Faculty of Science and Engineering (UF SDI)

Finite Element Method for structural analysis (9 ECTS)

Professor(s): Dr. C. Bois, Dr. B. Deltheil, Dr. Y. Ledoux

Distribution of courses: Lectures 16h - Practical works 20h – Labs 40h

Location of courses: Talence Campus

Prerequisites:

Basis on stress and strain tensor, continuum mechanics

1. Non-linear behavior of materials (plasticity, viscosity, damage) and anisotropy
2. Finite Element Method, basis on numerical analysis

Description:

From the functional requirements and technical specifications of a product (geometrical configuration, materials and load cases), students should be able to:

3. Propose a FE model, write and justify assumptions from a physical point of view
4. Implement the model and analyze the structural response in order to validate or optimise the structure

Contents of the course:

5. Structure sizing : failure modes, sizing criteria
6. Choice of boundary conditions and interactions
7. Contact and interface law
8. Resolution schemes (implicit and explicit), convergence

9. Modelling strategies, choice of finite element, multi-scale approach

Contents of industrial lectures:

10. Role of structural analysis in industrial product development
11. Interactions between structural analysis department, design department and material department
12. Industrial case study

Contents of practical works and supervised projects:

1. Structural analysis with non-linear constitutive law
2. Waves and vibrations
3. Structural buckling (in relation to teaching unit « Materials and structures for aeronautical applications »)
4. Contact issues in joints and connections (in relation to teaching unit « Modelling of joints and connections »)
5. Structural sizing with shape and mass optimisation
6. Composite laminates analysis
7. Crash analysis

Evaluation:

First session

1. Written test (2 h) – coef. 0.3
2. Lab – coef. 0.5
3. Project – coef. 0.2

Second session

4. Written test (2 h) – coef. 0.3
5. Lab (report of Lab rating), coef. 0.5
6. Project (report of Project rating) – coef. 0.2