INSTITUT NATIONAL DES SCIENCES APPLIQUÉES TOULOUSE

SCIENCE, TECHNOLOGY, HEALTH

MASTER APPLIED PHYSICS

Engineering sciences

Targeted level of education
BAC+5

Duration
2 années

Component
INSTITUT NATIONAL DES SCIENCES APPLIQUEES TOULOUSE

Introducing

Objectives

The training "Physicist Engineer" has for objective to form engineers with a wide scientific background capable of facing technical and scientific challenges. We offer to our students a knowledge and a practical knowledge to bring of innovation in the domains of Nanotechnologies, Material Physics and devices in the micro and nano scales, and in the field of Instrumentation-Sensor. The training allows to develop transverse abilities to act : 1) in the field of the conception and of the development of high technology systems, on the knowledge of the physical properties of materials, 2) in the field of the production with involvements in Project Driving, Quality, Failure Analysis and Management.

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 – GP
4th YEAR APPLIED PHYSICS

SEMESTER 7_4th YEAR GP

4th YEAR GP INSA_SEMESTER 7

4th YEAR GP INSA_SEMESTER 7

OPTION CSH or IAE

Liste d'éléments pédagogiques

Improve your management abilities	4 crédits	45h

Toulouse School of Management

Liste d'éléments pédagogiques

Laboratory Works Multiphysics Measurements 1	5 crédits	163h
Multidisciplinary project	6 crédits	61h
Condensed Matter Physics I	5 crédits	65h
Instrumentation	5 crédits	32h
Electronic and signal processing	5 crédits	57h
Political sciences semester 1	3 crédits	

CHALLENGE BASED LEARNING _SEMESTER 1

Liste d'éléments pédagogiques

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

SEMESTER 8_4th YEAR GP

4th YEAR GP INSA_SEMESTER 8

4th YEAR GP INSA_SEMESTER 8

Liste d'éléments pédagogiques

Laboratory Works Multiphysics Measurements 1	3 crédits	232h
Physical properties of Condensed Matter 2	4 crédits	85h
Multidisciplinary project	3 crédits	40h
Micro-nano technologies	3 crédits	23h
From the sensor to the test bench in open source hardware	3 crédits	92h
Safety, quality and applications to measurement	4 crédits	186h
[FRANCAIS] Physique pour la transistion énergétique	3 crédits	32h

Communication in organisations with LV2	6 crédits	
Improving one's autonomy and building one's own professional project level 2 S	4 crédits	40h
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	

CONTINUING EDUCATION_CT1 – APPLIED PHYSICS

SEMESTER_ T1 GP

Liste d'éléments pédagogiques

Thermodynamics and Diffusion	5 crédits	54h
Applied material physics	5 crédits	64h
Electronic and signal processing	5 crédits	57h
Communication in organisations with LV2	6 crédits	
Physical properties of Condensed Matter 2	4 crédits	85h
Safety, quality and applications to measurement	4 crédits	186h
Laboratory Works Multiphysics Measurements 1	5 crédits	163h
Condensed Matter Physics I	4 crédits	
Material Physics	4 crédits	85h
Experimental physics and stochastic modelling	5 crédits	59h
C language, Numerical analysis and Computer networks	6 crédits	71h
Micro-nano technologies	3 crédits	23h
From the sensor to the test bench in open source hardware	3 crédits	92h
Improve your management abilities	4 crédits	45h
[FRANCAIS] scénarios énergétiques	3 crédits	
[FRANCAIS] APS pour formation continue	4 crédits	

FIFTH YEAR – GP

5th YEAR APPLIED PHYSICS

SEMESTER 9_5th YEAR GP

5th YEAR GP INSA_SEMESTER 9

5th YEAR GP_MICRO NANO PHYSICAL COURSES

5th YEAR GP_OPTIONS_ SEMESTER 9

Liste d'éléments pédagogiques

Instrumentation Lab	5 crédits	35h
Nanobioengineering	5 crédits	27h
Gas Sensor	5 crédits	34h
Micro-nano-electro-mechanical systems ¿ Nanotechnology Engineering	5 crédits	42h
New 2D matérials	5 crédits	68h
Charged particle optics	5 crédits	30h

Liste d'éléments pédagogiques

NanoPhysics and Nanochemistry	4 crédits	
Innovative technologies, devices and materials	5 crédits	54h
Physics Engineering and Economic Development	5 crédits	75h
Applied physics and Scientific Communication	5 crédits	28h
Human relations	6 crédits	78h
rapport bibliographique	1 crédits	

5th YEAR GP_PHYSICAL INSTRUMENTATION COURSES

5th YEAR GP_OPTIONS_ SEMESTER 9

Liste d'éléments pédagogiques

Instrumentation Lab	5 crédits	35h
Nanobioengineering	5 crédits	27h
Gas Sensor	5 crédits	34h
Micro-nano-electro-mechanical systems ¿ Nanotechnology Engineering	5 crédits	42h
New 2D matérials	5 crédits	68h
Charged particle optics	5 crédits	30h

