ARTICULATION COURSES

Department of Civil & Environmental Engineering

Candidates for admission to the Graduate Program should typically have an undergraduate degree in Civil/Environmental Engineering area. In special cases, for candidates to the Graduate Program with Civil/Environmental Engineering emphasis area, who do not have an undergraduate degree in Civil/Environmental Engineering field, there are two options:

Option 1. First obtain a B.S. in Civil engineering, and then pursue a MS degree. This is a much more preferred option. With this option, you are much better prepared to take FE Exam and PE Exam, and you get a broad knowledge of civil engineering. This option takes longer to complete since you have to satisfy all course degree requirements for the B.S. in Civil Engineering Program, and the engineering courses are typically offered once a year. Your adviser and the Department will determine what courses can be transferred. See also information for transfer students.

Option 2. The second option is to take articulation courses first and then pursue a graduate program. This option can be completed faster, but does not give you a broad knowledge of civil engineering. In this case, you would take additional courses based on the courses your have already taken. The engineering courses are typically offered once a year. The articulation classes are described below.

Articulation Courses for Civil Engineering Emphasis Area

Candidates for the Civil Engineering emphasis area, who do not have an undergraduate degree in Civil Engineering or in closely related field, are required to satisfy, as a minimum, all the articulation courses listed in Table 1 in addition to satisfying four courses from the five articulation courses listed in Table 2. In addition, required pre-requisites (such as Calculus courses, Calculus-based Physics courses, Chemistry, etc.) to all articulation courses must be fulfilled as is required by the individual course. In addition to courses listed in table 1 and Table 2, the students are required to take several other undergraduate courses in specialty areas (structural engineering, geotechnical engineering, water resources engineering, and transportation engineering). The adviser and the Dept. will determine what additional courses are needed based on the student's program of study. As a result, a student may be required to take many more courses than the ones listed in Table 1 and Table 2.

Table 1. Required three courses

Course No.	Course Title	Credit
MATH 368	Ordinary Differential Equations	3
CIV 222	Engineering Mechanics I	3
CIV 240	Strength of Materials	3

Table 2. Choose four from the following five courses in consultation with the faculty adviser.

CIV 320	Structural Analysis	3
CIV 330 & CIVL 330	Fluid Mechanics Lecture & Lab	
CIV 340 & CIVL 340	Intro to Environm. Engr. & Lab	4
CIV 380 & CIVL 380	Intro to Geotechnical Engr & Lab	4
CIV 390	Intro to Transportation Engr	3

Note: In addition to the courses listed in Tables 1 and 2, the students are required to take several other courses in specialty areas (structural engineering, geotechnical engineering, water resources engineering, and transportation engineering). The adviser and the Dept. will determine what additional courses are needed based on the student's program of study.

Articulation Courses for Environmental Engineering Emphasis Area

Candidates for the Environmental Engineering emphasis area, who do not have an undergraduate degree in Civil/Environmental Engineering, are required to satisfy, as a minimum, the articulation courses listed in Table 3. Required pre-requisites (such as Calculus courses, Calculus-based Physics courses, Chemistry, etc.) to all articulation courses must be fulfilled as is required by the individual course. In addition to courses listed in Table 3, the students may be required to take several other undergraduate courses. The adviser and the Dept. will determine what additional courses are needed based on the student's program of study and his/her background. As a result, a student may be required to take many more courses than the ones listed in Table 3.

Table 3. Required courses for Environmental Engineering Emphasis area

Course No.	**Course Title**	**Credit**
MATH 368	Ordinary Differential Equations	3
CIV 330 & CIVL 330	Fluid Mechanics Lecture & Lab	3
CIV 340 & CIVL 340	Intro to Environm. Engr. & Lab	4

Note: The students may be required to take several additional courses. The adviser and the Dept. will determine what additional courses are needed based on the student's program of study.

Important Notes for Civil Engineering and Environmental Engineering Emphasis Area:

1. Required pre-requisites to all articulation courses must be fulfilled as is required by the individual course.

2. The above articulation courses serve as general guidelines. The students are required to meet with their faculty adviser. The adviser and the Dept. will determine what additional courses are needed.

3. Undergraduate civil engineering classes are typically offered once a year, either in Fall or in Spring semester. Please see the undergraduate curriculum.

