INSA INSTITUT NATIONAL DES SCIENCES APPLIQUÉES TOULOUSE

SCIENCE, TECHNOLOGY, HEALTH

MASTER MECHANICAL ENGINEERING

Engineering sciences

Targeted level of education
BAC+5

Duration
2 années

Component
INSTITUT NATIONAL DES SCIENCES APPLIQUEES TOULOUSE

Introducing

Objectives

The Mechanical Engineering programme highlights the complementarity of sciences and technologies. It has been built on several conceptual studies ending with today's industrial projects. It is renowned for its open minded character and industrial realism, enabling the engineer: -to manage and lead development projects (overall design or detailed design) -to treat system problems (manufacturing, production, integration and testing). Through a global understanding of the complete process and industrial constraints (from requirements to operations), the engineer is able to work with mechanical systems, equipments, components or piece parts. His generalist profile allows him to adapt to any industrial area. During his training, he will gain in-depth learning in one of the following subjects: -Computer assisted design to develop structures and power transmission systems using design software. -Design of energy transfer systems for the generation, transmission and conversion of energy. -Design and engineering for project management in the industrialization of mechanical systems.

Admissions

Access conditions

Diplôme d'ingénieur habilité par la commission des titres d'ingénieur, 5 années d'études après la fin des études secondaires, confère le grade de Master. Baccalauréat ou équivalent pour une admission en première année Admission sur titre possible en année 2, 3 ou 4. Admission A tous les niveaux, l'admission aux INSA s'effectue par concours sur titres, dossier et éventuellement entretien ; le dossier rassemble des éléments d'évaluation obtenus par ailleurs par le candidat.

Target audience

Necessary prerequisites

Recommended prerequisites

Practical info

Location(s)

Toulouse

Program

FOURTH YEAR – GM
4th YEAR MECHANICAL ENGINEERING

SEMESTER 7_4th YEAR GM

4th YEAR GM INSA_SEMESTER 7

4th YEAR GM – SYSTEM ENGINEERING COURSES_SEMESTER 7

OPTION CSH or IAE

Liste d'éléments pédagogiques

Improve your management abilities	4 crédits	45h

Toulouse School of Management

Liste d'éléments pédagogiques

Multiphysics modeling	6 crédits	
Modelling tools and Optimization	5 crédits	
Architectures or technological systems	7 crédits	93h
Automatic control	4 crédits	
Improving one's autonomy and building one's own professional project level 2 S7	4 crédits	46h
Communication in organisations with LV2	6 crédits	
FLE Summer school	5 crédits	104h
French I	3 crédits	
Improve your management abilities	4 crédits	45h
Political sciences semester 1	3 crédits	

4th YEAR GM – MECHANICAL ENGINEERING COURSES_SEMESTER 7

OPTION CSH or IAE

Liste d'éléments pédagogiques

Improve your management abilities	4 crédits	45h

Toulouse School of Management

Liste d'éléments pédagogiques

Design of structures	7 crédits	79h
Manufacture	6 crédits	64h
Power transmission case study	9 crédits	107h
FLE Summer school	5 crédits	104h
French I	3 crédits	
Improving one's autonomy and building one's own professional project level 2 S7	4 crédits	46h
Political sciences semester 1	3 crédits	

CHALLENGE BASED LEARNING _SEMESTER 1

Liste d'éléments pédagogiques

[FRANCAIS] Challenge – Formation ECIU	1 crédits	
[FRANCAIS] Challenge – Formation ECIU	2 crédits	
[FRANCAIS] Challenge – Formation ECIU	3 crédits	
[FRANCAIS] Challenge – Formation ECIU	4 crédits	
[FRANCAIS] Challenge – Formation ECIU	5 crédits	

SEMESTER 8_4th YEAR GM

4th YEAR GM INSA_SEMESTER 8

4th YEAR GM – MECHANICAL ENGINEERING COURSES_SEMESTER 8

Liste d'éléments pédagogiques

Advanced heat transferts and fluid flow	5 crédits	
Materials, vibrations and advanced mechanical modeling	7 crédits	100h
Research projects and sports	6 crédits	2h
Multidisciplinary industrial project	6 crédits	85h
French II	3 crédits	
Communication in organisations with LV2	6 crédits	
Political sciences semestre 2	3 crédits	

4th YEAR GM – SYSTEM ENGINEERING COURSES_SEMESTER 8

Liste d'éléments pédagogiques

Systems Engineering processes	5 crédits	77h
Mechatronic project	4 crédits	
Quality, security, environment and sports	4 crédits	61h
Dynamics of structures and control	4 crédits	22h
Object-Oriented and Real-Time Programming	3 crédits	50h
Research Initiating Project	4 crédits	
Communication in organisations with LV2	6 crédits	
French II	3 crédits	
Political sciences semestre 2	3 crédits	

CHALLENGE BASED LEARNING _SEMESTER 2

Liste d'éléments pédagogiques

[FRANCAIS] Challenge – Formation ECIU	1 crédits	
[FRANCAIS] Challenge –	2 crédits	

[FRANCAIS] Challenge – Formation ECIU	3 crédits	
[FRANCAIS] Challenge – Formation ECIU	4 crédits	
[FRANCAIS] Challenge – Formation ECIU	5 crédits	

APPRENTICESHIP 4th YEAR MECHANICAL ENGINEERING

SEMESTER 7_GM APPRENTICESHIP

Liste d'éléments pédagogiques

Engineering 1	4 crédits	80h
[FRANCAIS] Transmission mécanique	6 crédits	140h
Innovation and Mechatronics	4 crédits	44h
Conduct a meeting	4 crédits	60h
Apprenticeship 5	6 crédits	
Apprenticeship 6	6 crédits	10h

SEMESTER 8_GM APPRENTICESHIP

Liste d'éléments pédagogiques

Fluids Mechanics and Heat transfert 2	6 crédits	78h
Mechanical Vibrations	5 crédits	48h
Hydraulic machines and Combustion Engineering	3 crédits	50h
Improve your management abilities	4 crédits	44h
Apprenticeship 7	6 crédits	2h
Apprenticeship 8	6 crédits	15h

CONTINUING EDUCATION_CT1 MECHANICAL ENGINEERING

SEMESTER T1GM_SEMESTER 7

Liste d'éléments pédagogiques

Design of structures	7 crédits	79h
Manufacture	6 crédits	64h
Power transmission case study	9 crédits	107h
Improving one's autonomy and building one's own professional project level 2 S7	4 crédits	46h
[FRANCAIS] Formation Continue Tutorat Spécifique GM S1 CT1		
Métallurgie transfert thermique		
Improve your management abilities	4 crédits	45h

SEMESTER T1 GM_SEMESTER 8

4th YEAR GM – MECHANICAL ENGINEERING
COURSES_SEMESTER 8

Liste d'éléments pédagogiques

Advanced heat transferts and fluid flow	5 crédits	
Materials, vibrations and advanced mechanical modeling	7 crédits	100h
Research projects and sports	6 crédits	2h
Multidisciplinary industrial project	6 crédits	85h
French II	3 crédits	
Communication in organisations with LV2	6 crédits	
Political sciences semestre 2	3 crédits	

Liste d'éléments pédagogiques

Advanced heat transferts and fluid flow	5 crédits	
Materials, vibrations and advanced mechanical modeling	7 crédits	100h
Multidisciplinary industrial project	6 crédits	85h
Research projects and sports	6 crédits	2h
Tutorat Spécifique GM S2 CT1		

FIFTH YEAR – GM

5th YEAR MECHANICAL ENGINEERING

SEMESTER 9_5th YEAR GM

5th YEAR GM INSA _SEMESTER 9

5th YEAR GM -MECHANICAL ENGINEERING
COURSES_SEMESTER 9

Liste d'éléments pédagogiques

System level modelling and simulation	3 crédits	29h
Composite structures and case study	3 crédits	46h
Heat Engines, Refrigerators and Heat Pumps	3 crédits	38h
Non destructive testing – English	4 crédits	20h
Research project part II	4 crédits	7h
Optional modulus	7 crédits	30h
Human relations	6 crédits	78h

5th YEAR GM – SYSTEM ENGINEERING
COURSES_SEMESTER 9

Liste d'éléments pédagogiques

Multidisciplinary design	4 crédits	45h
Management of risks	5 crédits	68h
Industrialization	5 crédits	
Systems on chip	4 crédits	47h

Thermal engines and systems	4 crédits	56h
[FRANCAIS] Projet de recherche et propriété industrielle	6 crédits	74h
Human relations	6 crédits	78h