Liste d'éléments pédagogiques

Advenced intrumentation 1	5 crédits	62h
Instrumentation advanced 2	4 crédits	58h
Physics Engineering and Economic Development	5 crédits	75h
Applied physics and Scientific Communication	5 crédits	28h
Human relations	6 crédits	78h

5th YEAR THEME ENERGY

OPTION THEME ENERGY _SEMESTER 9

Liste d'éléments pédagogiques

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

Liste d'éléments pédagogiques

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

5th YEAR THEME RISK ENGINEERING

Liste d'éléments pédagogiques

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

5th YEAR THEME INNOVATIVE SMART SYSTEM

Liste d'éléments pédagogiques

Smart Devices	5 crédits	
Communication	5 crédits	
Middleware and services	5 crédits	62h
Analysis and data processing, business applications	4 crédits	37h
Innovative project	5 crédits	76h
Innovation and humanity	6 crédits	76h

[FRANCAIS] 5AGP PARCOURS ENERGIE

Liste d'éléments pédagogiques

Human relations	6 crédits	78h
[FRANCAIS] Projet énergie	19 crédits	15h
[FRANCAIS] Projet INSA	5 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	
Instrumentation Lab	5 crédits	35h
Gas Sensor	5 crédits	34h
Physics Engineering and Economic Development	5 crédits	75h
Instrumentation	3 crédits	
Laser and OptoElectronics	2 crédits	
Management, Organisation in a group, professionnal behavior	3 crédits	
English	3 crédits	

SEMESTER 10_5th YEAR GP

Liste d'éléments pédagogiques

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

CONTINUING EDUCATION_CT2 – APPLIED PHYSICS

SEMESTER_T2 GP

Liste d'éléments pédagogiques

Training period 4th year	9 crédits	
Training period 5th year	21 crédits	
Advenced intrumentation 1	5 crédits	62h
Instrumentation advanced 2	4 crédits	58h

Improve your management abilities

ECTS
4 crédits

Hourly volume
45h

Management I3CCGE51

Introducing

Objectives

At the end of this module, the student will

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

They can be consulted on :

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

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

Necessary prerequisites

Practical info

Location(s)

Toulouse

INSA INSTITUT NATIONAL DES SCIENCES APPLIQUÉES TOULOUSE

Toulouse School of Management

Practical info

Location(s)

Toulouse

Laboratory Works Multiphysics Measurements 1

ECTS
5 crédits

Hourly volume
163h

Practical info

Location(s)

Toulouse

Multidisciplinary project

ECTS
6 crédits

Hourly volume
61h

Practical info

Location(s)

Toulouse

Condensed Matter Physics I

ECTS
5 crédits

Hourly volume
65h

Practical info

Location(s)

Toulouse

Instrumentation

ECTS
5 crédits

Hourly volume
32h

Practical info

Location(s)

Toulouse

Electronic and signal processing

ECTS
5 crédits

Hourly volume
57h

Practical info

Location(s)

Toulouse

Political sciences semester 1

ECTS
3 crédits

Hourly volume

Practical info

Location(s)

Toulouse

[FRANCAIS] Challenge – Formation ECIU

ECTS
1 crédits

Hourly volume

Practical info

Location(s)

Toulouse

[FRANCAIS] Challenge – Formation ECIU

ECTS
2 crédits

Hourly volume

Practical info

Location(s)

Toulouse

[FRANCAIS] Challenge – Formation ECIU

ECTS
3 crédits

Hourly volume

Practical info

Location(s)

Toulouse

[FRANCAIS] Challenge – Formation ECIU

ECTS
4 crédits

Hourly volume

Practical info

Location(s)

Toulouse

[FRANCAIS] Challenge – Formation ECIU

ECTS
5 crédits

Hourly volume

Practical info

Location(s)

Toulouse

Laboratory Works Multiphysics Measurements 1

ECTS
3 crédits

Hourly volume
232h

Practical info

Location(s)

Toulouse

Physical properties of Condensed Matter 2

ECTS
4 crédits

Hourly volume
85h

Practical info

Location(s)

Toulouse

Multidisciplinary project

ECTS
3 crédits

Hourly volume
40h

Practical info

Location(s)

Toulouse

Micro-nano technologies

ECTS
3 crédits

Hourly volume
23h

Introducing

Objectives

The goal of the course is to introduce the techniques used in the micro-electronics industry for the fabrication of integrated circuits (photolithography, growth and deposition of thin films, doping, etching techniques), as well as various optical and electrical characterization techniques.
The physical and the chemical processes involved in these techniques are studied.

The complete fabrication process of NMOS and CMOS circuits is presented.

The students are also initiated to the design and the simulation of integrated circuits.

Necessary prerequisites

Semiconductor physics (electrons, holes, doping, band structure).
Design and working principle of basics electronics components (PN junction, MOS transistor).

