

SCIENCE, TECHNOLOGY, HEALTH

MASTER AUTOMATIC CONTROL AND ELECTRONICS

Engineering sciences



Targeted
level of
education
BAC+5



Duration
2 années



Component
INSTITUT
NATIONAL DES
SCIENCES
APPLIQUÉES
TOULOUSE

Introducing

Objectives

The Automatic control-Electronics engineering course focuses on the concepts, methods and techniques of automatic control and also develops the competences required to design the implementation of methods and techniques for real-time control and electronic circuit design. Two major topics are developed: automatic control systems, electronic and micro-electronic systems with their associated IT techniques. An important aspect of the specificity of A-E engineers and of the course itself is the demonstration of how the integration of the three disciplines, Automatic control, Electronics and Computer science makes it possible to meet the needs and demands of industry in the context of complex systems. It provides Cross-disciplinary competences: capacity to manage the economic, financial, human, organisational and technical aspects of a project in the sphere of activity of a generalist engineer for the: Design and Management of automatic systems: including the systems theory and the techniques of electronics: logic and analog circuits, electronics of power, optoelectronics, micro-electronics. Moreover, sound training in the basic computer techniques stressing Real-Time for control reinforces the ability to design and implement automatic systems.

Development of integrated automatic systems: today, whatever the sphere of activity, a large number of tasks require, in what is called a "systems approach", the integration of varied concepts and techniques. The piloting of simple or complex industrial systems passes in general by the knowledge of the process, the design of efficient control rules, the command of electronic tools and digital calculators, making it possible to manage and enable communication between the various components of the system. This requires a generalist engineering course at the crossroads of the three disciplines: automatic control, electronics and computer science.

Admissions

Access conditions

Baccalauréat or equivalent for admission into first year
Admission on record possible for years 2, 3 or 4

Target audience

Necessary prerequisites

Recommended prerequisites

Practical info

Location(s)

 Toulouse

Program

FOURTH YEAR – AE

4th YEAR – AUTOMATIC CONTROL AND ELECTRONICS

SEMESTER 7_4th YEAR AE

SEMESTER 7_4th YEAR AE INSA

SEMESTER 7_4th YEAR AE_THEME
IS

Liste d'éléments pédagogiques

Architectures or technological systems	7 crédits	93h
Multiphysics modeling	6 crédits	
Modelling tools and Optimization	5 crédits	
Automatic control	4 crédits	
Improving one's autonomy and building one's own professional project level 2 S7	4 crédits	46h
Improve your management abilities	4 crédits	45h
Toulouse School of Management		
Political sciences semester 1	3 crédits	

SEMESTER 7_4th YEAR AE_THEME
SE

Liste d'éléments pédagogiques

Device modeling and digital circuits architectures (reconfigurable computing)	5 crédits	55h
Analog electronic system architecture	4 crédits	54h
[FRANCAIS] Analyse des systèmes complexes	4 crédits	50h
Digital signal acquisition architectures and Computed controlled systems	4 crédits	60h
[FRANCAIS] Informatique matérielle	3 crédits	
QSE APS 4A GEI – 1	4 crédits	67h

Improve your management abilities	4 crédits	45h
Toulouse School of Management		
Machine Learning	2 crédits	
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

Liste d'éléments pédagogiques

French I 3 crédits

SEMESTER 8_4th YEAR AE

4th YEAR AE_SEMESTER 8

SEMESTER 8_4th YEAR
AE_THEME SE

OPTION CSH or IAE

Liste d'éléments pédagogiques

Improve your management abilities 4 crédits 45h

Toulouse School of Management

Liste d'éléments pédagogiques

Practical Work in Control 3 crédits 34h

Energy management for embedded systems 3 crédits

Discrete and Continuous Systems Optimisation 5 crédits

Research project 4 crédits

Computer science 5 crédits

Improving one's autonomy and building one's own professional project level 2 S 4 crédits 40h

Communication in organisations with LV2 6 crédits

Communication in organisations 6 crédits 42h

Political sciences semestre 2 3 crédits

SEMESTER 8_4th YEAR
AE_THEME IS

Liste d'éléments pédagogiques

Systems Engineering processes 5 crédits 77h

Object-Oriented and Real-Time Programming 3 crédits 50h

Dynamics of structures and control 4 crédits 22h

Mechatronic project 4 crédits

Research Initiating Project 4 crédits

Quality, security, environment and sports 4 crédits 61h

Communication in organisations with LV2 6 crédits

Communication in organisations 6 crédits 42h

Toulouse School of Management

Political sciences semestre 2 3 crédits

CHALLENGE BASED LEARNING
_SEMESTER 2

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

Liste d'éléments pédagogiques

French II	3 crédits
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FORMATION CONTINUE CT1 AUTOMATIC CONTROL AND ELECTRONICS

SEMESTER T1 AE

SEMESTER 7_4th YEAR AE_THEME
IS

Liste d'éléments pédagogiques

Architectures or technological systems	7 crédits	93h
Multiphysics modeling	6 crédits	

Modelling tools and Optimization	5 crédits	
Automatic control	4 crédits	
Improving one's autonomy and building one's own professional project level 2 S7	4 crédits	46h
Improve your management abilities	4 crédits	45h
Toulouse School of Management		
Political sciences semester 1	3 crédits	

SEMESTER 7_4th YEAR AE_THEME
SE

Liste d'éléments pédagogiques

Device modeling and digital circuits architectures (reconfigurable computing)	5 crédits	55h
Analog electronic system architecture	4 crédits	54h
[FRANCAIS] Analyse des systèmes complexes	4 crédits	50h
Digital signal acquisition architectures and Computed controlled systems	4 crédits	60h
[FRANCAIS] Informatique matérielle	3 crédits	
QSE APS 4A GEI – 1	4 crédits	67h
Improve your management abilities	4 crédits	45h
Toulouse School of Management		

Machine Learning 2 crédits

Political sciences semester 1 3 crédits

SEMESTER 8_4th YEAR
AE_THEME SE

OPTION CSH or IAE

Liste d'éléments pédagogiques

Improve your management abilities 4 crédits 45h

Toulouse School of Management

Liste d'éléments pédagogiques

Practical Work in Control 3 crédits 34h

Energy management for embedded systems 3 crédits

Discrete and Continuous Systems Optimisation 5 crédits

Research project 4 crédits

Computer science 5 crédits

Improving one's autonomy and building one's own professional project level 2 S 4 crédits 40h

Communication in organisations with LV2 6 crédits

Communication in organisations 6 crédits 42h

Political sciences semestre 2 3 crédits

SEMESTER 8_4th YEAR
AE_THEME IS

Liste d'éléments pédagogiques

Systems Engineering processes 5 crédits 77h

Object-Oriented and Real-Time Programming 3 crédits 50h

Dynamics of structures and control 4 crédits 22h

Mechatronic project 4 crédits

Research Initiating Project 4 crédits

Quality, security, environment and sports 4 crédits 61h

Communication in organisations with LV2 6 crédits

Communication in organisations 6 crédits 42h

Toulouse School of Management

Political sciences semestre 2 3 crédits

Liste d'éléments pédagogiques

Digital signal acquisition architectures and Computed controlled systems 4 crédits 60h

Analog electronic system architecture 4 crédits 54h

[FRANCAIS] Analyse des systèmes complexes 4 crédits 50h

QSE APS 4A GEI – 1 4 crédits 67h

Communication in organisations 6 crédits

with LV2

Communication in organisations	6 crédits	42h	Industrialization	5 crédits	
Object-Oriented and Real-Time Programming	3 crédits	50h	Systems on chip	4 crédits	47h
Device modeling and digital circuits architectures (reconfigurable computing)	5 crédits	55h	Thermal engines and systems	4 crédits	56h
Discrete and Continuous Systems Optimisation	5 crédits		[FRANCAIS] Projet de recherche et propriété industrielle	6 crédits	74h
Practical Work in Control	3 crédits	34h	Human relations	6 crédits	78h
Improving one's autonomy and building one's own professional project level 2 S7	4 crédits	46h			
Research project	4 crédits				
Energy management for embedded systems	3 crédits				

FIFTH YEAR – AE

5th YEAR – AUTOMATIC CONTROL AND ELECTRONICS

SEMESTER 9_5th YEAR AE

5th YEAR AE_SEMESTER 9 INSA

5th YEAR GM – SYSTEM ENGINEERING
COURSES_SEMESTER 9

Liste d'éléments pédagogiques

Multidisciplinary design	4 crédits	45h
Management of risks	5 crédits	68h

SEMESTER 9_5th YEAR AE_THEME ESPE

Liste d'éléments pédagogiques

[FRANCAIS] Architecture électronique pour l'énergie	5 crédits	66h
Embedded software and command for energy	4 crédits	48h
Technology, fabrication and industrialization of embedded systems	5 crédits	66h
Electronic design for electrical vehicle	5 crédits	55h
Interdisciplinary project: smart energy manager for solar panel system	5 crédits	68h
Human relations	6 crédits	78h

5th YEAR AE_THEME SIEC

5th YEAR GEI CHOIX OPTIONNEL
MINEURE

Liste d'éléments pédagogiques

Prescriptive Analytics	4 crédits		Middleware and services	5 crédits	62h
Software Defined Communication Infrastructure	4 crédits		Analysis and data processing, business applications	4 crédits	37h
Cloud Computing	6 crédits	69h	Innovative project	5 crédits	76h
Model driven engineering	6 crédits		Innovation and humanity	6 crédits	76h
Modeling, evaluation and optimisation of networks and protocols	4 crédits	78h			
[FRANCAIS] Commande avancée et supervision	6 crédits				
Projet physique PTP_ISS	4 crédits				
Service Robotics	6 crédits	50h			

Liste d'éléments pédagogiques

Human relations	6 crédits	78h
Embedded Computer Architecture	4 crédits	
Engineering methods	4 crédits	42h
Dependability	5 crédits	68h
Interdisciplinary Project	5 crédits	

5th YEAR THEME INNOVATIVE SMART SYSTEM

Liste d'éléments pédagogiques

Smart Devices	5 crédits	
Communication	5 crédits	

5th YEAR _PTP RISK ENGINEERING_SEMESTER 9

Liste d'éléments pédagogiques

Qualitative Approach
Quantitative Approach
Designing for safety
Process Safety

Functional Safety

Structural Safety

Toxic risks

5th YEAR THEME SECURITY

Liste d'éléments pédagogiques

Security fundamentals	5 crédits	77h
Software security	4 crédits	47h
System security, hardware security and reverse	4 crédits	54h
Networks and protocols security	3 crédits	40h

Architectures of secured networks 4 crédits 54h

[FRANCAIS] Sécurité des systèmes embarqués critiques 5 crédits 31h

[FRANCAIS] SHSJ 5 crédits 42h

[FRANCAIS] UE commune M2 RT 9 crédits 45h

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

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

Liste d'éléments pédagogiques

French I 3 crédits

SEMESTER 10_5th YEAR AE

Liste d'éléments pédagogiques

Training period 4th year

Training period 5th year

FORMATION CONTINUE CT2
AUTOMATIC CONTROL AND
ELECTRONICS

SEMESTER 9_T2 AE

SEMESTER 9_5th YEAR
AE_THEME ESPE

Liste d'éléments pédagogiques

[FRANCAIS] Architecture électronique pour l'énergie	5 crédits	66h
Embedded software and command for energy	4 crédits	48h
Technology, fabrication and industrialization of embedded systems	5 crédits	66h
Electronic design for electrical vehicle	5 crédits	55h
Interdisciplinary project: smart energy manager for solar panel system	5 crédits	68h
Human relations	6 crédits	78h

5th YEAR AE_THEME SIEC

5th YEAR GEI CHOIX OPTIONNEL
MINEURE

Liste d'éléments pédagogiques

Prescriptive Analytics	4 crédits	
Software Defined Communication Infrastructure	4 crédits	
Cloud Computing	6 crédits	69h
Model driven engineering	6 crédits	
Modeling, evaluation and optimisation of networks and protocols	4 crédits	78h

[FRANCAIS] Commande avancée et supervision 6 crédits

Projet physique PTP_ISS 4 crédits

Service Robotics 6 crédits 50h

Liste d'éléments pédagogiques

Human relations	6 crédits	78h
Embedded Computer Architecture	4 crédits	
Engineering methods	4 crédits	42h
Dependability	5 crédits	68h
Interdisciplinary Project	5 crédits	

5th YEAR IR_ORIENTATION SDBD

5th YEAR GEI CHOIX OPTIONNEL
MINEURE

Liste d'éléments pédagogiques

Prescriptive Analytics	4 crédits	
Software Defined Communication Infrastructure	4 crédits	
Cloud Computing	6 crédits	69h
Model driven engineering	6 crédits	
Modeling, evaluation and optimisation of networks and protocols	4 crédits	78h
[FRANCAIS] Commande avancée et supervision	6 crédits	

Projet physique PTP_ISS	4 crédits	
Service Robotics	6 crédits	50h

Liste d'éléments pédagogiques

Software engineering and service oriented architectures	4 crédits	41h
Reliability and model-checking	4 crédits	42h
[FRANCAIS] Analyse descriptive et prédictive	4 crédits	56h
Infrastructure for massive data processing	4 crédits	61h
[FRANCAIS] Projet SDBD	4 crédits	52h
Human relations	6 crédits	78h
Module élève ingénieur (UE PETAR dispensée UPS)	4 crédits	

SEMESTER 10_T2 AE

Liste d'éléments pédagogiques

Training period 5th year

Training period 4th year

Architectures or technological systems



ECTS
7 crédits



Hourly volume
93h

Introducing

Description

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 electronics

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

Évaluation

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

Practical info

Location(s)

 Toulouse

Multiphysics modeling



ECTS
6 crédits



Hourly volume

Introducing

Description

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/Modelica, 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.