Department of Civil & Environmental Engineering

Civil Engineering Articulation Courses Descriptions

CIV 222 (3) Engineering Mechanics I. Co-requisite: PHY 211. Calculus-based statics of particles and rigid bodies; equilibrium; distributed forces; centroids; structures, trusses, frames, machines; forces in beams and cables; friction; moments of inertia, real life examples for engineering applications and systems approach**.**

CIV 240 (3) Strength of Materials. Prerequisite: EN 222. Forces and stresses, axial loading, torsion, pure bending, transverse loading, shear force and bending moment diagrams, transformation of stress and strain, design of beams and shafts, deflection of beams, statically indeterminate problems, energy methods, columns, real life examples and systems approach.

CIV 320 (3) Structural Analysis. Prerequisite: EN 240. Analysis of statically determinate and indeterminate structures for fixed and moving loads. Equations of equilibrium and compatibility. Influence lines, and shear and moment envelopes. Analysis of forces and deflections in structures by methods of moment distribution, consistent deformation, and virtual work, computer analysis of structures, real life examples.

CIV 330 (2) Fluid Mechanics. Prerequisites: EN 223, EN 240, Co-requisite: MATH 368, CIVL 330. Fluid properties and definition; fluid statics; fluid dynamics; Bernoulli equation and linear momentum; viscous flow; drag forces and boundary layer concepts; ideal flow; velocity potential and stream functions; dimensional analysis and dynamic similitude, real life problems.

CIVL 330 (1) Fluid Mechanics Laboratory. Co-requisite: CIV 330. Laboratory experience to measure fluid properties and apply principles for application in engineering design. The experiments will include pressure and velocity measurement, application of mass, energy, and momentum principles, energy losses, forces on immersed bodies, and flow measurement devices; critically analyze and interpret data, report writing.

CIV 340 (3) Introduction to Environmental Engineering. Prerequisites: CHEM 141; co-requisites; CIVL 340, CIV 330, and CIVL 330. Basic concepts of environmental engineering, local and global environmental issues, scientific, social, ethical, regulations and public policy on environmental protection; quantitative engineering analysis of sources, transformations, and effects of pollutants in water, air, and soil; introduction to water and wastewater treatment processes, air pollution control technologies, solid waste and hazardous waste management. This course requires the completion of a service learning component in specific areas of environmental engineering.

CIVL 340 (1) Environmental Engineering Laboratory. Prerequisite: CHEM 141 , Co-requisites: CIV 340, CIV 330, CIVL 330. Experiments for the analysis of water, wastewater and certain solid wastes. Selected experiments may include determinations of water's or wastewater's pH, alkalinity, turbidity, hardness, and electric conductivity; solids, nitrogen species, dissolved oxygen, biochemical oxygen demand (BOD), chemical oxygen demand (COD), total organic carbon, and chlorinated compounds. Also included will be contaminant leaching test of some solid or hazardous wastes and absorption of contaminants by solid media. Critical analysis of experimental and interpretation of data and scientific presentation (reporting) of results are emphasized.

CIV 380 (3) Introduction to Geotechnical Enineering. Prerequisites: EN 240, and CIV 330. Co-requisite: CIVL 380. Engineering soil classification, flow of water in soils, soil permeability and seepage, concepts of effective stress, stress and compressibility of soils, primary and secondary consolidation settlement, time rate of settlement, soil compaction, soil shear strength, introduction to slope stability, critical thinking and engineering judgment.

CIVL 380 (3) Geotech. Engrg. Laboratory. Co-requisite: CIV 380. Laboratory experiments to be performed by students to obtain soil parameters required for designed problems. Engineering classification of soils, grain size distribution, Atterberg limits, specific gravity, unconfined compression, compaction, in-situ field tests, consolidation, and shear strength determination, applications to design problems, critically analyze and interpret data, report writing.

CIV 390 (3) Introduction to Transportation Engineering. Co-requisite: CIV 380. Introduction to planning practice and procedure, design, operation, management, and maintenance of transportation systems, with emphasis on urban issues. General characteristics of transportation engineering systems including streets, highways, transit, airways. Capacity considerations including time-space diagrams. Elementary dynamics of traffic and functional consideration of routes and terminals. Components of transportation engineering facility design including geometric design, earthwork, and pavements.

CIV 430 (3) Foundation Engineering. Prerequisite: CIV 380. Shallow foundation analysis and factors to consider for design, subsurface investigations for design, bearing capacity and settlement, mat foundations, piles, caissons, lateral earth pressures and retaining walls, site

improvement techniques, design of sheet pile walls and support systems, critical thinking and engineering judgment, ethical considerations.