Location(s)

Toulouse

Practical info

From the sensor to the test bench in open source hardware

ECTS
3 crédits

Hourly volume
92h

Introducing

Objectives

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

THE MANUFACTURING OF ¿low tech¿ SENSORS based on graphite: with elements of physics (electronic transport) allowing the understanding of the electrical characteristics of a sensor based on a granular system (graphite nanoparticles).

SENSORS AND ACQUISITION CHAIN:
- The criteria for the design and use of this sensor and an adapted 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.

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

MICROCONTROLERS AND OPEN SOURCE HARDWARE:
Elements to master the microcontrollers allowing the design and implementation of concrete applications in Open Source Hardware,
- The architecture and operation of ATMEL AVR microcontrollers,
- Programming in the C and C++ language of the Arduino and IDE development environment,
- Creating his own libraries and programs,
- Creating its own human/machine interfaces: in Arduino / Processing, Android and python,
- The achievement of its own circuit boards (PCB + Eagle...)
- Board interfacing with various devices (displays, motors, sensors, Nunchuk, touch screens, I2C bus, wifi, Bluetooth LE ...)
- Intellectual property in open source hardware

REALIZATION OF AN ANDROID APPLICATION:
He will be able to create an ANDROID application to retrieve data from the graphite sensor.

REALIZATION OF A TEST BENCH ADAPTED TO THE SENSOR
He will be able to build a bench allowing characterizing in a optimal and reproducible way the electrical characteristics of the sensor.

REALIZATION OF THE SENSOR DATASHEET
Finally, he will realize the data sheet of the sensor realized.

Necessary prerequisites

Knowledge of Fortran, C and even C++
Knowledge of algorithmic

Practical info

Location(s)

Toulouse

Safety, quality and applications to measurement

ECTS
4 crédits

Hourly volume
186h

Introducing

Objectives

This module provides a theoretical and experimental approach of the main concepts involved in the field of quality, safety, environment and measurement. The following topics are covered:
¿ design of experiments,
¿ Statistical process control.
¿ component failure
¿ Metrology and testing
¿ decision making and risk analysis

This entire course is motivating for the student by putting it in concrete situation with report to the problems they might encounter in his life as a future engineer.
In this framework, the guiding principle of the training is to focus on the one hand on the work group around applications and unifying themes and secondly, strengthening the link between academic courses of their curriculum and the concepts they will required during practical training in laboratory and/or company.

At the end of this UF, the student will:
1 - Be able to define, build and analyze an experimental design of a complex physics problem and have a critical look on the obtained results.
2 - Master the requirements of the space industry in terms of reliability as well as its normative aspects with the consequences that this can sometimes have (limitation of performances, etc...).
3 - Be aware of safety, quality, decision, environmental risks and risk analysis

Practical info

Location(s)

Toulouse

[FRANCAIS] Physique pour la transistion énergétique

ECTS
3 crédits

Hourly volume
32h

Practical info

Location(s)

Toulouse

Communication in organisations with LV2

ECTS
6 crédits

Hourly volume

Introducing

Objectives

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

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

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

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

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

Necessary prerequisites

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

Practical info

Location(s)

Toulouse

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

ECTS
4 crédits

Hourly volume
40h

Practical info

Location(s)

Toulouse

Political sciences semestre 2

ECTS
3 crédits

Hourly volume

Practical info

Location(s)

Toulouse

[FRANCAIS] Challenge – Formation ECIU

ECTS
1 crédits

Hourly volume

Practical info

Location(s)

Toulouse

[FRANCAIS] Challenge – Formation ECIU

ECTS
2 crédits

Hourly volume

Practical info

Location(s)

Toulouse

[FRANCAIS] Challenge – Formation ECIU

ECTS
3 crédits

Hourly volume

Practical info

Location(s)

Toulouse

[FRANCAIS] Challenge – Formation ECIU

ECTS
4 crédits

Hourly volume

Practical info

Location(s)

Toulouse

[FRANCAIS] Challenge – Formation ECIU

ECTS
5 crédits

Hourly volume

Practical info

Location(s)

Toulouse

Thermodynamics and Diffusion

ECTS
5 crédits

Hourly volume
54h

Introducing

Objectives

At the end of this module, the student should have understood and be able to explain (main concepts):
- The laws of thermodynamics, the notions of work, heat, energy associated with a transformation,
- The application to thermal machines, thermodynamic cycles, and the calculation of efficiency.
- This course is intended to provide students with an understanding of the laws of thermodynamics and the concepts of work, heat and energy associated with a transformation,
- simple phase diagrams and binary materials.
- This course is intended to provide students with the opportunity to learn more about the following topics: - The concepts of diffusion and heat/matter transport.

The student will have to integrate notions, contextualise them and then be able to decontextualise them to be able to project them into an adidactic situation.