Évaluation

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

Practical info

Location(s)

 Toulouse

Modelling tools and Optimization



ECTS
5 crédits



Hourly volume

Introducing

Description

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.

Évaluation

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

Practical info

Location(s)

 Toulouse

Automatic control



ECTS

4 crédits



Hourly volume

Introducing

Description

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)

Évaluation

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

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

Description

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.

Évaluation

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

Practical info

Location(s)

 Toulouse

Improve your management abilities



ECTS

4 crédits



Hourly volume

45h

Introducing

Description

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 CEFR 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

Management I3CCGE51

Évaluation

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

Practical info

Location(s)

 Toulouse

Toulouse School of Management

Introducing

Description

Évaluation

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

Practical info

Location(s)

 Toulouse

Political sciences semester 1



ECTS
3 crédits



Hourly volume

Introducing

Description

Évaluation

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

Practical info

Location(s)

 Toulouse

Device modeling and digital circuits architectures (reconfigurable computing)



ECTS
5 crédits



Hourly volume
55h

Introducing

Description

Objectives

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

- the electronic device and digital electronic systems modelling
- the issue of the integration of electronic circuits
- the design and performance optimisation of digital architectures especially in frequency and power consumption. Ultra low power architectures will be studied for sustainable development.
- the technologies for green computing
- reconfigurable computing using FPGAs
- digital architectures dedicated to embedded Artificial Intelligence (AI)

The student will be able to understand the models of main electronics active devices and digital complex architectures and their optimisation for sustainable development. The student will be prepared for the future technological breakout in their professional life.

Necessary prerequisites

Electrical circuits, electrostatics, analog and digital electronics, computer engineering

Évaluation

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

Practical info

Location(s)

 Toulouse

Analog electronic system architecture



ECTS

4 crédits



Hourly volume

54h

Introducing

Description

Objectives

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

- Dimension and design of analog electronic functions of information processing (filtering, amplification, automatic gain control, voltage controlled oscillators, modulators / demodulators AM and FM;
- Optimize the signal to noise ratio in each subset of an embedded system
- Modeling architectures for robust usage constraints (consumption, temperature to dissipate), the thermal variations of the environment and dispersions characteristics of components

Practical info

Location(s)

 Toulouse

Évaluation

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

[FRANCAIS] Analyse des systèmes complexes



ECTS

4 crédits



Hourly volume

50h

Introducing

Description

Objectives

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

- Principles, difficulties and limits of the modelling of systems with multiple inputs and multiple outputs.
- Design and implementation of control of systems with multiple inputs and multiple outputs.
- Main possible and observable behaviors which can occur in the nonlinear systems (equilibrium states, limit cycles, complex behaviors) and their evolution by variation of the parameters.
- Basis of the theory of Lyapunov

The student will be able to:

- To apprehend the implementation of the control of a process with multiple inputs and multiple outputs.
- To begin the analysis of a nonlinear system by various techniques (qualitative, geometrical, and simulations)
- To lean on numerical analysis (Matlab©) to establish, confirm, validate, simulate and implement the theoretical results discussed during the courses.

Necessary prerequisites

- Cours de 2e année « Systèmes bouclés » (I2MAAU11)
- Cours 3e année IMACS « Modélisation et analyse des systèmes linéaires » (I3AMAU11)
- Cours 3e année IMACS « Commande des systèmes » (I3AMAU12)

Évaluation

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

Practical info

Location(s)

 Toulouse

Digital signal acquisition architectures and Computed controlled systems



ECTS
4 crédits



Hourly volume
60h

Introducing

Location(s)

 Toulouse

Description

Objectives

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

The complete modelling from sensor to actuator is presented, associated with digital control techniques. A specific labwork deal with the implementation of a complete chain of acquisition and digital processing in order to carry out the control of an actuator.

Évaluation

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

Practical info

[FRANCAIS] Informatique matérielle



ECTS
3 crédits



Hourly volume

Introducing

Description

Objectives

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

- Programming specificities of the peripheral units for microcontroller.
- The different peripherals of a microcontroller and their behaviour.
- How to take into account hardware constraints for the design of embedded system.

The student will be able to:

- To select an architecture processor adapted to the software application and to the process configuration.
- To conceive and test the techniques of the programming by hardware interruption.
- To use debug tools and test in the context of cross-development.
- To find information into datasheet

continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

Practical info

Location(s)

 Toulouse

Évaluation

L'évaluation des acquis d'apprentissage est réalisée en

QSE APS 4A GEI – 1



ECTS
4 crédits



Hourly volume
67h

Introducing

Description

Évaluation

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

Practical info

Location(s)

 Toulouse

Improve your management abilities



ECTS

4 crédits



Hourly volume

45h

Introducing

Description

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 CEFR 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

Management I3CCGE51

Évaluation

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

Practical info

Location(s)

 Toulouse

Toulouse School of Management

Introducing

Description

Évaluation

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

Practical info

Location(s)

 Toulouse

Machine Learning



ECTS
2 crédits



Hourly volume

Introducing

Description

Évaluation

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

Practical info

Location(s)

 Toulouse

Political sciences semester 1



ECTS
3 crédits



Hourly volume

Introducing

Description

Évaluation

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

Practical info

Location(s)

 Toulouse

[FRANCAIS] Challenge – Formation ECIU



ECTS

1 crédits



Hourly volume

Introducing

Description

Évaluation

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

Practical info

Location(s)

 Toulouse

[FRANCAIS] Challenge – Formation ECIU



ECTS
2 crédits



Hourly volume

Introducing

Description

Évaluation

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

Practical info

Location(s)

 Toulouse

[FRANCAIS] Challenge – Formation ECIU



ECTS
3 crédits



Hourly volume

Introducing

Description

Évaluation

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

Practical info

Location(s)

 Toulouse

[FRANCAIS] Challenge – Formation ECIU



ECTS
4 crédits



Hourly volume

Introducing

Description

Évaluation

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

Practical info

Location(s)

 Toulouse

[FRANCAIS] Challenge – Formation ECIU



ECTS
5 crédits



Hourly volume

Introducing

Description

Évaluation

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

Practical info

Location(s)

 Toulouse

French I



ECTS
3 crédits



Hourly volume

Introducing

Description

Évaluation

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

Practical info

Location(s)

 Toulouse

Improve your management abilities



ECTS

4 crédits



Hourly volume

45h

Introducing

Description

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 CEFR for the 5 language activities, are specific for the language studied Chinese, German, Spanish ¿ and the level of the student.

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<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

Management I3CCGE51

Évaluation

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

Practical info

Location(s)

 Toulouse

Toulouse School of Management

Introducing

Description

Évaluation

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

Practical info

Location(s)

 Toulouse

Practical Work in Control



ECTS

3 crédits



Hourly volume

34h

Introducing

Description

Objectives

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

This teaching illustrates all the 4th year automation courses (control of nonlinear systems, optimal control, numerical control, multi-variable control, graphs).

The student should be able to:

- Model/identify a system
- Synthesize a control according to a specification (performance) and implement it
- Know how to be critical on a command
- Know how to write a report

Necessary prerequisites

Analysis of non-linear systems - Multivariable systems -
Peripherals - Numerical control - Acquisition chains and
numerical control - optimal control - graph

Évaluation

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

Practical info

Location(s)

 Toulouse

Energy management for embedded systems



ECTS
3 crédits



Hourly volume

Introducing

Description

Objectives

- At the end of this module, the student will have understood and be able to explain (main concepts):
- The characteristics of the energy sources that can be used on embedded systems,
- The characteristics of quantities in electrical distribution networks
- Power converter architectures,
- The modeling of an electric motor/generator based on its coupled electrical and mechanical values.
- The operation of a transformer and its model.
- The structures and main characteristics of single-phase and three-phase AC-DC converters.
- The main chopper structures, their properties, reversibilities and their control.
- The principle of torque and/or speed regulation of a DC machine using a chopper.

The student should be able to:

- Analyze the energy needs of an on-board system and propose and size a solution,
- Use coupled electrical and mechanical equations to model an electro-mechanical system
- Analyze a mechanical system and identify the drive requirements, the type of converter that must be associated with the machine.

- Dimension the elements of an electrical energy conversion chain which allows to drive a given actuator.

Necessary prerequisites

General knowledge of electricity, alternating current, electrical circuits, analog and digital electronics as well as mathematical tools (Fourier and Laplace transforms) and the basics of automatic control (transfer functions and block diagrams)

Évaluation

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

Practical info

Location(s)

 Toulouse

Discrete and Continuous Systems Optimisation



ECTS
5 crédits



Hourly volume

Introducing

Description

Objectives

At the end of this module, the student will have understood

and be able to explain (main concepts):

- different approaches to analyse, evaluate the performance of discrete event systems through different models (deterministic or stochastic, graphs) and to optimise them (linear programming)
- the optimisation methods for continuous systems :
 - static (first and second order conditions)
 - dynamic (dynamic programming)
- their applications to optimal or model predictive control mainly for linear systems

The student will be able to:

- to analyse, model and solve an optimization problem of discrete systems by a linear programming or a graph, by applying relevant algorithms (simplex, usual graphs and networks algorithms, combinatorial optimization)
- to model and to characterize: stationary Markovian processes with discrete state space (chains) and continuous or discrete time, queuing systems, to

analyse

their transient and stationary behaviours, to evaluate their

performances

- to model a discrete event systems by Petri nets and to analyse the properties by enumerative and structural approaches.

- to formalise and solve a quadratic criterion, nonlinear,

without or with constraints optimisation problem in the case

of systems with real variables

- to develop and design an optimal control law (LQG) for a

linear or linearized process.

Necessary prerequisites

Linear algebra & Probabilities & Dynamic systems (state concept) - Basic elements in logic systems and Petri nets.

Évaluation

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

Practical info

Location(s)

 Toulouse

Research project



ECTS

4 crédits



Hourly volume

Introducing

Description

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 facilitate the writing of a state-of-the-art review of the domain. A course on project management techniques is also provided to guide students during the realisation phase of the project.

At the end of this module, the student will 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 project report and prepare a presentation in english for its proj

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

Practical info

Location(s)

 Toulouse

Évaluation

Computer science



ECTS
5 crédits



Hourly volume

Introducing

Description

Objectives

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

- Object-Oriented Programming part:
 - . The principles of object-oriented programming: method call, classes.
 - .The application of those notions for programming connected objects
- Networks part:
 - . The basic concepts and techniques allowing interconnecting local area networks in the Internet: repeater, bridge, router
 - .the basic concepts and techniques allowing interconnecting LAN in the Internet : subnetting, CIDR, VLAN, VPN, applicative proxy, NAT
 - . the main protocols of the TCP/IP Internet architecture : UDP, TCP, IP, ARP/proxy ARP, ICMP, DHCP, RIP, OSPF, BGP
- Real-Time part:
 - .Designing real time applications.
 - . Understand and manipulate a real time kernel.

The student will be able to:

- Object-Oriented Programming part:
 - . Develop java applications, using a modular object-oriented style.

- Networks part:
 - .Do architecture choices allowing to take into account requirements and constraints associated to a LAN interconnection.
 - . Do basic or complex addressing and routing schemas.
 - . Set up (administrate) Ethernet and IP networks in the basic and advanced interconnection contexts considered in the course.

