

# Civil Engineering

*College of Science, Engineering and Technology*

*Department of Mechanical & Civil Engineering*

205 Trafton Science Center E • 507-389-6383

Fax 507-389-5002

Web site: ce.mnsu.edu

Chair: Saeed Moaveni, Ph.D., P.E.

Vance Browne, Ph.D., P.E.; Karen C. Chou, Ph.D., P.E.; Jerzy Fiszdon, Ph.D., P.E.; Charles W. Johnson, Ph.D., P.E.; Vojin Nikolic, Ph.D.; Deborah K. Nykanen, Ph.D.; W. James Wilde, Ph.D., P.E.;

Adjunct Faculty: Herman A. Dharmarajan, Ph.D., P.E.; DEE; William R. Douglass, P.E.; Joe Duncan, P.E.; Theodore V. Galambos, Ph.D., P.E.; Jon Huseby, P.E.; Peter Kjeer; Timothy O. Loose, P.E.; Ken Saffert, P.E.; Mark B. Snyder, Ph.D., P.E.; Chad Surprenant, P.E.

Civil Engineering, as defined by the American Society of Civil Engineers, is a profession in which a knowledge of the mathematical and physical science gained by study, experience, and practice is applied with judgement to develop ways to utilize, economically, the materials and forces of nature for the progressive well-being of humanity in creating, improving and protecting the environment, in providing facilities for community living, industry and transportation, and in providing structures for the use of humanity.

Civil engineers design and supervise, among others, the construction of roads, buildings, airports, tunnels, dams, bridges, and water supply and water and wastewater treatment systems. Major specialties within civil engineering are: structures, geotechnical engineering, water resources, transportation, environmental engineering, and construction.

Many civil engineers hold administrative positions, from city engineers to deputy commissioner of state department of transportation. Others may work in design, construction, research, and teaching. Most civil engineers hold supervisory positions such as project engineers.

**Program Mission Statement.** The Mission of the Civil Engineering Program at Minnesota State University, Mankato, is to provide a broad-based education that will allow students to attain the knowledge and communication skills necessary to be successful in any area of Civil Engineering professions, serving the needs of the State of Minnesota and the Nation. The program also provides the students with the necessary background to pursue graduate studies in Civil Engineering.

**Goals and Objectives.** Goals and objectives are attributes necessary to achieve a mission. The Civil Engineering Program at Minnesota State University, Mankato has identified the following goals and objectives to meet its mission:

1. To provide a high quality learning environment.
2. To provide highly competent and dedicated faculty.
3. To provide modern teaching and laboratory equipment and facilities.
4. To provide professional courses to achieve proficiency in geotechnical, structures, transportation and water resource (hydrology) engineering.
5. To provide opportunities for students to acquire communication, people, and managerial skills.
6. To provide strong hands-on laboratory experience.
7. To provide opportunity for professional practices, such as internships.
8. To foster strong faculty-student interaction through extracurricular activities such as ASCE, personal advising and consultation.
9. To foster an appreciation for professional development and lifelong learning.

These goals and objectives are fully compatible with the mission of Minnesota State University, Mankato and the College of Science, Engineering, and Technology. Goals and objectives are monitored by the constituencies (civil engineering profession through the program's Advisory Board and employers, students, and alumni) of the program.

Other important features of an education in civil engineering at Minnesota State University, Mankato include:

- Senior students work together as a design team in a full academic year course incorporating multiple civil engineering disciplines in comprehensive design project.
- Students work closely with engineers from design firms and government agencies and with faculty and students from other engineering courses in the senior design project.
- Students are required to take the Fundamentals of Engineering exam in their senior year – the first step towards professional registration.
- The flexible curriculum allows the students to have either a diverse or focused civil engineering study.
- The faculty maintains ties to industry, thereby keeping current with new technologies, design methodologies, and the world of civil engineering practice – a valuable resource for students.

## Preparations

Recommended high school preparation is two years of algebra, one year of geometry, one-half year of trigonometry, one-half year of college algebra, and a year each of physics and chemistry. Computer skills such as word processors, spreadsheets, and PowerPoint presentation or similar are also recommended. Without this background it may take longer than four years to earn the degree.

**Admission to Major** is necessary before enrolling in 300- and 400-level courses. Admission to the program is granted by the department. Near the end of the sophomore year, students should submit an application for

admission to the civil engineering program. Applications to the program may be obtained from the Department of Mechanical and Civil Engineering or downloaded from the department homepage.

