

## Professional Software in Solid Mechanics

---

**ECTS:** 6 ECTS

---

**COORDINATOR:** María Luisa Seoane Martínez (marialuisa.seoane@usc.es)

---

**UNIVERSITY WHERE THE COORDINATOR IS:** USC

---

**HAVE YOU GIVEN PERMISSION TO RECORD YOUR CLASSES?** No

---

**LECTURER 1:** José Ramón Fernández García (jose.fernandez@uvigo.es)

---

**UNIVERSITY WHERE THE LECTURER 1 IS:** UVigo

---

**HAVE YOU GIVEN PERMISSION TO RECORD YOUR CLASSES?** No

---

### SUBJECT CONTENTS

#### 1. Linear elasticity.

1.1. Three-dimensional elasticity.

1.2. One-dimensional models (beam and rod) y two-dimensional models (plate, shell and membrane). Combined beam and plate structures.

1.3. Normal modes and frequencies of vibration.

1.4. Linear thermoelasticity.

#### 2. Nonlinear problems.

2.1 Nonlinear material laws: elasplasticity.

2.2. Contact problems: Contact between a deformable body and a rigid foundation,

Contact between two deformable bodies.

#### 3. Industry applications.

---

---

## METHODOLOGY

1- Explanation of the physical problems: mathematical formulation and analytical solution. The aim is to work out the CG1, CG2, CG4, CG5, CE1, CE2 and CE3 competences.

2- Planning of the tasks to solve with the course programmes (PATRAN-NASTRAN and MENTAT-MARC). The CG1, CG2, CG4, CG5, CE3, CE4, CS1 and CS2 skills are developed.

3- To solve using computers some of these problems. This item is related to the CG1, CG2, CG3, CG4, CG5, CE3 and CE5 competences.

---

**LANGUAGE USED IN CLASS:** Spanish

---

**IS IT COMPULSORY TO ATTEND CLASS?** Students can attend via conference system.

---

## BIBLIOGRAPHY

Bower, A.F. (2010) Applied Mechanics of Solids. CRC Press.

Kikuchi, N., Oden, J.T. (1988) Contact problems in elasticity. SIAM.

Lemaitre, J., Chaboche, J.L. (1994) Mechanics of solids materials. Cambridge University Press.

Timoshenko, S., Goodier, J.N. (1975) Teoría de la elasticidad. URMO.

---

## SKILLS

### Basic:

CG1: To have knowledge that provide a basis or opportunity for originality in developing and / or applying ideas, often within a research context, knowing how to translate industrial needs in terms of R & D in the field of mathematics Industrial.

CG4: To have the ability to communicate the findings to specialist and non-specialist audiences in a clear and unambiguous way.

### Specific:

CE4: To be able to select a set of numerical techniques, languages and tools, appropriate to solve a mathematical model.

CE5: To be able to validate and interpret the results, comparing them with visualizations, experimental measurements and functional requirements of the physical engineering system.

### Numerical specialization:

CS1: To know, be able to select or use how to handle most suitable professional software tools (both commercial and free) for the simulation of processes in the industrial and business sector.

CS2: To adapt, modify and implement software tools for numerical simulation.

---

**WILL YOU BE USING A VIRTUAL PLATFORM?** No.

---

**WILL YOU BE USING ANY SPECIFIC SOFTWARE?** Yes. PATRAN-NASTRAN and MENTAT-MARC

---

#### **CRITERIA FOR THE 1ST ASSESSMENT OPPORTUNITY**

It will be realized an exam, in the computer, based in the programmes proposed in the course. This test allows the evaluation of the CE1, CE3,CE4,CE5 and CS1 competences.

Students may also perform programming assignments and a report of practices in order to show their handle of the CE1,CE2,CE3,CE4,CE5 and CS1 competences. This mark will not be saved for the second opportunity.

The final grade will be computed by the formula:

- First assessment opportunity:  $MAX (0.4 * Essays + 0.6 Exam, Exam)$

---

#### **CRITERIA FOR THE 2ND ASSESSMENT OPPORTUNITY**

100% exam

---