



MECHANICAL ENGINEERING

PRESENTING THE UTC DEPARTEMENT OF MECHANICAL ENGINEERING

The Mechanical Engineering department provides solid grounding and skills in both Mechanical and Industrial engineering sciences. After training, graduates with the Mechanical Engineering diploma will be able to design, make, implement and maintain products, processes and systems to meet the needs of an evolving industrial world. They will, for instance, be able to:

- design and size robust and safe mechanical systems;
- propose materials best suited to expected constraints and property specifications;
- integrate vibro-acoustic analyses to mechanical designs;
- implement quality assurance measurements and certification;
- use digital engineering tools and software (CAD, PLM ...)
- supervise and control production systems and manufacturing processes;
- identify, choose and implement suitable mechatronic and/or innovative solutions.

COURSE DESCRIPTIONS

AP52 - SIMULATION FOR MECHANICAL ENGINEERING (8 ECTS)

Responsible : Ludovic Cauvin (Fall semester)

This course is a workshop on computational mechanics (FEM, CFD,...). Followed by at least one professor, all the projects are conducted in collaboration with an industrial company. As a workshop, students have to frequently present their progress to professors and to industrial partners.

MP03 - SUPPLY CHAIN MANAGEMENT - (6 ECTS)

Responsible : Joanna Daaboul (Fall semester)

MP03 presents the methods and tools to design and manage a Supply Chain from designing the supply network, distribution Chanel, and transportation network to defining the price strategy, the selection of suppliers, demand forecasting, aggregate planning, warehouse management, and stock optimization.

MQ12 - MATERIALS, PROCESSES AND CHOICE - (6 ECTS)

Responsible : Salima Bouvier (Fall semester)

This course has been designed and thought out in such a way as to provide a student with an overview of the different classes of materials, their main properties, the fields of application, the means used for their shaping and the consequences on the properties of use. Different classes of materials are discussed: metal alloys, polymers, ceramics, composite materials and other types of materials such as natural materials, architectural materials, hybrid materials.

MS03 - PROJECT IN ACOUSTICS AND VIBRATION - (6 ECTS)

Responsible : Nicolas DAUCHEZ (Fall semester)

After an introduction to advanced experimental methods in acoustics and vibrations (modal analysis, laser vibrometry, sound radiation), this course develops in the format of a project in response to a research or industrial issue.

Keywords

Acoustics
Engineering
Automatic Control
Computational
Mechanics
Electromechanical
Systems
Geometric Modeling
Manufacturing
Technologies
Materials
Engineering
Quality Management
Sensors
Signal Processing
Simulation
Supply Chain

NF04 - NUMERICAL METHODS FOR ENGINEERING - (6 ECTS)*Responsible : Mohamed Rachik (Fall semester)*

This course is a comprehensive introduction to numerical methods for engineering. The covered topics include the notions required for the numerical resolution of ordinary and partial differential equations used in engineering problems and the numerical techniques like finite difference and finite element methods. Both steady state and transient problems are addressed.

PS12 - ROOM ACOUSTICS: MATERIALS AND MODELING (6 ECTS)*Responsible : Nicolas Dauchez (Fall semester)*

This course covers the modeling of rooms (buildings, concert halls) and urban environments. Geometrical acoustics and statistical methods are applied to study the properties of existing rooms. A particular attention is given to the physics of sound absorbing materials, used for insulation and reverberation control.

PS13 - NUMERICAL METHODS FOR VIBROACOUSTICS - (6 ECTS)*Responsible : Jean-Daniel Chazot (Fall semester) (Teaching material in English)*

This course presents the numerical methods used in vibroacoustic to predict the structural radiation, the transmission loss, the vibroacoustic coupling... Integral equations used in the Finite Element Method and the Boundary Element method are presented and applied to vibroacoustic problems. The basics of acoustic radiation and acoustic isolation, useful to understand the numerical results obtained with a simulation tool, are detailed. A short overview of the Statistical Energy Method is given. A commercial software is used to apply these numerical methods in vibroacoustic on academic cases.

SY03 - INTRODUCTION TO ELECTROMECHANICAL SYSTEMS - (6 ECTS)*Responsible : Nicolas Damay (Fall semester) (Teaching material and subtitles in English)*

SY03 is focused on mechanical and electrical energies in order to study electromechanical systems. One part of this course is about the components of these systems (theory and technology). Another part covers the interactions between the components (energy transfer, compatibility). The course purpose is to allow the students to propose and justify a complete electrochemical system that meets specifications.

SY06 - SIGNAL PROCESSING - (6 ECTS)*Responsible : Solène Moreau (Fall semester) (teaching material and subtitles in English)*

The objective is to set up the theoretical basis for signal analysis, and to give the main ideas and model to understand the various treatments that are generally used to extract features from signals.

AC03 - IMPLEMENTATION OF QUALITY IMPROVEMENT APPROACHES IN INDUSTRY (6 ECTS)*Responsible : Hai Canh Vu (Spring semester) (only teaching material in English)*

The main objective of this module is to train managers who are actors of change and performance improvement in their organizations. Some important courses of the module are: Risk analysis, ISO9001, Quality management system, Lean Management, 6 Sigma.