[FRANCAIS] 5A GM
ORIENTATION IM – MASTER 2
RECHERCHE DET S9

Liste d'éléments pédagogiques

[FRANCAIS] MASTER 2 GENIE MECANIQUE

[FRANCAIS] MASTER 2 ENERGIE	9 crédits	

5th YEAR THEME ENERGY

OPTION THEME ENERGY
_SEMESTER 9

Liste d'éléments pédagogiques

Energy production from renewable resources	5 crédits	32h
Technologies and architectures for the conversion and storage of electrical energy	5 crédits	47h
Innovative materials for the energy	5 crédits	15h

Liste d'éléments pédagogiques

Combination of multi-sources of energy platform	9 crédits	161h
The different generation technologies and energy management	5 crédits	7h
Human relations	6 crédits	78h

5th YEAR THEME RISK ENGINEERING

Liste d'éléments pédagogiques

Qualitative Approach	4 crédits	45h
Quantitative Approach	5 crédits	45h
Designing for safety	5 crédits	42h
Process Safety	5 crédits	45h
Functional Safety		
[FRANCAIS] Structural Safety		
Human relations	6 crédits	78h
Toxic risks	5 crédits	42h

CHALLENGE BASED LEARNING
_SEMESTER 2

Liste d'éléments pédagogiques

[FRANCAIS] Challenge – Formation ECIU	1 crédits	
[FRANCAIS] Challenge – Formation ECIU	2 crédits	
[FRANCAIS] Challenge –	3 crédits	

[FRANCAIS] Challenge – Formation ECIU	4 crédits	
[FRANCAIS] Challenge – Formation ECIU	5 crédits	

SEMESTER 10_5th YEAR GM

Liste d'éléments pédagogiques

Training period 5th year	21 crédits	
Training period 4th year	9 crédits	

APPRENTICESHIP 5th YEAR MECHANICAL ENGINEERING

SEMESTER 9 _GM
APPRENTICESHIP

5th YEAR GM
INSA_APPENTICESHIPS
SEMESTER 9

5th YEAR GM
APPENTICESHIPS_SEMESTER 9

Liste d'éléments pédagogiques

[FRANCAIS] Relations Humaines et Professionnelles, éthique	6 crédits	
Industrialization	3 crédits	
Industrial training	4 crédits	10h
System level modelling and simulation	3 crédits	29h
Composite structures and case study	3 crédits	46h
Heat Engines, Refrigerators and Heat Pumps	3 crédits	38h
Optional modulus	7 crédits	30h
Non destructive testing – English	4 crédits	20h
Human relations	6 crédits	78h

SEMESTER 10 _GM
APPRENTICESHIP

Liste d'éléments pédagogiques

[FRANCAIS] Stage en entreprise	30 crédits	

CONTINUING EDUCATION_CT2 MECHANICAL ENGINEERING

Liste d'éléments pédagogiques

Non destructive testing – English	4 crédits	20h
Composite structures and case study	3 crédits	46h
Research project part II	4 crédits	7h
System level modelling and simulation	3 crédits	29h
Heat Engines, Refrigerators and Heat Pumps	3 crédits	38h
Optional modulus	7 crédits	30h

Human relations	6 crédits	78h
Training period 5th year	21 crédits	
Training period 4th year	9 crédits	
Modules pluridisciplinaire FC GM		

Improve your management abilities

ECTS
4 crédits

Hourly volume
45h

Management I3CCGE51

Introducing

Objectives

At the end of this module, the student will

¿ Know the legal environment and responsibilities of a business
activity
¿ Be able to objectively assess the financial health of a company and evaluate the rentability of an investment
¿ Realize a market diagnosis (benchmarking) and a business diagnosis in order to make decisions and set goals and strategies
¿ Collect the market data and put in action a business plan adapted to the means and goals of the company
Module L 2
The objectives, defined in reference to the CEFRL for the 5 language activities, are specific for the language studied Chinese, German, Spanish ¿ and the level of the student.

They can be consulted on :

https://moodle.insa-toulouse.fr/course/view.php?id=44

In certain cases, students may be authorised to follow an English module instead of another language

Necessary prerequisites

Practical info

Location(s)

Toulouse

INSA INSTITUT NATIONAL DES SCIENCES APPLIQUÉES TOULOUSE

Toulouse School of Management

Practical info

Location(s)

Toulouse

Multiphysics modeling

ECTS
6 crédits

Hourly volume

Location(s)

Toulouse

Introducing

Objectives

At the end of this module, the student will have understood and be able to explain (main concepts):
- Lumped (0D/1D) and distributed (3D) parameters models for Multiphysic systems.
- Network approach for lumped parameters models, Acausal/causal concepts, bond graph, Finite Element Methods.

The student will be able to:
- Set up 0D/1D (electrical, mechanical, hydraulical, thermal) and 3D models (mechanical) for mechatronics systems.
- Use 0D/1D platforms such as : Dymola/Modeilca, AMESim, Simulink.
- Use 3D platforms such as : Patran/Nastran or Abaqus

Necessary prerequisites

Kirchhoff laws, electrocinetic, work/energy/power, pressure and hydrostatic, conduction/convection, heat transfer.
Strength of material for BSME.

Practical info

Modelling tools and Optimization

ECTS
5 crédits

Hourly volume

Introducing

Objectives

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

- Various approaches to analyze and evaluate the performances of discrete event system DES,
- Various types of modelling adapted to the problems considered (deterministic or stochastic models , numerical and combinatorics optimization models, models of concurrency)
- Algorithms available to solve these problems.

The student will be able to:

Model and solve operational research problems (optimisation, linear programming, graphs, stochastic process) and discrete-event systems problems.

Model stochastic systems, such as a network of queues , using Markov chains. Compute their stationary performance measures, and dimension their capacity.

Model a DES by Petri net, analyse the properties of the Petri net by various methods of analysis (exhaustive and structural)

Necessary prerequisites

Linear Algebra, Differential Calculus, Probabilities, Dynamic systems, Basic concepts in propositional logics and in Petri Nets.

Practical info

Location(s)

Toulouse

Architectures or technological systems

ECTS
7 crédits

Hourly volume
93h

Introducing

Objectives

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

Power transmissions
-Needs for power, associated functions, power architectures in technological systems (mechanic, hydraulic, electric)
-The interest of system modeling, methods and tools,

Computer science & Electronics
- the interest to have a common modeling graphical language, the concepts relative to a object oriented approach.
- Industrial network introduction, interface eelctronics

The student will be able to:
Power transmissions
- identify and structure the power needs (supply, meter, distribute, transform, condition, manage, etc)
- analyse a schematic of a power system (mechanical, hydraulic, electric) at an architectural and functional level
- assess/list/compare solutions for implementing a given function of power transmission
- synthesize a power architecture (mechanical, electrical, electric) from functional needs

Computer science & Electronics
- how to choose the most appropriate diagrams depending on the approach: structure, behaviour, interaction
- Propose an object-oriented UML model of a system
- Implement a technological solution on a mechatronic system

Necessary prerequisites

Basic technological knowledge in mechanics, hydraulics, electrics

Practical info

Location(s)

Toulouse

Automatic control

ECTS
4 crédits

Hourly volume

Introducing

Objectives

For GM students, this course is a practical extension of the continuous marking methods seen in the previous year.
Optional part for AE: Understand the basic principles and constraints of hardware in the loop (HIL) simulations.

All students follow the end of the UF which deals with numerical control techniques and methods.

The student will be expected to be able to:
- Model a discrete system or discretize a continuous system.
- Give the performance of a discrete system.
- Synthesize a discrete control following a specification (performance) and implement it.

Necessary prerequisites

- AE-SE :
Feedback systems (I2MAAU11)
Control and computer architecture (I3MAAU11)
Control of Linear Time Invariant Systems (I3MAAU21)

- GM-IS :
Dynamic Systems (I3ICDM11)

Practical info

Location(s)

Toulouse

Improving one's autonomy and building one's own professional project level 2 S7

ECTS
4 crédits

Hourly volume
46h

Introducing

Objectives

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

Physical and Sports Activities
The student will be able to:
to list the problems to be solved:
¿ Know the Physical and Sports Activity (rules, meaning, roles, etc.),
¿ Design the objective of the project.
to organize:
¿ Know the constraints, the resources, and the means available,
¿ Know how to choose and plan actions over time,
¿ Know how to get involved in the group and the project: know how to adapt, dare to stimulate action, know how to give up, propose, etc.
to regulate:
¿ Know how to observe,
¿ Know how to carry out a balance sheet,
¿ Know how to readjust the choices if necessary.

Individualized Professional Project
The student should be able to:
¿ Develop your professional vision and define a strategy.
¿ Customize, present and compare your project to professionals
¿ Enrich your professional network
¿ Set development axes, objectives and action plans

Necessary prerequisites

Learning outcomes 1st, 2nd, 3rd year.

