advisors must define the major field of study (15 credits minimum) and minor field of study (9 credits minimum) on the Ph.D. Degree Program Form. The choice of major and minor field is at the discretion of the advisor.
  - b. With the advisor's consent, a student's minor field could be innovation and entrepreneurship through the Clarkson School of Business. This can be satisfied by completing three of the following four courses:
    - i. OM676 Developing and Managing Technology
    - ii. SB613 Entrepreneurship and New Venture Creation
    - iii. MK689 New Product Marketing
    - iv. OM680 Strategic Project Management
4. Graduate Committee Selection (within the first year of study)
  - a. In order to provide guidance to Ph.D. students, a Degree Committee must be selected within one year of entry into the Ph.D. program and prior to the student's Research Proposal defense. In consultation with the student, the Committee will be selected by the student's Major Professor, who also serves as the dissertation advisor. Approval for the Degree Committee must be obtained from the MAE Department Chair and the Dean of the Graduate School.

- b. The Committee will consist of a minimum of five members, of which a minimum of three must be faculty members from Clarkson's MAE Department and at least one must be from a department at Clarkson other than MAE. With the approval of the Provost, the fifth member may be any person with appropriate credentials from either inside or outside the University. This Committee will judge the technical competence of the Research Proposal, the dissertation and other oral presentations. With the Provost's approval, additional Committee members may be appointed from outside the faculty as necessary.
5. Qualifying Examination (within the first year of study, and after choosing the Graduate Committee)
- a. Both a written and oral qualifying examination based on general preparation in the major field must be taken at the first offering after the student completes one semester in the Ph.D. program. M.S. students may take the exam one time prior to completion of their M.S. thesis with written permission from their advisor. The written exam will be offered in January, with the oral portion to be scheduled no less than one week after completion of the written exam.
  - b. If a Ph.D. student fails any portion of the exam, studies cannot proceed until approval is obtained from the Department Chairman and from the Dean of the Graduate School. If a Ph.D. student fails the qualifying exam twice, the student will be dropped from the Graduate School.
  - c. The written qualifying examination is comprised of two separate exams:
    - i. Mathematics – all students must take this exam. Subject areas will include:
      1. Integrals of delta/heavyside functions
      2. Integration by parts, chain/product rule, Leibniz theorem, limits
      3. Line and surface integrals, complex integrals and contour integration
      4. Vector identities, indicial notation
      5. Divergence/Green's theorem
      6. Laplace transforms and applications
      7. First order ODEs:
        - a. linear constant coefficient inhomogeneous systems
        - b. Separable
        - c. Dimensionless
      8. Second order ODEs:

- a. constant coefficient homogeneous
    - b. Green's functions
  - 9. PDEs:
    - a. Separation of variables for steady and unsteady problems
    - b. Similarity solution
    - c. Fourier solution
  - 10. Linear algebra, eigenvalues/eigenvectors
  - 11. Taylor and Fourier series
  - 12. Calculus of variations
  - 13. Lagrange multipliers
  - 14. Numerical approximation: interpolation, integrals, derivatives
6. Subject exam – all students must take one subject exam
- a. Each subject exam has 3 major areas.
    - i. The advisor will identify the subject and major area of the exam that the student will take. Students must notify the graduate committee chair of the subject and major area of the qualifying exam that they will take before the October 31 that precedes the January examination date.
    - ii. The subjects and associated major areas are:
      - 1. Thermal Sciences (Fluid Mechanics/Thermodynamics/Heat Transfer)
      - 2. Material Science (Solid Mechanics/Materials/Manufacturing)
      - 3. Dynamics (Dynamics/Controls/Vibrations)
    - iii. A total of 3 problems will be assigned for each major area. Students must answer two questions within their major area, and one question from either of the two remaining areas.
    - iv. The problems will be open-ended, requiring students to draw upon various aspects of the major area. Grading will focus on the students ability to formulate a solution by making the necessary assumptions, applying appropriate equations/analysis, and reaching a reasonable answer.
7. Oral Exam
- a. No less than one week after the written exam is completed, an oral exam will be administered. The oral examining committee will consist of at least the student's research advisor and two members of the graduate committee.

- b. The student will be given the opportunity to explain their approach/justification for how they solved the problems on the written portion of the exam. The committee will also question the student to evaluate their decision-making process on the written portion of the oral exam. This is an opportunity for the committee to probe the level of understanding of the student, and also for the student to make-up for mistakes they may have made on the written portion. As such, students should be prepared to justify their solution approach, as well as explain what they would do differently, and how, if they were to answer the problems again.
- 8. Research Proposal Defense Examination (within 24 months, and after passing the qualifying exam)
  - a. A formal written and oral presentation of a Research Proposal must be made to the Degree Committee within two years after enrollment in the Ph.D. program. It is also required that the written and oral proposal be completed at least one year prior to the completion date of the research work. The primary purpose of the research proposal defense examination is to provide an opportunity for the Degree Committee to evaluate the technical competency of the student and the scientific merit of the proposed research, and to make critical but constructive suggestions regarding the proposed work. The written proposal may be brief, but must clearly describe the justification for the work (i.e., an introduction), the research methods/analysis to be performed (i.e., methods), research performed to date (i.e., preliminary results), and the proposed research plan that will carry the student to completion. It is required that the proposal be distributed to the Degree Committee at least one week prior to the formal presentation. The oral presentation should provide an overview of the written proposal. The Degree Committee must approve the written and oral Research Proposal for successful completion of the proposal defense examination.
  - b. Note: A student is considered a Ph.D. candidate after passing both the Qualifying and Research Proposal Defense Examinations.
- 9. Examination on the Dissertation
  - a. Before the final dissertation examination can be taken, the candidate must submit at least two peer-reviewed research articles to academic journals. At the time of the examination, these papers must be either under review or accepted by the journal.
  - b. A final dissertation based on independent research must be written, and an examination must be passed. The written dissertation must be



sent to the Graduate Committee members at least two weeks prior to the examination date. The final dissertation examination will include, as a minimum, an oral examination based on the dissertation. The candidate must give a presentation and defend his/her dissertation. The Degree Committee and the Dean of the Graduate School must approve the dissertation.

- c. The candidate must submit an announcement flyer to the MAE Graduate Coordinator at least one week prior to the dissertation examination. Prior to submission, the flyer must be approved by the advisor.
  - i. ir of the subject and major area of at least the student's research advisor and two members of the graduate committee.
  - ii. The student will be given the opportunity to explain their approach/justification for how they solved the problems on the written portion of the exam. The committee will also question the student to evaluate their decision-making process on the written portion of the oral exam. This is an opportunity for the committee to probe the level of understanding of the student, and also for the student to make-up for mistakes they may have made on the written portion. As such, students should be prepared to justify their solution approach, as well as explain what they would do differently, and how, if they were to answer the problems again.

## **Energy Systems Programs**

### **MS Prerequisites (Capital Region Campus)**

A BS in engineering or equivalent. Students applying from other disciplines will be handled on a case by case basis. Those students who are not fully prepared to pursue graduate work in engineering may be required to take additional courses for which graduate credit will not be given. Admission to the MS program will be given only after the required prerequisite coursework has been completed.

### **Program Objectives**

The objective of the Master of Science in Energy Systems is to enable students to integrate:

1. Mechanical/Electrical energy related courses
2. Mechanical and Electrical fundamental discipline courses; and
3. Non-technical courses regarding the impact of environmental, economic, and regulatory issues on energy

This is a technical degree focused on energy systems and related technology and the impact of our external changing environment on these technologies.

The engineering profession continues to require the understanding and application of technologies that complement each other in their product, system or service applications. Course offerings that include two disciplines (Mechanical/ Electrical Engineering) provide a student with the technical breadth/depth required to compete in the design, commercialization, and service associated with products related to emerging energy systems. Career growth may be additionally enhanced by a broad understanding of non-technical elements impacting change such as sustainability, the disruptive nature of new technology, and the Business of Energy.

The Master of Science in Energy Systems provides a balanced degree program of energy focused mechanical/electrical courses, fundamental discipline mechanical and electrical courses, and the broad understanding of related environment, economic, and regulatory issues.

### **Requirements for MS in Energy Systems**

The Master of Science in Energy Systems requires a total of 11 courses. Each student's program will include at least 5 to 9 energy related mechanical or electrical engineering courses, 2 to 3 non-technical Mechanical or Electrical energy-related and/or Business of Energy courses, and 0 to 4 fundamental technical Mechanical or Electrical engineering courses. Course selection should be approved by the graduate advisor before course registration. Each student should submit a program plan of study (to be approved by the advisor) before completion of the first course taken for graduate credit.

Courses taken should be selected from the following groupings:

### **Energy Systems Courses (Choose 5-9)**

#### **Cross-Listed Courses**

<b>EE 640/ ME 581</b>	Fuel Cell Science and Hydrogen Engineering
<b>EE 643/ ME 582</b>	Photovoltaic Engineering
<b>EE 657/ ME 560</b>	Linear Control Systems
<b>EE 683/ ME 583</b>	Turbine Engineering
<b>EE 684/ ME 588</b>	Wind Energy Engineering
<b>EE 685/ ME 587</b>	Solar Energy Engineering
<b>EE 686/ ME 589</b>	Synchronous Electrical Generators
<b>EE 687/ ME 575</b>	Nuclear Engineering

#### **EE Courses**

<b>EE 642</b>	Electronic Power Conversion
<b>EE 645</b>	Superconductivity
<b>EE 653</b>	Modeling and Control of Energy Conversion
<b>EE 658</b>	Digital Control Systems
<b>EE 680</b>	Power System Analysis I
<b>EE 681</b>	Power System Analysis II
<b>EE 682</b>	Electromechanical Energy Conversion

#### **ME Courses**

<b>ME 568</b>	Thermal Energy Processes
<b>ME 570</b>	Superconductivity
<b>ME 584</b>	Principles of Thermal Systems

### **Non-technical Energy Systems Courses (Choose 2-3)**

#### **Cross-Listed Courses**

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<b>EE 600/ ME 600</b>	Disruptive Technology
<b>EE 601/ ME 601</b>	Sustainability
<b>BOE Courses</b>	
<b>BOE 610</b>	Fundamentals of the Business of Energy
<b>BOE 611</b>	Planning and Operations of Power Systems
<b>BOE 612</b>	Power Markets
<b>BOE 613</b>	Deregulation & Restructuring
<b>BOE 614</b>	Electric Power Industry Economics and Finance
<b>BOE 615</b>	Challenges to Upgrading Aging Infrastructure

**Other Fundamental Technical Courses (Choose 0-4)**

**Cross Listed Courses**

<b>EE 602/ ME 577</b>	Engineering Statistics
<b>EE 606/ ME 579</b>	Motor Acoustics

**EE Courses**

<b>EE 644</b>	Solid State Electronics
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**ME Courses**

<b>ME 500</b>	Elasticity
<b>ME 501</b>	Transport Phenomena
<b>ME 502</b>	Engineering Analysis
<b>ME 506</b>	Mechanical Behavior of Materials
<b>ME 508</b>	Fracture Mechanics
<b>ME 509</b>	Current Approaches to Fatigue in Design
<b>ME 510</b>	Advanced Dynamics
<b>ME 512</b>	Vibrations of Discrete Systems

<b>ME 513</b>	Processing and Selection of Engineering Materials
<b>ME 516</b>	Finite Element Methods in Engineering
<b>ME 561</b>	Engineering Optimization
<b>ME 562</b>	Composites
<b>ME 563</b>	Dynamics of a Viscous Fluid
<b>ME 564</b>	Compressible Fluid Flow
<b>ME 565</b>	Combustion Fundamentals
<b>ME 566</b>	Fluid Dynamics of Turbo Machinery
<b>ME 567</b>	Thermodynamic Analysis
<b>ME 569</b>	Conduction Heat Transfer
<b>ME 571</b>	Convection Heat Transfer
<b>ME 572</b>	Advanced Fluid Dynamics
<b>ME 573</b>	Flow and Heat Transfer in Multiphase Systems
<b>ME 574</b>	Computational Fluid Dynamics
<b>ME 576</b>	System Modeling and Optimization
<b>ME 586</b>	Welding

**Program Length**

One and one-half – Two years (Full-time)

Two and one half – Three years (Part- time)

# **Engineering & Management Systems Program**

## **Program Objectives**

The objective of the Engineering and Management Systems program is to integrate engineering and computer science technologies with the components of MBA and/or Business of Energy. Students become architects of a multi-disciplined technical/management degree that provides the skills necessary to quickly develop products and move them toward commercialization.

The engineering professions continue to require the understanding and application of broadening technologies that complement each other in their product, system, or service application. Course offerings from all three disciplines (Electrical Engineering, Mechanical Engineering, and Computer Science) may be required to provide a student with their desired technical growth or parallel the direction of their industrial interests. Technical career growth may be additionally enhanced by supplementing strong technical fundamentals with management disciplines such as finance, marketing, operations, or other related business skills related to the energy industry.

The Master of Science in Engineering and Management Systems provides a balanced degree program of Engineering and Computer Science complimented by School of Business MBA Program and/or Business of Energy courses.

## **MS Prerequisites (Capital Region Campus)**

A BS in engineering or equivalent. Students applying from other disciplines will be handled on a case by case basis. Those students who are not fully prepared to pursue graduate work in engineering may be required to take additional courses for which graduate credit will not be given. Admission to the MS program will be given only after the required prerequisite coursework has been completed.

## **Program Length**

One and one-half – Two years (Full- time)

Two and one half – Three years (Part- time)

## **Requirements for MS in Engineering & Management Systems**

The Master of Science in Engineering and Management Systems Program requires a total of 11 courses. Each student's program will include 6 technical courses from School of Engineering and/or Computer Science (see below) and 5 courses from the School of Business MBA and/or Business of Energy programs. Not all courses from these areas are satisfactory selections; therefore all course selections should be approved by the graduate advisor before course registration. Each student should submit a program plan of study (to be approved by the advisor) before completion of the first course taken for graduate credit.

School of Engineering courses should be selected from the Mechanical and Electrical technical courses located in the requirements for the Master of Science Degrees in this catalog and/or the Computer Science courses listed below:

<b>Computer Science Courses</b>	
<b>CS 500</b>	Network & Systems Security
<b>CS 501</b>	Software Quality Management
<b>CS 502</b>	Business Intelligence
<b>CS 503</b>	Systems Analysis & Design Methods
<b>CS 504</b>	Enterprise Architecture
<b>CS 505</b>	Business Data Communications and Networking
<b>CS 506</b>	Engineering Statistics

School of Business Courses should be selected from the MBA Core courses and/or electives. Business of Energy courses should be selected from the Business of Energy Program Courses listed in this catalog.

The Master of Science in Engineering and Management Systems Program will not allow graduate work from another institution to be transferred toward completion of this degree program per the existing transfer policy noted elsewhere in this catalog unless specifically approved by the Dean of the School of Engineering.

## **Business of Energy Programs**

(Capital Region Campus – Online Program)

### **Program Objectives**

The Business of Energy graduate certificate program combines contemporary energy issues and related business principles to produce leaders well-versed in the energy marketplace. Students will gain an understanding of power generation, transmission, distribution and the market functions.

Working professionals and recent graduates seeking to advance their careers in professions associated with the energy industry are encouraged to apply. The program is designed for students from all academic backgrounds – including engineering, geosciences, law, business, policy and related disciplines.

### **Graduate Certificate Prerequisites**

A minimum of a bachelor's degree. Applications will be assessed on a case by case basis.

### **Requirements for Graduate Certificate in the Business of Energy Program**

The Online Graduate Certificate in the Business of Energy requires a minimum of 4 courses. The Fundamentals of the Business of Energy course (BOE 610) core course must be taken by all students. The remaining 3 courses must be from the 5 Business of Energy courses. To get the most out of the program, students are recommended to take all 6 BOE courses. Students interested in particular courses, but not the complete certificate, may take those courses with the approval of the program advisor.

<b>Business of Energy Courses</b>	
<b>BOE 610</b>	Fundamentals of the Business of Energy
<b>BOE 611</b>	Planning and Operations of Power Systems
<b>BOE 612</b>	Power Markets
<b>BOE 613</b>	Deregulations and Restructuring
<b>BOE 614</b>	Electric Power Industry Economics and Finance
<b>BOE 615</b>	Challenges to upgrading infrastructure

### **Program Duration**

One– Two years (full time or part-time)



## **Master of Science in the Business of Energy Program**

(Capital Region Campus – Online Program)

### **Program Objectives**

The objective of the Master of Science in The Business of Energy degree program is to combine contemporary energy issues and related business principles to produce leaders well-versed in the energy marketplace. Students will gain an understanding of power generation, transmission, distribution and the market functions.

The program graduates students with a comprehensive understanding of how business principles apply to power generation, transmission, distribution and consumption. The program blends contemporary energy issues and related business principles to create a focused learning experience designed to increase the student's competency to generate ideas, solve problems, and manage change and complexity in the challenging energy industry. It is designed for both working professionals and recent graduates, and the courses serve 2 functions:

1. Core program courses provide an understanding of the complexity of the integrated functions within the energy industry from fuel selection/ power production to end-user consumption; and
2. Business courses strengthen the students' competency in their professional discipline(s) for application within the energy industry sector

The program curriculum is delivered entirely online and taught by senior managers with years of experience in the energy business.

### **MS Prerequisites**

A minimum of a bachelor's degree. Applications will be handled on a case by case basis. Successful applicants will have backgrounds in engineering, business, sciences, law, policy or related disciplines who seek to advance their careers in professions associated with the energy industry.

### **Requirements for MS in the Business of Energy Programs**

The MS-BOE requires a total of 10 courses and a total of 30 credit hours. Each student's program should include 5 to 6 Business of Energy courses and 4 to 5 School of Business MBA Program Courses. The BOE 610 (Fundamentals of the Business of Energy) course must be taken by all students. Not all MBA Program courses are satisfactory selections; therefore all course selections must be approved by the graduate advisor before course registration. Each student must submit a program plan of study (to be approved by the advisor) before completion of the first course taken for graduate credit.

Students are also required to complete an MS Graduate Project in The Business of Energy (BOE 616). This is a non-credit, no-fee project that serves as the culminating experience of the MS in The Business of Energy degree.

### **Business of Energy Courses**

<b>BOE 610</b>	Fundamentals of the Business of Energy
<b>BOE 611</b>	Planning and Operations of Power Systems
<b>BOE 612</b>	Power Markets
<b>BOE 613</b>	Deregulations and Restructuring
<b>BOE 614</b>	Electric Power Industry Economics and Finance
<b>BOE 615</b>	Challenges to upgrading infrastructure

### **Sample Electives**

<b>OM 607</b>	Global Supply Chain Management
<b>OS 603</b>	Leadership and Organizational Behavior

### **Additional School of Business MBA Core Courses and Electives**

#### **Program Length**

One and one-half – Two years (Full-time)

Two and one half – Three years (Part-time)

# **INSTITUTE FOR A SUSTAINABLE ENVIRONMENT**

*Susan Powers, Director and the Spence Professor in Sustainable Environmental Systems*  
[spowers@clarkson.edu](mailto:spowers@clarkson.edu)

*Alan Rossner, Associate Director for Education*  
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## **About the Institute**

The Clarkson Institute for a Sustainable Environment is home to Clarkson's environmental and broader sustainability activities associated with research, interdisciplinary graduate and undergraduate degree programs, and outreach programs. The Institute was established to support Clarkson's long-standing expertise in this field and to increase interdisciplinary collaboration among faculty.

