

# Curriculum of the program in Computer science, Data, Usage



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# Glossary

## Program

IDU Computer science, Data, Usage

## Course codes

DATA	Data science
EASI	Electrical engineering and signal processing
INFO	Computer science
ISOC	Computers and Society
LANG	English
MATH	Mathematics
MECA	Mechanical
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 : Professional Environment	6	LANG500	Tutoring in English		12			
		LANG501	English		40.5		4	CCI (écrit et oral)
		SHES501	Sport		21		1	CC/pratique
		SHES505	Business Game		19.5		1	CC (écrit et oral)
UE502 : Engineering Sciences and Tools	12	DDRS501	Sustainable Development	12	9		1.5	CC(45%) + Projets (55%)
		EASI501	Electrical Engineering	13.5	15	12	3	CC(70%) TP(30%)
		INFO501	Number representation and algorithm design	12	10.5	16	3	CC(70%) + TP(30%)
		INFO502	Data base	6	4.5	12	1.5	CC
		MATH500	Mathematics refresher course		21			
		MATH501	Mathematics	21	19.5		3	CC
UE503 : Engineering Sciences IDU1	12	EASI541a	Automation	6	13.5	20	3	CC(70%) + TP(30%)
		ISOC531	Digital society	13.5	22.5	4	3	CC
		MATH531	Graphs Theory and Language	12	12	16	3	CC
		PROJ531	Project management	6	6	28	3	CC (70%) + Pratique (30%)

## 1. UE501 : Professional Environment

### 1.1. LANG500 - Tutoring in English

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

Language(s) for the course

- English

Descriptif

## 1.2. LANG501 - English

Class (h)	Exer. (h)	Lab. (h)	Weight	Examination
	40.5		4	CCI (écrit et oral)

### Language(s) for the course

- English

### Descriptif

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. SHES501 - Sport

Class (h)	Exer. (h)	Lab. (h)	Weight	Examination
	21		1	CC/pratique

### Language(s) for the course

- French

### Descriptif

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	CC (écrit et oral)

### Language(s) for the course

- French

### Descriptif

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
12	9		1.5	CC(45%) + Projets (55%)

### Descriptif

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. EASI501 - 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

### Descriptif

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

## 2.3. INFO501 - Number representation and algorithm design

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

### Language(s) for the course

- French
- French with documents in english

### Descriptif

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. INFO502 - Data base

Class (h)	Exer. (h)	Lab. (h)	Weight	Examination
6	4.5	12	1.5	CC

### Language(s) for the course

- French

### Descriptif

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. MATH500 - Mathematics refresher course

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

### Descriptif

This course aims to reinforce the bases in mathematics .

## 2.6. MATH501 - Mathematics

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

### Descriptif

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

## 3. UE503 : Engineering Sciences IDU1

### 3.1. EASI541a - Automation

Class (h)	Exer. (h)	Lab. (h)	Weight	Examination
6	13.5	20	3	CC(70%) + TP(30%)

**Language(s) for the course**

- French

**Descriptif**

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. ISOC531 - Digital society**

Class (h)	Exer. (h)	Lab. (h)	Weight	Examination
13.5	22.5	4	3	CC

**Language(s) for the course**

- English

**Descriptif**

New information technologies based on digital platforms proliferate in our society. Such technologies now affect everyday life, groups, personal identity, culture, safety, and virtually all aspects of existence. From a sociological standpoint, The Digital Society is so pervasively a part of our world as to be almost invisible. Therefore, the necessity of recognizing the impacts of such technologies on us as individuals as well as the societal repercussions is of increasing importance. Emphasis in such a course of study will be placed on understanding the beginnings and development of digitalization, the internet in its many manifestations, online subcultures, gaming, privacy, information management, cyber-terrorism and bullying, business and corporate interface, identity, key individuals within the subject, relationships, criminal overtones, government interfaces, law, virtual worlds, and mass media.

**3.3. MATH531 - Graphs Theory and Language**

Class (h)	Exer. (h)	Lab. (h)	Weight	Examination
12	12	16	3	CC

**Language(s) for the course**

- French

**Descriptif**

This course will introduce you to some of the key features of the language and theory of graphs. The main themes discussed are:

- Properties of Tree, rooted tree and binary tree
- Properties of directed and undirected graphs
- Modelling of practical problems
- Algorithms for the exploration of tree or graphs

**3.4. PROJ531 - Project management**

Class (h)	Exer. (h)	Lab. (h)	Weight	Examination
6	6	28	3	CC (70%) + Pratique (30%)

**Language(s) for the course**

- French

**Descriptif**

This course is an introduction to required skills for managing small-size software projects. Besides the general aspects and tasks to take into account in any project (scope, planning, organisation, resource allocation, product life-cycle), students learn practices, methods and tools that are specific to software projects. At the end of this course, students will be able to identify and manage the project/product scope, build a work breakdown structure, create a project plan, define and allocate resources, choose a process development method/model for the software product, manage the project development. Students learn on the different ways software development can be organized (waterfall, evolutive, spiral, and agile methods) and on what relevant tools they may use. Students will practice some of those methods and tools (PERT/GANTT, Scrum, Trello, SVN, GitHub) through a concrete project.