Practical info

Location(s)

Toulouse

Communication in organisations with LV2

ECTS
6 crédits

Hourly volume

Introducing

Objectives

Objectives:
At the end of this module, the student will have understood and be able to explain (main concepts):

-How to answer the demand of the civil society for technical and scientific information
-How to carry out critical analysis in order to give appropriate answers when questioned about such issues
-How to consider the circulation and content of information within the organizations in which they will be hired

The classes given in English will focus on the specific linguistic characteristics of the English used in scientific contexts in order for the students to understand and master them.
The students will also be made aware of the specificities of scientific English as relates to publications in his specific field of research.

Module L 2
The objectives, defined in reference to the CEFRL for the 5 language activities, are specific for the language studied ¿ Chinese, German, Spanish ¿ and the level of the student.
They can be consulted on :
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In certain cases, students may be authorised to follow an English module instead of another language

Necessary prerequisites

Necessary knowledge:
For classes in English : understanding of scientific English

Practical info

Location(s)

Toulouse

FLE Summer school

ECTS
5 crédits

Hourly volume
104h

Practical info

Location(s)

Toulouse

French I

ECTS
3 crédits

Hourly volume

Practical info

Location(s)

Toulouse

Improve your management abilities

ECTS
4 crédits

Hourly volume
45h

Management I3CCGE51

Introducing

Objectives

At the end of this module, the student will

¿ Know the legal environment and responsibilities of a business
activity
¿ Be able to objectively assess the financial health of a company and evaluate the rentability of an investment
¿ Realize a market diagnosis (benchmarking) and a business diagnosis in order to make decisions and set goals and strategies
¿ Collect the market data and put in action a business plan adapted to the means and goals of the company
Module L 2
The objectives, defined in reference to the CEFRL for the 5 language activities, are specific for the language studied Chinese, German, Spanish ¿ and the level of the student.

They can be consulted on :

https://moodle.insa-toulouse.fr/course/view.php?id=44

In certain cases, students may be authorised to follow an English module instead of another language

Necessary prerequisites

Practical info

Location(s)

Toulouse

Political sciences semester 1

ECTS
3 crédits

Hourly volume

Practical info

Location(s)

Toulouse

Improve your management abilities

ECTS
4 crédits

Hourly volume
45h

Management I3CCGE51

Introducing

Objectives

At the end of this module, the student will

¿ Know the legal environment and responsibilities of a business
activity
¿ Be able to objectively assess the financial health of a company and evaluate the rentability of an investment
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Module L 2
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In certain cases, students may be authorised to follow an English module instead of another language

Necessary prerequisites

Practical info

Location(s)

Toulouse

INSA INSTITUT NATIONAL DES SCIENCES APPLIQUÉES TOULOUSE

Toulouse School of Management

Practical info

Location(s)

Toulouse

Design of structures

ECTS
7 crédits

Hourly volume
79h

Introducing

Objectives

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

The student will be able to:
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 I4GMPJ21 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 I4GMPJ21.

Necessary prerequisites

Finite element module :
Computer aided design (CAD)
Finite element concepts.

Mechanics of vibrations module :
Basics in solid mechanics, strength of material, dynamic systems.

Practical info

Location(s)

Toulouse

Manufacture

ECTS
6 crédits

Hourly volume
64h

Introducing

Objectives

The student will be able to:

Classify groups of manufacturing processes and understand the relationship between process and mechanical properties

Define the influencing parameter on cutting material
Optimize a machining operation in HSM

Define a Production Management Approach

Design parts by casting / forge / folding

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

Necessary prerequisites

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

Practical info

Location(s)

Toulouse

Power transmission case study

ECTS
9 crédits

Hourly volume
107h

Introducing

Objectives

At the end of this module, the students 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.

Necessary prerequisites

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)

Practical info

Location(s)

Toulouse

FLE Summer school

ECTS
5 crédits

Hourly volume
104h

Practical info

Location(s)

Toulouse

French I

ECTS
3 crédits

Hourly volume

Practical info

Location(s)

Toulouse

Improving one's autonomy and building one's own professional project level 2 S7

ECTS
4 crédits

Hourly volume
46h

Introducing

Objectives

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

Physical and Sports Activities
The student will be able to:
to list the problems to be solved:
¿ Know the Physical and Sports Activity (rules, meaning, roles, etc.),
¿ Design the objective of the project.
to organize:
¿ Know the constraints, the resources, and the means available,
¿ Know how to choose and plan actions over time,
¿ Know how to get involved in the group and the project: know how to adapt, dare to stimulate action, know how to give up, propose, etc.
to regulate:
¿ Know how to observe,
¿ Know how to carry out a balance sheet,
¿ Know how to readjust the choices if necessary.

Individualized Professional Project
The student should be able to:
¿ Develop your professional vision and define a strategy.
¿ Customize, present and compare your project to professionals
¿ Enrich your professional network
¿ Set development axes, objectives and action plans

Necessary prerequisites

Learning outcomes 1st, 2nd, 3rd year.

Practical info

Location(s)

Toulouse

Political sciences semester 1

ECTS
3 crédits

Hourly volume

Practical info

Location(s)

Toulouse

[FRANCAIS] Challenge – Formation ECIU

ECTS
1 crédits

Hourly volume

Practical info

Location(s)

Toulouse

[FRANCAIS] Challenge – Formation ECIU

ECTS
2 crédits

Hourly volume

Practical info

Location(s)

Toulouse

[FRANCAIS] Challenge – Formation ECIU

ECTS
3 crédits

Hourly volume

Practical info

Location(s)

Toulouse

[FRANCAIS] Challenge – Formation ECIU

ECTS
4 crédits

Hourly volume

Practical info

Location(s)

Toulouse

[FRANCAIS] Challenge – Formation ECIU

ECTS
5 crédits

Hourly volume

Practical info

Location(s)

Toulouse

Advanced heat transferts and fluid flow

ECTS
5 crédits

Hourly volume

Introducing

Objectives

At the end of this course, the student should have understood and will be able to explain the basics allowing to approach a phenomenon involving real (viscous) fluids. He will be able to tackle situations involving more or less complex heat and mass transfers.
The student will also be able to conduct a numerical simulation with Ansys Fluent code.

Necessary prerequisites

Inviscid fluid dynamics (I3ICFT01 ¿ Fluid Mechanics 1)

Introduction to heat transfer (I3ICFT01 ¿ heat Transfer 1)

Practical info

Location(s)

Toulouse

Materials, vibrations and advanced mechanical modeling

ECTS
7 crédits

Hourly volume
100h

Introducing

Objectives

the end of this module, the student will have understood and be able to explain how works a pre-stressed (or preloaded) mechanical system, basis of fracture mechanics and computations of vibrations and transient dynamics

The student will be able to identify mechanical systems that are preloaded, discuss with a specialist of fracture mechanics and carry out a simulation of vibrations and transient dynamics.

Necessary prerequisites

Basis on mechanical design, materials and vibrations

Practical info

Location(s)

Toulouse

Research projects and sports

ECTS
6 crédits

Hourly volume
2h

Introducing

Objectives

The module aims at giving the students a first experience with research through a tutored project in teams (2 to 4 students).

At the end of the module, the student will :
- know how to conduct a bibliography search, synthesise and cite it, for a given scientific topic;
- communicate with rigor in English, orally of through written documents to highlight the research activity performed;
- perform a simple research action in a team organization to generate scientific propositions, then implement and finally assess them

Necessary prerequisites

None

Practical info

Location(s)

Toulouse

Multidisciplinary industrial project

ECTS
6 crédits

Hourly volume
85h

Introducing

Objectives

At the end of this module, the student will have understood and be able to explain the main principles and definitions of quality management, the importance of health and safety at work, how to assess and prevent risks, eco-design and life-cycle analysis.

The student will be able to develop their capabilities in mechanical design in an industrial project.

Necessary prerequisites

Bacchelor in mechanical design

Practical info

Location(s)

Toulouse

French II

ECTS
3 crédits

Hourly volume

Practical info

Location(s)

Toulouse

Communication in organisations with LV2

ECTS
6 crédits

Hourly volume

Introducing

Objectives

Objectives:
At the end of this module, the student will have understood and be able to explain (main concepts):

-How to answer the demand of the civil society for technical and scientific information
-How to carry out critical analysis in order to give appropriate answers when questioned about such issues
-How to consider the circulation and content of information within the organizations in which they will be hired

The classes given in English will focus on the specific linguistic characteristics of the English used in scientific contexts in order for the students to understand and master them.
The students will also be made aware of the specificities of scientific English as relates to publications in his specific field of research.

Module L 2
The objectives, defined in reference to the CEFRL for the 5 language activities, are specific for the language studied ¿ Chinese, German, Spanish ¿ and the level of the student.
They can be consulted on :
https://moodle.insa-toulouse.fr/course/view.php?id=44

In certain cases, students may be authorised to follow an English module instead of another language

Necessary prerequisites

Necessary knowledge:
For classes in English : understanding of scientific English

Practical info

Location(s)

Toulouse

Political sciences semestre 2

ECTS
3 crédits

Hourly volume

Practical info

Location(s)

Toulouse

Systems Engineering processes

ECTS
5 crédits

Hourly volume
77h

Introducing

Objectives

At the end of this module, the student will have understood and be able to explain (main concepts):
What are the engineering processes to develop a system, how they must be implemented and managed in companies, what are the associated standards.

