M3S: Mechanical Modelling of Materials and structures

Students attending M3S courses during their final year before graduation focus on solid mechanics.

From September to March all Centrale Marseille engineering school students attend core courses (~120h in management and foreign languages), professional specialty courses (~110h in Conception, Design Office or Research and Development, …) and extension courses (~400h). More details can be found on the school page. M3S is part of the general “Mechanics” extension course which also covers fluid mechanics and acoustics.

Starting from April, students then realize their end-of-studies internship during 4 to 6 months.

If you have any question, please contact Emmanuelle Sarrouy.

M3S Mandatory courses

All M3S students will attend the following courses:

- **Numerical methods in mechanics** [24h]
  General overview of methods for solid, fluid and acoustics; application on dedicated software such as Comsol.
- **Waves in mechanics** [24h]
  Linear and non linear wave propagation in different media.
- **Slender structures (beams and plates), dynamics and instabilities** [48h]
  Beams and plates theory; buckling instability
  Eigenmodes definition and use (general behavior prediction, computation acceleration, model reduction)
  Introduction to rotor dynamics, dynamic instabilities and nonlinear vibrations
- **Material behavior (at small and finite strains)** [48h]
  Visco-plasticity and damage phenomenon and models
  Large strains: theory and practice on Abaqus
- **Software tools in mechanical engineering**
  FEM: practice on Abaqus
  Overview of welding and heat treatment simulation using Sysweld

Students also have to work on a **project** which can be related to an industrial need or an academic research (~100h).

M3S Optional courses

Each student will also chose 4 courses among the following ones:

- **Composite and laminated materials** [24h]
- **Fast dynamics and crash** [24]

- **Civil engineering** [24h]
- **Fluid-structure interactions** [24h]
- **Porous media** [24h]
- **Optimization of structures** [24h]
- **Fracture, fatigue, yield design and limit analysis** [24h]

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