

## Lightweight Structures

Academic Year: ( 2022 / 2023 )

Review date: 10-06-2021

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

Coordinating teacher: ARTERO GUERRERO, JOSE ALFONSO

Type: Electives ECTS Credits : 3.0

Year : 4 Semester :

## REQUIREMENTS (SUBJECTS THAT ARE ASSUMED TO BE KNOWN)

Mechanics of Structures

Elasticity

Strength of Materials

## OBJECTIVES

Knowledge of the basic tools for the analysis of one-dimensional thin-walled elements, such as industrial robot arms or shafts, and other tubular structures.

Knowledge of the basic techniques of the design of lightweight structures made with composite laminated and sandwich beams, used in various engineering fields such as aerospace or transportation.

Knowledge of the basic concepts for the calculation of two-dimensional structural elements such as pipes, tanks and other pressurized structures.

Capacity to analyse light structures, to assess the hypotheses and to interpret the results.

## DESCRIPTION OF CONTENTS: PROGRAMME

Chapter 1. Bending of thin-walled beams

Chapter 2. Torsion of thin-walled shafts

Chapter 3. Introduction to composites laminated and sandwich beams

Chapter 4. Introduction to the theory of elastic plates

Chapter 5. Introduction to the theory of elastic shells

## LEARNING ACTIVITIES AND METHODOLOGY

Lecture sessions (master class) and practical sessions (in reduced groups) will be taught. The first is geared to the acquisition of theoretical knowledge, and the second to the acquisition of practical skills related to theoretical concepts. In addition to these sessions one laboratory practical session in reduced groups (maximum 20 students) will be imparted.

Additionally, tutorial sessions in group may be taught.

## ASSESSMENT SYSTEM

Final exam (mandatory): 40%

Continuum evaluation: 60%

- Laboratory: 30%

- Evaluation controls: 30%

In order to pass the course, attendance and successful completion of the laboratory practices foreseen in the weekly planning are mandatory. The weighting of the laboratory practice mark in the continuous assessment corresponds to what it is established in the course, in accordance with the regulations of the university. In the Lightweight Structures course, the weighting of the laboratory practices takes the value of 30% of the continuous assessment grade.

<b>% end-of-term-examination:</b>	40
<b>% of continuous assessment (assignments, laboratory, practicals...):</b>	60

#### BASIC BIBLIOGRAPHY

- Megson, T.H.G. Aircraft structures for engineering students, Elsevier, 2007
- Timoshenko, S.P. Teoría de placas y láminas, Urmo, 1975

#### ADDITIONAL BIBLIOGRAPHY

- Ugural, A. C. Stresses in beams, plates, and shells, Taylor & Francis, 2009
- Vinson, J. R. The Behavior of thin walled structures: beams, plates, and shells, Kluwer Academic Publishers, 1989