# Semester 6

UE	ECTS	Module	Course name	Class (h)	Exer. (h)	Lab. (h)	Weight	Examination
UE601 : Profession- nal Envi- ronment	6	LANG600	Tutoring in English		12			
		LANG601	English		40.5		4	CC
		PROJ601	Internship Dis- covery of the Professional Environment					Quitus diplôme
		SHES601	Introduction to Accounting and Corporate Finance	10.5	9		1	Oral
		SHES602	Introduc- tion to Law	15	4.5		1	CT
UE602 : Mathemat- ics and Al- goritimics	10	INFO631	Logic Pro- gramming	10.5	10.5	20	3	CC
		MATH641a	Mathematics	18	18		3	CC(50%) + ET(50%)
		PROJ631	Algorith- mic project		42		4	CC
UE603 : Comput- er and En- gineering	5	INFO633	Databases and Web technologies	8.5	7.5	20	2.5	CCI
		INFO641a	Object-orient- ed design and Programming	9	9	20	2.5	CC(60%) + TP(40%)
UE604 : Envrion- ment and applications	9	INFO632	Operating systems and Virtualization	10.5	13.5	16	3	CC
		ISOC631	Collabora- tive platforms	13.5	15	12	3	CC
		PROJ632	Data Science Project		30		3	CC

## 1. UE601 : Professionnal Environment

### 1.1. LANG600 - Tutoring in English

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

**Language(s) for the course**

- English

**Descriptif****1.2. LANG601 - English**

Class (h)	Exer. (h)	Lab. (h)	Weight	Examination
	40.5		4	CC

**Language(s) for the course**

- English

**Descriptif**

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. PROJ601 - Internship Discovery of the Professional Environment**

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

**Descriptif**

Discovery of the professional environment

**1.4. SHES601 - Introduction to Accounting and Corporate Finance**

Class (h)	Exer. (h)	Lab. (h)	Weight	Examination
10.5	9		1	Oral

**Language(s) for the course**

- French

**Descriptif**

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

**1.5. SHES602 - Introduction to Law**

Class (h)	Exer. (h)	Lab. (h)	Weight	Examination
15	4.5		1	CT

**Language(s) for the course**

- French

**Descriptif**

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

**2. UE602 : Mathematics and Algorithmics****2.1. INFO631 - Logic Programming**

Class (h)	Exer. (h)	Lab. (h)	Weight	Examination
10.5	10.5	20	3	CC

**Language(s) for the course**

- French

**Descriptif**

The aim of this course is to introduce you to the theory and practice of logic programming. The course has two components:

- Logic programming - theory
- Logic programming - programming

## 2.2. MATH641a - Mathematics

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

### Language(s) for the course

- French

### Descriptif

This course is divided into three parts:

- Linear algebra supplements , matrices reductions
- Euclidean and Hermitian spaces
- Sequences and series of functions, different types of convergence

## 2.3. PROJ631 - Algorithmic project

Class (h)	Exer. (h)	Lab. (h)	Weight	Examination
	42		4	CC

### Language(s) for the course

- French

### Descriptif

Students are required to perform two individual algorithmic projects for solving selected problems in computer science. The aim of these projects is to provide a balance between the theoretical and practical aspects of software development.

From the theoretical point of view, a particular emphasis is placed on the use and implementation of the specific data structures and algorithms studied in the module « Graph theory and Languages » for addressing real problems.

Concerning the practical aspect of software development, students will be required to apply software engineering methodologies in order to plan, organize and execute their project works. Some focus will be also given on the use of version management tools.

## 3. UE603 : Computer and Engineering

### 3.1. INFO633 - Databases and Web technologies

Class (h)	Exer. (h)	Lab. (h)	Weight	Examination
8.5	7.5	20	2.5	CCI

### Language(s) for the course

- French

### Descriptif

The aim of this course is to teach students how to design and realize web-based applications. First, data conceptual modeling and concrete implementation into databases are addressed. Then, web technologies are tackled to design web pages able to interact with the databases. 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 relational databases,
- access the information through a web server and design web interfaces for presenting and manipulating the information,
- use current technologies such as PostGres DBMS, SQL, PHP, CSS, HTML, Javascript.

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

### 3.2. INFO641a - Object-oriented design and Programming

Class (h)	Exer. (h)	Lab. (h)	Weight	Examination
9	9	20	2.5	CC(60%) + TP(40%)

#### Language(s) for the course

- French

#### Descriptif

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.

## 4. UE604 : Environment and applications

### 4.1. INFO632 - Operating systems and Virtualization

Class (h)	Exer. (h)	Lab. (h)	Weight	Examination
10.5	13.5	16	3	CC

#### Language(s) for the course

- French

#### Descriptif

This course aims to introduce operating systems and virtualization from a user perspective. The course tackles the main principles and practical works provide the ability to observe the reactions of the system and to better understand its behavior.

### 4.2. ISOC631 - Collaborative platforms

Class (h)	Exer. (h)	Lab. (h)	Weight	Examination
13.5	15	12	3	CC

#### Language(s) for the course

- English

#### Descriptif

The aim of this course is to introduce collaborative platforms principles and usage. In particular the concept of API will be described and illustrated. We will in particular look at social networks (Facebook and Twitter), Cooperative development platforms like github and freshmeat, and Crowd Funding. Finally an introduction to open source development will be presented. The course will be the occasion for the student to make a project combining several of the collaborative platforms.

