Civil Engineering (CIV)

Major in Civil Engineering

Department of Mechanical Engineering, College of Engineering and Applied Sciences

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Civil Engineering (CIV)

The Bachelor of Engineering in Civil Engineering is designed to give students a solid foundation in civil engineering and sciences. It will provide students with a breadth and depth of technical knowledge in the field, preparing them to work immediately in most areas of the profession, including geotechnical engineering, environmental engineering, hydraulics, structural engineering, construction management, and transportation/traffic engineering. Students take courses in chemistry, physics, and math, in addition to a core set of engineering courses common to most engineering disciplines. Students are also introduced to computer software which expedites the design process, and they are taught how to balance engineering designs with economic constraints.

Program Educational Objectives

The educational objectives of the civil engineering program are to prepare our graduates to:

1. Establish a successful career in civil engineering.
2. Possess a strong fundamental, scientific and technical knowledge-base, and critical thinking skills, to serve as the foundation for lifelong learning related to the civil engineering profession, and in preparation for graduate studies.
3. Have a broad and well-integrated background in the concepts, theories, and methodologies needed to plan, design, analyze, develop, organize, and manage civil engineering projects.
4. Have expertise in the major areas of civil engineering: structural analysis, design and reliability, transportation systems engineering, and water resources and environmental engineering.

Program Outcomes

To prepare students for the above educational objectives, we have adopted the following set of program outcomes that describe what they are expected to attain when they graduate:

(a) an ability to apply knowledge of mathematics, science, and engineering
(b) an ability to design and conduct experiments, as well as to analyze and interpret data
(c) an ability to design a system, component, or process to meet desired needs within realistic constraints, such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
(d) an ability to function on multidisciplinary teams
(e) an ability to identify, formulate, and solve engineering problems
(f) an understanding of professional and ethical responsibility
(g) an ability to communicate effectively
(h) the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
(i) a recognition of the need for, and an ability to engage in life-long learning
(j) a knowledge of contemporary issues
(k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

Civil Engineering (CIV)

Requirements for Acceptance to the Major in Civil Engineering

Freshman applicants who have specified their interest in Civil Engineering on their applications may be accepted directly into the major upon admission to the University.

Requirements for the major in Civil Engineering (CIV)

The major in Civil Engineering leads to the Bachelor of Engineering degree.

Completion of the major requires approximately 112 credits.

1. Mathematics
   a. AMS 151, AMS 161 Applied Calculus I, II
   b. AMS 261 Applied Calculus III or MAT 203 Calculus III with Applications
   c. AMS 361 Applied Calculus IV: Differential Equations or MAT 303 Calculus IV with Applications
Note: The following alternate calculus course sequences may be substituted for AMS 151, AMS 161 in major requirements or prerequisites:
MAT 125, MAT 126, MAT 127 or MAT 131, MAT 132 or MAT 141, MAT 142 or MAT 171.

2. Natural Sciences
   a. PHY 131/PHY 133, PHY 132/PHY 134 Classical Physics I, II and Laboratories
   b. CHE 131/CHE 133, CHE 132/CHE 134 General Chemistry I, II and Laboratories or CHE 141/143, CHE 142/144 Honors Chemistry I, II and Laboratories

Note: The following alternate physics course sequences may be substituted for PHY 131/PHY 133, PHY 132/PHY 134: PHY 125, PHY 126, PHY 127, PHY 133, PHY 134 Classical Physics A, B, C and Laboratories or PHY 141, PHY 142 Classical Physics I, II: Honors

3. Laboratories
   MEC 316 Mechanical Engineering Laboratory I
   CIV 340 Civil Engineering Laboratory

4. Civil Engineering
   CIV 210 Land Surveying
   CIV 305 Transportation Systems Analysis I
   CIV 310 Structural Engineering
   CIV 320 Water Supply & Waste Management
   CIV 330 Soil Mechanics
   CIV 410 Principles of Foundation Engineering
   CIV 420 Hydraulics

