

# CIV

## Civil Engineering

### 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.

**SBC:** TECH

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, 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

**SBC:** TECH

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, slope 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 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. This course has an associated fee. Please see [www.stonybrook.edu/coursefees](http://www.stonybrook.edu/coursefees) for more information.

**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. This course has an associated fee. Please see [www.stonybrook.edu/coursefees](http://www.stonybrook.edu/coursefees) for more information.

**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. This course has an associated fee. Please see [www.stonybrook.edu/coursefees](http://www.stonybrook.edu/coursefees) for more information.

*Prerequisite: MEC 364*

*Pre- or Corequisite: CIV 320*

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 414: Advanced Construction Materials**

This course is targeted at senior undergraduate or graduate students in civil engineering specializing in structural materials. Students from material science engineering or mechanical engineering may also take this course. This course introduces emerging structural materials in construction which includes high performance concrete, fiber-reinforced polymers, calcium sulfoaluminate cement, and high performance steel.

*Prerequisite: CIV 340 or MEC 317 or ESM 335*

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 422: Introduction to Coastal Engineering**

Basic hydrodynamics of water waves. Topics include linear wave theory, energy, power and energy propagation, wave refraction, shoaling and breaking in the nearshore, diffraction by breakwaters and gaps, reflection and basin oscillations, wave statistics and spectra, wind-wave hindcast/forecast, wave forces on piles and pipes. Some coastal processes due to nonlinearity, including wave set-up/set-down, nearshore circulations and storm surges. Physical interpretations of mathematical formulas are particularly emphasized.

*Prerequisite: MEC 364*

3 credits

### **CIV 423: Coastal Engineering Planning and Design**

Planning and design of various types and function of coastal structures and shore protective measures. Considerations of site conditions; Design processes; Design of sloping - and vertical- front coastal structure; Scour and scour protection; coastal sediment transport; shore protection measures such as coastal armoring, beach restoration, and beach stabilization; and introduction to harbor and marina.

*Prerequisite: MEC 364 or permission of instructor.*

*Advisory Prerequisite: CIV 422*

3 credits

### **CIV 424: Stormwater Management & Design**

The main focus of this course is on the design of stormwater management practices to reduce runoff pollutants from impacting local waterways. Topics to be discussed will include an overview on regulations governing stormwater activities, stormwater impacts, basic hydrology, urban hydrology (rational method and TR55), stormwater runoff calculations, design and criteria for various standard practices, erosion and sediment control practices, with emphasis on the New York State stormwater management design requirements for meeting water quality and flood control. Policy discussion will include site redevelopment, flooding and drainage issues.

*Pre- or Corequisite: CIV 420*

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. This course has an associated fee. Please see [www.stonybrook.edu/coursefees](http://www.stonybrook.edu/coursefees) for more information.

*Prerequisite: CIV 440*

3 credits

### **CIV 499: Independent Research**

This course is designed to allow undergraduates an opportunity to do independent research with a faculty member in Civil Engineering. Permission to register requires the agreement of the faculty member to supervise the research. May be repeated twice but only three credits of research electives may be counted as technical electives.

*Prerequisite: Permission of department*

0-3 credits