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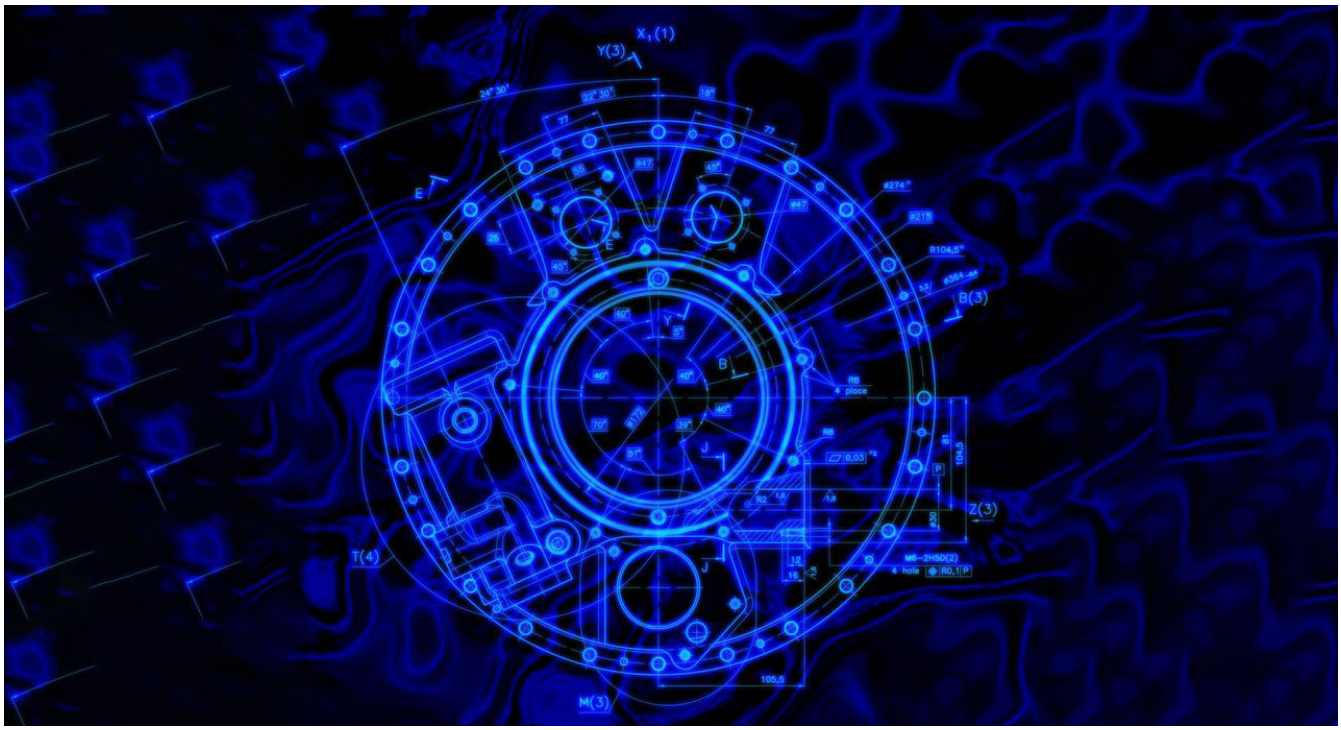
Curriculum of the program in Mechanical and Materials Engineering



UNIVERSITÉ
SAVOIE
MONT BLANC

Curriculum of the program in Mechanical and Materials Engineering

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Table of Contents

Glossary 1
Semester 5 2
1. UE501 : Engineering Sciences and Tools 2
1.1. DDRS501 - Sustainable Development 2
1.2. EASI501a - Electrical Engineering 2
1.3. INFO501a - Number representation and algorithm design 3
1.4. INFO502a - Data base 3
1.5. MATH500a - Mathematics refresher course 3
1.6. MATH501a - Mathematics 3
2. UE502 : Engineering Sciences 3
2.1. MATE551a - Material 3
2.2. MECA501b - Applied mechanics 4
2.3. MECA551a - Computer Aided Design and Prototyping 4
2.4. PHYS551a - Thermodynamics and heat transfer 4
3. UE503 : Professionnal Environment 4
3.1. LANG500a - Tutoring in English 4
3.2. LANG501a - English 4
3.3. SHES501a - Sport 5
3.4. SHES505 - Business Game 5
Semester 6 6
1. UE601 : Engineering Sciences MM2 6
1.1. MATH651a - Mathematics 7
1.2. MECA651 - Production Management and Quality 7
1.3. MECA654 - Static and Dynamic of Mechanical Systems. 7
2. UE602 : Digital for engineers 7
2.1. MECA652a - Numerical mechanics 7
2.2. MECA653a - Numerical tools for engineering 7
3. UE603 : Mechatronics and Mechanical Engineering 8
3.1. MATE651a - Implementation Materials 8
3.2. MECA655a - Design and mechanical technology 8
3.3. EASI651 - Functions and Component for Electronics 8
4. UE604 : Professionnal Environment 8
4.1. LANG600 - Tutoring in English 8
4.2. LANG601 - English 8
4.3. PROJ601 - Internship Discovery of the Professional Environment 9
4.4. SHES601 - Introduction to Accounting and Corporate Finance 9
4.5. SHES602 - Introduction to Law 9
Semester 7 10
1. UE701 : Engineering Sciences MM3 11
1.1. MECA753a - Mechanical Engineering (option in MPI)) 11
1.2. MECA751a - Mechanics of anisotropic materials (option in Materials) 11
1.3. MECA754a - Modeling, Finite Element Method 11
1.4. MECA756 - Product Design - Industrialisation 12
2. UE702 : Elements and Production 12
2.1. MATE751 - Durable Materials (option in Materials) 12
2.2. MATE755a - Material with specific properties 12
2.3. MECA755a - (option in MPI) 12
3. UE703 : Desing of Composites Materials (Option Materials) 13
3.1. PROJ752a - Application project 13
3.2. MATE752 - Synthesis and proerties of Polymers 13
3.3. MECA751 - Mechanics of composite structures 13
4. UE703 : Components and application (option MPI) 13
4.1. PROJ752 - Implementation Project 13
4.2. EASI751a - Electric Actuators 13
4.3. Au choix - 2 options: EASI752, EASI753, MECA752, MECA757 ou MECA758 14

