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.

Student Outcomes

The students will demonstrate the following:

(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 lifelong 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

Students in good academic standing who were admitted to the University but not immediately accepted into the major may apply for acceptance after they meet the following minimum requirements: 1) completion of at least 10 credits of mathematics, physics, chemistry, and engineering courses required for the major, 2) earned a G.P.A. of 3.0 in all mathematics, physics, chemistry, and engineering courses applicable to major requirements with no more than one grade of C or lower, and 3) completion of course evaluations for all transferred courses that are to be used to meet requirements of the major. Students interested in applying for admission are encouraged to talk to the Undergraduate Program Director.

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

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 135, PHY 134 Classical Physics A, B, C and Laboratories or PHY 141, PHY 142, PHY 133, PHY 134 Classical Physics I, II: Honors

c. A basic science elective to be selected from the following list of courses: GEO 102, The Earth; MAR 104, Oceanography; BIO 201, Fundamentals of Biology: From Organisms to Ecosystems; ATM 201, Introduction to Climate and Climate Change

3. Laboratories

- CIV 340 Civil Engineering Materials Laboratory
- CIV 341 Geotechnical Engineering Laboratory
- CIV 342 Hydraulics and Environmental Engineering Laboratory

4. Civil Engineering

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

5. Mechanical Engineering

- MEC 101 Engineering Computing and Problem Solving
- MEC 102 Engineering Computing and Problem Solving II
- MEC 203 Engineering Graphics and CAD
- MEC 214 Probability and Statistics for Mechanical Engineers
- MEC 260 Engineering Statics
- MEC 262 Engineering Dynamics
- MEC 280 Pollution and Human Health
- MEC 363 Mechanics of Solids
- MEC 364 Introduction to Fluid Mechanics

6. Material Science

- ESG 332 Materials Science I: Structure and Properties of Materials

7. Engineering Design

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

8. Writing and Oral Communication Requirement

- CIV 300 Technical Communication

9. Engineering Economics

- EST 392 Engineering and Manufacturing Economics or ECO 108 Introduction to Economics

10. 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 Technology Assessment
- EST 393 Project Management
- GEO 102 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 Technology Assessment
- EST 393 Project Management
- GEO 102 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 Fundamentals of Biology: Organisms to Ecosystems
- ESM 212 Introduction to Environmental Materials Engineering
- EST 102 Weather and Climate
- EST 304 Communications for Engineers and Scientists
- EST 331 Professional Ethics and Intellectual Property
- EST 341 Waste Treatment Technologies
- EST 391 Technology Assessment
- EST 393 Project Management
- GEO 102 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 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 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 10 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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<th>Freshman Fall</th>
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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 100: Infrastructure**

This course explores the science and engineering of the built environment and the important role of infrastructure in daily life. Students will learn about major infrastructure systems including transportation, water resources, environmental, energy, and structural infrastructure.

3 credits

**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 Materials Laboratory**

Laboratory experiments that illustrate the basic analysis and behavior of civil engineering materials and structures. Mechanical loading and analysis of steel, wood, and concrete; quality control tests and field testing; testing of concrete structures. Lab report writing, measurement analysis, and error propagation theory.

Prerequisite: MEC 363

Corequisite: CIV 310

2 credits

**CIV 341: Geotechnical Engineering Laboratory**

Laboratory experiments that illustrate the basic analysis and behavior of soils, including liquid and plastic limits, grain size, compaction, permeability, consolidation, compression and shear strength. Lab report writing, measurement and error analysis.

Prerequisite: MEC 363

Corequisite: CIV 330

2 credits

**CIV 342: Water Resources and Environmental Engineering Laboratory**

Laboratory experiments that illustrate the fundamentals of hydraulics with application to water resources and physical, chemical, and biological treatment techniques for purification of water. Lab report writing, measurement and error analysis.
Prerequisite: MEC 364
Corequisites: CIV 320; CIV 420
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