- Real-Time part
 - .Set up a design methodology to respond to a specification.
 - . Design software architectures for real time applications.
 - . Adjust the tasks parameters to reach the expected performances.
 -
 - Simulate and analyze real-time applications performance

Necessary prerequisites

Software Engineering, introduction to networking, C programming

Évaluation

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

Practical info

Location(s)

 Toulouse

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



ECTS
4 crédits



Hourly volume
40h

Introducing

Description

Évaluation

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

Practical info

Location(s)

 Toulouse

Communication in organisations with LV2



ECTS

6 crédits



Hourly volume

Introducing

Description

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

Évaluation

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

Practical info

Location(s)

 Toulouse

Communication in organisations



ECTS
6 crédits



Hourly volume
42h

Introducing

Description

Évaluation

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

Practical info

Location(s)

 Toulouse

Political sciences semestre 2



ECTS
3 crédits



Hourly volume

Introducing

Description

Évaluation

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

Practical info

Location(s)

 Toulouse

Systems Engineering processes



ECTS

5 crédits



Hourly volume

77h

Introducing

Description

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

Évaluation

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

Practical info

Location(s)

 Toulouse

Object-Oriented and Real-Time Programming



ECTS
3 crédits



Hourly volume
50h

Introducing

Location(s)

 Toulouse

Description

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.

Évaluation

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

Practical info

Dynamics of structures and control



ECTS
4 crédits



Hourly volume
22h

Introducing

Description

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

Évaluation

L'évaluation des acquis d'apprentissage est réalisée en

continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

Practical info

Location(s)

 Toulouse

Mechatronic project



ECTS

4 crédits



Hourly volume

Introducing

Description

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-in-the-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

Évaluation

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Practical info

Location(s)

 Toulouse

Research Initiating Project



ECTS

4 crédits



Hourly volume

Introducing

Description

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 facilitate the writing of a state-of-the-art review of the domain. A course on project management techniques is also provided to guide students during the realisation phase of the project.

At the end of this module, the student will 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 project report and prepare a presentation in English for its project defense.

Évaluation

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

Practical info

Location(s)

 Toulouse

Quality, security, environment and sports



ECTS

4 crédits



Hourly volume

61h

Introducing

Description

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.

enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

Practical info

Location(s)

 Toulouse

Évaluation

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des

Communication in organisations with LV2



ECTS
6 crédits



Hourly volume

Introducing

Description

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

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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

Évaluation

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

Practical info

Location(s)

 Toulouse

Communication in organisations



ECTS
6 crédits



Hourly volume
42h

Introducing

Description

Évaluation

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

Practical info

Location(s)

 Toulouse

Toulouse School of Management

Introducing

Description

Évaluation

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

Practical info

Location(s)

 Toulouse

Political sciences semestre 2



ECTS
3 crédits



Hourly volume

Introducing

Description

Évaluation

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

Practical info

Location(s)

 Toulouse

[FRANCAIS] Challenge – Formation ECIU



ECTS
1 crédits



Hourly volume

Introducing

Description

Évaluation

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

Practical info

Location(s)

 Toulouse

[FRANCAIS] Challenge – Formation ECIU



ECTS
2 crédits



Hourly volume

Introducing

Description

Évaluation

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Practical info

Location(s)

 Toulouse

[FRANCAIS] Challenge – Formation ECIU



ECTS
3 crédits



Hourly volume

Introducing

Description

Évaluation

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

Practical info

Location(s)

 Toulouse

[FRANCAIS] Challenge – Formation ECIU



ECTS
4 crédits



Hourly volume

Introducing

Description

Évaluation

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

Practical info

Location(s)

 Toulouse

[FRANCAIS] Challenge – Formation ECIU



ECTS
5 crédits



Hourly volume

Introducing

Description

Évaluation

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

Practical info

Location(s)

 Toulouse

French II



ECTS
3 crédits



Hourly volume

Introducing

Description

Évaluation

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

Practical info

Location(s)

 Toulouse

Architectures or technological systems



ECTS
7 crédits



Hourly volume
93h

Introducing

Description

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 electronics

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

Évaluation

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

Practical info

Location(s)

 Toulouse

Multiphysics modeling



ECTS
6 crédits



Hourly volume

Introducing

Description

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, hydraulic, thermal) and 3D models (mechanical) for mechatronics systems.
- Use 0D/1D platforms such as : Dymola/Modelica, 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.

Évaluation

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

Practical info

Location(s)

 Toulouse

Modelling tools and Optimization



ECTS
5 crédits



Hourly volume

Introducing

Description

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.

Évaluation

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

Practical info

Location(s)

 Toulouse

Automatic control



ECTS

4 crédits



Hourly volume

Introducing

Description

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)

Évaluation

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

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

Description

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.

Évaluation

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

Practical info

Location(s)

 Toulouse

Improve your management abilities



ECTS

4 crédits



Hourly volume

45h

Introducing

Description

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 CEFR 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

Management I3CCGE51

Évaluation

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

Practical info

Location(s)

 Toulouse

Toulouse School of Management

Introducing

Description

Évaluation

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

Practical info

Location(s)

 Toulouse

Political sciences semester 1



ECTS
3 crédits



Hourly volume

Introducing

Description

Évaluation

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

Practical info

Location(s)

 Toulouse

Device modeling and digital circuits architectures (reconfigurable computing)



ECTS
5 crédits



Hourly volume
55h

Introducing

Description

Objectives

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

- the electronic device and digital electronic systems modelling
- the issue of the integration of electronic circuits
- the design and performance optimisation of digital architectures especially in frequency and power consumption. Ultra low power architectures will be studied for sustainable development.
- the technologies for green computing
- reconfigurable computing using FPGAs
- digital architectures dedicated to embedded Artificial Intelligence (AI)

The student will be able to understand the models of main electronics active devices and digital complex architectures and their optimisation for sustainable development. The student will be prepared for the future technological breakout in their professional life.

Necessary prerequisites

Electrical circuits, electrostatics, analog and digital electronics, computer engineering

Évaluation

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

Practical info

Location(s)

 Toulouse

Analog electronic system architecture



ECTS

4 crédits



Hourly volume

54h

Introducing

Description

Objectives

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

- Dimension and design of analog electronic functions of information processing (filtering, amplification, automatic gain control, voltage controlled oscillators, modulators / demodulators AM and FM;
- Optimize the signal to noise ratio in each subset of an embedded system
- Modeling architectures for robust usage constraints (consumption, temperature to dissipate), the thermal variations of the environment and dispersions characteristics of components

Practical info

Location(s)

 Toulouse

Évaluation

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

[FRANCAIS] Analyse des systèmes complexes



ECTS

4 crédits



Hourly volume

50h

Introducing

Description

Objectives

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

- Principles, difficulties and limits of the modelling of systems with multiple inputs and multiple outputs.
- Design and implementation of control of systems with multiple inputs and multiple outputs.
- Main possible and observable behaviors which can occur in the nonlinear systems (equilibrium states, limit cycles, complex behaviors) and their evolution by variation of the parameters.
- Basis of the theory of Lyapunov

The student will be able to:

- To apprehend the implementation of the control of a process with multiple inputs and multiple outputs.
- To begin the analysis of a nonlinear system by various techniques (qualitative, geometrical, and simulations)
- To lean on numerical analysis (Matlab©) to establish, confirm, validate, simulate and implement the theoretical results discussed during the courses.

Necessary prerequisites

- Cours de 2e année « Systèmes bouclés » (I2MAAU11)
- Cours 3e année IMACS « Modélisation et analyse des systèmes linéaires » (I3AMAU11)
- Cours 3e année IMACS « Commande des systèmes » (I3AMAU12)

Évaluation

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

Practical info

Location(s)

 Toulouse

Digital signal acquisition architectures and Computed controlled systems



ECTS
4 crédits



Hourly volume
60h

Introducing

Location(s)

 Toulouse

Description

Objectives

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

The complete modelling from sensor to actuator is presented, associated with digital control techniques. A specific labwork deal with the implementation of a complete chain of acquisition and digital processing in order to carry out the control of an actuator.

Évaluation

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

Practical info

[FRANCAIS] Informatique matérielle



ECTS
3 crédits



Hourly volume

Introducing

Description

Objectives

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

- Programming specificities of the peripheral units for microcontroller.
- The different peripherals of a microcontroller and their behaviour.
- How to take into account hardware constraints for the design of embedded system.

The student will be able to:

- To select an architecture processor adapted to the software application and to the process configuration.
- To conceive and test the techniques of the programming by hardware interruption.
- To use debug tools and test in the context of cross-development.
- To find information into datasheet

Évaluation

L'évaluation des acquis d'apprentissage est réalisée en

continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

Practical info

Location(s)

 Toulouse

QSE APS 4A GEI – 1



ECTS
4 crédits



Hourly volume
67h

Introducing

Description

Évaluation

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

Practical info

Location(s)

 Toulouse

Improve your management abilities



ECTS

4 crédits



Hourly volume

45h

Introducing

Description

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 CEFR 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

Management I3CCGE51

Évaluation

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

Practical info

Location(s)

 Toulouse

Toulouse School of Management

Introducing

Description

Évaluation

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

Practical info

Location(s)

 Toulouse

Machine Learning



ECTS
2 crédits



Hourly volume

Introducing

Description

Évaluation

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

Practical info

Location(s)

 Toulouse

Political sciences semester 1



ECTS
3 crédits



Hourly volume

Introducing

Description

Évaluation

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

Practical info

Location(s)

 Toulouse

Improve your management abilities



ECTS

4 crédits



Hourly volume

45h

Introducing

Description

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 CEFR 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

Management I3CCGE51

Évaluation

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

Practical info

Location(s)

 Toulouse

Toulouse School of Management

Introducing

Description

Évaluation

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

Practical info

Location(s)

 Toulouse

Practical Work in Control



ECTS
3 crédits



Hourly volume
34h

Introducing

Description

Objectives

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

This teaching illustrates all the 4th year automation courses (control of nonlinear systems, optimal control, numerical control, multi-variable control, graphs).

The student should be able to:

- Model/identify a system
- Synthesize a control according to a specification (performance) and implement it
- Know how to be critical on a command
- Know how to write a report

Necessary prerequisites

Analysis of non-linear systems - Multivariable systems -
Peripherals - Numerical control - Acquisition chains and
numerical control - optimal control - graph

Évaluation

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

Practical info

Location(s)

 Toulouse

Energy management for embedded systems



ECTS
3 crédits



Hourly volume

Introducing

Description

Objectives

- At the end of this module, the student will have understood and be able to explain (main concepts):
- The characteristics of the energy sources that can be used on embedded systems,
- The characteristics of quantities in electrical distribution networks
- Power converter architectures,
- The modeling of an electric motor/generator based on its coupled electrical and mechanical values.
- The operation of a transformer and its model.
- The structures and main characteristics of single-phase and three-phase AC-DC converters.
- The main chopper structures, their properties, reversibilities and their control.
- The principle of torque and/or speed regulation of a DC machine using a chopper.

The student should be able to:

- Analyze the energy needs of an on-board system and propose and size a solution,
- Use coupled electrical and mechanical equations to model an electro-mechanical system
- Analyze a mechanical system and identify the drive requirements, the type of converter that must be associated with the machine.

- Dimension the elements of an electrical energy conversion chain which allows to drive a given actuator.

Necessary prerequisites

General knowledge of electricity, alternating current, electrical circuits, analog and digital electronics as well as mathematical tools (Fourier and Laplace transforms) and the basics of automatic control (transfer functions and block diagrams)

Évaluation

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

Practical info

Location(s)

 Toulouse

Discrete and Continuous Systems Optimisation



ECTS
5 crédits



Hourly volume

Introducing

Description

Objectives

At the end of this module, the student will have understood

and be able to explain (main concepts):

- different approaches to analyse, evaluate the performance of discrete event systems through different models (deterministic or stochastic, graphs) and to optimise them (linear programming)
- the optimisation methods for continuous systems :
 - static (first and second order conditions)
 - dynamic (dynamic programming)
- their applications to optimal or model predictive control mainly for linear systems

The student will be able to:

- to analyse, model and solve an optimization problem of discrete systems by a linear programming or a graph, by applying relevant algorithms (simplex, usual graphs and networks algorithms, combinatorial optimization)
- to model and to characterize: stationary Markovian processes with discrete state space (chains) and continuous or discrete time, queuing systems, to

analyse

their transient and stationary behaviours, to evaluate their

performances

- to model a discrete event systems by Petri nets and to analyse the properties by enumerative and structural approaches.

