MECHANICAL ENGINEERING COURSES

Design of structures	7 credits	79h
Manufacturing	6 credits	64h
Mechanical power transmission	9 credits	133h
Improving autonomy and building a professional project	4 credits	39h
Improve your management abilities	4 credits	45h

Design of structures

Level
BAC +3

ECTS
7 credits

Component
INSTITUT NATIONAL DES SCIENCES APPLIQUEES TOULOUSE

Number of hours
79h

In brief

Teaching language(s): Français, Anglais

Presentation

Description

Program (detailed contents):

Finite element module :

The student learns various phases of a finite element analysis using a modern software: geometrical modeling of structures, meshing, applying the boundary conditions, solving, postprocessing and analyzing the results from a critical point of view. Student gets to know various features built-in the software related to: meshing technique working firstly on the single part and later on part assembly, using specific finite elements and particular algorithms devoted to linear and nonlinear problems (contact, plasticity), error estimation...

Course is divided into two parts. The first part considers training (with significant help of the teacher) oriented towards understanding and familiarizing with the user interface of the software and the capabilities of the computer code. This computer code serves as a tool to support the training and test the concepts known from the previous courses such as Finite elements, Continuum mechanics and Resistance of materials. During the second part, the student must conduct the analysis of a real-life problem, with a partial autonomy, in the form of a project.

Reliability and Design of experiments module :

The contents are divided in two parts. The first part presents the role and objective of RAMS (Reliability, Avaibility, Maintainability, Safety) analysis. The design of experiments part presents the Taguchy method.

Mechanics of vibrations module :

Firstly the teaching focuses on discrete models with localized parameters (mass-spring model). The analysis and understanding of the basic one-degree-of-freedom oscillator is followed by an extension to multi-degree-of-freedom models. Time domain resolution by direct resolution of differential equations or frequency domain resolution by use of Frequency Response Functions are discussed in the different cases. A second part of the teaching focuses on the vibrations of continuous models (beams, plates, etc.).

Bibliographic work module :

Initiation to bibliographic search tools. Awareness to the concept of "industrial property".

Organization:

Finite element module :

9 seances of 3h, 5x3h of mixed lecture and practical work, 4x3h project

Reliability:

Design of experiments:

4h of lectures, 4 tutorials and 1 labwork of 4h.

Mechanics of vibrations module :

10x1,25h Lecture + 9x1,25h practical

Objectives

Finite element module :

* Perform finite element analysis using a commercial finite element code (Abaqus for example) following the presented principles and good practice.
* Identify the features offered by these numerical tools and the associated potentialities.
* Create relevant models related to the target objectives.
* Analyse and postprocess the obtained results.
* Analyze the impact of the modeling assumptions.
* Assess the risks inherent to the wrong interpretation of the results.

Reliability and Design of experiments module :

* Apply to practical case analyses the basics of reliability
* Build a design of experiments for the modeling of a physical system from numerical or experimental data.

Mechanics of vibrations module :

* Develop a linear dynamic model of a mechanical structure: a lumped parameters model for a discrete elements structure, or a distributed parameters model for a continuous structure.
* Determine the vibrations of these structures undergoing transient or permanent excitation.

Bibliographic work module :

* Carry out a literature review and establish a state of the art on a research topic that will be developed in I4GMPJ81 formation unit.

This state of the art will present :

* past history (previous studies, de facto situation, necessity of research)
* the main results of these past studies
* The elements that could guide future work in UF I4GMPJ81.

Pre-requisites

Finite element module :

Computer aided design (CAD)

Finite element concepts.

Mechanics of vibrations module :

Basics in solid mechanics, strength of material, dynamic systems.

Useful info

Contacts

Education manager
EDUARD MARENIC

Place

Toulouse

Manufacturing

Level
BAC +3

ECTS
6 credits

Component
INSTITUT NATIONAL DES SCIENCES APPLIQUEES TOULOUSE

Number of hours
64h

Presentation

Description

Theory of cutting

Cutting tools

Optimization of cutting conditions

High speed machining

Chatter

Shaping of plastics and composites

Production management : Types of manufacturing, inventory management, lean manufacturing and associated tools.