4.4. EASI752 - Sensors and Measuring Chains 14
4.5. EASI753 - Electronics 14
4.6. MECA752 - Production Management 14
4.7. MECA757 - Digital Machining 14
4.8. MECA758 - hydraulic and pneumatic technologies 15
5. UE704 : Professionnal Environment 15
5.1. LANG700a - Tutoring in English 15
5.2. LANG701a - English 15
5.3. LANG702a - Foreign languages (above Toeic level) 15
5.4. SHES703a - Professional resources and dynamics 15
5.5. SHES704a - Creativity and innovation management 16
Semester 8 17
1. UE801 : Systems, Production and Quality 18
1.1. MATE853a - Composite Manufacturing (option in Materials) 18
1.2. MECA851a - Production Quality 18
1.3. MECA852a - Life cycle management of industrial products 19
1.4. MECA853a - Machine components (Option in MPI) 19
2. UE802 : Design of Composite materials (option in Materials) 19
2.1. PROJ852a - Technical and innovation project 19
2.2. MATE854 - Synthesis and properties of polymers 19
2.3. MECA854 - Fluid mechanics and Rheology 20
2.4. MECA855 - Design of Composite Structures (Option in Materials) 20
3. UE802 : Mechanical and Mechatronical Design (Option in MPI) 20
3.1. PROJ852 - Technical and innovative project 20
3.2. EASI851 - Automatics: Analysis and Monitoring of Continuous Systems 20
3.3. EASI852 - Automation 20
3.4. Au choix - Choice of 2 modules from 5 modules: EASI853, INFO851, MECA856, MECA857, MECA858 21
3.5. EASI853 - Automatics: Analysis and Discrete-time Systems 21
3.6. INFO851 - Embedded systems 21
3.7. MECA856 - Vibration 21
3.8. MECA857 - Digital Machining 21
3.9. MECA858 - Production processes 21
4. UE804 : Professionnal Environment 22
4.1. LANG800 - Tutoring in English 22
4.2. LANG801a - English 22
4.3. LANG802a - Foreign languages (above Toeic level) 22
4.4. PROJ801 - Engineering Assistant Internship 22
4.5. SHES802a - Integrated Management System QSE (Quality Safety Environment) 23
4.6. SHES803a - Organization theory 23
Semester 9 24
1. UE901 : Design aof composites materials (option in Materials) 25
1.1. MATE951 - Polymerisation 25
1.2. MECA953 - Design and Calculations of Composites 25
1.3. MECA954 - Structural Calculation: 26
1.4. MECA958a - Non-linear Mechanics 26
2. UE901 : Design an automation (MPI option) 26
2.1. EASI951 - Decentralized Automation and Embedded System 26
2.2. MECA950 - Robotics 26
2.3. MECA951 - Theory of Mechanisms 26
2.4. MECA955 - Metrology and Tolerancing 27
3. UE902 : Manufacturing and implementation of composites materials(Materials Option) 27
3.1. MATE952 - Composite Manufacturing 27
3.2. MATE953a - Instrumental Methods 27
3.3. MECA957 - Composite 4.0 27
3.4. PROJ951 - Design Project of Composites: Biomechanics applications 27
4. UE902 : Mechatronic Systems, Production Systems: Design and Optimization 28
4.1. MECA956 - Advanced Management of Production 28

4.2. PROJ952 - Synthesis project 28
4.3. Au choix - 2 options: EASI941b, MECA959, MECA960, MECA994 28
4.4. EASI941b - Communicating Sytems, Communicating Sensors 28
4.5. MECA959 - Digital Plant 29
4.6. MECA960 - Industrial Performance 29
4.7. MECA994b - Modeling and Control of Mechatronic Systems 29
5. UE904 : Professionnal Environment 29
5.1. LANG901a - English 29
5.2. LANG902a - Foreing Language (above TOEIC Level) 29
5.3. PROJ901a - R and D Project 30
5.4. SHES901a - Management 30
Semester 10 31
1. UE001 : Internship 31
1.1. PROJ001 - Internship 31

Glossary

Program

EBE	Material science, Mechanical engineering

Special tracks

IM	Mechanical engineering
MC	Material Composites
MT	Mechatronics

Course codes

CHIM	Chimistry
EASI	Electrical engineering and signal processing
INFO	Computer science
LANG	Foreign languages
MATE	Materials
MATH	Mathematics
MECA	Mechanical engineering
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 : 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
UE502 : Engineering Sciences	12	MATE551a	Material	16.5	12	12	3	CT(70%) TP(30%)
		MECA501b	Applied mechanics	16.5	24		3	CI(30%) CT(70%)
		MECA551a	Computer Aided Design and Prototyping		4.5	36	3	CC
		PHYS551a	Thermodynamics and heat transfer	13.5	15	12	3	CT(0,7) + TP(0,3)
UE503 : Professional 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

1. UE501 : Engineering Sciences and Tools

1.1. 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.

1.2. 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.

1.3. 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.

1.4. 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

1.5. 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 .

