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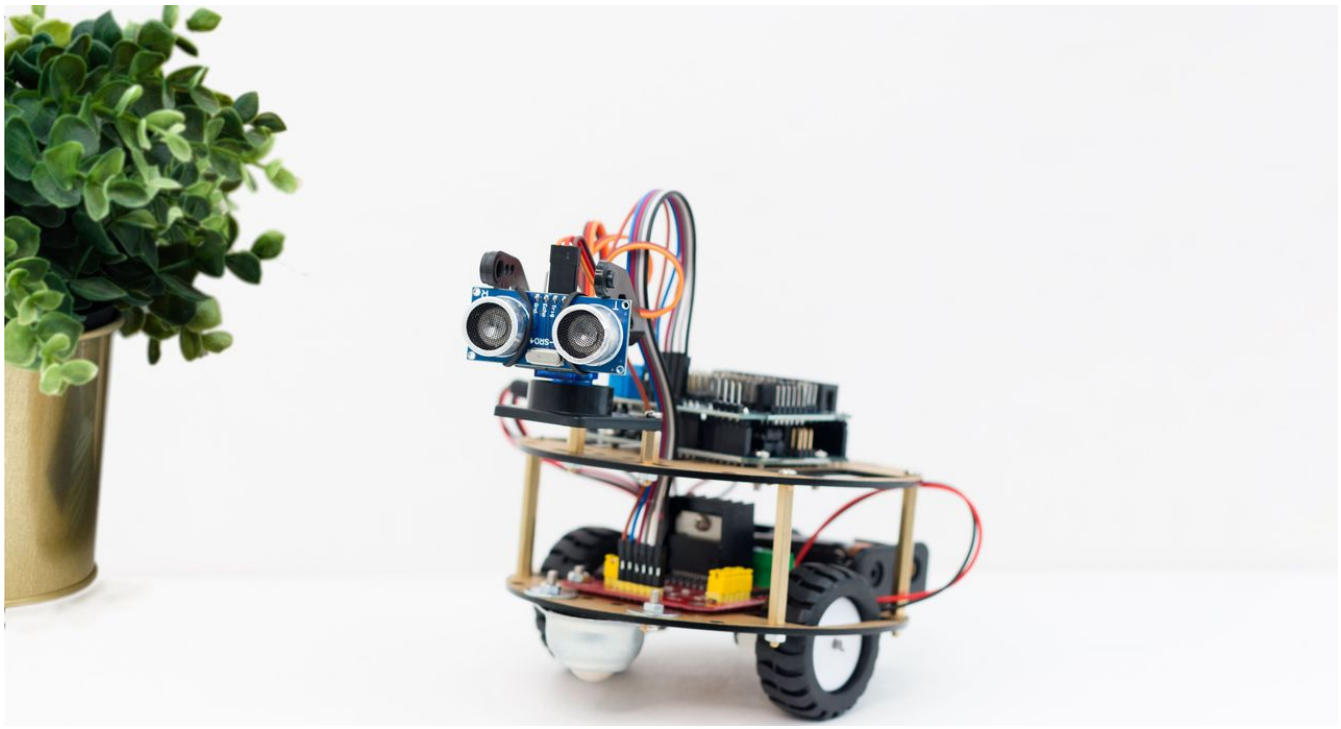
Curriculum of the program in Electrical Engineering and Computer Science



UNIVERSITÉ
SAVOIE
MONT BLANC

Curriculum of the program in Electrical Engineering and Computer Science

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Glossary

Program

SNI	Digital Sysytems and Instrumentation

Course codes

EASI	Electrical engineering and signal processing
INFO	Computer science
LANG	Foreign languages
MATH	Mathematics
MECA	Mechanical
PHYS	Physics
PROJ	Projects and internships
SHES	Humanities and social sciences

General terms

CC	Continuous examination
ET	Final examination
TC	Common course
TD	Exercices
TP	Labs
UE	Program unit

Semester 5

UE	ECTS	Module	Course name	Class (h)	Exer. (h)	Lab. (h)	Weight	Examination
UE501 : Professionnal Environment	6	LANG500a	Tutoring in English		12			
		LANG501a	English		40.5		3	CC
		SHES501a	Sport		21		1.5	CC
		SHES505	Business Game		19.5		1.5	CC
UE502 : Engineering Sciences and Tools	12	DDRS501	Sustainable Development	11.5	9		1.5	CC(50%) + CT(50%)
		EASI501a	Electrical Engineering	13.5	15	12	3	CC(70%) TP(30%)
		INFO501a	Number representation and algorithm design	12	10.5	16	3	CT(70%) + TP(30%)
		INFO502a	Data base	6	4.5	12	1.5	CT(70%) TP(30%)
		MATH500a	Mathematics refresher course		21			CC
		MATH501a	Mathematics	21	19.5		3	CC
UE503 : Engineering Sciences	12	EASI541a	Automation	7.5	12	20	3	CC (70%) + TP (30%)
		PHYS541a	Material properties	20	12	8	3	CC(20%) CT(60%) TP(20%)
		PHYS542a	Electromagnetism applied to the transmission of information	17	15	8	3	CT(70%) TP(30%)
		PROJ541a	An Experimental First Look of the Curriculum			40	3	TP

1. UE501 : Professionnal Environment

1.1. LANG500a - Tutoring in English

Class (h)	Exer. (h)	Lab. (h)	Weight	Examination
	12			

Language(s) for the course

- English

Course description

1.2. LANG501a - English

Class (h)	Exer. (h)	Lab. (h)	Weight	Examination
	40.5		3	CC

Language(s) for the course

- English

Course description

This course aims at training our engineering students to obtain a minimum score of 785/990 in the TOEIC test (« Test of English for International Communication ») as required by the CTI (the accredited French National Institution supervising the award of engineering degrees. Our students are also trained to improve in all four language skills (listening, reading, writing and speaking) on a variety of (everyday life and professional) topics via the news, videos, oral presentations, mock interviews, debates, writing assignments, etc...