Admission to the program is based on GPA and performance in selected courses and is subject to approval by the Department of Mechanical and Civil Engineering. Only students admitted to the program are permitted to enroll in upper-division civil engineering courses. Generally, no transfer credits are allowed for upper-division civil engineering courses. For any exceptions to this policy, special written permission must be obtained and will be reviewed by the department. The department makes a special effort to accommodate transfer students. Transfer students are encouraged to contact the department as soon as possible to facilitate a smooth transition. Please feel free to write, call, or visit the department.

Before being admitted to upper-division civil engineering courses, a student must complete a minimum of 49 credits, including the following courses: General Physics (calculus based) 10 credits; Calculus and Differential Equations 16 credits; Introduction to Engineering 1 credit; Computer Graphics 2 credits; computer programming language 2 credits; Engineering Mechanics (Statics, Dynamics, and Mechanics of Materials) 9 credits; Chemistry 5 credits; and English Composition 4 credits. Moreover, students are required to take a diagnostic test. The purpose of the test is to identify areas of weakness so that we can provide future improvements in those areas.

For transfer students the distribution of credits specified in the previous paragraph may vary, but the total credits must satisfy departmental transfer requirements. Transfer students should contact the department for individual evaluation.

All courses and credits shown above must be completed before enrollment in 300-level engineering courses. All of the above courses except Introduction to Engineering and any internship credits must be taken for "grade". It is not acceptable for the student to take any of these courses on a pass/no credit basis. A grade of "C" or better must be achieved in each course. To be considered for admission, the student must have a cumulative GPA of 2.5 for all science, math, ME, and CIVE courses. Admission to the Civil Engineering Program is selective and subject to approval of the Civil Engineering Academic Standards Committee. Failure to submit an application could result in the student being denied admission to the program and registration in junior or higher level classes in the Civil Engineering Program. If a student is denied admission to the Civil Engineering Program, he/she can reapply to the Civil Engineering Program for admission in subsequent years. If the applicant has attended Minnesota State University, Mankato only the application form is submitted to the Department of Mechanical and Civil Engineering along with a copy of that student's MSU transcript obtained from "The Hub". If the applicant has transfer credits

from another college or university, or expects to be admitted as a transfer student, all transfer courses/credits must be evaluated by the Office of Admissions at Minnesota State University, Mankato. The transfer student will need to refer to the Supplemental Information and/or the Minnesota State University, Mankato Undergraduate Bulletin for information about procedures that need to be followed when making application for admission as a transfer student. Applicants for admission to the program must also submit a complete plan of study.

## CIVIL ENGINEERING BSCE

### **Required (Special General Education, 23 credits):**

The Bachelor of Science in Civil Engineering degree does NOT adhere to the 44 credits of general education required by other colleges. Rather it requires a special distribution of communication, humanities, and social science courses. Courses should be chosen to simultaneously satisfy the university cultural diversity requirement.

### **Required Communication Courses (7 credits):**

ENG 101 Composition (4) and  
SPEE 102 Public Speaking (3) or  
SPEE 233 Public Speaking for Technical Profession  
(3) **OR**  
ENG 271 Technical Communication (4)

### **Required Humanities and Social Science Courses (minimum of 16 credits):**

To satisfy this requirement, the courses selected must provide both breadth and depth and not be limited to a selection of unrelated introductory courses. Not all courses in humanities and social sciences are acceptable. Courses should be chosen to simultaneously satisfy the university cultural diversity requirement. Each student should discuss with his/her civil engineering advisor on the selection of courses to meet this requirement. All students are urged to discuss this plan with their civil engineering advisors early in their academic year. An updated list of acceptable courses is posted in the department office.

Specifically, the minimum requirements consist of (a) three credits of microeconomics or macroeconomics, (b) at least 6 credits in the humanities area, and (c) at least 6 credits in the social science area; again (a), (b), and (c) must total at least 16 credits.

To provide the measure of depth to the course of study, at least 3 credits at the 300-level or above must be included in the 16 credit requirement. At least one upper division course must follow a course in the same subject area.