## **Mission Statement**

The Institute for a Sustainable Environment is a collaborative and multidisciplinary community that serves as the hub for the University's drive toward a sustainable world. We facilitate high impact learning experiences, foster transformative scholarship, and engage the campus and broader community in order to understand and address environmental and sustainability challenges.

The Clarkson Institute for a Sustainable Environment sponsors workshops, seminars, and student co-curricular activities to foster links among its affiliates and facilitate environmental activities. Faculty and students also participate in the interdisciplinary programs: BS-Environmental Science & Policy, BS-Environmental Health Science; MS-Environmental Policy; MS & PhD Environmental Science and Engineering. More information can be found in the Interdisciplinary Program sections of the catalog.

## **Institute Faculty**

The Institute for a Sustainable Environment is comprised of a small group of faculty fully and jointly-appointed in the Institute plus a large number (~70) of affiliated faculty from across the University. The expertise of these faculty spans nearly all fields and disciplines from Engineering, Natural and Physical Sciences, Social Sciences, Political Science, Business, and the Humanities.

## **MS and PhD in Environmental Science and Engineering**

Master's and doctoral degrees in Environmental Science and Engineering (ESE) span multiple disciplines to investigate how science and engineering interact with the environment in a broad context. This approach is necessary since the environment comprises complex, interacting biological, chemical, physical and social systems. It is essential to apply an interdisciplinary framework to understand how these systems function and the many ways environmental factors should be integrated into a comprehensive decision-making process. The unusually broad background of ESE graduates enables them to better understand how engineering and science impact policy decisions. The research-focused ESE degree programs provide a flexible framework for students to develop coursework and pursue research projects that fit their individual interests.

### **MS Prerequisites**

Students are expected to have completed at least 1 year of calculus, physics, and chemistry, have some background in Fluid Mechanics, and have obtained a BS, BE or equivalent degree from an engineering or science program.

### **Requirements for MS in Environmental Science and Engineering**

Students must take:

1. EV 532 (Risk Analysis),
2. Policy choice: one of - POL 570 (Environmental Policy) or POL571 (Energy Policy) or EC660 (Env. Economics)
3. Systems thinking choice: Either CE 586 (Industrial Ecology) or CE 582 (Environmental Systems Analysis and Design)
4. Two credits of seminar credit (EV610)
5. Elective courses following a theme subject to approval by the student's advisor AND the chair of the Graduate Committee. At least two of these electives must have an environmental or sustainability focus, as defined in the ISE Graduate Handbook. Thesis students must take at least 3 additional electives (9 credits); Project students must take 4 additional elective classes (12 credits)

Among all of the courses, at least 3 must be designated as Engineering courses. These are either any course offered by the Coulter School of Engineering, or other courses with significant engineering content, as determined by the Graduate Committee. Details are included in the ISE Graduate Handbook.

All students must complete either a Thesis or a Project. Students choosing to complete a Thesis must defend it orally to a Committee consisting of a minimum of 3 faculty members. Students choosing to complete a project must present their work on campus and have their project and presentation approved by their Advisor and at least one other faculty member affiliated with ISE. Thesis students must complete at least 6 credits of thesis work. Students choosing a Project must complete at least 4 credits towards this project. Projects are expected to be more substantial than a term project, but not

necessarily of the depth or breadth such as to be publishable in the academic literature. Projects may be related to a student's work in a professional context.

### **Program Length**

MS Students typically complete their degree in 18-24 months (thesis) or 15-20 months (project).

### **PhD Prerequisites**

Students are expected to have completed at least 1 year of calculus, physics, and chemistry. Most students enter the PhD program following completion of an MS degree. Exceptional students may be invited to proceed directly to the PhD. Such students will be awarded the MS upon completing 40 credit hours and passing the doctoral qualifying examination with a superior grade.

### **Requirements for PhD in Environmental Science and Engineering**

Students must take:

1. EV 532 (Risk Analysis),
2. Policy choice: One of - POL 570 (Environmental Policy) or POL571 (Energy Policy) or EC660 (Env. Economics)
3. Systems thinking course: Either CE 586 (Industrial Ecology) or CE 582 (Environmental Systems Analysis and Design)
4. Electives: Each student must take at least 5 additional electives (15 credits) following a theme of the student's choosing, subject to approval by the student's advisor AND the chair of the Graduate Committee. At least two of these electives must have an environmental or sustainability focus as defined in the ISE Graduate Handbook.
5. Six credits of seminar credit (EV610 or related seminar credits)

Among all of the courses, at least 3 must be designated as Engineering courses. These are either any course offered by the Coulter School of Engineering, or other courses with significant engineering content, as determined by the Graduate Committee. Details are included in the ISE Graduate Handbook.

PhD students must pass the candidacy exam within 24 mo. to be classified as a PhD candidate. A research proposal is then required within one year of candidacy. The final dissertation must be presented, reviewed and approved by a committee of at least five members.

### **Program Length**

PhD Students are expected to complete their degree in 3-5 years.

### **Faculty Affiliates**

Any ISE Faculty Affiliates can advise ESE graduate students. Recent advisors include: *Professors Susan Powers, Alan Rossner, Thomas Holsen, Andrea Ferro, Michelle Crimi, Tom Langen; Stefan Grimberg, Michelle Crimi, Selma Mededovic, Shane Rogers, Michael*

*Twiss, Weiming Wu; Associate Professors Stephen Bird, Tyler Smith; Assistant Professors: Susan Bailey, Beatrice Hernout, Yang Yang, Taeyoung Kim*

## **MS in Environmental Policy**

The interdisciplinary MS Degree in Environmental Policy provides a unique graduate experience in the policy aspects of environmental management. Graduates are prepared to be the next generation of environmental and energy policy analysts and experts who understand the complex socioeconomic and political processes that inform environmental outcomes – including the allocation of federal funding of environmentally-related research and the development of science-based environmental policy while taking into account the actions and interests of private sector firms and non-governmental organizations in the environmental arena.

### **MS Prerequisites**

Students are expected to have taken a course on American Politics or American Society (sociology) as well as an introductory course in environmental science and have obtained a BS, BE or equivalent degree from an accredited institution.

### **Requirements for MS in Environmental Policy**

All students must take:

1. POL 570 (Environmental Policy) or POL 571 (Energy Policy)
2. EC 660 Environmental Economics
3. A research methods course: one of SS 580 (Research Methods) OR EC 611 (Econometrics) OR CE502 (Applications of GIS) OR EV 591 Special Topics (Methods) under the direction of the advisor OR other methods course approved by the Graduate Chair
4. Additional elective courses following a theme determined by the student and approved by the advisor and the chair of the graduate committee. At least two of the electives must have an environmental or sustainability focus as defined in the ISE Graduate Handbook. Students completing a thesis must take at least three additional elective courses for a total of at least 18 course credits. Students completing a Project must take at least four additional elective courses for a total of at least 21 credits course work.
5. Two credits of seminar credit (EV610 or the equivalent)

All students must complete either a Thesis or a Project. Students choosing to complete a Thesis must defend it orally to a Committee consisting of a minimum of 3 faculty members. Students choosing to complete a project must present their work on campus and have their project and presentation approved by their Advisor and at least one other faculty member affiliated with ISE. Thesis students must complete at least 6 credits of thesis work. Students choosing a Project must complete at least 4 credits towards this project. Projects are expected to be more substantial than a term project, but not necessarily of the depth or breadth such as to be publishable in the academic literature. Projects may be related to a student's work in a professional context.

**Options for dual degrees:**

MS-EP and MBA, with 12 credits that count towards both degrees for a total of 50-52 credit hours,

MS-EP and MS Data Analytics, for which 9 credits can count towards both degrees for a total of 51 credits.

**Program Length**

Students are expected to complete their degree in 15-24 months.

**Faculty Affiliates**

Any ISE Faculty Affiliates can advise ESE graduate students. Recent advisors include: *Professors Susan Powers, Santosh Mahapatra; Associate Professor Stephen Bird, Christopher Robinson; Assistant Professors Camille Frazier, Courtney Johnson-Woods*

# **INSTITUTE FOR STEM EDUCATION**

*Kathleen R. Kavanagh, Director, [kkavanag@clarkson.edu](mailto:kkavanag@clarkson.edu)*

*Ben Galluzzo, Associate Director [bgalluzz@clarkson.edu](mailto:bgalluzz@clarkson.edu)*

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*Cindy L. Smith, Operations Manager [csmith@clarkson.edu](mailto:csmith@clarkson.edu)*

## **The Mission of the Institute for STEM Education (STEM Ed) is**

To combine disciplinary rigor with pedagogical science in outreach, teacher training, graduate student and faculty professional development to establish Clarkson University as a national leader in all aspects of STEM Education.

## **Vision**

STEM Ed will:

- Build a reputation of student achievement, exemplary pedagogy, and K12 outreach, STEM Ed will focus on engagement and workforce preparation,
- Support faculty across disciplines and campuses to create learning experiences and curriculum that support all undergraduate and graduate students to be successful beyond Clarkson.
- Deploy Clarkson values of collaborative and innovative STEM teaching and learning to impact undergraduate and graduate student recruitment, retention and education of students from diverse backgrounds and on teacher preparation for K-12 and college-level.

STEM Ed's current objectives include coordination and expansion of Clarkson's STEM Education activities:

1. Expand the TA training "boot camp" both internally and externally and develop an undergraduate TA training module
2. Outreach projects and new grant opportunities coordinated across all three campuses
3. Coordinate student work experiences in educational projects
4. Informal education
5. Academic Retention Programs (First Year Council etc.)
6. Bring the (mostly CRC-based) expertise in academic assessment and evaluation
7. Create and implement programs to support faculty in the classroom and improve learning experiences for Clarkson students
8. Dissemination of Scholarship of Teaching and Learning both on campus and in publications
9. Establish a Teaching Fellow program for Clarkson TA's and other graduate students wanting to pursue academic careers
10. Advise students in the pre-teaching minor

Through all of this, STEM Ed will further enhance Clarkson's reputation on the national and international stage.



# **THE EARL R. and BARBARA D. LEWIS SCHOOL of HEALTH SCIENCES**

*Lenn Johns, PhD, ATC, Dean*  
*ljohns@clarkson.edu*

The Earl R. and Barbara D. Lewis School of Health Sciences offers 4 health professions graduate degrees: Doctor of Physical Therapy (DPT), Master of Science in Physician Assistant Studies (MS-PAS), Master of Science in Occupational Therapy (MS-OT), and Master of Science in Bioethics. The clinical programs (PT, PA, and OT) are designed to prepare students to become highly skilled, entry-level healthcare providers who offer care through a patient centered approach that values interdisciplinary care and evidence based practice. Students and faculty of the programs contribute to the knowledge of their professions through interprofessional scholarship and practice. The clinical programs are located in Clarkson Hall, that houses state of the art facilities and equipment designed to provide a supportive and innovative learning environment. The Bioethics Program provides education, through the Master of Science and advanced certificates, preparing professionals for careers in clinical ethics, research ethics, and bioethics policy.

The School has two programs associated with undergraduate education, the Freshman Direct Entry program and pre-healthcare advising tracks. The Freshman Direct Entry program allows students to apply for acceptance into an undergraduate program of study while simultaneously applying to one of our three clinical graduate healthcare programs (PT, PA, OT). When accepted into the Freshman Direct Admit program, students are guaranteed a spot in their selected graduate program as long as they meet that program's prerequisite requirements (see detailed requirement for each program in the undergraduate programs). The pre-healthcare tracks provide students with additional advising and programming opportunities aimed to inform and prepare them for graduate school and a variety of careers in healthcare

## **Master of Science in Bioethics**

*Jane Oppenlander, PhD, Chair and Program Director*

[joppenla@clarkson.edu](mailto:joppenla@clarkson.edu) or [bioethics@clarkson.edu](mailto:bioethics@clarkson.edu) office 518-631-9905

Jointly offered by Clarkson and the Icahn School of Medicine at Mount Sinai, the mission of the Bioethics Program is to prepare students academically and professionally for the responsibilities of a practicing bioethicist. The program is designed to enhance the career and educational opportunities of those interested in such topics as end-of-life care and allocation of scarce medical resources, animal and human subjects research, and public health and health policy. Courses in the Bioethics Program are taught by practicing bioethicists with a range of scholarly expertise.

### **Application**

Applications can be submitted online at <https://gradapp.clarkson.edu/apply/> and will not be reviewed until all materials are received. A rolling acceptance policy is in effect and students may begin their program at the start of any of the four quarters.

Application requirements for the Bioethics Program are:

- Completed Online Application Form
- Resume
- Statement of Purpose
- 3 Letters of Recommendation
- Official Transcripts from all colleges attended
- For International Applicants, an English Proficiency Test is required. Minimum Test Score Requirements: TOEFL (80), IELTS (6.5), PTE (56) and Duolingo English Test (115).

The prerequisites for admission to the Bioethics Program are a bachelor's degree with a minimum GPA of 3.0.

### **Program Curriculum**

A hybrid model of education is employed with most courses conducted online, enabling students to train in bioethics without disrupting their professional and personal lives. These online courses are complemented by an on-site proseminar, practicum and capstone. The number of on-site courses required varies by specialization.

### **Master's degree in Bioethics**

The master's degree in bioethics consists of 39 credit hours of graduate coursework.

There are three specialization options within the bioethics degree:

- Clinical ethics
- Research ethics
- Bioethics policy

Our course sequence prepares students with a solid foundation in bioethics and practical skills to enter the healthcare workforce. The curriculum is designed around six key components:

1. A one-week, on-site proseminar that introduces students to fundamental topics in the field of bioethics.
2. Online history and theory courses that cover the basics of biomedical ethics, clinical ethics, research ethics, bioethics and healthcare policy, and law.
3. Elective courses that allow students to pursue areas of interest beyond the core bioethical concepts. Elective courses include: Neuroethics, Pediatric Ethics, Ethical Issues at End-of-Life, Reproductive Ethics, Managerial Epidemiology, and Contemporary Issues in Bioethics.
4. Competency-based online and on-site practicums which give students hands-on experience in the analytical, communication, mediation, organizational, political, and moral reasoning skills required of practicing bioethicists.
5. Personalized master's projects in which students work one-on-one with faculty supervisors to explore bioethical topics of interest in greater depth.
6. An on-site capstone assessment course in which faculty evaluate student mastery of the knowledge and skills taught.

***Bioethics Certificate Programs***

The Bioethics Program's certificates offer advanced training in bioethics without undertaking a full master's program. Certificate students may continue their studies by applying the certificate to the master's degree. Each certificate consists of 12 credit hours of graduate coursework. Certificate students specialize in one of the three areas.

**Clinical ethics**

The required courses for a graduate certificate in clinical ethics are:

BIE530	Bioethics and the Law
BIE590	Clinical Ethics
BIE610	Online Clinical Ethics Practicum
BIE620	Onsite Clinical Ethics Practicum

**Research ethics**

The required courses for a graduate certificate in clinical ethics are:

BIE555	Research Ethics I
BIE580	Research Ethics II
BIE611	Online Research Ethics Practicum
BIE621	Onsite Research Ethics Practicum

**Health Policy & Law**

The required courses for a graduate certificate in health policy & law are:

BIE510	Biomedical Ethics
BIE520	Healthcare Policy
BIE530	Bioethics and the Law
	One specialty course chosen by the student

**Program Length**

The master's degree can be completed full-time by taking three or more courses per term and part-time taking one or two courses per term. Graduate certificates can be completed in one academic year.

## **Master of Science in Occupational Therapy**

*Alisha Ohl, PhD, OT/L, Chair and Program Director*

*aohl@clarkson.edu or [ot@clarkson.edu](mailto:ot@clarkson.edu) office 315-268-4413*

### **Mission**

The Occupational Therapy Department at Clarkson University is committed to:

- Developing professionals with deep cultural sensitivity and innovative problem solving skills who will respond to current and emerging societal needs and improve the health and well-being of diverse individuals, groups, and populations.
- Expanding the knowledge base of the profession through interprofessional scholarship and practice.
- Serving the unique needs of rural and underserved communities.

### **Program Philosophy**

Occupations are the activities that bring meaning to the daily lives of individuals, families, and communities. Occupational therapy is guided by the belief that all individuals have a fundamental right and need to engage in occupations. We believe participating in meaningful occupations is integral to health and well-being and contributes to identity formation. We believe individuals have the right to live their lives with dignity throughout their lifespans, and that barriers to performance can be addressed with innovative solutions. We are committed to the use of occupations as both interventions and outcomes to promote the health and well-being of an ever changing-society.

### **Philosophy of Teaching and Learning**

The Clarkson University Occupational Therapy Department follows a constructivist philosophy of teaching and learning. Within constructivism, educational knowledge is developed using the construction metaphor. Students obtain knowledge and construct meaning from the discoveries they make during interactions with the instructional environment (i.e., instructional activities), and instructors design active learning experiences and promote discoveries. Several key assumptions provide a basis for our constructivist learning and teaching philosophy:

1. Knowledge is constructed upon knowledge. Students integrate new knowledge with previously learned material and their values, beliefs, experiences, and insights.
2. Learning is active. In order to construct meaning, learning involves the senses. Students need to engage with material in order to learn.
3. Learning is social. Learning is dependent upon students' connection and social interaction with the instructor and their classmates.

4. Learning is contextual. Learning takes place in multiple environments and is not limited to the classroom.
5. Learning requires continuous self-reflection and commitment to personal and professional growth.
6. Learning is lifelong.

Our curriculum is designed to build on prior knowledge and promote interactive learning within and between our cohorts of students. We create safe learning environments and use collaborative and interactive activities that engage students. We embrace the following teaching methods that are congruent with the constructivist teaching and learning philosophy.

1. Simulation, role-playing, modeling
2. Group work and presentations (e.g., World café; Think-Pair Share [TPS]; Socratic Circles)
3. Interactive lab activities
4. Interactive lectures
5. Interprofessional education
6. Peer to peer mentorship

### **Curricular Goals**

**Goal 1:** Students will be able to design and deliver humanistic, ethical and high quality, individualized occupational therapy services to individual clients and their family/caregivers in both individual and group treatment.

**Goal 2:** Students will understand and be able to respond with occupation based programs to contemporary and global issues affecting health, wellbeing and disability, with specific focus on unmet and emerging needs in rural and underserved populations.

**Goal 3:** Students will be able to integrate innovative, technological, imaginative art and educational resources into program planning, design, management and intervention.

**Goal 4:** Students will demonstrate the ability to reflect on science and technology, including their relationship to society, their impact on the environment and occupation, and demonstrate the capacity and commitment to grow as an individual and as a professional.

**Goal 5:** Students will collaborate skillfully with clients, inter-professional team members, and non-professional colleagues, families, and community members and demonstrate the important contribution of OT by doing good work.

### **Curricular Threads**

Clarkson's Occupational Therapy Program's "curricular threads" represent the themes that are interwoven throughout all of the coursework. They reflect the values and priorities of our program, as well as the unique philosophy and mission of Clarkson University.

### **Professional Identity**

Students will value and assume an identity of service and contribution, by promoting occupation and participation in multiple contexts through the identification of barriers to and providing supports for occupational roles and performance patterns.

### **Innovation**

Students will develop the ability to meet the needs of local, regional, and global society, including a focus on rural communities, through research and scholarship.

