

Semester: 5
Teaching unit: UEF 3.1.2
Subject : Elasticity
VHS: 45h00 (class: 1h30, tutorial: 1h30)
Credits: 4
Coefficient: 2

Teaching objectives:

This course is an introduction to the fundamental notions of elasticity, it focuses on stress and strain tensors as well as Hooke's laws.

Recommended prior knowledge:

- Algebra
- Differential and integral calculation
- Matrix calculation
- Strength of materials

Contents :

Chapter 1: Introduction, Essential Mathematics (3 weeks)

Indicial notation, Vector calculus, Tensor calculus.

Chapter 2: Stress tensor (4 weeks)

- section, face and Stress vector
- Cauchy formula, stress tensor
- Equilibrium equations
- Principal Stresses and principal directions
- Scalar invariants of the stress tensor
- Spherical tensor and deviator

Chapter 3: Strain tensor (3 weeks)

- Displacement vector
- Strain tensor
- Transformation of lengths and angles
- Principal Strain
- Scalar invariants of the strain tensor
- Spherical tensor and deviator

Chapter 4: Hooke's law (Stress – Strain relation) (4 weeks)

- Stress formulation
- Strain formulation
- Thermo-elastic formulation

Chapter 5: Resistance criteria (Strength criteria) (1 week)

- Maximum normal stress criterion (Rankine criterion)
- Maximum shear stress criterion (Tresca criterion)
- Von Mises criterion

Evaluation method: Continuous monitoring: 40%; Examination: 60%.