Undergraduate Technological Degree

PHYSICAL MEASURES

Association
des Directeurs
d'IUT

1. Objectives of the course

The Undergraduate Technology Degree (DUT) in Physical Measures aims at training multi-skilled technicians who carry out and process measurements: the latter requires knowledge in the fields of physics, chemistry, materials, electronics, and computing, as well as skills based on instrumentation (tests, trials, research and development…). Graduates easily fit into all fields of industry, research, and services (car industry, aeronautics, space industry, electronics, optics, materials, chemistry, pharmacy, energy, food processing, biomedical, environment, etc.). The specialized degree enables them to adapt to innovating technologies and to succeed professionally.

Versatility and adaptability are the main assets of the Physical Measures graduates. Thus, they can integrate easily into professional life, but also carry on with their studies.

The technicians having graduated from their Physical Measures UTD find jobs in a laboratory, in production or in a research department in the following fields:

- Research and development
- Control, tests, and trials
- Metrology
- Quality
- Production and industrialization
- Maintenance
- Sales of scientific instruments (technical salesman)

Besides, the educational approach through technology provided by the course of study allows for active, sensible and pragmatic educational methods, in order to have students advance towards autonomy and acquire a know-how that will be valued in the professional world. The Personal and Professional Project (PPP) which is part of the whole course of study is a major tool enabling the students to be key players in their choice of professional orientation.

Finally, taking into account, during the training, economical issues and their evolution, is an additional asset for a successful integration into the world of work.

2. System of reference of activities and skills

Whatever the chosen branch of industry is, Physical Measures graduates are in charge of the choice, the setting up, and implementation of the measuring chain, from the sensor to signal acquisition, data evaluation, and transmission of results, in an economical and metrological context, as well as one of quality-assurance.

The Physical Measures graduate is defined by a number of "key qualities". During his course of study, he or she will have learnt to:

- Have an analytical and synthesizing mind
- Have an expertise in communications tools in french and in english
- Use office automation, instrumentation, and scientific calculation software
- Read, understand, and draw up a technical document in french and in english
- Perform a technical watch on the evolution of systems of references
- Implement and respect the rules of hygiene, safety, and environment
- Work in a group, manage a project

a. Activities and skills

THE ACTIVITIES AND GENERAL SKILLS OF GRADUATES ARE DEFINED IN THE TABLE BELOW :

ACTIVITIES	SKILLS (BEING ABLE TO)
DEFINITION AND EXPRESSION OF A NEED FOR MEASUREMENT, MONITORING, AND TRIAL SELECTION AND/OR DESIGN AND VALIDATION OF METHODS AND DEVICES OF MEASUREMENT, CONTROL AND TRIAL IMPLEMENTATION OF METHODS AND DEVICES OF MEASUREMENT, MONITORING, AND TRIAL	• Identify the physical and physicochemical units to characterize • Analyze needs • Master the principles and techniques of measurement of physical and physicochemical units (theory, implementation and influential factors) • Take into account the metrological constraints • Select device and methods depending on their features and needs • Validate the chosen protocol • Follow up instructions and procedures • Carry out the measurement • Check the consistency of results and orders of magnitude on the first obtained values • Store results and make them accessible and available
ANALYSIS, INTERPRETATION, AND PROCESSING OF RESULTS CONCLUSION AND IMPLEMENTATION OF CORRECTIVE ACTIONS IF NEEDED EXPRESSION AND COMMUNICATION OF RESULTS AND CONCLUSIONS (LABORATORY BOOK, SUMMARIES, TRIALS REPORTS)	• Select the right indicators to express the result • Carry out relevant processing of experimental data • Perform statistical analyses • Implement the tools for quality control and problem solving • Maintain a measurement protocol, adjust it, and improve it if necessary • Carry out the various types of professional

	productions • Assess the uncertainty associated with a measurement result • Carry out the final writing of results • Adapt oral or written communication to the speaker • Train and follow up users of measurement tools

b. Specific skills

BESIDES GENERAL ACTIVITIES AND SKILLS, SPECIFIC ACTIVITIES, AND SKILLS ARE PRESENTED IN THE TABLE BELOW :