### **Technology**

Students will learn to engineer solutions through technology including telehealth, assistive technology, and virtual contexts.

### **Education & Research**

Students will develop problem-solving abilities through science-driven practice and the use of practice-based evidence, with a focus on occupation as both intervention and outcome.

### **Inter-professional Practice**

Students will exhibit strong leadership and collaborative skills as they assume roles of advocacy and activism for both clients and the profession.

### **MS Prerequisites**

Students must:

1. Complete a baccalaureate degree with a cumulative GPA of 3.00 or higher
2. Take the necessary prerequisite courses. The overall grade-point average in all prerequisite courses should be a minimum of 3.20 with no grade lower than a C. See list below for prerequisite courses.
3. Submit documentation of a minimum of 40 hours of observation/ volunteer or work experience under the supervision of an occupational therapist or occupational therapy assistant.
4. Submit 3 letters of recommendation. At least 1 must be from a faculty member who can speak to your academic or professional character and at least 1 letter must be from an occupational therapy practitioner . Letters from family, friends or clergy will not be accepted.
5. Satisfactorily complete the admissions process through OTCAS.

## Prerequisite courses for the MSOT Program at Clarkson University

General Psychology (3 credits)

Abnormal Psychology (3 credits)

Development Psychology (3 credits)

Statistics (3 credits)

Biology (in addition to A&P) (3 credits)

Physics or Kinesiology (3 credits)

Human Anatomy (3 credits)

Human Physiology (3 credits)

English Composition/ Critical Thinking (6 credits)

Social Sciences (Anthropology, Humanities, Philosophy, Sociology) (6 credits)

Recommended but not required courses:

Communication/ Public Speaking (3 credits)

Scientific Writing (3 credits)

### Application

Applications are made via the Centralized Application Service for Occupational Therapy (OTCAS) <https://portal.otcas.org>. A rolling acceptance policy is used. The class size is approximately 30 students.

### Program Curriculum

A Clarkson education prepares each student for today's world and tomorrow's challenges. Our occupational therapy curriculum provides a sequential progression and follows a cohort model, where students move through the curriculum together. The first semester provides a strong foundation in the basic sciences, research methods, theories and models, and the framework that guides the domain and process of occupational therapy practice. In subsequent semesters, students receive more advanced content related to the leadership and management of occupational therapy services, evidence-based practice, and professionalism. Students learn and practice hands-on skills through a series of experiential learning and bridge courses designed to provide opportunities to demonstrate competency and clinical reasoning across practice settings and with diverse individuals, groups, and populations. Starting in term III and continuing through term V, students receive specialized education in one of three track courses (i.e., technology, innovation, or research), which culminate with a



professional presentation and scholarly report. To enrich the didactic coursework, level I fieldwork occurs in Summer I (Term III) and Fall II or Spring II (Terms IV or V). After students have finished the didactic portion of their education and possess a strong declarative and procedural knowledge base for the practice of occupational therapy, level II fieldwork occurs in Summer II (Term VI) and Fall III (Term VII). The purpose of the level II fieldwork is to further develop students into competent entry-level occupational therapists.

### **Specialty Tracks**

Students will have the opportunity to pursue one of three Clarkson OT Specialty Tracks of study, which will allow them to become immersed in advanced study in their area of interest.

1. Technology for Health-Related Quality of Life Track: Students will become clinicians who can design and implement new products utilizing cutting edge technology to assist with client participation in desired activities.
2. Occupational Therapist as a Researcher Track: Students will become clinicians who can design and implement research studies that enhance the profession.

Innovative Practitioner Track: Students will become clinicians who can use innovative principles and inter professional collaboration to design new products, new programs, or a new way of delivering occupational therapy services.

### **Fieldwork**

At Clarkson University, experiential learning plays a fundamental role in helping students make connections between the classroom and real-life practice. Initially, this begins informally through service-based learning projects, volunteerism and class assignments. As students enter the second year of the program, they complete several required fieldwork placements that provide them with strategic learning opportunities to prepare them for transitioning from the role of student to that of occupational therapist.

Our students will have the opportunity to complete two Level I Fieldwork placements while completing the didactic portion of the curriculum. Level I Fieldwork is intended to provide exposure to different populations and settings, to further develop professional behaviors, and to build the comfort and confidence that will be essential to success in Level II Fieldwork. Level I assignments may be with an occupational therapist or with other related professionals.

Upon completing all other coursework, students will be required to complete two 12-week Level II Fieldwork placements, which reflect Clarkson's commitment to innovation. Students will have the opportunity to immerse themselves in OT practice in both traditional settings, as well as those where OT is new or emerging. Students' unique interests, skills and areas of specialty are taken into account when assigning Level II placements to ensure a good fit.

Term I		Credits	Term II		Credits
OT 501	Basic Science: Gross Anatomy	4	OT 503	Basic Science: Neuroscience	4
OT 511	Basic Science: Development and Occupational Performance across the Lifespan	2	OT 533	Basic Science: Applied Kinesiology for OT's	2
OT 521	Basic Science: Mental Health and Occupational Performance	2	OT 553	Basic Science: Cognition and Occupational Performance	2
OT 531	Foundations in Occupation Based Practice	3	OT 563	Bridging Science to Adult Conditions and Assessments	2
OT 541	Foundations in Research	3	OT 583	Experiential Learning Lab I: Adult Assessment and Intervention Lab	3
OT 551	Foundations in Defining and Understanding Occupational Performance	3	OT 603	Engineering Health through Creativity, Craft and Analysis of Occupation	3
OT 591	Professional Seminar A: Professionalism in Occupational Therapy	2			
Total		19	Total		16

Term III		Credits	Term IV		Credits
OT 605	Engineering Pathway to Participation through Technology	2	OT 537	Bridging Science to Pediatric Assessment	2

OT 595	Professional Seminar B: Inter-professional Practice and Emerging Practice	2	OT 557	Bridging Science to Upper Extremity Rehabilitation	2
OT 630, 631, 632	Engineering your pathway through scholarship I	2	OT 567	Bridging Science to Adult Neuro Assessment and Intervention Lab	2
OT 700A	Fieldwork Experience	2	OT 587	Experiential Learning Lab II: Adult Neuro Assessment and Intervention Lab	3
			OT 597	Professional Seminar C: Specialty seminars in OT	2
			OT 640, 641, 642	Engineering your pathway through scholarship II	2
			OT 700b	Fieldwork experience	2
Total		8	Total		13-15
<b>Term V</b>		<b>Credits</b>	<b>Term VII</b>		<b>Credits</b>
OT 539	Professional Practice, Leadership, Management & Activism	3	OT 705	Fieldwork Level IIA	9
OT 549	Synthesizing Evidence and Practice to Become an Evidence Based Practitioner	3			

OT 579	Experiential Learning Lab III: Group Dynamics across Practice Settings	3			
OT 589	Experiential Learning Lab IV: Pediatric Intervention Lab	3			
OT 599	Professional Seminar D: Innovation and Advanced Cases	2			
OT650, 651, 652	Engineering your pathway through scholarship III	2			
OT 700b	Fieldwork Experience (either term IV or V)	2			
Total		16-18	Total	9	
<b>Term VII</b>					<b>Credits</b>
OT 710	Fieldwork Level IIB				9
Total					9

**Total Program Credits**

**92**

### Program Length

The Clarkson Occupational Therapy Program is a 7-trimester program.

### Program Sequence

Students are expected to complete the designated professional curriculum in the sequence specified. Each semester's course work is to be considered pre-requisite to the next semester. In order to be eligible to take a course, a student must pass all courses in the previous semester. There is no opportunity to change the order of the courses or the order of the fieldwork. Students are expected to complete each semester on time as a cohort. Student progression will be a function of successfully passing all required courses in a semester.

### Graduation Requirements

To graduate from the OT Program, and earn the Master of Science in Occupational Therapy degree (MSOT) candidates must:

1. Achieve a grade of C or better for all courses in the program.
2. Achieve a minimum overall GPA of 3.00 or better at program completion.
3. Successful completion of both levels of fieldwork.
4. Be recommended for graduation by the Program Chair and Clarkson University Faculty.
5. Students must have paid all debts to the school and be in good standing.

### **Accreditation**

The Clarkson University Master of Occupational Therapy program is accredited by the Accreditation Council for Occupational Therapy Education (ACOTE) of the American Occupational Therapy Association. ACOTE awarded the program a 7-year, full accreditation in August 2017. The next evaluation will be in 2023-2024.

ACOTE is located at 6116 Executive Blvd, Suite 200, North Bethesda, MD 20852-4929. ACOTE's telephone number is [301-652-6611 x2914](tel:301-652-6611), email is [accred@aota.org](mailto:accred@aota.org) and its website is <http://www.acoteonline.org>

Clarkson University is accredited by the Commission on Higher Education of the Middle States Association of Colleges and Schools, 3624 Market St., Philadelphia, PA 19104-2680, 215-662-5606. In addition, the University is accredited by the United States Civil Service Commission, and its curricula are approved by the New York State Board of Regents. The Occupational Therapy Program has been registered by the New York State Education Department.

Graduates of the program will be eligible to sit for the National Certification Examination for the Occupational Therapist, administered by the National Board for Certification in Occupational Therapy (NBCOT). After successful completion of this exam, the graduate will be an occupational therapist, registered (OTR). Graduation from an accredited program is a requirement of NBCOT for certification. It is also required for most states for licensing. For more information on the requirements for certification, see the NBCOT website at <http://www.nbcot.org/>. For more information on license requirements for New York State, see the New York State Education Department, Office of the Professions website at <http://www.op.nysed.gov/prof/ot/>.

A felony conviction may affect a graduate's ability to sit for the NBCOT Certification Examination or attain state licensure.

### **Faculty in Occupational Therapy**

*Clinical Assistant Professors: Brittany DiSalvo, Cindy Hammecker-McLean (AFWC), and Beth Randall.*

*Clinical Associate Professors: Ashleigh Graveline.*

*Associate Professors: Alisha Ohl ( PD), David Schelly.*

## **Masters of Science Physician Assistant Studies Program**

Joan Caruso, PA-C, Chair and Program Director, Clinical Associate Professor  
[pa@clarkson.edu](mailto:pa@clarkson.edu)

The mission of the Clarkson University Department of Physician Assistant Studies is to prepare exceptional, highly skilled clinicians who actively demonstrate the University's core values of teamwork, caring, integrity, diversity, service, growth and diligence while compassionately providing for the healthcare needs of their communities.

### **Program Goals:**

1. Produce highly skilled and compassionate health care providers licensed to practice medicine as part of a healthcare team.
2. Establish student competence in medical and evidence-based research through scholarly activity.
3. Develop in students the professionalism, medical knowledge, and clinical skills needed to provide comprehensive care to diverse populations in a variety of clinical settings.
4. Instill in students the core values of Clarkson University, while fostering a commitment to community service.

The Department of Physician Assistant Studies will prepare individuals to become valued members of the health care team licensed to practice medicine with physician supervision.

*Department motto: a posse ad esse - from possibility to reality.*

### **Application**

Applications are made via the Centralized Application Service for Physician Assistants (CASPA) <https://portal.caspaonline.org/>. A supplemental Clarkson University PA program application will be required for qualified CASPA applicants. Deadline for applications through CASPA is January 15th. A rolling acceptance policy is being used. The class size will be approximately 30 students.

The prerequisites for admission are listed below. Be sure that you meet the Clarkson program prerequisites before submitting your CASPA application. This includes your score on the GRE and CASPer assessments. Please review the technical standards for the program. Those applicants who are invited to submit a supplemental application will sign a statement in that application that these standards can be met.

## **Clarkson PA Prerequisites**

1. Bachelor's degree from a regionally accredited college/ university
2. 2 semesters Human/ Animal/ Vertebrate Anatomy & Physiology or 1 semester of Human/ Anima/ Vertebrate Anatomy & 1 semester of Physiology – minimum 6 hours total
3. 2 semesters of Biology – 1 of which must be Microbiology (A&P cannot be used to fulfill the remaining course requirement) – minimum 6 hours total
4. 2 semesters of Chemistry (Organic Chemistry recommended) – minimum 6 hours total
5. 1 semester of Humanities/ Social Sciences – minimum 3 credits
6. 1 semester of Statistics – minimum 3 credits
7. 1 semester of Genetics – minimum 3 credits
8. 1 semester of Psychology (upper level recommended) – minimum 3 credits

The 10 prerequisites listed above must be completed or in progress at the time of application. Students need to earn a B or higher (B- is not accepted) in all of the prerequisite courses. A minimum overall, prerequisite, and science prerequisite GPA of a 3.25 or higher on a 4.0 scale is required. All prerequisite coursework must be completed at an accredited institution within the United States or Canada.

Three letters of reference. One reference needs to be completed by a clinician. It is recommended (but not required) to have a reference from a Professor.

Must have taken the GRE with official results sent to Clarkson University (CASPA code 0285). We do not have a minimum accepted score for the GRE; however, below are scores from our competitive applicants to our program:

- Verbal : 40th or higher percentile
- Quantitative: 40th or higher percentile
- Analytical Writing : 4 or higher

A minimum of 500 hours of patient care experience must be completed, documented and verifiable at the time of application. 700 hours must be completed by the January 15th deadline and a minimum of 1,000 hours of documented and verifiable patient care experience is to be completed by the time of matriculation. Patient care experience is considered by two factors, quality and quantity. A heavy emphasis is placed on the quality of the experience. The program defines quality as hands-on responsibility for the patient. Applicants with compensated hours of direct patient care experience will have an advantage. Shadowing or observation is not accepted as patient care experience or used towards your required hours.

Completion of the CASPer test that assesses non-cognitive and interpersonal characteristics important for successful students and graduates of the program and is used to complement the other applicant screening tools. Completion of the CASPer test

is required; results are valid for one admissions cycle. Plan your test date accordingly. Test dates are limited. Learn more at CASPer.

Applicants who studied extensively outside of North America will require formal evaluation of those transcripts by the World Education Service (WES). Completion of TOEFL will be required for those for whom English is not the primary language. This requirement may be waived if the applicant has a bachelor's, master's, or doctoral degree from a regionally accredited U.S. college/university. All prerequisite coursework must be completed at an accreditation institution within the United States or Canada. Ensure the technical standards can be met. Please review the standards prior to applying.

Simply meeting the prerequisites and submitting an application will not guarantee an interview or acceptance into the program. The admissions committee will decide which applicants are interviewed and which are selected for admission.

### **Technical Standards Requirements**

The abilities and skills which candidates and students *must* possess in order to complete the education and training associated with Physician Assistant education are referred to as "Technical Standards." These same abilities and skills are essential for clinical practice as a Physician Assistant. The Technical Standards listed below reflect five categorical areas: observation, communication, critical reasoning (intellectual), motor and sensory, and behavioral/social and represent minimum competence levels. Students must attest that they meet these Technical Standards prior to or at the time of matriculation to the Clarkson University Department of PA Studies. Students found to be in violation of Technical Standards are at risk for dismissal from the program. Each standard is defined below and is followed by examples of indicators of minimum competence in that area. Reasonable accommodation for persons with documented disabilities will be considered on an individual basis, but a candidate must be able to perform in an independent manner.

#### **Observation**

Candidates must have sufficient capacity to observe in the lecture hall, the laboratory, the outpatient setting and the patient's bedside. Sensory skills to perform a physical examination are required. Functional vision, hearing and tactile sensation are required to properly observe a patient's condition and to perform procedures regularly required during a physical examination such as inspection, auscultation and palpation.

#### **Communication**

Candidates must be able to communicate effectively in both academic and health care settings. Candidates must show evidence of effective written and verbal communication skills. Candidates must be able to communicate with patients in order to elicit information, describe changes in mood, activity and posture and perceive nonverbal communications.



Candidates must be capable of completing, in a thorough and timely manner, appropriate medical records and documents and plans according to protocol.

### **Motor**

The ability to participate in basic diagnostic and therapeutic maneuvers and procedures (e.g., palpation, auscultation) is required. Candidates must have sufficient motor function to execute movements reasonably required to properly care for all patients. Candidates must be able to move freely about patient care environments and must be able to move between settings such as clinics, classroom buildings, and hospitals. In addition, physical stamina sufficient to complete the rigorous course of didactic and clinical study is required. Long periods of sitting, standing, or moving are required in classroom, laboratory and clinical experiences.

### **Intellectual**

Candidates must be able to measure, calculate, reason, analyze and synthesize. Problem solving, one of the critical skills demanded of physician assistants, requires all of these intellectual abilities. Candidates must be able to read and understand medical literature. In order to complete the Physician Assistant Studies program, candidates must be able to demonstrate mastery of these skills and the ability to use them together in a timely fashion in medical problem-solving and patient care.

### **Behavioral and Social Attributes**

Candidates must possess the emotional health and stability required for full utilization of their intellectual abilities, the exercise of good judgment and the prompt completion of all academic and patient care responsibilities. The development of mature, sensitive and effective relationships with patients and other members of the healthcare team is essential. The ability to function in the face of uncertainties inherent in clinical practice, flexibility, compassion, integrity, motivation, interpersonal skills and concern for others, are all required. Candidates must be able to function effectively under stress and have the ability to accept constructive criticism and handle difficult interpersonal relationships during training.

### **Supplemental Application**

Candidates will be required to certify that they have read and understand the Technical Standards of the Department of PA Studies at Clarkson University and attest that they have no condition -as noted above- that would interfere, inhibit, compromise or distract from their participation in the program.

The supplemental application is in addition to the CASPA application. After verification of the CASPA application the program will review and invite qualified applicants to complete a supplemental application. Supplemental applications received that have not been requested by the program will be disregarded and will not be considered for

admission to the program. The supplemental application is to be completed only at the request of the program.

For the supplemental application to be completed, it will include:

1. The application form
2. Your personal statement answering the following: Identify why you feel the Clarkson University Physician Assistant Program will enhance your PA education in pursuit of becoming a highly skilled Physician Assistant.
3. Certification of meeting technical standards (form is in the application)
4. Reference letter from a practicing physician, Physician Assistant, or Nurse Practitioner if one was not included in your CASPA application (form is in the application)
5. The CASPA and supplemental application must contain a total of 3 reference letters. If additional letters are needed to meet the minimum requirement, submit additional letters with the supplemental application (form is in the application)
6. Official transcript for all coursework not verified in the CASPA application
7. Documentation of shadowing PA (form is in the application)
8. GRE – school code. Must be official scores reported by ETS directly to CASPA
9. \$50.00 application fee (made payable to Clarkson University)

All materials are to be mailed directly to Clarkson University at:

Clarkson University Department of Physician Assistant Studies  
Box 5882, 8 Clarkson Avenue  
Potsdam, NY 13699-5882

The supplemental application must be returned within 30 days of the request from the program. If the supplemental application is not received within thirty days the entire application will be closed and applicant status will be moved to withdrawn. Incomplete applications, applications received after the deadline, or applications received without the application fee will not be considered.

### **Program Curriculum**

The PA Program at Clarkson University is a professional degree program intended to prepare students academically and professionally for responsibilities and services as a Physician Assistant. This entry level master's degree program consists of 82 credit hours divided into three phases that span 28 consecutive months.