### 4.3. PROJ632 - Data Science Project

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

#### Language(s) for the course

- French

#### Descriptif

This first project in Data Science considers the first steps when solving a Data Science problem, that is acquiring and curating the data to be then used for analysis and visualisation.

Several kinds of data will be considered: structured data (like the ones available in the Open Data initiative), unstructured ones such as text, audio and video (cooking recipes, comments for restaurants).

The aim of this project is for students, finding which data could be required, the acquiring them, curating them, and propose the models for both the application and the database.

# Semester 7

UE	ECTS	Module	Course name	Class (h)	Exer. (h)	Lab. (h)	Weight	Examination
UE701 : Professional Environment	6	LANG700	Tutoring in English		6			
		LANG701	English (below B2 level)		40.5		3	CC
		LANG702	Foreign languages (B2 level)		35		3	CC
		SHES703	Professional resources and dynamics		15	4	1.5	Oral (50%) + rapport et soutenance stage 3A (50%)
		SHES704	Creativity and innovation management		25.5		1.5	CCI : 50% (rapport/QCM) et 50% (soutenance)
UE702 : Mathematics and data	8	DATA731	Stochastic modeling	12		24	3	CC
		INFO731	Security and cryptography	13.5	22.5	4	3	CT(50%) + CC(50%)
		MATH741a	Probability and statistic	18	18		2	CC(50%) + ET(50%)
UE703 : Computing and Design	7	INFO732	Behaviour and dynamic modelling	7.5	6	24	2.5	CC(50%) + ET(50%)
		INFO743a	Computer networks and distributed systems	18	16	4	2.5	CT(60%) + TP(40%)
		PROJ731	Data stream and Concurrency	2	4	16	2	CC
UE704 : Display and governance	9	DATA732	Data analysis and data visualization	12	23.5		3	CC
		INFO734	Full Stack Development	12	24		3	CC
		ISOC731	Economy and data governance	15	21	4	3	CC
		LANG700w			6			
		LANG701w	English (Below B2 level)		40.5		3	CC
		LANG702w	Foreign languages ( B2 level)		35		3	CC

UE	ECTS	Module	Course name	Class (h)	Exer. (h)	Lab. (h)	Weight	Examination
		SHES703w	Professional resources and dynamics		15	4	1.5	CC (50%) + rapport et soutenance stage 3A (50%)
		SHES704w	Creativity and innovation management		25.5		1.5	CCI
UE704 : Professional environment	6	DATA732	Data analysis and data visualization	12	23.5		3	CC
		INFO734	Full Stack Development	12	24		3	CC
		ISOC731	Economy and data governance	15	21	4	3	CC
		LANG700w			6			
		LANG701w	English (Below B2 level)		40.5		3	CC
		LANG702w	Foreign languages ( B2 level)		35		3	CC
		SHES703w	Professional resources and dynamics		15	4	1.5	CC (50%) + rapport et soutenance stage 3A (50%)
		SHES704w	Creativity and innovation management		25.5		1.5	CCI

## 1. UE701 : Professionnal Environment

### 1.1. LANG700 - Tutoring in English

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

#### Descriptif

### 1.2. LANG701 - English (below B2 level)

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

#### Language(s) for the course

- English

#### Descriptif

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. LANG702 - Foreign languages (B2 level)

Class (h)	Exer. (h)	Lab. (h)	Weight	Examination
	35		3	CC

#### Descriptif

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

And a 20-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. SHES703 - Professional resources and dynamics

Class (h)	Exer. (h)	Lab. (h)	Weight	Examination
	15	4	1.5	Oral (50%) + rapport et soutenance stage 3A (50%)

#### Language(s) for the course

- French

#### Descriptif

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. SHES704 - Creativity and innovation management

Class (h)	Exer. (h)	Lab. (h)	Weight	Examination
	25.5		1.5	CCI : 50% (rapport/QCM) et 50% (soutenance)

#### Language(s) for the course

- French

#### Descriptif

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 : Mathematics and data

### 2.1. DATA731 - Stochastic modeling

Class (h)	Exer. (h)	Lab. (h)	Weight	Examination
12		24	3	CC

#### Language(s) for the course

- French
- French with documents in english

#### Descriptif

The course proposes a study of generalized stochastic models, in a context of description, analysis and retrieval of information from data. The main models studied are associated with the mono and multivariate probability features, the entropy and likelihood functions, the so-called linear and non-linear autoregressive neural based families, the stochastic differenced/integrated processes with integer and fractional orders, the so-called Poisson process, the markovian properties of certain class of processes, as well as interactions of processes and mixture models.

### 2.2. INFO731 - Security and cryptography

Class (h)	Exer. (h)	Lab. (h)	Weight	Examination
13.5	22.5	4	3	CT(50%) + CC(50%)

**Language(s) for the course**

- French with documents in english
- English

**Descriptif**

This course provides an introduction to the principles and practice of computer and network security with a focus on both fundamentals and practical information. Topics include ethics, primary definitions, applied cryptography, networking (e.g., firewalls, VPNs, wireless security), operating systems, malware, and incident handling. The course will also cover application areas, such as data centers, mobile applications, payment systems, and data security.