1.6. 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

2. UE502 : Engineering Sciences

2.1. MATE551a - Material

Class (h)	Exer. (h)	Lab. (h)	Weight	Examination
16.5	12	12	3	CT(70%) TP(30%)

Language(s) for the course

- French

Course description

To know the basic concepts associated with the three main families of materials (ceramics, metals and polymers) and to introduce the concepts of composites.

2.2. MECA501b - Applied mechanics

Class (h)	Exer. (h)	Lab. (h)	Weight	Examination
16.5	24		3	CI(30%) CT(70%)

Language(s) for the course

- French

Course description

The course "Applied mechanics" leads (i) to acquire basic knowledge of continuum mechanics, (ii) to analyze the state of solicitations (stress, strain, plasticity criterion) of simple structures and (iii) to solve simple problems of continuum mechanics.

It is composed of:

- statics of non-deformable solids: 2D application,
- the states of stress and strain,
- the elastic and isotropic behavior law,
- the general equations of continuous media and the methods of resolution,
- criteria of plasticity and sizing.

2.3. MECA551a - Computer Aided Design and Prototyping

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

Language(s) for the course

- French

Course description

This course will describe and master CAD software tools. These tools are used in mechanical engineering and production automation to make industrial prototypes. The CAD software used will be Solidworks.

2.4. PHYS551a - Thermodynamics and heat transfer

Class (h)	Exer. (h)	Lab. (h)	Weight	Examination
13.5	15	12	3	CT(0,7) + TP(0,3)

Language(s) for the course

- French with documents in english

Course description

The course describes the fundamental principles that govern the evolution of systems undergoing transformations involving energy exchanges in the form of work and heat. The three modes of heat transfer (convection, conduction and radiation) will be explored in more detail.

3. UE503 : Professionnal Environment

3.1. LANG500a - Tutoring in English

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

Language(s) for the course

- English

Course description

3.2. 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.

3.3. 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.

3.4. 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.

Semester 6

UE	ECTS	Module	Course name	Class (h)	Exer. (h)	Lab. (h)	Weight	Examination
UE601 : Engineering Sciences MM2	9	MATH651a	Mathematics	21	18		3	CC
		MECA651	Production Management and Quality	10.5	18	12	3	CT (70%) TP (30%)
		MECA654	Static and Dynamic of Mechanical Systems.	12	15	12	3	CI(30%) + CT(50%) +TP(20%)
UE602 : Digital for engineers	6	MECA652a	Numerical mechanics	15	15	8	3	2-4 CC(0,7) + TP(0,3)
		MECA653a	Numerical tools for engineering	7.5	7.5	24	3	Project
UE603 : Mechatronics and Mechanical Engineering	9	MATE651a	Implementation Materials	13.5	10.5	16	3	CC(70%) TP(30%)
		MECA655a	Design and mechanical technology	10.5	12	16	3	CT(70%) + TP(30%)
		EASI651	Functions and Component for Electronics	13.5	9	16	3	2-4 CC(70%) + TP(30%)
UE604 : Professional Environment	6	LANG600	Tutoring in English		12			
		LANG601	English		40.5		3	CC
		PROJ601	Internship Discovery of the Professional Environment					Quitus diplôme
		SHES601	Introduction to Accounting and Corporate Finance	10.5	9		1.5	CT
		SHES602	Introduction to Law	15	4.5		1.5	CT

1. UE601 : Engineering Sciences MM2

1.1. MATH651a - Mathematics

Class (h)	Exer. (h)	Lab. (h)	Weight	Examination
21	18		3	CC

Language(s) for the course

- French

Course description

This course is divided into four parts:

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

1.2. MECA651 - Production Management and Quality

Class (h)	Exer. (h)	Lab. (h)	Weight	Examination
10.5	18	12	3	CT (70%) TP (30%)

Language(s) for the course

- French

Course description

The aim of this course consists of discovering the basic knowledge in the area of Operation Management and Quality. The mains subjects deal with are the inventory management, the MRP and MRPII methods and the ISO 9000 Quality Management System.

1.3. MECA654 - Static and Dynamic of Mechanical Systems.

Class (h)	Exer. (h)	Lab. (h)	Weight	Examination
12	15	12	3	CI(30%) + CT(50%) +TP(20%)

Language(s) for the course

- French

Course description

Training in modeling methods and calculation of forces, positions and movements in mechanisms.

2. UE602 : Digital for engineers

2.1. MECA652a - Numerical mechanics

Class (h)	Exer. (h)	Lab. (h)	Weight	Examination
15	15	8	3	2-4 CC(0,7) + TP(0,3)

Language(s) for the course

- French

Course description

The objective of this course is an introduction to numerical methods for the calculation of structures. The content will focus on slender structures such as trusses and beams. These structures will be analyzed analytically to introduce the RDM and then numerical to obtain finite elements.

2.2. MECA653a - Numerical tools for engineering

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

Language(s) for the course

- English

Course description

This course aims at making students able to select and use numerical tools in the field of engineering. The general purpose programming languages Python (open source) is used extensively. The course is split into 5 blocks, each of which corresponding to a given topic (image processing, data management, machine learning, *etc*...).

3. UE603 : Mechatronics and Mechanical Engineering

3.1. MATE651a - Implementation Materials

Class (h)	Exer. (h)	Lab. (h)	Weight	Examination
13.5	10.5	16	3	CC(70%) TP(30%)

Language(s) for the course

- French

Course description

Presentation and practical knowledge of the main implementation processes for materials (metals and alloys, ceramics, plastics and composites).

3.2. MECA655a - Design and mechanical technology

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

Course description

Introductory course in mechanical design, with functional analysis, the rules of industrial design and drawing, as well as some standard components and the basics of tolerancing. The use of software tools for modeling and calculation for the mechanical designer will also be discussed.

