Liste d’éléments pédagogiques

Practical info

Location(s)

Toulouse

Digital signal acquisition architectures and Computed controlled systems

ECTS
4 crédits

Hourly volume
60h

Introducing

Objectives

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

The complete modelling from sensor to actuator is presented, associated with digital control technics. 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.

Practical info

Location(s)

Toulouse

Analog electronic system architecture

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):
- 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

[FRANCAIS] Analyse des systèmes complexes

ECTS
4 crédits

Hourly volume
50h

Introducing

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

Practical info

Location(s)

Toulouse

QSE APS 4A GEI – 1

ECTS
4 crédits

Hourly volume
67h

Practical info

Location(s)

Toulouse

Communication in organisations with LV2

ECTS
6 crédits

Hourly volume

Introducing

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

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

Necessary prerequisites

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

Practical info

Location(s)

Toulouse

Communication in organisations

ECTS
6 crédits

Hourly volume
42h

Practical info

Location(s)

Toulouse

Object-Oriented and Real-Time Programming

ECTS
3 crédits

Hourly volume
50h

Introducing

Objectives

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

Practical info

Location(s)

Toulouse

Device modeling and digital circuits architectures (reconfigurable computing)

ECTS
5 crédits

Hourly volume
55h

Introducing

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

Practical info

Location(s)

Toulouse

Discrete and Continuous Systems Optimisation

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):
- 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 Makovian 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.

Practical info

Location(s)

Toulouse

Practical Work in Control

ECTS
3 crédits

Hourly volume
34h

Toulouse

Introducing

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

Practical info

Location(s)

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

ECTS
4 crédits

Hourly volume
46h

Introducing

Objectives

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

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

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

Necessary prerequisites

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

Practical info

Location(s)

Toulouse

Research project

ECTS
4 crédits

Hourly volume

Introducing

Objectives

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

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

Practical info

Location(s)

Toulouse

Energy management for embedded systems

ECTS
3 crédits

Hourly volume

Introducing

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)

Practical info

Location(s)

Toulouse