GM - Mechanical engineering - S7

GÉNIE MÉCANIQUE TECHNOLOGIE-MÉCANIQUE GÉNÉRALE-RDM

MECHANICAL ENGINEERING

Lecturers: Olivier DESSOMBZ, Bertrand HOUX, Didier LACOUR, Emmanuel RIGAUD,

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

Objectives

Approaching the design, dimensioning and construction of a mechanical system, as well as the study of its operation. The 1st part makes it possible 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 2nd part makes it possible to establish the equations of motion of a system of solids, from a Newtonian approach or a Lagrangian approach based on the principle of virtual power. The 3rd part makes it possible to dimension the slender deformable structures in stresses and displacements, from the internal forces induced by the loading and the reactions to the connections.

Keywords : Forces and connections, Functional dimensioning, Analytical mechanics, Principle of virtual power, Lagrange equations, Beam theory, Stress and displacement dimensioning

Programme

- Mechanical Technology Program: Forces and connections in mechanical systems. Functional specifications and product definition.
- General and analytical mechanics of rigid body systems: Description of the movement, fundamental principle, principle of virtual powers (PPV), model assumptions. PPV for a single solid, definition of the different torsors, kinetic energy theorem. PPV for a system of solids, diagramming of connections, Lagrange equations. Limits of the model.
- Strength of materials: Definition, diagram of a beam and model assumptions; inner efforts. Elastic sizing. Constitutive law. Limits.

Learning outcomes

- Knowing how to analyse the architecture of a mechanical system and its geometric description from technical drawings.
- Knowing how to design a mechanical system and define its rating that respects the conditions for proper operation.
- To be able to analyse the dynamic behavior of a system of rigid solids.
- Know how to size a slender part subjected to static loading.

Independent study

Objectifs : Understand and assimilate the course.

Méhodes : Complementary exercises to the tutorials available online, to be solved in self-assessment.
Corrected exercises available on the educational server.

Core texts

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

Assessment

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

ACTIVITÉS PRATIQUES DE GÉNIE MÉCANIQUE

PRACTICTAL COURSES IN MECHANICAL ENGINEERING

Lecturers: Bertrand HOUX, Hélène MAGOARIEC, Olivier DESSOMBZ

| Lecturers : 0.0 | TC : 0.0 | PW : 20.0 | Autonomy : 0.0 | Study : 10.0 | Project : 0.0 | Language : FR

Objectives

The objective of the training action is to put into practice (know-how) the skills of the GM Teaching Unit. The objective of the technological product development project is to implement all the stages of design, manufacture and control of the geometric conformity of the components of a mechanical system. The other practicals aim to analyse the architecture of a real mechanical system, to carry out a performance diagnosis, according to the external stresses and the technological elements used to make the connections between solids or to put the system into action.

Keywords : Architecture of a mechanical system; Building elements; Design; Manufacturing; Metrology; Elastic sizing; Performance diagnostics.

Programme

- Discovery lab program - Technological analysis (4h)
- BE drawing - Technological project (2h)
- BE quotation - Technological project (4h)
- BE manufacturing - Technological project (2h)
- BE machining range - Technological project (4h)
- Machining TP - Technological project (4h)
- Dimensional metrology practical work - Technological project (4h)
- Design work in RdM (4h)
- Dynamic lab (4h)

Learning outcomes

- Knowing how to analyse the architecture of a mechanical system.
- Master the stages of design and manufacture of a mechanical system.
- To be able to control the geometric conformity of a mechanical system.
- To be able to diagnose the performance of a mechanical system.

Independent study

Objectifs : This activity is not concerned with framed autonomy activities outside personal work.

Méhodes : This activity is not concerned with framed autonomy activities outside personal work.

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% know-how
Know-how mark = 100% continuous assessment.

CONCEPTION DE MÉCANISME

MECHANISMS DESIGN

Lecturers: Didier LACOUR

| Lecturers : 4.0 | TC : 4.0 | PW : 0.0 | Autonomy : 0.0 | Study : 12.0 | Project : 0.0 | Language : FR

Objectives

Knowledge and dimensioning of power transmission elements, particularly those used in ground transport, understand their operation and analyze their performance.

Keywords : power transmission, gearbox, vehicle, hydraulics transmission

Programme

- Elements of technology for power transmission.
- Epicyclic trains and applications.
- Gearboxes and drives.
- Hydraulics transmissions;
- Hybrid Vehicle Architectures.
- Three 4h Studies: Analysis of the operation of a DSG7 gearbox. Simulation of the operation of a gearbox and a DPC differential (with Catia software and applications). Analysis of the power transmission system of a 4x4 vehicle.

Learning outcomes

- Be able to perform functional analysis of a mechanical transmission system.
- Be able to analyse and simulate the operation of a mechanical transmission system.

Independent study

Objectifs : This activity is not concerned with framed autonomy activities outside personal work.

Méhodes : This activity is not concerned with framed autonomy activities outside personal work.

Core texts

Esnault F., *CONSTRUCTION MÉCANIQUE, TOME 1*, Dunod, 2009
Esnault F. *CONSTRUCTION MÉCANIQUE, TOME 2*, Dunod, 2009
Esnault F.*CONSTRUCTION MÉCANIQUE, TOME 3*, Dunod, 2009

Assessment

Final mark = 100% Know-how
Know-how mark = 100% continuous assessment

MODÉLISATION ET CONCEPTION

MECHANICAL DESIGN

Lecturers: Olivier DESSOMBZ, Francesco FROIIO

| Lecturers : 4.0 | TC : 4.0 | PW : 0.0 | Autonomy : 2.0 | Study : 10.0 | Project : 0.0 | Language : FR

Objectives

Give more advanced notions on the mechanics of solids and structures, having a direct link with applications.

Keywords : Dimensioning, truss, static, dynamic

Programme

- Course 1 and TD 1: Calculation of isostatic and hyperstatic lattices. Buckling.
- Course 2 and TD 2: Small movements in vibration. Clean modes, free response and forced response.
- Design office 1 and 2: Calculation of the coverage of a gymnasium (static sizing and dynamic analysis).

Learning outcomes

- Apply the concepts of structural statics to the design of a truss
- Apply the concepts of structural dynamics to the design of a truss.
- Use digital calculation platforms (Matlab, Scilab) for the analysis of structures.
- Report on the static and dynamic analysis of a structure.

Independent study

Objectifs : Finalize the work of the design office.

Méhodes : Group work: case study and report writing .

Core texts

Assessment

Score = 100% know-how
Know-how score = 100% continuous assessment.