The students are evaluated through continuous assessment.

1.3. SHES501a - Sport

Class (h)	Exer. (h)	Lab. (h)	Weight	Examination
	21		1.5	CC

Language(s) for the course

- French

Course description

This course is based on the practice of physical and sports activities and has two axes.

On the one hand, it allows the students to acquire know-how for the sports activities and to put forward their social skills, qualities required for their insertion and their professional success. This axis is based on the values conveyed by the various sports activities and their diversified modes of practice.

On the other hand, it allows the students to acquire collective skills in the realization of a project and the management of a group and also to develop their individual capacities of adaptation and regulation. This axis examines the collective organization and the implementation of a sports event on a session.

1.4. SHES505 - Business Game

Class (h)	Exer. (h)	Lab. (h)	Weight	Examination
	19.5		1.5	CC

Language(s) for the course

- French

Course description

Business Games (or serious games) aim to simulate management process and are used to train and develop knowledge and skills in areas such as strategic thinking, leadership, teamwork management, financial analysis, market analysis and operations management. Like a business, games should involve people, resources and processes. The aim is to give participants an experience comparable to one in 'real-life'. A business has also to remain competitive, so business games are usually competitive in character with compressed time periods, allowing the result of decisions and policies to be seen.

2. UE502 : Engineering Sciences and Tools

2.1. DDRS501 - Sustainable Development

Class (h)	Exer. (h)	Lab. (h)	Weight	Examination
11.5	9		1.5	CC(50%) + CT(50%)

Course description

This course aims to educate engineering students to the issue of sustainable development and its integration in enterprises' policy and enable them to take control of this aspect in their professional life.

2.2. EASI501a - Electrical Engineering

Class (h)	Exer. (h)	Lab. (h)	Weight	Examination
13.5	15	12	3	CC(70%) TP(30%)

Language(s) for the course

- French

Course description

Basics of electrical engineering, transient operations, direct and alternative currents.

2.3. INFO501a - Number representation and algorithm design

Class (h)	Exer. (h)	Lab. (h)	Weight	Examination
12	10.5	16	3	CT(70%) + TP(30%)

Language(s) for the course

- French

Course description

This course aims on the one hand to acquire the basic knowledge on the representation of information in computers and on the other hand to acquire the basics of algorithmics and programming with an introduction to the use of an object language.

2.4. INFO502a - Data base

Class (h)	Exer. (h)	Lab. (h)	Weight	Examination
6	4.5	12	1.5	CT(70%) TP(30%)

Language(s) for the course

- French

Course description

This course introduces some of the key features of relational databases. The practical classes will be applied to both general and professional issues :

- UML Entity Relationship Diagram (ERD)
- Relational Model (RM) and algebra
- SQL

2.5. MATH500a - Mathematics refresher course

Class (h)	Exer. (h)	Lab. (h)	Weight	Examination
	21			CC

Course description

This course aims to reinforce the bases in mathematics .

2.6. MATH501a - Mathematics

Class (h)	Exer. (h)	Lab. (h)	Weight	Examination
21	19.5		3	CC

Course description

This course aims to give the basic concepts in analysis useful for engineering sciences

3. UE503 : Engineering Sciences

3.1. EASI541a - Automation

Class (h)	Exer. (h)	Lab. (h)	Weight	Examination
7.5	12	20	3	CC (70%) + TP (30%)

Language(s) for the course

- French

Course description

Production lines in factories or energy management in habitats possess numerous and varied automated systems. This course deals with the basic elements required for modeling, analysis, control and implementation of automated systems.

3.2. PHYS541a - Material properties

Class (h)	Exer. (h)	Lab. (h)	Weight	Examination
20	12	8	3	CC(20%) CT(60%) TP(20%)

Language(s) for the course

- French

Course description

The course begins with general concepts concerning the structure of materials and then discusses models describing their electrical, thermal and mechanical properties. It also provides basic notions of heat transfer between materials.

3.3. PHYS542a - Electromagnetism applied to the transmission of information

Class (h)	Exer. (h)	Lab. (h)	Weight	Examination
17	15	8	3	CT(70%) TP(30%)

Language(s) for the course

- French with documents in english

Course description

Fundamental principles explaining the presence of electric and magnetic fields are described. These principles allow to explain the propagation of electromagnetic waves and their use for information transmission (optical fiber, wire cables, waveguide, etc ...).

3.4. PROJ541a - An Experimental First Look of the Curriculum

Class (h)	Exer. (h)	Lab. (h)	Weight	Examination
		40	3	TP

Language(s) for the course

- French

Course description

This unit aims at an experimental first look at several aspects of the curriculum. It consists in 5 practical sessions of 8 hours each, during which students work in groups of 3 or 4.