The student will be able to:
- define, capture, analyze and express the stakeholders
- needs
- transform the needs into requirements
- define several logical and physical solutions from the needs, evaluate them and choose one manage development processes

Practical info

Location(s)

Toulouse

Mechatronic project

ECTS
4 crédits

Hourly volume

Introducing

Objectives

At the end of this module, the student will have understood and be able to explain (main concepts):
- power and information channels of mechatronic systems
- the place of system simulation activities in the design cycle (V design cycle) of complex systems
- the principle of data acquisition with computers

The student will be able to:
- Establish models suitable for various engineering tasks during the design of mechatronic systems.
- Implement models in a system simulation environment and perform validation and verification tasks associated to the V design cycle.
- Specify and conduct model-in-the-loop and software-inthe-loop activities for a complex system.
- Design the different elements of a simple data acquisition system
- Implement a graphical programming language dedicated to the acquisition (LabVIEW)
- Perform a security analysis
- Perform a lifecycle analysis with a dedicated software

Necessary prerequisites

Basics of mechanics, electronics, heat transfer, and automation.

Basic of algorithmic

Practical info

Location(s)

Toulouse

Quality, security, environment and sports

ECTS
4 crédits

Hourly volume
61h

Introducing

Objectives

At the end of this module, the student will have understood and be able to explain the main principles and definitions of quality management, the importance of health and safety at work, how to assess and prevent risks, eco-design and life-cycle analysis.

The students will be able to develop their capabilities in eco design in a project related to mechatronics.

Sports:
The student will have to build a project with his team by:
- Taking into account everyone's skills,
- Seeking to enhance the strengths of each partner and compensate potential weaknesses.
- Analyzing the balance of power they will be confronted with.

Practical info

Location(s)

Toulouse

Dynamics of structures and control

ECTS
4 crédits

Hourly volume
22h

Introducing

Objectives

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

Vibrations of mechanical systems and structures.

Controlling the articulated systems and flexible structures.

The global and local modelling of electromagnetic actuators.

Necessary prerequisites

Basis in electromagnetism, solid mechanics and control

Practical info

Location(s)

Toulouse

Object-Oriented and Real-Time Programming

ECTS
3 crédits

Hourly volume
50h

Introducing

Objectives

This module consists of two parts:
- The part on real time systems introduces real time systems, key concepts, applications, constraints, and teaches the programming of these systems using the services of real time operating systems.
-At the end of the object programming part, students will be able to produce C++ code from a UML class diagram with relationships, inheritance and polymorphism.

Practical info

Location(s)

Toulouse

Research Initiating Project

ECTS
4 crédits

Hourly volume

Introducing

Objectives

The module aims at motivating students with research activities through a selection of tutored projects. Each project involves a team of 6 students tutored by a researcher or an industrial partner. Those projects also benefit from a preliminary training on documentary research techniques to facilit the writing of a state-of-theart review of the domain. A course to project management techniques is also provided to guide students during the realisation phase of the project.

At the end of this module, the student wil have a practical experience of the following activities :
- identify a bibliography on a given topic, and present it through a standard formulation (IEEE form).
- write a state-of-the-art synthesis.
- precise the perimeter of the realization phase.
- apply project management and collaborative work techniques.
- write a projectif report and prepare a presentation in english for its project defense.

Practical info

Location(s)

Toulouse

Communication in organisations with LV2

ECTS
6 crédits

Hourly volume

Introducing

Objectives

Objectives:
At the end of this module, the student will have understood and be able to explain (main concepts):

-How to answer the demand of the civil society for technical and scientific information
-How to carry out critical analysis in order to give appropriate answers when questioned about such issues
-How to consider the circulation and content of information within the organizations in which they will be hired

The classes given in English will focus on the specific linguistic characteristics of the English used in scientific contexts in order for the students to understand and master them.
The students will also be made aware of the specificities of scientific English as relates to publications in his specific field of research.

Module L 2
The objectives, defined in reference to the CEFRL for the 5 language activities, are specific for the language studied ¿ Chinese, German, Spanish ¿ and the level of the student.
They can be consulted on :
https://moodle.insa-toulouse.fr/course/view.php?id=44

In certain cases, students may be authorised to follow an English module instead of another language

Necessary prerequisites

Necessary knowledge:
For classes in English : understanding of scientific English

Practical info

Location(s)

Toulouse

French II

ECTS
3 crédits

Hourly volume

Practical info

Location(s)

Toulouse

Political sciences semestre 2

ECTS
3 crédits

Hourly volume

Practical info

Location(s)

Toulouse

[FRANCAIS] Challenge – Formation ECIU

ECTS
1 crédits

Hourly volume

Practical info

Location(s)

Toulouse

[FRANCAIS] Challenge – Formation ECIU

ECTS
2 crédits

Hourly volume

Practical info

Location(s)

Toulouse

[FRANCAIS] Challenge – Formation ECIU

ECTS
3 crédits

Hourly volume

Practical info

Location(s)

Toulouse

[FRANCAIS] Challenge – Formation ECIU

ECTS
4 crédits

Hourly volume

Practical info

Location(s)

Toulouse

[FRANCAIS] Challenge – Formation ECIU

ECTS
5 crédits

Hourly volume

Practical info

Location(s)

Toulouse

Engineering 1

ECTS
4 crédits

Hourly volume
80h

Practical info

Location(s)

Toulouse

[FRANCAIS] Transmission mécanique

ECTS
6 crédits

Hourly volume
140h

Introducing

Objectives

At the end of this module, the student will have understood and be able to explain (main concepts):
Electrical power transfer and transformation.

The student will be able to:
Calculate electrical powers (DC/AC), induction in magnetic network, Laplace force in electrical machines.

Necessary prerequisites

Practical info

Location(s)

Toulouse

Innovation and Mechatronics

ECTS
4 crédits

Hourly volume
44h

Toulouse

Introducing

Objectives

At the end of this module, the student will have understood and be able to explain (main concepts):
-the basic and the key benchmarks regarding industrial property
-the role of the industrial property in the research and development approach and the process of innovation
-the terminology, the basic notions of the patents law

The student will be able to:
-Identify the information contained in a patent
-Get acquainted in the searches for anteriority and in the use of databases patent (Espacenet)
-Build basic requests to verify the state of the technique
-Put into practice the use of the property industrial as strategic tool for an innovative company
-Make decisions concerning industrial property : legal elements, diversity of the strategic choices, financial stakes, partnership agreements, damages of the counterfeiting
-Develop a strategy of protection of an innovation

Practical info

Location(s)

Conduct a meeting

ECTS
4 crédits

Hourly volume
60h

Introducing

Objectives

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

ENGLISH (25 teaching hours)
The main characteristics of business English, and specialised English
The skills required to pass the TOEIC test

CONDUCT A MEETING (15 hours teaching hours)
At the end of this module, the student will have understood and be able to explain (main concepts):
- Different types of meetings.
- The role of the chairperson
- The different stages of a meeting
- How to put it all together
-The principles of the interpersonal communication.
- The golden rules of group participation
- Managing stress and emotions
- Written summaries, briefs and reports

The student will be able to:
ENGLISH
- Communicate with English speakers (written and spoken English) in a professional context
- Deal with professional issues in relations with their specialization (written and spoken English)
- Understand written and spoken documents in relation with business life (TOEIC)

CONDUCT A MEETING
- Chairing a meeting efficiently from a management position
- Defining objectives and adapting the approach
- Applying his/her knowledge and personal approach to highlight his/her savoir faire and savoir être.
- Adopting the role of chairperson whilst insuring group dynamics.
- Creating varied visual documents

Necessary prerequisites

ENGLISH: B1 level minimum

CONDUCT A MEETING: none

Practical info

Location(s)

Toulouse

Apprenticeship 5

ECTS
6 crédits

Hourly volume

Introducing

Objectives

The apprentice should be able to:
- integrate and adapt to the company's project
- get involved in the work (initiatives, deepening)
- solve open industrial problems
- learn on their own.

