PÉRIODE D'ACCRÉDITATION : 2016 / 2021

UNIVERSITÉ PAUL SABATIER

SYLLABUS MASTER

Mention Chimie

M2 chimie verte

http://www.fsi.univ-tlse3.fr/
http://masterchimie.univ-tlse3.fr

2020 / 2021

21 SEPTEMBRE 2021

SUMMARY OF THE CONTENT

PRESENTATION

PRESENTATION OF DISCIPLINE AND SPECIALTY

DISCIPLINE CHIMIE

The master in chemistry offers four specialties : green chemistry, analytical chemistry, chemistry for health, theoretical chemistry and also offers training towards careers in teaching.
The objective is to train students into chemists executives for academic positions or positions in companies covering various business sectors such as the pharmaceutical, cosmetics, chemicals and food industry, materials and instrumentation.
The training also helps develop important transversal skills for employability such as : autonomy, communication, project management, ...
The master in chemistry proposes a progressive orientation in the chosen specialty.
The first year includes a significant share of core courses (60%), and 40% specific courses in the chosen specialty.
The second year is rather strongly focused on the specialty (85%) and comprises only 15% of core teachings.
Internships are included in the training (minimum 8 weeks in M1, 5 to 6 months in M2).

SPECIALITY

The aim of the Green Chemistry Master's course is to provide students with the necessary skills to innovate towards more sustainable chemistry. Down the road they will be able to join academia or R&D teams in small or large industrial groups. The course will train high level graduates who will join the high ranks of the chemical industry, mainly in fine chemistry. They will be tomorrow's innovators for cleaner and more efficient chemistry, and will be at the cornerstone of the debate between all actors of sustainable development.The proposed course is an undistinguished Master's 2 (formerly "Research or Pro") and can, depending on the student's professional project, facilitate his hiring after graduation, or lead on to the preparation of a PhD. To this end, the course is associated with various research laboratories locally in accordance with the Sciences de la Matière graduate school (www.edsdm.ups-tlse.fr) . The course also has a very valuable partnership with a local green chemistry industrial cluster (www.clusterchimieverte.fr).

PRESENTATION OF THE YEAR OF M2 CHIMIE VERTE

With this training, students will be able to devise and develop cleaner and safer processes, more respectful of the environment, particularly in the fields of alternative reaction media, catalysis, green processes, depollution, biodegradable materials design, alternative energy sources, biomass valorization. Aspects of regulation, legislation, toxicity, ecotoxicity, life cycles and project management will be dealt with.
The second year of the green chemistry Master's is divided into 2 semesters :
-First semester (from September to December) : theoretical teachings.
-Second semester (January to June) : internship in academic or industrial lab.
Details of Semester 1 teaching units :
Common core (TU common to all courses within the Chemistry Master's) :

- *Professionalization*(6 ECTS). Management tools, project management, legislation, conferences by industrials and academics.
- *English* (3 ECTS).

Teaching units specific to green chemistry (these units will be taught in English) :

- *Further advances in organic synthesis* (3 ECTS). Advanced strategies and synthetic tools towards greener chemistry.

- *Heterochemistry and stereoselective synthesis*(3 ECTS). The chemistry of heteroelements and transition metal complexes, and their vital role in synthesis and reactivity.
- *Tools in green chemistry and processes*(3 ECTS). This TU will introduce the currents stakes of the chemical industry and will demonstrate the advantages of cleaner chemistry.
- *Catalysis and alternative energies* (3 ECTS). This TU will describe the theoretical bases necessary to develop novel energy technologies.
- *Homogeneous, heterogeneuous and nano-catalysis* (3 ECTS). This TU will describe will describe catalysis in eco-friendly settings.Project (3 ECTS). Students will have the opportunity to exploit some of the knowledge and skills they acquired during the course by putting forward a green chemistry strategy in response to a particular challenge.
- *Toxicology/ecotoxicology*(3 ECTS). This TU will develop basic notions of toxicity that are necessary for debating with chemistry professionals.

