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, Availability, 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 :

Non-contractual information.
Last update on 17 March 2021

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 :

Non-contractual information.
Last update on 17 March 2021

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

Useful info

Contacts

Education manager
EDUARD MARENIC

Place

Toulouse

Non-contractual information.
Last update on 17 March 2021