MECHANICS OF MATERIALS – 30123

Learning outcomes:
This subject is about the performance of deformable solids in various materials under the action of different kinds of loads. Thus the main objective of the course will be to show how to determine the stress, strain, and deflection suffered by bi-dimensional (and simple tri-dimensional) structural elements when subjected to different loads (e.g. normal, shear, torsion, bending and combined loads). Once the state of stresses and strains has been established for a particular structure type, the student will be able to evaluate the allowable loads and associated allowable stresses before mechanical failure. Understanding the adequacy of mechanical and structural elements under different loads is essential for the design and safe evaluation of any kind of structure. That is why this course is a major subject in many different engineering careers (Aeronautics, civil engineering, antennas, etc.). Upon successful completion of this course students should be able to:

- Understand the fundamental concepts of stress and strain and the relationship between both through the strain-stress equations in order to solve problems for simple tri-dimensional elastic solids
- Calculate and represent the stress diagrams in bars and simple structures
- Solve problems relating to pure and non-uniform bending of beams and other simple structures
- Solve problems relating to torsional deformation of bars and other simple tri-dimensional structures
- Understand the concept of buckling and be able to solve the problems related to isolated bars
- Distinguish between isostatic and hiperstatic problems and be able to use various methods for the resolution of both
- Be familiar with at least one software program for the evaluation of structures

Course outline:
- Fundamentals of stress and strain
- Allowable stresses, allowable loads, and safety factors
- Tension, Compression and Shear
- Torsion
- Bending
- Buckling
- Deflections of beams
- Numerical calculation of structures by computer

Teaching Activities:
Classroom activities (60h): Type 1 - Lectures (Theory) (24h), Type 2 - Problem solving (24h)
Type 3 - Laboratory (8h), Type 4 - Exams (4h)
Work done outside class (90h): Type 5 - student self-study

Assessment:
- Written assignment (80%)
- Practicals (20%)

Contact: Dr Belén Solano ( e-mail: bsolano at unizar.es)