3.3. EASI651 - Functions and Component for Electronics

Class (h)	Exer. (h)	Lab. (h)	Weight	Examination
13.5	9	16	3	2-4 CC(70%) + TP(30%)

Language(s) for the course

- French

Course description

The course should allow the student to make the proper choice of the design of a microelectronic model or its basic electronics building blocks for her/his personal application.

4. UE604 : Professionnal Environment

4.1. LANG600 - Tutoring in English

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

Language(s) for the course

- English

Course description

4.2. LANG601 - 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.

4.3. PROJ601 - Internship Discovery of the Professional Environment

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

Course description

Discovery of the professional environment

4.4. SHES601 - 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.

4.5. SHES602 - 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

Semester 7

UE	ECTS	Module	Course name	Class (h)	Exer. (h)	Lab. (h)	Weight	Examination
UE701 : Engineering Sciences MM3	9	MECA753a	Mechanical Engineering (option in MPI))	12	13.5	12	3	CT(70%) + TP(30%)
		MECA751a	Mechanics of anisotropic materials (option in Materials)	25.5	12		3	CC
		MECA754a	Modeling, Finite Element Method	12	10.5	16	3	CC(70%) + TP(30%)
		MECA756	Product Design - Industrialisation	13.5	13.5	12	3	CC(70%) + TP(30%)
UE702 : Elements and Production	6	MATE751	Durable Materials (option in Materials)	27	10.5		3	CC
		MATE755a	Material with specific properties	22.5	16.5		3	CC
		MECA755a	(option in MPI)	13.5	12	12	3	CC(70%) + TP(30%)
UE703 : Desing of Composites Materials (Option Materials)	9	PROJ752a	Application project	12	12	20	3	CC(80%) + TP(20%)
		MATE752	Synthesis and proerties of Polymers	21	16.5		3	CC
		MECA751	Mechanics of composite structures	18	19.5		3	CC
UE703 : Components and application (option MPI)	6	PROJ752	Implementation Project	12	12	20	3	CC(80%) + TP(20%)
		EASI751a	Electric Actuators	3	12	24	3	CC(60%) + TP(40%)
		Au choix	2 options: EASI752, EASI753, MECA752, MECA757 ou MECA758					

UE	ECTS	Module	Course name	Class (h)	Exer. (h)	Lab. (h)	Weight	Examination
		EASI752	Sensors and Measuring Chains		12	8	1.5	CT(70%) TP(30%)
		EASI753	Electronics		12	8	1.5	CT(70%) TP(30%)
		MECA752	Production Management		12	8	1.5	CT(70%) TP(30%)
		MECA757	Digital Machining		12	8	1.5	ET (60%) + TP (40%)
		MECA758	hydraulic and pneumatic technologies		12	8	1.5	CT(70%) TP(30%)
UE704 : Professional 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%)

1. UE701 : Engineering Sciences MM3

1.1. MECA753a - Mechanical Engineering (option in MPI))

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

Course description

Learn to analyze the functioning of existing industrial machines and mechanisms, from drawings, to carry out their selection, adaptation, design or maintenance.

1.2. MECA751a - Mechanics of anisotropic materials (option in Materials)

Class (h)	Exer. (h)	Lab. (h)	Weight	Examination
25.5	12		3	CC

Language(s) for the course

- French with documents in english

Course description

This course will introduce students to fundamentals necessary for the understanding of variational formulation in linear elasticity, constitutive laws of anisotropic continuum (i.e. orthotropic and isotropic engineering constants). Orthotropic lamina under plane stress condition and applications to several cases in anisotropic elasticity problems will be presented.

1.3. MECA754a - Modeling, Finite Element Method

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

Course description

This course will begin with a general description of the computational problems that engineers face, mechanical or thermal, for example, as well as associated essential theoretical concepts. We then discuss the modeling operations and simplification of the model that are commonly performed. The use of a finite elements industrial software will be discussed, with practical ideas to build the model, define the physical boundary conditions and properties. We conclude by discussing the accuracy of the calculations and operating results.

1.4. MECA756 - Product Design - Industrialisation

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

Language(s) for the course

- French

Course description

This course aims at the proposition of a global view on the entire product “development to manufacture” spectrum. It comprises approaches to product development, design, and manufacture. The discussed topics are: what is the general product design, the selection of material and processes, the methodologies designing products for quality, assembly and disassembly, maintenance, functionality, and usability, sustainability, the tests and control requirements, cost estimation and production.

2. UE702 : Elements and Production

2.1. MATE751 - Durable Materials (option in Materials)

Class (h)	Exer. (h)	Lab. (h)	Weight	Examination
27	10.5		3	CC

Language(s) for the course

- French

Course description

This course deals with biodegradable biobased polymers, natural fibres composites as well as with composites valorization.

2.2. MATE755a - Material with specific properties

Class (h)	Exer. (h)	Lab. (h)	Weight	Examination
22.5	16.5		3	CC

Language(s) for the course

- French

Course description

- conventional composite materials
- polymer blends (MC)
- nanocomposite materials (MC)
- specific properties of smart materials used in sensors, actuators and mechatronic devices (MPI)
- physical phenomena involved in these materials, description of behavior models, physical properties, and applications are explained.

2.3. MECA755a - (option in MPI)

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

Language(s) for the course

- French

Course description

The product reliability and the safety of the equipment are the two keys to the success of manufacturing companies. It is therefore important that the automation production engineer masters these two concepts and is able to implement them in the company or service providers.