Necessary prerequisites

Basics of mathematical analysis: functions of several variables, derivatives, integrations, differential equations.
General notions of thermodynamics of physical-chemical systems

Practical info

Location(s)

Toulouse

Applied material physics

ECTS
5 crédits

Hourly volume
64h

Introducing

Objectives

This UF constitutes an experimental approach to the physics of materials. The educational objectives are:
- acquire scientific knowledge relating to the techniques used in material science
- acquire practical skills on these techniques,
- acquire an experimental work method in physics (how to choose the experimental parameters, carry out the experiment, analyze the results)

The student should be able to:
- reproduce and apply techniques for the development and characterization of materials among the techniques mentioned in the program.

Necessary prerequisites

- UF Physics of materials must be completed before the practicals.
- Thermodynamic prerequisite : The following notions must be seen before the practicals: enthalpy, heat capacity and phase diagram.

Location(s)

Toulouse

Practical info

Electronic and signal processing

ECTS
5 crédits

Hourly volume
57h

Practical info

Location(s)

Toulouse

Communication in organisations with LV2

ECTS
6 crédits

Hourly volume

Introducing

Objectives

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

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

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

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

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

Necessary prerequisites

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

Practical info

Location(s)

Toulouse

Physical properties of Condensed Matter 2

ECTS
4 crédits

Hourly volume
85h

Practical info

Location(s)

Toulouse

Safety, quality and applications to measurement

ECTS
4 crédits

Hourly volume
186h

Introducing

Objectives

This module provides a theoretical and experimental approach of the main concepts involved in the field of quality, safety, environment and measurement. The following topics are covered:
¿ design of experiments,
¿ Statistical process control.
¿ component failure
¿ Metrology and testing
¿ decision making and risk analysis

This entire course is motivating for the student by putting it in concrete situation with report to the problems they might encounter in his life as a future engineer.
In this framework, the guiding principle of the training is to focus on the one hand on the work group around applications and unifying themes and secondly, strengthening the link between academic courses of their curriculum and the concepts they will required during practical training in laboratory and/or company.

At the end of this UF, the student will:
1 - Be able to define, build and analyze an experimental design of a complex physics problem and have a critical look on the obtained results.
2 - Master the requirements of the space industry in terms of reliability as well as its normative aspects with the consequences that this can sometimes have (limitation of performances, etc...).
3 - Be aware of safety, quality, decision, environmental risks and risk analysis

Practical info

Location(s)

Toulouse

Laboratory Works Multiphysics Measurements 1

ECTS
5 crédits

Hourly volume
163h

Practical info

Location(s)

Toulouse

Condensed Matter Physics I

ECTS
4 crédits

Hourly volume

Practical info

Location(s)

Toulouse

Material Physics

ECTS
4 crédits

Hourly volume
85h

Introducing

Objectives

At the end of this module the student should be able to:
- structurally characterize and orient a crystal: employ of basic X-ray and electron diffraction techniques, then analysis of the results.
- describe dislocations and their interactions from a geometric and energetic point of view, and relate them to the mechanical properties of the crystalline material: fragility and ductility
- calculate and predict electrical, thermal and mechanical effects resulting from electrical, thermal and mechanical solicitations applied to the crystal in particular directions.
- master the piezoelectric effect for applications of sensors and micro-actuators, and acousto-optical and electro-optical effects for applications of filtering, modulation or optical addressing and optoelectronic components.

Practical info

Location(s)

Toulouse

Experimental physics and stochastic modelling

ECTS
5 crédits

Hourly volume
59h

Toulouse

Introducing

Objectives

At the end of this module, the student will have understood and be able to explain (main concepts):
- Operation of the different sensors used during the lab sessions. They will know how to use them in order to solve a problem and view the results critically.
- Stochastic modelling of measurements, confidence intervals, statistical hypothesis tests, linear models.

The student will be able to build a data acquisition system starting from different sensors, to analyse the result and quantify the various components in measurement errors, to build a statistical model from observations in order to confirm or invalidate hypotheses concerning the problem at hand, and to plan experiments in simple cases.

Necessary prerequisites

I2AIMT21 Probability in IMACS

Practical info

Location(s)

C language, Numerical analysis and Computer networks

ECTS
6 crédits

Hourly volume
71h

Practical info

Location(s)

Toulouse

Micro-nano technologies

ECTS
3 crédits

Hourly volume
23h

Introducing

Objectives

The goal of the course is to introduce the techniques used in the micro-electronics industry for the fabrication of integrated circuits (photolithography, growth and deposition of thin films, doping, etching techniques), as well as various optical and electrical characterization techniques.
The physical and the chemical processes involved in these techniques are studied.

The complete fabrication process of NMOS and CMOS circuits is presented.

The students are also initiated to the design and the simulation of integrated circuits.

Necessary prerequisites

Semiconductor physics (electrons, holes, doping, band structure).
Design and working principle of basics electronics components (PN junction, MOS transistor).

