INSA INSTITUT NATIONAL DES SCIENCES APPLIQUÉES TOULOUSE

FIFTH YEAR – AE

Practical info

Location(s)

Toulouse

Multidisciplinary design

ECTS
4 crédits

Hourly volume
45h

Introducing

Objectives

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

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

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

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

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

Necessary prerequisites

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

Practical info

Location(s)

Toulouse

Management of risks

ECTS
5 crédits

Hourly volume
68h

Introducing

Objectives

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

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

Location(s)

Toulouse

Necessary prerequisites

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

Practical info

Industrialization

ECTS
5 crédits

Hourly volume

Introducing

Objectives

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

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

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

Necessary prerequisites

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

Practical info

Location(s)

Toulouse

Systems on chip

ECTS
4 crédits

Hourly volume
47h

Practical info

Location(s)

Toulouse

Thermal engines and systems

ECTS
4 crédits

Hourly volume
56h

Introducing

Objectives

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

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

Location(s)

Toulouse

Necessary prerequisites

Basics of thermodynamics and heat transfer.

Practical info

[FRANCAIS] Projet de recherche et propriété industrielle

ECTS
6 crédits

Hourly volume
74h

Practical info

Location(s)

Toulouse

Human relations

ECTS
6 crédits

Hourly volume
78h

Introducing

Location(s)

Toulouse

Objectives

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

Necessary prerequisites

None

Practical info

[FRANCAIS] Architecture électronique pour l'énergie

ECTS
5 crédits

Hourly volume
66h

Introducing

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

Practical info

Location(s)

Toulouse

Embedded software and command for energy

ECTS
4 crédits

Hourly volume
48h

Introducing

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 programable 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 programable platform

Practical info

Location(s)

Toulouse

Technology, fabrication and industrialization of embedded systems

ECTS
5 crédits

Hourly volume
66h

Introducing

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

Practical info

Location(s)

Toulouse

Electronic design for electrical vehicle

ECTS
5 crédits

Hourly volume
55h

Toulouse

Introducing

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)

Practical info

Location(s)

Interdisciplinary project: smart energy manager for solar panel system

ECTS
5 crédits

Hourly volume
68h

Introducing

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 programmation
I4AESE31 - Analog architectures for embedded systems
I5AEEE11 - Electronic architectures for energy
I5AELA11-Automation and embedded software for energy

Practical info

Location(s)

Toulouse

Human relations

ECTS
6 crédits

Hourly volume
78h

Introducing

Location(s)

Toulouse

Objectives

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

Necessary prerequisites

None

Practical info

Prescriptive Analytics

ECTS
4 crédits

Hourly volume

Introducing

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 litterals 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)

Practical info

Location(s)

Toulouse

Software Defined Communication Infrastructure

ECTS
4 crédits

Hourly volume

Introducing

Objectives

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

- 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

Practical info

Location(s)

Toulouse

Cloud Computing

ECTS
6 crédits

Hourly volume
69h

Practical info

Location(s)

Toulouse

Model driven engineering

ECTS
6 crédits

Hourly volume

Practical info

Location(s)

Toulouse

Modeling, evaluation and optimisation of networks and protocols

ECTS
4 crédits

Hourly volume
78h

Practical info

Location(s)

Toulouse

[FRANCAIS] Commande avancée et supervision

ECTS
6 crédits

Hourly volume

Practical info

Location(s)

Toulouse

Projet physique PTP_ISS

ECTS
4 crédits

Hourly volume

Practical info

Location(s)

Toulouse

Service Robotics

ECTS
6 crédits

Hourly volume
50h

Toulouse

Introducing

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

Practical info

Location(s)

Human relations

ECTS
6 crédits

Hourly volume
78h

Introducing

Location(s)

Toulouse

Objectives

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

Necessary prerequisites

None

Practical info

Embedded Computer Architecture

ECTS
4 crédits

Hourly volume

Introducing

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

Necessary prerequisites

C programming, computer organization, network, operating system

Practical info

Location(s)

Toulouse

Engineering methods

ECTS
4 crédits

Hourly volume
42h

Introducing

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.

Practical info

Location(s)

Toulouse

Dependability

ECTS
5 crédits

Hourly volume
68h

Introducing

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,

Practical info

Location(s)

Toulouse

Interdisciplinary Project

ECTS
5 crédits

Hourly volume

Introducing

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

Practical info

Location(s)

Toulouse

Smart Devices

ECTS
5 crédits

Hourly volume

Introducing

Objectives

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

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".
MICROCONTROLERS 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

Practical info

Location(s)

Toulouse

Communication

ECTS
5 crédits

Hourly volume

Introducing

Objectives

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

-the 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

Practical info

Location(s)

Toulouse

Middleware and services

ECTS
5 crédits

Hourly volume
62h

Introducing

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

Practical info

Location(s)

Toulouse

Analysis and data processing, business applications

ECTS
4 crédits

Hourly volume
37h

Introducing

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

Practical info

Location(s)

Toulouse

Innovative project

ECTS
5 crédits

Hourly volume
76h

Introducing

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.