3. UE703 : Desing of Composites Materials (Option Materials)

3.1. PROJ752a - Application project

Class (h)	Exer. (h)	Lab. (h)	Weight	Examination
12	12	20	3	CC(80%) + TP(20%)

Course description

Description of the fundamental tools to improve or develop a technical product

3.2. MATE752 - Synthesis and proerties of Polymers

Class (h)	Exer. (h)	Lab. (h)	Weight	Examination
21	16.5		3	CC

Course description

This course deals with the main way of synthesis of polymers and with glass transition and crystallization in polymers

3.3. MECA751 - Mechanics of composite structures

Class (h)	Exer. (h)	Lab. (h)	Weight	Examination
18	19.5		3	CC

Language(s) for the course

- French

Course description

4. UE703 : Components and application (option MPI)

4.1. PROJ752 - Implementation Project

Class (h)	Exer. (h)	Lab. (h)	Weight	Examination
12	12	20	3	CC(80%) + TP(20%)

Language(s) for the course

- French

Course description

Description of the fundamental tools to improve or develop a technical product.

4.2. EASI751a - Electric Actuators

Class (h)	Exer. (h)	Lab. (h)	Weight	Examination
3	12	24	3	CC(60%) + TP(40%)

Language(s) for the course

- French

Course description

Electrical actuators are widely present in the world of technical systems. Thus, this course, limited to electrical engines, deals with the basis necessary to understand their proceeding and their driving with static converters. Some features to choose and size these actuators are given and a focus is made on engine technologies widely found in mechanic and mechatronic systems.

4.3. Au choix - 2 options: EASI752, EASI753, MECA752, MECA757 ou MECA758

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

Course description

4.4. EASI752 - Sensors and Measuring Chains

Class (h)	Exer. (h)	Lab. (h)	Weight	Examination
	12	8	1.5	CT(70%) TP(30%)

Language(s) for the course

- English

Course description

This course covers topics related to modern instrumentation and sensing. It starts with a short review of metrology and uncertainty analysis. It continues with an overview of the most common types of sensors making emphasis on their working principle as well as their power conditionning and signal processing.

The course ends with a review of the most popular protocols of wired and wireless communications employed on sensor networks, industry and IOT.

4.5. EASI753 - Electronics

Class (h)	Exer. (h)	Lab. (h)	Weight	Examination
	12	8	1.5	CT(70%) TP(30%)

Language(s) for the course

- English

Course description

This course provides an introduction to analog and digital electronics using modern technologies. Within this context it introduces to filter desing, voltage converters design and signal acquisition systems using microcontrollers and FPGAs.

4.6. MECA752 - Production Management

Class (h)	Exer. (h)	Lab. (h)	Weight	Examination
	12	8	1.5	CT(70%) TP(30%)

Language(s) for the course

- French

Course description

This course deals with the scheduling step, as the intermediary step between manufacturing planning and manufacturing launch. General scheduling concepts are given first. Then the major methods are introduced and used. Hence, the characteristics and the specificities of the shceduling function are highlighted according to the types of the workshops and flows that are the most considered in manufactuing.

4.7. MECA757 - Digital Machining

Class (h)	Exer. (h)	Lab. (h)	Weight	Examination
	12	8	1.5	ET (60%) + TP (40%)

Language(s) for the course

- French

Course description

This course introduces the student to CAM and with a project to the use of the numerical chain from CAD to the manufacture of the part.

4.8. MECA758 - hydraulic and pneumatic technologies

Class (h)	Exer. (h)	Lab. (h)	Weight	Examination
	12	8	1.5	CT(70%) TP(30%)

Language(s) for the course

- French

Course description

This course aims at the development of the fundamental knowledge underlying the operation of hydraulic or pneumatic systems. Numerous application based on numerical simulation of usual hydraulic, pneumatic circuits and components illustrate the course. Advantages and constraints of these technologies will be highlighted.

5. UE704 : Professionnal Environment

5.1. LANG700a - Tutoring in English

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

Course description

5.2. LANG701a - 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.

5.3. 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)

5.4. 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.

5.5. 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.

Semester 8

UE	ECTS	Module	Course name	Class (h)	Exer. (h)	Lab. (h)	Weight	Examination
UE801 : Systems, Production and Quality	8	MATE853a	Composite Manufacturing (option in Materials)	10.5		28	3	CC(50%) + TP(50%)
		MECA851a	Production Quality	13.5	13.5	12	3	CC(75% ; 3 épreuves) + TP(25%)
		MECA852a	Life cycle management of industrial products	9	9	20	3	CC(30%) + TP(70%)
		MECA853a	Machine components (Option in MPI)	19.5	18		3	CC
UE802 : Design of Composite materials (option in Materials)	10	PROJ852a	Technical and innovation project	3	7.5	28		CC
		MATE854	Synthesis and properties of polymers	3		36	3	CC(20%) TP(80%)
		MECA854	Fluid mechanics and Rheology	19.5	10.5	8	3	CC(70%) + TP(30%)
		MECA855	Design of Composite Structures (Option in Materials)	12	15	12	3	CC(70%) + TP(030%)
UE802 : Mechanical and Mechatronical Design (Option in MPI)	10	PROJ852	Technical and innovative project	3	7.5	28	3	CC
		EASI851	Automatics: Analysis and Monitoring of Continuous Systems	13.5	12	12	3	CT(70%) TP(30%)
		EASI852	Automation	6	13.5	20	3	CT(70%) TP(30%)
		Au choix	Choice of 2 modules from 5 modules: EASI853, INFO851, MECA856,					

UE	ECTS	Module	Course name	Class (h)	Exer. (h)	Lab. (h)	Weight	Examination
			MECA857, MECA858					
		EASI853	Automatics: Analysis and Discrete-time Systems		12	8	1.5	CT(50%) TP(50%)
		INFO851	Embed-ded systems		12	8	1.5	CT(70%) TP(30%)
		MECA856	Vibration		12	8	1.5	CT(70%) TP(30%)
		MECA857	Digital Machining		12	8	1.5	CT(70%) TP(30%)
		MECA858	Production processes		12	8	1.25	CT(70%) TP(30%)
UE804 : Professional Environment	12	LANG800	Tutoring in English		6			
		LANG801a	English		40.5		3	CC
		LANG802a	Foreign languages (above Toeic level)		30		3	CC
		PROJ801	Engineering Assistant Internship				6	Soutenance, rapport écrit, évaluation entreprise
		SHES802a	Integrated Management System QSE (Quality Safety Environment)	9	10.5		1.5	CC
		SHES803a	Organization theory	13.5	6		1.5	CC

