CIVIL ENGINEERING (CEEN)

CEEN 5311 GIS for Civil Engineering
3 Semester Credit Hours (3 Lecture Hours)
This course is focused on the advanced applications of GIS methods in civil engineering. The main topics include data acquisition, vector analysis, raster analysis, geospatial data visualization, utility network analysis, spatial statistics, space-time pattern mining, WebGIS, and programming for geospatial analysis.
Prerequisite: CEEN 3330.

CEEN 5321 Structural Engineering
3 Semester Credit Hours (3 Lecture Hours)
Matrix force and displacement methods of structural analysis; virtual work theorem and principles, virtual forces and displacements; computation of element stiffness matrices and load vectors; introduction to finite element analysis and structural stability. Applications in structural design.

CEEN 5322 Optimization
3 Semester Credit Hours (3 Lecture Hours)
This course focuses on problem formulation, software technologies and analytical methods for optimization serving as an introduction to a wide variety of optimization problems and techniques including dynamic programming, network flows, integer programming, heuristic approaches, Markov chains, game theory, and decision analysis. This course provides tools to formulate engineering problems as the optimization of some function under some set of constraints. As such operations research is a quantitative discipline that deals with the application of advanced analytical methods to help make better decisions. This course employs techniques from other mathematical sciences, such as mathematical modeling, statistical analysis, and mathematical optimization and provides optimal or near-optimal solutions to complex decision-making problems. (Cross-listed with IEEN 5313 Optimization.)
Prerequisite: ENGR 5302.

CEEN 5323 Sustainable Infrastructure Engineering
3 Semester Credit Hours (3 Lecture Hours)
This course aims at providing students with simple scientific techniques for the optimum design of materials to improve its performance while minimizing cost and environmental impacts. The course aims at providing students with metrics of sustainability, principles of design for the environment, methods for pollution prevention, and use of mass and energy balances in the design of sustainable systems. In addition, concepts of Life-Cycle Assessment (LCA) and cost analysis are introduced to students. The concepts of carbon footprint and embodied energy of construction materials will be introduced to the students. The course will include new technologies, materials, and design processes for sustainable infrastructure; energy management and renewable energy and efficiency in structures; and connections between societal needs and infrastructure development.
Prerequisite: CEEN 5321 and 5331.

CEEN 5331 Water Resources Engineering
3 Semester Credit Hours (3 Lecture Hours)
This course is focused on the advanced extension of the principles of hydraulics and hydrology to applications in water resources systems. The main topics include water supply systems, stormwater systems, wastewater systems, irrigation systems, water conservation, watershed analysis and simulation, system reliability and resilience, and integrated water resources management.
Prerequisite: CEEN 4312.