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, geodetic, 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
1 credit

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
The role and ethical responsibilities of a structural engineer. Structures and their structural systems. Loads and load paths through structures. Analysis, behavior, and design of determinate and indeterminate beams, trusses and framed structures under static loads using various methods. Shear, moment, and deflection diagrams. Influence lines. Computer aided structural analysis.

Prerequisites: MEC 363; CIV or MEC or ESG major
**SBC:** TECH
3 credits

CIV 312: Steel and Reinforced Concrete Design
Strength limit states, behavior, and proportioning of steel and reinforced concrete members. Design principles also address serviceability and constructability limit states. Steel tension member and connection design including gross and net yielding and block shear. Steel and reinforced concrete flexural members and columns. Shear capacity design for reinforced concrete beams. Reinforced concrete T-beams, doubly reinforced beams, and one-way slabs. Introduction to combined loading for both steel and concrete members.

Prerequisite: CIV 310
3 credits

CIV 320: Water Supply and Waste Management
This course will cover the planning, design, and operation of water and wastewater infrastructure. Specific topics include: water and wastewater planning; environmental laws and regulations; water quality; physical water and wastewater treatment processes; chemical water and wastewater treatment processes; biological wastewater treatment processes; mass, material and energy balances; economics and financial calculations; resiliency and sustainability.

Prerequisite: MEC 364; CIV major
3 credits

CIV 330: Introduction to Geotechnical Engineering
This course will introduce students to the origin of soils and weight-volume relationships; Soil classification for engineering applications; Soil compaction; Flow of water through soils; Stresses in soil masses: Total, pore pressure, and effective stresses; Stresses in soil masses due to external loads: Foundations and Excavations; Consolidation of saturated clay deposits; Time rate of consolidation; Stresses in solid: Mohr's Circle; Shear strength of soils and Mohr-Coulomb failure criteria; Lateral earth pressure: at-rest conditions; In-situ tests: ground exploration for civil engineering applications.

Prerequisite: MEC 363
Corequisite: CIV 341
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 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 for more information.

Prerequisite: MEC 363
Corequisite: CIV 330
2 credits
CIV 342: Civil Engineering Hydraulics Laboratory

Laboratory experiments are conducted that illustrate the fundamentals of hydraulics including pipes under pressure (water mains and networks), and open channel flow (sewers, drains, and channel sections). The fundamental concepts of energy, momentum and continuity will be discussed. Topics covered include but are not limited to fluid statics, orifice and free jet flow, hydrostatic pressure, flow over weirs, energy loss in pipes and bends, and critical, subcritical and supercritical flow. Lab report writing, measurement and error analysis. This course has an associated fee. Please see www.stonybrook.edu/coursefees for more information.

Prerequisite: MEC 364
Pre- or Corequisite: CIV 320
1 credit

CIV 407: Transportation Economics

Microeconomics principles applied in the transportation field. Transportation demand and supply. Transportation costs (fixed costs, variable costs) and externalities. Economic and social benefits of transportation. Economic principles for transport pricing, e.g. toll pricing. Cost benefit analysis of a transportation project. History of government regulation of transportation.

Prerequisites: CIV 305 and EST 392 or ECO 108
3 credits

CIV 410: Principles of Foundation Engineering


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


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 the instructor
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 426: Introduction to Environmental Biotechnology

This undergraduate course covers the fundamental concepts of biological processes that are important in natural and engineered environmental systems. The course will incorporate basic fundamental microbiology into a quantifiable engineering context in order to describe, predict and control behavior of environmental biological system.

Prerequisite: CIV 320 or permission of the instructor
3 credits

CIV 436: Prestressed Concrete Design

Introduction to the behavior, analysis, and design of prestressed concrete structural members and structural systems. Limit states addressed will include flexure, shear, torsion, and deflection. Design examples will include indeterminate systems such as multi-span bridges and their construction. The design of prestressed composite beams and prestressed slabs will be presented.

Prerequisite: CIV 312
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 CIV 320 and CIV 330 and CIV 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 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 but only three credits may be counted as technical elective.

Prerequisite: Permission of department

0-3 credits