1. UE801 : Systems, Production and Quality

1.1. MATE853a - Composite Manufacturing (option in Materials)

Class (h)	Exer. (h)	Lab. (h)	Weight	Examination
10.5		28	3	CC(50%) + TP(50%)

Course description

Presentation of the main materials used in the manufacture of composite parts, the methods and the associated parameters for processing thermoset and thermoplastic composite materials.

1.2. MECA851a - Production Quality

Class (h)	Exer. (h)	Lab. (h)	Weight	Examination
13.5	13.5	12	3	CC(75% ; 3 épreuves) + TP(25%)

Language(s) for the course

- French

Course description

Training tools for controlling and improving the quality of products in production.

1.3. MECA852a - Life cycle management of industrial products

Class (h)	Exer. (h)	Lab. (h)	Weight	Examination
9	9	20	3	CC(30%) + TP(70%)

Language(s) for the course

- French

Course description

The Product Lifecycle Management course aims to explain what Product Lifecycle Management (PLM) is, and why it is needed. It gives participants competences that allow to establish the technical specifications, use, configure and implement tools of dedicated information system connected to the industrial product. Four main topics are addressed:

- It describes the environment in which products are developed, made and supported,
- It looks at the components of PLM, such as the product referential, processes and organization from user and administrator point of view
- It positions the technical reference of the product in the information system of the company
- The last part addresses the implementation of PLM, showing the steps of a project and typical activities such as change management.

1.4. MECA853a - Machine components (Option in MPI)

Class (h)	Exer. (h)	Lab. (h)	Weight	Examination
19.5	18		3	CC

Language(s) for the course

- French

Course description

We explore parts of the machines which are frequently used in products and industrial machinery. We begin by rotating pairs using bearings or plain bearings. We continue with bearing assemblies. Concepts will be extended to sliding pairs. We will also look at gears, transmissions by pulleys and belts and chains. Finally, we consider the housing function, lubrication and sealing.

2. UE802 : Design of Composite materials (option in Materials)

2.1. PROJ852a - Technical and innovation project

Class (h)	Exer. (h)	Lab. (h)	Weight	Examination
3	7.5	28		CC

Course description

Implementation of fundamental skills presented in PROJ751 to the design and fabrication of a multi-physical product

2.2. MATE854 - Synthesis and properties of polymers

Class (h)	Exer. (h)	Lab. (h)	Weight	Examination
3		36	3	CC(20%) TP(80%)

Language(s) for the course

- French
- English

Course description

Course on viscoelasticity of polymers, TP polymers discovery and polymers properties

2.3. MECA854 - Fluid mechanics and Rheology

Class (h)	Exer. (h)	Lab. (h)	Weight	Examination
19.5	10.5	8	3	CC(70%) + TP(30%)

Language(s) for the course

- French with documents in english

Course description

A good understanding of viscoelastic constitutive behavior is essential for industrial design. This course will introduce students to fundamentals necessary for the understanding of Newtonian viscous fluids, non-Newtonian viscous fluids, linear viscoelasticity (creep and relaxation, complex modulus) and measurements rheometry.

2.4. MECA855 - Design of Composite Structures (Option in Materials)

Class (h)	Exer. (h)	Lab. (h)	Weight	Examination
12	15	12	3	CC(70%) + TP(030%)

Language(s) for the course

- French with documents in english

Course description

Design of composite structures in the case of classical plate theory and first-order shear deformation theory under thermo-elasticity loadings. Application of tools for the design of composite material structures.

3. UE802 : Mechanical and Mechatronical Design (Option in MPI)

3.1. PROJ852 - Technical and innovative project

Class (h)	Exer. (h)	Lab. (h)	Weight	Examination
3	7.5	28	3	CC

Language(s) for the course

- French

Course description

Implementation of fundamental skills presented in PROJ751 to the design and fabrication of a multi-physical product.

3.2. EASI851 - Automatics: Analysis and Monitoring of Continuous Systems

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

Language(s) for the course

- French

Course description

Stability and control of dynamic continuous systems

3.3. EASI852 - Automation

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

Language(s) for the course

- French

Course description

Production lines in factories or electric vehicles have many and varied automated or mechatronic systems. This course deals with the basic elements required for modeling, analysis, control and implementation of automated or mechatronic systems.

3.4. Au choix - Choice of 2 modules from 5 modules: EASI853, INFO851, MECA856, MECA857, MECA858

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

Course description

3.5. EASI853 - Automatics: Analysis and Discrete-time Systems

Class (h)	Exer. (h)	Lab. (h)	Weight	Examination
	12	8	1.5	CT(50%) TP(50%)

Course description

This course deals with computer controlled systems. First time discretization and discrete transfer function modeling are introduced. Then stability analysis and simple controller design are presented.

3.6. INFO851 - Embedded systems

Class (h)	Exer. (h)	Lab. (h)	Weight	Examination
	12	8	1.5	CT(70%) TP(30%)

Language(s) for the course

- French

Course description

A mechatronic system is the result of a co-design of several subsystems (mechanical, electronic and electromechanical) whose electrical part is mainly based on an on-board computer system whose core is very often made from a microcontroller.

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The objective of this module is to discover the components of an on-board computer system based on a microcontroller. The pedagogical approach is based on the practice and use and programming of a microcontroller.