**2.3. MATH741a - Probability and statistic**

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

**Language(s) for the course**

- French

**Descriptif****3. UE703 : Computing and Design****3.1. INFO732 - Behaviour and dynamic modelling**

Class (h)	Exer. (h)	Lab. (h)	Weight	Examination
7.5	6	24	2.5	CC(50%) + ET(50%)

**Language(s) for the course**

- French

**Descriptif**

The aim of this course is to learn students how to design and realize software systems while considering software quality-related characteristics (ISO). As structural aspects are addressed in the previous course INFO641, the focus here is on the behavior of software systems. We address in particular non functional characteristics like maintainability and evolvability of software systems through design patterns. At the end of the course, students must be able to:

- analyse and design software behavior using UML (sequence, collaboration and state diagrams),
- design software while taking into account functional and non functional characteristics (ISO/CEI 9126, SquaRE),
- design and implement software behavior using suitable design patterns.

**3.2. INFO743a - Computer networks and distributed systems**

Class (h)	Exer. (h)	Lab. (h)	Weight	Examination
18	16	4	2.5	CT(60%) + TP(40%)

**Language(s) for the course**

- French
- French with documents in english

**Descriptif**

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 architecture of the Internet and to the notions of application protocols. The transport protocols will be presented as well as the structure of IP addressing. 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.

### 3.3. PROJ731 - Data stream and Concurrency

Class (h)	Exer. (h)	Lab. (h)	Weight	Examination
2	4	16	2	CC

#### Language(s) for the course

- French

#### Descriptif

This course aims to teach, through manipulation, the management of data streams. The manipulation of large data streams requires a good knowledge of inputs/outputs, network programming and concurrent programming.

## 4. UE704 : Professional environment

### 4.1. DATA732 - Data analysis and data visualization

Class (h)	Exer. (h)	Lab. (h)	Weight	Examination
12	23.5		3	CC

#### Language(s) for the course

- French

#### Descriptif

The course of Analyzing and Visualizing Data will provide to students the techniques to find which features in data are crucial to analyze data. These data could be structured, unstructured or graphs. The students will have a set of tools to accompany this course.

### 4.2. INFO734 - Full Stack Development

Class (h)	Exer. (h)	Lab. (h)	Weight	Examination
12	24		3	CC

#### Language(s) for the course

- French
- French with documents in english

#### Descriptif

The aim of this course is to present what is called Full Stack JS in two parts:

1. Back-end development with Node.js, Express and MongoDB
2. Front-end development with Angular 2 and Ionic 2

On server side, we develop with the Node.js server and Express, and data will be stored into a MongoDB database. The client side is provided into three different versions. In the first version, the Node.js version will generate HTML pages through EJS template engine. In the second version, the client side is responsible to create the web page via Angular 2, following the Single Page Application approach. Finally, in the last version, we will develop a mobile version with Ionic 2.

### 4.3. ISOC731 - Economy and data governance

Class (h)	Exer. (h)	Lab. (h)	Weight	Examination
15	21	4	3	CC

#### Language(s) for the course

- English

#### Descriptif

The aim of this course is to acquire the fundamentals and the analytical and methodological keys related to technical, economical, legal, ethical and political stakes in the data governance and of its usages, as well as to the wide range of involved public and private interests. The National, European and Global contexts will be introduced and analyzed. to understand how who sets norms, rules, and protocols for data processing, how and for which objectives, and how its technical, legal, political, economical and social norms implemented, articulated and enforced. In particular, we will emphasize on issues of privacy and trust as well as the economy of data.

**4.4. LANG700w -**

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

**Language(s) for the course**

- English

**Descriptif****4.5. LANG701w - English (Below B2 level)**

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

**Language(s) for the course**

- English

**Descriptif**

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.

**4.6. LANG702w - Foreign languages ( B2 level)**

Class (h)	Exer. (h)	Lab. (h)	Weight	Examination
	35		3	CC

**Language(s) for the course**

- French
- French with documents in english
- English

**Descriptif**

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

And a 20-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)

**4.7. SHES703w - Professional resources and dynamics**

Class (h)	Exer. (h)	Lab. (h)	Weight	Examination
	15	4	1.5	CC (50%) + rapport et soutenance stage 3A (50%)

**Language(s) for the course**

- French

**Descriptif**

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.

**4.8. SHES704w - Creativity and innovation management**

Class (h)	Exer. (h)	Lab. (h)	Weight	Examination
	25.5		1.5	CCI

**Language(s) for the course**

- French

**Descriptif**

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.

**5. UE704 : Display and gouvernance****5.1. DATA732 - Data analysis and data visualization**

Class (h)	Exer. (h)	Lab. (h)	Weight	Examination
12	23.5		3	CC

**Language(s) for the course**

- French

**Descriptif**

The course of Analyzing and Visualizing Data will provide to students the techniques to find which features in data are crucial to analyze data. These data could be structured, unstructured or graphs. The students will have a set of tools to accompany this course.