The 5 topics are :

- Initiation to service robots programming
- Analysis of images and computer vision
- Sensors : data acquisition and exploitation
- Automatic control systems
- Motor control for an embedded system

Semester 6

UE	ECTS	Module	Course name	Class (h)	Exer. (h)	Lab. (h)	Weight	Examination
UE601 : Professionnal Environment	6	LANG600a	Tutoring in English		12			
		LANG601a	English		40.5		3	CC
		PROJ601a	Internship Discovery of the Professional Environment					Quitus diplôme
		SHES601a	Introduction to Accounting and Corporate Finance	10.5	9		1.5	CT
		SHES602a	Introduction to Law	15	4.5		1.5	CT
UE602 : Applied Sciences and Project-Based Learning	12	MATH641a	Mathematics	18	18		3	CC(50%) CT(50%)
		PACI641	Active and Intelligent Materials for Instrumentation	21	15		3	CT
		PACI642	Applied optics and optical waveguiding	14.5	13.5	8	3	CT(70%) + TP(30%)
		PROJ641a	Project Based-Learning			24	3	CC (Rapport, soutenance, pratique)
UE603 : Information Processing and Programming	12	EASI641a	Signals and Systems	12	12	12	2.5	CT(70%) + TP(30%)
		EASI642a	Signal and Image Processing: basic operators	13.5	13.5	9	2.5	CT(70%) + TP(30%)
		INFO641a	Object Oriented Design and Programming	9	9	20	2.5	CC(20%) CT(50%) TP(30%)
		INFO642a	Data bases and web technologies	8.5	7.5	20	2.5	CC(70%) + TP(30%)
		MATH642a	Specialized Mathematics	18	18		2	CT

1. UE601 : Professionnal Environment

1.1. LANG600a - Tutoring in English

Class (h)	Exer. (h)	Lab. (h)	Weight	Examination
	12			

Language(s) for the course

- English

Course description

1.2. LANG601a - English

Class (h)	Exer. (h)	Lab. (h)	Weight	Examination
	40.5		3	CC

Language(s) for the course

- English

Course description

This course aims at training our engineering students to obtain a minimum score of 785/990 in the TOEIC test (« Test of English for International Communication ») as required by the CTI (the accredited French National Institution supervising the award of engineering degrees. Our students are also trained to improve in all four language skills (listening, reading, writing and speaking) on a variety of (everyday life and professional) topics via the news, videos, oral presentations, mock interviews, debates, writing assignments, etc...

The students are evaluated through continuous assessment.

1.3. PROJ601a - Internship Discovery of the Professional Environment

Class (h)	Exer. (h)	Lab. (h)	Weight	Examination
				Quitus diplôme

Course description

Discovery of the professional environment

1.4. SHES601a - Introduction to Accounting and Corporate Finance

Class (h)	Exer. (h)	Lab. (h)	Weight	Examination
10.5	9		1.5	CT

Language(s) for the course

- French

Course description

The objective of this course is to acquire the basics of financial management.

1.5. SHES602a - Introduction to Law

Class (h)	Exer. (h)	Lab. (h)	Weight	Examination
15	4.5		1.5	CT

Language(s) for the course

- French

Course description

The objective of this course is to obtain a basic understanding of law

2. UE602 : Applied Sciences and Project-Based Learning

2.1. MATH641a - Mathematics

Class (h)	Exer. (h)	Lab. (h)	Weight	Examination
18	18		3	CC(50%) CT(50%)

Language(s) for the course

- French

Course description

This course is divided into three parts :

- Linear algebra, matrice reductions
- Euclidean and Hermitian spaces
- Sequences and series of functions

2.2. PACI641 - Active and Intelligent Materials for Instrumentation

Class (h)	Exer. (h)	Lab. (h)	Weight	Examination
21	15		3	CT

Language(s) for the course

- French with documents in english

Course description

This course describes the specific properties of smart materials used in sensors, actuators and mechatronic devices. Physical phenomena involved in these materials, description of behavior models, physical properties, and applications are explained.

2.3. PACI642 - Applied optics and optical waveguiding

Class (h)	Exer. (h)	Lab. (h)	Weight	Examination
14.5	13.5	8	3	CT(70%) + TP(30%)

Language(s) for the course

- French

Course description

This course provides the fundamentals of geometrical and wave optics to describe optical-based communication systems. The matrix formalism and numerical modeling are introduced in order to give the future engineer reliable techniques for a quick and simple description/assessment of an optical system.

2.4. PROJ641a - Project Based-Learning

Class (h)	Exer. (h)	Lab. (h)	Weight	Examination
		24	3	CC (Rapport, soutenance, pratique)

Language(s) for the course

- French

Course description

Problem Based and Project Based Learning (PBL) is implemented here firstly to develop the skills of engineering students acquired in their studies and secondly to acquire additional skills in topics for the future:

- Intelligent building automation and Connected Objects
- Renewable energy management: photovoltaic, wind & others
- Image processing for environmental observation
- Service Robotics
- Health

These topics are the thread of PBL activities and are spread over 3-5 semesters with one module per semester. The work is done in teams (between 4 and 7 engineering students) in all semesters.

3. UE603 : Information Processing and Programming

3.1. EASI641a - Signals and Systems

Class (h)	Exer. (h)	Lab. (h)	Weight	Examination
12	12	12	2.5	CT(70%) + TP(30%)

Language(s) for the course

- French

Course description

At the end of this course, the student should be able to represent a dynamic system, in continuous time or discrete time, by a transfer function, as well as to characterize main properties of a system known by a model of transfer function type. The particular case of sinusoidal excitation is treated by Bode (gain and phase) locus.