1. The Didactic phase is the preclinical year and spans 13 months.
2. The Clinical phase consists of 14 months of supervised clinical education and coursework
3. The Summative Phase consists of 1 month and consists of evaluation and preparation for the future as a graduate PA

The curriculum is structured so that courses from term two build on courses in term One, etc. Therefore, opportunities for transfer of credit into the PA curriculum or advanced placement are not available. Supervised Clinical Practice Experiences are distributed among 9 clinical field experiences or “SCPE’s”. These experiences form the basis of the clinical and socialization processes for adaptation to the roles and functions of a Physician Assistant. A separate 5-week elective is designed for student research.

<b>Spring I</b>		<b>Credits</b>	<b>Summer I</b>		<b>Credits</b>
PA 518	Laboratory & Diagnostics	1	PA 502	Clinical Medicine II	6
PA 501	Clinical Medicine I	6	PA 505	Basic Science II	2
PA 504	Basic Science I	2	PA 508	Pharmacotherapeutics II	3
PA 507	Pharmacotherapeutics I	3	PA 511	Patient Assessment II	3
PA 510	Patient Assessment I	3	PA 514	The Patient and the PA II	1
PA 513	The Patient and the PA I	1	PA 516	Medical Informatics	1
Total		16	Total		16
<b>Fall I</b>		<b>Credits</b>	<b>Spring II</b>		<b>Credits</b>
PA 503	Clinical Medicine III	6	PA 517	Clinical Procedures	2
PA 506	Basic Science III	2	PA 600	Supervised Practice-Ambulatory Medicine	3
PA 509	Pharmacotherapeutics III	3	PA 601	Supervised Practice-Internal Medicine	3
PA 512	Patient Assessment III	3			
PA 515	The Patient and the PA III	1			

Total		15	Total		8
<b>Summer II</b>		<b>Credits</b>	<b>Fall II</b>		<b>Credits</b>
PA 602	Supervised Practice – General Surgery	3	PA 605	Supervised Practice – Women’s Health	3
PA 603	Supervised Practice – Emergency Medicine	3	PA 606	Supervised Practice – Behavioral Health	3
PA 604	Supervised Practice - Pediatrics	6	PA 607	Supervised Practice – Elective I	3
Total		12	Total		9

### **Program Length**

Students must complete the program in 28 months unless granted a leave of absence for health or personal reasons. Any student that requests and is granted a leave of absence must complete the program in 40 months (28 month program plus 1 year).

### **Program Sequence and Advance Standing**

Students are expected to complete the designated professional curriculum in the sequence specified. Each semester's course work is to be considered pre-requisite to the next semester.

1. Students may not enter the program with advanced standing
2. Students are required to successfully complete, in sequence, all course work as full-time students
3. There is no opportunity to progress into an advanced semester
4. There is no opportunity to change the order of pre-clinical course work
5. Elective courses are limited to the clinical year

Students are expected to complete each semester on time as a cohort. Student progression will be a function of successfully passing all required courses in a semester. In the didactic phase of the program, any course failure after attempts at remediation will result in dismissal from the program. In the clinical phase, one rotation may be failed, but with remediation and a repeat of that rotation once only for the clinical phase. In that instance, the student's education may continue 5 more weeks. In the summative phase, the student must pass both the physical assessment exam and the comprehensive written final to pass PA 610 and to be recommended for graduation. If after remediation, a student cannot successfully pass either or both exams, they will not be recommended for graduation and will be released from the program.

### **Graduation Requirements**

To graduate from the PA Program, and earn the Master of Science in Physician Assistant Studies degree (MS) candidates must:

- Achieve a grade of C or better for all courses in the program
- Achieve a minimum overall GPA of 3.00 or better at program completion
- Successful completion of a multi-station OSCE/history and physical skills assessment by score
- Successful completion of the comprehensive written final exam by score
- Be recommended for graduation by the Program Chair and Clarkson University Faculty. This includes an evaluation of student professionalism.
- Submit IRB completion forms successfully
- Student must file the appropriate graduation application
- Student must have paid all debts to the school and be in good standing

### **Accreditation**

The program has been granted continuing accreditation by the ARC-PA as of March 2015. The program has also been registered by the New York State Education Department. Graduation from an accredited program is a requirement of states for licensing and healthcare systems for credentialing. Accreditation-Continued is an accreditation status. The granting of Accreditation-Continued is an accreditation status granted when a currently accredited program is in compliance with ARC-PA Standards. Accreditation remains in effect until the program closes or withdraws from the accreditation process or until accreditation is withdrawn for failure to comply with the *Standards*.

### **Physician Assistant Faculty**

*Clinical Associate Professor Joan Caruso (Dept. Chair), Clinical Assistant Professors: Christopher LaPoint, Katharine Matthis, Dawn White, Margaret Thibodeau, and Heather Munz; Assistant Professor: Tushar Sirsat*

## **Doctor of Physical Therapy**

*Barbara A. Tschoepe PT, DPT, PhD, FAPTA, Interim Chair/Visiting Professor*

Physical Therapy is a health discipline that applies movement science to maintain or enhance quality of life through movement, activity and social participation. Physical therapists evaluate, alleviate and prevent impairments, functional limitations, and disability from injuries, disease and other causes. Physical therapists serve as movement system experts who promote health within a dynamic and comprehensive health care environment while engaging in diagnosis and interventions, consultation, education and research at the individual, community and societal levels.

The mission of the Clarkson Department of Physical Therapy is:

To graduate physical therapists who emulate the core values of the profession in their physical therapy practice; and for faculty, graduates, and students to contribute to the profession, community, and society through education, scholarship, service, or practice.

### **Identity Statement:**

We seek to guide the next generation of movement experts by promoting the well-being of our local community and those all around the globe. Through a Problem-Based Learning curriculum and hands-on clinical experience, we promote leaders in physical therapy that make sound clinical decisions and implement feasible solutions. Our unique learning environment provides students tight-knit connections with their peers, faculty, and the community at large and the ability to take their expertise anywhere.

### **Doctor of Physical Therapy Application Requirements**

1. Completion of baccalaureate degree (B.S., B.A., etc.) prior to matriculation into the professional curriculum with an overall grade point average greater than or equal to 3.20.
2. Take all the necessary prerequisite courses with a grade point average greater than or equal to 3.20 and no grade lower than a C in these courses.
3. Submit documentation of a minimum of 50 hours of observation/volunteer or work experience in a minimum of two different physical therapy and/ or another healthcare settings, of which a minimum of 30 hours must be completed under the supervision of a physical therapist.
4. Submit three letters of recommendation. At least one must be from a physical therapist and one must be from a faculty member. None can be from family, friends, or clergy
5. Meet the technical standards of the Doctorate in Physical Therapy program, with or without reasonable accommodations

All applications to the doctor of physical therapy program *must* be submitted through the Physical Therapy Centralized Application Service (PTCAS) at [www.ptcas.org](http://www.ptcas.org).

## Prerequisite Courses

### 3 Biology courses

**BY 160/ BY 162** Cellular and Molecular Biology/ Lab (5 credits)

**BY 471/ BY 473** Human Anatomy and Physiology I/ Lab (5 credits)

**BY 472/ BY 474** Human Anatomy & Physiology II/ Lab (5 credits)

### 2 Chemistry courses

**CM 131 OR CM 103/105** General Chemistry I with lab (4 credits)  
Structure and Bonding with lab (5 credits)

**CM 132 OR CM 104/106** General Chemistry II with lab (4 credits)  
Chemical Equilibrium and Dynamics with lab (5 credits)

### 2 Physics courses

**PH 131/ PH 141** Physics I with lab (4 credits)

**PH 132/ PH 142** Physics II with lab (4 credits)

### 1 Statistics course

**STAT 282, 284, 318, 383** Statistics (3 credits)

### 2 Psychology courses

**PY 151** General Psychology (3 credits)

**PY 370** Developmental Psychology, Life Span (3 credits)  
(Recommended) Or any other 3 credit Psychology course

**Evidence of competence in Medical Terminology** (Course work available at [www.ed2go.com](http://www.ed2go.com))

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### Academic Learning Experiences

The DPT curriculum utilizes a problem-based learning (PBL) approach to education, providing students an active, exciting and effective way to learn. PBL is student-centered, collaborative, self-directed, and an active learning process based on patient case studies. Students are prepared for clinical practice and lifelong learning.

### Clinical Learning Experiences

Clinical experiences are integrated into the curriculum throughout the educational process. To prepare students optimally for clinical practice in a variety of clinical settings, Clarkson has established over 250 clinical partnerships across the country that offer select rotations to supplement academic learning experiences. Students participate in integrated part time and 4 full time clinical experiences throughout the curriculum in various types of clinical settings across different geographic locations to prepare for the multitude of clinical environments available to physical therapists post graduation.

### The DPT Curriculum

The DPT professional curriculum is a full-time program, starting in the fall semester. Each year is divided into three semesters (trimesters). The professional curriculum takes three years to complete, finishing in May of the third year.

Fall I		Credits	Spring I		Credit
PT 505	Foundational Sciences for Physical Therapy	9	PT 515	Cardiopulmonary/ Exercise Science	9
PT 506	Professional Foundations for Physical Therapy	2	PT 517	Professional Practice	2
PT 508	Literature Critique and Review	1	PT 518	Principles of Measurement and Testing	1
Total		12	Total		12
Summer I		Credits	Fall II		Credits
PT 525	Musculoskeletal Physical Therapy	9	PT 537	Professional Practice II	6
PT 527	Professional Practice Preparation	2	PT 604	Physical Therapy for Multiple Systems Disorders I	5



PT 528	Analytical Methods for Evidence Based Practice	1	PT 608	Research Methods	1
Total		12	Total		12

Spring II		Credits	Summer II		Credits
PT 614	Neuromuscular Physical Therapy	8	PT 616	Physical Therapy for Multiple Systems Disorders II	6
PT 613	Professional Practice III	1	PT 617B	Professional Practice IV	1
PT 617A	Professional Practice IV	1	PT 627A	Professional Practice V	5
PT 618	Research Practicum	1			
Total		12	Total		12

Fall III		Credits	Spring III		Credits
PT 627B	Professional Practice V	2	PT 667	Professional Practice VII	8
PT 645	Practice Management in the Autonomous Environment	8	PT 677	Professional Practice VIII	8
PT 648	Writing & Presenting Research	1			
PT 657	Advanced Clinical Skills	2			
Total		13	Total		16

**Facilities**

The Doctor of Physical Therapy (DPT) program is housed in Clarkson Hall. The Department of Physical Therapy supports health sciences education, clinical practice and research in physical therapy for the University and the community.

**Program Length**

Students complete the Doctor of Physical Therapy degree in 2 2/3 years or 8 consecutive semesters.

**Accreditation Status**

The Doctor of Physical Therapy program at Clarkson University is accredited by [the Commission on Accreditation in Physical Therapy Education \(CAPTE\)](#). The program was originally accredited on Nov. 16, 2001, reaffirmed on Oct. 28, 2009, and reaffirmed again on April 26, 2017. CAPTE is the sole accreditation agency for physical therapy programs in the nation. It is our policy to maintain accreditation, and our next site visit is scheduled for the fall of 2026. Licensure through the state is required for practice as a physical therapist. Licensure is gained through successful completion of the National Physical Therapy Examination offered by the Federation of State Boards of Physical Therapy following graduation.

**Physical Therapy Department Faculty**

*Visiting Professor/Department Chair: Barbara A. Tschoepe, Clinical Professor: Stacey Zeigler; Clinical Associate Professor: Dana McGuire ; Clinical Assistant Professors: Moshe Marko; Jaime Bicknell; Heather Shattuck; and Christopher Towler; Assistant Professors: Alicia Grosso and Kwadwo Appiah-Kubi*

## INTERDISCIPLINARY PROGRAMS

In recent years, Clarkson University has built on its existing strengths in business, engineering, liberal arts, and the sciences to develop and increasing number of new interdisciplinary majors that combine learning from two or more traditionally distinct areas. Today, many of the most profound advances in knowledge are occurring at the intersections of previously separate academic disciplines and industrial fields. These innovative programs reflect not only the strength of the University's academic faculty and resources, but also the flexibility and vitality of Clarkson's highly collaborative academic environment.

### Bioethics Program

*Jane Oppenlander, Assistant Professor and Chair of Bioethics*

[joppenla@clarkson.edu](mailto:joppenla@clarkson.edu)

### Program Curriculum

The Bioethics Program at Clarkson University and the Icahn School of Medicine at Mount Sinai is a professional degree program intended to prepare students academically and professionally for responsibilities and services as a bioethicist. The Master of Science in Bioethics (MSB) degree program consists of 39 credit hours and the Graduate Certificate program consists of 12 credit hours. The degree can be taken full time taking three or more courses per term or part-time taking one or two course(s) per term. There are three specializations within the Master of Science degree: Clinical Ethics, Research Ethics and Bioethics Policy. There are three Graduate Certificate specializations: Clinical Ethics, Research Ethics and Health Policy and Law.

Course Plan for a full time student in the MSB Clinical Ethics Specialization					
Summer		Credits	Fall		Credits
BIE 500	Proseminar in Health & Human Values	3	BIE 510	Biomedical Ethics	3
			BIE 590	Clinical Ethics	3
			BIE 630	Master Project I (Pass/Fail)	3
Total		3	Total		9

Winter		Credits	Spring		Credits
BIE520	Health Care Policy	3	BIE530	Bioethics & The Law	3
BIE 610	Online Practicum in Clinical Ethics	3	BIE 620	Onsite Practicum in Clinical Ethics	3
BIE 635	Master Project II	3	BIE 640	Master Project III (Tuition Waived)	3
			BIE 650	Capstone	3
Total		9	Total		12

\*Students must also take two electives of their choice with a total of 6 credit hours.

Course Plan for a full time student in the MSB Research Ethics Specialization					
Summer		Credits	Fall		Credits
BIE 500	Proseminar in Health & Human Values	3	BIE 510	Biomedical Ethics	3
			BIE 555	Research Ethics I	3
			BIE 630	Master Project I (Pass/Fail)	3
Total		3	Total		9
Winter		Credits	Spring		Credits
BIE 520	Health Care Policy	3	BIE 530	Bioethics & The Law	3
BIE 580	Research Ethics II	3	BIE 611	Online Practicum in Research Ethics	3
BIE 635	Master Project II	3	BIE 621	Onsite Practicum in Research Ethics	3

			BIE 640	Master Project III (Tuition Waived)	3
			BIE 650	Capstone	3
Total		9	Total		15

\*Students must also take one elective of their choice with a total of 3 credit hours.

<b>Course Plan for a full time student in the MSB Bioethics Policy Specialization</b>					
<b>Summer</b>		<b>Credits</b>	<b>Fall</b>		<b>Credits</b>
BIE 500	Proseminar in Health & Human Values	3	BIE 510	Biomedical Ethics	3
			BIE535	Medicine and Social Justice	3
			BIE 570	Foundations of Bioethics Policy	3
			BIE630	Master Project I (Pass/Fail)	3
Total		3	Total		12
<b>Winter</b>		<b>Credits</b>	<b>Spring</b>		<b>Credits</b>
BIE520	Health Care Policy	3	BIE530	Bioethics & The Law	3
BIE 525	Public Health Ethics	3	BIE 612	Online Practicum in Bioethics Policy	3
BIE 635	Master Project II	3	BIE 640	Masters Project III (Tuition Waived)	3
			BIE650	Capstone	3
Total		9	Total		12

\*Students must also take one elective of their choice with a total of 3 credit hours.

<b>Course Plan for a Graduate Certificate student in Clinical Ethics Specialization</b>			<b>Credits</b>
Fall	BIE 590	Clinical Ethics	3
Winter	BIE 610	Online Practicum in Clinical Ethics	3
Spring	BIE 530 BIE 620	Bioethics and the Law On-site Practicum in Clinical Ethics (first week of June at Icahn School of Medicine at Mount Sinai)	3 3

<b>Course Plan for a Graduate Certificate student in Research Ethics Specialization</b>			<b>Credits</b>
Fall	BIE 555	Research Ethics I	3
Winter	BIE 580	Research Ethics II	3
Spring	BIE 611 BIE 621	Online Practicum in Research Ethics On-site Practicum in Research Ethics (first week of June at Icahn School of Medicine at Mount Sinai)	3 3

<b>Course Plan for a Graduate Certificate student in Clinical Ethics Specialization</b>			<b>Credits</b>
Fall	BIE 510	Biomedical Ethics	3
Winter	BIE 520	Health Care Policy	3
Spring	BIE 530	Bioethics and the Law	3

One specialty course chosen from the following list:	BIE	Medicine and Social	3
	535	Justice (Fall)	3
	BIE	Research Ethics I (Fall)	3
	555	Empirical Research	3
	BIE	Methods (Fall)	3
	565	Clinical Ethics	
	BIE	Reproductive Ethics	
	590		
BIE			
	545		

**Graduation Requirements**

To graduate from the Bioethics Program, candidates must:

1. Achieve a minimum overall GPA of 3.00 or better at program completion
2. Be recommended for graduation by the Program Chair and Clarkson University Faculty
3. Have paid all debts to the school and be in good standing

Additionally, candidates for the Master of Science in Bioethics degree (MSB) must successfully complete the comprehensive Capstone Assessment by score or remediation.

**Academic Performance Standards**

Standards of acceptable performance (cognitive and psychomotor) for courses are communicated to students in writing via the syllabus and, for onsite courses, orally reviewed at the introduction of the course.

The policy of 3.00 or better in a graduate professional program has been adopted to better ensure student’s preparation for future sequential course work. Students will be given feedback at the completion of each exam.

Performance in didactic courses is commonly assessed by written exams, oral presentations and/or research papers, as well as final written (cognitive) exams. In designated courses, psychomotor performance may be assessed by target skill competency exams and small group exercises. During the didactic phase of the program, grades for cognitive performances will be recorded as a raw score and a

percentage. At the end of each course the percentage scores will be converted to a grade, A through F for each of the core Bioethics courses.

To remain in good academic standing, please refer to the academic standing section. Additionally, Clinical Ethics and Research Ethics students may not progress to the Onsite Practicum with a cumulative GPA of less than 3.00.

### **Program Length**

The majority of Master of Science students finish in three years and Graduate Certificate students in one year. Students must complete the program in 5 years unless granted a leave of absence for health or personal reasons. Any student that requests and is granted a leave of absence must submit a letter to the academic committee requesting a return to studies.

### **Bioethics Faculty**

*Adjunct Professor Rosamond Rhodes, Associate Director*

*Research Assistant Professor Paul Cummins*

*Adjunct Professors Robert Baker, Ellen Tobin Ballato, Lori Bruce, Patty Mayer, Kristin Oliver, Ilene Penn, Kathleen Powderly, Henry Sacks, Abraham Schwab, Marty Strosberg, Ilene Wilets*



## **MS in Computer Science Program**

*Alexis Maciel, Interim Chair, Department of Computer Science*

[alexis@clarkson.edu](mailto:alexis@clarkson.edu)

*Christopher A. Lynch, Graduate Committee Chair, Department of Computer Science*

[clynch@clarkson.edu](mailto:clynch@clarkson.edu)

The Department of Computer Science offers a graduate program leading to the degree of Master of Science (offered interdisciplinary with the Department of Electrical and Computer Engineering) in Computer Science. The program is designed to increase fundamental knowledge in computer science, provide a strong background in programming, prepare students for specialization in industry and research through taking targeted electives, and provide students with end-to-end problem solving through project development or research and thesis writing. The department provides the advantage of close personal association between graduate students and faculty, giving special attention to individual needs and interests.

