Stability and structural integrity

Academic Year: (2020 / 2021) **Review date: 10-07-2020**

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

Coordinating teacher: ARANDA RUIZ, JOSUE

Type: Compulsory ECTS Credits : 4.0

Year : 1 Semester : 1

REQUIREMENTS (SUBJECTS THAT ARE ASSUMED TO BE KNOWN)

Students should have completed basic courses on Structural Mechanics, and Elasticity and Strength of Materials.

This course should be lectured partially or entirely in English.

OBJECTIVES

Basic knowledge on the design requirements of the mechanical and structural elements, considering both structural stability and structural integrity issues.
Ability to identify, formulate and solve design problems from the point of view of the structural stability and structural integrity. Analysis of different design solutions.
Basic knowledge on the structural integrity codes for the mechanical and structural elements
Basic knowledge on damage tolerant design concepts of the mechanical and structural elements

Learning results
To understand the basic concepts of structural stability and structural integrity of mechanical and structural elements
To conduct a proper design of mechanical and structural elements, considering bot structural stability and structural integrity concepts
To use structural integrity codes in the design of mechanical and structural elements
To apply damage tolerant design concepts

DESCRIPTION OF CONTENTS: PROGRAMME

- Basic concepts on structural stability
- Buckling of beams and columns
- Buckling of simple frames
- Basic concepts on the stability of plates
- Basic concepts on Fracture Mechanics. Fracture criteria of cracked solids
- Basic ideas on fatigue crack propagation
- Damage tolerant design concepts

LEARNING ACTIVITIES AND METHODOLOGY

- Seminars, including explanations of the basic theoretical aspects of the different subjects, as well as solutions to basic problems to illustrate the underlying theory. Personal work of the student oriented to learning about theoretical concepts (2 ECTS).

- Individual homework, in which the student has to develop the solution to more complex problems demanding more time that a single lecture (2 ECTS).

ASSESSMENT SYSTEM

Written exam to evaluate the global knowledge and skills (50% of the final mark)

Individual homework (50% of the final mark)

% end-of-term-examination:	50
% of continuous assessment (assigments, laboratory, practicals…):	50

BASIC BIBLIOGRAPHY

- J.A. Garrido y A. Foces Resistencia de materiales, Universidad de Valladolid, 1999
- J.A. Garrido, A. Foces Resistencia de materiales, Universidad de Valladolid, 1999
- M. Elices Mecánica de la Fractura aplicada a sólidos elásticos bidimensionales, UPM, 1998
- M.J. Anglada Fractura de materiales, UPC, 2002
- M.L. Gambhir Stability analysis and design of structures, Springer, 2004
- T.L. Anderson Fracture mechanics: Fundamentals and applications, CRC Press, 1995

ADDITIONAL BIBLIOGRAPHY

- D. Broek Elementary engineering fracture mechanics, Kluwer Academic, 1991
- D. P. Miannay. Fracture mechanics, Springer, 1998
- G.J. Simitses, D.H. Hodges Fundamentals of structural stability, Elsevier/Butterworth-Heinemann, 2006
- M. F. Kanninen, C. H. Popelar Advanced fracture mechanics, Oxford University Press, 1985
- Z.P. Bazant Stability of structures: elastic, inelastic, fracture and damage theories, Dover, 2003