The Following courses are part of an the Exchange program in Civil Engineering between the UC and Cornell University, and of the fourth year of the Bachelor in Civil Engineering. They can be available to exchange students and can also be combined with regular courses in Spanish.

### Unit courses (6 ECTS)

**Geotechnical Engineering: Foundations, Excavations and Tunnels**  
G1465 - Spring  
This course examines site characterization and geotechnical aspects of the design and construction of foundation systems, earth retaining structures, slopes and tunnels. Application of soil mechanics in the analyses and design of these geotechnical structures is presented. Topics include: site investigation (with emphasis on in situ testing), rock mechanics, deep foundations (piers), earth retaining structures, excavations and fills: slope stability, tunnels in rock and soft ground.

**Introduction to Geotechnical Engineering**  
G1446 - Fall  

**Introduction to Business Administration**  
G1447 - Spring  
At the end of the subject the student, will first be able to understand the basic economic restrictions affecting the engineer's work, being familiar with macroeconomic conditions of the society, and with microeconomic mechanisms explaining individual behavior. Second he will be familiar with the basic economic analytic instruments used in business as accounting, finance, operational research and engineering economic analysis. Finally he will understand the basic organisative framework rules governing complex organizations and managing human resources.

**Engineering Computation**  
G1462 - Fall  
The main objective of the course is to introduce numerical methods as a fundamental tool for engineering disciplines. We plan to review some main topics of Numerical Algebra (matrix calculations, systems of equations, ...) and Numerical Calculus (root finding, interpolation, differentiation and integration, numerical methods for initial and boundary value problems in differential equations, ... ), working with computational efficiency and controlling the errors. Computer tools and programming will be important; we will use software widely used in engineering and science (MATLAB,...).

**Heat Transfer and Two-Phase Flow**  
G1501 - Spring  
The main objectives of this course are to present the fundamentals of heat transfer, to obtain a deep view of the heat transfer processes, in steady and unsteady conditions and in one and more dimensions and to learn about the theory and different practical approaches — including numerical heat transfer analysis— of the sources of heat transfer: conduction, convection and radiation. The students will also obtain the ability to solve heat exchangers and extended surfaces problems and to obtain the necessary skills to carry out engineering design involving heat transfer.

**Geology**  
G1627 - Fall  
This subject covers the main properties of rocks with an emphasis on problems and applications to engineering projects. Rocks and discontinuities are the key elements of rock mass and the subject will cover the principles of bedrock classification based on these criteria. There is also an introduction to Geomorphology and its application to engineering projects. The course includes practical activities focused mainly on geological maps but also aerial photography and identification of rock samples.

**Uncertainty Analysis in Engineering**  
G1503 - Spring  
The course provides an introduction to the analysis of variability and uncertainty in science and engineering. Techniques for measuring, describing, and controlling variability are considered. This includes descriptive statistics and data analysis, concepts of probability, the main probability distributions, extreme value analysis, point and confidence interval estimation, hypothesis testing and experimental design. An introduction to multiple regression is briefly outlined. Examples are mostly drawn from civil, environmental, and industrial engineering.

**Strength of Materials**  
G1463 - Fall  
The course presents the basic concepts related to the analysis and design of structural members subject to tension, compression, torsion and bending. Specific topics include: stress and strain, deformations and displacements, elasticity and plasticity, stresses in beams, deflections of beams, internal forces diagrams, statically indeterminate beams, composite beams, energy methods.

**Fluid Mechanics**  
G1445 - Fall  
This course covers hydrostatics, the basic equations of incompressible fluid flow, potential flow and dynamic pressure forces, viscous flow and shear forces, steady pipe flow, turbulence, dimensional analysis, laminar and turbulence boundary layer, flows around obstacles, and open-channel flow. The course includes small-group laboratory assignments.