ACTIVITIES	SKILLS (BEING ABLE TO)
LABORATORY : • **Implementation and configuration of a measuring chain for a cross-disciplinary set**	• Define a measuring chain • Select the trials equipment to carry out the measuring chain • Perform the required measurements • Analyze the results of measurements • Draw up the measurement report as well as the findings
PRODUCTION AND INDUSTRIALIZATION : • **Performing the monitoring or trial of products in the context of single or serial production, or of after-sale service, according to the safety rules and the requirements of quality-assurance** • **Fixing products, making products compliant** • **Updating follow-up media and production of reports (trials, controls, etc.)** • **Implementation of an instrumentation**	• Select the equipment for monitoring and trials to check compliance with a technical specification • Define the procedures and methods of tests and perform analyses of non-compliance of products • Analyze measurement results, diagnose the causes of problems and carry out modifications of product compliance • Analyze the hardware and software architecture of trial tools and in situ, functional benchmarks
QUALITY CONTROL IN THE COMPANY • **Analysis of processes** • **Participating in an approach of sustainable development**	• Locate and understand processes within the company's organization • Analyze the relevance of procedures and methods in use • Apply the current standards • Suggest solutions for improvement
MANAGING A SET OF INSTRUMENTS IN A CONTEXT OF QUALITY ASSURANCE	• Know the features of the measuring instruments • Use current metrology standards • Apply standards and procedures of calibration • Schedule and monitor maintenance and metrological follow-up of measuring tools (Checking, calibration, preventive maintenance)

CARRYING OUT SURVEYS AND TECHNICAL WATCH : • Analysis of new products • Analysis of new technologies and measuring processes	• Put into context, within the company, any scientific or technological evolution • Adapt to the evolution of jobs • Select information in a relevant way

THE "KEY QUALITIES" AS WELL AS THE GENERAL AND SPECIFIC SKILLS ACQUIRED DURING THEIR COURSE OF STUDY WILL ENABLE THE PHYSICAL MEASURES GRADUATE TO ACCESS VARIOUS OCCUPATIONS WHOSE ROME CODES ARE GIVEN BELOW:

CODE ROME	TYPES OF JOBS
H2106	• Technical assistant of an engineer in studies, research and development in industry • Bench scientist in industry
H1207	• Writer of specification sheets • Technical writer • Technician writer in industry
H1210	• Laboratory worker in industrial research • Assistant in scientific instrumentation and experimental techniques • Technical assistant in research • Technical assistant in research studies • Technical assistant in experimentation • Engineer's assistant in research laboratory • Analyses and trials technician in research and development • Technician in technological development • Forensics technician • Technician in analytical development laboratory • Technician in research laboratory • Technician in trials laboratory • Technician in measure-trial in research and development • Technician in aerodynamic measures • Technician in applied research • Technician in materials trials in research and development • Technician in research experimentation • Technician in research-development experimentation • Technician in scientific experimentation • Technician in development • Technician in processes development • Technician in laser systems development • Technician in research-development materials • Technician in research-development physical measures • Technician in physical measures and trials • Technician in scientific research • Technician in research and development • Technician in science of materials • Technician in experimental techniques • Laboratory technician in research and development • Technician of large measuring instrument • Physicist technician in a research and development laboratory

H1501	• Assistant to manager of industrial analysis laboratory • Assistant to manager of control laboratory in industry • Assistant manager of industrial analysis laboratory • Assistant in industrial analysis laboratory
H1503	• Assistant physicist in industrial analysis • Operator in analysis laboratory • Operator in industrial analysis laboratory • Technician in industrial analysis • Technician in industrial analysis laboratory

3. Course organisation

a. Course description

The Physical Measures DUT is made of a major, that covers the DUT core skills, and of supplementary modules. These supplementary modules aim at completing the students' study pathway, whether they want to access the world of work right away or keep studying further.

Designed by the IUT in compliance with recommendations given by the Physical Measures *commission pédagogique nationale* (national education board), they include the same characteristics in terms of hours and coefficients as modules aiming at an immediate access to the world of work.

The Physical Measures DUT can be obtained via initial education (including as course-sandwich as apprentices) or via continuing education.

The program finds a perfect balance between:

- A core scientific multidisciplinary program for students to acquire basic knowledge to enable them to move up the career ladder
- Applied knowledge, rooted in professional experiences, to acquire solid know-how
- Learning step by step how to work autonomously, thoroughly, how to take initiatives and be in charge, to work as part of a team, in other words, the development of soft skills.