3.2. EASI642a - Signal and Image Processing: basic operators

Class (h)	Exer. (h)	Lab. (h)	Weight	Examination
13.5	13.5	9	2.5	CT(70%) + TP(30%)

Language(s) for the course

- French

Course description

Based on the modelization of analog signals, this course aims at providing the backround required for digital filtering and analysis, in both 1D and 2D cases. It includes:

- time-representation of deterministic signals
- frequency-representation of deterministic signals
- analog linear filtering
- digital signals: modelization, filtering
- 2D signals: modelization, representation, filtering; introduction to graph models

3.3. INFO641a - Object Oriented Design and Programming

Class (h)	Exer. (h)	Lab. (h)	Weight	Examination
9	9	20	2.5	CC(20%) CT(50%) TP(30%)

Language(s) for the course

- French

Course description

This course presents the basic concepts of the object oriented approach for software systems. It addresses both object oriented design and object oriented programming. The Java programming language is used as a support.

3.4. INFO642a - Data bases and web technologies

Class (h)	Exer. (h)	Lab. (h)	Weight	Examination
8.5	7.5	20	2.5	CC(70%) + TP(30%)

Language(s) for the course

- French

Course description

The aim of this course is towfolds: (1) teach students how to correctly design relational databases while taking into account constraints and management rules and ensuring database consistency and integrity; (2) design a web interface to create, access and manipulate data of the database. The access to the database is realized through a web server that generates de web pages of the application.

With this class, students will be able to:

- design medium size three-tier web applications,
- organize data using entity-association models and translate these conceptual models into a normalized relational database,
- formalize constraints and design treatments on data using SQL constraint mechanisms, triggers, stored functions and procedures,
- access the data through a web server and design web interfaces for presenting and manipulating the information,
- use current technologies such as PostGres/Mysql DBMS, SQL, PHP, HTML

Prerequisites: it is necessary to have basic knowledge in programming (algorithms) and in databases (relational model representation).

3.5. MATH642a - Specialized Mathematics

Class (h)	Exer. (h)	Lab. (h)	Weight	Examination
18	18		2	CT

Language(s) for the course

- French

Course description

This course provides essential mathematical complements for understanding, representing and analyzing data. The first part of the course deals with the theory of distributions, essential when the analyzed data are associated with analog signals. This part makes it possible to better understand and manipulate the mathematics used in signal and information processing, as well as other physical phenomena that cannot be represented by conventional functions. The second part of the course deals with the mathematics necessary for the analysis of numerical data. On the one hand, it proposes the study of mathematics necessary for the analysis of discrete signals and other numerical information (discrete convolution, Z-transform, Discrete Fourier Transform ...). It develops, on the other hand, techniques and methods for optimization. This part provides a set of mathematical tools that are essential for solving problems encountered in analysis, machine learning and information retrieval from numerical data.

Semester 7

UE	ECTS	Module	Course name	Class (h)	Exer. (h)	Lab. (h)	Weight	Examination
UE701 : Professionnal Environment	6	LANG700a	Tutoring in English		6			
		LANG701a	English		40.5		3	CC
		LANG702a	Foreign languages (above Toeic level)		30		3	CC
		SHES703a	Professional resources and dynamics		10.5	8	1.5	Oral (50%) + rapport et soutenance stage 3A (50%)
		SHES704a	Creativity and innovation management	12	13.5		1.5	CC (20%) Rapport +Soutenance(80%)
UE702 : Electronics, Automatics and Project-Based Learning	12	EASI744a	Automatics: Stability and Control of closed Loop Systems	7.5	9	20	2.5	CT(50%) + TP(50%)
		PACI741	Electronics for instrumentation: Basic for engineers	12	12	12	2.5	CC
		PACI742	Data acquisition systems - Graphic programming	4.5		32	2.5	CC
		PROJ741a	Project Based Learning			24	4.5	Rapport + soutenance + pratique
UE703 : Signals and Digital Systems	12	EASI741a	Random Signals	12	12	12	2.5	CT(70%) TP(30%)
		INFO741a	Embedded systems	9	3	24	2.5	CT(40%) TP(60%)
		INFO742a	Software Development Methods and Quality	12.5	7.5	16	2.5	CC(40%) CT(30%) TP(30%)
		INFO743a	Computer network and distributed systems	12	3	20	2.5	CT(60%) + TP(40%)
		MATH741a	Probability and statistic	18	18		2	CC(50%) CT(50%)

1. UE701 : Professionnal Environment

1.1. LANG700a - Tutoring in English

Class (h)	Exer. (h)	Lab. (h)	Weight	Examination
	6			

Course description

1.2. LANG701a - English

Class (h)	Exer. (h)	Lab. (h)	Weight	Examination
	40.5		3	CC

Language(s) for the course

- English

Course description

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The students are evaluated through continuous assessment.

1.3. LANG702a - Foreign languages (above Toeic level)

Class (h)	Exer. (h)	Lab. (h)	Weight	Examination
	30		3	CC

Course description

A 15-hour course in English: Culture, civilisation and language.

And a 15-hour course in a second foreign language in:

- Spanish, German et Italian at Chambéry and Annecy (no beginners).
- Chinese et Japanese at Annecy (beginners accepted)

1.4. SHES703a - Professional resources and dynamics

Class (h)	Exer. (h)	Lab. (h)	Weight	Examination
	10.5	8	1.5	Oral (50%) + rapport et soutenance stage 3A (50%)

Language(s) for the course

- French

Course description

The objective of the module is to lead the students towards a better self-knowledge in order for them to be able to define a professional project, develop a targeted research strategy and present themselves effectively in an interview.