- to formalise and solve a quadratic criterion, nonlinear,

without or with constraints optimisation problem in the case

of systems with real variables

- to develop and design an optimal control law (LQG) for a

linear or linearized process.

Necessary prerequisites

Linear algebra & Probabilities & Dynamic systems (state concept) - Basic elements in logic systems and Petri nets.

Évaluation

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

Practical info

Location(s)

 Toulouse

Research project



ECTS

4 crédits



Hourly volume

Introducing

Description

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 facilitate the writing of a state-of-the-art review of the domain. A course on project management techniques is also provided to guide students during the realisation phase of the project.

At the end of this module, the student will 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 project report and prepare a presentation in english for its proj

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

Practical info

Location(s)

 Toulouse

Évaluation

Computer science



ECTS
5 crédits



Hourly volume

Introducing

Description

Objectives

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

- Object-Oriented Programming part:
 - . The principles of object-oriented programming: method call, classes.
 - .The application of those notions for programming connected objects
- Networks part:
 - . The basic concepts and techniques allowing interconnecting local area networks in the Internet: repeater, bridge, router
 - .the basic concepts and techniques allowing interconnecting LAN in the Internet : subnetting, CIDR, VLAN, VPN, applicative proxy, NAT
 - . the main protocols of the TCP/IP Internet architecture : UDP, TCP, IP, ARP/proxy ARP, ICMP, DHCP, RIP, OSPF, BGP
- Real-Time part:
 - .Designing real time applications.
 - . Understand and manipulate a real time kernel.

The student will be able to:

- Object-Oriented Programming part:
 - . Develop java applications, using a modular object-oriented style.

- Networks part:
 - .Do architecture choices allowing to take into account requirements and constraints associated to a LAN interconnection.
 - . Do basic or complex addressing and routing schemas.
 - . Set up (administrate) Ethernet and IP networks in the basic and advanced interconnection contexts considered in the course.

- Real-Time part
 - .Set up a design methodology to respond to a specification.
 - . Design software architectures for real time applications.
 - . Adjust the tasks parameters to reach the expected performances.
 -
 - Simulate and analyze real-time applications performance

Necessary prerequisites

Software Engineering, introduction to networking, C programming

Évaluation

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

Practical info

Location(s)

 Toulouse

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



ECTS
4 crédits



Hourly volume
40h

Introducing

Description

Évaluation

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

Practical info

Location(s)

 Toulouse

Communication in organisations with LV2



ECTS

6 crédits



Hourly volume

Introducing

Description

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

Évaluation

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

Practical info

Location(s)

 Toulouse

Communication in organisations



ECTS
6 crédits



Hourly volume
42h

Introducing

Description

Évaluation

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

Practical info

Location(s)

 Toulouse

Political sciences semestre 2



ECTS
3 crédits



Hourly volume

Introducing

Description

Évaluation

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

Practical info

Location(s)

 Toulouse

Systems Engineering processes



ECTS

5 crédits



Hourly volume

77h

Introducing

Description

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

Évaluation

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

Object-Oriented and Real-Time Programming



ECTS
3 crédits



Hourly volume
50h

Introducing

Location(s)

 Toulouse

Description

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.

Évaluation

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

Practical info

Dynamics of structures and control



ECTS
4 crédits



Hourly volume
22h

Introducing

Description

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

Évaluation

L'évaluation des acquis d'apprentissage est réalisée en

continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

Practical info

Location(s)

 Toulouse

Mechatronic project



ECTS

4 crédits



Hourly volume

Introducing

Description

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-in-the-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

Évaluation

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

Practical info

Location(s)

 Toulouse

Research Initiating Project



ECTS

4 crédits



Hourly volume

Introducing

Description

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 facilitate the writing of a state-of-the-art review of the domain. A course on project management techniques is also provided to guide students during the realisation phase of the project.

At the end of this module, the student will 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 project report and prepare a presentation in English for its project defense.

Évaluation

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

Practical info

Location(s)

 Toulouse

Quality, security, environment and sports



ECTS

4 crédits



Hourly volume

61h

Introducing

Description

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.

Évaluation

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des

enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

Practical info

Location(s)

 Toulouse

Communication in organisations with LV2



ECTS

6 crédits



Hourly volume

Introducing

Description

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

Évaluation

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

Practical info

Location(s)

 Toulouse

Communication in organisations



ECTS
6 crédits



Hourly volume
42h

Introducing

Description

Évaluation

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

Practical info

Location(s)

 Toulouse

Toulouse School of Management

Introducing

Description

Évaluation

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

Practical info

Location(s)

 Toulouse

Political sciences semestre 2



ECTS
3 crédits



Hourly volume

Introducing

Description

Évaluation

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

Practical info

Location(s)

 Toulouse

Digital signal acquisition architectures and Computed controlled systems



ECTS
4 crédits



Hourly volume
60h

Introducing

Location(s)

 Toulouse

Description

Objectives

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

The complete modelling from sensor to actuator is presented, associated with digital control techniques. A specific labwork deal with the implementation of a complete chain of acquisition and digital processing in order to carry out the control of an actuator.

Évaluation

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

Practical info

Analog electronic system architecture



ECTS

4 crédits



Hourly volume

54h

Introducing

Description

Objectives

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

- Dimension and design of analog electronic functions of information processing (filtering, amplification, automatic gain control, voltage controlled oscillators, modulators / demodulators AM and FM;
- Optimize the signal to noise ratio in each subset of an embedded system
- Modeling architectures for robust usage constraints (consumption, temperature to dissipate), the thermal variations of the environment and dispersions characteristics of components

Practical info

Location(s)

 Toulouse

Évaluation

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

[FRANCAIS] Analyse des systèmes complexes



ECTS

4 crédits



Hourly volume

50h

Introducing

Description

Objectives

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

- Principles, difficulties and limits of the modelling of systems with multiple inputs and multiple outputs.
- Design and implementation of control of systems with multiple inputs and multiple outputs.
- Main possible and observable behaviors which can occur in the nonlinear systems (equilibrium states, limit cycles, complex behaviors) and their evolution by variation of the parameters.
- Basis of the theory of Lyapunov

The student will be able to:

- To apprehend the implementation of the control of a process with multiple inputs and multiple outputs.
- To begin the analysis of a nonlinear system by various techniques (qualitative, geometrical, and simulations)
- To lean on numerical analysis (Matlab©) to establish, confirm, validate, simulate and implement the theoretical results discussed during the courses.

Necessary prerequisites

- Cours de 2e année « Systèmes bouclés » (I2MAAU11)
- Cours 3e année IMACS « Modélisation et analyse des systèmes linéaires » (I3AMAU11)
- Cours 3e année IMACS « Commande des systèmes » (I3AMAU12)

Évaluation

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

Practical info

Location(s)

 Toulouse

QSE APS 4A GEI – 1



ECTS
4 crédits



Hourly volume
67h

Introducing

Description

Évaluation

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

Practical info

Location(s)

 Toulouse

Communication in organisations with LV2



ECTS

6 crédits



Hourly volume

Introducing

Description

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

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the student.

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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

Évaluation

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

Practical info

Location(s)

 Toulouse

Communication in organisations



ECTS
6 crédits



Hourly volume
42h

Introducing

Description

Évaluation

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

Practical info

Location(s)

 Toulouse

Object-Oriented and Real-Time Programming



ECTS
3 crédits



Hourly volume
50h

Introducing

Location(s)

 Toulouse

Description

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.

Évaluation

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

Practical info

Device modeling and digital circuits architectures (reconfigurable computing)



ECTS
5 crédits



Hourly volume
55h

Introducing

Description

Objectives

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

- the electronic device and digital electronic systems modelling
- the issue of the integration of electronic circuits
- the design and performance optimisation of digital architectures especially in frequency and power consumption. Ultra low power architectures will be studied for sustainable development.
- the technologies for green computing
- reconfigurable computing using FPGAs
- digital architectures dedicated to embedded Artificial Intelligence (AI)

The student will be able to understand the models of main electronics active devices and digital complex architectures and their optimisation for sustainable development. The student will be prepared for the future technological breakout in their professional life.

Necessary prerequisites

Electrical circuits, electrostatics, analog and digital electronics, computer engineering

Évaluation

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

Practical info

Location(s)

 Toulouse

Discrete and Continuous Systems Optimisation



ECTS
5 crédits



Hourly volume

Introducing

Description

Objectives

At the end of this module, the student will have understood

and be able to explain (main concepts):

- different approaches to analyse, evaluate the performance of discrete event systems through different models (deterministic or stochastic, graphs) and to optimise them (linear programming)
- the optimisation methods for continuous systems :
 - static (first and second order conditions)
 - dynamic (dynamic programming)
- their applications to optimal or model predictive control mainly for linear systems

The student will be able to:

- to analyse, model and solve an optimization problem of discrete systems by a linear programming or a graph, by applying relevant algorithms (simplex, usual graphs and networks algorithms, combinatorial optimization)
- to model and to characterize: stationary Markovian processes with discrete state space (chains) and continuous or discrete time, queuing systems, to

analyse

their transient and stationary behaviours, to evaluate their

performances

- to model a discrete event systems by Petri nets and to analyse the properties by enumerative and structural approaches.

- to formalise and solve a quadratic criterion, nonlinear,

without or with constraints optimisation problem in the case

of systems with real variables

- to develop and design an optimal control law (LQG) for a

linear or linearized process.

Necessary prerequisites

Linear algebra & Probabilities & Dynamic systems (state concept) - Basic elements in logic systems and Petri nets.

Évaluation

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

Practical info

Location(s)

 Toulouse

Practical Work in Control



ECTS
3 crédits



Hourly volume
34h

Introducing

Description

Objectives

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

This teaching illustrates all the 4th year automation courses (control of nonlinear systems, optimal control, numerical control, multi-variable control, graphs).

The student should be able to:

- Model/identify a system
- Synthesize a control according to a specification (performance) and implement it
- Know how to be critical on a command
- Know how to write a report

Necessary prerequisites

Analysis of non-linear systems - Multivariable systems -
Peripherals - Numerical control - Acquisition chains and
numerical control - optimal control - graph

Évaluation

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

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

Description

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.

Évaluation

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

Practical info

Location(s)

Toulouse

Research project



ECTS

4 crédits



Hourly volume

Introducing

Description

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 facilitate the writing of a state-of-the-art review of the domain. A course on project management techniques is also provided to guide students during the realisation phase of the project.

At the end of this module, the student will 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 project report and prepare a presentation in english for its proj

Évaluation

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

Practical info

Location(s)

 Toulouse

Energy management for embedded systems



ECTS
3 crédits



Hourly volume

Introducing

Description

Objectives

- At the end of this module, the student will have understood and be able to explain (main concepts):
- The characteristics of the energy sources that can be used on embedded systems,
- The characteristics of quantities in electrical distribution networks
- Power converter architectures,
- The modeling of an electric motor/generator based on its coupled electrical and mechanical values.
- The operation of a transformer and its model.
- The structures and main characteristics of single-phase and three-phase AC-DC converters.
- The main chopper structures, their properties, reversibilities and their control.
- The principle of torque and/or speed regulation of a DC machine using a chopper.

The student should be able to:

- Analyze the energy needs of an on-board system and propose and size a solution,
- Use coupled electrical and mechanical equations to model an electro-mechanical system
- Analyze a mechanical system and identify the drive requirements, the type of converter that must be associated with the machine.

- Dimension the elements of an electrical energy conversion chain which allows to drive a given actuator.

Necessary prerequisites

General knowledge of electricity, alternating current, electrical circuits, analog and digital electronics as well as mathematical tools (Fourier and Laplace transforms) and the basics of automatic control (transfer functions and block diagrams)

Évaluation

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

Practical info

Location(s)

 Toulouse

Multidisciplinary design



ECTS

4 crédits



Hourly volume

45h

Introducing

Description

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 useful 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.)

Évaluation

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

Practical info

Location(s)

 Toulouse

Management of risks



ECTS
5 crédits



Hourly volume
68h

Introducing

Description

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.

Necessary prerequisites

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

Évaluation

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

Practical info

Location(s)

 Toulouse

Industrialization



ECTS

5 crédits



Hourly volume

Introducing

Description

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 -

Évaluation

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

Practical info

Location(s)

 Toulouse

Systems on chip



ECTS

4 crédits



Hourly volume

47h

Introducing

Description

Évaluation

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

Practical info

Location(s)

 Toulouse

Thermal engines and systems



ECTS
4 crédits



Hourly volume
56h

Introducing

Description

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.

