Elasticity

Academic Year: (2020 / 2021) **Review date: 01-10-2020**

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

Coordinating teacher: VARAS DOVAL, DAVID

Type: Compulsory ECTS Credits : 6.0

Year : 3 Semester : 1

OBJECTIVES

By the end of this subject, students will be able to have:

1. A systematic understanding of the key aspects and concepts of elasticity on real solids.
2. The ability to apply their knowledge and understanding to identify, formulate and solve elasticity problems using established methods.
3. The ability to select and apply relevant analytic and modelling methods regarding the elastic behaviour.
4. The ability to apply their knowledge and understanding to develop and realise designs in elastic regime to meet defined and specified requirements.
5. An understanding of design methodologies in elasticity, and an ability to use them.
6. The ability to design and conduct appropriate characterization experiments, interpret the data and draw conclusions.
7. Workshop and laboratory skills in Elasticity.
8. The ability to select and use appropriate equipment, tools and methods to solve problems in elastic regime.
9. The ability to combine theory and practice to solve problems of Elasticity.
10. An understanding of applicable techniques and methods to solve problems in elastic regime, and of their limitations.

DESCRIPTION OF CONTENTS: PROGRAMME

Chapter 1. Fundamentals (Number of sessions: 10)
- Subject 1 Equilibrium of deformable bodies
- Subject 2 Kinematic of deformable bodies
- Subject 3: Behaviour laws

Chapter 2. Formulation of elasticity (Number of sessions: 3)
- Subject 4: Differential formulation
- Subject 5: Integral formulation

Chapter 3. Plastification criteria (Number of sessions: 2)
- Subject 6: Plastification criteria: Tresca-Guest and Von Mises

Chapter 4. Method of resolution (Number of sessions: 3)
- Subject 7: Finite element Method

Chapter 5. Bidimensional elasticity (Number of sessions: 5)
- Subject 8: Bidimensional elasticity (I). Plain stress and strain states.
- Subject 9: Bidimensional elasticity (II). Polar coordinates.

Chapter 6. Advanced concepts (Number of sessions: 2)
- Subject 10: Introduction to anisotropic elasticity
- Subject 11. Introduction to thermoelasticity

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. In addition to this sessions four laboratory practical sessions in reduced groups (maximum 20 students) will be impart.

Students will have the possibility of individual tutorials. Also, could be tutoring sessions at 15th week of the course.

ASSESSMENT SYSTEM

Final exam (obligatory): 60%
It is required a mark of 4,5 in the final exam to take into account the continuum evaluation.
Continuum evaluation: 40%
- Laboratory: 15%
- Evaluation controls: 25%
(Several evaluation control (between 4 and 6) in lecture classes. The exact dates will vary depending on the holidays of the course and will be indicated in advance)
*In order to pass the course, the attendance and performance of the laboratory practices foreseen in the weekly planning are compulsory. 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 subject Elasticity, the weighting of the laboratory practices takes the value of 37,5% (15/40) of the continuous assessment grade.

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

BASIC BIBLIOGRAPHY

- Barber, J. R. (James R.) Elasticity, Springer, 2010
- Chou, Pei Chi Elasticity : tensor, dyadic and engineering approaches, Dover, 1992
- Gould, Phillip L Introduction to Linear Elasticity, Springer, 2013
- Ortiz Berrocal, L Elasticidad, Ed. McGraw Hill.

ADDITIONAL BIBLIOGRAPHY

- Bickford W. A first course in the finite element method, Irwin Ed.
- Chandrupatla, T.; Belegundu D. Introducción al estudio del elemento finito en ingeniería, Ed. P. Hall.
- Doblaré Castellano, M. y Gracia Villa, L. Fundamentos de la Elasticidad Lineal, Ed. Síntesis,.