Location(s)

Toulouse

Practical info

From the sensor to the test bench in open source hardware

ECTS
3 crédits

Hourly volume
92h

Introducing

Objectives

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

THE MANUFACTURING OF ¿low tech¿ SENSORS based on graphite: with elements of physics (electronic transport) allowing the understanding of the electrical characteristics of a sensor based on a granular system (graphite nanoparticles).

SENSORS AND ACQUISITION CHAIN:
- The criteria for the design and use of this sensor and an adapted 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.

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

MICROCONTROLERS AND OPEN SOURCE HARDWARE:
Elements to master the microcontrollers allowing the design and implementation of concrete applications in Open Source Hardware,
- The architecture and operation of ATMEL AVR microcontrollers,
- Programming in the C and C++ language of the Arduino and IDE development environment,
- Creating his own libraries and programs,
- Creating its own human/machine interfaces: in Arduino / Processing, Android and python,
- The achievement of its own circuit boards (PCB + Eagle...)
- Board interfacing with various devices (displays, motors, sensors, Nunchuk, touch screens, I2C bus, wifi, Bluetooth LE ...)
- Intellectual property in open source hardware

REALIZATION OF AN ANDROID APPLICATION:
He will be able to create an ANDROID application to retrieve data from the graphite sensor.

REALIZATION OF A TEST BENCH ADAPTED TO THE SENSOR
He will be able to build a bench allowing characterizing in a optimal and reproducible way the electrical characteristics of the sensor.

REALIZATION OF THE SENSOR DATASHEET
Finally, he will realize the data sheet of the sensor realized.

Necessary prerequisites

Knowledge of Fortran, C and even C++
Knowledge of algorithmic

Practical info

Location(s)

Toulouse

Improve your management abilities

ECTS
4 crédits

Hourly volume
45h

Management I3CCGE51

Introducing

Objectives

At the end of this module, the student will

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

They can be consulted on :

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

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

Necessary prerequisites

Practical info

Location(s)

Toulouse

[FRANCAIS] scénarios énergétiques

ECTS
3 crédits

Hourly volume

Practical info

Location(s)

Toulouse

[FRANCAIS] APS pour formation continue

ECTS
4 crédits

Hourly volume

Practical info

Location(s)

Toulouse

Instrumentation Lab

ECTS
5 crédits

Hourly volume
35h

Practical info

Location(s)

Toulouse

Nanobioengineering

ECTS
5 crédits

Hourly volume
27h

Introducing

Objectives

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

- Nanotechnological processes for the investigation, the sensing and the quantification of biomolecular specific interactions, basis of all biosensing technologies.

- The principle of some of these technologies: Fluorescence, soft lithography, surface biofunctionalization, single molecule assays, biochips, 3D lithography, microfluidic.

The student will be able to:
- Formulate nanoscale mechanisms and give precise examples of biomolecular specific interactions
- Master nanoscale technics for transducing a molecular event into a measurable signal
- Analyze any kind of biosensor
- Implement a scientific experimental investigation
-Implement these nanotechnological and fluidic processes
- Discuss results, give interpretations and set the l advantages as well as limitations,
- Gather different concepts; assimilate them for being able to extract them from their context in order to face adidactical situations.

Necessary prerequisites

- Initiation to micro/nano-biotechnologies
- Scientific M1 in Chemistry, Biology or Physics

Practical info

Location(s)

Toulouse

Gas Sensor

ECTS
5 crédits

Hourly volume
34h

Introducing

Objectives

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

- the approach and the different steps for the conception and realization of a micro- and nano-electronic by integration of nano-objects synthesized as a colloidal solution;
- the operating model of a nano-sensor

the student will have understood and be able to explain:
- the main concepts and the experimental practices about nano-object synthesis and stabilization of colloidal solutions;
- the main concepts and the experimental practices about deposition of nano-objects from a solution into 2D and 3D arrays on a surface;
- the physical principles of nanoparticles based sensors (gaz sensor, strain sensor ¿).

The student will be able to:
- produce a sensor relying on nanoparticle arrays with particles synthesized and assembled during the project;
- measure the sensor properties and describe how it works;
-discuss the results obtained and suggest improvements..

The student will be able to:
- suggest a reasonable solution for the realization of a sensor gathering the different concepts described above;
- produce an expertise on the conception and the practical realization on a novel sensor.