Semester 2 : internship
The 5-6 months internship will be most students' first interaction with real world R&D. It can be done in an academic or industrial laboratory , in France or abroad. The internship will be finalised with a written report and an oral presentation.
Jobs : Engineers in industrial chemistry research and development - Engineers in technological innovation - Engineers in engineering and consulting firms - Life cycle analysts...
Beyond M2 Green Chemistry : Graduates of the green chemistry Master's course can carry on towards a PhD, particularly within the Science de la matière graduate school (www.edsdm.ups-tlse.fr) .
Admission : Admission into M2 green chemistry is garanteed for any student holding an M1 green chemistry from UPS. For students holding an M1 from another course or another university, admission will be reviewed based on the student's credentials.

LISTE OF COURSES GIVING ACCESS TO :

M1 CHIMIE VERTE (EMCHVE)

Students who have not followed the previous year of the course, please contact the person in charge of the degree.

CONTACTS SECTION

CONTACT INFORMATION CONCERNING THE SPECIALTY

PERSON IN CHARGE OF TEACHING AFFAIRS OF M2 CHIMIE VERTE

DE VIGUERIE Nancy
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SECRETARY OF STUDENT AFFAIRS OF

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CONTACT INFORMATION CONCERNING THE DISCIPLINE

PERSON IN CHARGE OF THE DISCIPLINE CHIMIE

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CONTACT INFORMATION FOR THE DEPARTMENT : FSI.CHIMIE

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TABLE SUMMARIZING THE MODULES THAT MAKE UP THE TRAINING PROGRAM

page	Code	Title of the module	ECTS	Mandatory Optional	Cours	TD	Projet	Stage
First semester								
8	EICHV3AM	PROFESSIONNALISATION	6	O	30	30		
9	EICHV3BM	CATALYSE 1	3	O	30			
10	EICHV3CM	CATALYSE 2	3	O	30			
11	EICHV3DM	APPROFONDISSEMENT SYNTHÈSE	3	O	30			
12	EICHV3EM	TOX ECOTOX	3	O	30	10		
13	EICHV3FM	PROJET ÉTUDIANT	3	O	10		50	
14	EICHV3GM	INTRODUCTION CHIMIE VERTE	3	O	30			
15	EICHV3HM	NOUVELLES ALTERNATIVES CHIMIQUES POUR L'ENERGIE	3	O	30			
16	EICHV3VM	ANGLAIS	3	O		24		
Second semester								
17	EICHV4AM	STAGE	30	O				5

LIST OF THE MODULES

UE	PROFESSIONNALISATION	6 ECTS	1st semester
EICHV3AM	Cours : 30h , TD : 30h		

TEACHER IN CHARGE OF THE MODULE

BEDOS Florence
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LEARNING GOALS

The objective is to prepare the student for his professional insertion by giving him a knowledge of the regional socio-economic environment in the field of chemistry and the expectations of companies.
Targeted skill :
- Understand how a company works : management tools, writing of a business plan...
- Interact with professionnals
- Apply for internship/job in companies or academic laboratories

SUMMARY OF THE CONTENT

This course is divided into four parts :
1) main management tools, marketing, business plan
2) legislation, patenting
3) conferences by industrials partners
4) courses given by invited professors from various countries

PREREQUISITES

Knowledge of your professionnal project and objectives.

KEYWORDS

management, marketing, business plan, patent

UE	CATALYSE 1	3 ECTS	1^{st} semester
EICHV3BM	Cours : 30h		

TEACHER IN CHARGE OF THE MODULE

GOUYGOU Maryse
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LEARNING GOALS

Homogeneous, Heterogeneous and Nano-catalysis (H2nanocat)
Increase and expand the knowledge of students in eco-friendly chemistry with integration of the catalysis concepts, homogeneous, heterogeneous and nano, for the development of cleaner and safer processes in the construction of compounds of industrial interest.
Skills :
Master the fundamental concepts of organometallic chemistry
Understand homogeneous catalysis and the basics of heterogeneous catalysis,
Understand the structure-property relationship of surface-catalytic properties of nano-objects,
Design nano-reactors for catalysis based on the concepts of self-assembly