Évaluation

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

Practical info

Location(s)

 Toulouse

[FRANCAIS] Projet de recherche et propriété industrielle



ECTS
6 crédits



Hourly volume
74h

Introducing

Description

Évaluation

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

Practical info

Location(s)

 Toulouse

Human relations



ECTS
6 crédits



Hourly volume
78h

Introducing

Description

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

Évaluation

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

Practical info

Location(s)

 Toulouse

Necessary prerequisites

None

[FRANCAIS] Architecture électronique pour l'énergie



ECTS
5 crédits



Hourly volume
66h

Introducing

Description

Objectives

General objectives: the goal of this UF is to know how to determine, size and produce the electronic architecture of an on-board system, select the components, under energy constraints: constraint of battery, autonomy, availability of power sources. energy. The UF therefore addresses questions of the architecture of electrical energy converters, the installation of charging and battery management systems, and architecture with multiple energy sources (advertising energy). The measurement of physical quantities (current, voltage, temperature, etc.) is essential in an energy conversion or control chain for an electromechanical actuator. The UF also deals with the various sensor technologies and associated Electronic Instrumentation and Measurements.

At the end of this module the student will be able to:

- Design an electronic architecture of an embedded system under energy constraints
- Select appropriate electronic components for energy converter system
- Choose electrical energy storage solutions according to the associated constraints

- (Battery Management System / cell balancing
- Implement an ambient energy harvesting solution to design embedded systems energy self-sufficient
- Create a co-design HW / SW

Évaluation

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

Practical info

Location(s)

 Toulouse

Embedded software and command for energy



ECTS

4 crédits



Hourly volume

48h

Introducing

Description

Objectives

Objectives:

The electrical efficiency of electronic systems can be drastically improved by an appropriate selection of controls and algorithms whose objectives are to reduce as much as possible the activation of available resources of programmable devices. The modeling of processing energy systems is central to evaluate their stability properties but also their dynamic performances which are key properties for the design of adequate control laws. One of the main difficulties is due to the nonlinear behavior and the commuting nature of all the processing energy systems which impose an important adaption of the control design methods. In this UF, control law design methods considering efficiency constraints are presented for static power electronics converters and for electrical motors. Some algorithmic aspects for the low energy programming associated to a wireless system are also developed.

Expected Competences:

- Modeling of static power electronic converters (Linearization around an equilibrium state, Nonlinear model, Switched model)
- Design and implementation of a control law for a static converter (linear and nonlinear control)

- Development of an embedded software reducing the energy consumption of the programmable platform

Évaluation

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

Practical info

Location(s)

 Toulouse

Technology, fabrication and industrialization of embedded systems



ECTS
5 crédits



Hourly volume
66h

Introducing

Description

Objectives

General objectives: this UF addresses the integration, characterization and certification aspects of electronic systems. The students approach the various technologies of manufacturing and assembly of electronic systems, by addressing the tools of specification and industrial design (Electronic Computer-Aided Design). In addition, aspects of design methods and standards / conformities for the economical marketing of an electronic product are addressed. As the power components are subject to strong voltage and thermal constraints, issues of reliability and robustness are also addressed. Finally, the characterization aspects of various energy-related performance in electronic systems are dealt with impedance adaptation for optimal transfer of power to an antenna, EMC and ESD characterization, measurement of energy consumption.

This UF is deliberately based on an industrial approach and is carried out around the design of an electronic card prototype in an industrial workshop and then its characterization.

- Integrate an electronic system

- Design an e-card, under integration, energy, EMC, thermal constraints, etc.
- Reliability and robustness of the new power components
- Measure the performance of an electronic system (energy consumption, efficiency, CEM, impedance matching)
- Specify and carry out the certification process of an electronic system

Évaluation

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

Practical info

Location(s)

 Toulouse

Electronic design for electrical vehicle



ECTS
5 crédits



Hourly volume
55h

Introducing

Description

Objectives

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

- Advanced commands and actuators for electric vehicle powertrain
- Aechnologies and devices for electric vehicles
- Aevelop field oriented control for synchronous motor control
- Aropose and dimension electronic architecture for electromechanical actuator chains
- Analyze the failure modes of a motor driver and propose diagnosis and solutions to ensure safety

The student will be able to:

- Design and realize the command of electromechanical actuator (field oriented control for synchronous motor command).
- Design electronic architecture and embedded software for safe powertrain application, realized with real devices dedicated for automotive applications (microcontroller, smart power devices, sensors, system basis chip)

Évaluation

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

Practical info

Location(s)

 Toulouse

Interdisciplinary project: smart energy manager for solar panel system



ECTS
5 crédits



Hourly volume
68h

Introducing

Description

Objectives

The aim of the module is to mobilize all the skills in electronics, automatic control systems and embedded programming acquired during years 2,3,4,5 for an ambitious and complex engineering or R&D project. The students will be work with a huge autonomy. During this module, the students will work on an engineering project proposed by a industrial partner with the following steps:

- ¿ Team work (organization, communication planning)
- ¿ Project based on partner specification
- ¿ Research and analysis of solutions, positioning of the solution to the state-of-the-art
- ¿ Design, assembling, test of the proposed solutions
- ¿ Meeting points with the customer
- ¿ Planning and hardware supply management
- ¿ Reports and deliverables

Necessary prerequisites

I4AESE51 ¿ Energy management for embedded systems

I4AEAU11 ¿ Data acquisition and digital command
I4AEIM11 -Microcontroller programming
I4AESE31 - Analog architectures for embedded systems
I5AESE11 - Electronic architectures for energy
I5AELA11-Automation and embedded software for energy

Évaluation

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

Practical info

Location(s)

 Toulouse

Human relations



ECTS
6 crédits



Hourly volume
78h

Introducing

Description

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

Évaluation

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

Practical info

Location(s)

 Toulouse

Necessary prerequisites

None

Prescriptive Analytics

**ECTS**

4 crédits

**Hourly volume**

Introducing

Description

Objectives

This course addresses several efficient models for processing data encountered in industrial combinatorial problems. These models are based on logical inference and mathematical optimisation techniques : constraint satisfaction problems (CSPs), boolean satisfiability (SAT)

and integer linear programming (ILP).

In the first part (CSPs), students are expected to understand and to be able to apply the main constraint propagation techniques and solving strategies, by hand, but are also initiated to programming tools that integrate general solvers (ex : CPLEX) during practical works.

In the SAT modeling part of this course, students are initiated to some propagation and heuristic solving techniques used in SAT solvers (DPPLL, Implication Graphs, Conflict Analysis, Two-watched literals algorithm). Various applications problems such as allocation, graph colouring, scheduling serve as training examples for SAT encoding.

In the last part (MILPs), students will have to translate industrial problems into mixed-integer linear programs, then to solve them efficiently using branching algorithms or decomposition methods, embedded in existing tools such as CPLEX.

Necessary prerequisites

Algorithmics & programming (I2MIIF11, I2MIIF21).
Fundamentals in Computer Science (I4IRIF11), Intelligent Systems (I4IRSD11)

Évaluation

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

Practical info

Location(s)

 Toulouse

Software Defined Communication Infrastructure



ECTS

4 crédits



Hourly volume

Introducing

Description

Objectives

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

- the concepts related to the virtualization of network functions (in the NFV sense)
- the concepts related to network programming (in the SDN sense)
- the model of autonomic computing defined (among others) by IBM
- the views of real-world actors involved in a large-scale project (application developer, -middleware operator, network operator)

The student will be able to:

- use an SDN network emulator (ContainterNET)
- use an SDN (Ryu) controller
- use a standardized MANO NFV (SON-EMU)
- develop a standardized VNF
- architect and implement solutions that take advantage of the concepts of virtualization of network functions and programmable networks, in the context of the realization of an SDCI
- apply and implement the model of autonomic computing to a problem of management of QoS in an SDCI

Necessary prerequisites

Networks Interconnexion - TCP/IP

Object oriented design UML (2. 0)

Object Oriented Programming - Java

Service-Oriented Architectures

Network Programming - TCP/IP

Évaluation

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

Practical info

Location(s)

 Toulouse

Cloud Computing



ECTS
6 crédits



Hourly volume
69h

Introducing

Description

Évaluation

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

Practical info

Location(s)

 Toulouse

Model driven engineering



ECTS
6 crédits



Hourly volume

Introducing

Description

Évaluation

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

Practical info

Location(s)

 Toulouse

Modeling, evaluation and optimisation of networks and protocols



ECTS
4 crédits



Hourly volume
78h

Introducing

Description

Évaluation

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

Practical info

Location(s)

 Toulouse

[FRANCAIS] Commande avancée et supervision



ECTS
6 crédits



Hourly volume

Introducing

Description

Évaluation

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

Practical info

Location(s)

 Toulouse

Projet physique PTP_ISS



ECTS
4 crédits



Hourly volume

Introducing

Description

Évaluation

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

Practical info

Location(s)

 Toulouse

Service Robotics



ECTS
6 crédits



Hourly volume
50h

Introducing

Description

Objectives

At the end of this module, the student would be able to explain the main components of a robot service and to say in which way it differs from industrial robotics; he/she will know the main concepts in humanoid robotics and why it is difficult to control a walking robot. His/her knowledge will include the main notions in jointed robotics: direct and inverse kinematic models, dynamic model of the robot, trajectory generation and stability of a bipedal robot.

The student is supposed to be able to model a jointed robot, to understand its technical components and to analyse the functioning of a service robot in its domestic or professional environment.

Necessary prerequisites

Matrix theory, Linear control

Évaluation

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

Practical info

Location(s)

 Toulouse

Human relations



ECTS
6 crédits



Hourly volume
78h

Introducing

Description

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

Évaluation

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

Practical info

Location(s)

 Toulouse

Necessary prerequisites

None

Embedded Computer Architecture



ECTS

4 crédits



Hourly volume

Introducing

- Choose a computer architecture adapted to the needs of an application.

Description

Necessary prerequisites

C programming, computer organization, network, operating system

Objectives

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

- The principles and specificities of networks used in embedded systems in the automotive, avionics and connected objects,
- The specificities of operating systems and their main services (scheduling, memory, privileges, etc.) for embedded systems
- The advantages and disadvantages of the different computer architectures used for embedded systems
- The elements impacting the performance (computation, energy consumption, etc.) of a computer architecture and the methods to optimize them.

The student will be able to:

- Choose a network technology that meets the needs of an embedded system,
- Set up the support network of an embedded system,
- Deploy an operating system on an embedded architecture,
- Develop a driver within an operating system,
- Compare two embedded computer architectures in terms of performance,

Évaluation

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

Practical info

Location(s)



Toulouse

Engineering methods



ECTS

4 crédits



Hourly volume

42h

Introducing

Location(s)

 Toulouse

Description

Objectives

Present the main principles of systems engineering and software engineering: concepts, methods and tools, to define and control the process development of a critical embedded system.

The student will be able to:

- apply these general competences to computer based embedded systems explain different methods and chose the best adapted to develop a specific application.

Évaluation

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

Practical info

Dependability



ECTS

5 crédits



Hourly volume

68h

Introducing

Description

Objectives

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

The basic concepts of dependability and main methods and techniques for obtaining and validation of the safety.

The student will be able to:

- apply these general competences to computer based embedded systems
- explain different methods and chose the best adapted to develop a specific application.

Necessary prerequisites

Discrete event systems, Propositional Logic,

Évaluation

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

Practical info

Location(s)

 Toulouse

Interdisciplinary Project



ECTS
5 crédits



Hourly volume

Introducing

concise and precise style respecting the conventions of genre in writing as well as orally

Description

Objectives

At the end of this module, the student will be able to:

- Implement and apply agile management according to the agile method in order to create a product,
- Select and interweave a set of interdisciplinary technical skills in order to develop a critical embedded system,
- Search autonomously and be able to critique technical solutions for which he/she does not have prior knowledge in order to meet requirements specific to critical embedded systems,
- Design and build a product deployed on a heterogeneous and communicating embedded architecture guaranteeing performance properties,
- Define needs, requirements and architecture when designing a product
- Communicate in an interdisciplinary context and to work together with actors with heterogeneous skills,
- Adapt the writing and presentation of scientific results according to the audience (client, decision maker, evaluator, general public) and through various media (presentation, website, report, synthesis, poster).

To express themselves correctly in English, using a

Évaluation

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

Practical info

Location(s)

 Toulouse

Smart Devices



ECTS
5 crédits



Hourly volume

Introducing

Description

Objectives

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

SMART SENSORS AND ACQUISITION CHAIN:

- The criteria for the design and use of a "smart device" and an acquisition chain

It will be capable of handling:

- The physical principles of sensors operation
- The concepts used in metrology
- Procedures implemented,
- electrical "conditioners"
- The design of an acquisition chain and a "smart device".

