Structural Integrity

Academic Year: (2023 / 2024) **Review date: 25/04/2023 10:36:17**

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

Coordinating teacher: VAZ-ROMERO SANTERO, ALVARO

Type: Electives ECTS Credits : 3.0

Year : Semester :

REQUIREMENTS (SUBJECTS THAT ARE ASSUMED TO BE KNOWN)

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.
RA2. Engineering Analysis: To be able to identify engineering problems within the industrial field, recognise specifications, establish different resolution methods and select the most appropriate one for their solution
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.

OBJECTIVES

Knowledge of the basic techniques for the structural integrity of solids under different load conditions, which fundament the formation of the Mechanical Engineer.
Capacity to analyse structures, to assess the hypotheses and to interpret the results.

DESCRIPTION OF CONTENTS: PROGRAMME

Basic concepts on structural stability.
1. . Introduction.
Elastoplastic fracture mechanics
2. Fracture criteria on elastic linear materials
3. Basic concepts on dynamic fracture dynamics
4. Fracture criteria on elastoplactic materials
Fatigue crack propagation
5. Fatigue behavior
6. Fatigue life calculation on mechanical components
7. Structural integrity at high temperature
7. Fatigue and fracture tests
Experimental techniques and numerical simulation
10. Design in fatigue and fracture.
11. Numerical methods in fatigue and fracture problems.
10. Standards in fracture and fatigue.

LEARNING ACTIVITIES AND METHODOLOGY

In each week one lecture session (master class) and one practical session (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.

ASSESSMENT SYSTEM

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

Final exam (obligatory): 40%

Continuum evaluation: 60%
- Laboratory: 20%
- Evaluation controls: 40%

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 this course, the weighting of the laboratory practices takes the value of 20% of the continuous assessment grade.

BASIC BIBLIOGRAPHY

- Anderson, T.L. Fracture mechanics: Fundamentals and applications , CRC Press, 1995

- Anglada, M.J. Fractura de materiales , UPC, 2002

- Broek, David Elementary engineering fracture mechanics, Kluwer Academic, 1991

ADDITIONAL BIBLIOGRAPHY

- K. Ravi-Chandar Fracture mechanics, Springer, 1998

- Kanninen, Melvin F. Advanced fracture mechanics, Oxford University Press, 1985