### **MS Requirements**

In addition to the general requirements for the MS degree that are established by the University, a student is required to satisfy the following set of requirements:

1. A minimum of 30 credit hours of graduate level work
2. Each student's program of study must be approved by the Graduate Committee

Those students who are not fully prepared to pursue graduate work in computer science may be required to take the course CS 511, Foundations in Computer Science. In addition, students with very little to no background in computer science may be required to take undergraduate computer science courses, for which graduate credit will not be given.

Two options are offered, the non-thesis option and the thesis option .

### **Non-thesis option overview**

The non-thesis option requires a minimum of 30 credit hours, of which a minimum of 24 must be coursework and a minimum of 6 must be project work, done by taking a two-course project sequence consisting of CS 613 and CS 614, and culminating in a project in computer science with a project report.

### **Thesis option overview**

A minimum of 30 credit hours, of which a minimum of 18 must be coursework, a minimum of 2 must be seminar credits, and 10 must be thesis work, done by taking thesis credits under course number CS 634.

### **Common Requirements Across the Thesis and Non-thesis Options**

The following requirements are common to both options, and provide foundational knowledge and breadth of knowledge in programming:

1. 1 foundation course: CS 547 Computer Algorithms.
2. 2 courses that qualify as requiring a substantial amount of programming.

Students are advised to consult the Graduate Committee of the Department of Computer Science to obtain a full listing of courses that qualify as requiring a substantial amount of programming. Under certain circumstances, the Graduate Committee may waive the requirement that the student take one or more of the above courses. Students are recommended to consult the Graduate Committee to determine if and what requirements can be waived. For each course waived, students will be required to take an alternate course in its stead in order to fulfill the requirement for 18 credit hours of coursework.

### **Additional Program Requirements for the Non-thesis Option for MS in Computer Science**

1. At least 5 restricted elective courses will be taken from the courses offered in the Computer Science or Electrical and Computer Engineering Departments. Of these 5 courses, 1 must be a computer engineering course with relevant emphasis on computer science topics. 4 are recommended to be courses that focus on attaining specialization in a field of computer science. The department has strengths in theory, artificial intelligence, software, graphics & visualization, security, systems, and network. Students are advised to consult with the Computer Science Graduate Committee to determine appropriate specialization courses for the area of the student's interest.
2. Project work credit will comprise of a minimum of 6 credit hours, and will involve working on a two-semester project done by taking a 2-course sequence (CS 613 and CS 614). Project ideas from all faculty affiliated with the program will be made available to MS students. The student will be responsible for submitting an end-to-end implementation of a project in computer science, together with a project report. The report will be turned in to the Computer Science Graduate Committee for evaluation.

### **Additional Program Requirements for the Thesis Option for MS in Computer Science**

1. At least 3 restricted elective courses will be taken from the courses offered in the Computer Science or Electrical and Computer Engineering Departments, as selected by the student and their advisor. Of these 3 restricted elective courses, 1 must be a computer engineering course with relevant emphasis on computer science topics. Of the remaining 2, 1 must be a 600-level course that focuses on research topics in computer science, and it is recommended that the courses be in a focused area of specialization. Students should consult with their advisors to identify courses in these categories.
- 2 seminar credits: To earn a seminar credit, students must enroll in a seminar course in Computer Science (CS 707 and CS 708).
- Thesis credit will comprise a maximum of 10 credit hours of the 30 credit hour minimum. All students must have a research advisor by the end of their first semester of study and must submit a research proposal to the Examination Committee by the end of the semester before they plan to graduate. The research advisor will be a faculty member in the Department of Computer Science, or affiliated with the department through a courtesy appointment. The department has strengths in theory, artificial intelligence, software, graphics & visualization, security, systems, and networks. An overview of research areas in the department can be found [here](#). The Examination Committee shall consist of a minimum of 3 faculty members. All students must complete a thesis and defend it orally to their Examination Committee. 2 copies of the completed thesis must be submitted to the University.

### **Program Length**

All work done for the master's degree in computer science is to be completed within five calendar years, although it is normative to complete the non-thesis option in 1 to 1.5 years, and the thesis option 1.5 to 2 years.

### **Computer Science Faculty**

Professors Daqing Hou, Christopher Lynch, Jeanna Matthews, Christino Tamon, Chuck Thorpe; Associate Professors Natasha Banerjee, Sean Banerjee, Alexis Maciel; Assistant Professors Shafique Chaudhry, Soumyabrata Dey, Faraz Hussain

## **Applied Data Science MS**

*Boris Jukic, Co-Director of Data Analytics & Professor of Operations & Information Systems*

[bjukic@clarkson.edu](mailto:bjukic@clarkson.edu)

*Joseph Skufca, Co-Director of Data Analytics & Professor and Chair of Mathematics*

[jskufca@clarkson.edu](mailto:jskufca@clarkson.edu)

*Daqing Hou, Co-Director of Data Analytics & Professor and Director of Software Engineering*

[dhou@clarkson.edu](mailto:dhou@clarkson.edu)

The MS-Applied Data Science degree provides students with the skills to be effective professionals in a highly sought-after field of identifying, acquiring, managing, presenting, analyzing and interpreting large amounts of data in a variety of professional fields and organizational settings. The program offers close faculty student interaction with core courses ensuring that students acquire a common set of key critical skills in areas of data management, decision analysis, statistics, data mining and knowledge discovery. In addition, the program offers a variety of elective courses in various areas of data science and analytics from which students can build additional levels of proficiency and expertise. Upon completion of this program students will possess skills and demonstrate proficiency in the core areas of data analytics and will be able to apply them to one or more specialized contexts of business, engineering or science. Students will develop a deep understanding of how to identify and satisfy data requirements of a variety of stakeholders, working closely across organizational boundaries to create, analyze and present valuable information. Their acquired expertise will enable them to manage, review, analyze, and evaluate data at a very advanced level for critical decision making purposes. These skills will enable them to secure positions in private enterprises as well as government and other institutions with job titles such as Data Analyst, Data Solution Analyst and Data Scientist, among many others.

### **Prerequisites**

The MS program requires completion of foundation courses in three specific areas: Calculus, Mathematical Statistics and Basic Programming. These courses can be completed as part of the regular undergraduate degree program or through pursuing the Summer Analytics Foundation program offered by this program, lasting from June to August preceding the start of the regular fall semester.

## **Degree Requirements**

The (36) thirty-six credits of the MS degree program consist of six three-credit core graduate courses, four three-credit graduate elective courses, and a six-credit capstone course based on a sponsored project work.

The core course titles are:

IA 510 - Database Modeling, Design and Implementation

IA 530 - Probability and Statistics for Analytics

IA 605 – Data Warehousing

IA 640 – Information Visualization

IA 650 -Data Mining

IA 651 – Machine Learning

Some of the core courses may be waived if the students can demonstrate that their previous undergraduate or graduate coursework contains equivalent material. In those cases, students will be required to take a greater number of elective courses to satisfy the 36-credit program requirement.

Graduate elective courses are offered in a variety of areas and they include but are not limited to the following:

IA 630 - Modeling for Insight

IA 626 - Big Data Processing and Cloud Services

IA 628 - Introduction to Big Data Architecture and Applications

CE 502 - Applications in Geospatial Analytics, Science, & Engineering

EM 680 - Decision Analysis and Risk Management

EM 620 - Introduction to Artificial Intelligence: Principles and Techniques

CS 502 - Business Intelligence

CS 503 - Systems Analysis and Design Methods

CS 570 - Deep Learning

CS 572 - Image Understanding

OM 680 - Strategic Project Management

MK 696 – Marketing Research Methods

EC 611- Econometrics

ES 505 - Design of Experiments

EE 574 - Pattern Recognition

ME 529, Stochastic Processes for Engineers

CS 551 - Artificial Intelligence

CS 559 - Human Computer Interaction

EE 501 - Digital Signal processing  
CS 549 - Computational/Machine Learning

The electives list is not exclusive. We anticipate that students entering the program will have an interest in working in a focused area of data analytics. Students will build an individualized plan of study through the selection of course electives that align with their intended focus. Faculty advisor will work with individual students to choose proper electives by exploring all graduate courses offered in the curriculum of the different schools at Clarkson University.

IA690 - Capstone Project is a course centered on sponsored data analytics projects with interdisciplinary teams. Capstone projects, depending on project parameters could consist of a 2 unit seminar w/4 unit project (consistent with engineering curriculum as currently offered) and/or be a mentored capstone of 6 total units. Depending on the nature of the capstone and its sponsorship, projects could be on-site fieldwork intensive.

### **Program Length**

Expected program length for the MSDA (residential) is three semesters, but it can be extended and expected program length for the MSDA (distance) is (5) five semesters , but it can be extended.

## **Engineering Science Programs**

*William Jemison, Dean of the Wallace H. Coulter School of Engineering*

[wjemison@clarkson.edu](mailto:wjemison@clarkson.edu)

Clarkson University offers MS and PhD programs in Engineering Science for qualified students who desire interdisciplinary graduate study in engineering that does not fit within any of the four engineering departments shown below:

1. Chemical and Biomolecular Engineering
2. Civil & Environmental Engineering
3. Electrical & Computer Engineering
4. Mechanical & Aerospace Engineering

### **Requirements for MS in Engineering Science**

Students must have a BS in Engineering or Science (Chemistry, Computer Science, Math or Physics; other degrees considered on a case-by-case basis). Students must also have the minimum requirements of:

1. 30 credits beyond BS
2. 18 credits of graduate course work (12 credits in engineering)
3. An average grade of B or better by graduation, with an overall cumulative GPA of 3.00
4. 2 credits of seminar work (in engineering or science)
5. 6 credit hours of thesis
6. 20 of the 30 credit hours must be earned in residence
7. 1 academic year of full time study beyond the Baccalaureate

The research advisor must be a member of the Clarkson School of Engineering (CSoE) (may be a courtesy appointment).

MS Thesis Committee will consist of a minimum of 3 faculty members (PhD) with at least 2 from the CSoE.

### **Requirements for PhD in Engineering Science**

Students must have a MS in Engineering or Science (Chemistry, Computer Science, Math or Physics; other degrees considered on a case-by-case basis). Students must also have the minimum requirements of:

1. 60 credits beyond MS, 90 credits beyond the BS
2. 30 credits of graduate course work (minimum of 24 credits in engineering)
3. An average grade of B or better by graduation, with an overall cumulative GPA of 3.00

4. PhD Thesis committee must be a minimum of 5 faculty members (PhD) with at least 3 from the CSoE.
5. All work must be completed within 7 years after the candidacy procedure is completed
6. A maximum of 30 credit hours transfer credit (grade of B or better)
7. The research advisor must be a member of the CSoE (can be a courtesy appointment)

### **Sequence of Examinations**

1. Qualifying Examination: A written qualifying exam is required within 1 year of admission to the PhD program. The qualifying exam will be administered by the Chair of the student's PhD Committee or the researcher advisor's departmental graduate committee. The outcome of the exam is determined by a vote of the respective committees, with no more than 1 dissenting vote permitted for passage. Failure to pass the qualifying examination twice is grounds for dismissal from the program
2. Research proposal defense examination: Administered by PhD Thesis Committee within 1 year of passing the qualifying exam
3. Examination on the dissertation: Administered by PhD Thesis Committee at least 1 year after passing the proposal defense

### **Engineering Science Faculty**

*Please see the Faculty Directory for all Engineering Faculty*

### **Master of Science in Engineering Management**

*Misty Spriggs, Associate Director of Professional & Interdisciplinary Graduate Programs*  
[mspriggs@clarkson.edu](mailto:mspriggs@clarkson.edu)

Clarkson University's Master of Science in Engineering Management brings together world-class engineering and technology expertise with best practices in business to deliver an unparalleled education and an exceptional degree, specifically for rising engineering and technical professionals. Our mission is accomplished by focusing on the three areas key to professional education including curriculum & instruction, people, and learning environment.

### **MS Prerequisites**

The MS in Engineering and Management (MSEM) program requires an engineering/technical degree OR relevant experience in an engineering/technology based organization.



## **Requirements for MS in Engineering Management**

The thirty credits required for the MS in Engineering and Management consists of 10 courses, 7 core and 3 electives. Program courses are illustrated below:

### **Required core classes:**

Cost Management and Financial Analysis

Decision Analysis and Risk Management

Strategic Project Management

Operations Strategy and International Competitiveness

Negotiations and Relationship Management

Leading and Managing Organizations

Capstone Project

### **Elective classes:**

Advanced Construction Engineering

Sustainable Infrastructure and Building

Special Topics in Construction Engineering Management

Operations Management and Factory Physics

Law for Engineers

Advanced Topics in Supply Chain Management

Enterprise Sustainability

Introduction to Artificial Intelligence: Principles and Techniques

Leading Organizational Change

Optimization Methods

Marketing Management for Innovation

Database Modeling, Design, and Implementation

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Information Visualization

Data Warehousing

Modeling for Insight

Geospatial Systems

## **Quality Management and Process Improvement**

### **Program Length**

The program has two models: a 24-month part-time program model designed for working professionals and a 12-month full-time model designed for recent graduates and those in career transition.

### **More Interdisciplinary Programs**

For information on the Interdisciplinary Programs of Environmental Politics and Governance MS and the Environmental Science and Engineering MS and PhD, please refer to the Institute for a Sustainable Environment.

## **Materials Science & Engineering PhD Program**

### ***MSE Key Contact***

*Devon A. Shipp – Director of MSE*

*dshipp@clarkson.edu*

The Doctor of Philosophy (PhD) degree in Materials Science and Engineering (MSE) focuses on advanced materials and their application across the full spectrum of technical challenges around the world. The objective of this program is to offer students from diverse science and engineering backgrounds the opportunity to develop special competence in one or more of the MSE application areas and to demonstrate their ability to conduct research and add to the body of knowledge in materials science or materials engineering. This MSE program is designed to provide graduate students with an in-depth, fundamental understanding of metals/alloys, polymers, ceramics, composites, and advanced materials, as well, an understanding of the relationships among structure, properties and processing. Applications of advanced materials in areas of biotechnology, electronic devices, alternative energy, and the environment, are at the forefront of technology development. Companies such as Corning, General Electric, IBM, and GLOBALFOUNDRIES (to name only a few) and the Federal Government seek scientists and engineers with MSE degrees to sustain their competitive edge.

The MSE graduate program is administered through its Director ([materials@clarkson.edu](mailto:materials@clarkson.edu)), who works closely with the Dean of Engineering and the Dean of Arts & Sciences. The MSE graduate program is closely associated with Clarkson's Center for Advanced Materials Processing, whose mission is "to perform innovative research and conduct educational efforts on the synthesis and processing of advanced materials of interest to industry." PhD MSE students are advised and mentored by faculty from appropriate underpinning disciplines and/or faculty with MSE degrees and experience.

Given the complex nature of advanced materials an interdisciplinary program has been developed, underpinned by courses from several academic disciplines, including physics (PH), chemistry (CM), mechanical engineering (ME), chemical engineering (CH), electrical engineering (EE) and engineering science (ES).

Students seeking the MSE PhD must complete:

1. 30 hours of classwork (courses)
2. A comprehensive qualifying examination (usually taken in the 3<sup>rd</sup> semester of matriculation)
3. 54 hours of research, completing dissertation on an appropriate MSE topic
4. 6 hours of Seminar (MAE, CBS, Physics or CBE)

Students seeking a PhD in MSE may enter the program with either a MS/ME in MSE or one of the supporting disciplines or a BS/BE in MSE or in one of the supporting disciplines (mechanical engineering, chemical engineering, civil engineering, chemistry or physics). Those entering with a MS/ME degree may transfer up to 30 credit hours from the completed courses of their MS/ME program, if the MSE program director deems these courses equivalent to the courses listed below.

### **Requirements for PhD in Materials Science & Engineering†**

PhD students are required to take 10 courses (30 hours) from the 3 areas below.

#### **Materials Science Required core classes**

<b>MSE 551</b>	Advanced Characterization of Materials (3 credits)
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<b>MSE 560</b>	Advanced Materials Science and Engineering (3 credits)
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#### **Materials Properties and Applications (Select 4)**

<b>CM 530</b>	Colloids and Interfaces (3 credits)
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<b>CM 553</b>	Introduction to Biomaterials (3 credits)
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<b>CM 566</b>	Bioelectronics and Bionanotechnology (3 credits)
<b>CM 583</b>	Introduction to Polymer Science (3 credits)
<b>CM 584</b>	Functional Polymer Systems (3 credits)
<b>CM 585</b>	Nanostructured Materials (3 credits)
<b>CH 515</b>	Polymer Materials ((3 credits)
<b>EE 539</b>	Dielectrics (3 credits)
<b>EE 541</b>	Electronic Devices for IC Simulation (3 credits)
<b>ES 552</b>	Biomaterials and Biomedical Engineering Applications(3 credits)
<b>ME 503</b>	Additive Manufacturing (3 credits)
<b>ME 557</b>	Advanced Mechanics of Composite Materials (3 credits)
<b>ME 590</b>	Advanced Welding Metallurgy (3 credits)
<b>ME 591</b>	Selected Topics in Materials Engineering (3 credits)
<b>ME 595</b>	Principles of Physical Metallurgy
<b>PH 528</b>	Intermolecular Forces in Modern Nanotechnology
<b>PH 589/ EE 543</b>	Physics of Semiconductor Devices (3 credits)

### **Materials Processing and Characterization (Select 2)**

<b>CM 551</b>	Manufacturing Implications of Advanced Materials Processing (3 credits)
<b>ES 557</b>	Microelectronic Circuit Fabrication
<b>ES 564</b>	Corrosion Engineering (Spring semesters) (3 credits)
<b>ME 637</b>	Particle Transport, Deposition and Removal (3 credits)
<b>PH 636</b>	Scanning Probe Techniques in Soft Condensed Matter Physics

† Other courses not listed here may be credited toward the degree requirements by approval of the thesis advisor and the Director of the MSE program.

### **Program Length**

Students entering with an MS/ME may expect to reach completion of the program within three to five years. Students entering with a BS/BE may expect to complete the program within five years.

### **Materials Science & Engineering Faculty**

The program is multi-disciplinary in its approach and engages faculty from across the divisions of the School of Engineering and the School of Arts and Sciences to offer a diverse perspective on research and study relating to the Materials Science & Engineering curriculum. Please see faculty listings for Mechanical Engineering, Chemistry, Physics, Electrical and Computer Engineering, and Engineering Science.

## **Interdisciplinary Bioscience and Biotechnology Programs**

*Thomas Lufkin, Bayard and Virginia Clarkson Endowed Chair of Biology*

[tlufkin@clarkson.edu](mailto:tlufkin@clarkson.edu)

The Department of Biology offers graduate programs leading to the MS and PhD degrees in Interdisciplinary Bioscience and Biotechnology (IBB-PhD, IBB-MS). The goal of these programs is to train students with the skills needed to work on complex problems in the biosciences. To support this aim, the graduate program faculty includes biologists, chemists, physicists, mathematicians, and engineers who serve as dissertation advisors. The program also requires participation of social scientists and ethicists who teach graduate courses in bioethics. In addition to the general program requirements described below, students are expected to acquire a significant specialized body of knowledge in at least one of the following four areas of specialization to provide intellectual depth to their education: (1) Molecular Bioscience and Biotechnology, (2) Biomedical Sciences and Neuroscience, (3) Computational Biology and Bioinformatics, or (4) Ecology, Evolution, and the Environment.