1.5. SHES704a - Creativity and innovation management

Class (h)	Exer. (h)	Lab. (h)	Weight	Examination
12	13.5		1.5	CC (20%) Rapport +Soutenance(80%)

Language(s) for the course

- French

Course description

This module aims to introduce the students to corporate strategy, and thus enable them to be able to understand the current major corporate orientations. The emergence of new competitive practices based on externalization perspectives or cooperation through partnership training in order to share the risks and costs will be studied.

2. UE702 : Electronics, Automatics and Project-Based Learning

2.1. EASI744a - Automatics: Stability and Control of closed Loop Systems

Class (h)	Exer. (h)	Lab. (h)	Weight	Examination
7.5	9	20	2.5	CT(50%) + TP(50%)

Language(s) for the course

- French

Course description

Stability and control of dynamic systems continuous linear

2.2. PACI741 - Electronics for instrumentation: Basic for engineers

Class (h)	Exer. (h)	Lab. (h)	Weight	Examination
12	12	12	2.5	CC

Language(s) for the course

- French
- English

Course description

This set of lectures concerns the basic electronic blocs necessary to understand the essential elements of a data acquisition system (DAQ). The system consists often of a single or many electronic boards for handling both the analogical and the numerical part of a given instrumentation. It might or not contain an embedded microcontroller. The following items will be introduced but not always thoroughly: Interface of the sensor to the front end electronics, low noise amplification, shapers, sample and hold, analog-to-digital conversion (ADC), digital-to-analog conversion (DAC), FPGA notions and finally the protocols and the of data transmission.

2.3. PACI742 - Data acquisition systems - Graphic programming

Class (h)	Exer. (h)	Lab. (h)	Weight	Examination
4.5		32	2.5	CC

Language(s) for the course

- French

Course description

Structure and operating principle of ADC and DAC converters. Architecture, performance and programming of data acquisition systems with a graphic language (LabView).

2.4. PROJ741a - Project Based Learning

Class (h)	Exer. (h)	Lab. (h)	Weight	Examination
		24	4.5	Rapport + soutenance + pratique

Language(s) for the course

- French

Course description

Problem Based and Project Based Learning (PBL) is implemented here firstly to develop the skills of engineering students acquired in their studies and secondly to acquire additional skills in topics for the future:

- Intelligent building automation and Connected Objects
- Renewable energy management: photovoltaic, wind & others
- Image processing for environmental observation
- Service Robotics

- Health

These topics are the thread of PBL activities and are spread over 3-5 semesters with one module per semester. The work is done in teams (between 4 and 7 engineering students) in all semesters.

3. UE703 : Signals and Digital Systems

3.1. EASI741a - Random Signals

Class (h)	Exer. (h)	Lab. (h)	Weight	Examination
12	12	12	2.5	CT(70%) TP(30%)

Course description

At the end of this module, students will be able:

- to define the properties of a random process, understand the ergodicity theorem
- explain estimators of statistical properties of a numeric random process (autocorrelation, spectral density, ...)
- illustrate by some applications such as optimal filtering, detection, estimation, ...

3.2. INFO741a - Embedded systems

Class (h)	Exer. (h)	Lab. (h)	Weight	Examination
9	3	24	2.5	CT(40%) TP(60%)

Course description

This course aims to present the characteristics of embedded systems. Hardware and software aspects are addressed in a systems approach. Important concepts related to the management of embedded systems are discussed and applied in a mini-project (Input-Output, interruptionss, CPU time sharing, multi-threading, operating system kernel features ...).

3.3. INFO742a - Software Development Methods and Quality

Class (h)	Exer. (h)	Lab. (h)	Weight	Examination
12.5	7.5	16	2.5	CC(40%) CT(30%) TP(30%)

Language(s) for the course

- French

Course description

This course includes an introduction to software development process models (waterfall, evolutionary, agile, etc.), software quality, quality-related standards (ISO, CMM), best practices and design patterns for maintainable software, software testing techniques for reliable software. At the end of the course, students must be able to:

- integrate the quality dimension into their engineering processes,
- design software while taking into account functional and non functional properties,
- design and implement a testing process with suitable test cases and relevant result analysis.

3.4. INFO743a - Computer network and distributed systems

Class (h)	Exer. (h)	Lab. (h)	Weight	Examination
12	3	20	2.5	CT(60%) + TP(40%)

Language(s) for the course

- French with documents in english

Course description

This course provides the fundamental concepts needed to understand computer networks and the deployment of applications and distributed systems. The course begins with an introduction to the archictecture of the Internet and to the notions of application protocols (HTTP, SMTP, SSH). The transport protocols (TCP, UDP) will be presented as well as the structure of IP addressing and routing ((BGP, OSPF, RIP). The sockets interface will be presented as well as the notion of middleware. Distributed algorithms will be introduced with concrete application examples. This will provide the essential bases for application deployment in networks and distributions.

3.5. MATH741a - Probability and statistic

Class (h)	Exer. (h)	Lab. (h)	Weight	Examination
18	18		2	CC(50%) CT(50%)

Language(s) for the course

- French

Course description

This course describe the main notions of probability and useful statistics in engineering sciences to know how to use them to model concrete situations.

