MASTER OF SCIENCE IN CIVIL ENGINEERING

Department: Civil Engineering and Construction (https://catalog.bradley.edu/graduate/engineering-technology/civil-engineering/)

MSCE Mission and Objectives

Offer an MSCE program that provides unique opportunities for students to synthesize advanced quantitative and qualitative knowledge in the interfaces of civil engineering, construction management, and business practices. To achieve our mission, our department has adopted the following objectives:

1. Student Driven Scholarship - Offer a graduate program that encourages student and faculty collaborations in research through thesis mentoring, assistantships, and partnerships with industry, state /federal agencies with an emphasis on student scholarship.
2. Business Focused Collaborations - Offer a graduate program that evolves and continues to integrate business practice and construction management into graduate education in civil engineering.
3. Practice Based Engineering - Offer a graduate program that provides opportunities to advance communication skills, learn quantitative and qualitative methods, and gain insights into globalization and sustainability.

Admission

Admission into the MSCE program requires a bachelor's degree in civil engineering or construction. Qualified graduates from other engineering or related fields may be considered for admission. Students are not required to take the Graduate Record Examination (GRE) for admission into the MSCE program. Details on admission requirements and categories of admission can be found in the Graduate Catalog under the Admissions (https://catalog.bradley.edu/graduate/education/admissions/) section.

Engagement and Service

Graduate students have numerous opportunities to develop leadership skills through professional activities such as the student chapters of the American Society of Civil Engineers (ASCE), Associated General Contractor (AGC) and the Mechanical Contractors Association of America (MCAA). These organizations sponsor noted speakers on a variety of topics and provide a forum for interaction between students and industry. In addition, graduate students may become involved with community service and outreach projects such as habitat for humanity, building pocket parks and playgrounds, Illinois River Sweep and others to strengthen their leadership abilities. Opportunities also exist for students to present their work in research at symposiums and conferences.

Advisory Board

The CEC department is supported by an industrial advisory board composed of successful civil engineers and construction leaders. Advisory board members are very active as speakers and outside professional contacts for our students. The university-wide job fair has attracted many companies interested in hiring civil engineers and construction managers. The Smith Career Center is an additional robust resource for students in their job search.

Graduation Requirements

Students may study in any one or more areas of emphasis: construction management, structural, environmental/water resources, or transportation engineering. Students have the opportunity of selecting a thesis or a non-thesis option. A total of 30 hours are required for the MSCE degree. The thesis option requires 6 semester hours of C E 699 Thesis and 24 hours of coursework. The non-thesis option requires 30 hours of coursework.

In addition to the Graduate Education requirements, the Department of Civil Engineering and Construction has the following requirements:

1. The MSCE program requires a minimum of 30 semester hours beyond the bachelor's degree.
2. All MSCE students must take a minimum of 18 semester hours from the department, in CE and/or CON designated courses. Students may take up to 12 semester hours from other related departments, per the approved Elective Courses listed below, subject to consent and approval of the Department offering the course.
3. Students should work with the CEC Graduate Coordinator to create a course plan by the end of the first semester, which lists the courses required for degree completion. Courses not on the approved plan may not be counted towards the MSCE degree.
4. Graduate students are required to pass a comprehensive examination during the last semester of their study. Students seeking the thesis option are required to make an oral defense of their thesis and submit their written thesis document instead.
5. Admission of undergraduate students into 500-level courses requires that the students have the necessary prerequisites and a minimum average of 2.75/4.0 overall GPA.

Graduate Course Areas

Courses in the MSCE graduate program are offered in the areas of: construction management, structural engineering, environmental/water resources engineering, and transportation engineering. Selected courses from other engineering and science departments, the college of business, and computer science may be taken as Elective Courses per the approved list below, subject to consent and approval of the respective departments. The MSCE program's flexibility provides graduate students with a wide variety of means to prepare for their future careers.