5. Mechanical Engineering
   MEC 101 Engineering Computing and Problem Solving I
   MEC 102 Engineering Computing and Problem Solving II
   MEC 202 Engineering Drawing and CAD I
   MEC 203 Engineering Drawing and CAD II
   MEC 214 Probability and Statistics for Mechanical Engineers
   MEC 220 Practical Electronics Mechanical Engineers
   MEC 260 Engineering Statics
   MEC 262 Engineering Dynamics
   MEC 280-H Pollution and Human Health
   MEC 363 Mechanics of Solids
   MEC 364 Introduction to Fluid Mechanics

6. Thermodynamics
   CME 304 Chemical Engineering Thermodynamics I

7. Material Science
   ESG 332 Materials Science I: Structure and Properties of Materials

8. Engineering Design
   CIV 312 Design of Civil Engineering Structures
   CIV 440 Senior Design I
   CIV 441 Senior Design II

9. Writing and Oral Communication Requirement
   CIV 300 Technical Communication

10. Engineering Economics
    EST 392 Engineering and Manufacturing Economics or ECO 108 Introduction to Economics

11. Engineering Specializations
    The area of specialization, composed of four electives, must be declared in writing by the end of the junior year. Two out of the four electives must be taken at the upper-division level. The area of specialization is selected in consultation with a faculty advisor.

    The four areas of specialization are transportation engineering, geotechnical engineering, environmental engineering and structural engineering.

Areas of Specialization
Each area of specialization requires a minimum of four electives from these lists.

Transportation Engineering

- CIV 306 Transportation Systems Analysis II
- EST 304 Communications for Engineers and Scientists
- EST 331 Professional Ethics and Intellectual Property
- EST 391-H Technology Assessment
- EST 393 Project Management
- GEO 102-E Earth
- GEO 318 Engineering Geology and Coastal Processes
- MEC 442 Experimental Stress Analysis
- MEC 455 Applied Stress Analysis

Geotechnical Engineering

- EST 304 Communications for Engineers and Scientists
- EST 331 Professional Ethics and Intellectual Property
- EST 391-H Technology Assessment
• EST 393 Project Management
• GEO 102-E Earth
• GEO 318 Engineering Geology and Coastal Processes
• GEO 420 Environmental Analysis Using Remote Sensing and Geographic Information Systems
• GEO 440 Geological Applications of Remote Sensing
• MEC 310 Introduction to Machine Design
• MEC 442 Experimental Stress Analysis
• MEC 455 Applied Stress Analysis

Environmental Engineering
• BIO 201-E Fundamentals of Biology: Organisms to Ecosystems
• ESM 212 Introduction to Environmental Materials Engineering
• EST 102-E Weather and Climate
• EST 304 Communications for Engineers and Scientists
• EST 331 Professional Ethics and Intellectual Property
• EST 341 Waste Treatment Technologies
• EST 391-H Technology Assessment
• EST 393 Project Management
• GEO 102-E Earth
• GEO 315 Groundwater Hydrology or CIV 422 Hydrology
• GEO 318 Engineering Geology & Coastal Processes
• GEO 353 Marine Ecology
• GEO 420 Environmental Analysis Using Remote Sensing and Geographic Information Systems
• MAR 104 Oceanography
• MAR 304-E Waves, Tides, and Beaches
• MAR 336 Marine Pollution
• MEC 393 Engineering Fluid Mechanics

Structural Engineering
• EST 304 Communications for Engineers and Scientists
• EST 331 Professional Ethics and Intellectual Property
• EST 391-H Technology Assessment
• EST 393 Project Management
• MEC 310 Introduction to Machine Design
• MEC 402 Mechanical Vibrations
• MEC 442 Experimental Stress Analysis
• MEC 455 Applied Stress Analysis

Grading
All courses taken to satisfy requirements 1 through 11 above must be taken for a letter grade. The grade point average for the courses MEC 260, 262, 280, 316, 363, 364, CME 304, CIV 305, 310, 320, 330, 410, 420, 440, 441, and all specialization and technical electives must be at least 2.00. A minimum grade of “C” in PHY 131 or PHY 125, MAT 125 or MAT 131, MEC 260, and MEC 262 is required for the BE degree. When a course is repeated, the higher grade will be used in calculating this average.