Necessary prerequisites

Master 1 in Physics, Applied Physics, Chemistry or Material Science or equivalent

Practical info

Location(s)

Toulouse

Micro-nano-electro-mechanical systems ¿ Nanotechnology Engineering

ECTS
5 crédits

Hourly volume
42h

Practical info

Location(s)

Toulouse

New 2D matérials

ECTS
5 crédits

Hourly volume
68h

Practical info

Location(s)

Toulouse

Charged particle optics

ECTS
5 crédits

Hourly volume
30h

Introducing

Objectives

Charged particle optics (CPO) is a science that compiles under a common theoretical base all the laws governing the transport, focusing, mass/energy dispersion, etc. of charged particles that can be electrons, positrons, ions or molecules. It allows the description of the optical properties of all the usual individual optical elements (lenses, energy filter, magnetic sector, etc.) and thanks to the multiple combinations of these elements, it allows the creation of a wide range of tools for the characterisation of innovative materials. For years, applications in this field have been considerable: development of increasingly powerful electron microscopes, focused ion beams that have opened the way to nano-manufacturing, secondary ion mass spectrometers (SIMS), an essential tool for characterising dopants in semiconductors, and also large instruments such as synchrotrons and particle accelerators.For several years, the demand for engineers with solid skills in this field has been significant and has been increasing regularly.

Indeed, the companies providing state-of-the-art analysis instruments are in a permanent race to innovate, on the one hand to meet the needs of the original market of increasingly small and complex semiconductor devices, but also to meet new markets such as the characterisation of chemical materials (pharmaceutical molecules, etc.) or biological materials (viruses, etc.) and the development of medical instruments (proton therapy for example). The development in the early 2000s of spherical aberration correctors for electron microscopes, whose innovative optics are based on the symmetry properties of magnetic multipoles, is an emblematic example that has revolutionised the use of these instruments.

In order to respond to this craze and to the demand for innovation that will enable the instruments of the future to be imagined, the industrial world is looking for engineering schools that can offer a modern approach to OPC adapted to their needs.

This module will aim to develop the theoretical foundations of OPC by insisting on the practical aspects useful for the development of new innovative optical instruments. The course will insist in particular on the strength of the general formalism of the OPC which gathers under the same logic all the elements which can transport, focus or disperse charged particles. The tutorials around simulations using the SIMION software (https://simion.com/docs/simion8brochure.pdf) and practical work will allow the engineering students to put this knowledge into practice around a design project of a concrete optical system such as, for example

- the manufacture of an electrostatic electron microscope whose elements, previously dimensioned with SIMION, can be manufactured with a 3D printer.

We would like to focus this module on aspects of the OPC that are of interest to industry and we will be in contact with Orsayphysics, a French manufacturer of focused ion beams. A visit to the company may even be considered, depending on requests and availability.

Necessary prerequisites

Electromagnetism, GP 4A Advanced Geometrical Optics, Fourier optics, quantum mechanics, and an approach to point mechanics problems using Lagrange's variational principle would be a plus.

Practical info

Location(s)

Toulouse

NanoPhysics and Nanochemistry

ECTS
4 crédits

Hourly volume

Practical info

Location(s)

Toulouse

Innovative technologies, devices and materials

ECTS
5 crédits

Hourly volume
54h

Introducing

Objectives

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

- plasma processes
- new technologies and materials for the microelectronics applications
- concepts of the physics of continuous media
- quantum phenomena such as diffusion, electron paramagnetic resonance, and quantum cryptography: entangled states, single-photon and pairs of entangled states source based on semiconductors quantum dots.

The student will be able to apply the quantum mechanics formalism to describe innovative devices at the nano-scale.

The student will be able to:
- choose the kind of scanning probe microscopy well adapted to a specific application/characterization
- analyze and interpret basic images of scanning probe microscopy.

Necessary prerequisites

Electromagnetism
Quantum Mechanics (I4GPPM11)
Mathematics: matrix calculus and differential equations
Physical Metallurgy (real crystal, diffusion, precipitation, nucleation and growth)
Basic knowledge of symbolic computational tool like Maxima.

Practical info

Location(s)

Toulouse

Physics Engineering and Economic Development

ECTS
5 crédits

Hourly volume
75h

Introducing

Objectives

This educational unit is composed of three distinct lectures. Two of them are technological: Physics of semiconductor heterostructures and Telecommunication satellites/RF Functions, the third being centered on the impact of modern science: Nano Cultures.

Multiple objectives are targeted:

- Acquire the fundaments of the recent innovations in semi-conductor devices for microelectronic industry
- Understanding and modelling of semiconductor heterostructures
- To be able to describe the basic Telecommunication payload architecture by understanding the functional description of a bent-pipe transponder
- To acquire good understanding of each RF equipment (Requirements, RF drivers, technologies and associated tips)
- Develop a personal thinking on the impact of sciences on society fin relation with global environemental changes
- Analyse and criticize the nature of Science and technology
- Construct a research project forming sense with respect to personal values and societal challenges

Necessary prerequisites

- Course on "semiconductors" given in 3IMACS.
- Use of decibel units
- RF basics (noise, gain¿)

Practical info

Location(s)

Toulouse

Applied physics and Scientific Communication

ECTS
5 crédits

Hourly volume
28h

Practical info

Location(s)

Toulouse

Human relations

ECTS
6 crédits

Hourly volume
78h

Introducing

Location(s)