**Coastal Engineering**  
G1466 – Fall  
The aim of this course is to provide the student with the knowledge for the design, construction and management of coastal works, and more specifically those devoted to coastal protection against erosion and beach nourishment and restoration. The course is divided into three main sections: understanding of coastal processes and the conceptual models and formulations used in engineering designs, hot topics related with shore protection and coastal management.
Civil Engineering

Study in English at UC

Structural Analysis
G1450 – Spring
The main objective of this course is to present both the conceptual analysis of structures and its computational approach based on matrix analysis and finite elements. Topics include: analysis of trusses; analysis of frames; virtual work and unit load method; basic concepts of structural stability; influence lines and introduction to the finite element method.

Energy Systems
G1467 – Spring
This course introduces energy systems with emphasis on design and costs. The course presents a systems approach to energy needs, covering carbon-based, nuclear, and renewable energy sources, including solar energy, small scale hydropower, wind, bioconversion processes, and house energy balances.

Environmental Engineering
G1468 – Spring
The course provides the students with the basic knowledge to understand and solve Environmental Engineering issues. It introduces the basic biological, chemical and physical processes of relevance in the field, stressing the mass balance and transport concepts. These principles are analyzed and applied to the main areas of Environmental Engineering: air and noise pollution, solid waste management, water treatment, water quality and wastewater treatment.

Hydrology
G1448 – Spring
All the relevant processes of the hydrological cycle are studied in this course, including precipitation, interception, infiltration, evapotranspiration, runoff generation and groundwater flow. Measuring techniques and modeling schemes for all processes are covered. Hydrologic engineering topics, such as return levels for different variables, hydrograph routing and rainfall-runoff modeling are also covered in the course.

Mechanical Properties of Materials, Processing and Design
G1449 – Spring
The aim of this course is to provide the student with the basis to understand the different models of mechanical behaviour of materials used for structural purposes. The course is divided into two sections: Understanding the linear-elastic, plastic and viscous behaviour of materials and the application of fracture mechanics and failure analysis in structural integrity assessments. In all cases a threefold point of view is used for the description of the phenomena: phenomenological description of the models, structural application and microstructural understanding.

Engineering Economics and Management
G1569 – Spring
At the end of this subject the student will be able: To rigorously formalize the decisions inherent to his technical work to justify and to defend the elections he propose. To include in his analytical framework economic concepts as inflation, taxation, depreciation, financial planning, economic optimization. To analyze and discuss the selections made by others. To understand the economic consequences derived from his personal decisions about savings, investment, retirement…

Experimental and Applied Mechanics of Structures
G1898 – Fall
This course develops the theory of elasticity with a focus on the formulation, solution and application of problems involving mechanical and aerospace structures. A brief incursion in plastic behavior is also included. The course also provides an introduction to experimental solid mechanics, instrumentation, data analysis and computational mechanics through a series of laboratory practices. Emphasis is placed on the integration of analysis with experimental approaches. The Finite Element method is employed through the commercial software ANSYS, in a series of practical sessions.

Construction of Civil Infrastructure
G1464 – Spring
This course offers the student a review of the main engineering concepts related with the construction of civil infrastructure: types of civil infrastructures, machinery used in civil engineering, construction procedures and management systems in construction engineering. At the end of the course, the student will learn to allocate resources during the construction process with effectiveness and efficiency, to use interdisciplinary approach as basic mechanism of value-creating in construction engineering, to respect the built heritage and the cultural expression in construction, and to be sensitive to problems of safety and health in construction.

Applied Geomorphology
G1827 – Spring
At the end of this course the student will be able to: Identify the main landforms and surface processes Identify the main problems of Engineering Projects due to surface processes. Know how to use of aerial photographs for the geomorphologic analysis. Know how to manage the geomorphologic data/information using GIS software (ArcGis).

Workshop on projects
G1750 – Fall
This subject offers the students a deepening in BIM tools, particularly in regard to linear infrastructures. The student’s work is focused on two main applications: Civil 3D and Revit (both Arquitectural and Structural). Other basic BIM concepts are debated in the classes (life cycle of civil works, the ideas of DoF, maturity level, MacLeamy's workflow, dimensional approach to BIM 4D, 5D, etc.). The learning is completely supported and developed in Laboratory sessions. The assessment is based on the continuous work of each student.

Geotechnical Works
G1147 – Fall

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