SUMMARY OF THE CONTENT

I-Introduction. Class of catalysts, REACH regulation. Activity, selectivity, separation, recycling.
II-Homogeneous organometallic catalysis. Activation of small molecules (H2, CO, CO2, NH3, alkenes, alkynes), oligomerization, polymerization and metathesis. Mechanisms of catalytic reactions and significant processes.
III-Phase-transfer catalysis and nanoreactors. Emulsions, micro-emulsions. Phase-transfer catalysis and micellar catalysis.
IV-Nano-catalysis. Nanoparticles : synthesis, properties, characterization and catalysis.
Growth process, solid-liquid interface stabilization, surface-reactivity relationship.
V-Supported catalysis and confinement. Covalent and noncovalent catalyst immobilization on organic, inorganic and membrane supports. Catalyst confinement in mesoporous and MOF materials.
VI. Heterogeneous Catalysis. Molecule adsorption, reaction on solid surfaces, large-scale processes.

PREREQUISITES

Organic and organometallic chemistry of the Master 1's level - Basic knowledge of kinetic and thermodynamic chemistry of the L3's level.

REFERENCES

Catalysis, From principles to Applications, M. Beller, A. Renken, R. A. van Santen, Wiley-VCH, 2012.
Concepts of Nanochemistry, L. Cademartiri, G.A. Ozin, Wiley-VCH, 2009.
Handbook of Green Chemistry, P. T. Anastas, Vol 1-2, Wiley-VCH, 2013.

KEYWORDS

catalysis, catalytic cycle, mechanism, selectivity, atom-economy, saving steps, recycling.

UE	CATALYSE 2	3 ECTS	1^{st} semester
EICHV3CM	Cours : 30h		

TEACHER IN CHARGE OF THE MODULE

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LEARNING GOALS

Heterochemistry and Stereoselective Catalysis (tHESIS)
The aim of this course is the thorough study of main group and transition metal chemistry, with a particular interest dedicated to their role in synthesis and reactivity. The first part will be devoted to the non-classical main group elements (B, Si, P, S...), with particular attention to their use in synthesis and their contribution to transition metal chemistry and in catalysis. The second part will deal with stereoselective synthesis and enantioselective catalysis.
Skills :Achieve a chemical transformation involving a heteroelement and/or to carry out a chemical transformation in a stereoselective way according to the rules of the green chemistryDesign and implement syntheses in a context of sustainable development

SUMMARY OF THE CONTENT

1) Application of non-classical main group elements (B, Si, P, S). **Physico-chemical properties :**Influence on structure and reactivity. **Functionalization :** Organoboron and organosilane compounds, phosphines and sulfoxides in organic synthesis, organocatalysis. **Chiral auxiliaries and formation of C-C bonds :** Sulfoxides and sulfones as chiral auxiliaries. Enolate chemistry (B, Si). Dithioacetals. Radical chemistry (S). **Formation of C=C bonds :** Stabilization of α-carbanions. Wittig reaction and related transformations. Peterson and Corey-Chaykovsky reactions. **Interface Main group elements/Transition metals** : Ligands. Hydrofunctionalization. C-C (Suzuki, Hyama) and C-X coupling.
2) Stereoselective synthesis and catalysis. **Modern stereochemistry** : Complements on stereochemical analysis. Concepts and general strategies in enantioselective synthesis and catalysis. Chiral ligands. **Chiral transition metal complexes** : Synthesis and stoichiometric reactivity. Central and planar chirality (Ti, Fe, Cr ...). **Enantioselective catalysis :**Enzymatic, organic and organometallic catalysis. Oxidation (Ti, Mn, Os ...). Reduction (Rh, Ru, Ir ...). Formation of C-C bonds (Ni, Cu, Pd ...).

PREREQUISITES

Fundamental organic chemistry, elemental steps in organometallic chemistry, catalytic cycle, stereochemistry.