Necessary prerequisites

(English) Students must master general English and follow strict standard scientific guidelines for both oral presentations and written abstracts and reports.

Practical info

Location(s)

Toulouse

Innovation and humanity

ECTS
6 crédits

Hourly volume
76h

Introducing

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.

Necessary prerequisites

Prerequisites
None

Practical info

Location(s)

Toulouse

Qualitative Approach

ECTS
4 crédits

Hourly volume
45h

Practical info

Location(s)

Toulouse

Quantitative Approach

ECTS
5 crédits

Hourly volume
45h

Practical info

Location(s)

Toulouse

Designing for safety

ECTS
5 crédits

Hourly volume
42h

Practical info

Location(s)

Toulouse

Process Safety

ECTS
5 crédits

Hourly volume
45h

Practical info

Location(s)

Toulouse

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Functional Safety

Practical info

Location(s)

Toulouse

INSA INSTITUT NATIONAL DES SCIENCES APPLIQUÉES TOULOUSE

[FRANCAIS] Structural Safety

Practical info

Location(s)

Toulouse

Human relations

ECTS
6 crédits

Hourly volume
78h

Introducing

Location(s)

Toulouse

Objectives

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

Necessary prerequisites

None

Practical info

Toxic risks

ECTS
5 crédits

Hourly volume
42h

Practical info

Location(s)

Toulouse

Security fundamentals

ECTS
5 crédits

Hourly volume
77h

Introducing

Objectives

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

- main concepts 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

Practical info

Location(s)

Toulouse

Software security

ECTS
4 crédits

Hourly volume
47h

Introducing

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.

Practical info

Location(s)

Toulouse

System security, hardware security and reverse

ECTS
4 crédits

Hourly volume
54h

Introducing

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 contermeasures;
- 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 contermeasures 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.

Practical info

Location(s)

Toulouse

Networks and protocols security

ECTS
3 crédits

Hourly volume
40h

Introducing

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 imlement 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 functionnalities (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.

Practical info

Location(s)

Toulouse

Architectures of secured networks

ECTS
4 crédits

Hourly volume
54h

Introducing

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 gatewaus
- Implement and audit such an IPSEC tunnel
- Deploy and audit a VPN based on IPSEC, either by configuring ¿by hand¿ the VPN 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.

Practical info

Location(s)

Toulouse

[FRANCAIS] Sécurité des systèmes embarqués critiques

ECTS
5 crédits

Hourly volume
31h

Introducing

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

Practical info

Location(s)

Toulouse

[FRANCAIS] SHSJ

ECTS
5 crédits

Hourly volume
42h

Practical info

Location(s)

Toulouse

[FRANCAIS] UE commune M2 RT

ECTS
9 crédits

Hourly volume
45h

Practical info

Location(s)

Toulouse

Energy production from renewable resources

ECTS
5 crédits

Hourly volume
32h

Practical info

Location(s)

Toulouse

Technologies and architectures for the conversion and storage of electrical energy

ECTS
5 crédits

Hourly volume
47h

Practical info

Location(s)

Toulouse

Innovative materials for the energy

ECTS
5 crédits

Hourly volume
15h

Practical info

Location(s)

Toulouse

Combination of multi-sources of energy platform

ECTS
9 crédits

Hourly volume
161h

Practical info

Location(s)

Toulouse

The different generation technologies and energy management

ECTS
5 crédits

Hourly volume
7h

Practical info

Location(s)

Toulouse

Human relations

ECTS
6 crédits

Hourly volume
78h

Introducing

Location(s)

Toulouse

Objectives

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

Necessary prerequisites

None

Practical info

[FRANCAIS] Challenge – Formation ECIU

ECTS
1 crédits

Hourly volume

Practical info

Location(s)

Toulouse

[FRANCAIS] Challenge – Formation ECIU

ECTS
2 crédits

Hourly volume

Practical info

Location(s)

Toulouse

[FRANCAIS] Challenge – Formation ECIU

ECTS
3 crédits

Hourly volume

Practical info

Location(s)

Toulouse

[FRANCAIS] Challenge – Formation ECIU

ECTS
4 crédits

Hourly volume

Practical info

Location(s)

Toulouse

[FRANCAIS] Challenge – Formation ECIU

ECTS
5 crédits

Hourly volume

Practical info

Location(s)

Toulouse

French I

ECTS
3 crédits

Hourly volume

Practical info

Location(s)

Toulouse

Training period 4th year

ECTS
9 crédits

Hourly volume

Practical info

Location(s)

Toulouse

Training period 5th year

ECTS
21 crédits

Hourly volume

Practical info

Location(s)

Toulouse

[FRANCAIS] Architecture électronique pour l'énergie

ECTS
5 crédits

Hourly volume
66h

Introducing

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

Practical info

Location(s)

Toulouse

Embedded software and command for energy

ECTS
4 crédits

Hourly volume
48h

Introducing

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 programable 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 programable platform

Practical info

Location(s)

Toulouse

Technology, fabrication and industrialization of embedded systems

ECTS
5 crédits

Hourly volume
66h

Introducing

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

Practical info

Location(s)

