Civil Engineering


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 judgment to design, construct, operate, maintain, and control the works, structures, and systems of an economic, efficient, and environmentally sound nature to meet public needs. Civil engineers, therefore, are involved in the planning of public and private works such as roads, bridges, buildings, airports, harbors, dams, irrigation and flood control projects, electric power plants, landfills, and water and wastewater treatment systems. As such, they have the ability to provide solutions to a variety of problems that are unique to civil engineering.

Civil Engineering Program Objectives

1. To provide students with a strong technical foundation to practice civil engineering, or to pursue graduate study, particularly in four major disciplines: geotechnical, structural, transportation, and water resources engineering; or to pursue a career in engineering management.
2. To prepare graduates to enter practice as registered professional engineers.
3. To communicate technical information effectively with the public, their peers, and clients.
4. With an understanding of the need for life-long learning and of the importance of professional ethics.
5. To become registered professional engineers.
6. With an awareness of cultural, societal, and professional issues.
7. To pursue graduate study, particularly in four major disciplines: geotechnical, structural, transportation, and water resources engineering.

Cooperative Education

More than 80% of the graduating students in the Civil Engineering program participate in Cooperative Education. Younger students usually start in projects which closely parallel classroom lecture material. As they mature, the students are allowed to perform for an extended period of time as members of collaborative design teams on projects that demand a broader knowledge base. Participation in Cooperative Education is required of all students majoring in Civil Engineering.

Career Development

Graduates of the Civil Engineering program at Minnesota State University, Mankato will be prepared:

1. With a strong technical foundation to practice civil engineering, or to pursue graduate study, particularly in four major disciplines: geotechnical, structural, transportation, and water resources engineering; or to pursue a career in engineering management.
2. To become registered professional engineers.
3. To communicate technical information effectively with the public, their peers, and clients.
4. With an understanding of the need for life-long learning and of the importance of professional ethics.
5. With an awareness of cultural, societal, and professional issues.
6. To pursue graduate study, particularly in four major disciplines: geotechnical, structural, transportation, and water resources engineering.

Required for Major (42-43 credits): CIVE 201 Introduction to Problem Solving and Civil Design (2) CIVE 271 Civil Engineering Measurements (2)

Required for Major (Prerequisites, 62-63 credits): Mathematics (16 credits): MATH 121 Calculus I (4) MATH 122 Calculus II (4) MATH 223 Mechanics of Materials (3) ME/CIVE 321 Fluid Mechanics (3) Required Humanities and Social Science Courses (minimum of 16 credits): To satisfy this requirement, the courses selected must provide a minimum of 16 credits in the humanities and social sciences. 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 for Major (Prerequisites, 62-63 credits): Mathematics (16 credits): MATH 121 Calculus I (4) MATH 122 Calculus II (4) MATH 223 Mechanics of Materials (3) ME/CIVE 321 Fluid Mechanics (3) Required Humanities and Social Science Courses (minimum of 16 credits): To satisfy this requirement, the courses selected must provide a minimum of 16 credits in the humanities and social sciences. 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 for Major (Prerequisites, 62-63 credits): Mathematics (16 credits): MATH 121 Calculus I (4) MATH 122 Calculus II (4) MATH 223 Mechanics of Materials (3) ME/CIVE 321 Fluid Mechanics (3) Required for Major (42-43 credits): CIVE 491 Introduction to Problem Solving and Civil Engineering Design (2) CIVE 271 Civil Engineering Measurements (2)
CIV 340 Structural Mechanics (3)
CIV 350 Hydraulics & Hydrology (4)
CIV 360 Geotechnical Engineering (4)
CIV 370 Transportation Engineering (4)
CIV 381 Civil Engineering Design I (3)
CIV 402 Civil Engineering Design II (3)
CIV 435 Civil Engineering Experimentation I (2)
CIV 436 Civil Engineering Experimentation II (2)
CIV 446 Reinforced Concrete Design (3) OR
CIV 448 Steel Design (3)
CIV electives (7-10 credits)
Technical electives from approved list (2-4 credits)

Required Minor: None.

Civil, Science and Technical Electives
A civil engineering student is required to choose a minimum of 16 credits in CIV, science and technical electives: science elective (4-5 credits), technical electives (2-4 credits), and CIV electives (7-10 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.

POLICIES/INFORMATION
GPA Policy. To maintain satisfactory progress in the upper-division Civil Engineering Program, a student must: (1) maintain a GPA of 2.3 for all upper-division engineering courses required for the major; 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 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 of one semester. During the probationary period, the student must 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 policies 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.

Course Repeat Policy: Only the first 12 semester credits of repeated classes will be exempted from GPA calculation.