1. **Construction Management**
   The construction industry is the largest industry in the United States. Its impact is felt in every area of civil engineering, both nationally and internationally. This fast-growing area provides courses that enhance the education of students by examining the most recent trends and methods in the management of the construction process. Opportunities are provided through coursework dealing with Building Information Modeling, advanced construction scheduling and estimating, contract administration, productivity analysis, total quality management (TQM), green and sustainable construction, and many other areas that affect the profession.
2. **Structural Engineering**
   The structural graduate courses provide a strong theoretical and applied background suitable for both practice and research. The faculty teaching in this area employ experimental, numerical, and analytical techniques in coursework and research such as: behavior and design of reinforced concrete, analysis and design of steel structures, structural durability, analysis and design of bridges, finite element analysis, computational mechanics, structural stability,

seismic analysis and design, sustainable technologies in concrete, 3D printing and the use of novel materials in extraterrestrial applications. Students are given the opportunity to utilize a spectrum of computer facilities, including networked personal computers and workstations, equipped with structural design and finite elements software packages. The well-equipped concrete laboratory provides state-of-the-art research tools, data acquisition systems, and universal and compression testing machines. The new state-of-the-art structural laboratory has a strong floor and strong wall, MTS actuators, overhead crane and is designed for small and large scale testing.

3. **Environmental/Water Resources Engineering**
   Graduate courses in this area meet the growing need for professionals who are well educated in the science and engineering of treatment processes, pollutant transport and our society's impact and reliance on the environment. Coursework and research in this area also address the need for more informed decision-making with respect to environmental risks, sustainability, and the global nature of today's challenges. Funded research from Caterpillar Inc., local water and wastewater municipalities and from regional and national environmental agencies provides an opportunity for graduate students to participate in the research of hazardous waste treatment, biological wastewater treatment, physiochemical treatment, and management models of environmental policies and systems.
4. **Transportation Engineering**
   The transportation industry and the motoring public rely on transportation systems that can move people and goods safely and efficiently. Graduate courses in transportation focus on the planning, design, operation, maintenance, rehabilitation, performance, and evaluation of transportation systems that provide optimal economic and sustainable societal benefits. Specific graduate courses include urban transportation planning, geometric highway design, traffic signal systems, highway safety, traffic flow theory, transportation economics, pavement materials, pavement design and analysis, and infrastructure asset management. Funded research from the Federal Highway Administration, the Illinois Center for Transportation, state and local governmental agencies, and organizations, such as the Illinois Asphalt Pavement Association (IAPA), provides opportunities for graduate students to participate in the research of highway and work zone safety, traffic engineering operations, asset management systems, asphalt pavement technologies, and the use of sustainable technologies in infrastructure.

The Civil Engineering (https://catalog.bradley.edu/graduate/course-descriptions/c_e/) and Construction (https://catalog.bradley.edu/graduate/course-descriptions/con/) graduate course listing and *course descriptions* can be found at the hyperlinked pages in the Catalog.

Elective Courses

Elective Courses are not required for the MSCE degree. A graduate student may select all 30 semester hours from courses offered in the department (CE and/or CON designated courses).

As appropriate to the graduate student's plan of study, a maximum of 12 semester hours of elective courses may be taken from the following list, in consultation with the CEC Graduate Coordinator, subject to consent and approval by the respective department offering the course:

- College of Business Courses - Any 500 or 600 level business course that the student satisfies the prerequisite for, subject to consent and approval by the College of Business. This includes courses under the designations of Business (BUS), Accounting (ATG), Economics (ECO), Finance (FIN), Management (ML, MIS, IB, ENT, BLW), Marketing (MTG), and Quantitative Methods (QM).
- Computer Science and Information Systems Courses - Any 500 or 600 level computer science and information system course that the student satisfies the prerequisite for, subject to consent and approval by the Computer Science and Information Systems department. This includes courses under the designation of Computer Information System (CIS) and Computer Science (CS).

Code	Title	Hours
CHM 516	Environmental Chemistry	3.0
IME 501	Engineering Cost Analysis	3.0
IME 511	Probability and Statistics for Analytics	3.0
IME 512	Design and Analysis of Experiments	3.0
IME 514	Introduction to Operations Research	3.0
IME 515	Linear Programming and Extensions	3.0
IME 522	Manufacturing Quality Control	3.0
IME 524	Six Sigma Theory and Methodologies	3.0
IME 526	Reliability Engineering	3.0
IME 586	Logistics & Supply Chain Systems	3.0
IME 587	Occupational Safety and Health	3.0
M E 509	Solar Engineering	3.0
M E 536	Industrial Pollution Prevention	3.0
M E 537	Building Energy Management	3.0
M E 556	Mechanics of Composite Materials	3.0
M E 577	Finite Element Methods in Engineering	3.0