BZ08 - FINITE ELEMENT MODELLING OF BIOMECHANICAL SYSTEMS (6 ECTS)*Responsible : Marie-Christine Ho Ba Tho (Spring semester)*

The objectives are to provide the methodology for the development of numerical models of biomechanical systems. The basics of geometrical and numerical modelling and specific courses on geometrical modelling derived from medical image, mechanical properties of hard and soft biological materials will be addressed. The exam consists in performing a modelling project and literature review associated.

MQ03 – VIBRATION MECHANICS – I (6 ECTS)*Responsible : Jean-Daniel Chazot (Spring semester) (only teaching material in English)*

This course gives the keys to analyze, calculate and understand free and forced vibrations of linear, damped and undamped, single- or multi-degree-of-freedom systems.

MS02 - SENSORS AND INSTRUMENTATION (6 ECTS)

Responsible : Frédéric Lamarque (Spring semester)

The purpose of this course is to give students an extensive technological culture on the various sensors encountered in the industrial environment and on their uses (metrology, data acquisition, integration). The students will be able to choose sensors according to the criteria fixed by the requirements of the targeted application.

PS09 - INTRODUCTION TO THE PRACTICE OF ACOUSTICS (6 ECTS)

Responsible : Solène Moreau (Spring semester) (Teaching material and subtitles in English)

The noise dimension is now an essential element to describe the quality of an environment or a product. In the design or improvement of an aircraft, an automobile, a washing machine, a building, acoustic characteristics are included in the specifications. PS09 is an introduction to acoustics and addresses the physical, metrological and design rules aspects for the mechanical and building industry.

SY04 - LINEAR SERVO SYSTEMS: ANALYSIS AND CONTROL (6 ECTS)

Responsible : Christine Prella (Spring semester) (teaching material and subtitles in English)

The purpose of SY04 is to discover the basics of automatic control. SY04 gives tools necessary to describe the behavior of various systems (mechanical, electrical, mechatronics...) and techniques for their control (choice and tuning of the controller for linear systems).

TN20 - GEOMETRIC MODELING (6 ECTS)

Responsible : Alain Rassineux (Spring semester) (Only teaching material is in English)

At the end of this course, the student must be able to create digital graphic representations to support collaboration during design activities. This teaching allows students to master the basics of CAD software and the "skeleton" methodology.

TN24 - ADVANCED MANUFACTURING TECHNOLOGIES - (6 ECTS)

Responsible : Alexandre DURUPT (Spring semester) (teaching material and subtitles in English)

Implementation of machining on CNC machine tools. Practical and detailed studies will be carried out. This course will highlight the equipment and numerical conditions of NC machines in a workshop and production plant. Variations in terms of equipment facilitating flexibility and productivity in production will be addressed.

GENERAL LAB AND PROJECT COURSES

PR00 – MULTIDISCIPLINARY PROJECT (5 ECTS)

Responsible: Bruno Ramond (Fall and Spring semesters)

The goal of this course is to have students participating to the achievement of a project. The project should be under the supervision of one adviser.

TX00 - LAB PROJECT (5 ECTS)

Responsible: Claude-Olivier Sarde (Fall and Spring semesters)

The TX Unit is a technical Unit belonging to the category "Techniques and Methods" (TM). It allows the students to realize a concrete technical project operating an approach of engineering.

HUMANITIES AND LANGUAGES

EI02 : INTERNATIONAL PROJECT MANAGEMENT (4 ECTS)

Responsible: Frederic Huet (Fall and Spring semesters)

Managing international projects presents unique challenges: implementing standard project management methods and tools while accommodating cultural differences and distance in the project team. This course addresses the knowledge, skills, and behaviors required to successfully manage projects across the world.

EI05 : EUROPEAN UNION, SOCIETY AND SCIENCE POLICY (4 ECTS)

Responsible: Martin Morgeneyer (Fall and Spring semesters)

Introduction to Europe: Countries, figures, languages - and you! - EU's history and EU's news - From an economic to a political Europe: The treaties and the constitution project, Introduction to Lisbon - The European Institutions - Europeans about Europe - The European citizenship - Key figures - Intro to ERA and REACh - Intro to Bologna - Decision making - European law - Research, EIT, REACh and Sustainable development in Europe - Horizon 2020 - Public consultations - Europe and me.

SO07 : DIGITAL POLICIES AND INTERNET REGULATION (4 ECTS)

Responsible: Anne Bellon (Fall and Spring semesters)

Can we govern technology and how? By bringing together different disciplines (political science, law, and economics). This course explores the technical and social arrangements that shape the organization and transformation of content and practices on the web. It adopts a thematic and historical perspective, which aims to discuss specific issues, but above all to grasp the evolution and ruptures that mark the regulation of the Internet.

LA91 - FRENCH AS A FOREIGN LANGUAGE - level 1 (4 ECTS)

Responsible: Anna Wiacek-Le Verger (Fall and Spring semesters)

LA92 - FRENCH AS A FOREIGN LANGUAGE - level 2 (4 ECTS)

Responsible: Anna Wiacek-Le Verger (Fall and Spring semesters)

LA93 - FRENCH AS A FOREIGN LANGUAGE - level 3 (4 ECTS)

Responsible: Carole Lefrancois-Yasuda (Fall and Spring semesters)

LA94 - FRENCH AS A FOREIGN LANGUAGE - level 4 (4 ECTS)

Responsible: Carole Lefrancois-Yasuda (Fall and Spring semesters)

Contact

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