Mechanics of Structures

Academic Year: (2022 / 2023) **Review date: 02-09-2022**

Department assigned to the subject: Continuum Mechanics and Structural Analysis Department

Coordinating teacher: IVAÑEZ DEL POZO, INES

Type: Compulsory ECTS Credits : 6.0

Year : 2 Semester : 1

OBJECTIVES

By the end of this content area, students will be able to have:

1. knowledge and understanding of strength of materials and structural calculus.
2. awareness of the wider multidisciplinary context of engineering.
3. the ability to apply their knowledge and understanding to identify, formulate and solve problems of strength of materials and structural calculus using established methods;
4. the ability to design and conduct appropriate experiments, interpret the data and draw conclusions;
5. workshop and laboratory skills.
6. the ability to select and use appropriate equipment, tools and methods;
7. the ability to combine theory and practice to solve problems of strength of materials and structural calculus
8. an understanding of applicable techniques and methods in mechanics of structures, and their limitations

DESCRIPTION OF CONTENTS: PROGRAMME

I: BEHAVIOUR OF REAL BODY EQUILIBRIUM AND CALCULUS OF REACTIONS FOR STRUCTURAL MECHANICS
Topic 1: FORCE SYSTEMS AND EQUILIBRIUM
1.1 Main concepts
1.2 Force systems and equivalent force systems

Topic 2: REACTIONS FORCES
2.1 Computation of reactions in statically determinate structures
2.2 Computation of reactions in statically indeterminate externally structures

Topic 3: MASS GEOMETRY
3.1 Centre of mass of planar bodies
3.2 Moment of inertia of planar bodies

II: FORCE LAWS IN ISOSTATIC STRUCTURES
Topic 4: FORCE LAWS (I)
4.1 Concept and types of internal forces
4.2 Relationship between load, shear force and bending moment

Topic 5: FORCE LAWS (II)
5.1 Determination of internal forces in simple beams
5.2 Determination of internal forces in archs

Topic 6: FORCE LAWS (III)
6.1 Determination of internal forces for complex beams
6.2 Determination of internal forces for frames

III: TRUSS STRUCTURES AND CABLE STRUCTURES
Topic 7: TRUSSES
7.1 Internal forces for trusses
7.2 Resolution procedures

Topic 8: CABLES

8.1 Cables under concentrated loads
8.2 Cables under distributed loads

IV: CONCEPT OF UNIAXIAL STRESS AND UNIAXIAL STRAIN
RELATIONSHIP BETWEEN STRESS AND STRAIN IN ELASTIC SOLIDS
Topic 9: DEFORMABLE BODY
9.1 Main concepts. Cauchy stress
9.2 Mechanical behaviour of solids

V: PRINCIPLES OF STRENTH OF MATERIALS. GENERAL STUDY OF STRUCTURAL BEHAVIOUR OF CROSS SECTION STRENGTH
Topic 10: TENSILE/COMPRESSION (I)
10.1 Principles of strength of materials
10.2 Tensile and compressive axial force

Topic 11: BENDING (II)
11.1 Strength of materials. Bending (I)
11.2 Pure bending

Topic 12: BENDING (III)
12.1 Strength of materials. Bending (II)
12.2 Complex bending

VI: INTRODUCTION TO EXPERIMENTAL METHODS FOR STRUCTURAL MECHANICS ENGINEERING APPLICATIONS

Laboratory sessions

LEARNING ACTIVITIES AND METHODOLOGY

- Face-to-face teaching.

- In order to pass the subject, attendance and completion of the laboratory sessions in the weekly planning are compulsory. The mark of lab practices in the continuous evaluation corresponds to what is established in the subject, in accordance with the university regulations. In the subject "Mechanics of Structures", the laboratory sessions take the value of 37.5% of the mark of the continuous evaluation (15/40).

ASSESSMENT SYSTEM

Continuum assessment system based on reports, class participation and skills and knowledge tests.

A minimum grade of 4.5 in the final exam is required to take into account the continuum assessment.

% end-of-term-examination:	60
% of continuous assessment (assigments, laboratory, practicals…):	40

BASIC BIBLIOGRAPHY

- F.P. Beer, E. Russel Johnston Vector Mechanics for Engineers., Vol. Static, McGraw Hill, 1994
- J. Case Strength of material and structures, Ed. Arnold, 1999
- J.M. Gere Mechanics of materials, Ed. Thomson, 2002
- W.M.C. McKenzie Examples in structural analysis, Taylor & Francis, 2006