**CIV 505: Transportation Network Analysis**
Traffic flows on networks; Deterministic and user equilibrium traffic assignment problems; Transportation networks and optimality; Transportation network design and reliability; Vulnerability of transportation networks
3 credits, Letter graded (A, A-, B+, etc.)

**CIV 507: 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.
3 credits, Letter graded (A, A-, B+, etc.)

**CIV 509: Transportation Logistics Systems**
This course provides a deep understanding of logistics systems by introducing the models and analytic techniques to evaluate their design and operation. Emphasis will be placed on the development of models to demonstrate the core concepts involved in network distribution strategies, discrete facility location design, vehicle routing and scheduling, and inventory management.
3 credits, Letter graded (A, A-, B+, etc.)

**CIV 510: Advanced Foundation Engineering**
The course is designed to provide students with the theory and experience-based knowledge necessary to evaluate and estimate soil properties and earth pressure for analysis and design of retaining walls, anchored bulkheads, and excavation bracing systems. Bearing capacity and settlement of shallow foundations are also covered. Semesters Offered: Fall
3 credits, Letter graded (A, A-, B+, etc.)

**CIV 511: Advanced Shear Strength of Soils**
This course covers topics related to advanced analysis for shear strength of soils including stress-path, shear strength of cohesive soils, and shear strength of granular soils.
3 credits, Letter graded (A, A-, B+, etc.)

**CIV 513: Seepage and Slope Stability**
This class will expose students to water flow in soils and the associated seepage forces applied on underground structures. Also included in this class is a detailed discussion about determining the soil hydraulic properties in the lab and in the field. Additionally, the course will discuss the stability of earth slopes forming natural and manmade slopes using various analysis methods.
3 credits, Letter graded (A, A-, B+, etc.)

**CIV 515: Analysis of Deep Foundations**
This course covers topics related to the analysis and design of deep foundations including the design of vertically loaded drilled shafts and driven piles, the analysis of laterally loaded piles, and in-situ pile load tests.
3 credits, Letter graded (A, A-, B+, etc.)

**CIV 516: Soil and Site Improvement**
This class will expose students to techniques currently used in practice to improve the properties of soils in-situ. These techniques will include shallow and deep compaction, overexcavation and replacement, deep replacement, drainage and dewatering, preloading, deep soil mixing, and fill reinforcement. At the end of the class, students will be able to perform preliminary analysis to select the most appropriate soil improvement technique for a given project and deliver a detailed design of the selected technique.
3 credits, Letter graded (A, A-, B+, etc.)

**CIV 522: 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. Semesters Offered: Spring
3 credits, Letter graded (A, A-, B+, etc.)

**CIV 523: Coastal Engineering Planning and Design**
The basic principles involved in the planning and design of various types and functions of coastal structures and shore protective measures will be discussed. Topics will include review of linear wave theory, considerations of site conditions; design processes; design of sloping- and vertical-front coastal structures; 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.
3 credits, Letter graded (A, A-, B+, etc.)

**CIV 524: Coastal Processes and Sediment Transport**
This course describes processes associated with water and sediment movements close to shoreline. The topics covered in this course includes: sediment characteristics; long-term processes, hydromorphologies of coastal zone; field measurement techniques and analysis, equilibrium beach profiles, sediment transport, modeling of beaches and shorelines, shoreline modification and analysis including soft and hard engineering approaches and tidal inlets.
3 credits, Letter graded (A, A-, B+, etc.)

**CIV 526: Environmental Biotechnology**
This graduate 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.
3 credits, Letter graded (A, A-, B+, etc.)

**CIV 532: Structural Dynamics**
Analysis of the dynamic response of structures and structural components to transient loads and foundation excitation; single-degree-of-freedom and multi-degree-of-freedom systems; response spectrum concepts; numerical methods for integration of the equations of motion; simple inelastic structural systems; systems with distributed mass and flexibility.
3 credits, Letter graded (A, A-, B+, etc.)

**CIV 533: Intermediate Steel Design**
Metal members under combined loads; connections, welded and bolted; moment-resistant connections; plate girders, conventional behavior, and tension field action.
3 credits, Letter graded (A, A-, B+, etc.)

**CIV 534: Intermediate Reinforced Concrete Design**
Strength, behavior, and design of indeterminate reinforced concrete structures, with primary emphasis on slab systems; emphasis on the strength of slabs and on the available methods of design of slabs spanning
in two directions, with or without supporting beams.

3 credits, Letter graded (A, A-, B+, etc.)

**CIV 535: Earthquake Engineering**
Source mechanisms, stress waves, and site response of earthquake shaking; effect on the built environment; nature of earthquake actions on structures; fundamental structural response characteristics of stiffness, strength, and ductility; representation of the earthquake input in static and dynamic structural analysis; modeling of steel and concrete structures under earthquake effects; outputs for safety assessment; comprehensive source-to-design actions project.

3 credits, Letter graded (A, A-, B+, etc.)