MICROCONTROLLERS AND OPEN SOURCE HARDWARE:
the elements necessary for the design and implementation of concrete applications in Open Source Hardware,

DESIGN OF A CIRCUIT IN ANALOG ELECTRONICS:

It will be able to design and simulate an amplification stage dedicated to the measurement of the sensor realized

DESIGN OF AN ELECTRONIC BOARD OF THE SENSOR:

He will be able to design and build an electronic board

containing the sensor, its conditioning electronics and the communication elements necessary to send the data on a low speed network such as LoRa.

NANO-SENSOR:

- The approach of making nano devices and micro-electronic methods by integrating low-cost nano-objects prepared in solution;
- The operation of a nano-sensor.

The student will have understood and be able to explain:

- Experimental concepts and practices to synthesis nano-objects in liquid phase; Stabilization of colloidal solutions;
- Experimental concepts and practices of deposits of these nano-objects as 2D and 3D networks;
- The physical principles of sensors based on nanoparticles (gas sensors, stress ...)

The student will be able to:

- Experimentally produce a nanoparticle-based sensor that will be synthesized and assembled between two electrodes;
- Measure the properties of the sensor and describe its operation;
- Discuss experimental results and suggest improvements

Necessary prerequisites

General physic and electronic lectures. C et C++ programming

Évaluation

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

Practical info

Location(s)

 Toulouse

Communication



ECTS
5 crédits



Hourly volume

Introducing

Description

Objectives

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

- the communication architectures and protocols for wireless sensors networks and Internet of Things (IoT)
- the quality of services for adaptative networks (routing layer, MAC layer, beamforming algorithms)
- the functioning of adaptative networks and adaptative communication services
- the Software Defined Radio (SDR) and cognitive radio principles (reconfigurability in mobile networks)
- the functioning and the services of 4G and 5G networks
- the overall architecture of an energy management system, capturing or not ambient energy.
- the difficulties to assure the integrity, the availability and the confidentiality of the deployed equipment on a large scale, in different environments using heterogeneous communication interfaces

The student will be able to:

- design, dimensioning and deploying a wireless sensor networks depending on the applications
- having strong knowledges about quality of service on

- the MAC layer and beamforming algorithms
- having strong knowledges on 4G and 5G networks and adaptative networks
- identify the information to protect in IoT with respect to the security properties
- analyse the communication interferences to characterise the weakness of the system
- propose or modify the communication architectures to take into account the security problems
- design the energy management of a connected object

Évaluation

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

Practical info

Location(s)

 Toulouse

Middleware and services



ECTS
5 crédits



Hourly volume
62h

Introducing

Description

Objectives

This training consists of 3 parts, the following concepts will be discussed:

- Service oriented architectures
- Middlewares
- The Middleware for the Internet of Things through standards and the deployment of an architecture of sensors networks.
- The concept of Cloud and especially Infrastructure As A Service.
- Dynamic management through the principles of autonomic computing

The student will be able to:

- Design and develop a service oriented architecture
- Implement Web services SOAP and Rest
- Develop a service composition (orchestration) via BPEL
- Know the main standards of the Internet of Things
- Deploy an architecture according to a standard and implement a sensor network system services
- Understand the concept of cloud
- Use a cloud infrastructure in Infrastructure as a Service
- Recognise the different architecture types (type 1 and type 2) of cloud hypervisors

- Provision service-based (develop, deploy, manage) in cloud environment using Docker containers
- Deploy and adapt an Internet of things platform on cloud and manage it with autonomic concept

Necessary prerequisites

Java programming, Object Oriented design, base notion on network, XML and XML schema, NodeJS

Évaluation

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

Practical info

Location(s)

 Toulouse

Analysis and data processing, business applications



ECTS
4 crédits



Hourly volume
37h

Introducing

Description

Objectives

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

Data management:

Exploratory/confirmatory data analysis. Algorithmic Complexity vs. development costs, parallelism, software engineering notions (life cycle of a data analysis pipeline).

Data visualisation techniques.

Semantic manipulation:

- What an ontology is
- What are the main constituting elements of an ontology
- What are the perks of enriched data compared to raw data

Software engineering:

- Software project lifecycle
- The challenges of software development
- Project management methods, including agile method

The student will be able to:

- Explore a dataset, leverage it to answer specific questions, and present the results of this analysis -incl.

Its limits- in a synthetic written report.

- Design an ontology to capture domain knowledge
- Discover and reuse knowledge sources (ontologies, knowledge bases) online
- Enrich a dataset with semantic metadata
- Control the conduct of a software development project with a team by following the agile method
- Perform requirement analysis: expression, analysis and transformation into technical requirements

Necessary prerequisites

- Algorithms and programming
- Statistics (notions)
- Java programming
- Web technologies background knowledge

Évaluation

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

Practical info

Location(s)

Innovative project



ECTS
5 crédits



Hourly volume
76h

Introducing

presentations and written abstracts and reports.

Description

Évaluation

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

Objectives

The student will be able to:
(English course)

- present their scientific research in a clear, logical, and organized manner, both orally and in a written report
- adapt their register to their audience and follow standard scientific publication standards with respect to format and appropriate style
- quote scientific sources according to international citation standards
- use specific technical vocabulary and terms relevant to their field of study

Regarding the innovative project, students will be able to carry out an innovative project using the skills learnt during this semester. The project will cover the specification, design, implementation and a presentation to a jury of academia and industry.

Practical info

Location(s)

 Toulouse

Necessary prerequisites

(English) Students must master general English and follow strict standard scientific guidelines for both oral

Innovation and humanity



ECTS

6 crédits



Hourly volume

76h

Introducing

Prerequisites

None

Description

Objectives

Aims

The student will learn how to:

- ↳ Analyze group situations using social psychology concepts
- ↳ Identify the ethical dimensions of these situations and take a stance
- ↳ Identify and understand HR-related information
- ↳ Analyze a team management situation in a theoretical context
- ↳ Formulate and justify managerial decisions
- ↳ Operate in a natural environment: analysis, decision, action, safety implementation, use of specific equipment, site exploration
- ↳ Respect and adapt to an environment that is different from their own
- ↳ Consistently commit to the activity project
- ↳ Take an active role within the group
- ↳ Fulfill their career objectives, build a strategic plan and acquire job searching skills.

Évaluation

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

Practical info

Location(s)

 Toulouse

Necessary prerequisites

Qualitative Approach

Introducing

Description

Évaluation

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

Practical info

Location(s)

 Toulouse

Quantitative Approach

Introducing

Description

Évaluation

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

Practical info

Location(s)

 Toulouse

Designing for safety

Introducing

Description

Évaluation

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

Practical info

Location(s)

 Toulouse

Process Safety

Introducing

Description

Évaluation

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

Practical info

Location(s)

 Toulouse

Functional Safety

Introducing

Description

Évaluation

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

Practical info

Location(s)

 Toulouse

Structural Safety

Introducing

Description

Évaluation

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

Practical info

Location(s)

 Toulouse

Toxic risks

Introducing

Description

Évaluation

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

Practical info

Location(s)

 Toulouse

Security fundamentals



ECTS
5 crédits



Hourly volume
77h

Introducing

Description

Objectives

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

- main concepts of operating systems, TCP/IP networks and language C and assembling programming;
- main concepts of dependability
- main concepts of cryptography

The student will be able to:

- describe the main components of an information system
- describe the main principles of the network protocols, analyse network traces and understand the flow encapsulation
- design and implement basic and advanced language C programs as well as basic assembling programs
- understand the different issues of the safety and security domains and correctly use the associated terminology
- distinguish the different cryptographic tools, understand when and how choose a specific tool, its capabilities and weaknesses
- find the main international cryptographic standards, and understand their content

- deploying high level security tools such as PKI, VPN, IPSEC tools or low-level security tools such as openssl, and choosing purposely the parametrisation of such tools

Évaluation

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

Practical info

Location(s)

 Toulouse

Software security



ECTS
4 crédits



Hourly volume
47h

Introducing

Description

Objectives

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

- The different types of software vulnerabilities that are frequently encountered, especially in programs written in C language;
- The main memories protections to protect software from these types of vulnerabilities;
- The theory related to worms and viruses, especially the algorithms used by these malware to infect computer systems and spread on the internet; the protection against these malicious software and the methods employed by antivirus to detect worms and viruses;
- Best practices for developing software securely.
- Formal methods for security

The student will be able to:

- Develop software taking into account the risks associated with software vulnerabilities;
- Use formal methods to detect software vulnerabilities;
- Appreciate the challenges of viral protection, describe the different types of computer infection, viral and analyze the technical and antiviral éagir in case of

infection.

Necessary prerequisites

- Good programming skills in C and assembly language;
- A minimum of knowledge about the internals of the OS;
 - Bases in algebra and the use of automata theory.

Évaluation

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

Practical info

Location(s)

 Toulouse

System security, hardware security and reverse



ECTS
4 crédits



Hourly volume
54h

Introducing

Description

Objectives

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

- The main protection mechanisms that now exist in the kernel of operating system;
- The main attacks carried out from hardware component and associated countermeasures;
- The internals of the key hardware components for security such as hypervisor and IOMMU;
- The advantages of latest advances in hardware protection carried out by the founders of processors and chipset;
- The logic of physical attacks targeting computer systems;
- Reverse engineering software (reverse engineering) while being able to explain the toolchain of the compilation with the models used by compilers to generate machine code;
- Strategies to make reverse engineering software more difficult to achieve.

The student will be able to:

- Identify the most suitable software components to protect the operating system software against attacks;

- Identify threats from lower layers to higher layers and attack vectors to be considered in a system;
- Obtain an overview of the exchanges between the hardware components of a system to identify critical components and determine the countermeasures to integrate into the operating system;
- Identify threats on the physical components of a system;
- Conduct a reverse engineering of malware to understand their behavior and generate signatures to detect them.

Necessary prerequisites

Good programming skills in C and assembly language;

- A minimum of knowledge about the internals of the OS;
- Bases in algebra and the use of automata theory.

Évaluation

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

Practical info

Location(s)

 Toulouse

Networks and protocols security



ECTS
3 crédits



Hourly volume
40h

Introducing

Description

Objectives

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

- the main concepts of network security, main threats targeting these networks and associated protection mechanisms
- the main concepts of non wired network security (Wifi, GSM, GPRS, LTE, UMTS)
- the main weaknesses of the network protocols and how to eliminate these weaknesses

The student will be able to:

- Understand and carry out basic networks attacks in the context of intrusion tests ; identify and implement protection mechanisms mitigating these attacks, use and install protection infrastructures
- Choose a security solution dedicated to a Wifi access point; carry out intrusion tests on an access point
- Distinguish the security objectives in different cellular networks ; describe authentication mechanisms and key exchange protocols ; describe the different attacks targeting these different technologies ; identify the architectural components of security in operator networks

- Identify the weak protocols currently used in networks ; propose solutions for these weaknesses, through the use of tunnels when this is necessary ; use SSH and its associated functionalities (file transfers ,proxies, etc) ; describe the good practices for the definition of a secure network protocol

Necessary prerequisites

Knowledges and skills in computer networks and the underlying protocols are required (TCP/IP, routing protocols). The corresponding terminology must be known and the main concepts of cryptography must be clearly understood.

Évaluation

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

Practical info

Location(s)

 Toulouse

Architectures of secured networks



ECTS
4 crédits



Hourly volume
54h

Introducing

Description

Objectives

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

- The main concepts associated to the design and the implementation of secure network architectures
- The main tools and technics allowing to implement protection measures, and their usage according to the different contexts and objectives
- The vulnerabilities inherent in system architectures and network and major intrusion techniques;
- The operation of the main vulnerabilities of the web.

The student will be able to:

- Identify the different classes of firewalls as well as their functionalities and weaknesses
- Define and audit a filtering architecture dedicated to a specific network
- Choose, for an IPSEC tunnel, the correct protocols, the correct execution modes and a routing plan adapted to the associated gateways
- Implement and audit such an IPSEC tunnel
- Deploy and audit a VPN based on IPSEC, either by configuring it by hand or by using all-in-one

preconfigured tools available

- Deploy and audit a network intrusion detection system (or intrusion prevention system)
- Design a complete security architecture for a complex network
- Identify the advantages and limitations of different intrusion detection solutions;
- Position the intrusion detection sensors efficiently;
- Analyze the events collected by the sensors and correlate these events to identify a real threat.
- Identify vulnerabilities in web architectures and propose solutions to achieve effective protection.

