

## Civil Engineering Courses-1

### **CIV 211/Surveying**

**.5 course unit**

(laboratory)  
(fall semester)

*Prerequisite:* MAT 127

An introduction to the theory and applications of modern surveying processes. Students use optical and digital land surveying instruments to measure distance, direction, elevation and location. Electronic data collection in the field and computers for subsequent survey computation in the laboratory are used. Concepts of higher order survey techniques and global positioning systems are introduced.

### **CIV 213/CAD Laboratory**

**.5 course unit**

(laboratory)  
(fall semester)

*Prerequisite:* MAT 127

This course focuses on the principles of computerized drafting and design, graphic entities, hatch patterns, layering, part file creation, and information extraction. Two-dimensional drafting and drawings using a CAD system is used. Three-dimensional modeling and surface revolution is introduced.

### **CIV 251/Strength of Materials**

**1 course unit**

(same as MEC 251)  
(spring semester)

*Prerequisites:* ENG 222, computer programming

Topics include axial, lateral, and torsional loading of shafts and beams; statically indeterminate structures; temperature and prestrain effects; shear force and bending moment in beams; axial, shear, bearing and bending stresses; deflection of beams; and buckling of columns.

### **CIV 263/Engineering Materials Laboratory**

**.5 course unit**

(same as MEC 263)  
(laboratory)  
(spring semester)

*Corequisite:* CIV 251

Experiments related to strength of materials and basic stress analysis and material science. Computer data acquisition and data analysis.

### **CIV 311/Structural Analysis**

**1 course unit**

(fall semester)

*Prerequisites:* CIV 251 with a grade of at least C-

Topics covered are: various types of structural forms and loads; determination of forces at a structure's supports and connections; analysis of various types of statically determined trusses; shear and bending-moment functions and diagrams for beams and frames; analysis of simple cable and arch systems; influence lines for beams, girders, and trusses; elastic deflections using double integration, moment-area and conjugate-beam methods; and energy methods such as virtual work and Castigliano's theorems.

## Civil Engineering Courses-2

### **CIV 321/Numerical Methods for Engineers**

**1 course unit**

(same as MEC 321)

(fall semester)

*Prerequisites:* ENG 272, computer programming

Numerical solutions to linear and non-linear systems of equations; root finding methods; numerical integration; numerical methods for finding eigenvalues and eigenvectors; numerical integration of ordinary and partial differential equations.

### **CIV 331/Soil Mechanics**

**1 course unit**

(fall semester)

*Prerequisite:* CIV 251 with at least a grade of C-

*Corequisite:* CIV 333

The basic principles of soil mechanics are introduced. Topics included are elements of mechanics and hydraulic properties of soils, soil-water systems and fluid flow, stresses in soils, compressibility, consolidation and settlement, shear strength and subsoil exploration and interpretation.

### **CIV 333/Soil Mechanics Laboratory**

**.5 course unit**

(laboratory)

(fall semester)

*Corequisite:* CIV 331

In this course, students obtain extensive hands-on experience in the use of laboratory equipment and in the essentials of engineering classifications of soils, physical properties and shear strength of soils such as moisture content, Atterberg limits, compaction, permeability, unconfined compression, direct shear tests and triaxial test.

### **CIV 351/Structural Steel Design**

**1 course unit**

(with design hour)

(spring semester)

*Prerequisite:* CIV 311

The load and resistance factor design, LRFD and the allowable steel design, ASD approaches are used throughout the course. Types of loading, structural systems, analysis and design of components of structural systems in tension, compression, flexure, and combined axial bending loads are covered. Bolted and welded connections, steel joists and decking and use of computer in analysis, design, and detailing are also discussed.

### **CIV 361/Fluid Mechanics**

**1 course unit**

(fall semester)

*Prerequisites:* ENG 262

Topics include hydrostatics; kinematics of fluid motion; conservation equations; dimensional analysis; laminar and turbulent viscous incompressible flow; pipe networks, flow over immersed bodies, open channel flow.

### **CIV 363/Fluid Measurement Laboratory**

**.5 course unit**

(laboratory)

(spring semester)

*Corequisites:* CIV 361

Experiments related to fluid mechanics illustrating principles of flow behavior including computer aided analysis and interpretation.

### Civil Engineering Courses-3

#### **CIV 371/Civil Engineering Materials**

**.5 course unit**

(laboratory)

(spring semester)

*Prerequisites:* CIV 333

This course covers the behavior and testing of metals, polymer composites, and cementitious and asphaltic concrete as well as their constitutive materials. Common ASTM laboratory testing procedures and specifications are used.

#### **CIV 381/Environmental Engineering**

**1 course unit**

(fall semester)

*Prerequisites:* CHE 201

General principles associated with environmental engineering are discussed including: water, soils, and air pollution analyses. Topics discussed include: introductory water and air quality constituents, hazardous waste, wastewater, air pollution, noise pollution, nuclear waste, commercial and residential environmental concerns, environmental law, solid waste and alternative energy sources.

#### **CIV 385/Hydraulic Engineering and Hydrology**

**1 course unit**

(spring semester)

*Prerequisite:* CIV 361

The characteristics and operation of pumps is discussed. Engineering hydrology is discussed. Topics include: pump characteristic curves, affinity laws, pumps in series and parallel, rainfall-runoff relationship, hydrologic losses, unit hydrograph theory, statistical methods for peak flow prediction, regression equations, reservoir routing.

#### **CIV 411/Transportation Engineering**

**1 course unit**

(fall semester)

*Prerequisite:* CIV 211

This course covers the fundamentals of transport facilities and service design, with emphasis on highway geometric design, pavement design, and transit service design. Topics include vehicle performance, horizontal and vertical alignments of highways, flexible and rigid pavements, pavement management, transit operations and control, and transit route design.