### **Required for Major (Prerequisites, 64-65 credits):**

*Mathematics (19 credits):*

MATH 121 Calculus I (4)  
MATH 122 Calculus II (4)  
MATH 223 Calculus III (4)  
MATH 321 Differential Equations (4)  
MATH 354 Concepts of Prob. & Stat. (3)

*Basic Science (19-20 credits):*

|      |     |                         |
|------|-----|-------------------------|
| CHEM | 201 | General Chemistry I (5) |
| PHYS | 221 | General Physics I (5)   |
| PHYS | 222 | General Physics II (5)  |

Science Elective from approved list (4-5)

*Computing Science & Graphics (4 credits):*

|          |     |                               |
|----------|-----|-------------------------------|
| COMS     | 171 | Intro. to C++ Programming (2) |
| MET/CIVE | 145 | Computer Graphics (2)         |

*Engineering Science (22 credits):*

|         |     |                                 |
|---------|-----|---------------------------------|
| EE      | 101 | Introduction to Engineering (1) |
| EE      | 230 | Circuit Analysis I (3)          |
| ME      | 206 | Material Science (3)            |
| ME/CIVE | 212 | Statics (3)                     |
| ME/CIVE | 214 | Dynamics (3)                    |
| ME/CIVE | 223 | Mechanics of Materials (3)      |
| ME      | 241 | Thermodynamics (3)              |
| ME/CIVE | 321 | Fluid Mechanics (3)             |

**Required for Major (41-45 credits):**

|  |                         |  |
|--|-------------------------|--|
| CIVE   | 201                     | Civil Engineering Seminar (1)            |
| CIVE   | 340                     | Structural Mechanics (3)                 |
| CIVE   | 350                     | Intro. to Hydraulics & Hydrology (4)     |
| CIVE   | 360                     | Geotechnical Engineering (4)             |
| CIVE   | 370                     | Transportation Engineering (4)           |
| CIVE   | 401                     | Civil Engineering Design I (1)           |
| CIVE   | 402                     | Civil Engineering Design II (2)          |
| CIVE   | 436                     | Civil Engineering Experimentation (2)    |
| CIVE   | 446                     | Reinforced Concrete Design (3) <b>OR</b> |
| CIVE   | 448                     | Steel Design (3)                         |
| CIVE   | electives (7-9 credits) |  |
| IDCM   | 212                     | Surveying and Site Planning (2)          |
| Technical electives from approved list (6-7 credits) |                         |  |

**Required Minor: None.****No minor or other major accepted for degree.****Civil, Science and Technical Electives**

A civil engineering student is required to choose a minimum of 19 credits in CIVE, science and technical electives: science elective (4-5 credits), technical electives (6-7 credits), and CIVE electives (7-9 credits). The science and technical electives are recommended to be taken after the student has identified his/her area of interest in consultation with his/her academic advisor. Science elective must be selected from the approved list (shown below) which would complement the student's area of interest in civil engineering. Technical electives must be selected from the approved list (shown below) which would enhance the student's experience in civil engineering.

*Approved Science Electives:*

|      |     |                                |
|------|-----|--------------------------------|
| BIO  | 105 | General Biology I (5)          |
| CHEM | 202 | General Chemistry II (5)       |
| ENVR | 101 | Persp. in Environ. Science (4) |
| GEOL | 121 | Physical Geology (4)           |

*Approved Technical Electives:*

|   |     |                  |
|---|-----|------------------|
| All CIVE courses except required courses                              |     |                  |
| All EE courses 300-level and above and EE 250 (Engineering Economics) |     |                  |
| All ME courses 300-level and above                                    |     |                  |
| BIO   | 270 | Microbiology (4) |

|      |     |  |
|------|-----|--|
| BLAW | 450 | Contracts, Sales & Prof. Responsibility (3)  |
| BLAW | 453 | International Legal Environ. of Business (3) |
| BLAW | 474 | Environ. Regulation & Land Use (3)           |
| BLAW | 476 | Construction and Design Law (3)              |
| CHEM | 305 | Analytical Chemistry (4)                     |
| CHEM | 407 | Water Chemistry (3)                          |
| ENVR | 440 | Environmental Regulations (3)                |
| ENVR | 450 | Environmental Pollution Control (3)          |
| ENVR | 460 | Analysis of Pollutants (3)                   |
| GEOL | 270 | Structural Geology (4)                       |
| GEOL | 351 | Engineering Geology (2)                      |
| GEOL | 450 | Hydrogeology (3)                             |

**POLICIES/INFORMATION**

**GPA Policy.** To maintain satisfactory progress in the upper-division Civil Engineering Program, a student must: (1) maintain a cumulative GPA of at least 2.3; and (2) achieve a GPA of at least 2.0 each semester.

**P/N Grading Policy.** P/N credit may not be applied to any 200-level or higher required course in the civil engineering curriculum except for internship credits and courses designated as P/N only.

**Probation Policy.** A student who does not maintain satisfactory progress as defined above will be placed on academic probationary status for a maximum of one semester. During the probationary period, the student must maintain satisfactory progress in addition: (a) must complete at least 8 credits for grade from the prescribed Civil Engineering curriculum; and (b) shall not receive a degree without first conforming to the satisfactory progress criteria. A student who does not maintain satisfactory progress during the probationary period will not be allowed to continue in the program. The student may later reapply for admission to the program.