The program faculty are engaged in research covering a wide range of subjects in Bioscience and Biotechnology. Expertise of core program faculty include developmental genetics, tissue regeneration, tissues and biomaterials, biotechnology, plant molecular biology, toxicology, microbial evolution, genomics, cell molecular biology, neurophysiology, pharmacology, bioinformatics, biomathematics, zoology and evolutionary parasitology, animal behavior, conservation biology, ecology, and limnology.

### **Requirements for Admission**

Applicants must possess a baccalaureate (4-year) degree in a Bioscience, Chemistry, or other Math, Science or Engineering affiliated-discipline that included coursework in cell & molecular biology, genetics, and organic chemistry.

Submitted application materials must include an official undergraduate transcript, statement of purpose including the names of 2-3 Biology faculty members who could serve as advisor, three letters of recommendation, and score results of the Graduate Records Examination (GRE) aptitude test. The GRE requirement may be waived for students with a Clarkson B.S. degree, at the discretion of the IBB Program Director. All international students for whom English is not a first language must submit a TOEFL or IELTS score unless their undergraduate or Master of Science degree was in the English

language. The admissions committee will select candidates on the basis of aptitude, programmatic needs, and overall excellence of academic qualifications.

### **Degree Requirements for the PhD in Interdisciplinary Bioscience & Biotechnology**

Clarkson University requirements include:

1. Completion of a minimum of 90 total credit hours including a minimum of 24 credits of coursework,
2. A minimum of 6 credit hours in research seminars, and
3. An original doctorate thesis research project submitted as a written dissertation defended orally and approved by a committee of five PhD faculty members

Specific Course Requirements for the Interdisciplinary Bioscience & Biotechnology (IBB) PhD Program include:

1. Two core courses in Cell and Molecular Biology (BY 580 and BY 582)
2. One Biotechnology or Molecular Biology lab course (BY 612 or CM 570)
3. Two specialization elective courses from one of four categories (Molecular Bioscience and Biotechnology; Biomedical Science and Neuroscience; Computational Biology and Bioinformatics; Ecology, Evolution, and the Environment)
4. One free elective course from any category
5. One course from the Computational Biology category, and
6. One course on Bioethics, Policy, or Law.
7. A minimum cumulative GPA of 3.0 in courses used to meet graduate requirements.

The IBB Program director maintains a list of courses that fulfill each category. For further details on the objectives, outcomes, and detailed requirements of the IBB-PhD program, please refer to the IBB Graduate Program Handbook.

### **Degree Requirements for the M.S in Interdisciplinary Bioscience & Biotechnology**

Clarkson University requirements include:

1. Completion of a minimum of 30 total credit hours including a minimum of 20 credits of coursework,
2. A minimum of 2 credit hours in research seminars,
3. A minimum cumulative GPA of 3.0 in courses used to meet graduate requirements, and
4. An original masters thesis research project or an appropriate professionally-oriented special project submitted as a written dissertation and defended orally and approved by a committee of three PhD faculty members.

Specific Course Requirements for the Interdisciplinary Bioscience & Biotechnology (IBB)

M.S. Program include:

1. Two core courses in Cell and Molecular Biology (BY 580 and BY582)
2. One Biotechnology or Molecular Biology lab course (BY 612 or CM 570)
3. Two free elective courses
4. One course Quantitative Skills Elective, and
5. One course on Bioethics, Policy, or Law.

The IBB Program director maintains a list of courses that fulfill each category. For further details on the objectives, outcomes, and detailed requirements of the IBB-MS program, please refer to the IBB Graduate Program Handbook.

Please see Detailed Degree Requirements for Clarkson University Graduate Program for more information.

**Program Length**

The PhD may be completed in a minimum of three years and a maximum of seven years of post-undergraduate study. The M.S. degree may be completed in a minimum of one year and a maximum of five years of post-undergraduate study.

**Interdisciplinary Bioscience and Biotechnology Faculty**

*Professors Tom Langen, Thomas Lufkin, Michael Twiss, Ken Wallace; Associate Professors Ali Boolani , Damien Samways, Shantanu Sur; Assistant Professors Susan Bailey, Beatrice Hernout , Ginger Hunter, Petra Kraus , Stefanie Kring, Michelle Yoo.*

Affiliated faculty include faculty in the departments of: Chemistry & Biomolecular Science, Chemical & Biomedical Engineering, Civil & Environmental Engineering, Electrical & Computer Engineering, Institute for a Sustainable Environment, Mathematics, Computer Science, Mechanical and Aeronautical Engineering, Physics, Physical Therapy and Psychology.



## **Master of Science in Environmental Policy (MS)/Master of Business Administration Dual Degree**

*Susan Powers, Director and the Spence Professor in Sustainable Environmental Systems  
spowers@clarkson.edu*

*Joshua LaFave, Director, Graduate Business Programs, Reh School of Business  
jlafave@clarkson.edu*

### **Program Description**

Clarkson's 2-year dual-degree program leading to a Master of Science in Environmental Policy (MSEP) degree and a Master of Business Administration (MBA) degree integrates the study of the function and management of complex environmental systems.

The MSEP course work prepares students to understand and negotiate the complex process of policy making in order to promote science-based environmental policy regulations (e.g., energy policies and decisions). Students learn about strategies to further an interest in a political, social, or economic outcome. They also learn how to develop policy within the public and private sectors.

The MBA program course work emphasizes teamwork, leadership, and managerial skills. Classes, projects, and other opportunities focus on development of effective communication skills, including oral, written, and multimedia methods.

There are 12 credits of overlapping coursework between the MSEP and MBA programs, allowing for the 38 credit hour MBA program and 30 credit hour MSEP program to be completed together in a combined 50-52 credit program of study spanning two years, including an MS thesis (6 credits) or Project (4 credits) supporting the EP degree.

Together the MSEP and MBA double degree prepares our graduates to be exceptional leaders in solving the most challenging environmental issues of today and the future including climate change, access to affordable and clean energy and water, controlling air pollution, and maintaining sustainable habitats and communities.

### **Admissions Process**

Applicants must meet the admission requirements for both the MSEP and MBA programs, summarized below.

- No minimum grade point average is required for admission, however in general a GPA > 3.25 is expected in combination with a superior record of academic achievement.
- Submission of official Graduate Record Examination (GRE) or GMAT test scores

- Applicants are expected to have completed a bachelor's degree, preferably in a field relevant to environmental management
- Official transcripts from all universities or colleges and other post-secondary educational institutions (including trade schools) attended. All transcripts must be submitted regardless of how many credits were earned.
- Resume
- Three letters of recommendation.
- One Essay, up to one page in length: Describe your career progress to date and your future short-term and long-term career goals that you expect to be supported by this dual degree.

### **Application Process**

Applicants will complete the MBA application, which will be reviewed by both programs' Graduate Admissions Committees. Both programs must independently accept the student for admission. Students must be accepted by both programs

### **MS EP Prerequisites**

If the students have not taken a course on American Politics or American Society (sociology) and/or introduction to environmental science, they must take, for no graduate credit, POL 220: American Politics, and/or EV 280: Environmental Science or a relevant Environmental Science graduate elective (if permitted enrollment by course instructor).

### **MBA Prerequisites**

Our prerequisites represent the foundation business coursework that we require all students to have before beginning the MBA program. They can be completed during undergraduate study, our **Summer Business Concepts Program** (all courses are offered on our campus at no cost), or over the summer at a different institution. The prerequisites are as follows:

- Microeconomics
- Macroeconomics
- Organizational Behavior/Principles of Management
- Financial Accounting
- Managerial Accounting
- Statistics
- Corporate Finance
- Operations Management
- Marketing
- Business Law

- Information Systems/Computer Science

<b>Required Course List (34 credits)</b>
EC660 Environmental Economics (3 Credits, EP)
POL570 Environmental Policy OR POL571 Energy Policy (3 credits, EP)
Research Methods Course (3 credits, EP)
EV610 ISE Graduate Seminar (2 credits total, 1 credit each semester, EP)
OS608 Organizational Behavior and Performance Management (2 Credits, MBA)
OM606 Supply Chain Management (2 Credits, MBA)
SB693 Seminar in International Business or SB696 Global Business Strategies (3 credits, MBA)
EC604 Applied Economics (2 Credits, MBA)
FN607 Financial Management (2 Credits, MBA)
OS610 Strategic Planning (2 Credits, MBA)
MK609 Marketing Management (2 Credits, MBA)
OM602 Decision Analysis and Supply Chain Design (2 Credits, MBA)
IS605 Information Systems (2 Credits, MBA)
AC603 Management Accounting (2 Credits, MBA)
SB609 Corporate Ethics (2 credits, MBA)
EV612 MS Project (minimum 4 credits) or MS Thesis (minimum 6 credits)
Total of 4 electives (12 credits); 3 of which must have environmental content
<i>Elective Courses with Environmental Content:</i>
OM671 Supply Chain Environmental Management (3 Credits, EP and MBA)

POL570 Environmental Policy or POL571 Energy Policy (3 Credits, EP and MBA)
EV532 Risk Analysis (3 credits, EP and MBA)
POL572 Environmental Law (3 credits, EP and MBA)
Or other courses as approved by the MSEP/MBA joint graduate committee

## **Master of Science in Applied Data Science (MSADS)/Master of Business Administration (MBA)**

*Boris Jukic, Co-Director of Data Analytics & Professor of Operations & Information Systems*

[bjukic@clarkson.edu](mailto:bjukic@clarkson.edu)

*Joseph Skufca, Co-Director of Data Analytics & Professor and Chair of Mathematics*

[jskufca@clarkson.edu](mailto:jskufca@clarkson.edu)

*Daqing Hou, Co-Director of Data Analytics, Professor and Director of Software Engineering*

[dhou@clarkson.edu](mailto:dhou@clarkson.edu)

### **Program Description**

Clarkson's new 2-year double degree program leading to a Master of Science in Applied Data Science (MSADS) degree and a Master of Business Administration (MBA) degree integrates the study of all functional areas of business and aspects of management practice with the with the skills of identifying, acquiring, managing, presenting, analyzing and interpreting large amounts of information for the purpose of data driven strategic and tactical decision making. The degree program is advised by an interdisciplinary committee that will include faculty representatives from the School of Business, School of Engineering and the School of Arts and Sciences.

The MSADS PROGRAM coursework enables students to develop a common set of key critical skills in areas of data management, decision analysis, statistics, data mining and knowledge discovery. Students develop a deep understanding of how to identify and satisfy data requirements of a variety of stakeholders, working closely across organizational boundaries to create, analyze and present valuable information. Their acquired expertise will enable them to manage, review, analyze, and evaluate data at a very advanced level for critical decision making purposes.

The MBA PROGRAM course work emphasizes teamwork, leadership, and managerial skills. Classes, projects, and other opportunities focus on development of effective communication skills, including oral, written, and multimedia methods. There are 18 credits of overlapping coursework between the MSADS and MBA programs, allowing for the 38 credit hour MBA program and 36 credit hour MSADS program to be completed together in a combined 54 credit program of study spanning two years, including an MS capstone course (6 credits) supporting the MSADS degree. Together the MSADS and MBA double degree prepares our graduates to be exceptional leaders in many different functional areas of business with high level of skill and ability to use large amounts of structured and unstructured data for enhanced decision making

### **Admission Requirements**

Applicants must meet the admission requirements for both the MSADS and MBA programs, summarized below:

- No minimum grade point average is required for admission, however in general a GPA > 3.25 is expected in combination with a superior record of academic achievement.
- Submission of official GMAT or Graduate Record Examination (GRE) test scores (Note: This requirement may be waived for any applicant that has previously completed a Master's or Doctoral degree program). The results of this test, together with the academic record and professional recommendations, form the basis for admission decisions and the awarding of financial assistance. Applicants with an MS degree from accredited institutions and/or 5+ years of relevant work experience may request a waiver, to be granted at the discretion of the admission committees
- Applicants are expected to have completed a bachelor's degree, preferably but not limited to a field that relies on quantitative methods (business, economics, engineering, sciences, mathematics)
- Any degree earned internationally must be deemed equivalent to a U.S. bachelor degree.
- Official transcripts from all universities or colleges and other post-secondary educational institutions (including trade schools) attended. All transcripts must be submitted regardless of how many credits were earned.
- Resume (when using our online application tool, you will be required to submit this along with your application).
- Three letters of recommendation.
- Two Essays (when using our online application tool, you will be required to submit this along with your application) that are one page each in length, double spaced:

- Describe your career progress to date and your future short-term and long-term career goals. How do you expect an MBA from Clarkson University to help you achieve these goals and why now? (NOTE: This is the general MBA application essay; applicants are expected to incorporate their expectations of how the MSADS will facilitate achieving this goal).
- Describe a personal characteristic or something in your background that will help the Graduate Admission Committee to get to know you better.
- OPTIONAL: If you feel there are extenuating circumstances of which the Committee should be aware, please explain them here (i.e. gaps in work experience, academic performance, choice of references, significant strengths or weaknesses to your application, etc.).

### **MSDA Prerequisites**

Students are expected to have complete equivalents of the following courses. They can be completed during undergraduate study, or through our summer prerequisites program.

- Elementary Calculus
- Mathematical Statistics
- Programming Fundamentals

### **MBA Prerequisites**

Our prerequisites represent the foundation business coursework that we require all students to have before beginning the MBA program. They can be completed during undergraduate study, our SUMMER BUSINESS CONCEPTS PROGRAM (all courses are offered on our campus at no cost), or over the summer at a different institution. The prerequisites are as follows:

- Microeconomics
- Macroeconomics
- Organizational Behavior/Principles of Management
- Financial Accounting
- Managerial Accounting
- Statistics
- Corporate Finance
- Operations Management
- Marketing
- Business Law
- Information Systems/Computer Science

## Application Process

Applicants will complete the MBA APPLICATION, which will be reviewed by both programs' Graduate Admissions Committees. Both programs must independently accept the student for admission.

## Notes

The MBA and MSADS schedule do not directly correspond. For example, the MBA program typically begins prior to the start of the MSADS semester and the MBA program has a two week Spring break (to allow for international travel), while the MSADS semester has a one-week break. Students are expected to be available to start with the earliest starting program. Breaks (including the two-week MBA spring break) will be accommodated, however students are expected to communicate with faculty regarding missed course work and make up any work/assignments during missed class. This policy holds for students traveling to attend conferences or for any-other school-related activity.

IA/IS 510 - Database Modeling, Design and Implementation

IA 651 Applied Machine Learning

IA/IS 605 - Data Warehousing

IA 530 - Probability and Statistics for Analytics

IA 650 - Data Minings

IA 630 - Modeling for Insight

EC 611 – Econometrics

OM 680 - Strategic Project Management

MK 696 – Marketing Research Methods

Fall Year 1	Spring Year 1
OS 608 Organizational Behavior and Performance Management (2 Credits, MBA)	OM 680 Strategic Project Management (3 Credits MBA and DA)
IA/IS 510 Database Modeling, Design and Implementation (3 Credits, DA and MBA)	IA 626 Big Data Processing and Cloud Services (3 Credits MBA and DA)

EC 604 Applied Economics (2 Credits, MBA)	MK 696 Marketing Research Methods (3 Credits MBA and DA)
MK 609 Marketing Management (2 Credits, MBA)	IA/IS 605 Data Warehousing (3 Credits MBA and DA)
IS 605 Information Systems (2 Credits, MBA)	

Fall Year 2	Spring Year 2
IA 530 - Probability and Statistics for Analytics (3 Credits, DA)	IA 651 Applied Machine Learning
OM 606 Supply Chain Management (2 Credits, MBA)	IA 650 Data Mining (3 Credits, DA)
FN 607 Financial Management (2 Credits, MBA)	OS 610 Strategic Planning (2 Credits, MBA)
IA 530 Probability and Statistics (3 Credits, DA)	EC 611 Econometrics (3 Credits, MBA and DA)
AC 603 Management Accounting (2 Credits, MBA)	
SB 609 Corporate Ethical Decision Making (2 Credits, MBA)	

Summer after year 2: 6 credits of IA690 - Capstone Project

### **Program Length**

2 years



## **Master of Arts in Teaching**

*Catherine Snyder, Chair*

*graduate@clarkson.edu, 518-631-9870*

The MAT degree is a licensure endorsing program that prepares candidates for New York State certification at the secondary level (7-12 grade) in the following disciplines: biology, chemistry, earth science, physics, technology (K-12), mathematics, business and marketing (K-12), computer science (K-12), English, social studies, Chinese, French, German, Greek, Latin, Russian, Spanish, and Teaching English to Speakers of Other Languages.

The Department of Education also offers programs for New York State teachers who are already initially certified:

1. 5<sup>th</sup> and 6<sup>th</sup> Grade Extension: 2 courses that extend teachers' certifications to 5<sup>th</sup> and 6<sup>th</sup> Grade in the case of the science, math, social studies, and English
2. Grades 1-6 Foreign Language in the Elementary School (FLES) Extension: A 1 course program that extends a New York State certified foreign language teacher's certification to 1<sup>st</sup> Grade.
3. Certificate of Advanced Study in Teaching English to Speakers of Other Languages (TESOL): 6 courses that allow teachers who are already New York State certified to add K-12 TESOL certification. Some prerequisites apply, including 12 credits of study in languages other than English

With a 30-year history of success, the MAT program offers prospective teacher candidates all the tools they need to be successful classroom teachers. The Clarkson Master of Arts in Teaching program is the right career choice because:

1. Since 2016, 100% of our graduates have obtained teaching positions
2. Our graduates have a 95% success rate on the rigorous [New York State Teacher Certification Exams](#)
3. Every student is placed into a full-year teaching residency in a school based on their career goals
4. Every member of the Clarkson University Master of Arts in Teaching [faculty](#) has substantial K-12 teaching experience

Most of the students who join the Master of Arts in Teaching program arrive with a bachelor's degree in the discipline they want to teach. No prior education or pedagogy coursework is necessary.

### **MAT Accreditation**

The Master of Arts in Teaching program is accredited by the Association for Advancing Quality in Teacher Education and the New York State Department of Education.

## **MAT Prerequisites**

Clarkson undergraduates interested in pursuing an MAT degree will want to consider the Pre-Teaching Minor. The Pre-Teaching advisor will provide students with guidance in selecting coursework within the candidate's discipline that meets New York State certification requirements, so that undergraduate courses will count towards both the undergraduate degree and the master's degree. The Pre-Teaching advisor will help students define career goals, and find opportunities to observe and participate in secondary teaching, so that candidates enter the MAT with strong knowledge of what secondary teachers do. For information on the Pre-Teaching Program, contact Professor Kavanagh at [kkavanag@clarkson.edu](mailto:kkavanag@clarkson.edu).

The MAT program requires all candidates to have completed the following prior enrolling:

1. Undergraduate liberal arts core including courses in humanities/arts, writing/communication, social sciences, and STEM
2. ED 300- Field Experience - 4 days of structured observations in secondary schools or through an online observation protocol. Can be arranged by CRC Department of Education Coordinator. Please call 518-631-9870 (must be completed prior to the summer intensive program for one year candidates; can be completed in fall or spring in year one if student selects the 2 year program.
3. Educational Psychology - an undergraduate course, or independent study with Clarkson's CRC Department of Education. (Must be completed prior to the summer intensive program for one year candidates; can be completed in fall or spring in year one if student selects the 2 year program. Available to Clarkson undergraduates as PY 246.
4. Finally, highly qualified candidates must have at least 24 credit hours of undergraduate study in their major with a GPA of 3.0 or higher at the completion of their undergraduate degree studies. The Pre-Teaching advisor can assist candidates with the selection of appropriate coursework.