A multidisciplinary program comprising several teaching axes:

- The Physics axis to understand phenomena at stake with sensors and to be able to interpret results (mechanical, optical, acoustic, thermal, energy, etc.)
- The Chemistry, Chemistry analysis, and Environmental analysis axis to understand and be an expert in the main chemical analysis techniques and be able to interpret results (solutions chemistry, electrochemistry, chemical analysis instrumentation methods)
- The Materials science axis to understand specific properties of great classes of materials and become expert in the main techniques of materials characterization and control
- The Metrology axis to acquire basic measurement rules: validation of measurement methods and protocols, compliance with current standards, evaluation of uncertainty, writing of results
- The Instrumentation axis that includes all necessary courses to design and implement a measurement process (electricity, electronics, signal processing, IT instrumentation, embedded systems, etc.)

This program is supplemented with courses in languages, communications, mathematics, IT, and corporate understanding.

All students cover semesters 1 and 2 program and all modules are mandatory, for they belong to the core of the curriculum.

Semester 3 and 4 modules both include core subjects of the curriculum as well as supplementary modules (representing 15% of the number of hours of the program).

Two specialized pathways are offered via the supplementary modules of the Immediate Integration in the World of Work pathway (IPI):

- Instrumental Techniques (TI) with supplementary courses in acoustics and vibrations, electronics, measurement systems and instrumentation IT
- Materials and Physicochemical Controls (MCPC) with supplementary courses in physics-chemistry, and materials characterization and controls.

Supplementary modules of the Immediate Integration in the World of Work pathway (IPI) include 3 cross-subject modules and 6 specialized modules. Therefore, in addition to cross-subject modules, students can select 6 TI modules or 6 MCPC modules, depending on what the IUT offers and on students' Personal and Professional Project (PPP).

The number of hours and schedules set by the national program can be altered by the department in order to organize courses specific to the department's professional environment. Each IUT can, in compliance with recommendations from the IUT board and the university life and studies advisory board, adapt courses to its professional or otherwise environment within 20% of the total number of hours for each major, in compliance with conditions set in the national program (Article 15 of the arrêté du 3 août 2005).

Assessment method:

- Assessment method is defined in compliance with the Arrêté du 3 août 2005 related to the technological university degree within the European Higher Education Area.

b. Program Summary Charts per Semester

The program runs over 4 semesters. It includes classes, supervised projects, and a placement.

Within each semester, courses are divided into cumulative Teaching Units (TU) themselves divided into Modules (M). Each module is assigned a coefficient so students' work can be evaluated.

Classes can be delivered as:

- Lectures (CM), attended by the entire promotion
- Supervised classes (TD), attended by a class of 26 students
- Practical work classes (TP), attended by half a class

Attendance is mandatory.

THE NUMBER OF HOURS ALLOTTED TO THE MAJOR AND SUPPLEMENTARY MODULES IS AS FOLLOWS:

SEMESTER 1	Major 485 hours + Project 60 hours
SEMESTER 2	Major 500 hours + Project 60 hours
SEMESTER 3	Major 380 hours + Supplementary modules 120 hours + Project 90 hours
SEMESTER 4	Major 135 hours + Supplementary modules 150 hours + Project 90 hours
TOTAL	**Major 1530 hours + Supplementary modules 270 hours + Project 300 hours + Placement at least 10 weeks**

Abbreviations used:

- TU: Teaching unit
- M: Major's module (compulsory)
- MC: Supplementary module
- IPI: Immediate integration in the world of work
- PPP: Personal and professional project
- MCPC: Materials and physicochemical controls
- TI: Instrumental techniques

Cumulative teaching units (TU) and modules (M and MC):
For the teaching units (TU):

- XY TU, core subjects with: X (figure) semester, Y (figure) TU number

For the major's modules (M):

- M XYZZ: X (figure) semester, Y (figure) TU number, ZZ (number) module's number

For supplementary modules:

- C for supplementary

- CM for supplementary modules specialized in MCPC and CT for supplementary modules specialized in TI.

