29722 - Deformable Solids Theory

Información del Plan Docente

Academic Year	2017/18
Faculty / School	110 - Escuela de Ingeniería y Arquitectura
Degree	434 - Bachelor's Degree in Mechanical Engineering
ECTS	6.0
Year	3
Semester	First semester
Subject Type	Compulsory
Module	---

1.General information

1.1.Introduction

1.2.Recommendations to take this course

1.3.Context and importance of this course in the degree

1.4.Activities and key dates

2.Learning goals

2.1.Learning goals

2.2.Importance of learning goals

3.Aims of the course and competences

3.1.Aims of the course

3.2.Competences

4.Assessment (1st and 2nd call)

4.1.Assessment tasks (description of tasks, marking system and assessment criteria)

5.Methodology, learning tasks, syllabus and resources

5.1.Methodological overview

The methodology followed in this course is oriented towards the achievement of the learning objectives. It is based on the participation and the active role of the student to favour the development of communication and decision-making skills. A wide range of teaching and learning tasks are implemented, such as lectures, guided assignments, laboratory sessions, autonomous work, and tutorials.
Students are expected to participate actively in the class throughout the semester.
Classroom materials will be available via web-based Moodle platform. These include a repository of the lecture notes

used in class, the course syllabus, as well as other course-specific learning materials.
Further information regarding the course will be provided on the first day of class.

5.2.Learning tasks

The course includes 6 ECTS organized according to:

- Lectures: 45 hours.

- Four computer lab session: 12 hours.

- One laboratory session: 3 hours.

- Guided assignments: 22 hours.

- Autonomous work: 63 hours

- Tutorials: Optional.

Lectures: the professor will explain the theoretical contents of the course and solve illustrative applied problems. Lectures run for 3 weekly hours. Although it is not a mandatory activity, regular attendance is highly recommended.

Laboratory sessions: sessions will take place every 2 weeks (5 sessions in total) and last 3 hours each.

Guided assignments: students will complete two assignments related to concepts seen in laboratory sessions and lectures, one of the first part Linear Continimum Mechanics and other related to the second part of the subject Finite Elements. They will be submitted at fixed dates through Mooodle.

Autonomous work: students are expected to spend about 63 hours to study theory, solve problems and prepare lab sessions.

Tutorials: the professor's office hours will be posted on Moodle and on the website of the degree to assist students with questions and doubts. It is beneficial for the student to come with clear and specific questions.

5.3.Syllabus

Part I: Continuum Mechanics

1. Introduction to Linear Continuum Mechanics
2. Strain
3. Stress
4. Principal strains and stresses.
5. Constitutive equations.
6. Differential formulation of the elasticity problem
7. Limits of the elastic behavior.

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Part II: Finite Element Method (FEM) in Continuum Mechanics

8. Introduction to FEM

9. FEM formulation in one dimension

10. FEM formulation in two dimensional elasticity (plane strain and plane strain)

11. Formulation FEM formulation in three dimensions

12. User recommendations in MEF

5.4.Course planning and calendar

The course calendar is defined by the Escuela de Ingeniería y Arquitectura.

5.5.Bibliography and recommended resources

[BB: Basic Bibliography / BC: Additional Bibliography]

- [BB] Calvo Calzada, Begoña. Apuntes de elementos finitos / Begoña Calvo, Miguel A. Martínez, Estefanía Peña. Stylo digital
- [BB] Calvo Calzada, Begoña. Teoría de la elasticidad lineal : problemas resueltos / Begoña Calvo Calzada, Manuel Doblaré Castellano, Luis Gracia Villa Zaragoza : Copy Center, D. L. 2000
- [BB] París Carballo, Federico. Teoría de la elasticidad / Federico París . - 3ª ed. Sevilla : Universidad, Escuela Técnica Superior de Ingenieros Industriales, 2000
- [BB] Peña Baquedano, Estefanía. Apuntes de mecánica de sólidos deformables / Estefanía Peña Baquedano. Stylo digital
- [BC] Fish, Jacob. A first course in finite elements / Jacob Fish, Ted Belytschko Chichester (England) : John Wiley & Sons, cop. 2007
- [BC] Oliver Olivella, Xavier. Mecánica de medios contínuos para ingenieros / Xavier Oliver Olivella, Carlos Agelet de Saracíbar Bosch ; compilación, Eduardo Vieira Chaves, Eduardo Car . - [1a. ed.] Barcelona : Edicions UPC, 2000
- [BC] Oñate Ibañez de Navarra, Eugenio. Cálculo de estructuras por el método de elementos finitos : análisis estático lineal / Eugenio Oñate Ibañez de Navarra . - [2a. ed.] Barcelona : Centro internacional de Métodos Numéricos en Ingenieria, 1995
- [BC] Samartín Quiroga, Avelino. Curso de elasticidad / por Avelino Samartín Quiroga . - [1a. ed.] Madrid : Bellisco, 1990

All materials related to the course are available in add.unizar.es