Necessary prerequisites

Good knowledge of web architectures, cryptography and networks.

Évaluation

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

Practical info

Location(s)

[FRANCAIS] Sécurité des systèmes embarqués critiques



ECTS
5 crédits



Hourly volume
31h

Introducing

Description

Objectives

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

- The different techniques used today to secure ground / air communications with satellites;
- Issues related to different types of mission and standards used;
- The means for securing transmissions spread spectrum (TRANSSEC);
- The principles of the computer network for air traffic management (ATM) and related security issues;
- The principles and issues of security management in the context of the DGAC.

The student will be able to:

- Make relevant choice for securing ground / air communications architectures;
- Perform a black box analysis of a critical embedded system

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

Practical info

Location(s)

 Toulouse

Évaluation

[FRANCAIS] SHSJ



ECTS
5 crédits



Hourly volume
42h

Introducing

Description

Évaluation

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

Practical info

Location(s)

 Toulouse

[FRANCAIS] UE commune M2 RT



ECTS
9 crédits



Hourly volume
45h

Introducing

Description

Évaluation

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

Practical info

Location(s)

 Toulouse

Energy production from renewable resources



ECTS
5 crédits



Hourly volume
32h

Introducing

Description

Évaluation

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

Practical info

Location(s)

 Toulouse

Technologies and architectures for the conversion and storage of electrical energy



ECTS
5 crédits



Hourly volume
47h

Introducing

Description

Évaluation

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

Practical info

Location(s)

 Toulouse

Innovative materials for the energy



ECTS
5 crédits



Hourly volume
15h

Introducing

Description

Évaluation

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

Practical info

Location(s)

 Toulouse

Combination of multi-sources of energy platform



ECTS
9 crédits



Hourly volume
161h

Introducing

Description

Évaluation

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

Practical info

Location(s)

 Toulouse

The different generation technologies and energy management



ECTS
5 crédits



Hourly volume
7h

Introducing

Description

Évaluation

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

Practical info

Location(s)

 Toulouse

Human relations



ECTS
6 crédits



Hourly volume
78h

Introducing

Description

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

Évaluation

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

Practical info

Location(s)

 Toulouse

Necessary prerequisites

None

[FRANCAIS] Challenge – Formation ECIU



ECTS

1 crédits



Hourly volume

Introducing

Description

Évaluation

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

Practical info

Location(s)

 Toulouse

[FRANCAIS] Challenge – Formation ECIU



ECTS
2 crédits



Hourly volume

Introducing

Description

Évaluation

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

Practical info

Location(s)

 Toulouse

[FRANCAIS] Challenge – Formation ECIU



ECTS
3 crédits



Hourly volume

Introducing

Description

Évaluation

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

Practical info

Location(s)

 Toulouse

[FRANCAIS] Challenge – Formation ECIU



ECTS
4 crédits



Hourly volume

Introducing

Description

Évaluation

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

Practical info

Location(s)

 Toulouse

[FRANCAIS] Challenge – Formation ECIU



ECTS
5 crédits



Hourly volume

Introducing

Description

Évaluation

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

Practical info

Location(s)

 Toulouse

French I



ECTS
3 crédits



Hourly volume

Introducing

Description

Évaluation

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

Practical info

Location(s)

 Toulouse

Training period 4th year

Introducing

Description

Internship period must last between 8 and 16 weeks
Internship period can be done in France or in a foreign country
Internship period can be done in an enterprise or a laboratory
Student job must concern theoretical knowledge learned in the department (physics, materials, electronics, instrumentation, ...)

Objectives

Goals of internship are :

- Get a professional experience in enterprise or laboratory
- apply theoretical knowledges
- produce a scientific work

Necessary prerequisites

Theoretical knowledge of Genie Physique 4th year program

Évaluation

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

Practical info

Location(s)

 Toulouse

Training period 5th year

Introducing

 Toulouse

Description

16 to 26-week internship in a company whose main field of activity is civil engineering.

Objectives

The aim of this internship is to position the student as a working engineer, and to validate the skills acquired during the course. To this end, the student will develop a particular theme during the internship, which will be the subject of a dissertation (entitled technical dissertation).

The problem will be defined by mutual agreement between the company and the INSA tutor.

Évaluation

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

Practical info

Location(s)

[FRANCAIS] Architecture électronique pour l'énergie



ECTS
5 crédits



Hourly volume
66h

Introducing

Description

Objectives

General objectives: the goal of this UF is to know how to determine, size and produce the electronic architecture of an on-board system, select the components, under energy constraints: constraint of battery, autonomy, availability of power sources. energy. The UF therefore addresses questions of the architecture of electrical energy converters, the installation of charging and battery management systems, and architecture with multiple energy sources (advertising energy). The measurement of physical quantities (current, voltage, temperature, etc.) is essential in an energy conversion or control chain for an electromechanical actuator. The UF also deals with the various sensor technologies and associated Electronic Instrumentation and Measurements.

At the end of this module the student will be able to:

- Design an electronic architecture of an embedded system under energy constraints
- Select appropriate electronic components for energy converter system
- Choose electrical energy storage solutions according to the associated constraints

- (Battery Management System / cell balancing
- Implement an ambient energy harvesting solution to design embedded systems energy self-sufficient
- Create a co-design HW / SW

Évaluation

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

Practical info

Location(s)

 Toulouse

Embedded software and command for energy



ECTS
4 crédits



Hourly volume
48h

Introducing

Description

Objectives

Objectives:

The electrical efficiency of electronic systems can be drastically improved by an appropriate selection of controls and algorithms whose objectives are to reduce as much as possible the activation of available resources of programmable devices. The modeling of processing energy systems is central to evaluate their stability properties but also their dynamic performances which are key properties for the design of adequate control laws. One of the main difficulties is due to the nonlinear behavior and the commuting nature of all the processing energy systems which impose an important adaption of the control design methods. In this UF, control law design methods considering efficiency constraints are presented for static power electronics converters and for electrical motors. Some algorithmic aspects for the low energy programming associated to a wireless system are also developed.

Expected Competences:

- Modeling of static power electronic converters (Linearization around an equilibrium state, Nonlinear model, Switched model)
- Design and implementation of a control law for a static converter (linear and nonlinear control)

- Development of an embedded software reducing the energy consumption of the programmable platform

Évaluation

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

Practical info

Location(s)

 Toulouse

Technology, fabrication and industrialization of embedded systems



ECTS
5 crédits



Hourly volume
66h

Introducing

Description

Objectives

General objectives: this UF addresses the integration, characterization and certification aspects of electronic systems. The students approach the various technologies of manufacturing and assembly of electronic systems, by addressing the tools of specification and industrial design (Electronic Computer-Aided Design). In addition, aspects of design methods and standards / conformities for the economical marketing of an electronic product are addressed. As the power components are subject to strong voltage and thermal constraints, issues of reliability and robustness are also addressed. Finally, the characterization aspects of various energy-related performance in electronic systems are dealt with impedance adaptation for optimal transfer of power to an antenna, EMC and ESD characterization, measurement of energy consumption.

This UF is deliberately based on an industrial approach and is carried out around the design of an electronic card prototype in an industrial workshop and then its characterization.

- Integrate an electronic system

- Design an e-card, under integration, energy, EMC, thermal constraints, etc.
- Reliability and robustness of the new power components
- Measure the performance of an electronic system (energy consumption, efficiency, CEM, impedance matching)
- Specify and carry out the certification process of an electronic system

Évaluation

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

Practical info

Location(s)

 Toulouse

Electronic design for electrical vehicle



ECTS
5 crédits



Hourly volume
55h

Introducing

Description

Objectives

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

- Advanced commands and actuators for electric vehicle powertrain
- Aechnologies and devices for electric vehicles
- Aevelop field oriented control for synchronous motor control
- Aropose and dimension electronic architecture for electromechanical actuator chains
- Analyze the failure modes of a motor driver and propose diagnosis and solutions to ensure safety

The student will be able to:

- Design and realize the command of electromechanical actuator (field oriented control for synchronous motor command).
 - Design electronic architecture and embedded software for safe powertrain application, realized with real devices dedicated for automotive applications (microcontroller, smart power devices, sensors, system basis chip)
-

Évaluation

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

Practical info

Location(s)

 Toulouse

Interdisciplinary project: smart energy manager for solar panel system



ECTS
5 crédits



Hourly volume
68h

Introducing

Description

Objectives

The aim of the module is to mobilize all the skills in electronics, automatic control systems and embedded programming acquired during years 2,3,4,5 for an ambitious and complex engineering or R&D project. The students will be work with a huge autonomy. During this module, the students will work on an engineering project proposed by a industrial partner with the following steps:

- ¿ Team work (organization, communication planning)
- ¿ Project based on partner specification
- ¿ Research and analysis of solutions, positioning of the solution to the state-of-the-art
- ¿ Design, assembling, test of the proposed solutions
- ¿ Meeting points with the customer
- ¿ Planning and hardware supply management
- ¿ Reports and deliverables

Necessary prerequisites

I4AESE51 ¿ Energy management for embedded systems

I4AEAU11 ¿ Data acquisition and digital command
I4AEIM11 -Microcontroller programming
I4AESE31 - Analog architectures for embedded systems
I5AESE11 - Electronic architectures for energy
I5AELA11-Automation and embedded software for energy

Évaluation

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

Practical info

Location(s)

 Toulouse

Human relations



ECTS
6 crédits



Hourly volume
78h

Introducing

Description

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

Évaluation

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

Practical info

Location(s)

 Toulouse

Necessary prerequisites

None

Prescriptive Analytics



ECTS

4 crédits



Hourly volume

Introducing

Description

Objectives

This course addresses several efficient models for processing data encountered in industrial combinatorial problems. These models are based on logical inference and mathematical optimisation techniques : constraint satisfaction problems (CSPs), boolean satisfiability (SAT)

and integer linear programming (ILP).

In the first part (CSPs), students are expected to understand and to be able to apply the main constraint propagation techniques and solving strategies, by hand, but are also initiated to programming tools that integrate general solvers (ex : CPLEX) during practical works.

In the SAT modeling part of this course, students are initiated to some propagation and heuristic solving techniques used in SAT solvers (DPPLL, Implication Graphs, Conflict Analysis, Two-watched literals algorithm). Various applications problems such as allocation, graph colouring, scheduling serve as training examples for SAT encoding.

In the last part (MILPs), students will have to translate industrial problems into mixed-integer linear programs, then to solve them efficiently using branching algorithms or decomposition methods, embedded in existing tools such as CPLEX.

Necessary prerequisites

Algorithmics & programming (I2MIIF11, I2MIIF21).
Fundamentals in Computer Science (I4IRIF11), Intelligent Systems (I4IRSD11)

Évaluation

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

Practical info

Location(s)

 Toulouse

Software Defined Communication Infrastructure



ECTS

4 crédits



Hourly volume

Introducing

Description

Objectives

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

- the concepts related to the virtualization of network functions (in the NFV sense)
- the concepts related to network programming (in the SDN sense)
- the model of autonomic computing defined (among others) by IBM
- the views of real-world actors involved in a large-scale project (application developer, -middleware operator, network operator)

The student will be able to:

- use an SDN network emulator (ContainterNET)
- use an SDN (Ryu) controller
- use a standardized MANO NFV (SON-EMU)
- develop a standardized VNF
- architect and implement solutions that take advantage of the concepts of virtualization of network functions and programmable networks, in the context of the realization of an SDCI
- apply and implement the model of autonomic computing to a problem of management of QoS in an SDCI

Necessary prerequisites

Networks Interconnexion - TCP/IP

Object oriented design UML (2. 0)

Object Oriented Programming - Java

Service-Oriented Architectures

Network Programming - TCP/IP

Évaluation

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

Practical info

Location(s)

 Toulouse

Cloud Computing



ECTS
6 crédits



Hourly volume
69h

Introducing

Description

Évaluation

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

Practical info

Location(s)

 Toulouse

Model driven engineering



ECTS
6 crédits



Hourly volume

Introducing

Description

Évaluation

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

Practical info

Location(s)

 Toulouse

Modeling, evaluation and optimisation of networks and protocols



ECTS
4 crédits



Hourly volume
78h

Introducing

Description

Évaluation

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

Practical info

Location(s)

 Toulouse

[FRANCAIS] Commande avancée et supervision



ECTS
6 crédits



Hourly volume

Introducing

Description

Évaluation

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

Practical info

Location(s)

 Toulouse

Projet physique PTP_ISS



ECTS
4 crédits



Hourly volume

Introducing

Description

Évaluation

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

Practical info

Location(s)

 Toulouse

Service Robotics



ECTS
6 crédits



Hourly volume
50h

Introducing

Description

Objectives

At the end of this module, the student would be able to explain the main components of a robot service and to say in which way it differs from industrial robotics; he/she will know the main concepts in humanoid robotics and why it is difficult to control a walking robot. His/her knowledge will include the main notions in jointed robotics: direct and inverse kinematic models, dynamic model of the robot, trajectory generation and stability of a bipedal robot.