3.7. MECA856 - Vibration

Class (h)	Exer. (h)	Lab. (h)	Weight	Examination
	12	8	1.5	CT(70%) TP(30%)

Language(s) for the course

- French

Course description

This course aims at a comprehensive knowledge of the behavior of 1 degree of freedom dynamical system. From the analysis of such system, the design and implementation of the usual anti-vibration technical solutions will be considered. Finally, the extension of the 1 DOF systems to multi-dimensional systems and the concept of eigenmodes will allow the introduction of the flexural structure analysis.

3.8. MECA857 - Digital Machining

Class (h)	Exer. (h)	Lab. (h)	Weight	Examination
	12	8	1.5	CT(70%) TP(30%)

Language(s) for the course

- French

Course description

This course introduces the student to CAM and with a project to the use of the numerical chain from CAD to the manufacture of the part.

3.9. MECA858 - Production processes

Class (h)	Exer. (h)	Lab. (h)	Weight	Examination
	12	8	1.25	CT(70%) TP(30%)

Language(s) for the course

- French

Course description

4. UE804 : Professionnal Environment

4.1. LANG800 - Tutoring in English

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

Language(s) for the course

- English

Course description

4.2. 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.

4.3. 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)

4.4. 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.

4.5. 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.

4.6. 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.

Semester 9

UE	ECTS	Module	Course name	Class (h)	Exer. (h)	Lab. (h)	Weight	Examination
UE901 : Design aof composites materials (option in Materials)	10	MATE951	Polymerisation	13.5	12	12	2.5	CC(70%) TP(30%)
		MECA953	Design and Calculations of Composites	7.5	15	16	2.5	CC(70%) + TP(30%)
		MECA954	Structural Calculation:	18		20	2.5	CC(70%) TP(30%)
		MECA958a	Non-linear Mechanics	15	7.5	16	2.5	CC(70%) + TP(30%)
UE901 : Design an automa-tion (MPI option)	10	EASI951	Decentralized Automation and Embedded System	4.5		36	2.5	TP
		MECA950	Robotics	13.5	13.5	12	2.5	CC(70%) + TP(30%)
		MECA951	Theory of Mechanisms	13.5	12	12	2.5	CT(70%) + TP(30%)
		MECA955	Metrology and Tolerancing	9	3	24	2.5	CI(40%) CT(40%) TP(20%)
UE902 : Manufac-turing and implemen-tation of composites materials(Materials Option)	10	MATE952	Composite Manufacturing	4.5	4.5	28	2.5	CT(30%) +TP(70%)
		MATE953a	Instrumen-tal Methods	13.5		24	2.5	CC (50%) et TP (50%)
		MECA957	Composite 4.0	21	9	8	2.5	CC(70%) TP(30%)
		PROJ951	Design Project of Composites: Biomechanics applications	15	12	12	2.5	CC
UE902 : Mechatron-ic Systems, Production Systems:	10	MECA956	Advanced Man-agement of Production	13.5	12	12	2.5	CT(70%) + TP(30%)

UE	ECTS	Module	Course name	Class (h)	Exer. (h)	Lab. (h)	Weight	Examination
Design and Optimization								
		PROJ952	Synthesis project		7.5	32	2.5	
		Au choix	2 options: EASI941b, MECA959, MECA960, MECA994					
		EASI941b	Communicating Sytems, Communicating Sensors			36	2.5	TP
		MECA959	Digital Plant	13.5	12	12	2.5	TP
		MECA960	Industrial Performance	13.5	13.5	12	2.5	TP
		MECA994b	Modeling and Control of Mechatronic Systems			40	2.5	TP
UE904 : 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

1. UE901 : Design aof composites materials (option in Materials)

1.1. MATE951 - Polymerisation

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

Language(s) for the course

- French

Course description

Polymerisation methods

1.2. MECA953 - Design and Calculations of Composites

Class (h)	Exer. (h)	Lab. (h)	Weight	Examination
7.5	15	16	2.5	CC(70%) + TP(30%)

Language(s) for the course

- French with documents in english

Course description

Analytical et finite elements study of composite structures damage.

1.3. MECA954 - Structural Calculation:

Class (h)	Exer. (h)	Lab. (h)	Weight	Examination
18		20	2.5	CC(70%) TP(30%)

Language(s) for the course

- French
- French with documents in english

Course description

Our purpose is to afford the student who goes primarily through preliminary curse on finite element methods in structural mechanics (static analysis) a sound foundation in variational calculus, energy methods and finite element approach for structural dynamic analysis.

1.4. MECA958a - Non-linear Mechanics

Class (h)	Exer. (h)	Lab. (h)	Weight	Examination
15	7.5	16	2.5	CC(70%) + TP(30%)

Language(s) for the course

- French

Course description

Understand the main non-linear mechanical behavior of structures and how to use the associated numerical methods.

2. UE901 : Design an automation (MPI option)

2.1. EASI951 - Decentralized Automation and Embedded System

Class (h)	Exer. (h)	Lab. (h)	Weight	Examination
4.5		36	2.5	TP

Language(s) for the course

- French

Course description

Decentralized Automation : Since automated systems have been based on computers, their structures have greatly changed to become distributed. These labs introduce the main elements necessary to analyze, model and implement these distributed automated systems.

Embedded system : The first part of the decentralised automatisms relies heavily on embedded systems to perform some of the functions of the global automation system. These labs provides the basis for understanding the design of these embedded systems, both from a software and hardware perspective.

2.2. MECA950 - Robotics

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

Language(s) for the course

- French
- English

Course description

This course aims at getting knowledge and understanding of scientific principles and methodologies in Industrial Robotics which will provide a foundation for senior roles in the selection of the adequate robot for given industrial context and application. It focuses on the following key areas : architecture, main characteristics, modeling and model inversion.