## **Program Curriculum**

Qualified Clarkson undergraduates are automatically accepted into the MAT program and awarded a two course scholarship. MAT candidates complete the following coursework as part of their 38 credit master's degree:

## Requirements for Master of Arts in Teaching in Secondary Disciplines

Required core classes (29 credits)	
ED501	Teaching Practicum (1 credit)
ED502	NY State Teacher Requirements (0 credit)
ED503	Professionalism in Teaching I (1 credits)
ED504	Professionalism in Teaching II (1 credit)
ED511	Curriculum and Methods of Teaching (the discipline in which the student will become certified) (3 credits)
ED540	The Psychology of Teaching with Teaching Lab (3 credits)
ED541	Essential Reading Literacy (3 credits)
ED544	Literacy for the Content Classroom (3 credits)
ED550	Effective Teaching for All Learners (3 credits)
ED551	Teaching Residency (4 credits) <b>Fall</b>
ED552	Teaching Residency (4 credits) <b>Spring</b>
ED560	The Modern Teacher (3 credits)

### Research Project

All students complete a research project in their certification area:  
XX 580 MAT Project (Prefix will be listed by discipline ex. HST 580 for MAT Project in History.) (3 credits)

### Subject Area Courses

Students complete two courses in the subject area in which they will be obtaining certification. (6 credits)

## Requirements for Master of Arts in Teaching English to Speakers of Other Languages (13 courses/39 credits):

Required core classes (39 credits)	
TE 501	Teaching Practicum (2 credits)
ED 502	NY State Teacher Requirements (0 credits)
TE 513	Curriculum and Methods of Teaching ESOL (3 credits)
TE 517	Teaching and Assessment Methods for TESOL (3 credits)
TE 542	TESOL Literacy (3 credits)
ED 550	Effective Teaching for All Learners (3 credits)
ED 560	The Modern Teacher (3 credits)
TE 530	English Grammar for the ENL Teacher (3 credits)
TE 531	English Linguistics (3 credits)
TE 540	Foundations of Teaching ESOL (3 credits)
TE 551*	Teaching Residency (5 credits)
TE 552*	Teaching Residency (5 credits)
TE 580	MAT Project ( Research project in TESOL) (3 credits)

**\*TE 553 and TE 554 are summer residency options for NYS teachers obtaining their MAT-ESOL.**

### Program Length

Many candidates complete the MAT program in one year (12 months) starting with an intensive summer program, followed by a full-time fall and spring term. Candidates may choose a longer timeline ranging from one and a half years to three years.

### Faculty

*Associate Professor: Catherine Snyder, Chair; Assistant Professors: Sherri Duan, Director of the MAT in Chinese Language; Karen Gregory, Director of TESOL programs; Gretchen Oliver, Assistant Director of TESOL Programs, Patti Rand, Assistant Professor; Seema Rivera, Assistant Professor; Richard Lasselle, Assistant Professor. Instructors: Stephanie Conklin, Dan Mattoon, Bryan Mattice, David Besozzi, Becky Remis, Tracy Pontin, Sean O'Connell, Leigh Feguer, Frank Adamo, Cesaera Pirrone, Lisa Saccocio, Kelly Mattice, Mary Sandoval, Judy Morley, Lainie Christou, Erin Blauvelt, Loretta, Robert Buehler, Tracy Farrell, Stephanie Andrejczak, Maria Fielteau, Patricia Kapps, Matthew Pinchinat, Kathy Cotugno-Surin, Tracy Farrell, Mary Beth Arcidiacono.*

## **SPONSORED RESEARCH SERVICES**

Sponsored Research Services (SRS) is the central office charged with overseeing the conduct and promotion of research activities at Clarkson University. It is the philosophy of the University that research supports and enhances its educational mission. SRS strives to provide and constantly enhance services to the Clarkson community as well as individuals and companies that come in contact with the Division. Examples of such services include proposal development for faculty and staff; administration of grants and contracts established under federal, state, and private awards on behalf of the University; assurance of compliance with federal, state, private, and other regulations pertaining to grant sponsorship activities at the University; and the creation, submission, or provision of analyses, reports or policies as required. Through these activities, SRS promotes innovation and creativity, thereby increasing knowledge and making the knowledge available and useful for scholarship and education.

Some typical areas of sponsored research in engineering and science include: crystal growth, aerosol kinetics and scavenging, light scattering, stability of colloidal dispersion, strength of materials, metallic systems, ceramic surfaces, phase transitions, bio-engineering, heat transfer and mass transfer, thin film adsorption, film flow stability, transition and turbulence and active flow control, nonlinear wave motion, dynamical systems, chaos and control, computational applied math, optimization and numerical p.d.e.s., wave forces, surface shear viscosity, nutrient regeneration in lakes, flow slides, copper and zinc protein, nanotechnology, artificial intelligence, oxygenation of metal complexes, asynchronous networks, communication networks, detection of random signals, renewable energy production, power transmission, energy conversion, plasma deposition, osmotic work, and corrosion.

In the business area, studies have been conducted relative to dispute settlement techniques, scientific and technical information systems, effects of organizational changes, economic impact of environmental damage from acid rain, marketing approaches, pricing environmental alternatives, banking systems, and monetary policies.

## **The Shipley Center for Innovation**

*Jamey Hoose, Director, [jhoose@clarkson.edu](mailto:jhoose@clarkson.edu)*

The Shipley Center for Innovation, which is organized within the Office of Sponsored Research Services, is a University-wide resource dedicated to bringing Clarkson innovations to market via technology transfer, gaining recognition for the technology created by our faculty and students, and creating local jobs for graduating Clarkson students. The Center, which acts as the “business incubation” component of Clarkson Ignite, serves as an engine for economic development in the North Country by engaging in the creation of new enterprises that capitalize on emerging technologies.

In addition to providing general mentorship and services to Clarkson startups, the Shipley Center manages a thriving business incubator location on Clarkson’s downtown campus. In 2018 the Shipley Center launched a new student accelerator program, The Cube, which provides dedicated student entrepreneurs with additional resources to help grow their idea into a profitable company. Shipley Center staff also conduct workshops and hold office hours to provide instruction in basic early-stage concepts such as business modeling and customer discovery.

## ACADEMIC CENTERS

### Center for Advanced Materials Processing (CAMP)

#### A New York State Center for Advanced Technology

*Devon A. Shipp, Director*

[dshipp@clarkson.edu](mailto:dshipp@clarkson.edu)

The Center for Advanced Materials Processing (CAMP) is a Center for Advanced Technology (CAT) funded by New York's Empire State Development Division of Science Technology and Innovation (ESD-NYSTAR).

CAMP's mission is to offer companies, industries and entrepreneurs a vibrant, collaborative, trusted environment in which to engage in focused applied research and technology development activities intended to advance innovation, improve products, solve manufacturing challenges and/or develop new products. CAMP's overarching goal is to contribute significantly to economic growth in New York State. Our main objectives are to:

1. Form collaborative relationships with industry, corporations and entrepreneurs in NYS to assist them in accelerating innovation, discovering and implementing next generation materials, addressing real-world challenges and fostering growth of their businesses.
2. Perform applied research, technology development and technology transfer activities related to the synthesis, processing and design of advanced materials to benefit industry and corporations.
3. Develop the next-generation, high tech workforce by providing excellent education and real-world research/development experiences needed by NY industry and companies.

CAMP relies on faculty and students in four core capability areas:

1. Materials synthesis and functionalization
2. Materials processing
3. Materials-by-design, and
4. Chemical mechanical planarization, underpinned by materials characterization and computational modeling and simulation

CAMP's industry-sponsored research program provides numerous materials science and engineering research opportunities to enrich undergraduate and graduate students' educational experience.

## **Center for Air and Aquatic Resources Engineering and Sciences (CAARES)**

*Thomas M. Holsen, Director, [tholsen@clarkson.edu](mailto:tholsen@clarkson.edu)*

*Suresh Dhaniyala, Co-Director, [sdhaniya@clarkson.edu](mailto:sdhaniya@clarkson.edu)*

The presence of contaminants in the environment can have a wide variety of negative effects including impacting public health, degrading ecosystems, harming lakes and rivers, and damaging forests and crops. Although, environmental quality has significantly improved over the past 40 years, there are still a number of problems that are attributed to the release of contaminants including the widespread loss of environmental services, climate change, harmful algal blooms, and emerging contaminants including per- and polyfluoroalkyl substances (PFAS). Clarkson University has significant resources in people and equipment that focus on the management of air, water and soil pollution. CAARES is the center that brings together this world-class expertise. CAARES laboratory, office space, and equipment including an aerosol wind tunnel; aerosol sensors, analyzers, and spectrometer; air and water field sampling platforms including Clarkson's 25 foot coastal research vessel, the R.V. Lavinia; and, world class analytical equipment are available for research and education programs at Clarkson. Specific analytical instruments include high-resolution gas and liquid chromatographs, high resolution instruments for trace metals analysis, mercury analytical instrumentation, ion chromatographs and sample preparation instrumentation. Additional information can be found at <https://www.clarkson.edu/caares>.



## **Center for Rehabilitation, Engineering, Science, & Technology (CREST)**

The Center for Rehabilitation Engineering, Science and Technology was established at Clarkson University in 2005. Its mission is to educate, mentor and train students to be able to integrate and apply a combined scientific, analytic, technological and business approach to emerging biomedical engineering and biomedical science areas. It is of note that biomedical engineering is the most rapidly growing field of engineering, with outstanding biomedical job prospects, and with half of the undergraduates being female, a ratio that exists in no other engineering discipline.

The Center for Rehabilitation Engineering, Science and Technology takes a unique approach to the study of rehabilitation problems. First, through its focus on biomedical engineering, the Center studies how the nervous and skeletal muscle systems of the human body normally work. Secondly, through its rehabilitation science and technology components, it models the mechanisms by which these systems become impaired through disease or injury. Within its rehabilitation technology aspects, the Center investigates how technology can help to restore or replace functions such as hearing, speaking, seeing or moving through the use of artificial assistive or substitutive devices. Through a clinical link with Clarkson's Physical Therapy and Occupational Therapy programs, the Center investigates the outcome of the applications of this assistive technology. The Center also organizes and presents seminars, campus lectures and classroom discussions by visiting leaders in the field of rehabilitation.

Medical and health care have become increasingly technology-based in recent years, with an increased demand for engineers with skills that integrate engineering principles with an understanding of the human physical and psychosocial characteristics. The Center for Rehabilitation Engineering, Science and Technology offers a Minor in Biomedical Engineering to meet this need. Combining a traditional engineering degree with this BmE Minor is an attractive opportunity for engineering students who have a strong desire to use their talents to improve the quality of life for people with medical conditions or disabilities. Clarkson offers this Minor to augment a degree from a traditional engineering department. A similar Minor in Biomedical Science and Technology (BS&T) is available to non-engineers. Both Minors are multi-disciplinary, and will include courses from multiple schools or departments across the University. The Biomedical Engineering Minor is just one of the examples addressing Clarkson's Coulter School of Engineering's motto "Technology Serving Humanity."

## Center for Identification Technology Research (CITeR)

*Stephanie Schuckers, Director*

[sschucke@clarkson.edu](mailto:sschucke@clarkson.edu)

Clarkson University is the lead university for an NSF Industry/University Cooperative Research Center, called the Center for Identification Technology Research (CITeR). Other sites include West Virginia University, University at Buffalo, and Michigan State University. CITeR focuses on biometrics, identity, and human analytics <https://citer.clarkson.edu/> Over 20 affiliates, including the FBI, DOD, DHS, Qualcomm, Northrop Grumman, and other industrial and government partners, cooperatively define, fund, and execute work to meet common needs. Applications include defense, homeland security, forensics, consumer electronics, financial services, and humanitarian applications.

Research focus areas in identification technology include:

1. Human sensing and acquisition
2. Feature extraction and processing
3. Machine learning and analytics
4. Performance and modeling
5. Multispectral and cross spectral imaging
6. Novel modalities
7. Mobile & computing
8. Social signal processing
9. Authentication & cybersecurity
10. Behavioral and soft biometrics
11. Science of Biometrics

Students are key team members for research projects which are cooperatively defined by industrial and government affiliates. At the completion of their degree, students often go to work for organizations that funded their research project. Educational programs which CITeR researchers pursue include electrical, computer, and software engineering, computer science, mathematics, among others. Additional information is available at <https://citer.clarkson.edu/>.

## **Center for Metamaterials**

*David Crouse, Professor / Chair of Electrical & Computer Engineering*  
[dcrouse@clarkson.edu](mailto:dcrouse@clarkson.edu)

The Center for Metamaterials (CfM) is an NSF-sponsored Industry/University Cooperative Research Center. The CfM's mission is to provide a collaborative, multi-university one-stop shop to research, design, fabricate and test a wide range of metamaterials, photonic crystals, and plasmonic structures. These structures and materials are nano and micro composite structures that are engineered to control light in unusual ways that are not possible with naturally occurring materials; behavior such as cloaking, channeling and stopping light, and complex light filtering are possible with such structures. Industry interest in metamaterials is growing as these materials are being used to develop new or higher performing optical, electronic and acoustic devices.

Researchers at the Center focus on precompetitive topics jointly identified by the university and industry participants as being of high value, and include fundamental research, metamaterials processing, and device and system development. The CfM projects advance the knowledge base through fundamental and applied metamaterials research and development. The projects involve research teams composed of academic researchers (professors, postdocs, research staff, graduate students and undergraduate students), industry researchers at large and small companies, and researchers from government agencies (e.g., Air Force Research Laboratory (AFRL) and U.S. Army). The intent is to nurture long-term relationships and collaborations among the university, industry, and government laboratories. The intent is also to develop and perform technology transfer of metamaterials-based technologies to the applications of renewable energy, sensing and imaging, antennas, and communication systems. Industry members participating in the Center share in the products of the research and development, the generated intellectual property, have access to laboratories, equipment and expertise, and the resulting economic benefits.

## **Center for Complex Systems Science**

*Erik Bollt, W Jon Harrington Professor of Mathematics/Professor of Electrical & Computer Engineering/Director of the Clarkson Center for Complex Systems Science*  
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Complex systems science involves the study of how many elements develop behaviors that are beyond those behaviors possible by considering the individual elements alone. While the behavior of each individual component of a system in isolation may support intricate dynamics, together the individual components interact to support group behaviors and system dynamics well beyond those possible from individual components alone.

Complex systems science is a rapidly growing and emerging field that is inherently interdisciplinary. It can be applied to a wide variety of fields including biology, medicine and cognitive science, mechanical, chemical, electrical, and civil engineering, physics and astronomy, economics and social sciences. The future of research in these fields lies in understanding not just the isolated components of a given system, but the manner in which the individual components interact to produce “emergent” group behavior.

In contrast to “data mining” or “big data”, where a primary focus is to understand hidden patterns or structure in large data sets, complex systems science attempts to identify “causality” and uncover “universality” that exists in large scale systems. Causality and universality are due to peer and hierarchical interactions, patterns, and scaling of individual system components. Universality has been observed across a wide range of fields such as brain science, insect swarming, social science, and fluid dynamics.

Key to the advancement of complex systems science is the development and use of mathematical tools designed to understand the resultant outcome of group behaviors that are not evident when studying the behavior individual elements alone. Mathematical tools for complex systems science are drawn from the following fields:

1. Information dynamics. The study of interaction of elements and the information flow between elements. Of particular interest is the minimum information needed to produce an outcome of important behaviors
2. Algorithmic complexity. In contrast to information dynamics and entropy of evolving systems is the concept of algorithmic complexity, Kolmogorov complexity, and the concept of minimality of description, as a contrast that intricate behavior is often opposite to simplicity of design
3. Structure and dynamics on networks, as a large number of interacting parts can give rise to behaviors that emerge from the group interactions and not implicit in any one element. Consider that collective behaviors and capabilities of an ant swarm, which is clearly not understood in terms of the behaviors of the parts.

Considering networks brings in the mathematics of graph theory, but well beyond this when understanding dynamics on networks, comes complexity theory.

4. Criticality and scaling, modeling of random networks, the implications of critical phenomena to complexity, and the recent approaches to evolutionary dynamics are all part of this field. As such, understanding interactions from food webs to economies all have a universality that can be understood in terms of the science that includes hierarchical interactions. It is the characterization of such universalities that lead to complex systems as a unifying field across such disciplines
5. Technical details and the tool-sets include areas of dynamical systems and chaos theory, network theory and graph theory, information theory, thermodynamics and statistical mechanics, cellular automata, information theory, activated processes including glasses, fractals, scaling and renormalization

## **Center for Electric Power Systems**

*Thomas Ortmeyer, Director*

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Electric Power System Engineering is a recognized strength of Clarkson University. The electric power system is undergoing rapid dynamic change due to the development of clean energy sources, the deployment of smart grid technologies, the deregulation of the industry, and the developing growth of the electric vehicle industry. There is a strong need for research, development, and workforce training across the breadth of research areas that focus on electric power systems.

The Center for Electric Power System Research mission is to foster research collaborations across the university, and to grow our power systems research capability. The Center goal is to work closely with industry, and the Industry Advisory Board has an important role in the Center governance.

The center has a strong education mission, at the undergraduate and graduate levels, as well as in programs for practicing professionals. Our undergraduates can select the Electrical Power Engineering Concentration. This concentration is a set of 6 courses that prepare our students for careers in the electric power industry, whether working for electric power utilities, generation and utilization industries, equipment manufacturers, consultants, and government. The large majority of students in the Concentration complete one or more internships in the power industry before graduating.

