

Academic Year: (2021 / 2022)

Review date: 27-07-2021

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

Coordinating teacher: ZAERA POLO, RAMON EULALIO

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
 End of term exam: 4.5h
 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

End of term exam: 50%

Continuous assessment (deliverable about concrete structures): 25%

Continuous assessment (deliverable about metal structures): 25%

% end-of-term-examination:	50
% of continuous assessment (assignments, laboratory, practicals...):	50

BASIC BIBLIOGRAPHY

- AISC Steel Construction Manual, 15th Edition, AISC, 2017
- Código ACI 318-19 Requisitos para la Construcción con Hormigón Armado, American Concrete Institute, 2014
- Jack McCormac, Stephen Cernak 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), Springer / 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
- Juan Carlos Arroyo Portero, Ramón Sánchez Fernández, Antonio Romero Ballesteros, otros Números Gordos en el proyecto de estructuras: Edición corregida y ampliada, CINTER, 2009
- Juan Carlos Arroyo, Francisco Morán, Álvaro García Meseguer JIMÉNEZ MONTOYA ESENCIAL Hormigón armado, CINTER, 2018
- Paul W. Richards Build With Steel: A Companion to the AISC Manual, CreateSpace, 2012