



## GÉNIE MÉCANIQUE TECHNOLOGIE-MÉCANIQUE GÉNÉRALE-RDM

### MECHANICAL ENGINEERING

Lecturers: **Christophe JANOLIN, Damien CONSTANT, Emmanuel RIGAUD, Hélène**

| Lecturers : 18.0 | TC : 22.0 | PW : 0.0 | Autonomy : 0.0 | Study : 0.0 | Project : 0.0 | Language : FR

#### Objectives

The aim of this module is to study the technical design, dimensioning and realization of a mechanical system, as well as the study of its functioning. The first part allows the students to understand the architecture of a mechanical system from the description of the connections between the parts and to define the toleranced geometry of the functional surfaces. The second part allows the students to establish the equations of motion of a system of rigid bodies, using a Newtonian or a Lagrangian approach based on the principle of virtual powers. The third part makes it possible to dimension thin deformable structures as beams, according to stresses and displacements criterion, starting from the internal forces induced by the loading and the reactions to the

**Keywords :** Effects and connections, Functional dimensioning, Analytical mechanics, Principle of virtual powers, Lagrange equations, Beam theory, Sizing : stresses, strains, and displacements

#### Programme

- Mechanical technology: Efforts and connections in mechanical systems. Functional specifications and product definition. Obtaining parts by machining using cutting tools.
- General and analytical mechanics of rigid solids systems: Description of the movement, fundamental principle, principle of the virtual powers (PVP), hypotheses of the model. PVP for a single solid, definition of different torsors, kinetic energy theorem. PVP for a system of solids, schematization of the connections, equations of Lagrange. Discussion on the limitations of the model.
- Strength of materials: Definition, schematization of a beam and model hypotheses. Elastic dimensioning. Constitutive relation.

#### Learning outcomes

- To know how to analyse the architecture of a mechanical system and its geometrical description from the technical drawings.
- To know how to design a mechanical system and define its functional tolerancing that respect the conditions of good functioning.
- To be able to analyse the dynamic behaviour of a rigid solids system.
- To know how to dimension a slender piece subjected to static loading.

#### Independent study

**Objectifs :** Understanding and assimilating the course.

**Méthodes :** Exercises complementary to the tutorials available online, to be solved in self-evaluation (DidacTest).  
Corrected exercises available on teaching server.

#### Core texts

Trotignon J.P., *PRÉCIS DE CONSTRUCTION MÉCANIQUE TOMES 1 ET 2*, Nathan, 2007  
Brousse P. *MÉCANIQUE ANALYTIQUE*, Vuibert, Paris, 1981  
Timoshenko S.P. *RÉSISTANCE DES MATÉRIAUX, TOMES 1 ET 2*, Dunod, Paris, 1990

#### Assessment

Final mark = 100% Knowledge  
Knowledge mark = 84% final exam + 16% continuous assessment