Refer to the College regarding advising for students on academic probation.

**Appeals.** A student has the right to appeal a department decision in writing. The department will consider such appeals individually.

For most up-to-date list of Civil Engineering courses, please visit our web site at [ce.mnsu.edu](http://ce.mnsu.edu). Also see the Mechanical Engineering program for detailed description of ME courses and ME/CIVE dual listing courses, and the Manufacturing Engineering Technology program for detailed description of MET/CIVE dual listing courses that are required for the Civil Engineering Program.

**COURSE DESCRIPTIONS****CIVE 145 (2) Computer Graphics**

Same as MET 145.

**CIVE 201 (1) Civil Engineering Seminar**

To introduce the students to the civil engineering pro-

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fession and to begin the preparation for development towards the profession as an engineer through interactions with practicing engineers, reading, discussions and search of information through the internet.

**CIVE 212 (3) Statics**

Same as ME 212.

**CIVE 214 (3) Dynamics**

Same as ME 214.

**CIVE 223 (3) Mechanics of Materials**

Same as ME 223.

**CIVE 321 (3) Fluid Mechanics**

Same as ME 321.

**CIVE 340 (3) Structural Mechanics**

Analysis of determinate and indeterminate structural systems using classical methods such as consistent displacements, energy method, slope-deflection and moment distribution. Use of computer software is expected.  
Pre: ME/CIVE 223

**CIVE 350 (4) Introduction to Hydraulics and Hydrology**

Concept of hydraulics such as pipe flow and open channel flow. Hydrologic principles such as weather patterns; precipitation measurement and distribution, abstractions, and runoff; storm hydrograph and peak flow analysis. Design includes flood designs, reservoir and channel routing.  
Pre: ME/CIVE 321

**CIVE 360 (4) Geotechnical Engineering**

Study of soil behaviors and their classifications; index properties. Applications of mechanics principles to soils as an engineering material, consolidation theory, compaction theory, effective stresses, shear strength; earth pressure and slope stability. Elements of foundation designs.

Pre: ME/CIVE 223 and Co-req.: ME/CIVE 321

**CIVE 370 (4) Transportation Engineering**

Introduction to Transportation systems; land use and transportation interaction, planning, and traffic operations; transportation decision making using economic analysis. Introduction to design, construction, maintenance, and operation of various transportation modes.  
Co-req.: ME/CIVE 321 or consent of instructor.

**CIVE 401 (1) Civil Engineering Design**

Practical civil engineering design project with “real world” constraints. This course focuses on the planning and formulation of the project and is a pre-requisite course of CIVE 402.

Pre: CIVE 350, CIVE 360, CIVE 370, and Co-req.: CIVE 446 or CIVE 448

**CIVE 402 (2) Civil Engineering Design II**

Practical civil engineering design project with “real world” constraints. This course focuses on the engineering analysis and design and economic analysis of the project. The course includes a design lab.

Pre: CIVE 401

**CIVE 436 (2) Civil Engineering Experimentation**

Laboratory experiments in the testing of civil engineering materials including, soil, concrete, asphalt, and metals as well as testing of structural components and structural systems. The course also provides students with experiments in fluid mechanics and hydraulics.  
Co req.: CIVE 340, CIVE 350, CIVE 360.

**CIVE 446 (3) Reinforced Concrete Design**

Design of reinforced concrete beams, columns, slabs and structural foundations. Use of standard specifications is required. Use of computer software is expected  
Pre: CIVE 340

**CIVE 448 (3) Steel Design**

Behavior and properties of structural steel; proportionality of tension members, beams, and columns and design of connections using LRFD specifications.  
Pre: CIVE 340

**CIVE 450 (3) Finite Element Method**

Same as ME 450

**CIVE 465 (3) Foundation Design**

Classification of foundations; applications of fundamental soil mechanics to design and analysis of soil-structure systems; design and computer application of shallow and deep foundations, piles and caissons, retaining structures. Introduction to rock mechanics.  
Pre: CIVE 360

**CIVE 470 (3) Traffic Engineering**

Elements of traffic engineering including road use, vehicle and roadway systems; traffic flow theory; traffic studies and data collections; traffic control devices; principles of intersecting signalization; capacity and level of service; analysis of freeways, rural highways and intersections using computer software for traffic operations and management.

**CIVE 497 (3) Internship**

**CIVE 499 (1-6) Individual Study**