**5.2. INFO734 - Full Stack Development**

Class (h)	Exer. (h)	Lab. (h)	Weight	Examination
12	24		3	CC

**Language(s) for the course**

- French
- French with documents in english

**Descriptif**

The aim of this course is to present what is called Full Stack JS in two parts:

1. Back-end development with Node.js, Express and MongoDB
2. Front-end development with Angular 2 and Ionic 2

On server side, we develop with the Node.js server and Express, and data will be stored into a MongoDB database. The client side is provided into three different versions. In the first version, the Node.js version will generate HTML pages through EJS template engine. In the second version, the client side is responsible to create the web page via Angular 2, following the Single Page Application approach. Finally, in the last version, we will develop a mobile version with Ionic 2.

**5.3. ISOC731 - Economy and data governance**

Class (h)	Exer. (h)	Lab. (h)	Weight	Examination
15	21	4	3	CC

**Language(s) for the course**

- English

**Descriptif**

The aim of this course is to acquire the fundamentals and the analytical and methodological keys related to technical, economical, legal, ethical and political stakes in the data governance and of its usages, as well as to the wide range of involved public and private interests. The National, European and Global contexts will be introduced and analyzed. to understand how who sets norms, rules, and protocols for data processing, how and for which objectives, and how its technical, legal, political, economical and social norms implemented, articulated and enforced. In particular, we will emphasize on issues of privacy and trust as well as the economy of data.

**5.4. LANG700w -**

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

**Language(s) for the course**

- English

**Descriptif****5.5. LANG701w - English (Below B2 level)**

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

**Language(s) for the course**

- English

**Descriptif**

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.

**5.6. LANG702w - Foreign languages ( B2 level)**

Class (h)	Exer. (h)	Lab. (h)	Weight	Examination
	35		3	CC

**Language(s) for the course**

- French
- French with documents in english
- English

**Descriptif**

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

And a 20-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)

**5.7. SHES703w - Professional resources and dynamics**

Class (h)	Exer. (h)	Lab. (h)	Weight	Examination
	15	4	1.5	CC (50%) + rapport et soutenance stage 3A (50%)

**Language(s) for the course**

- French

**Descriptif**

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.

**5.8. SHES704w - Creativity and innovation management**

Class (h)	Exer. (h)	Lab. (h)	Weight	Examination
	25.5		1.5	CCI

**Language(s) for the course**

- French

**Descriptif**

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.

# Semester 8

UE	ECTS	Module	Course name	Class (h)	Exer. (h)	Lab. (h)	Weight	Examination
UE801 : Professional Environment	6	LANG800	Tutoring in English		6			
		LANG801	English (Below B2 Level)		40.5		3	CC
		LANG802	Foreign languages (B2 level)		35		3	CC
		SHES802	Integrated Management System QSE (Quality Safety Environment)	9	10.5		1.5	CC
		SHES803	Organization theory	9	9		1.5	CC
UE802 : Internship	6	PROJ801	Engineering Assistant Internship				6	Évaluation par compétences
UE803 : Data and Decision Aiding	9	DATA831	Big Data	7.5		12	1	CC(70%) + TP(30%)
		DATA832	Machine Learning	9	9	12	2.5	CC
		INFO831	Business-intelligence	9	9	12	2.5	CC
		PROJ831	Database and use Project	4.5	36		3	CC
UE804 : Computing and Design	9	INFO832	Data and Software Quality Assurance	12	12	16	2.5	CC
		INFO833	Large-scale distributed systems	12	13.5	15	2.5	ET(70%) + CC(30%)
		INFO834	Distributed databases.	7.5	7.5	24	2.5	CC
		ISOC831	Business dimension	30			1.5	CCI
		LANG801w	English (below B2 level)		40.5		3	CC
		LANG802w	Foreign languages (B2 level)		35		3	CC
		SHES802w	Integrated Management System QSE (Quality Safety Environment)	9	10.5		1.5	CC



UE	ECTS	Module	Course name	Class (h)	Exer. (h)	Lab. (h)	Weight	Examination
		SHES803w	Organization theory	9	9		1.5	CC
UE804 : Professional Environment	6	INFO832	Data and Software Quality Assurance	12	12	16	2.5	CC
		INFO833	Large-scale distributed systems	12	13.5	15	2.5	ET(70%) + CC(30%)
		INFO834	Distributed databases.	7.5	7.5	24	2.5	CC
		ISOC831	Business dimension	30			1.5	CCI
		LANG801w	English (below B2 level)		40.5		3	CC
		LANG802w	Foreign languages (B2 level)		35		3	CC
		SHES802w	Integrated Management System QSE (Quality Safety Environment)	9	10.5		1.5	CC
		SHES803w	Organization theory	9	9		1.5	CC

## 1. UE801 : Professional Environment

### 1.1. LANG800 - Tutoring in English

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

#### Language(s) for the course

- English

#### Descriptif

### 1.2. LANG801 - English (Below B2 Level)

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

#### Language(s) for the course

- French

#### Descriptif

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. LANG802 - Foreign languages (B2 level)

Class (h)	Exer. (h)	Lab. (h)	Weight	Examination
	35		3	CC

#### Descriptif

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

And a 20-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. SHES802 - 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

#### Descriptif

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. SHES803 - Organization theory

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

#### Language(s) for the course

- French

#### Descriptif

The content of this course is deliberately descriptive and follows a very clear chronology. The programme retraces the beginnings of organization management from the end of the XIXth century to today. The course thus analyzes the main theories, research 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	Évaluation par compétences