SEMESTER 1

TEACHING UNIT (TU)	MODULE REFERENCE (M)	MODULE NAME	COEF. /M	TOTAL COEF. /TU	LECTURE VOLUME	SUPERVISED WORK	PRACTICAL WORK VOLUME	TOTAL HOURS STUDENT /TU
TU 11 PROFESSIONAL ENVIRONMENT AND MATHEMATICAL TOOLS	M 1101	The English language for communication and technical terminology	2.5	10		15	20	130
	M 1102	Expression – Communication: communication basics	2			9	16	
	M 1103	PPP: professional environment	2			10	20	
	M 1104	Supervised project 1: communication and PPP (60 hours/student)	1					
	M 1105	Mathematical tools: analysis, trigonometry, and complex numbers	2.5		14	26		
TU 12 MEASUREMENT TOOLS	M1201	Data processing – DAO	2	9		6	24	155
	M 1202	Metrology and Sensors	2.5		8	12	20	
	M 1203	Mathematical tools: geometry – differential equation	2		14	26		
	M 1204	Algorithmics and IT	2.5		7	10	28	
TU 13 SCIENCE BASICS	M 1301	Electrical systems	3	11	13	18	24	200
	M 1302	Atomic and molecular structures	2		12	18		
	M 1303	Chemical balance – Lab safety	2		8	12	20	
	M 1304	Thermodynamics	2		10	18	12	
	M 1305	Thermal machines	2		6	9	20	
TOTAL HOURS SEMESTER 1 (excluding the project)					**92**	**189**	**204**	**485**
TOTAL HOURS SEMESTER 1 (including the project)				**30**				**545**

SEMESTER 2

TEACHING UNIT (TU)	MODULE REFERENCE (M)	MODULE NAME	COEF. /M	TOTAL COEF. /TU	LECTURE VOLUME	SUPERVISED WORK	PRACTICAL WORK VOLUME	TOTAL HOURS STUDENT /TU
TU 21 PROFESSIONAL ENVIRONMENT AND MATHEMATICAL TOOLS	M 2101	Technical and scientific English	2.5	10		15	20	125
	M 2102	Expression – Communication: tools for a professional integration and communication	2			9	16	
	M 2103	Mathematical tools: analysis and linear algebra	2.5		18	32		
	M 2104	Supervised project 2: describing, planning, and implementing the project (60 hours/student)	2					
	M 2105	PPP: PPP formalisation and industrial project management tools	1			7	8	
TU 22 APPLIED PHYSICS AND MATERIALS	M2201	Electromagnetism and applications	2	10	7	12	16	215
	M 2202	Electronic systems	2		10	15	20	
	M 2203	Instrumentation IT	2		8	13	24	
	M 2204	Materials structure	2		10	15	20	
	M 2205	Materials property	2		10	15	20	
TU 23 SCIENCE BASICS REINFORCEMENT	M 2301	Redox – Chemical kinetics	2	10	6	8	16	190
	M 2302	Materials mechanics and resistance	3		12	20	28	
	M 2303	Optical systems	2		10	15	20	
	M 2304	Thermal transfers	3		12	19	24	
TOTAL HOURS SEMESTER 2 (excluding the project)					**103**	**195**	**232**	**530**
TOTAL HOURS SEMESTER 2 (including the project)				**30**				**590**

SEMESTER 3

TEACHING UNIT (TU)	MODULE REFERENCE (M)	MODULE NAME	COEF. /M	TOTAL COEF. /TU	LECTURE VOLUME	SUPERVISED WORK	PRACTICAL WORK VOLUME	TOTAL HOURS STUDENT /TU
TU 31 PROFESSIONAL ENVIRONMENT EXPERTISE	M 3101	Professional English	2	11		23	12	165
	M 3102	Expression – Communication: Professional communication	2			13	12	
	M 2103	PPP: Placement and post-graduation preparation	1			3	12	
	M 3104	Metrology, quality, and statistics	2		10	15	20	
	M 3105	Mathematics and signal processing	2		11	18	16	
	M 3106	Supervised project 3: real-life working situation (90 hours/student)	2					
TU 32 PHYSICS	M 3201	Fluid mechanics and Vacuum techniques	3	9	14	22	24	165
	M 3202	Wave optics	2		10	15	20	
	M 3203	Photonics	2		8	10	12	
	M 3204	Vibration and acoustics mechanics	2		8	10	12	
TU 33 PHYSICS-CHEMISTRY, INSTRUMENTATION, AND SPECIALIZATION	M 3301	Analog signals conditioning	2	10	10	10	20	170
	M 3302	Instruments steering	2		6	8	16	
	M 3303	Spectroscopic techniques	2		10	10	20	
	M 3304 C	M 3304 CT Network measurement systems / M 3304 CM Materials structure and properties	2		8	10	12	
	M 3305 C	M 3305 CT Instrumentation electronics / M 3305 CM Materials properties alteration	2		8	10	12	
TOTAL HOURS SEMESTER 3 (excluding the project)					103	177	220	500
TOTAL HOURS SEMESTER 2 (including the project)				30				590