Toulouse

Electronic design for electrical vehicle

ECTS
5 crédits

Hourly volume
55h

Toulouse

Introducing

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)

Practical info

Location(s)

Interdisciplinary project: smart energy manager for solar panel system

ECTS
5 crédits

Hourly volume
68h

Introducing

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 programmation
I4AESE31 - Analog architectures for embedded systems
I5AEEE11 - Electronic architectures for energy
I5AELA11-Automation and embedded software for energy

Practical info

Location(s)

Toulouse

Human relations

ECTS
6 crédits

Hourly volume
78h

Introducing

Location(s)

Toulouse

Objectives

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

Necessary prerequisites

None

Practical info

Prescriptive Analytics

ECTS
4 crédits

Hourly volume

Introducing

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 litterals 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)

Practical info

Location(s)

Toulouse

Software Defined Communication Infrastructure

ECTS
4 crédits

Hourly volume

Introducing

Objectives

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

- 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

Practical info

Location(s)

Toulouse

Cloud Computing

ECTS
6 crédits

Hourly volume
69h

Practical info

Location(s)

Toulouse

Model driven engineering

ECTS
6 crédits

Hourly volume

Practical info

Location(s)

Toulouse

Modeling, evaluation and optimisation of networks and protocols

ECTS
4 crédits

Hourly volume
78h

Practical info

Location(s)

Toulouse

[FRANCAIS] Commande avancée et supervision

ECTS
6 crédits

Hourly volume

Practical info

Location(s)

Toulouse

Projet physique PTP_ISS

ECTS
4 crédits

Hourly volume

Practical info

Location(s)

Toulouse

Service Robotics

ECTS
6 crédits

Hourly volume
50h

Toulouse

Introducing

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

Practical info

Location(s)

Human relations

ECTS
6 crédits

Hourly volume
78h

Introducing

Location(s)

Toulouse

Objectives

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

Necessary prerequisites

None

Practical info

Embedded Computer Architecture

ECTS
4 crédits

Hourly volume

Introducing

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

Necessary prerequisites

C programming, computer organization, network, operating system

Practical info

Location(s)

Toulouse

Engineering methods

ECTS
4 crédits

Hourly volume
42h

Introducing

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.

Practical info

Location(s)

Toulouse

Dependability

ECTS
5 crédits

Hourly volume
68h

Introducing

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,

Practical info

Location(s)

Toulouse

Interdisciplinary Project

ECTS
5 crédits

Hourly volume

Introducing

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

Practical info

Location(s)

Toulouse

Prescriptive Analytics

ECTS
4 crédits

Hourly volume

Introducing

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 litterals 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)

Practical info

Location(s)

Toulouse

Software Defined Communication Infrastructure

ECTS
4 crédits

Hourly volume

Introducing

Objectives

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

- 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

Practical info

Location(s)

Toulouse

Cloud Computing

ECTS
6 crédits

Hourly volume
69h

Practical info

Location(s)

Toulouse

Model driven engineering

ECTS
6 crédits

Hourly volume

Practical info

Location(s)

Toulouse

Modeling, evaluation and optimisation of networks and protocols

ECTS
4 crédits

Hourly volume
78h

Practical info

Location(s)

Toulouse

[FRANCAIS] Commande avancée et supervision

ECTS
6 crédits

Hourly volume

Practical info

Location(s)

Toulouse

Projet physique PTP_ISS

ECTS
4 crédits

Hourly volume

Practical info

Location(s)

Toulouse

Service Robotics

ECTS
6 crédits

Hourly volume
50h

Toulouse

Introducing

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

Practical info

Location(s)

Software engineering and service oriented architectures

ECTS
4 crédits

Hourly volume
41h

Introducing

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

Practical info

Location(s)

Toulouse

Reliability and model-checking

ECTS
4 crédits

Hourly volume
42h

Introducing

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

Practical info

Location(s)

Toulouse

[FRANCAIS] Analyse descriptive et prédictive

ECTS
4 crédits

Hourly volume
56h

Introducing

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

Necessary prerequisites

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

Practical info

Location(s)

Toulouse

Infrastructure for massive data processing

ECTS
4 crédits

Hourly volume
61h

Introducing

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 programing

Practical info

Location(s)

Toulouse

[FRANCAIS] Projet SDBD

ECTS
4 crédits

Hourly volume
52h

Toulouse

Introducing

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

Practical info

Location(s)

Human relations

ECTS
6 crédits

Hourly volume
78h

Introducing

Location(s)

Toulouse

Objectives

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

Necessary prerequisites

None

Practical info

Module élève ingénieur (UE PETAR dispensée UPS)

ECTS
4 crédits

Hourly volume

Practical info

Location(s)

Toulouse

INSA INSTITUT NATIONAL DES SCIENCES APPLIQUÉES TOULOUSE

Training period 5th year

ECTS
21 crédits

Hourly volume

Practical info

Location(s)

Toulouse

INSA INSTITUT NATIONAL DES SCIENCES APPLIQUÉES TOULOUSE

Training period 4th year

ECTS
9 crédits

Hourly volume

Practical info

Location(s)

Toulouse