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.

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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, PHY134 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

Freshman Fall	**Credits**	**Spring**	**Credits**
First Year Seminar 101	1	First Year Seminar 102	1
AMS 151	3	AMS 161	3
PHY 131/PHY 133	4	PHY 132/PHY 134	4
MEC 101	2	MEC 102	2
CHE 131	4	CHE 132	4
D.E.C. A	3	D.E.C.	3
Total	17	Total	17
Sophomore Fall	**Credits**	**Spring**	**Credits**
AMS 261	4	AMS 361	4

MEC 260	3	MEC 214	1
EST 392 (D.E.C. F)	3	MEC 262	3
MEC 220	2	MEC 363	3
CHE 133	1	MEC 203	2
MEC 202	1	CHE 134	1
D.E.C.	3		
Total	17	Total	14
Junior Fall	**Credits**	**Spring**	**Credits**
CME 304	3	MEC 280 (D.E.C. H)	3
ESG 332	4	CIV 300	1
MEC 316	2	CIV 305	3
MEC 364	3	CIV 312	3
CIV 210	1	CIV 320	3
CIV 310	3	CIV 330	3
		CIV 340	1
Total	16	Total	17
Senior Fall	**Credits**	**Spring**	**Credits**
CIV 440	3	CIV 441	3
CIV 410	3	D.E.C.	3
CIV 420	3	D.E.C.	3
Specialization Course	3	Specialization Course	3
Specialization Course	3	Specialization Course	3
Total	15	Total	15

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, queuing 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

Mechanics of materials related to engineering structures. Theory and analysis of structures, structural form and modeling. Load paths. Determinate and indeterminate structure analysis. Structural analysis using virtual work. Stiffness and flexibility methods. Influence lines. Design of structures with different materials: concrete, steel-concrete composites, timber and masonry structures. Structural systems. Structural reliability and serviceability.

Prerequisites: MEC 363; CIV major

3 credits

CIV 312: Design of Civil Engineering Structures

The application of the principles of structural engineering to the design of steel, concrete, masonry and timber structures. Design of cold formed steel structures. Design of composite structures. Design of hydraulic structures. Design with concrete and pre-stressed concrete. Design of beams, columns, and structural members for various loadings. Connections. Structural systems. Code requirements for various loading applications. Load paths and loads from earthquake and wind forces. Analysis of frames and wood engineering.

Prerequisite: CIV 310

3 credits

CIV 320: Water Supply and Waste Management

Water and wastewater planning. Physical water and wastewater treatment processes. Chemical water and wastewater treatment processes. Settling. Mass, material and energy balances. Filtration and disinfection, membrane and absorption processes. Biological wastewater treatment processes. Air pollution and incinerators. Solid waste/ landfills. Modeling applications. Economics and financial calculations. Environmental laws and regulations. Life cycle assessment and sustainability.

Prerequisites: MEC 364; CME 304; CIV major

3 credits

CIV 330: Soil Mechanics

Soil relationships and classification, consolidation and settlement analysis. Soil compaction. Stress distribution, slop stability, and retaining structures. Foundation engineering introduction. Site improvements. Geo-synthetics, geotechnical earthquake engineering, geo-environment. In-situ subsurface characterization, in-situ testing and field instrumentation. Ground water modeling seepage forces, flow nets, and computer applications.

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. Determinate 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

Strength, deformation and stress distributions in soils. Drained and undrained soil strength, soil exploration and sampling, in-situ subsurface characterization, in-situ testing and field instrumentation. Soil-structure interactions. Bearing capacity, footings and mats. Settlement and consolidation. Single piles and pile groups, load transfer to soils, pile driving, and pile load tests. Lateral loading of piles. Auger cast piles. Drilled shafts. Modeling and computer applications.

Prerequisites: CIV 312 and CIV 330

3 credits

CIV 420: Hydraulics

Fundamentals of hydraulics. Open channel hydraulics, sediment transportation in open channels. Coastal engineering hydraulics. Simulation in hydraulics. Water resources planning and management, storm sewers and flood detention. River flood waves. Storm analysis, intensity, and frequency.

Stochastic hydraulics and risk assessments. Eco-hydraulics. Modeling and computer applications.

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