SEMESTER 4

TEACHING UNIT (TU)	MODULE REFERENCE (M)	MODULE NAME	COEF. /M	TOTAL COEF. /TU	LECTURE VOLUME	SUPERVISED WORK	PRACTICAL WORK VOLUME	TOTAL HOURS STUDENT /TU
TU 41 Professional and technological skills	M 4101	Technical English and personal project	1	9		7	8	120
	M 4102	Expression – Communication: corporate communication and labor law	1			17	8	
	M 4103	Supervised project 4: real-life working situation (90 hours/student)	3					
	M 4104	Electrochemical analyses and chromatographic methods	2.5		12	18	20	
	M 4105C	Renewable energy, production and storage	1.5		8	10	12	
TU 42 Measurement, instrumentation, and specialization expertise	M4201	Measurement, monitoring, and trials process	3	9	10	15	20	165
	M 4202C	M4202CT Acoustics measurement M4202CM Industrial products expertise and control	1.5		8	10	12	
	M 4203C	M4203CT Vibration measurement M4203CM Materials techniques and characterization	1.5		8	10	12	
	M 4204C	M4204CT Electromagnetic compatibility M4204CM Materials characterization methods	1.5		8	10	12	
	M 4205C	M4205CT Optoelectronics M4205CM Chemical analysis instrumental techniques	1.5		8	10	12	
TU 43 Professional activity	M 4301	Placement (at least 10 weeks)	12	12				

TOTAL HOURS SEMESTER 4 (excluding the project)		62	107	116	285
TOTAL HOURS SEMESTER 4 (including the project)	30				375

IPI PATHWAY SUPPLEMENTARY MODULES SUMMARY

CROSS-SUBJECT MODULES	
Photonics	
Vibration and acoustics mechanics	
Renewable energy, production, and storage	
SPECIALIZATION MODULES	
TI Specialization	**MCPC Specialization**
Network measurement systems	Materials structure and properties
Instrumentation electronics	Materials properties alteration
Acoustics measurement	Industrial products expertise and monitoring
Vibration measurements	Materials characterization techniques
Electromagnetic compatibility	Materials characterization methods
Optoelectronics	Chemical analysis instrumental techniques

GENERAL SUMMARY

	Coef	Lecture	Supervized classes	Practical work classes	Number of hours
PROGRAM, EXCLUDING PROJECTS	120	360	668	772	**1800**
PROJECTS					**300**
PROGRAM, EXCLUDING EXPRESSION, COMMUNICATION, LANGUAGES, AND PPP		360	540	620	**1520**
EXPRESSION, COMMUNICATION, LANGUAGES, AND PPP			128	152	**280**

Learning in a different way:

The article 15 of the arrêté du 3 août 2005 indicates that 10% of the number of hours of the training must be dedicated to “Learning in a different way”. This method must be used in each class and is also the content of specific modules.

Learning in a different way aims at:

- Enabling students to work more autonomously
- Using digital resources (ICT) to impart knowledge and know-how.
- Description of modules includes a non-exhaustive list of ways to apply this methodology.

Practical terms:

The order of supplementary modules, with similar coefficient, can be altered so as to adapt to local organizational constraints.

In order to make the implementation of practical work classes and to foster the cross-subject aspect of the program, practical work classes of correlated modules can be gathered together.

c. Placement and supervised projects

The placement lasts at least 10 weeks and takes place during Semester 4.

Students have to draft a placement report and make an oral presentation.

The placement is supervised by both a company supervisor and a IUT supervisor. The IUT supervisor should pay a visit to the student on site and make a critical review of the report.

The placement's evaluation includes:

- The student's evaluation by the company supervisor
- The quality of the report, assessed by the IUT supervisor
- The quality of the oral presentation, assessed by the oral presentation jury

Supervised projects last 300 hours spread over the program's four semesters. They aim at making students work autonomously, in real-life working situations.

During semesters 1 and 2, students will have to carry out 60-hour/semester projects in order for them to develop their social skills and their ability to work autonomously.

