ICE2403   STRUCTURAL DESIGN

Credits and contact hours: 10 UC credits / 10 hours (3 h. Lectures; 3 h. Assistantship; 4 h. Independent learning experiences)

Instructor's name: Cristián Sandoval Mandujano

Course coordinator's name   None

Textbook: Riddell, R.; Hidalgo P. (1997) Diseño estructural, 5ª edición. Ediciones Universidad Católica de Chile.

Course Catalog Description: This course offers a global view of structural design, covering three materials (reinforced concrete, steel, and wood), considering both elastic and inelastic behavior, and the allowable stress and ultimate strength design methods, applied to members subjected to tension, compression, bending, and combined axial-bending loads. Design of composite elements and serviceability requirements are also covered. The course emphasizes the fundamental concepts of structural design avoiding detail aspects of code provisions.

The course has 3 lectures per week plus one exercise session.

Students should dedicate at least 4 hour of personal study per week to attain the objectives of the course.

Prerequisite Courses: ICE2313 Mechanics of solids

Co-requisite Courses: None

Status in the Curriculum: Required

Course Learning Outcomes:

1. Know the properties of structural materials that are necessary and relevant for design.
2. Understand the design conditions relative to strength, stability and serviceability.
3. Understand the concept of safety factor and the manner it is taken into account in the methods of design.
4. Know the different types of loads and load combinations to be considered for design.
5. Apply the methods of allowable stress and ultimate strength to design wood, steel, and reinforced concrete elements.
6. Understand the behavior of structural elements up to failure, recognizing brittle and ductile limit states.

Relation of Course to ABET Criteria: a. Knowledge of mathematics, science and engineering

Topics covered:

1. Introduction to structural design. Basic aspects of structural design. Structural Mechanics principles.

2. Elements subjected to axial loads. Homogeneous materials. Composite elements. Elastic buckling of columns. Inelastic buckling. Design of steel members in tension and compression. Design of wood elements in tension and compression.

3. Elements in bending and shear. Beams of homogeneous materials in elastic and inelastic behavior. Composite elements. Applications to reinforced concrete.

4. Elements subjected to combined bending and axial load. Homogeneous material and composite members. Steel and reinforced concrete columns. Reinforced concrete foundations and retaining walls.