Semester 8

UE	ECTS	Module	Course name	Class (h)	Exer. (h)	Lab. (h)	Weight	Examination
UE801 : Professionnal Environment	12	LANG800	Tutoring in English		6			
		LANG801a	English		40.5		3	CC
		LANG802a	Foreign languages (above Toeic level)		30		3	CC
		SHES802a	Integrated Management System QSE (Quality Safety Environment)	9	10.5		1.5	CC
		SHES803a	Organization theory	13.5	6		1.5	CC
UE802 : Internship	6	PROJ801	Engineering Assistant Internship				6	Soutenance, rapport écrit, évaluation entreprise
UE803 : Measurement, Instrumentation and System Control	7	EASI843a	Decentralized automation			24	2	TP
		PACI841	Experimental Physics, Measurements, Sensors and Instrumentation	15	13.5	64	5	CC(25%) TP(50%) Projet(25%)
UE804 : Data Science and Project Based-Learning	11	EASI842a	Image analysis and computer vision	15	13.5	12	2	CT(70%) + TP(30%)
		EASI844a	Models of Discrete Event Systems and Applications	9	19.5	12	1.5	CC(70%) TP(30%)
		INFO841	Security of cyber-physical systems	7.5	4.5	12	2	CT(50%) TP(50%)
		PROJ841a	Project Based Learning			40	5.5	Rapport + soutenance + pratique

1. UE801 : Professionnal Environment

1.1. LANG800 - Tutoring in English

Class (h)	Exer. (h)	Lab. (h)	Weight	Examination
	6			

Language(s) for the course

- English

Course description

1.2. LANG801a - English

Class (h)	Exer. (h)	Lab. (h)	Weight	Examination
	40.5		3	CC

Language(s) for the course

- French

Course description

This course aims at training our engineering students to obtain a minimum score of 785/990 in the TOEIC test (« Test of English for International Communication ») as required by the CTI (the accredited French National Institution supervising the award of engineering degrees).

Our students are also trained to improve in all four language skills (listening, reading, writing and speaking) on a variety of (everyday life and professional) topics via the news, videos, oral presentations, mock interviews, debates, writing assignments, etc...

The students are evaluated through continuous assessment.

1.3. LANG802a - Foreign languages (above Toeic level)

Class (h)	Exer. (h)	Lab. (h)	Weight	Examination
	30		3	CC

Course description

A 15-hour course in English: Culture, civilisation and language.

And a 15-hour course in a second foreign language in:

- Spanish, German et Italian at Chambéry and Annecy (no beginners).
- Chinese and Japanese at Annecy (beginners accepted)

1.4. SHES802a - Integrated Management System QSE (Quality Safety Environment)

Class (h)	Exer. (h)	Lab. (h)	Weight	Examination
9	10.5		1.5	CC

Language(s) for the course

- French

Course description

The students must be aware that the quality management system, the environmental management system and the occupational health and safety management system are today inescapable in the company. It is thus necessary for them to have sufficient knowledge of these systems to take them into account and integrate them into their engineer's job.

1.5. SHES803a - Organization theory

Class (h)	Exer. (h)	Lab. (h)	Weight	Examination
13.5	6		1.5	CC

Language(s) for the course

- French

Course description

The content of this course is deliberatley descriptive and follows a very clear chronology. The programme retraces the beginnnings of organization management from the end of the XIXth century to today. The course thus analyzes the main theories, reasearch and managerial progress made during the development of companies.

This module is divided into three main themes :

- The foundations of organization management (traditional approach and school of human relations);
- The concept of organizational structure using, for example, the works of Mintzberg which highlight the opportunities and constraints in terms of design, coordination and layout of a company;
- Organizational behavior with the notions of performance, diversity, conflict,negotiation, stress...

This is a basic course in the domain of management. Students can obtain a global overview of company management and thus understand the ins and outs.

2. UE802 : Internship

2.1. PROJ801 - Engineering Assistant Internship

Class (h)	Exer. (h)	Lab. (h)	Weight	Examination
			6	Soutenance, rapport écrit, évaluation entreprise

Language(s) for the course

- French

Course description

The 4th year internship is an application internship in a professional environment such as a technician or assistant engineer. The engineering student will be responsible for a specific study, the development or adaptation of new techniques or methods. This training period will be carried out in a company or organization whose activity is representative of the chosen specialty.

3. UE803 : Measurement, Instrumentation and System Control

3.1. EASI843a - Decentralized automation

Class (h)	Exer. (h)	Lab. (h)	Weight	Examination
		24	2	TP

Course description

Since automated systems have been based on computers, their structures have changed greatly to become distributed. This course introduces the main elements necessary to analyze, model and implement these distributed automated systems.

3.2. PACI841 - Experimental Physics, Measurements, Sensors and Instrumentation

Class (h)	Exer. (h)	Lab. (h)	Weight	Examination
15	13.5	64	5	CC(25%) TP(50%) Projet(25%)

Language(s) for the course

- French

Course description

This course aims at getting knowledge and understanding of scientific principles and methodologies which will provide a foundation for senior roles in the selection and implementation of the adequate sensor for a given application. It focuses on the following key areas : metrology, fundamentals of the main sensor types and the associated electronics as well as the underlying physics. This module consists of a series core lecture courses, tutorials, laboratory sessions and projects which underpin the education in the engineering context and support the understanding of related technologies and applications. Students are expected to report their work in a laborarory notebook. They will be assessed through write-ups, oral presentation and project reports, presented in a logical way, with scientific rigour and critical thinking.