During the 1st semester, the supervised project can be an application of the PPP so that students can have a better understanding of the industry's professions.

During the 2nd semester, the aim will be to experiment different approaches to managing a project and teamwork.

During semesters 3 and 4, students carry out 90-hour/semester projects that enable them to apply activities of the Physical Measures technician by tackling an actual technical subject matter. This work should enable students to use knowledge acquired in all courses of the program, whether general or technological, and to prepare for the placement. Projects can also start during the 3rd semester (define the bill of specifications, plan, analysis) and end during the 4th semester (consolidation of the project via a technical application). The subject of the project can be given by the department, a company, or a local government administration.

d. Personal and Professional project

The PPP aims at enabling students to fine-tune their personal and professional project, to play an active part in their orientation and within their environment, and to confront their desires to the reality.

In order to involve students in the definition and development of their studies, the PPP must help students understand the professional world and the industry's professions better.

It should namely enable them to:

- Know of the different professions and industries related to the Physical measures program
- Grasp the different professional environment and working conditions
- Identify training pathways enabling them to access these professions
- Define a personal statement to select the right education and career pathways
- Design relevant and efficient tools to find their placement
- Define their post-DUT pathway via an analysis of the different options available to them (job offers or training programs)

e. Education orientation – Education through Technology

Education orientations:

The content of the Physical Measures program was defined in order to ensure a bridge between high school and the IUT, for a smooth transition.

During the 1st semester, the "Measurement tools" teaching unit enables students to get a better understanding of knowledge acquired in high school in metrology or algorithmics, for instance. The "Scientific basics" teaching unit covers basic knowledge in physics, chemistry, and electricity in order for students with an S, STI2D or STL high school degree to succeed.

Furthermore, the content of "Mathematics tools" modules was designed to take into account notions useful to the different teaching axes: physics, chemistry, materials science, metrology, and instrumentation. For instance, during the first semester, mathematics tools are taught via application activities related to physics-chemistry.

Finally, education through projects, already implemented in high school, is developed throughout the two years via the "supervised project" modules and the way modules are tackled, for instance an investigative approach can be used to teach the "Redox – Chemical kinetics" module during the 2nd semester. This teaching method can enable students to work more autonomously, to take initiatives and to work as a team in order to successfully integrate the world of work.

Teaching though technology:

Within each module, the content tackled is oriented towards the applications of measurement of an actual physical quantity, its practical applications and the different techniques necessary to work in the physical measures industry.

Students develop a know-how specific to the physical measures industry via a large number of practical cases, directly in keeping with the industry.

Furthermore, during practical work classes, students focus on both theoretical and practical knowledge of technical instruments and processes.

The cross-subject approach of the program enables physical measures technicians to be versatile. For instance, a number of modules tackle both the science of sensors and metrology, key notions of the Physical measures DUT.

620 hours are dedicated to practical work classes which also shows a desire to teach using technologies. The use of tools and study cases make up the "implementation modes" of modules and also contributes to this teaching approach. Within each module, technical, technological, and scientific elements also contribute to this teaching approach.

f. Taking into account of current economic issues

The program takes into account the way the professional and economical environment evolves. Therefore, the content includes the following elements: standardization, sustainable development, health and safety regulations, project management, and entrepreneurship.

Some skills can be validated with a professional certificate (foreign languages, spelling, etc.). We advise departments to encourage students to obtain an Electrical authorization.

Regarding standardization, more than a third of the modules explicitly tackle the standard system, a key aspect of the industry.

Sustainable environment issues and measurements: materials, energy, electromagnetic compatibility, acoustics. A "Renewable energy, production and storage" module is offered as one the supplementary modules within the IPI pathway.

Several modules enable students to become aware of waste management, leading to the wider product lifecycle notion.

From the start of the program, the understanding and compliance with health and safety regulations are tackled. These aspects are covered in many modules related to chemistry, electricity, electromagnetism, optics, and nuclear energy. For instance, as early as the 1st semester, an "Electrical systems" module tackles electrical safety and the "Chemical balance – Lab safety" namely covers safety regulations within the chemistry laboratory, as well as lab good practices.

Project management is also tackled during the first two semesters and directly applied thanks to supervised projects of the second year.

Entrepreneurship is tackled within the PPP and communication modules of the 3rd and 4th semesters, as well as in the competitive intelligence module of the 4th semester.