Solid Mechanics

ECTS: 6 ECTS

COORDINATOR: Peregrina Quintela Estévez (peregrina.quintela@usc.es)

UNIVERSITY WHERE THE COORDINATOR IS: USC

HAVE YOU GIVEN PERMISSION TO RECORD YOUR CLASSES? Yes

LECTURER 1: Patricia Barral Rodiño (patricia.barral@usc.es)

UNIVERSITY WHERE THE LECTURER 1 IS: USC

HAVE YOU GIVEN PERMISSION TO RECORD YOUR CLASSES? Yes

SUBJECT CONTENTS

1. Linear elastodynamic equations.
2. Stresses and strains.
3. Strain tensor.
4. General methods of resolution in linear elasticity.
5. Plane problems in linear elasticity.
6. Axially and spherically symmetric problems.
7. Bending and torsion of cylindrical beams.
8. One-dimensional beam models.
9. Plate models.
10. Vibrations.
11. Behaviour laws in elasticity.

12. Viscoelasticity, plasticity, viscoplasticity..

13. Non linear boundary conditions..

14. An introduction to fracture mechanics.

METHODOLOGY

The classes will be carried out by video conference system, supported by a digital presentation and by COMSOL software package. During the course essays to be taken individually or in reduced groups will be proposed.

The course will also rely on a book and video notes that will help the students to study. This will also allow students to follow the course online however it is still compusory to present the essays proposed during the course and to take the final exam.

In addition to the bibliography indicated, we will handle recent publications in scientific journals.

LANGUAGE USED IN CLASS: Spanish however it will depend on the audience

IS IT COMPULSORY TO ATTEND CLASS? Students can attend via conference system, It is not compulsory.

BIBLIOGRAPHY

• Barber, J.R. Elasticity. Solid Mechanics and its applications. Kluwer Academic Publishers. 2002.

• Barral, P. y Quintela, P. Modelos Matemáticos na Mecánica de Sólidos. Curso Virtual de la Universidad de Santiago de Compostela. 2008.

• Bermúdez de Castro, A. Continuum Thermomechanics. Progress in Mathematical Physics. Edit. Birkhäuser. 2005.

• Broek, D. The Practical Use of Fracture Mechanics. Kluwer Academic Publishers. 1988.

• Bui H.D. Mécanique de la rupture fragile. Masson. 1978.

• Carpinteri, A. Structural Mechanics – A unified approach. Chapman & Hall. London, 1997.

• Fraeijs de Veubeke. A Course in Elasticity. Applied Mathematical Sciences, 29. Springer-Verlag 1979.

• Germain, P. Mecanique. Tomos I y II. École Polytechnique. Ellipses. 1986.

• Guiu Giralt, F. Fundamentos físicos de la mecánica de la fractura. Textos Universitarios. Consejo Superior de Investigaciones Científicas. 1997.

• Gurtin, M.E. An Introduction to Continuum Mechanics. Academic Press. New York, 1981.

• Henry, J.P. y Parsy, F. Cours d'Élasticité. Dunod Université. 1982.

• Lemaitre J. A A course on damage mechanics. Springer-Verlag, 1996.

• Lemaitre, J. y Chaboche, J.L. Mécanique des Matériaux Solides. Dunod. 1988.

• Lubliner, J. Plasticity Theory. Maxwell Macmillan International Editions. 1990.

• Necas, J. y Hlavácek. Mathematical Theory of Elastic and Elasto-Plastic Bodies: An Introduction. Studies in applied mechanics, 3. Elsevier, 1981.

• Obala, J. Exercices et problèmes de mécanique des milieux continus. Masson. 1988.

• Quintela Estévez, P. Métodos matemáticos en mecánica de sólidos. Publicaciones del Departamento de Matemática Aplicada, nº 24. 1999. Revisada en 2004.

• Roger D. y Dieulesaint E. Elastic Waves in Solids I, II. Springer. 1999.

• Segel, L.A. Mathematics Applied to Continuum Mechanics. Macmillan Publishing Co., Inc. 1977.

• Sokolnikoff, I.S. Mathematical theory of elasticity. Krieger Publishing Company. 1956.

• Vinson, J.R. The Behavior of Thin Walled Structures, Beams, Plates and Shells. Kluwer academic publishers. 1989.

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.

CG2: To be able to apply the acquired knowledge and abilities to solve problems in new or unfamiliar environments within broader contexts, including the ability to integrate multidisciplinary R & D in the business environment.

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

CG5: To have the appropriate learning skills to enable them to continue studying in a way that will be largely self-directed or autonomous, and also to be able to successfully undertake doctoral studies.

Specific:

CE1: To acquire a basic knowledge in an area of Engineering / Applied Science, as a starting point for an adequate mathematical modelling, using well-established contexts or in new or unfamiliar environments within broader and multidisciplinary contexts.

CE2: To model specific ingredients and make appropriate simplifications in the model to facilitate their numerical treatment, maintaining the degree of accuracy, according to previous requirements.

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

Modelling specialization:

CM1: To be able to extract, using different analytical techniques, both qualitative and quantitative models.

WILL YOU BE USING A VIRTUAL PLATFORM? Yes. Moodle (USC)

WILL YOU BE USING ANY SPECIFIC SOFTWARE? Yes. COMSOL

CRITERIA FOR THE 1ST ASSESSMENT OPPORTUNITY

The final mark will be combined by the mark obtained by essays carried out by the students during the course and the final exam, This final exam will count to 60% of the total mark.

CRITERIA FOR THE 2ND ASSESSMENT OPPORTUNITY

The same as for the 1st assessment opportunity.