Toulouse

Objectives

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

Necessary prerequisites

None

Practical info

INSA INSTITUT NATIONAL DES SCIENCES APPLIQUÉES TOULOUSE

rapport bibliographique

ECTS
1 crédits

Hourly volume

Practical info

Location(s)

Toulouse

Instrumentation Lab

ECTS
5 crédits

Hourly volume
35h

Practical info

Location(s)

Toulouse

Nanobioengineering

ECTS
5 crédits

Hourly volume
27h

Introducing

Objectives

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Practical info

Location(s)

Toulouse

Gas Sensor

ECTS
5 crédits

Hourly volume
34h

Introducing

Objectives

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Practical info

Location(s)

Toulouse

Micro-nano-electro-mechanical systems ¿ Nanotechnology Engineering

ECTS
5 crédits

Hourly volume
42h

Practical info

Location(s)

Toulouse

New 2D matérials

ECTS
5 crédits

Hourly volume
68h

Practical info

Location(s)

Toulouse

Charged particle optics

ECTS
5 crédits

Hourly volume
30h

Introducing

Objectives

Charged particle optics (CPO) is a science that compiles under a common theoretical base all the laws governing the transport, focusing, mass/energy dispersion, etc. of charged particles that can be electrons, positrons, ions or molecules. It allows the description of the optical properties of all the usual individual optical elements (lenses, energy filter, magnetic sector, etc.) and thanks to the multiple combinations of these elements, it allows the creation of a wide range of tools for the characterisation of innovative materials. For years, applications in this field have been considerable: development of increasingly powerful electron microscopes, focused ion beams that have opened the way to nano-manufacturing, secondary ion mass spectrometers (SIMS), an essential tool for characterising dopants in semiconductors, and also large instruments such as synchrotrons and particle accelerators.For several years, the demand for engineers with solid skills in this field has been significant and has been increasing regularly.

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Necessary prerequisites

Electromagnetism, GP 4A Advanced Geometrical Optics, Fourier optics, quantum mechanics, and an approach to point mechanics problems using Lagrange's variational principle would be a plus.

Practical info

Location(s)

Toulouse

Advenced intrumentation 1

ECTS
5 crédits

Hourly volume
62h

Practical info

Location(s)

Toulouse

Instrumentation advanced 2

ECTS
4 crédits

Hourly volume
58h

Introducing

Objectives

At the end of this module, the student will have understood and be able to explain (main concepts):
Real Time : Real time concept, scheduling, rules to develop a real time application, determinism and jitter concepts
Can Bus : General CAN concept, from concept to protocol
Network : Interest of local network for tests and measurements applications.

The student will be able to:
Real Time : Develop a real time application running on National Instruments Compact RIO
Can Bus : Manage communication between two CAN nodes
Network : Manage network technologies to realise a simple project

Necessary prerequisites

General computing
LabVIEW programming
Labwindows/CVI programming

Practical info

Location(s)

Toulouse

Physics Engineering and Economic Development

ECTS
5 crédits

Hourly volume
75h

Introducing

Objectives

This educational unit is composed of three distinct lectures. Two of them are technological: Physics of semiconductor heterostructures and Telecommunication satellites/RF Functions, the third being centered on the impact of modern science: Nano Cultures.

Multiple objectives are targeted:

- Acquire the fundaments of the recent innovations in semi-conductor devices for microelectronic industry
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- To be able to describe the basic Telecommunication payload architecture by understanding the functional description of a bent-pipe transponder
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- Develop a personal thinking on the impact of sciences on society fin relation with global environemental changes
- Analyse and criticize the nature of Science and technology
- Construct a research project forming sense with respect to personal values and societal challenges

Necessary prerequisites

- Course on "semiconductors" given in 3IMACS.
- Use of decibel units
- RF basics (noise, gain¿)

Practical info

Location(s)

Toulouse

Applied physics and Scientific Communication

ECTS
5 crédits

Hourly volume
28h

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

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

Qualitative Approach

ECTS
4 crédits

Hourly volume
45h

Practical info

Location(s)

Toulouse

Quantitative Approach

ECTS
5 crédits

Hourly volume
45h

Practical info

Location(s)

Toulouse

Designing for safety

ECTS
5 crédits

Hourly volume
42h

Practical info

Location(s)

Toulouse

Process Safety

ECTS
5 crédits

Hourly volume
45h

Practical info

Location(s)

Toulouse

INSA INSTITUT NATIONAL DES SCIENCES APPLIQUÉES TOULOUSE

Functional Safety

Practical info

Location(s)

Toulouse

[FRANCAIS] Structural Safety

Practical info

Location(s)

Toulouse

Human relations

ECTS
6 crédits

Hourly volume
78h

Introducing

Location(s)

Toulouse

Objectives

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

Necessary prerequisites

None

Practical info

Toxic risks

ECTS
5 crédits

Hourly volume
42h

Practical info

Location(s)

Toulouse

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

Human relations

ECTS
6 crédits

Hourly volume
78h

Introducing

Location(s)

