



Co-funded by the Horizon 2020 programme of the European Union

Module 1: Continuum Thermomechanics

Lecturers: Iñigo Arregui Álvarez, Patricia Barral Rodiño, Peregrina Quintela Estévez

Syllabus: The First Module, Continuum Thermomechanics, is focused on the study of some mathematical models in solid mechanics, referred to static and dynamic problems. Elastic, isotropic and anisotropic materials, as well as the thermal effects will be considered. Simplifications due to the geometry of the piece, the volume forces, the boundary conditions, or the existence of symmetries will be also introduced. In addition, an introduction to more general behaviour laws, and to the formulation of non-linear boundary conditions will also be considered. The numerical simulation will be performed using COMSOL Multiphysics software package.

Teaching hours/lecture: 16.5 h

Contents:

# Lecture	Schedule	Lecturer	Content
1	June 25, 9:00-10:30 (1,5h)	Iñigo Arregui Álvarez	Vectors and tensors, differential operators and theorems. Bodies, deformations and motions.
2	June 25, 10:30-12:00 (1,5h)	Iñigo Arregui Álvarez	Transport theorems. Conservation of mass, linear and angular moments. Forces and stresses, Cauchy theorem. Conservation of energy.
3	June 26, 12:30-14:00 (1,5h)	Peregrina Quintela Estévez	Elastic constitutive law. Isotropic materials. Lagrangian conservation laws. Boundary conditions. Linear elastodynamics.
4	June 27, 12:00-14:00 (2h)	Peregrina Quintela Estévez	Stress tensor. Principal stresses. Principal directions. Scalar invariants. Spherical and deviatoric stress tensor. Strain tensor. Rotation tensor. Compatibility equations of St. Venant
5	June 28, 9:00-10:30 (1,5h)	Peregrina Quintela Estévez	Hooke's law. Physical interpretation of the elasticity coefficients. Principle of virtual work. Strain energy.



UNIVERSIDADE DA CORUÑA





Co-funded by the Horizon 2020 programme of the European Union

6	June 28, 10:30-12:00 (1,5h)	Patricia Barral Rodiño	Anisotropic Hooke's law. Orthotropic materials. Linear thermoelasticity.
7	June 29, 10:30-12:00 (1,5h)	Peregrina Quintela Estévez	3D Numerical simulations.
8	June 29, 12:30-14:00 (1,5h)	Patricia Barral Rodiño	1D stress-strain plastic curves. Hardening. J2 theory of plasticity.
9	July 2, 9:00-10:30 (1,5h)	Peregrina Quintela Estévez	Plane problems in linear elasticity. Plane strain. Plane stress. Practical cases.
10	July 2, 10:30-11:30 (1h)	Peregrina Quintela Estévez	Axially symmetric problems. Practical cases.
11	July 2, 12:00-13:30 (1,5h)	Patricia Barral Rodiño	Contact boundary conditions. Nonlinear numerical simulations.



UNIVERSIDADE DA CORUÑA