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

CIV 101 (2) Introduction to Engineering - Civil

To prepare the students for a career in engineering with some emphasis in civil; introduce the engineering fundamentals and the skills necessary to have a successful learning experience; and to prepare students for engineering education and profession through interactions with upper-class engineering students and practicing engineers.

CIV 145 (2) Computer Graphics
Principles of AutoCAD along with Civil Engineering applications are covered.

CIV 201 (2) Introduction to Problem Solving and Civil Engineering Design
Introduction to the design concepts of civil engineering projects including presentations, codes and standards, construction drawings, and public hearing; problem solving skills for civil engineering analysis and design including the use of appropriate computational tools and programming logic.
Pre: CIV 101

CIV 212 (3) Statics
Same as ME 212.

CIV 214 (3) Dynamics
Same as ME 214.

CIV 223 (3) Mechanics of Materials
Same as ME 223.

CIV 271 (2) Civil Engineering Measurements
Basic civil engineering measurements as relates to construction layout, including distances, angles, bearings, elevations, mapping, and positioning.
Co-requisites: MATH 121 or instructor consent.

CIV 321 (3) Fluid Mechanics
Same as ME 321.

CIV 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

CIV 350 (4) 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 design, reservoir and channel routing.
Pre: ME/CIVE 321

CIV 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

CIV 370 (4) Transportation Engineering
Introduction to Transportation systems; land use and transportation interactions, 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.

CIV 380 (3) Environmental Engineering
Application of fundamental chemical, biological and physical principles of environment engineering to design and operation of water and wastewater treatment and distribution systems, solid waste management, air pollution control, and analysis of quality of air, surface water and ground water.
Pre-req.: CHEM 201, MATH 321, and Co-req.: ME 321 or instructor consent.

CIV 401 (2) Civil Engineering Design I
Practical civil engineering design project with "real world" constraints. This
course focuses on the planning and formulation of project, and the presentation of the preliminary findings to the public.
Pre-req.: CIVE 340, 350, 360, and 370.

CIVE 402 (3) Civil Engineering Design II
Practical civil engineering design project with "real world" constraints. Focuses on the engineering analysis, design, and economic analysis of the project. Includes a design lab.
Pre-req.: CIVE 401

CIVE 432 (3) Properties of Concrete
Selected studies in the properties and design of concrete mixtures, cement chemistry, concrete availability, specialty concrete construction, admixtures, and quality control.
Pre-req.: CIVE 435 and consent of instructor

CIVE 435 (2) Civil Engineering Experimentation I
To provide students with hands-on experience in the testing of civil engineering materials such as concrete and metals and structural systems. The course also provides students with experiments in transportation.
Pre-req.: CIVE 340 & 370.

CIVE 436 (2) Civil Engineering Experimentation II
To provide students with hands-on experience in testing civil engineering materials such as soil and asphalt. The course also provides students with experiments in fluid mechanics, hydraulics, and hydrology.
Pre-req.: CIVE 350, 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 452 (3) Open Channel Flow
Analysis of open channel flow systems. Includes natural channels, designed channels, flow transitions, steady flow, unsteady flow, uniform flow, and non-uniform flow.
Pre-req: CIVE 350

CIVE 454 (3) Stormwater Management
Application of fluid mechanics and hydrology to the design of stormwater management facilities.
Pre-req: CIVE 350

CIVE 461 (3) Fundamentals of Pavement Design
Performance and design of rigid, flexible, and composite pavement structures with emphasis on modern pavement design procedures. Principles of pavement maintenance and rehabilitation, and pavement management systems. Materials characterization, tests, quality control, and life cycle cost analysis.
Pre-req: ME/CIVE 223, CIVE 360, and CIVE 370

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 471 (3) Highway Planning and Design
Introduces the classification and design process of highways; development and use of design controls, criteria, and highway design elements; design of vertical and horizontal alignment, and establishment of sight distances; design of cross-sections, intersections, and interchanges.
Pre-req: CIVE 271, CIVE 370

CIVE 476 (3) Planning and Design of Airports
Development and design of airport facilities and the integration of multiple disciplines including runway orientation and capacity, terminal facilities, forecasting, planning, noise, airspace utilization, parking, lighting, and construction.
Pre-req: CIVE 370

CIVE 481 (3) Water and Wastewater Treatment, Collection, and Distribution
Overview of municipal water and wastewater treatment and distribution practices. Application of chemical, biological and physical principles to design and operation of water and wastewater treatment and distribution systems.
Pre-req: CIVE 380

CIVE 497 (3) Internship

CIVE 499 (1-6) Individual Study