#### **CIV 421/Reinforced Concrete Design**

**1 course unit**

(with design hour)

(fall semester)

*Prerequisites:* CIV 311, CIV 371

An introduction to the design of reinforced concrete structures, concrete technology, properties of concrete and reinforcing steel, construction practice, and general code requirements. Students are introduced to analysis and design of members subjected to axial load, flexure, shear, and torsion forces. Bond, anchorage, development length, and serviceability conditions such as cracking and deflection are checked. Numerous practical design problems will be assigned.

#### **CIV 431/Foundation Engineering**

**1 course unit**

(with design hour)

(spring semester)

*Prerequisites:* CIV 331, CIV 333

This course introduces the concepts of analysis and design for embankments, foundations and retaining systems. Topics include slope stability, bearing capacity, lateral earth pressure, retaining structures, and shallow and deep foundations.

## Civil Engineering Courses-4

### **CIV 441/Structural Steel Design II**

**1 course unit**

(with design hour)

(occasionally)

*Prerequisite:* CIV 351

The load and resistance factor design, LRFD and the allowable steel design, ASD approaches are used throughout the course. This course focuses on the behavior and design of various structural members in steel building and bridge structures. Topics include code design requirements, stability and post-buckling, plate girders, composite steel/concrete girders, second-order frame behavior, high-strength bolted and welded connections.

### **CIV 443/Foundation Engineering II**

**1 course unit**

(with design hour)

(occasionally)

*Prerequisite:* CIV 431

This course introduces advanced topics relevant to geotechnical engineering practice. Topics include geosynthetics, foundations on difficult soils, soil improvement and ground modification, instrumentation and monitoring, soil liquefaction, pipe jacking and tunneling, soil dynamics and soil structure interaction, pavement design and biotechnology applications in geotechnical engineering.

### **CIV 445/Water Resources Engineering**

**1 course unit**

(with design hour)

(occasionally)

*Prerequisite:* CIV 361

This course focuses on the nature of water flow in a natural environment. Topics include: subcritical vs. supercritical flow, hydraulic jumps, water surface profiles, flow through hydraulic structures such as bridges and culverts, floodplains delineation, bridge and culvert scour, unsteady flow. The HEC-RAS program is used extensively throughout the course

### **CIV 446/Hydraulic Structure Design**

**1 course unit**

(with design hour)

(occasionally)

*Prerequisite:* CIV 385

This course focuses on the design of hydraulic structures including: dams, spillways, and stilling basins. Topics include: Design life of the structure, Hydrologic analysis, Supercritical and spatially varied flow, Energy dissipation. The Hec-HMS and Hec-RAS programs are used throughout the course.

### **CIV 449/Prestressed Concrete**

**1 course unit**

(with design hour)

(occasionally)

*Prerequisite:* CIV 421

This course explores the design and behavior of prestressed concrete structures: materials and systems (including specifics for pre-tensioned and post-tensioned members), losses, flexure, shear, bond, deflections, and continuous beams.

## Civil Engineering Courses-5

### **CIV 451/Construction Management**

**1 course unit**

(spring semester)

*Prerequisite:* ENG 372 and ((CIV 351, CIV 385, CIV 411), or (CIV 351, CIV 385, CIV 431), or (CIV 351, CIV 411, CIV 431), or (CIV 385, CIV 411, CIV 431))

An introduction to the management of construction projects and the project delivery processes. Topics include the nature of the industry, construction planning and scheduling, allocation of resources, critical path networks, and use of computer software, estimating, bidding and cost control, contract administration, and dispute resolutions.

### **CIV 461/Reinforced Concrete Design II**

**1 course unit**

(with design hour)

(occasionally)

*Prerequisite:* CIV 421

Behavior and design of reinforced concrete structures and structural components subjected to axial, flexural, and torsion loading conditions. Topics include detailing of reinforcement, design of two-way floor systems, slender columns, members subjected to torsion, shear walls, strut and tie models, and connections in precast elements. An introduction to prestressed concrete and seismic design of reinforced concrete structures is made.

### **CIV 471/Transportation Engineering II**

**1 course unit**

(with design hour)

(occasionally)

*Prerequisite:* CIV 411

The fundamentals of transportation engineering and carrying field observations of traffic characteristics with application to various modes, planning, selection, formulation, and administration of modern transportation systems are covered. Impacts of economic, sociological, geographic, environmental, and political factors on transportation systems are also discussed.

### **CIV 481/Structural Analysis II**

**1 course unit**

(with design hour)

(occasionally)

*Prerequisite:* CIV 311

The course covers the general flexibility and stiffness methods of analysis; multi-span beams, trusses, frames and grids; loadings due to force, support displacement, temperature change and member pre-strain; axial and flexural stability; and basic plasticity. This course represents the basis for the finite element method of analysis.

### **CIV 495/Senior Project I**

**0.5 course unit**

(fall semester)

*Prerequisites:* (CIV 351, CIV 385, CIV 411), or (CIV 351, CIV 385, CIV 431), or (CIV 351, CIV 411, CIV 431), or (CIV 385, CIV 411, CIV 431)

Senior project focuses students' previous experience upon a specific technical project. Library research, preliminary design, evaluation of alternatives, project planning, cost and scheduling analysis, written reports, and oral presentation. Students work closely with a faculty advisor.

### **CIV 496/Senior Project II**

**0.5 course unit**

(spring semester)

*Prerequisite:* CIV 495

Senior project focuses students' previous experience upon a specific technical project. Library research, preliminary design, evaluation of alternatives, project planning, cost and scheduling analysis, written reports, and oral presentation. Students work closely with a faculty advisor.