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BS, Jimei University  
MS, Xiamen University  
MS, New Mexico Institute of Mining and Technology  
PhD, North Carolina State University  
Assistant Professor of Electrical and Computer Engineering

**ZHANG, Ying**

B.E., Jinan University, China  
MS, Jilin University, China  
PhD, Syracuse University  
Assistant Professor of Psychology

**ZHANG, Yuan**

BS, Beijing International Studies University  
MS, University of California San Diego  
PhD, University of Texas at Arlington  
Assistant Professor Instructor of Operations and Information Systems

**Instructors****BACKUS, Erik C.**

BS, Clarkson University  
MS, University of Missouri- Rolla  
PE, Missouri (active)  
Professor of Practice and Executive Officer of Civil and Environmental Engineering/ Director of CEM

**BELASEN, Alan**

BA, MA, Hebrew University  
PhD, State University of New York  
Participating Professor of Consumer and Organizational Studies

**BILLINGS, James J.**

BS, Clarkson University  
Adjunct Instructor of Civil and Environmental Engineering

**BROOKSBY, Evan**

MBA, Union Graduate College  
BS, Brigham Young University  
Instructor, Healthcare Management

**BUCKINGHAM, Ronald**

Professor of Practice in Mechanical and Aeronautical Engineering

**CHAPMAN, Edward**

Senior Military Instructor of Military Science

**CHAPMAN, Elisabeth**

Instructor of School of Engineering

**COMPEAU, Marc**

BS, SUNY Potsdam

MS, Clarkson University

Professor of Practice, Consumer & Organizational Studies/Co-Director Reh Center  
Entrepreneurship

**CONLON, Tyler**

Instructor and Director of Projects and IT  
Infrastructure, Data Analytics

**DEUEL, Ryan**

BA, Gardner-Webb University

MA, Kent State University

Ph.D., McGill University

Instructor, Communication, Media & Design

**DULLEA, Daniel**

BS, MS, SUNY Syracuse

Adjunct Instructor of Media Creation and Production,  
Communication, Media & Design

**GUO, Zhujin**

MS, PhD, University of Missouri

BA, Southwestern University of Finance and Economics

Instructor, Economics & Financial Studies

**HEINL, Jared**

Adjunct Instructor of Civil and  
Environmental Engineering

**HOPKINS, John**

Adjunct Instructor

Humanities and Social Sciences

**HUDAK, Bryan**

Adjunct Instructor

Humanities and Social Sciences

**ISSEN, Marshall**

BS, University of Illinois, Urbana

MS, Roosevelt University

P.E., Illinois

Professor of Practice, Engineering and Management

**JOHNS, Danielle**

BFA, SUNY Potsdam

MFA, Rochester Institute of

Technology

Instructor of Digital Arts and Sciences,

Communication, Media & Design

**KAUFFMAN, Brett**

BS, State University of New York at Buffalo

MBA, Union College

Participating Faculty of Operations and

Information Systems

**KELLY, Gary**

Adjunct Instructor

Honors Program

**MARTIN, Christopher**

BS, Clarkson University

MS, SUNY Potsdam

Instructor of Mathematics

**MILLER, Zachary**

BA Pitzer College

Adjunct Instructor of Communication, Media & Design

**MORRISON, Sara**

BS, St. Lawrence University

MS, University of Vermont

Instructor of Mathematics

**OLSEN, William**

Professor of Practice of Civil and Environmental Engineering

**PAIGE, Samantha**

Adjunct Instructor  
BA/BS, SUNY Potsdam  
MPH, Purdue University  
PhD, University of Florida

**PIERCE, Duane**

Instructor for the School of Engineering

**RILEY, Charles**

Adjunct Instructor  
Beacon Institute

**SEKELI, Gasper**

BS, MBA, Clarkson University  
Instructor of Economics and Financial Studies

**SHATTUCK, Heather**

PT, DPT Utica College  
Clinical Instructor of Physical Therapy

**SMITH, Brad**

BA, MA, SUNY Potsdam  
Instructor of Mathematics

**STRANG, Carl**

BA, Union College  
MS, SUNY Albany  
Participating Faculty of Operations and Information Systems

**SZARKA, Andrew**

Adjunct Instructor Humanities and Social Sciences

**TIGHE, Michael**

Assistant Instructor of Biology

**TIRION, Monique**

Adjunct Research Associate Professor

**TITUS, Leo**

Adjunct Instructor of Civil and Environmental Engineering



**WANG, Modi**

BS, PhD, Hong Kong Baptist University

Visiting Assistant Professor of Chemistry & Biomolecular Science

**WELLS, David John**

BS, MS, PhD, Clarkson University

PE, Wyoming (active)

Dean Emeritus- SUNY Canton

Adjunct Professor, MAE Department

**WIGGINS, Arderrick**

Instructor of Military Science

**WULTSCH, Elisabeth**

Instructor of School of Engineering

# ACADEMIC CALENDARS

The academic calendar contains the dates of major academic events occurring each academic year and serves as an information source and planning tool for students, faculty, staff, families, and outside organizations. The academic calendar is published once a year, and is subject to change at any time.

## Graduate Semester Based Programs Calendar

The academic calendar for semester-based programs includes all graduate residential programs in Potsdam, excluding the Health Sciences, as well as Engineering Management MS and graduate Education programs based at the Capital Region Campus.

<b>Fall Semester Events</b>	<b>2022-2023</b>	<b>2023-2024</b>
	<b>Fall 2022</b>	<b>Fall 2023</b>
New Student Move-in	25-26 August	24-25 August
Returning Student Move-In	27 August	27 August
Classes Begin	29 August	28 August
Fall Recess	8-11 October	7-10 October
Classes Resume & Midterm grades due	12 October	11 October
Family Weekend Begins	21-22 October	TBD October
Enrollment For Spring Classes Begin	9 November	8 November
Thanksgiving Recess	23-27 November	22-26 November
Classes Resume	28 November	27 November
Last Day of Class	9 December	8 December
Final Exams	12-16 December	11-15 December
Fall Graduates Recognition Ceremony	17 December	16 December
Final Grades Due at 9:00am	19 December	18 December

<b>Spring Semester Events</b>	<b>2022-2023</b>	<b>2023-2024</b>
	<b>Spring 2023</b>	<b>Spring 2024</b>
New Student Move-In	10 January	9 January
Returning Student Move-In	11 January	10 January

<b>Spring Semester Events</b>	<b>2022-2023</b>	<b>2023-2024</b>
	<b>Spring 2023</b>	<b>Spring 2024</b>
Classes Begin	12 January	11 January
February Break	23-26 February	22-25 February
Classes Resume	27 February	26 February
Midterm Grades Due	3 March	8 March
Spring Recess	11-19 March	16-24 March
Classes Resume	20 March	25 March
Enrollment For Fall Classes Begin	5 April	3 April
Last Day of Class	28 April	26 April
Reading Days	1-2 May	29-30 April
Final Exams	3-9 May	1-7 May
Graduate Commencement Ceremony	11 May	9 May
Final Grades Due at 9:00am	12 May	10 May

<b>Summer Semester Events</b>	<b>2022-2023</b>	<b>2023-2024</b>
<b>10 Week Session</b>	<b>Summer 2023</b>	<b>Summer 2024</b>
Classes Begin	22 May	27 May
Classes End	5 August	3 August
Grades Due	8 August	6 August
<b>First 5 Week Session</b>	<b>Summer 2023</b>	<b>Summer 2024</b>
Classes Begin	22 May	27 May
Classes End	24 June	28 June
Grades Due	27 June	2 July
<b>Second 5 Week Session</b>	<b>Summer 2023</b>	<b>Summer 2024</b>
Classes Begin	3 July	1 July
Classes End	5 August	3 August
Grades Due	8 August	6 August
<b>MAT Session II</b>	<b>Summer 2023</b>	<b>Summer 2024</b>
Classes Begin	23 June	24 June
Classes End	5 August	3 August
Grades Due	8 August	6 August

<b>Summer Semester Events</b>	<b>2022-2023</b>	<b>2023-2024</b>
<b>Alumni Reunion Dates</b>	<b>13-16 July</b>	<b>TBD July</b>

### **The Earl R. and Barbara D. Lewis School of Health Sciences Calendar**

The academic calendar for The Earl R. and Barbara D. Lewis School of Health Sciences programs includes the Doctor of Physical Therapy program, the Master of Science in Occupational Therapy program, and the Master of Science in Physician Assistant Studies program. Students should refer to their program handbook for specific information about clinical rotation or fieldwork schedules.

<b>Fall Trimester Events</b>	<b>2022-2023</b>	<b>2023-2024</b>
<b>Occupational Therapy Program</b>	<b>Fall 2022</b>	<b>Fall 2023</b>
New Student Orientation	24-26 August	23-26 August
Classes Begin	29 August	28 August
Fall Recess	8-11 October	7-10 October
Classes Resume & Midterm Grades Due	12 October	11 October
Enrollment in Spring Classes begins	9 November	8 November
Thanksgiving Recess	23-27 November	22-26 November
Classes Resume	28 November	27 November
Last Day of Classes	9 December	8 December
Final Exams	12-16 December	11-15 December
Fall December Recognition Ceremony	17 December	16 December
Final Grades Due (9AM)	19 December	18 December
<b>Physician Assistant Program</b>	<b>Fall 2022</b>	<b>Fall 2023</b>
Classes Begin	29 August	28 August
Fall Recess	3-5 September	2-4 September
Classes Resume	6 September	5 September
Midterm Grades Due (12PM, noon)	12 October	11 October
Enrollment in Spring Classes begins	9 November	8 November
Thanksgiving Recess	23-27 November	22-26 November
Classes Resume	28 November	27 November
Last Day of Classes	2 December	1 December
Final Exams	5-9 December	4-8 December
Fall December Recognition Ceremony	17 December	16 December

<b>Fall Trimester Events</b>	<b>2022-2023</b>	<b>2023-2024</b>
Final Grades Due (9AM)	19 December	18 December

<b>Fall Trimester Events</b>	<b>2022-2023</b>	<b>2023-2024</b>
<b>Physical Therapy Program</b>	<b>Fall 2022</b>	<b>Fall 2023</b>
New Student Orientation	24-26 August	23-25 August
Classes Begin	29 August	28 August
Fall Recess	Varies by cohort	Varies by cohort
Classes Resume	Varies by cohort	Varies by cohort
Midterm Grades Due (12PM, noon)	12 October	11 October
Enrollment in Spring Classes begins	9 November	8 November
Thanksgiving Recess	23-27 November	22-26 November
Classes Resume	28 November	27 November
Last Day of Classes	9 December	8 December
Final Exams	12-16 December	11-15 December
Fall December Recognition Ceremony	17 December	16 December
Final Grades Due (9AM)	19 December	18 December

<b>Spring Trimester Events</b>	<b>2022-2023</b>	<b>2023-2024</b>
<b>Occupational Therapy Program</b>	<b>Spring 2023</b>	<b>Spring 2024</b>
Classes Begin	9 January	11 January
Level I Fieldwork Rotation	31 January - 19 April	31 January - 19 April
Winter Recess	23-26 February	22-25 February
Classes Resume	27 February	26 February
Midterm Grades Due (12PM, noon)	3 March	8 March
Spring Recess	11-19 March	16-24 March
Classes Resume	20 March	25 March
Summer & Fall Enrollment Begins	5 April	3 April
Last Day of Classes	28 April	3 May
Final Exams	1-5 May	6-9 May
Graduate Commencement Ceremony	11 May	9 May

<b>Spring Trimester Events</b>	<b>2022-2023</b>	<b>2023-2024</b>
Final Grades Due at 9:00am	12 May	10 May
<b>Physician Assistant Program</b>	<b>Spring 2023</b>	<b>Spring 2024</b>
Orientation and Classes Begin	3 January	8 January
Midterm Grades Due (12PM, noon)	3 March	8 March
Spring Recess	11-19 March	16-24 March
All Classes Resume	20 March	25 March
Summer & Fall Enrollment Begins	5 April	3 April
Last Day of Classes	14 April	19 April
Final Exams	17-21 April	22-26 April
Graduate Commencement Ceremony	11 May	9 May
Final Grades Due at 9:00am	12 May	10 May
<b>Physical Therapy Program</b>	<b>Spring 2023</b>	<b>Spring 2024</b>
Classes Begin	9 January	8 January
Winter Recess	23-26 February	15-18 February
Classes Resume	27 February	19 February
Midterm Grades Due (12PM, noon)	3 March	8 March
Spring Recess	11-19 March	16-24 March
All Classes Resume	20 March	25 March
Summer & Fall Enrollment Begins	5 April	3 April
Last Day of Classes	5 May	3 May
Final Exams	8-12 May	6-10 May
Graduate Commencement Ceremony	11 May	9 May
Final Grades Due at 9:00am	12 May	10 May

<b>Summer Trimester Events</b>	<b>2022-2023</b>	<b>2023-2024</b>
<b>Occupational Therapy Program</b>	<b>Summer 2023</b>	<b>Summer 2024</b>
Level 1 Fieldwork Rotation 1	8-19 May	13-24 May
Level 2 Fieldwork Rotation	15 May - 4 August	13 May - 2 August
Classes begin	22 May	27 May
Break	3-7 July	4-7 July
Level 1 Fieldwork Rotations 2-4	10 July - 18 August	8 July - 16 August
Classes end	25 August	3 July

<b>Summer Trimester Events</b>	<b>2022-2023</b>	<b>2023-2024</b>
Final Grades Due (9AM)	29 August	27 August
<b>Physician Assistant Program</b>	<b>Summer 2023</b>	<b>Summer 2024</b>
Classes/Clinicals begin	1 May	6 May
Breaks	29 May 26-30 June 4 July	27 May 1-5 July
Classes/Clinicals end	11 August	16 August
Final Grades Due (9AM)	29 August	27 August
<b>Physical Therapy Program</b>	<b>Summer 2023</b>	<b>Summer 2024</b>
Classes begin	15 May	13 May
Breaks	Varies by Cohort	Varies by Cohort
Classes End	18 August	16 August
Final Exams	21-25 August	19-21 August
Final Grades Due (9AM)	29 August	27 August

## Quarter Programs

The academic calendar for the quarter-based programs includes all remaining graduate programs not referenced above.

<b>Quarter Program Events</b>	<b>2022-2023</b>	<b>2023-2024</b>
<b>Summer Quarter Events</b>	<b>Summer 2022</b>	<b>Summer 2023</b>
Classes Begin	13 June	12 June
Enrollment in Fall Classes Begins	22 July	TBD
Last Day of Classes	19 August	18 August
Final Exams	22-26 August	21-25 August
Final Grades Due (9AM)	30 August	29 August
<b>Fall Quarter Events</b>	<b>Fall 2022</b>	<b>Fall 2023</b>
Classes Begin	7 September	6 September
Enrollment in Winter Classes Begins	21 October	20 October
Last Day of Classes	15 November	14 November
Final Exams	16-22 Nov	15-21 Nov
Final Grades Due (9AM)	28 November	28 November
December Recognition Ceremony	17 December	16 December
<b>Winter Quarter Events</b>	<b>Winter 2023</b>	<b>Winter 2024</b>
Classes Begin	3 January	8 January
Enrollment in Spring Classes Begins	10 February	9 February
Last Day of Classes	10 March	15 March
Final Exams	13-17 March	18-22 March
Final Grades Due (9AM)	21 March	26 March
<b>Spring Quarter Events</b>	<b>Spring 2023</b>	<b>Spring 2024</b>
Classes Begin	27 March	1 April
Enrollment in Summer Classes Begins	5 May	10 May
Last Day of Classes	2 June	7 June
Final Exams	5-9 June	10-14 June
Final Grades Due (9AM)	13 June	18 June
June Commencement Ceremony	8 June	TBD



# **POLICIES**

## **Clarkson University Non-Discrimination Policy**

Clarkson University does not discriminate on the basis of race, color, religion, sex, sexual orientation, gender identity, gender expression, national or ethnic origin, age, disability, veteran status, predisposing genetic characteristics, domestic violence victim 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 Title IX, the Age Discrimination Act, or other discrimination concerns should be directed to Chief Inclusion Officer/Title VI and IX Coordination/ADA and 504 Coordinator Jen Ball at jball@clarkson.edu , ERC 1003A, or 315-268-4208.

Information on the processing of grievances and charges relating to the above policies can be obtained from the Chief Inclusion Office.

Clarkson University is making a special effort to identify employment opportunities and participation in its educational programs for a broad spectrum of candidates including women, minorities, and people with disabilities.

## **Student Complaint Process (HEOA)**

In compliance with the Higher Education Opportunity Act of 2008 and the state complaint processes as prescribed for under 34 CFR 600.0, the following resources are provided: Filing a Grievance with NY State New York State Education Department Office of College and University Evaluation EBA Room 969 89 Washington Avenue, Albany, New York, 12234.

For more information, please visit:

<http://www.nysed.gov/college-university-evaluation/filing-complaint-about-college-or-university>

## **Campus Crime Statistics**

The Advisory Committee on Campus Safety will provide upon request all campus crime statistics as reported to the United States Department of Education. Contact the Director of Campus Safety and Security, 315-268-6666, or visit [www.clarkson.edu/campussafety](http://www.clarkson.edu/campussafety).

## **Protection of Privacy**

Clarkson University abides by the provisions of the Family Educational Rights and Privacy Act of 1974 (Buckley Amendment). The University will release or withhold information under these provisions, which are published annually in the Clarkson Regulations.

## **Nonimmigrant Students**

Clarkson is authorized under federal law to enroll nonimmigrant students.

## **Student Regulations**

Each student is responsible for knowing the contents of the Clarkson Regulations. The Regulations contain information on registration, class absences, the grading system, scholastic requirements, the method for removing course deficiencies, special examinations, and the Code of Student Conduct, campus policies, and other information regarding University operations. For a link to the Clarkson student regulations, please visit:

<https://www.clarkson.edu/student-administrative-services-sas/clarkson-regulations>.

## LIST OF GRADUATE PROGRAMS/CERTIFICATES & HEGIS CODES

The number following the degree program is the Higher Education General Information Survey (HEGIS) code for classifying academic areas designated by the New York State Education Department. Enrollment in other than registered or otherwise approved programs may jeopardize a student's eligibility for certain student aid awards.

Program	Degree(s)	HEGIS Code
Adolescence Education 7-12	MAT	0803
Applied Data Science	MS	0702
Basic Science	MS	4902
Bioethics (Interdisciplinary)	MS	0499
Biomedical Engineering	MS	0905
Business Administration	MBA	0506
Business and Marketing Education	MAT	0838
Business of Energy	MS	4904
Chemical Engineering	MS, PhD	0906
Chemistry	MS, PhD	1905
Civil and Environmental Engineering	MS, PhD	0908
Computer Science (Interdisciplinary)	MS, PhD	0701
Curriculum and Instruction	MA	0829
Cybersecurity	MS	0799
Electrical and Computer Engineering	PhD	0909
Electrical Engineering	MS	0909
Energy Systems	MS	4904
Engineering and Management Systems	MS	4904
Engineering Management (Interdisciplinary)	MS	0913
Engineering Science	MS, PhD	0901
Environmental Policy (Interdisciplinary)	MS	0420

Environmental Science & Engineering (Interdisciplinary)	MS, PhD	0922
Healthcare Management	MBA	1202
Leadership in Medicine- Clinical Leadership in Healthcare Management	MS	1202
Leadership in Medicine - Healthcare Management	MBA	1202
Healthcare Data Analytics	MS	1202
Interdisciplinary Bioscience & Biotechnology	MS, PhD	0499
Materials Science and Engineering	PhD	0915
Mathematics	MS, PhD	1701
Mechanical Engineering	MS, PhD	0910
Occupational Therapy	MS	1208
Physical Therapy	DPT	1212
Physician Assistant Studies	MS	1299.10
Physics	MS, PhD	1902
Supply Chain Management	MS	0506
Systems Engineering	MS	0913
Teaching English to Speakers of Other Languages	MAT	1508
Technology Education K-12	MAT	0839.02
World Language and English Speakers of Other Languages	MAT	1508

<b>Advanced Certificate Programs</b>	<b>Degree(s)</b>	<b>HEGIS Code</b>
Bioethics	Advanced Certificate	0499
Business Fundamentals	Advanced Certificate	0506
Business of Energy	Advanced Certificate	4904
Construction Engineering Management	Advanced Certificate	0908
Coordinator for Work-Based Learning Program	Extension Certificate	0899
Curriculum and Instruction	Advanced Certificate	0829
Environmental Management	Advanced Certificate	0501
Healthcare Management	Advanced Certificate	1202
Human Resource Management	Advanced Certificate	0515
Innovation and New Venture Management	Advanced Certificate	0501
Management and Leadership	Advanced Certificate	0506
Power Systems Engineering	Advanced Certificate	0909
Supply Chain Management	Advanced Certificate	0501
Teaching English to Speakers of Other Languages	Advanced Certificate	1508
Teacher Leadership and Mentoring	Advanced Certificate	0899
Teacher Leadership and Service Learning	Advanced Certificate	0807