Sample Course Sequence for the Major in Civil Engineering

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CIV Faculty
Faculty information for this program can be found at http://me.eng.sunysb.edu/index.php?option=com_content&view=article&id=83&Itemid=169
CIV

Civil Engineering

CIV 210: Land Surveying
Introduces the general mathematical and physical concepts related to engineering surveying. Covers plane surveying, geodesy, geodetics, measurement techniques and instruments, leveling, error theory, survey adjustments, coordinate systems and datums. Practical measurement techniques and instruments, and survey staking. Introduces photogrammetry and remote sensing, geographic information systems (GIS).
Prerequisites: PHY 127 or 132; MAT 127 or 132 or 142 or AMS 161; CIV major
1 credit

CIV 300: Technical Communication
Aims to ensure proficiency in the types of communication necessary for success in the engineering professions. Provides students with the ability to apply their knowledge of correct written and spoken English to the diverse modes of communication encountered and used by engineers in the professional workplace. Combined with laboratory courses to create practical application of writing skills to civil engineering laboratory reports.
Prerequisites: WRT 102 and CIV major
Corequisite: CIV 340
1 credit, S/U grading

CIV 305: Transportation Systems Analysis I
Focused on highway transportation planning and traffic analysis. Topics include transportation planning, performance analysis of highway and road design, highway segments, highway and airport pavement design, geometric design, sight elevations and alignment, highway traffic operations, queueing theory and modeling, traffic analysis and control, travel demand models, ethics, sustainability, and environmental considerations during transportation planning.
Prerequisites: AMS 361 or MAT 303; CIV major
3 credits

CIV 306: Transportation Systems Analysis II
Focus is on high-speed ground transportation, urban transit and advanced modeling. Transportation and systems modeling. Planning, modeling and design of high-speed transit systems. Urban travel demand modeling. Transportation network modeling, uncongested and congested network models, planning and design issues of urban transit design. Highway asset management.

Environmental transportation models, sustainability. Transportation system comparisons and evaluation, benefit and revenue cost analysis, and multi-criteria analysis.
Prerequisite: CIV 305
3 credits

CIV 310: Structural Engineering
Prerequisites: MEC 363; CIV major
3 credits

CIV 312: Design of Civil Engineering Structures
Prerequisite: CIV 310
3 credits

CIV 320: Water Supply and Waste Management
Prerequisites: MEC 364; CME 304; CIV major
3 credits

CIV 330: Soil Mechanics
Prerequisite: CIV 310
3 credits

CIV 340: Civil Engineering Laboratory
Laboratory experiments that illustrate the basic principles of soil and material mechanics, environmental engineering and hydraulics, and civil engineering structures. Shear and cohesive strength of soils, slope stability; mechanical loading and analysis of steel, wood, concrete and composites; quality control tests and field testing. Hydraulic pressure, velocity, and flow; dissolved oxygen, biochemical and chemical oxygen demands; hydrologic, sediment and solids measurements. Determine and indeterminate structure analysis, steel and wood structures; foundations; testing of concrete structures. Lab report writing, measurement analysis, and error propagation theory.
Prerequisites: MEC 316 and MEC 364
Corequisites: CIV 320 and CIV 330 and CIV 300
1 credit

CIV 410: Principles of Foundation Engineering
Prerequisites: CIV 312 and CIV 330
3 credits

CIV 420: Hydraulics

*Prerequisites: MEC 364 and CIV major
3 credits*

**CIV 440: Senior Design I**
Students will participate in structured engineering projects under supervision. They will be assigned to carry out significant professional responsibilities and whatever additional assignments are determined by their advisors. Assignments will cover in-situ data management and testing, specific limits, engineering judgments and reporting.

*Prerequisites: CIV 305 and 312 and 320 and 330 and 340
3 credits*

**CIV 441: Senior Design II**
Students will participate in structured engineering projects under supervision. They will be assigned to carry out significant professional responsibilities and whatever additional assignments are determined by their advisors. Assignments will design of civil engineering structures, design of special structures, comprehensive and realistic design project using the systems approach, design choices and their effect upon the environment, design constraints including constructability, minimization of environmental impact, and cost-effectiveness, managerial and professional aspects of design practice.

*Prerequisite: CIV 440
3 credits*