Practical info

Location(s)

Toulouse

Apprenticeship 6

ECTS
6 crédits

Hourly volume
10h

Introducing

Objectives

The apprentice should be able to
- define an innovative project for the company

Beyond the technical achievement, the apprentice must also be able to:
- define the characteristics of a project and the challenges of project management, deal with the management of deadlines, costs, quality, human resources, communication, risks and purchases, present the techniques for conducting meeting.
- Put into practice the use of industrial property as a strategic tool for an innovative company

Practical info

Location(s)

Toulouse

Fluids Mechanics and Heat transfert 2

ECTS
6 crédits

Hourly volume
78h

Practical info

Location(s)

Toulouse

Mechanical Vibrations

ECTS
5 crédits

Hourly volume
48h

Introducing

Objectives

At the end of this module, the student will have understood and be able to explain (main concepts):
- fundamentals of control engineering for linear systems in time and frequency domains

The student will be able to:
- by means of computer tools, design a controller that ensures a set of performance requirements for a given process

Practical info

Location(s)

Toulouse

Hydraulic machines and Combustion Engineering

ECTS
3 crédits

Hourly volume
50h

Practical info

Location(s)

Toulouse

Improve your management abilities

ECTS
4 crédits

Hourly volume
44h

Introducing

Objectives

ENGLISH
At the end of this module, the student will be able to:
* Understand and summarise technical documents in English (written and oral) linked to mechanical engineering
* Learn and apply technical vocabulary linked to mechanical engineering
* Present a technical subject in mechanical engineering

MARKETING, LAW, FINANCE
¿ Know the legal environment and responsibilities of a business activity
¿ Be able to objectively assess the financial health of a company and evaluate the rentability of an investment
¿ Conduct a market diagnosis (benchmarking) and a business diagnosis in order to make decisions and set goals and strategies
¿ Collect market data and put into action a business plan adapted to the means and goals of the company

Necessary prerequisites

ENGLISH: B1 level minimum

WORKING RELATIONS WITH ANGLO/AMERICANS: None

LAW: None

FINANCIAL MANAGEMENT: Studied the « accountancy and financial analysis course »

Practical info

Location(s)

Toulouse

Apprenticeship 7

ECTS
6 crédits

Hourly volume
2h

Introducing

Objectives

The apprentice should be able to
- get involved in the company's project
- solve open industrial problems
- plan and manage your work
- team working
- open up to other technological fields.

Practical info

Location(s)

Toulouse

Apprenticeship 8

ECTS
6 crédits

Hourly volume
15h

Introducing

Objectives

- Active skills ¿ Students work on a case study prepared by the teacher. (main aspects: service provider with a growing market, requiring a larger network of agencies to develop capital)
- work groups (teams of 2 or 3 members)
- Elaboration of an economical report to be shown and commented on in front of a share holders commitee
- Discussions with trainer during course
- Use of a business plan software

Practical info

Location(s)

Toulouse

Design of structures

ECTS
7 crédits

Hourly volume
79h

Introducing

Objectives

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

The student will be able to:
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 I4GMPJ21 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 I4GMPJ21.

Necessary prerequisites

Finite element module :
Computer aided design (CAD)
Finite element concepts.

Mechanics of vibrations module :
Basics in solid mechanics, strength of material, dynamic systems.

Practical info

Location(s)

Toulouse

Manufacture

ECTS
6 crédits

Hourly volume
64h

Introducing

Objectives

The student will be able to:

Classify groups of manufacturing processes and understand the relationship between process and mechanical properties

Define the influencing parameter on cutting material
Optimize a machining operation in HSM

Define a Production Management Approach

Design parts by casting / forge / folding

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

Necessary prerequisites

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

Practical info

Location(s)

Toulouse

Power transmission case study

ECTS
9 crédits

Hourly volume
107h

Introducing

Objectives

At the end of this module, the students 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.

Necessary prerequisites

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)

Practical info

Location(s)

Toulouse

Improving one's autonomy and building one's own professional project level 2 S7

ECTS
4 crédits

Hourly volume
46h

Introducing

Objectives

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

Physical and Sports Activities
The student will be able to:
to list the problems to be solved:
¿ Know the Physical and Sports Activity (rules, meaning, roles, etc.),
¿ Design the objective of the project.
to organize:
¿ Know the constraints, the resources, and the means available,
¿ Know how to choose and plan actions over time,
¿ Know how to get involved in the group and the project: know how to adapt, dare to stimulate action, know how to give up, propose, etc.
to regulate:
¿ Know how to observe,
¿ Know how to carry out a balance sheet,
¿ Know how to readjust the choices if necessary.

Individualized Professional Project
The student should be able to:
¿ Develop your professional vision and define a strategy.
¿ Customize, present and compare your project to professionals
¿ Enrich your professional network
¿ Set development axes, objectives and action plans

Necessary prerequisites

Learning outcomes 1st, 2nd, 3rd year.

Practical info

Location(s)

Toulouse

[FRANCAIS] Formation Continue Tutorat Spécifique GM S1 CT1

Practical info

Location(s)

Toulouse

INSA INSTITUT NATIONAL DES SCIENCES APPLIQUÉES TOULOUSE

Métallurgie transfert thermique

Practical info

Location(s)

Toulouse

Improve your management abilities

ECTS
4 crédits

Hourly volume
45h

Management I3CCGE51

Introducing

Objectives

At the end of this module, the student will

¿ Know the legal environment and responsibilities of a business
activity
¿ Be able to objectively assess the financial health of a company and evaluate the rentability of an investment
¿ Realize a market diagnosis (benchmarking) and a business diagnosis in order to make decisions and set goals and strategies
¿ Collect the market data and put in action a business plan adapted to the means and goals of the company
Module L 2
The objectives, defined in reference to the CEFRL for the 5 language activities, are specific for the language studied Chinese, German, Spanish ¿ and the level of the student.

They can be consulted on :

https://moodle.insa-toulouse.fr/course/view.php?id=44

In certain cases, students may be authorised to follow an English module instead of another language

Necessary prerequisites

Practical info

Location(s)

Toulouse

Advanced heat transferts and fluid flow

ECTS
5 crédits

Hourly volume

Introducing

Objectives

At the end of this course, the student should have understood and will be able to explain the basics allowing to approach a phenomenon involving real (viscous) fluids. He will be able to tackle situations involving more or less complex heat and mass transfers.
The student will also be able to conduct a numerical simulation with Ansys Fluent code.

Necessary prerequisites

Inviscid fluid dynamics (I3ICFT01 ¿ Fluid Mechanics 1)

Introduction to heat transfer (I3ICFT01 ¿ heat Transfer 1)

Practical info

Location(s)

Toulouse

Materials, vibrations and advanced mechanical modeling

ECTS
7 crédits

Hourly volume
100h

Introducing

Objectives

the end of this module, the student will have understood and be able to explain how works a pre-stressed (or preloaded) mechanical system, basis of fracture mechanics and computations of vibrations and transient dynamics

The student will be able to identify mechanical systems that are preloaded, discuss with a specialist of fracture mechanics and carry out a simulation of vibrations and transient dynamics.

Necessary prerequisites

Basis on mechanical design, materials and vibrations

Practical info

Location(s)

Toulouse

Research projects and sports

ECTS
6 crédits

Hourly volume
2h

Introducing

Objectives

The module aims at giving the students a first experience with research through a tutored project in teams (2 to 4 students).

At the end of the module, the student will :
- know how to conduct a bibliography search, synthesise and cite it, for a given scientific topic;
- communicate with rigor in English, orally of through written documents to highlight the research activity performed;
- perform a simple research action in a team organization to generate scientific propositions, then implement and finally assess them

Necessary prerequisites

None

Practical info

Location(s)

Toulouse

Multidisciplinary industrial project

ECTS
6 crédits

Hourly volume
85h

Introducing

Objectives

At the end of this module, the student will have understood and be able to explain the main principles and definitions of quality management, the importance of health and safety at work, how to assess and prevent risks, eco-design and life-cycle analysis.

The student will be able to develop their capabilities in mechanical design in an industrial project.

Necessary prerequisites

Bacchelor in mechanical design

Practical info

Location(s)

Toulouse

French II

ECTS
3 crédits

Hourly volume

Practical info

Location(s)

Toulouse

Communication in organisations with LV2

ECTS
6 crédits

Hourly volume

Introducing

Objectives

Objectives:
At the end of this module, the student will have understood and be able to explain (main concepts):

-How to answer the demand of the civil society for technical and scientific information
-How to carry out critical analysis in order to give appropriate answers when questioned about such issues
-How to consider the circulation and content of information within the organizations in which they will be hired

The classes given in English will focus on the specific linguistic characteristics of the English used in scientific contexts in order for the students to understand and master them.
The students will also be made aware of the specificities of scientific English as relates to publications in his specific field of research.

Module L 2
The objectives, defined in reference to the CEFRL for the 5 language activities, are specific for the language studied ¿ Chinese, German, Spanish ¿ and the level of the student.
They can be consulted on :
https://moodle.insa-toulouse.fr/course/view.php?id=44

In certain cases, students may be authorised to follow an English module instead of another language

Necessary prerequisites

Necessary knowledge:
For classes in English : understanding of scientific English

Practical info

Location(s)

Toulouse

Political sciences semestre 2

ECTS
3 crédits

Hourly volume

Practical info

Location(s)

Toulouse

Advanced heat transferts and fluid flow

ECTS
5 crédits

Hourly volume

Introducing

Objectives

At the end of this course, the student should have understood and will be able to explain the basics allowing to approach a phenomenon involving real (viscous) fluids. He will be able to tackle situations involving more or less complex heat and mass transfers.
The student will also be able to conduct a numerical simulation with Ansys Fluent code.