The student is supposed to be able to model a jointed robot, to understand its technical components and to analyse the functioning of a service robot in its domestic or professional environment.

Necessary prerequisites

Matrix theory, Linear control

Évaluation

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

Practical info

Location(s)

 Toulouse

Human relations



ECTS
6 crédits



Hourly volume
78h

Introducing

Description

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

Évaluation

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

Practical info

Location(s)

 Toulouse

Necessary prerequisites

None

Embedded Computer Architecture



ECTS

4 crédits



Hourly volume

Introducing

- Choose a computer architecture adapted to the needs of an application.

Description

Necessary prerequisites

C programming, computer organization, network, operating system

Objectives

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

- The principles and specificities of networks used in embedded systems in the automotive, avionics and connected objects,
- The specificities of operating systems and their main services (scheduling, memory, privileges, etc.) for embedded systems
- The advantages and disadvantages of the different computer architectures used for embedded systems
- The elements impacting the performance (computation, energy consumption, etc.) of a computer architecture and the methods to optimize them.

The student will be able to:

- Choose a network technology that meets the needs of an embedded system,
- Set up the support network of an embedded system,
- Deploy an operating system on an embedded architecture,
- Develop a driver within an operating system,
- Compare two embedded computer architectures in terms of performance,

Évaluation

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

Practical info

Location(s)



Toulouse

Engineering methods



ECTS
4 crédits



Hourly volume
42h

Introducing

Location(s)

 Toulouse

Description

Objectives

Present the main principles of systems engineering and software engineering: concepts, methods and tools, to define and control the process development of a critical embedded system.

The student will be able to:

- apply these general competences to computer based embedded systems explain different methods and chose the best adapted to develop a specific application.

Évaluation

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

Practical info

Dependability



ECTS

5 crédits



Hourly volume

68h

Introducing

Description

Objectives

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

The basic concepts of dependability and main methods and techniques for obtaining and validation of the safety.

The student will be able to:

- apply these general competences to computer based embedded systems
- explain different methods and chose the best adapted to develop a specific application.

Necessary prerequisites

Discrete event systems, Propositional Logic,

Évaluation

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Practical info

Location(s)

 Toulouse

Interdisciplinary Project



ECTS
5 crédits



Hourly volume

Introducing

concise and precise style respecting the conventions of genre in writing as well as orally

Description

Objectives

At the end of this module, the student will be able to:

- Implement and apply agile management according to the agile method in order to create a product,
- Select and interweave a set of interdisciplinary technical skills in order to develop a critical embedded system,
- Search autonomously and be able to critique technical solutions for which he/she does not have prior knowledge in order to meet requirements specific to critical embedded systems,
- Design and build a product deployed on a heterogeneous and communicating embedded architecture guaranteeing performance properties,
- Define needs, requirements and architecture when designing a product
- Communicate in an interdisciplinary context and to work together with actors with heterogeneous skills,
- Adapt the writing and presentation of scientific results according to the audience (client, decision maker, evaluator, general public) and through various media (presentation, website, report, synthesis, poster).

To express themselves correctly in English, using a

Évaluation

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

Practical info

Location(s)

 Toulouse

Prescriptive Analytics



ECTS

4 crédits



Hourly volume

Introducing

Description

Objectives

This course addresses several efficient models for processing data encountered in industrial combinatorial problems. These models are based on logical inference and mathematical optimisation techniques : constraint satisfaction problems (CSPs), boolean satisfiability (SAT)

and integer linear programming (ILP).

In the first part (CSPs), students are expected to understand and to be able to apply the main constraint propagation techniques and solving strategies, by hand, but are also initiated to programming tools that integrate general solvers (ex : CPLEX) during practical works.

In the SAT modeling part of this course, students are initiated to some propagation and heuristic solving techniques used in SAT solvers (DPPLL, Implication Graphs, Conflict Analysis, Two-watched literals algorithm). Various applications problems such as allocation, graph colouring, scheduling serve as training examples for SAT encoding.

In the last part (MILPs), students will have to translate industrial problems into mixed-integer linear programs, then to solve them efficiently using branching algorithms or decomposition methods, embedded in existing tools such as CPLEX.

Necessary prerequisites

Algorithmics & programming (I2MIIF11, I2MIIF21).
Fundamentals in Computer Science (I4IRIF11), Intelligent Systems (I4IRSD11)

Évaluation

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

Practical info

Location(s)

 Toulouse

Software Defined Communication Infrastructure



ECTS
4 crédits



Hourly volume

Introducing

Description

Objectives

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

- the concepts related to the virtualization of network functions (in the NFV sense)
- the concepts related to network programming (in the SDN sense)
- the model of autonomic computing defined (among others) by IBM
- the views of real-world actors involved in a large-scale project (application developer, -middleware operator, network operator)

The student will be able to:

- use an SDN network emulator (ContainterNET)
- use an SDN (Ryu) controller
- use a standardized MANO NFV (SON-EMU)
- develop a standardized VNF
- architect and implement solutions that take advantage of the concepts of virtualization of network functions and programmable networks, in the context of the realization of an SDCI
- apply and implement the model of autonomic computing to a problem of management of QoS in an SDCI

Necessary prerequisites

Networks Interconnexion - TCP/IP

Object oriented design UML (2. 0)

Object Oriented Programming - Java

Service-Oriented Architectures

Network Programming - TCP/IP

Évaluation

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

Practical info

Location(s)

 Toulouse

Cloud Computing



ECTS
6 crédits



Hourly volume
69h

Introducing

Description

Évaluation

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

Practical info

Location(s)

 Toulouse

Model driven engineering



ECTS
6 crédits



Hourly volume

Introducing

Description

Évaluation

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Practical info

Location(s)

 Toulouse

Modeling, evaluation and optimisation of networks and protocols



ECTS
4 crédits



Hourly volume
78h

Introducing

Description

Évaluation

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

Practical info

Location(s)

 Toulouse

[FRANCAIS] Commande avancée et supervision



ECTS
6 crédits



Hourly volume

Introducing

Description

Évaluation

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

Practical info

Location(s)

 Toulouse

Projet physique PTP_ISS



ECTS
4 crédits



Hourly volume

Introducing

Description

Évaluation

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

Practical info

Location(s)

 Toulouse

Service Robotics



ECTS

6 crédits



Hourly volume

50h

Introducing

Description

Objectives

At the end of this module, the student would be able to explain the main components of a robot service and to say in which way it differs from industrial robotics; he/she will know the main concepts in humanoid robotics and why it is difficult to control a walking robot. His/her knowledge will include the main notions in jointed robotics: direct and inverse kinematic models, dynamic model of the robot, trajectory generation and stability of a bipedal robot.

The student is supposed to be able to model a jointed robot, to understand its technical components and to analyse the functioning of a service robot in its domestic or professional environment.

Necessary prerequisites

Matrix theory, Linear control

Évaluation

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

Practical info

Location(s)

 Toulouse

Software engineering and service oriented architectures



ECTS

4 crédits



Hourly volume

41h

Introducing

Description

Objectives

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

- Software project lifecycle
- The challenges of software development
- Project management methods, particularly the agile method
- Service oriented architecture
- Resource oriented architecture (RESTful)
- Microservice architecture

The student will be able to:

- Control the conduct of a software development project with a team by following the scrum agile method
- Perform requirement analysis: expression, analysis and transformation into technical requirements
- Design and develop a service oriented architecture
- Implement Web services SOAP and Rest
- Develop a service composition (orchestration) via BPEL
- Develop microservices
- Understand and implement a RESTfull API

Necessary prerequisites

Algorithmic, Object oriented programming (Java), Object oriented design (UML), XML, and XML schema

Évaluation

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

Practical info

Location(s)

 Toulouse

Reliability and model-checking



ECTS
4 crédits



Hourly volume
42h

Introducing

Description

Objectives

At the end of this module, the student will have understood and be able to explain the main principles of systems engineering and software engineering: concepts, methods and tools, to define and control the process development of a critical embedded system.

The student will be able to:

- apply these general competences to computer based systems
- .explain different methods and chose the best adapted to develop a specific application.

Necessary prerequisites

Petri Nets, Communicating Automata, formal Logic, Graph theory

Évaluation

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

Practical info

Location(s)

 Toulouse

[FRANCAIS] Analyse descriptive et prédictive



ECTS

4 crédits



Hourly volume

56h

Introducing

(basic knowledge), programming

Description

Évaluation

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Objectives

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

- the different problems associated with data study (in exploratory data analysis and in machine learning)
- the main concepts and algorithms allowing to solve those problems
- the main existing libraries

The student will be able to:

- analyze the requirements of the data processing
- set up the most efficient algorithms
- use the algorithms that are implemented in the main existing libraries
- adapt and develop his/her own algorithms
- analyze and explain the results of those algorithms
- program in Python and R languages

Practical info

Location(s)

 Toulouse

Necessary prerequisites

Algorithms, data structures, computational complexity, programming, optimization, supervised machine learning (basic knowledge), statistics and probability

Infrastructure for massive data processing



ECTS

4 crédits



Hourly volume

61h

Introducing

Description

Objectives

At the end of this module, the student will understand and be able to explain the concepts and techniques related to the main pillars that have to be managed by an IT service provider, in terms of:

- physical infrastructure (network, storage , computing) ;
- organizational and data management (allocation of storage , ...);
- computation services of such data (based on calculation models like map reduce, etc.).

The student will be able to:

- 1) With regard to physical infrastructures
 - design and deploy a network architecture adapted to a big data oriented service, using advanced network technology (network virtualization, optimization protocols, etc.);
 - dimension and deploy a physical storage infrastructure aimed at receiving massive amounts of data;
 - assess and deploy the computing power required to process massive data, based on the latest technologies for processors, such as virtualization.

2) With regard to the organization and data management

- design and implement tools to organize data within the physical infrastructure;
- provide appropriate interfaces for access to such data;
- choose a data organization adapted to the constraints of treatment (offline versus real-time processing);

3) With regard to the data processing services

- provide facilities for analyzing data and extract value added information (e.g., learning, trends).

Necessary prerequisites

Networks
Operating systems
Databases
Algorithmic and programming

Évaluation

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Practical info

Location(s)

 Toulouse

[FRANCAIS] Projet SDBD



ECTS
4 crédits



Hourly volume
52h

Introducing

Description

Objectives

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

- The objectives of an Artificial Intelligence and Big Data project
- The methodological and technological choices retained and developed to respond to a specific project

The student should be able:

- To create a software chain for the collection, storage and processing of massive data,
- to argue about the choices made,
- to evaluate the proposed solution.

Necessary prerequisites

Descriptive and Predictive Analysis, Big Data Infrastructures

Évaluation

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

Practical info

Location(s)

 Toulouse

Human relations



ECTS
6 crédits



Hourly volume
78h

Introducing

Description

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

Évaluation

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

Practical info

Location(s)

 Toulouse

Necessary prerequisites

None

Module élève ingénieur (UE PETAR dispensée UPS)



ECTS
4 crédits



Hourly volume

Introducing

Description

Évaluation

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Practical info

Location(s)

 Toulouse

Training period 5th year

Introducing

 Toulouse

Description

16 to 26-week internship in a company whose main field of activity is civil engineering.

Objectives

The aim of this internship is to position the student as a working engineer, and to validate the skills acquired during the course. To this end, the student will develop a particular theme during the internship, which will be the subject of a dissertation (entitled technical dissertation).

The problem will be defined by mutual agreement between the company and the INSA tutor.

Évaluation

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

Practical info

Location(s)

Training period 4th year

Introducing

Description

Internship period must last between 8 and 16 weeks
Internship period can be done in France or in a foreign country
Internship period can be done in an enterprise or a laboratory
Student job must concern theoretical knowledge learned in the department (physics, materials, electronics, instrumentation, ...)

Objectives

Goals of internship are :

- Get a professional experience in enterprise or laboratory
- apply theoretical knowledges
- produce a scientific work

Necessary prerequisites

Theoretical knowledge of Genie Physique 4th year program

Évaluation

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

Practical info

Location(s)

 Toulouse