REFERENCES

Catalytic asymmetric synthesis, 2nd Ed, Ed. I. Ojima, Wiley-VCH, **2000**
Organic chemistry, J. Clayden, N. Greeves, S. Warren ; Oxford University Press, USA, **2012**

KEYWORDS

Main-group elements, Complexes, Transition metals, Hydrofunctionalization, Catalysis, Stereochemistry, Stereoselective synthesis, Chiral ligands

UE	APPROFONDISSEMENT SYNTHÈSE	3 ECTS	1st semester
EICHV3DM	Cours : 30h		

TEACHER IN CHARGE OF THE MODULE

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LEARNING GOALS

Further advances in Organic Synthesis (OrgaSyn)
Improve & broaden the knowledge of students in organic synthesis, with particular emphasis on the selective construction of molecular architectures within the Green Chemistry context. Noteworthy is that this teaching unit is in logic continuation of the notions & concepts developed in two teaching units of the M1 CHIMIE, *ie.*ØOutils et Stratégies de Synthèse' / ØMilieux Réactionnels et Modes d'Activation Alternatifs'.
Targeted skills :Master the concepts / principles of green chemistry and implement them rationally in organic synthesisKnow the advantages of new technologies, like flow chemistry, for the synthesis of molecules of interest

SUMMARY OF THE CONTENT

(1) Tools & strategies for organic synthesis I -alternative methods for functional group interconversion (focus on oxidation/reduction reactions) and for the formation of a single C-C bond (aldol-type reactions) - principles of asymmetric synthesis will be dealt with in this part.
(2) Tools & strategies for organic synthesis II -methods for the one-pot formation of multiple bonds (multicomponent reactions, domino/tandem reactions).
(3) Technological tools -miniaturization of processes, microfluidics, flow chemistry, automated synthesis.
(4) Recent applications -applications in the construction of complex molecular architectures and in total synthesis (cases studies with a further focus on protecting group-free chemistry, biomimetic chemistry, biomass, and chiral pool).

PREREQUISITES

Organic Chemistry & Organometallic Chemistry at the Master 1's level - Knowledge of Green Chemistry principles & familiarity with the related metrics.

REFERENCES

Modern Oxidation Methods, JE Bäckvall, **2010** ,WILEY-VCH
Domino Reactions in Organic Synthesis, L Tietze, G Brasche, KM Gericke, **2006**, WILEY-VCH
Multicomponent Reactions in Organic Synthesis, J Zhu, Q Wang, M Wang, **2014**, WILEY-VCH

KEYWORDS

alternative oxidation/reduction methods - asymmetric synthesis - multicomponent reactions - domino/tandem reactions - flow chemistry

UE	TOX ECOTOX	3 ECTS	1^{st} semester
EICHV3EM	Cours : 30h , TD : 10h		

TEACHER IN CHARGE OF THE MODULE

GAUTHIER Laury
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LEARNING GOALS

The aim is to make students aware of the problematics of toxicity and ecotoxicity and to introduce them to the basics in these areas (scientific and regulatory), a key education to participate in active discussions with industrial partners. The student should then be able to play a major role in the sustainable development of chemical processes.
Targeted skills :Identify the main categories of environmental contaminantsUnderstand the transfers and distribution of pollutants in the different compartmentsAnalyze the biological effects of chemical substances at different scales of life organizationInterpret the societal and regulatory consequences in a situation of contamination

SUMMARY OF THE CONTENT

- Toxicity : The different forms of toxicity will be presented as well as their expression at the level of the molecule, the individual and the ecosystem.
- Ecotoxicity : the structure and functioning of the environment will be presented in order to better understand the issues related to the dysfunction of the environment directly related to chemistry. The consequences of chemical productions will be examined in terms of impacts on living systems at different levels of perception of our environment.
- Environmental law : basic notions of law, presentation of the Environmental Risk Assessment process (ERA), on which multiple levels of national and international regulations are built, such as the European REACH regulation on the control of chemicals.
- Life cycle of a product and its optimization.

PREREQUISITES

Knowledge of the problematics of green / sustainable chemistry

REFERENCES

Essentials of Toxicology, Casarett & Doulls, Mc Graw Hill, 3e Ed, **2015**.
Chimie et environnement, P. Behra, Sciences Sup, Dunod, **2013**.
Introduction à l'écotoxicologie fondements et applications [ebook], F. Ramade, Tec et Doc, Lavoisier, **2010**.

KEYWORDS

Toxicity ; Ecotoxicity ; Environmental law ; Life cycle.

