

Lightweight Structures

Academic Year: (2023 / 2024)

Review date: 27/04/2023 23:24:35

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

LEARNING OUTCOMES

CB1. Students have demonstrated possession and understanding of knowledge in an area of study that builds on the foundation of general secondary education, and is usually at a level that, while relying on advanced textbooks, also includes some aspects that involve knowledge from the cutting edge of their field of study

CB2. Students are able to apply their knowledge to their work or vocation in a professional manner and possess the competences usually demonstrated through the development and defence of arguments and problem solving within their field of study.

CB3. Students have the ability to gather and interpret relevant data (usually within their field of study) in order to make judgements which include reflection on relevant social, scientific or ethical issues.

CB5. Students will have developed the learning skills necessary to undertake further study with a high degree of autonomy.

CG1. Ability to solve problems with initiative, decision-making, creativity, critical reasoning and to communicate and transmit knowledge, skills and abilities in the field of Industrial Engineering.

CG3. Ability to design a system, component or process in the field of Industrial Technologies to meet the required specifications

CG4. Knowledge and ability to apply current legislation as well as the specifications, regulations and mandatory standards in the field of Industrial Engineering.

CG5. Adequate knowledge of the concept of company, institutional and legal framework of the company. Organisation and management of companies.

CG6. Applied knowledge of company organisation.

CG8. Knowledge and ability to apply quality principles and methods.

CG9. Knowledge and ability to apply computational and experimental tools for the analysis and quantification of Industrial Engineering problems.

RA1. Knowledge and understanding: Have basic knowledge and understanding of science, mathematics and engineering within the industrial field, as well as knowledge and understanding of Mechanics, Solid and Structural Mechanics, Thermal Engineering, Fluid Mechanics, Production Systems, Electronics and Automation, Industrial Organisation and Electrical Engineering.

RA3. Engineering Design: To be able to design industrial products that comply with the required specifications, collaborating with professionals in related technologies within multidisciplinary teams.

RA4. Research and Innovation: To be able to use appropriate methods to carry out research and make innovative contributions in the field of Industrial Engineering.

RA5. Engineering Applications: To be able to apply their knowledge and understanding to solve problems and design devices or processes in the field of industrial engineering in accordance with criteria of cost, quality, safety, efficiency and respect for the environment.

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 this sessions one laboratory practical session in reduced groups (maximum 20 students) will be impart.

Additionally, tutorial sessions in group may be taught.

ASSESSMENT SYSTEM

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

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