2.3. MECA951 - Theory of Mechanisms

Class (h)	Exer. (h)	Lab. (h)	Weight	Examination
13.5	12	12	2.5	CT(70%) + TP(30%)

Language(s) for the course

- French

Course description

We begin by calculating the efficiency of mechanical power transmission lines. Then we discuss the effects of friction in the bearings. Mechanism theory will determine the mobility and degree of hyperstaticity in mechanisms so as to control the design. This will be applied to power and kinematic chains.

2.4. MECA955 - Metrology and Tolerancing

Class (h)	Exer. (h)	Lab. (h)	Weight	Examination
9	3	24	2.5	CI(40%) CT(40%) TP(20%)

Language(s) for the course

- French

Course description

Training in methods and tools on: calculation of dimensional and geometric tolerances; specifying these tolerances in mechanical engineering drawings; and checking these tolerances.

3. UE902 : Manufacturing and implementation of composites materials(Materials Option)

3.1. MATE952 - Composite Manufacturing

Class (h)	Exer. (h)	Lab. (h)	Weight	Examination
4.5	4.5	28	2.5	CT(30%) +TP(70%)

Language(s) for the course

- French

Course description

Introduction and analysis of industrial processes for high performance composite materials

3.2. MATE953a - Instrumental Methods

Class (h)	Exer. (h)	Lab. (h)	Weight	Examination
13.5		24	2.5	CC (50%) et TP (50%)

Language(s) for the course

- French
- English

Course description

Presentation and use of the main chemical analysis techniques for polymers in composites, such as Liquid Chromatography, Infra-Red Spectrometry, Nuclear Magnetic Resonance

3.3. MECA957 - Composite 4.0

Class (h)	Exer. (h)	Lab. (h)	Weight	Examination
21	9	8	2.5	CC(70%) TP(30%)

Language(s) for the course

- French

Course description

Presentation and study of the latest innovations in the field of composite materials for added value and low environmental impact.

3.4. PROJ951 - Design Project of Composites: Biomechanics applications

Class (h)	Exer. (h)	Lab. (h)	Weight	Examination
15	12	12	2.5	CC

Language(s) for the course

- French with documents in english

Course description

This course provides fundamental tools and knowledge of biomedical applications of mechanics. It provides to engineering students the tools to address the many challenges of biomechanical R-D, to apply their skills, to solve specific biomedical problems, to collaborate and interact in projects at the interfaces between mechanics, materials and biomedical science with examples related to prostheses. The scientific orientations of this teaching are:

1. Properties and behavior of biomaterials for implants, orthotics, prostheses.

2. Finite element modeling and numerical simulation of biomechanical devices

3. Experimental characterizations of biomechanical structures

4. UE902 : Mechatronic Systems, Production Systems: Design and Optimization

4.1. MECA956 - Advanced Management of Production

Class (h)	Exer. (h)	Lab. (h)	Weight	Examination
13.5	12	12	2.5	CT(70%) + TP(30%)

Language(s) for the course

- French

Course description

The Semester 6 course called « Operation Management » and the Semester 7 course called « Scheduling » will be extended. New operation management techniques are considered such as the Kanban, the Optimized Production Technology. Flow improvement is viewed through implantation techniques and the Lean Manufacturing approach. The location of the company is also considered to take into account the suppliers and deliverers in the flow management. Moreover the scheduling problem is dealt with through the project and the production management.

4.2. PROJ952 - Synthesis project

Class (h)	Exer. (h)	Lab. (h)	Weight	Examination
	7.5	32	2.5	

Course description

This course aims at the implementation of knowledge and skills acquired during the third and fourth school years. Multidisciplinarity and innovation will be especially promoted through the covered topics. Strong links between these works and the research thematic of the school’s laboratories could be proposed.

4.3. Au choix - 2 options: EASI941b, MECA959, MECA960, MECA994

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

Course description

4.4. EASI941b - Communicating Sytems, Communicating Sensors

Class (h)	Exer. (h)	Lab. (h)	Weight	Examination
		36	2.5	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.

4.5. MECA959 - Digital Plant

Class (h)	Exer. (h)	Lab. (h)	Weight	Examination
13.5	12	12	2.5	TP

Course description

Industry currently knows its 4.0 revolution. The aim of this course will be the discovery of the technological, the informational as well as the organisational and the managerial aspects of the digital vision of the industry, in particular with regards to its manufacturing system. Morevoer, the positioning of this transformation will be made according to the 3.0 post-taylorian paradigms.

Key-words: Big-Data, IoT, Cyber-Physical Production Systems (CPPS), Real time, IA, Middle management.

The different aspects of the Industry 4.0 will be handled thanks to both academic courses and industrial conferences, beyond manufacturiing systems visits.

4.6. MECA960 - Industrial Performance

Class (h)	Exer. (h)	Lab. (h)	Weight	Examination
13.5	13.5	12	2.5	TP

Language(s) for the course

- French

Course description

By talking about industrial performance, major concepts are involved, namely decision-making, continuous improvement process and performance measurement systems.

The aim of this course is thus the acquisition of the basic notions around the handling and the control of continuous improvement processes. Particular methods are described, respectively the Lean and the 6 Sigma ones. MACBETH illustrates the decision-making problem with regards to the expression of overall performances.

4.7. MECA994b - Modeling and Control of Mechatronic Systems

Class (h)	Exer. (h)	Lab. (h)	Weight	Examination
		40	2.5	TP

Course description

To integrate and implement the knowledge and skills in the mechanical, electrical, instrumentation and signal processing aiming to analyze and design multiphysics systems

5. UE904 : Professionnal Environment

5.1. 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.

5.2. 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)

5.3. 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

5.4. 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

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.