**CIV 544: Environmental Fluid Dynamics**
Free surface flows of water and air occurring in natural fluid systems and influencing environmental transport and mixing. Fundamental principles of fluids, covering the scales relevant to both engineering and geophysical applications. Topics include waves, instability, stratification, turbulent boundary layers, jets and plumes, and river hydraulics.

3 credits, Letter graded (A, A-, B+, etc.)

**CIV 545: Computational Fluid Dynamics**

3 credits, Letter graded (A, A-, B+, etc.)

**CIV 547: Environmental Physchical-Chemical Processes**
Physical-chemical processes that affect environmental quality in natural and engineered systems. The focus is on developing a qualitative understanding of mechanisms as well as quantitative tools to describe, predict, and control physical-chemical processes. Topics include reactor mixing and reaction kinetics, gas transfer, sorption, particle dynamics, filtration, membranes, and disinfection. Most of the applications are in the water quality subdomain, but overlap exists with air quality, soil and sediment contamination, and even some applications to biological systems.

3 credits, Letter graded (A, A-, B+, etc.)

May be repeated for credit.

**CIV 595: Independent Study in Civil Engineering**
Students can register this course in order to conduct research or participate in a project under the supervision of one or more members of the Civil Engineering faculty.

1-6 credits, Letter graded (A, A-, B+, etc.)

May be repeated 2 times FOR credit.

**CIV 596: MS Project**
This course is taken by M.S. students who select MS Project track. Conducted jointly by graduate students and one or more members of the faculty. A final project report must be submitted to the advisor as well as to the Graduate Program Director. Without the submitted report, credits from his course cannot be applied toward the MS degree.

0-6 credits, Letter graded (A, A-, B+, etc.)

May be repeated 1 times FOR credit.

**CIV 599: M.S. Thesis Research**
This course is taken by M.S. students for their thesis research work.

1-12 credits, S/U grading

May be repeated 2 times FOR credit.

**CIV 680: Special Topics in Transportation Engineering**
The subject matter of special topics course can vary semester to semester depending on the interests of the students and the faculty, and the contemporary topics in transportation field.

3 credits, Letter graded (A, A-, B+, etc.)

May be repeated for credit.

**CIV 681: Special Topics In Geomechanics and Geotechnical Engineering**
The subject matter of special topics course can vary semester to semester depending on the interests of the students and the faculty, and the contemporary topics in geotechnical engineering field.

3 credits, Letter graded (A, A-, B+, etc.)

May be repeated for credit.

**CIV 682: Special Topics in Ocean and Coastal Engineering**
The course is designed for the discussion of topics of special interest on demand that may not be covered in regularly scheduled courses. Varying topics from ocean wave mechanics, offshore structures, coastal processes, sediments and morphology to estuarine dynamics may be offered concurrently.

3 credits, Letter graded (A, A-, B+, etc.)

May be repeated for credit.

**CIV 683: Special Topics in Structural Engineering**
The subject matter of special topics course can vary semester to semester depending on the interests of the students and the faculty, and the contemporary topics in structural engineering field.

3 credits, Letter graded (A, A-, B+, etc.)

May be repeated for credit.

**CIV 684: Special Topics in Water Resources and Environmental Engineering**
The course is designed for the discussion of topics of special interest on demand that may not be covered in regularly scheduled courses. Varying topics from water treatment, solid waste management, urban and watershed hydrology, stormwater management, water quality modeling to environmental fluid mechanics may be offered concurrently.

3 credits, Letter graded (A, A-, B+, etc.)

May be repeated for credit.

**CIV 685: Special Topics in Materials Engineering**
The subject matter of special topics course can vary semester to semester depending on the interests of the students and the faculty, and the contemporary topics in materials engineering field.

3 credits, Letter graded (A, A-, B+, etc.)

May be repeated for credit.

**CIV 689: Dissertation Research On Campus**
Students have to register for this class during their dissertation research after advancement to candidacy. Major portion of research must take place on SBU campus, at Cold Spring Harbor, or at the Brookhaven National Lab.
1-9 credits, S/U grading  
May be repeated for credit.

**CIV 700: Dissertation Research Off Campus-Domestic**

Students have to register for this class during their dissertation research after advancement to candidacy. Major portion of research will take place off-campus, but in the United States and/or U.S. provinces. All international students must enroll in one the graduate student insurance plans and should be advised by an international advisor.

1-9 credits, S/U grading  
May be repeated for credit.

**CIV 701: Dissertation Research Off Campus-International**

Major Portion of research will take place outside of the United States and/or U.S. provinces. Domestic students have the option of the health plan and may also enroll in MEDEX. International students who are in their home country are not covered by mandatory health plan and must contact the Insurance Office for the insurance charge to be removed. International students who are not in their home country are charged for the mandatory health insurance. If they are to be covered by another insurance plan they must file a waiver before second week of classes. The charge will only be removed if other plan is deemed comparable. All international students must receive clearance for an International Advisor.

1-9 credits, S/U grading  
May be repeated for credit.