Necessary prerequisites

Inviscid fluid dynamics (I3ICFT01 ¿ Fluid Mechanics 1)

Introduction to heat transfer (I3ICFT01 ¿ heat Transfer 1)

Practical info

Location(s)

Toulouse

Materials, vibrations and advanced mechanical modeling

ECTS
7 crédits

Hourly volume
100h

Introducing

Objectives

the end of this module, the student will have understood and be able to explain how works a pre-stressed (or preloaded) mechanical system, basis of fracture mechanics and computations of vibrations and transient dynamics

The student will be able to identify mechanical systems that are preloaded, discuss with a specialist of fracture mechanics and carry out a simulation of vibrations and transient dynamics.

Necessary prerequisites

Basis on mechanical design, materials and vibrations

Practical info

Location(s)

Toulouse

Multidisciplinary industrial project

ECTS
6 crédits

Hourly volume
85h

Introducing

Objectives

At the end of this module, the student will have understood and be able to explain the main principles and definitions of quality management, the importance of health and safety at work, how to assess and prevent risks, eco-design and life-cycle analysis.

The student will be able to develop their capabilities in mechanical design in an industrial project.

Necessary prerequisites

Bacchelor in mechanical design

Practical info

Location(s)

Toulouse

Research projects and sports

ECTS
6 crédits

Hourly volume
2h

Introducing

Objectives

The module aims at giving the students a first experience with research through a tutored project in teams (2 to 4 students).

At the end of the module, the student will :
- know how to conduct a bibliography search, synthesise and cite it, for a given scientific topic;
- communicate with rigor in English, orally of through written documents to highlight the research activity performed;
- perform a simple research action in a team organization to generate scientific propositions, then implement and finally assess them

Necessary prerequisites

None

Practical info

Location(s)

Toulouse

INSA INSTITUT NATIONAL DES SCIENCES APPLIQUÉES TOULOUSE

Tutorat Spécifique GM S2 CT1

Practical info

Location(s)

Toulouse

System level modelling and simulation

ECTS
3 crédits

Hourly volume
29h

Introducing

Objectives

The student will be able to model, simulate and analyse multi-domain power systems

Necessary prerequisites

Dynamic systems, fluid mechanics, solid rigid mechanics.

Practical info

Location(s)

Toulouse

Composite structures and case study

ECTS
3 crédits

Hourly volume
46h

Introducing

Objectives

The student will be able to perform simple sizing of composite structures and to choice a couple manufacturing/material for a given case study.

The student will be able to:
-Choice a couple of fibers and matrix and their commercial products.
-Choice a type of composite architecture: laminates, sandwichs, 2D1/2,3D, 4D.
-Determine the manufacturing method: hand layup, fiber placement, RTM, LRI, RFI.
-To be inspired by solutions of automotive, naval, wind energy or aerospace industry.
-To be inspired by past experience in aeronautic industry.
-Know and use laminate theory.
-Knows and use simple sizing of junctions.
-Know issues of impact and ageing.
-Know issues of failure and damage.
-Realize a case study: example wing box of an acrobatic aircraft
-Make a presentation of their sizing and their design.
-Work in a collaborative manner.

Necessary prerequisites

Beam theory, continuum mechanics, materials behaviors.

Matrix Calculation

Practical info

Location(s)

Toulouse

Heat Engines, Refrigerators and Heat Pumps

ECTS
3 crédits

Hourly volume
38h

Introducing

Objectives

At the end of this course, the student should have understood and will be able to explain the operation of conventional heat engines, refrigerators and heat pumps as well as the basics of combustion

The student should be able to size and optimize conventional heat engines, refrigerators and heat pumps

Necessary prerequisites

Fundamentals in thermodynamics (1st year)
Thermodynamics and Thermodynamic Analysis (1st year)

Practical info

Location(s)

Toulouse

Non destructive testing – English

ECTS
4 crédits

Hourly volume
20h

Introducing

Objectives

Module 1 : Non Destructive testing (NDT)
Students have to know the main nondestructive testing methods with advantages/drawbacks and how to apply them to practical industrial cases. They must be able to choose the most appropriate method to solve specific industrial issues.

Module 2 : Metallic alloys for high temperature applications ¿ Creep behaviour
Analysis of the physics occurring during creep and of the parameters which affect creep resistance.
How to apply basic theoretical models to calculate rupture life expectancy.
Knowledge of the main metallic alloys withstanding creep at high temperatures.

Module 3 : English
Students must be able to organize their scientific speech and writing logically, to use proper English in a concise and appropriate style while meeting genre conventions; master technical terms; resort to appropriate registers (specialized/non specialized audiences/readers) and quote scientific sources according to international citation standards.

Necessary prerequisites

Module 1: Nondestructive testing (NDT)
L1, 2 and 3 courses or equivalent: knowledge of fundamental principles in physics i.e. electricity, electromagnetism, optics, atomic structure and Materials Science.

Module 2 : Metallic alloys for high temperature applications ¿ Creep behaviour
Mechanics of Materials: defects in metallic materials and plastic deformation mechanisms; behaviour of materials

Module 3 : English
Students must master general English and know how to write and talk about general scientific elements in a rigorous way (1st, 2nd, 3rd & 4th year English courses).

Practical info

Location(s)

Toulouse

Research project part II

ECTS
4 crédits

Hourly volume
7h

Introducing

Objectives

The module is aimed at motivating students with research activities by means of a tutored projects involving groups of several students and directed by an academic or an industrial tutor.

At the end of this module, the student will have understood and be able to explain (main concepts):
- the concepts and techniques in relationship with the management of the research project involving several persons.

The student will be able to:
- finalize a research project involving several persons,
- integrate scientific approaches and techniques of different scientific domains to meet the realization goals of the research project

Necessary prerequisites

A final report

Location(s)

Toulouse

Practical info

Optional modulus

ECTS
7 crédits

Hourly volume
30h

Introducing

Objectives

The student will be able to successfully follow 3 optional modules related to mechanical design skills

Practical info

Location(s)

Toulouse

Human relations

ECTS
6 crédits

Hourly volume
78h

Introducing

Location(s)

Toulouse

Objectives

L'étudiant devra être capable de :
-Analyser des situations de groupe avec des concepts issus de la psychologie sociale
-Identifier les dimensions éthiques de ces situations et prendre position
-Repérer et comprendre des informations liées aux RH
-Analyser une situation de management d¿équipe en référence à un cadre théorique
-Formuler et argumenter des solutions managériales
-Agir dans un milieu naturel : analyser, décider, agir ; mettre en œuvre la sécurité, utiliser du matériel spécifique. découvrir un site.
-Respecter et s'intégrer dans un environnement différent de ses habitudes
-S'engager avec cohérence dans le projet d'activités
-Prendre part activement au collectif
-Valider son projet professionnel et construire une stratégie pour trouver un emploi

Necessary prerequisites

None

Practical info

Multidisciplinary design

ECTS
4 crédits

Hourly volume
45h

Introducing

Objectives

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

Design of experiments
-To know the global concepts of DoE and understand the interest of the tool.

Surrogate models and sizing of mechatronic systems
-To explain the process and the different models usefull for the optimal sizing of mechatronic systems

The student will be able to:
Design of experiments
-To be able to define and set into work some tests allowing to get an optimistic process.
-To carry out one's own design of experiments.

Surrogate models and sizing of mechatronic systems
-To define the sizing scenarios of a technical system
-To establish the estimation models and simulation modes of the set of components
-To set a design procedure and to define the optimization problem
-To Implement the calculations in a numerical environment

Necessary prerequisites

Probability (basic), statistics (basic), notions of system architecture (mechanical, hydraulic, electric, etc.)

Practical info

Location(s)

Toulouse

Management of risks

ECTS
5 crédits

Hourly volume
68h

Introducing

Objectives

At the end of this module, the student will have understood and be able to explain the notions associated with dependability, reliability, maintenance and risk, as well as the organizations, trades, methods and activities useful to implement these notions.

The student will be able
- to identify the hindrances to the availability and to the reliability of systems,
- to make an assessment for choosing the most suitable architectures,
- to choose among the available methods the most appropriate to obtain the expected service of a system, when designing and maintaining, and to provide its insurance.

Location(s)

Toulouse

Necessary prerequisites

System life cycle.
Basic knowledge on probabilities.
Statistics.
Signal processing.