UE	PROJET ÉTUDIANT	3 ECTS	1st semester
EICHV3FM	Cours : 10h , Projet : 50h		

TEACHER IN CHARGE OF THE MODULE

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LEARNING GOALS

The objectives are to mobilize the knowledge acquired through this formation in order to reach given objectives. For this, based on a problematic proposed by the course team, the students will have to propose an action plan to achieve the societal, economical, scientific and technical aspects in relation with this project.
Targeted skills :Analyzing the environmental impacts related to the use of a material / processBeing able to analyze the life cycle of a material and know how to implement the corresponding indicatorsImplementing project management tools for group work
Using theoretical knowledge through a multidisciplinary project

UE	INTRODUCTION CHIMIE VERTE	3 ECTS	1^{st} semester
EICHV3GM	Cours : 30h		

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LEARNING GOALS

This teaching unit aims to introduce current issues in the chemical industry and show the contribution of clean chemistry to control costs and impacts. The aim is to raise awareness of the different approaches available to the chemist to make an eco-friendly transformation (new environments, modes of activation, catalytic systems) and show that the use of raw materials of plant origin and the implementation of catalytic processes are the key elements in developing green chemistry.
Skills :Master the basic concepts of green chemistry and their implementation in chemical engineeringBe able to analyze a production scheme and identify improvement pathways to reduce impacts.

SUMMARY OF THE CONTENT

In introduction are presented the current challenges of chemistry and chemical engineering are faced in a context of scarcity of raw materials, energy saving and environmental pressure. This context favors the development of a sustainable chemistry based on a set of principles aimed specifically to reduce or eliminate the use or generation of hazardous or toxic substances in the design, manufacture and use of a product. We will show how the development of green chemistry, bioprocesses and other clean technologies can provide solutions to the chemical industry, meeting the requirements of sustainable development and innovation. Biomass is an inexhaustible reservoir of molecules whose properties make it interesting alternative raw materials. On heterogeneous catalysis, green chemistry tool, methods of preparation, characterization of catalysts (supported or not) are presented in relation to their application.

PREREQUISITES

Good level in organic chemistry concepts in chemical engineering or chemistry-industrial.

REFERENCES

Chimie verte, chimie durable, Sylvain Antoniotti, Ellipse, **2013**.
Génie des procédés durables, M. Poux, P. Cognet, et Ch. Gourdon, Dunod, **2010**.
Green Chemistry for Environmental Sustainability, S. K. Shama, A. Mudhoo, CRC Press **2010**.

KEYWORDS

green chemistry, sustainable industry, renewable resources, heterogeneous catalysis

UE	NOUVELLES ALTERNATIVES CHIMIQUES POUR L'ENERGIE	3 ECTS	1^{st} semester
EICHV3HM	Cours : 30h		

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LEARNING GOALS

After this training, students will be aware of the socio-economic, technical and environmental issues related to the current high energy demand. They will have acquired the theoretical foundations of new energy technologies. They will be able to offer sources / vectors of alternative energy sources to conventional fuels. The theoretical knowledge provided by the courses will be supplemented by concrete examples that will enable students to identify in particular the catalysts involved in specific processes (fuel cell, biomass conversion and CO2).
Skills :Master the basic concepts of new energy technologies, including the contributions of chemistry and catalysis Being able to analyze a chemical problem in the context of new energy technologies and to be a source of proposals.

SUMMARY OF THE CONTENT

The Teaching Unit illustrates the major role of chemistry in particular catalysis, which is the basis of efficient energy components.
In a national and international context that largely promotes low-carbon energy, the TU addresses the fields of new energy technologies that are key to a sustainable energy future. Among them should be mentioned : the production of electricity from solar energy, both for stationary applications as mobility ; production, storage and use of hydrogen for various applications such as electric mobility or smoothing the production of intermittent renewable energy with fuel cells ; or the energy uses of non-food biomass, and recovery of CO2. Examples of catalytic processes involved in the development of biomass or CO2 for the production of biofuels and high value-added industrial products will also be detailed.

PREREQUISITES

Good level in inorganic chemistry, basic level in material chemistry, concepts in heterogeneous catalysis (TU : Tools in Green Chemistry and Processes).