#### Language(s) for the course

- French

#### Descriptif

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 : Data and Decision Aiding

#### 3.1. DATA831 - Big Data

Class (h)	Exer. (h)	Lab. (h)	Weight	Examination
7.5		12	1	CC(70%) + TP(30%)

#### Language(s) for the course

- French

#### Descriptif

Avec l'avènement du Digital, les données sont de plus en plus omniprésentes et en nombre tel qu'il n'est plus possible d'envisager une analyse sur un ordinateur personnel. Le Big Data est né chez les géants de l'Internet (Google, Amazon, Facebook, Yahoo) et a donné lieu à de nombreux outils devenus Open Source comme Big Table, Hadoop, MongoDB pour n'en citer que quelques-uns. Le module Big Data présente les différentes approches existantes pour la prise en compte de données massives à savoir un traitement par batch (avec Hadoop et Map Reduce), un traitement live (avec Apache Spark) et finalement l'architecture lambda mixant les deux approches.

#### 3.2. DATA832 - Machine Learning

Class (h)	Exer. (h)	Lab. (h)	Weight	Examination
9	9	12	2.5	CC

#### Language(s) for the course

- French with documents in english

#### Descriptif

This course presents an overview of machine learning, from its main principles to its implementation by specialized algorithms. Learning principles are presented through a typology of addressed problems and learning frameworks. Concretely, the formulation of a learning problem corresponds to the specification of objectives, data and models. The formulated problem is then solved using an appropriate algorithm. Although most learning principles apply to the various problems addressed, their resolution is based on different algorithms. This course focuses on supervised and unsupervised classification problems. In this context, most frequently used model types (trees, neural networks, rules, bayesian models, etc.) and associated algorithms are introduced from practical case studies. Then, learning paradigms are revisited in order to clarify underlying principles and concepts.

#### 3.3. INFO831 - Business-intelligence

Class (h)	Exer. (h)	Lab. (h)	Weight	Examination
9	9	12	2.5	CC

#### Language(s) for the course

- French with documents in english

#### Descriptif

This course presents the statistical methods exploited in data analysis (factor analysis) or in modeling the explanatory relation of a response variable (regression) and their use in the pyramid of business intelligence. The first part of the course is devoted to the factorial analysis which, by confronting the representation spaces of individuals and variables, enriches the interpretation and makes it possible to exhibit the internal structure of the data. The data nature and coding lead to two essential variants of factorial methods, namely Principal Component Analysis (PCA) and Multiple Correspondence Analysis (MCA), combined in Multiple Factor Analysis (MFA). The second part presents different regression models and methods for estimating their parameters, from the linear model to more complex models with ill-known structure or suitable for unusual data distribution.

#### 3.4. PROJ831 - Database and use Project

Class (h)	Exer. (h)	Lab. (h)	Weight	Examination
4.5	36		3	CC

**Language(s) for the course**

- French
- French with documents in english

**Descriptif**

The first project at Semester 6 considers what is needed from data viewpoint to answer to a specific problem: how to acquire them, curate them and complete them when data are missing.

This second project aims at going one step further in a Data Science project, that is analyzing and visualizing the data. It requires to decide which features have to be considered and how to visualize data and results.

Like PROJ 631, this project starts with a Data Science problem for which students have to find the data, curate them and finally visualize them.

This project could be the subject of a challenge between a company and students. The company provides the data and a joint team of employees and students try to solve the problem.

**4. UE804 : Professionnal Environment****4.1. INFO832 - Data and Software Quality Assurance**

Class (h)	Exer. (h)	Lab. (h)	Weight	Examination
12	12	16	2.5	CC

**Language(s) for the course**

- French

**Descriptif**

This course will introduce you to some of the key features of Software Testing and Quality Assurance QA. The main themes discussed in this course are:

- Software Quality Assurance
- Software Testing
- Software Reengineering

**4.2. INFO833 - Large-scale distributed systems**

Class (h)	Exer. (h)	Lab. (h)	Weight	Examination
12	13.5	15	2.5	ET(70%) + CC(30%)

**Language(s) for the course**

- English

**Descriptif**

This course aims to teach large-scale distributed systems, especially those managing huge amount of data.

**4.3. INFO834 - Distributed databases.**

Class (h)	Exer. (h)	Lab. (h)	Weight	Examination
7.5	7.5	24	2.5	CC

**Language(s) for the course**

- French

**Descriptif**

This course aims at providing students with knowledge on how to design and realize databases dedicated to Big Data. Two aspects are addressed: data organization (representation, storage, distribution, scaling, etc.) and organization of operations on data (definition, distribution, restitution, etc.). Overview of the course:

- Introduction to distributed databases for Big Data: requirements and characteristics
- Basic concepts of NoSQL DBMSs (vs. SQL): implicit schema, key-value pair, document or column oriented databases
- WHAT properties (vs. TIPS/ACID, RICE), NewSQL
- Development of distributed NoSQL databases (e.g. Hadoop, Spark & Storm)

#### 4.4. ISOC831 - Business dimension

Class (h)	Exer. (h)	Lab. (h)	Weight	Examination
30			1.5	CCI

##### Descriptif

Being a Data Scientist requires to be proficient in the three following domains:

- (1) Statistics
- (2) Computer Science
- (3) Business orientation

The objective of this course is to provide a forum with professionals that will present their daily tasks and some Data Science problems they met in their daily tasks.