4. UE804 : Data Science and Project Based-Learning

4.1. EASI842a - Image analysis and computer vision

Class (h)	Exer. (h)	Lab. (h)	Weight	Examination
15	13.5	12	2	CT(70%) + TP(30%)

Language(s) for the course

- French

Course description

In this course, the students deepen the basic knowledge of image processing introduced in EASI642, by using the specialized mathematics (MATH642) and random signal basics (EASI742) acquired in the monodimentional case. It includes two parts: the first one is dedicated to image analysis methods (segmentation, classification, ...) and the second one to image correlation for target detection and displacement measurement.

4.2. EASI844a - Models of Discrete Event Systems and Applications

Class (h)	Exer. (h)	Lab. (h)	Weight	Examination
9	19.5	12	1.5	CC(70%) TP(30%)

Language(s) for the course

- French
- French with documents in english

Course description

The aim of this course is an introduction to discrete event systems, their various models and the relevance of these models in domains such as communication, sizing, verification, simulation, prediction and supervision. We will focus not only on various mathematical models of such a system, but also on modeling its inputs in order to predict the future states and outputs of the system according to its current state and available inputs. Analytical and machine learning based strategies will also be addressed.

4.3. INFO841 - Security of cyber-physical systems

Class (h)	Exer. (h)	Lab. (h)	Weight	Examination
7.5	4.5	12	2	CT(50%) TP(50%)

Language(s) for the course

- French with documents in english

Course description

The purpose of this course is to identify the vulnerabilities and risks to which data, systems, and computer networks are exposed. The course will select and deploy appropriate countermeasures to increase the security of cyber-physical systems and protect them from internal and external threats.

4.4. PROJ841a - Project Based Learning

Class (h)	Exer. (h)	Lab. (h)	Weight	Examination
		40	5.5	Rapport + soutenance + pratique

Language(s) for the course

- French

Course description

Problem Based and Project Based Learning (PBL) is implemented here firstly to develop the skills of engineering students acquired in their studies and secondly to acquire additional skills in topics for the future:

- Intelligent building automation and Connected Objects
- Renewable energy management: photovoltaic, wind & others
- Image processing for environmental observation
- Service Robotics
- Health

These topics are the thread of PBL activities and are spread over 3-5 semesters with one module per semester. The work is done in teams (between 4 and 7 engineering students) in all semesters.

Semester 9

UE	ECTS	Module	Course name	Class (h)	Exer. (h)	Lab. (h)	Weight	Examination
UE901 : Professionnal Environment	10	LANG901a	English		40.5		2.5	CC
		LANG902a	Foreing Language (above TOEIC Level)		30		2.5	CC
		PROJ901a	R and D Project			40	6	Pratique + Rapport + Soutenance
		SHES901a	Management	15	7.5		1.5	CC
UE902 : Automatics and Project Based-Learning	8	EASI943a	State Space Approach: Representation, Control and Observability	25.5	25.5	20	4	CC(20%) CT(50%) TP(30%)
		PROJ943a	Project based-Learning			24	4	Pratique + rapport + soutenance
UE903 : Data Science and Communicating Objects	12	EASI941a	Wireless Systems, Wireless Sensors			36	2	TP
		EASI942a	3D Imaging Technology : principles, methods, applications	13.5	10.5	12	2	CT(70%) + TP(30%)
		INFO941a	Embedded Systems and Concurrent Computing	9	3	24	2	CT(40%) TP(60%)
		INFO942a	Machine learning and data mining	12		24	2	CC(30%) CT(30%) TP(40%)
		INFO943	Internet of Things	3	9	24	2	CT(30%) TP(70%)
		PROJ942a	Information processing project			36	2	Rapport + soutenance

1. UE901 : Professionnal Environment

1.1. LANG901a - English

Class (h)	Exer. (h)	Lab. (h)	Weight	Examination
	40.5		2.5	CC

Language(s) for the course

- English

Course description

Our students are trained to enter the professional world where it is essential to be able to work in English. All four language skills (listening and reading, writing and speaking) are regularly practised. Our students are placed in learning contexts and situations where they can keep fine tuning their comprehension and communication skills, through role plays and debates, mock interviews, professional projects...,etc.

1.2. LANG902a - Foreing Language (above TOEIC Level)

Class (h)	Exer. (h)	Lab. (h)	Weight	Examination
	30		2.5	CC

Course description

A 15-hour course in English: Culture, civilisation and language.

And a 15-hour course in a second foreign language in:

- Spanish, German et Italian at Chambéry and Annecy (no beginners).
- Chinese and Japanese at Annecy (beginners accepted)

1.3. PROJ901a - R and D Project

Class (h)	Exer. (h)	Lab. (h)	Weight	Examination
		40	6	Pratique + Rapport + Soutenance

Language(s) for the course

- French

Course description

This work consists of an introduction to fundamental or applied research. It is carried out in pairs on a subject proposed by the industrial world or by a research laboratory. The first part of the project concerns a state of the art of knowledge and/or techniques on the subject, the identification of the method and/or technique that will be implemented as part of the project, and the development of an experience or work plan to address the problem.

