

Academic Year: (2022 / 2023)

Review date: 06-07-2022

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

Coordinating teacher: BARBERO POZUELO, ENRIQUE

Type: Compulsory ECTS Credits : 6.0

Year : 1 Semester : 1

REQUIREMENTS (SUBJECTS THAT ARE ASSUMED TO BE KNOWN)

Engineering degree with theoretical concepts in Structural Mechanics (see Master's degree entry requirements)

OBJECTIVES

- Possess knowledge and understand concepts that provide a basis or opportunity to be original in the development and/or application of ideas, often in a research context.
- That students know how to apply their acquired knowledge and problem-solving skills in new or unfamiliar environments within broader (or multidisciplinary) contexts related to their area of study.
- To know the aspects and techniques of analytical and computational methods to project, calculate and design structures and plants in the field of Industrial Construction.
- Ability to formulate the necessary hypotheses to solve structural problems in industry.

DESCRIPTION OF CONTENTS: PROGRAMME

1. Steel Structures. Calculation methodologies and applicable standards
 - Types of steel structures
 - Standards and regulations
 - Materials. Materials selection criteria.
2. Design, calculation and analysis of metallic structural elements.
 - Design requirements
 - Structural flexural elements. Lateral buckling and flexural buckling.
 - Structural elements subjected to compression. Compression buckling.
 - Structural elements subjected to shear
 - Structural elements subjected to torsion.
 - Structural elements subjected to combined forces.
- 3 Design of joints in steel structures
 - General aspects
 - Welded joints
 - Bolted joints
 - Supports
- 4 Reinforced concrete structures.
 - Standards
 - Characteristics of reinforced concrete. Material selection criteria.
 - Special considerations in the analysis.
- 5 Design, calculation and dimensioning of reinforced concrete elements. Limit State Method.
 - Elements and cross-sections subjected to bending.
 - Elements and sections subjected to compression. Second order effects.
 - Elements subjected to shear, torsion and punching.
 - Longitudinal shear. Cantilevers.
 - Displacement limit state (deformations and cracking).
- 6 Anchors and overlaps in reinforcements
- 7 Seismic resistant structures.
 - General design requirements.
 - Seismic-resistant systems.
 - Metal rigid-frame system.
 - Steel braced-frame system.

- Reinforced concrete rigid-node frame system.
 - Reinforced concrete shear-frame system. Diaphragms.
- 8 Case studies.

LEARNING ACTIVITIES AND METHODOLOGY

Lecture classes: 21 h

Problem solving sessions: 21 h

Laboratory sessions: 2 sessions of 1.5h each

The student must also submit reports with the solutions of cases proposed by the professor.

Tutorial sessions (2h each week) on the established schedule

ASSESSMENT SYSTEM

Final assessment: 30%.

The final assessment consist of two reports (one on steel structures and the other on concrete structures) that will cover the knowledge acquired throughout the course.

Continuous assessment (70%)

- Short continuous assessment tests (14%) (four tests).
- Laboratory practice report (18%) (two laboratory sessions).
- Practical exercises (38%) (four exercises)

% end-of-term-examination: 30

% of continuous assessment (assignments, laboratory, practicals...): 70

BASIC BIBLIOGRAPHY

- AISC Steel Construction Manual, 15th Edition, AISC, 2017
- Code ACI 318-19 Building Code Requirements for Structural Concrete, American Concrete Institute, 2014
- Jack McCormac, Stephen Csernak Structural steel design 6th edition, Pearson, 2017
- Roger L. Brockenbrough Structural Steel Designer's Handbook 6th Edition, Mc Graw Hill, 2019
- William T. Segui Steel Design 6th Edition, CL Engineering, 2017

ADDITIONAL BIBLIOGRAPHY

- Edward S. Hoffman, David P. Gustafson Structural Design Guide to the AISC (LFRD), Spinger / Chapman&Hall, 1996
- Jay Shen, Bulent Akbas Design Of Steel Structures, Mc Graw Hill, 2021
- Akbar R. Tamboli Handbook of Structural Steel Connection Design and Details (3rd ed), Mc Graw Hill, 2016
- Paul W. Richards Build With Steel: A Companion to the AISC Manual, CreateSpace, 2012