#### 4.5. LANG801w - English (below B2 level)

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

##### Language(s) for the course

- English

##### Descriptif

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.

#### 4.6. LANG802w - Foreign languages (B2 level)

Class (h)	Exer. (h)	Lab. (h)	Weight	Examination
	35		3	CC

##### Language(s) for the course

- French
- French with documents in english
- English

##### Descriptif

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

And a 20-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)

#### 4.7. SHES802w - 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

##### Descriptif

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.

#### 4.8. SHES803w - Organization theory

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

##### Language(s) for the course

- French

##### Descriptif

The content of this course is deliberately descriptive and follows a very clear chronology. The programme retraces the beginnings of organization management from the end of the XIXth century to today. The course thus analyzes the main theories, research 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.

## 5. UE804 : Computing and Design

### 5.1. INFO832 - Data and Software Quality Assurance

Class (h)	Exer. (h)	Lab. (h)	Weight	Examination
12	12	16	2.5	CC

##### Language(s) for the course

- French

##### Descriptif

This course will introduce you to some of the key features of Software Testing and Quality Assurance QA. The main themes discussed in this course are:

- Software Quality Assurance
- Software Testing
- Software Reengineering

### 5.2. INFO833 - Large-scale distributed systems

Class (h)	Exer. (h)	Lab. (h)	Weight	Examination
12	13.5	15	2.5	ET(70%) + CC(30%)

##### Language(s) for the course

- English

##### Descriptif

This course aims to teach large-scale distributed systems, especially those managing huge amount of data.

### 5.3. INFO834 - Distributed databases.

Class (h)	Exer. (h)	Lab. (h)	Weight	Examination
7.5	7.5	24	2.5	CC

##### Language(s) for the course

- French

**Descriptif**

This course aims at proving students with knowledge on how to design and realize databases dedicated to Big Data. Two aspects are addressed: data organization (representation, storage, distribution, scaling, etc.) and organization of operations on data (definition, distribution, restitution, etc.). Overview of the course:

- Introduction to distributed databases for Big Data: requirements and characteristics
- Basic concepts of NoSQL DBMSs (vs. SQL): implicit schema, key-value pair, document or column oriented databases
- WHAT properties (vs. TIPS/ACID, RICE), NewSQL
- Development of distributed NoSQL databases (e.g. Hadoop, Spark & Storm)

**5.4. ISOC831 - Business dimension**

Class (h)	Exer. (h)	Lab. (h)	Weight	Examination
30			1.5	CCI

**Descriptif**

Being a Data Scientist requires to be proficient in the three following domains:

- (1) Statistics
- (2) Computer Science
- (3) Business orientation

The objective of this course is to provide a forum with professionals that will present their daily tasks and some Data Science problems they met in their daily tasks.

**5.5. LANG801w - English (below B2 level)**

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

**Language(s) for the course**

- English

**Descriptif**

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.

**5.6. LANG802w - Foreign languages (B2 level)**

Class (h)	Exer. (h)	Lab. (h)	Weight	Examination
	35		3	CC

**Language(s) for the course**

- French
- French with documents in english
- English

**Descriptif**

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

And a 20-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)

### 5.7. SHES802w - 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

#### Descriptif

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.

### 5.8. SHES803w - Organization theory

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

#### Language(s) for the course

- French

#### Descriptif

The content of this course is deliberately descriptive and follows a very clear chronology. The programme retraces the beginnings of organization management from the end of the XIXth century to today. The course thus analyzes the main theories, research 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.



# Semester 9

UE	ECTS	Module	Course name	Class (h)	Exer. (h)	Lab. (h)	Weight	Examination
UE901 : Professional Environment	10	LANG901	English		40.5		2.5	CC
		LANG902	Foreign Language (above TOEIC Level)		35		2.5	CC
		PROJ901	R and D Project			40	6	Pratique + Rapport + Soutenance
		SHES901	Management	15	7.5		1.5	CC
UE902 : Optimization and HPC	10	INFO931	Optimization and multicriteria decision aiding	12	12	16	3	CC
		INFO932	High-Performance Computing and Cloud Computing	7.5	7.5	24	3	CC
		PROJ931	Use Project			40	4	CC
UE903 : Data and Decision Aiding II	10	DATA931	Machine Learning	12	12	16	3	CC
		ISOC931	Research and Innovation	6	12	20	3	CC
		PROJ932	Data Science Project			40	4	CC
UE904 : Professional Environment	10	LANG901w	English (Below B2 level)		40.5		2.5	CC
		LANG902w	Foreign languages (B2 level)		35		2.5	CC
		PROJ901w	R and D Project			40	6	Pratique + Rapport + Soutenance
		SHES901w	Management	15	7.5		1.5	CC

## 1. UE901 : Professional Environment

### 1.1. LANG901 - English

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

#### Language(s) for the course

- English

**Descriptif**

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. LANG902 - Foreign Language (above TOEIC Level)**