The second part of the work concerns the realization of the study and the analysis of the results

1.4. SHES901a - Management

Class (h)	Exer. (h)	Lab. (h)	Weight	Examination
15	7.5		1.5	CC

Language(s) for the course

- French

Course description

Course description: This SHES course is made up of 2 independent modules : Management and Ethics. The objective of this module is to grasp the human and communication aspects of management and to develop the students' managerial assertion

2. UE902 : Automatics and Project Based-Learning

2.1. EASI943a - State Space Approach: Representation, Control and Observability

Class (h)	Exer. (h)	Lab. (h)	Weight	Examination
25.5	25.5	20	4	CC(20%) CT(50%) TP(30%)

Language(s) for the course

- French

Course description

The main objectives of this course are:

- The design of state space models for multi-input multi-output systems

- Analysis of main properties of the system (at least locally)
- Simulation of their dynamic behavior with appropriate software such as Matlab/Simulink
- Build observers to obtain information on state variables
- The implementation of rapid prototyping tools for test of control schemes

2.2. PROJ943a - Project based-Learning

Class (h)	Exer. (h)	Lab. (h)	Weight	Examination
		24	4	Pratique + rapport + soutenance

Course description

Problem Based and Project Based Learning (PBL) is implemented here firstly to develop the skills of engineering students acquired in their studies and secondly to acquire additional skills in topics for the future:

- Intelligent building automation and Connected Objects
- Renewable energy management: photovoltaic, wind & others
- Image processing for environmental observation
- Service Robotics
- Health

These topics are the thread of PBL activities and are spread over 3-5 semesters with one module per semester. The work is done in teams (between 4 and 7 engineering students) in all semesters.

3. UE903 : Data Science and Communicating Objects

3.1. EASI941a - Wireless Systems, Wireless Sensors

Class (h)	Exer. (h)	Lab. (h)	Weight	Examination
		36	2	TP

Language(s) for the course

- French

Course description

This course aims to develop and make wireless sensors. It includes the sensor itself, the conditioning circuit, the energy source, a communication module and the embedded intelligence.

3.2. EASI942a - 3D Imaging Technology : principles, methods, applications

Class (h)	Exer. (h)	Lab. (h)	Weight	Examination
13.5	10.5	12	2	CT(70%) + TP(30%)

Language(s) for the course

- French with documents in english
- English

Course description

This course mainly addresses: acquisition, reconstruction, segmentation and analysis of 3D images acquired by means of X-ray tomography. Examples are given in the field of industrial control (NDT, material science, ...) as well as medical imaging. Case studies are presented by industrialists and research engineers from RX-solutions company or ESRF. A visit of the facilities of RX-solutions (a SME manufacturing tomographs) is organized in parallel to the course.

The course is composed of three parts:

- physical aspects; interaction of radiation with matter
- computed tomography
- 3D-image processing

Case studies are presented by industrialists and research engineers from RX-solution (a tomograph manufacturing company) and ESRF. A visit of RX-solutions facilities is organized in parallel to the course.

Course documents are in English. Lectures are given in English for non-French speaking students.

3.3. INFO941a - Embedded Systems and Concurrent Computing

Class (h)	Exer. (h)	Lab. (h)	Weight	Examination
9	3	24	2	CT(40%) TP(60%)

Course description

This module explains how work the embedded sytems running with an Operating System (OS). In particular, we show the importance of the constraints linked to the real time and the multi-task. Finally, we will introduce the implementation from technical specifications of a real-time embedded systems.

3.4. INFO942a - Machine learning and data mining

Class (h)	Exer. (h)	Lab. (h)	Weight	Examination
12		24	2	CC(30%) CT(30%) TP(40%)

Language(s) for the course

- French
- French with documents in english

Course description

This module is dedicated to machine learning in context of data analysis. It aims at constructing non-necessarily analytical models from a given set of data. The issue is discovering, through the data and according to the problem to be solved (decision making, decision support, segmentation, classification, content retrieval from a query, ...), optimal functionals capable of decomposing the data in order to extract meaningful features and thus, lead to sophisticated processing of digital information. These functionals can be very parsimonious (shallow learning) or organized in several non-trivial layers (deep learning). Built from several scientific disciplines (statistics, numerical analysis, optimization, computer science, ...) and being an essential part of artificial intelligence, machine learning is exploited nowadays in many engineering and research fields.

3.5. INFO943 - Internet of Things

Class (h)	Exer. (h)	Lab. (h)	Weight	Examination
3	9	24	2	CT(30%) TP(70%)

Language(s) for the course

- French with documents in english

Course description

The objective of this course is to give students an awareness of the importance of IoT. It introduces the fundamental concepts of the Internet of Things and describes the design chain of connected objects.

3.6. PROJ942a - Information processing project

Class (h)	Exer. (h)	Lab. (h)	Weight	Examination
		36	2	Rapport + soutenance

Language(s) for the course

- French

Course description

The aim of this module is the development of an information processing application (images) on a tablet type support.

This project will therefore combine several skills: those acquired in information processing (and more particularly in image and vision processing), those acquired in design and programming and those acquired in distributed processing. Projects will be carried out in groups (typically 5 students). They will have four aspects:

- the realization of an image acquisition interface (a face) on a tablet

- the realization of an image processing program for face recognition.

- the realization of a communication between the tablet and the processing server

- a "project management" work mode

Semester 10

UE	ECTS	Module	Course name	Class (h)	Exer. (h)	Lab. (h)	Weight	Examination
UE001 : Internship	30	PROJ001	Internship				30	Soutenance, rapport écrit, évaluation entreprise

1. UE001 : Internship

1.1. PROJ001 - Internship

Class (h)	Exer. (h)	Lab. (h)	Weight	Examination
			30	Soutenance, rapport écrit, évaluation entreprise

Language(s) for the course

- French

Course description

This Internship takes place in a company in which engineering students have one (or more) task (s) to achieve, close (s) to his future engineering function, integrating a project approach with technical, economic and social aspects. These aspects should be highlighted in the written and oral presentation of the course even if the engineering student has not been the direct actor.