ICE2313   MECHANICS OF SOLIDS

Credits and contact hours: 10 UC credits/ 10 hours 10 credits / 10 hours (3 h. Lectures; 1,5 h. Assistantship;1,5 h. Labs; 4 h. Independent learning experiences)

Instructor's name: Claudio Fernández

Course coordinator's name Matías Hube

Textbook: R.C. Hibbeler (2013), Mechanics of Materials, 9th Edition

Course Catalog Description: This introductory course of mechanics of solids provides the basic concepts related to the mechanics of rigid and deformable solids in equilibrium. This introduction to continuum mechanics is the basis of computational mechanics and of the finite element method. The basic elasticity equations are formulated and applied to obtain the elastic stresses and strains of slender elements subjected to axial forces, bending moments, torsional moments and shear forces. Deflections due to bending and an introduction to buckling of columns is also covered in the course.

Prerequisite Courses: ING1024 Properties and Materials Resistance

Co-requisite Courses: None

Status in the Curriculum: Required

Course Learning Outcomes:
1. Apply statics concepts to compute internal loads in structures.
2. Explain the existing methods to solve statically indeterminate structures.
3. Understand the equilibrium equations of continuum mechanics.
4. Understand the concept of engineering deformation from a general 3D kinematic deformation.
5. Understand the origin and the utility of constitutive relationships.
6. Apply the equation of continuum mechanics to elements subjected to torsion.
7. Apply the equation of continuum mechanics to elements subjected to bending and shear.
8. Apply beam theory to compute deformations in simple beams and structures.
9. Understand the instability phenomenon en structural elements subjected to compressive forces.
10. Analyze solid mechanics problems using computational tools
11. Understand concepts of mechanics of solids by conducting and analyzing experiments.

Relation of Course to ABET Criteria: a. Knowledge of mathematics, science and engineering
b. Design and conduct experiments: analyze and interpret data

Topics covered:

1. Statics of rigid bodies and internal forces in 2D and 3D.
2. Introduction to mechanics of deformable bodies
3. Stress analysis
4. Strain analysis
5. Stress-strain relationships
6. Torsion
7. Beams subjected to bending and shear
8. Beam deflections
9. Stability of equilibrium and buckling of columns