Practical info

Industrialization

ECTS
5 crédits

Hourly volume

Introducing

Objectives

At the end of this module, the student will have understood and be able to explain (main concepts):
The systems of industrialization and its interfaces. The challenges of production management (PM) and supply chain (SCM) as well as issues of scheduling.

What is configuration management, what are the enablers and what is the purpose

The student will be able to:
- Have an overview on manufacturing processes
- Understand the historical context of Industrialization
- Have a critical view on global manufacturing strategy
- Understand the elements on Smart Manufacturing and Industry 4.0
- Use the information of the different types of Industrial Management Tools
- Roughly describe airbus world (A/Cs family, industrial sharing across the Europe)
- Define a hierarchical & appropriated breakdown of a complex product
- Apply the change process and identify required data to allow decision
- Identify mechanisms that enable management of product offer and its customisation
- Demonstrate that final product manufactured is conform to expectations

Necessary prerequisites

Not applicable (no pre-requisit needed)
Reading of plans, current metallic materials, various types of machining.
Basic elements on: probabilities -Linear programming -

Practical info

Location(s)

Toulouse

Systems on chip

ECTS
4 crédits

Hourly volume
47h

Practical info

Location(s)

Toulouse

Thermal engines and systems

ECTS
4 crédits

Hourly volume
56h

Introducing

Objectives

By the end of this module, the student should have understood and be able to analyze thermal and mechanical energy production systems and their associated components.

The student should be able to:
- Analyze the thermodynamic cycle associated with a power plant.
- Size a thermal engine to meet specifications in terms of requested power.
- Specify the components of a thermal engine or system.
- Calculate the air conditioning flow requirements to perform various functions (pressurization, fresh air renewal, heating, cooling) in an aircraft and adjust the recirculation and the flow distribution between the different cabin zones.

Necessary prerequisites

Basics of thermodynamics and heat transfer.

Location(s)

Toulouse

Practical info

[FRANCAIS] Projet de recherche et propriété industrielle

ECTS
6 crédits

Hourly volume
74h

Practical info

Location(s)

Toulouse

Human relations

ECTS
6 crédits

Hourly volume
78h

Introducing

Location(s)

Toulouse

Objectives

L'étudiant devra être capable de :
-Analyser des situations de groupe avec des concepts issus de la psychologie sociale
-Identifier les dimensions éthiques de ces situations et prendre position
-Repérer et comprendre des informations liées aux RH
-Analyser une situation de management d¿équipe en référence à un cadre théorique
-Formuler et argumenter des solutions managériales
-Agir dans un milieu naturel : analyser, décider, agir ; mettre en œuvre la sécurité, utiliser du matériel spécifique. découvrir un site.
-Respecter et s'intégrer dans un environnement différent de ses habitudes
-S'engager avec cohérence dans le projet d'activités
-Prendre part activement au collectif
-Valider son projet professionnel et construire une stratégie pour trouver un emploi

Necessary prerequisites

None

Practical info

INSA INSTITUT NATIONAL DES SCIENCES APPLIQUÉES TOULOUSE

[FRANCAIS] MASTER 2 GENIE MECANIQUE

Practical info

Location(s)

Toulouse

[FRANCAIS] MASTER 2 ENERGIE

ECTS
9 crédits

Hourly volume

Practical info

Location(s)

Toulouse

Energy production from renewable resources

ECTS
5 crédits

Hourly volume
32h

Practical info

Location(s)

Toulouse

Technologies and architectures for the conversion and storage of electrical energy

ECTS
5 crédits

Hourly volume
47h

Practical info

Location(s)

Toulouse

Innovative materials for the energy

ECTS
5 crédits

Hourly volume
15h

Practical info

Location(s)

Toulouse

Combination of multi-sources of energy platform

ECTS
9 crédits

Hourly volume
161h

Practical info

Location(s)

Toulouse

The different generation technologies and energy management

ECTS
5 crédits

Hourly volume
7h

Practical info

Location(s)

Toulouse

Human relations

ECTS
6 crédits

Hourly volume
78h

Introducing

Location(s)

Toulouse

Objectives

L'étudiant devra être capable de :
-Analyser des situations de groupe avec des concepts issus de la psychologie sociale
-Identifier les dimensions éthiques de ces situations et prendre position
-Repérer et comprendre des informations liées aux RH
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-Agir dans un milieu naturel : analyser, décider, agir ; mettre en œuvre la sécurité, utiliser du matériel spécifique. découvrir un site.
-Respecter et s'intégrer dans un environnement différent de ses habitudes
-S'engager avec cohérence dans le projet d'activités
-Prendre part activement au collectif
-Valider son projet professionnel et construire une stratégie pour trouver un emploi

Necessary prerequisites

None

Practical info

Qualitative Approach

ECTS
4 crédits

Hourly volume
45h

Practical info

Location(s)

Toulouse

Quantitative Approach

ECTS
5 crédits

Hourly volume
45h

Practical info

Location(s)

Toulouse

Designing for safety

ECTS
5 crédits

Hourly volume
42h

Practical info

Location(s)

Toulouse

Process Safety

ECTS
5 crédits

Hourly volume
45h

Practical info

Location(s)

Toulouse

INSA INSTITUT NATIONAL DES SCIENCES APPLIQUÉES TOULOUSE

Functional Safety

Practical info

Location(s)

Toulouse

[FRANCAIS] Structural Safety

Practical info

Location(s)

Toulouse

Human relations

ECTS
6 crédits

Hourly volume
78h

Introducing

Location(s)

Toulouse

Objectives

L'étudiant devra être capable de :
-Analyser des situations de groupe avec des concepts issus de la psychologie sociale
-Identifier les dimensions éthiques de ces situations et prendre position
-Repérer et comprendre des informations liées aux RH
-Analyser une situation de management d¿équipe en référence à un cadre théorique
-Formuler et argumenter des solutions managériales
-Agir dans un milieu naturel : analyser, décider, agir ; mettre en œuvre la sécurité, utiliser du matériel spécifique. découvrir un site.
-Respecter et s'intégrer dans un environnement différent de ses habitudes
-S'engager avec cohérence dans le projet d'activités
-Prendre part activement au collectif
-Valider son projet professionnel et construire une stratégie pour trouver un emploi

Necessary prerequisites

None

Practical info

Toxic risks

ECTS
5 crédits

Hourly volume
42h

Practical info

Location(s)

Toulouse

[FRANCAIS] Challenge – Formation ECIU

ECTS
1 crédits

Hourly volume

Practical info

Location(s)

Toulouse

[FRANCAIS] Challenge – Formation ECIU

ECTS
2 crédits

Hourly volume

Practical info

Location(s)

Toulouse

[FRANCAIS] Challenge – Formation ECIU

ECTS
3 crédits

Hourly volume

Practical info

Location(s)

Toulouse

[FRANCAIS] Challenge – Formation ECIU

ECTS
4 crédits

Hourly volume

Practical info

Location(s)

Toulouse

[FRANCAIS] Challenge – Formation ECIU

ECTS
5 crédits

Hourly volume

Practical info

Location(s)

Toulouse

INSA INSTITUT NATIONAL DES SCIENCES APPLIQUÉES TOULOUSE

Training period 5th year

ECTS
21 crédits

Hourly volume

Practical info

Location(s)

Toulouse

Training period 4th year

ECTS
9 crédits

Hourly volume

Practical info

Location(s)

Toulouse

[FRANCAIS] Relations Humaines et Professionnelles, éthique

ECTS
6 crédits

Hourly volume

Practical info

Location(s)

Toulouse

Industrialization

ECTS
3 crédits

Hourly volume

Practical info

Location(s)

Toulouse

Industrial training

ECTS
4 crédits

Hourly volume
10h

Introducing

Objectives

The apprentice will carry out his end-of-study project within his company or on international mobility.
The objective is to put into practice his knowledge and engineering skills in the professional environment.

Practical info

Location(s)

Toulouse

System level modelling and simulation

ECTS
3 crédits

Hourly volume
29h

Introducing

Objectives

The student will be able to model, simulate and analyse multi-domain power systems

Necessary prerequisites

Dynamic systems, fluid mechanics, solid rigid mechanics.

Practical info

Location(s)

Toulouse

Composite structures and case study

ECTS
3 crédits

Hourly volume
46h

Introducing

Objectives

The student will be able to perform simple sizing of composite structures and to choice a couple manufacturing/material for a given case study.

The student will be able to:
-Choice a couple of fibers and matrix and their commercial products.
-Choice a type of composite architecture: laminates, sandwichs, 2D1/2,3D, 4D.
-Determine the manufacturing method: hand layup, fiber placement, RTM, LRI, RFI.
-To be inspired by solutions of automotive, naval, wind energy or aerospace industry.
-To be inspired by past experience in aeronautic industry.
-Know and use laminate theory.
-Knows and use simple sizing of junctions.
-Know issues of impact and ageing.
-Know issues of failure and damage.
-Realize a case study: example wing box of an acrobatic aircraft
-Make a presentation of their sizing and their design.
-Work in a collaborative manner.

