Mechanics of Structures

Academic Year: (2019 / 2020) **Review date: 04-12-2019**

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

- Magisterial classes, tutorship and personal work oriented to the acquisition of theoretical knowledge. (3 ECTS credits)
- Problems solution classes, laboratory sessions, tutorship and personal work oriented to the acquisition of practical skills. (3 ECTS credits)

Additionally, collective tutorship can be included in the programme

ASSESSMENT SYSTEM

Continuum assessment system based on short tests and laboratory reports.
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
- W.M.C. McKenzie Examples in structural analysis, Taylor & Francis, 2006