Class (h)	Exer. (h)	Lab. (h)	Weight	Examination
	35		2.5	CC

**Descriptif**

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

And a 20-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. PROJ901 - R and D Project**

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

**Language(s) for the course**

- French

**Descriptif**

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. SHES901 - Management**

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

**Language(s) for the course**

- French

**Descriptif**

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 : Optimization and HPC****2.1. INFO931 - Optimization and multicriteria decision aiding**

Class (h)	Exer. (h)	Lab. (h)	Weight	Examination
12	12	16	3	CC

**Language(s) for the course**

- French with documents in english

**Descriptif**

This course aims to address multi-criteria problems from two different points of view: optimization and decision aiding. In both cases, the general problem is presented before detailing the different approaches. Multi-criteria optimization is approached by evolutionary algorithms (genetic algorithms, genetic programming). The different components of artificial evolution are presented before discussing multi-criteria optimization using dominance-based

approaches and presenting the Non-dominated Sorting Genetic Algorithm (NSGA) algorithm. Multi-criteria decision aiding is widely used in decision problems to find the "best possible" alternative solution, making the process more explicit, rational and efficient. The decision maker is helped by automatic tools to construct one or more preference models. Addressed problems and modeling approaches lead to various methods and tools presented.

## 2.2. INFO932 - High-Performance Computing and Cloud Computing

Class (h)	Exer. (h)	Lab. (h)	Weight	Examination
7.5	7.5	24	3	CC

### Language(s) for the course

- French with documents in english

### Descriptif

This course aims at understanding the specificities of cloud computing (on-demand resources, virtualization, deployment, ...) and of high performance computing.

## 2.3. PROJ931 - Use Project

Class (h)	Exer. (h)	Lab. (h)	Weight	Examination
		40	4	CC

### Language(s) for the course

- French
- French with documents in english

### Descriptif

For a long time, data in companies were only reused to find information about a customer, a product, but now, companies understand these data are valuable. Two options seem possible for companies: (1) refine this data deluge to understand better their customers or (2) offer these data to external companies for marketing campaigns for example.

It is then crucial to manage how data are acquired (with prior customer consent), curated and analyzed. The objective of this project around social network is to define security policies and data privacy for these data.

## 3. UE903 : Data and Decision Aiding II

### 3.1. DATA931 - Machine Learning

Class (h)	Exer. (h)	Lab. (h)	Weight	Examination
12	12	16	3	CC

### Language(s) for the course

- English

### Descriptif

This module is a continuation of the DATA832 and INFO831 modules in which the BA-ba of data science has been presented through the different paradigms of machine learning and exploratory data analysis. Experimental studies with basic algorithmic machinery have highlighted limitations of basic modeling tools and the need of using advanced methods.

A set of advanced methods, extending the fundamentals of machine learning, is presented in this module. Each approach improves the learning process by focusing on a particular aspect, such as reducing variance of decisions, dealing with non-linear problems, or learning from a very large number of examples with automatic feature extraction.

A conceptual presentation of different methods will be associated with some thoughts on their implementation and with experimentations based on case studies used in applied research.

### Contents

- ensemble methods (bagging, random forests, boosting)
- vector support machines, kernel methods
- deep learning
- reinforcement methods

- time series, sequential patterns

### 3.2. ISOC931 - Research and Innovation

Class (h)	Exer. (h)	Lab. (h)	Weight	Examination
6	12	20	3	CC

#### Language(s) for the course

- French

#### Descriptif

The objective of this module is to give the methodological basis of

1. a documentary research
2. a bibliographic synthesis, i.e. report and critical analysis of a set of documents addressing the same issue, based on explicit criteria

### 3.3. PROJ932 - Data Science Project

Class (h)	Exer. (h)	Lab. (h)	Weight	Examination
		40	4	CC

#### Language(s) for the course

- French
- French with documents in english

#### Descriptif

This final project builds on previous projects (PROJ 631, 831, 931) and considers developing a complete process and system, from acquiring and curating data to analyzing and visualizing them. The main difference comparing to previous project is this one no longer remains on a single (even high-end) machine. It is required to distribute data and computation on a set of machines organised into a cluster (in a Cloud).

The deliverable for this project is a Virtual Machine or a Docker containing all the tools (in-house or open source ones) to reuse the process.

## 4. UE904 : Professional Environment

### 4.1. LANG901w - English (Below B2 level)

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

#### Language(s) for the course

- English

#### Descriptif

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.

### 4.2. LANG902w - Foreign languages (B2 level)

Class (h)	Exer. (h)	Lab. (h)	Weight	Examination
	35		2.5	CC

#### Language(s) for the course

- French
- French with documents in english
- English

#### Descriptif

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

And a 20-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)

#### 4.3. PROJ901w - R and D Project

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

##### Language(s) for the course

- French

##### Descriptif

This work consists of a detailed study concerning:

- a technological or industrial project on a topic given by an industrialist, allowing to analyze the activities of research departments that are experimental, or using technology transfer ;
- a project based on research, proposed by an industrialist or a public/private laboratory, allowing for the initiation to a research process on a joint university-industry topic ;
- a project based on the knowledge of industry which completes the specific courses on the subject.

#### 4.4. SHES901w - Management

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

##### Language(s) for the course

- French

##### Descriptif

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

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# 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

#### Descriptif

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.