Necessary prerequisites

Beam theory, continuum mechanics, materials behaviors.

Matrix Calculation

Practical info

Location(s)

Toulouse

Heat Engines, Refrigerators and Heat Pumps

ECTS
3 crédits

Hourly volume
38h

Introducing

Objectives

At the end of this course, the student should have understood and will be able to explain the operation of conventional heat engines, refrigerators and heat pumps as well as the basics of combustion

The student should be able to size and optimize conventional heat engines, refrigerators and heat pumps

Necessary prerequisites

Fundamentals in thermodynamics (1st year)
Thermodynamics and Thermodynamic Analysis (1st year)

Practical info

Location(s)

Toulouse

Optional modulus

ECTS
7 crédits

Hourly volume
30h

Introducing

Objectives

The student will be able to successfully follow 3 optional modules related to mechanical design skills

Practical info

Location(s)

Toulouse

Non destructive testing – English

ECTS
4 crédits

Hourly volume
20h

Introducing

Objectives

Module 1 : Non Destructive testing (NDT)
Students have to know the main nondestructive testing methods with advantages/drawbacks and how to apply them to practical industrial cases. They must be able to choose the most appropriate method to solve specific industrial issues.

Module 2 : Metallic alloys for high temperature applications ¿ Creep behaviour
Analysis of the physics occurring during creep and of the parameters which affect creep resistance.
How to apply basic theoretical models to calculate rupture life expectancy.
Knowledge of the main metallic alloys withstanding creep at high temperatures.

Module 3 : English
Students must be able to organize their scientific speech and writing logically, to use proper English in a concise and appropriate style while meeting genre conventions; master technical terms; resort to appropriate registers (specialized/non specialized audiences/readers) and quote scientific sources according to international citation standards.

Necessary prerequisites

Module 1: Nondestructive testing (NDT)
L1, 2 and 3 courses or equivalent: knowledge of fundamental principles in physics i.e. electricity, electromagnetism, optics, atomic structure and Materials Science.

Module 2 : Metallic alloys for high temperature applications ¿ Creep behaviour
Mechanics of Materials: defects in metallic materials and plastic deformation mechanisms; behaviour of materials

Module 3 : English
Students must master general English and know how to write and talk about general scientific elements in a rigorous way (1st, 2nd, 3rd & 4th year English courses).

Practical info

Location(s)

Toulouse

Human relations

ECTS
6 crédits

Hourly volume
78h

Introducing

Location(s)

Toulouse

Objectives

L'étudiant devra être capable de :
-Analyser des situations de groupe avec des concepts issus de la psychologie sociale
-Identifier les dimensions éthiques de ces situations et prendre position
-Repérer et comprendre des informations liées aux RH
-Analyser une situation de management d¿équipe en référence à un cadre théorique
-Formuler et argumenter des solutions managériales
-Agir dans un milieu naturel : analyser, décider, agir ; mettre en œuvre la sécurité, utiliser du matériel spécifique. découvrir un site.
-Respecter et s'intégrer dans un environnement différent de ses habitudes
-S'engager avec cohérence dans le projet d'activités
-Prendre part activement au collectif
-Valider son projet professionnel et construire une stratégie pour trouver un emploi

Necessary prerequisites

None

Practical info

[FRANCAIS] Stage en entreprise

ECTS
30 crédits

Hourly volume

Practical info

Location(s)

Toulouse

Non destructive testing – English

ECTS
4 crédits

Hourly volume
20h

Introducing

Objectives

Module 1 : Non Destructive testing (NDT)
Students have to know the main nondestructive testing methods with advantages/drawbacks and how to apply them to practical industrial cases. They must be able to choose the most appropriate method to solve specific industrial issues.

Module 2 : Metallic alloys for high temperature applications ¿ Creep behaviour
Analysis of the physics occurring during creep and of the parameters which affect creep resistance.
How to apply basic theoretical models to calculate rupture life expectancy.
Knowledge of the main metallic alloys withstanding creep at high temperatures.

Module 3 : English
Students must be able to organize their scientific speech and writing logically, to use proper English in a concise and appropriate style while meeting genre conventions; master technical terms; resort to appropriate registers (specialized/non specialized audiences/readers) and quote scientific sources according to international citation standards.

Necessary prerequisites

Module 1: Nondestructive testing (NDT)
L1, 2 and 3 courses or equivalent: knowledge of fundamental principles in physics i.e. electricity, electromagnetism, optics, atomic structure and Materials Science.

Module 2 : Metallic alloys for high temperature applications ¿ Creep behaviour
Mechanics of Materials: defects in metallic materials and plastic deformation mechanisms; behaviour of materials

Module 3 : English
Students must master general English and know how to write and talk about general scientific elements in a rigorous way (1st, 2nd, 3rd & 4th year English courses).

Practical info

Location(s)

Toulouse

Composite structures and case study

ECTS
3 crédits

Hourly volume
46h

Introducing

Objectives

The student will be able to perform simple sizing of composite structures and to choice a couple manufacturing/material for a given case study.

The student will be able to:
-Choice a couple of fibers and matrix and their commercial products.
-Choice a type of composite architecture: laminates, sandwichs, 2D1/2,3D, 4D.
-Determine the manufacturing method: hand layup, fiber placement, RTM, LRI, RFI.
-To be inspired by solutions of automotive, naval, wind energy or aerospace industry.
-To be inspired by past experience in aeronautic industry.
-Know and use laminate theory.
-Knows and use simple sizing of junctions.
-Know issues of impact and ageing.
-Know issues of failure and damage.
-Realize a case study: example wing box of an acrobatic aircraft
-Make a presentation of their sizing and their design.
-Work in a collaborative manner.

Necessary prerequisites

Beam theory, continuum mechanics, materials behaviors.

Matrix Calculation

Practical info

Location(s)

Toulouse

Research project part II

ECTS
4 crédits

Hourly volume
7h

Introducing

Objectives

The module is aimed at motivating students with research activities by means of a tutored projects involving groups of several students and directed by an academic or an industrial tutor.

At the end of this module, the student will have understood and be able to explain (main concepts):
- the concepts and techniques in relationship with the management of the research project involving several persons.

The student will be able to:
- finalize a research project involving several persons,
- integrate scientific approaches and techniques of different scientific domains to meet the realization goals of the research project

Location(s)

Toulouse

Necessary prerequisites

A final report

Practical info

System level modelling and simulation

ECTS
3 crédits

Hourly volume
29h

Introducing

Objectives

The student will be able to model, simulate and analyse multi-domain power systems

Necessary prerequisites

Dynamic systems, fluid mechanics, solid rigid mechanics.

Practical info

Location(s)

Toulouse

Heat Engines, Refrigerators and Heat Pumps

ECTS
3 crédits

Hourly volume
38h

Introducing

Objectives

At the end of this course, the student should have understood and will be able to explain the operation of conventional heat engines, refrigerators and heat pumps as well as the basics of combustion

The student should be able to size and optimize conventional heat engines, refrigerators and heat pumps

Necessary prerequisites

Fundamentals in thermodynamics (1st year)
Thermodynamics and Thermodynamic Analysis (1st year)

Practical info

Location(s)

Toulouse

Optional modulus

ECTS
7 crédits

Hourly volume
30h

Introducing

Objectives

The student will be able to successfully follow 3 optional modules related to mechanical design skills

Practical info

Location(s)

Toulouse

Human relations

ECTS
6 crédits

Hourly volume
78h

Introducing

Location(s)

Toulouse

Objectives

L'étudiant devra être capable de :
-Analyser des situations de groupe avec des concepts issus de la psychologie sociale
-Identifier les dimensions éthiques de ces situations et prendre position
-Repérer et comprendre des informations liées aux RH
-Analyser une situation de management d¿équipe en référence à un cadre théorique
-Formuler et argumenter des solutions managériales
-Agir dans un milieu naturel : analyser, décider, agir ; mettre en œuvre la sécurité, utiliser du matériel spécifique. découvrir un site.
-Respecter et s'intégrer dans un environnement différent de ses habitudes
-S'engager avec cohérence dans le projet d'activités
-Prendre part activement au collectif
-Valider son projet professionnel et construire une stratégie pour trouver un emploi

Necessary prerequisites

None

Practical info

Training period 5th year

ECTS
21 crédits

Hourly volume

Practical info

Location(s)

Toulouse

Training period 4th year

ECTS
9 crédits

Hourly volume

Practical info

Location(s)

Toulouse

INSA INSTITUT NATIONAL DES SCIENCES APPLIQUÉES TOULOUSE

Modules pluridisciplinaire FC GM

Practical info

Location(s)

Toulouse