Toulouse

Objectives

L'étudiant devra être capable de :
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-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] Projet énergie

ECTS
19 crédits

Hourly volume
15h

Practical info

Location(s)

Toulouse

[FRANCAIS] Projet INSA

ECTS
5 crédits

Hourly volume

Practical info

Location(s)

Toulouse

[FRANCAIS] Challenge – Formation ECIU

ECTS
1 crédits

Hourly volume

Practical info

Location(s)

Toulouse

[FRANCAIS] Challenge – Formation ECIU

ECTS
2 crédits

Hourly volume

Practical info

Location(s)

Toulouse

[FRANCAIS] Challenge – Formation ECIU

ECTS
3 crédits

Hourly volume

Practical info

Location(s)

Toulouse

[FRANCAIS] Challenge – Formation ECIU

ECTS
4 crédits

Hourly volume

Practical info

Location(s)

Toulouse

[FRANCAIS] Challenge – Formation ECIU

ECTS
5 crédits

Hourly volume

Practical info

Location(s)

Toulouse

Training period 5th year

ECTS
21 crédits

Hourly volume

Practical info

Location(s)

Toulouse

Training period 4th year

ECTS
9 crédits

Hourly volume

Practical info

Location(s)

Toulouse

INSA INSTITUT NATIONAL DES SCIENCES APPLIQUÉES TOULOUSE

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

Advenced intrumentation 1

ECTS
5 crédits

Hourly volume
62h

Practical info

Location(s)

Toulouse

Instrumentation advanced 2

ECTS
4 crédits

Hourly volume
58h

Introducing

Objectives

At the end of this module, the student will have understood and be able to explain (main concepts):
Real Time : Real time concept, scheduling, rules to develop a real time application, determinism and jitter concepts
Can Bus : General CAN concept, from concept to protocol
Network : Interest of local network for tests and measurements applications.

The student will be able to:
Real Time : Develop a real time application running on National Instruments Compact RIO
Can Bus : Manage communication between two CAN nodes
Network : Manage network technologies to realise a simple project

Necessary prerequisites

General computing
LabVIEW programming
Labwindows/CVI programming

Practical info

Location(s)

Toulouse

Instrumentation Lab

ECTS
5 crédits

Hourly volume
35h

Practical info

Location(s)

Toulouse

Gas Sensor

ECTS
5 crédits

Hourly volume
34h

Introducing

Objectives

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

- the approach and the different steps for the conception and realization of a micro- and nano-electronic by integration of nano-objects synthesized as a colloidal solution;
- the operating model of a nano-sensor

the student will have understood and be able to explain:
- the main concepts and the experimental practices about nano-object synthesis and stabilization of colloidal solutions;
- the main concepts and the experimental practices about deposition of nano-objects from a solution into 2D and 3D arrays on a surface;
- the physical principles of nanoparticles based sensors (gaz sensor, strain sensor ¿).

The student will be able to:
- produce a sensor relying on nanoparticle arrays with particles synthesized and assembled during the project;
- measure the sensor properties and describe how it works;
-discuss the results obtained and suggest improvements..

The student will be able to:
- suggest a reasonable solution for the realization of a sensor gathering the different concepts described above;
- produce an expertise on the conception and the practical realization on a novel sensor.

Necessary prerequisites

Master 1 in Physics, Applied Physics, Chemistry or Material Science or equivalent

Practical info

Location(s)

Toulouse

Physics Engineering and Economic Development

ECTS
5 crédits

Hourly volume
75h

Introducing

Objectives

This educational unit is composed of three distinct lectures. Two of them are technological: Physics of semiconductor heterostructures and Telecommunication satellites/RF Functions, the third being centered on the impact of modern science: Nano Cultures.

Multiple objectives are targeted:

- Acquire the fundaments of the recent innovations in semi-conductor devices for microelectronic industry
- Understanding and modelling of semiconductor heterostructures
- To be able to describe the basic Telecommunication payload architecture by understanding the functional description of a bent-pipe transponder
- To acquire good understanding of each RF equipment (Requirements, RF drivers, technologies and associated tips)
- Develop a personal thinking on the impact of sciences on society fin relation with global environemental changes
- Analyse and criticize the nature of Science and technology
- Construct a research project forming sense with respect to personal values and societal challenges

Necessary prerequisites

- Course on "semiconductors" given in 3IMACS.
- Use of decibel units
- RF basics (noise, gain¿)

Practical info

Location(s)

Toulouse

Instrumentation

ECTS
3 crédits

Hourly volume

Practical info

Location(s)

Toulouse

Laser and OptoElectronics

ECTS
2 crédits

Hourly volume

Practical info

Location(s)

Toulouse

Management, Organisation in a group, professionnal behavior

ECTS
3 crédits

Hourly volume

Practical info

Location(s)

Toulouse

English

ECTS
3 crédits

Hourly volume

Practical info

Location(s)

Toulouse