Casting : Presentation of the processes of shaping of crudes / mechanical parts by plastic deformation, with technologies and associated calculations. The processes discussed are mainly forging, stamping, folding and stamping.

Presentation of Additive Manufacturing processes and intervention of specialized industrialists.

Method of implementing a 3D printing process.

Organization:

The teaching sessions are divided down into Courses, Lectures and Practical work.

6 x 1h15 of course in HSM + 6 x 1h15 of lectures

3 x 1h15 of course in Production Management course + 3 x 1h15 of lectures

2 x 1h15 of course in plastic deformation course + 4 x 1h15 of lectures

4 x 1h15 of course in casting course + 3 x 2h5 of lectures

5 x 1h15 of course in Additive Manufacturing +3 x 1h15 of lectures

3h of practical work on the implementation of means of Additive Manufacturing

9h of practical work on plastic injection, cutting forces and HSM

Objectives

The student will be able to :

- Define the influencing parameter on cutting material,

optimize a machining operation in HSM.

- Define a Production Management Approach.

- Design parts by casting.

- Define the advantages and limitations of additive manufacturing processes.

- Design and produce plastic parts using an additive manufacturing process.

- Know the different ways to get rough part and their costs and performance, define a range of rough part and design the necessary tools.

Pre-requisites

CAM manufacturing technology

Tolerance Manufacturing analysis

Mechanical characteristics of materials

Resistance of materials : elasticity

Digital production chain : CAD, CAM, Post-processing, use of means of production, control

Knowledge check

Written exam in the different subjects.

Useful info

Contacts

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Place

Toulouse

Mechanical power transmission

Level
BAC +3

ECTS
9 credits

Component
INSTITUT NATIONAL DES SCIENCES APPLIQUEES TOULOUSE

Number of hours
133h

Presentation

Description

Part I - CAD

- best use of CAD software (organising the data; top-bottom modeling via skeletons)

- practice with 3DX

Part II - Gears

- planetary gears

- detailed geometry of involute gears

- gear sizing using ISO6336

Part III - Project work

Groups of 2 or 3 students

Using the following specifications:

. use context, geometrical constraints

. input and output data

. expected service life

Each team has to produce:

. a thorough sizing synthesis document (gears, bearings, shafts, clampings)

. a drawing of the mechanism

. a CAD model of the mechanism

Objectives

At the end of this module, the student will be able to analyse technical requirements related to the design of a gear reducer, create a design with the associated sizing calculations, present their solution by means of both a draft and a CAD model.

Pre-requisites

Fundamentals of mechanical design:

- basics of manufacturing (welding, machining)

- common clamping technology (key, splines, screws, etc.)

- pivot joints (rolling bearings joint design and sizing)

- basics of technical drawing

- calculating forces in a mechanical system (equilibrium laws)

- calculating stresses (torsion and bending of beams)

Useful info

Contacts

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Place

Toulouse

Improving autonomy and building a professional project

ECTS
4 credits

Component
INSTITUT NATIONAL DES SCIENCES APPLIQUEES TOULOUSE

Number of hours
39h

Presentation

Objectives

Construire une équipe projet, Approfondir ses connaissances,

Investir le métier, les domaines d'activité, les fonctions.

L'étudiant devra être capable de :

- d'analyser avec les autres un problème posé (Identifier le problème, définir les axes d'approche dans un bilan interactif : organisation, physique, technique, stratégique, motivation, confiance...

- de décider ensemble (permettre à tout le monde d'exprimer son avis, ajuster et réguler sa conduite en fonction de l'analyse collective),

- d'identifier les ressources du groupe (sens critique, repérage des points forts et faibles de chacun).

Place

Toulouse

Useful info

Improve your management abilities

ECTS
4 credits

Number of hours
45h

Presentation

Objectives

At the end of this module, the student will have understood and be able to explain :

* The basic rules of business law

* The objectives, principles and means of marketing

* The principles and procedures of financial diagnosis and/or investment.

The student will be able to apply principles and rules of management and law in simple situations. Take into account the parameters of the management (customer needs, cost effectiveness an legal compliance).

Useful info

Contacts

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