REFERENCES

Green Chemistry and Catalysis, R A Sheldon, I Arends, U Hanefeld, Wiley-VCH, **2007**. Introduction to Biomass Energy conversions, S Capareda, CRC Press, **2013**. Biofuels and Bioenergy, Processes and Technologies, S Lee, TY Shah, CRC Press, **2012**.

KEYWORDS

energy, catalysis, fuel cells, photovoltaic, hydrogen, CO2, biomass

UE	ANGLAIS	3 ECTS	1st semester
EICHV3VM	TD : 24h		

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LEARNING GOALS

Level C1 of the CEFRL (Common European Framework of Reference for Languages)
To develop the indispensable skills enabling students to integrate into professional life. To improve communication tools to enable students to express themselves in today's international environment and to acquire the linguistic autonomy required for this purpose.

SUMMARY OF THE CONTENT

Teaching is centred on oral expression.
Documents in the field of expertise can be used for collaborative activities between science and language teachers.
Training is tailored to the individual needs of each student. Oral Comprehension - Reading Comprehension - Oral Expression - Written Expression
Being able to communicate in scientific English
Being able to pick out key elements of oral or written statements in their field of expertise.
Being able to speak in public (conferences or meetings) at a symposium, for a research project or for a professional project.

PREREQUISITES

N.A.

REFERENCES

N.A.

KEYWORDS

project - pick out - writing scientific English - style - register - review - professional - commenting

UE	STAGE	30 ECTS	2^{nd} semester
EICHV4AM	Stage : 5 mois minimum		

TEACHER IN CHARGE OF THE MODULE

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LEARNING GOALS

This 5-6 month internship is intended as a first experience in real world RnD situations. It is an opportunity to put in practice the theoretical understandings of chemistry in a professional environment and to further develop the skills that are necessary for professional integration.
This internship is the perfect opportunity to explore various career choices. The internship in industry will help you familiarize with the chemical industry and better prepare your professional integration at the end of your Master's. The internship in an academic research settings is geared towards a future PhD.

SUMMARY OF THE CONTENT

Starting in January and until June, the students will carry out a full time, research-based internship. The internship topic must match the preoccupations of green chemistry. It can be carried out in an academic or industrial laboratory, in France or abroad. Students are strongly incited to find an internship either in industry in order to facilitate their future professional integration, or in an academic lab abroad to broaden their horizons.
In Toulouse, the Green Chemistry Master's course is associated with a number of chemistry research laboratories that are affiliated with the graduate school Ecole Doctorale des Sciences de la Matière (EDSDM, www.edsdm.ups-tlse.fr), as well with a local cluster of companies with a focus on green chemistry (www.clusterchimieverte.fr).
In either cases, you will be an integral member of a research team and will take asked to attend meetings and conferences, present your results...

KEYWORDS

Internship

GLOSSARY

GENERAL TERMS

DEPARTMENT

The departments are teaching structures within components (or faculties). They group together teachers lecturing in one or more disciplines.

MODULE

A semester is structured into modules that may be mandatory, elective (when there is a choice) or optional (extra). A module corresponds to a coherent teaching unit whose sucessful completion leads to the award of ECTS credits.

ECTS: EUROPEAN CREDITS TRANSFER SYSTEM

The ECTS is a common unit of measure of undergraduate and postgraduate university courses within Europe, created in 1989. Each validated module is thus assigned a certain number of of ECTS (30 per teaching semester). The number of ECTS depends on the total workload (lectures, tutorials, practicals, etc.) including individual work. The ECTS system aims to facilitate student mobility as well as the recognition of degrees throughout Europe.

TERMS ASSOCIATED WITH DEGREES

Degrees have associated domains, disciplines and specialities.

DOMAIN

The domain corresponds to a set of degrees from the same scientific or professional field. Most of our degrees correspond to the domain Science, Technology and Health.

DISCIPLINE

The discipline corresponds to a branch of knowledge. Most of the time a discipline consists of several specialities.

SPECIALITY

The speciality constitutes a particular thematic orientation of a discipline chosen by a student and organised as a specific trajectory with specialised modules.

TERMS ASSOCIATED WITH TEACHING

LECTURES

Lectures given to a large group of students (for instance all students of the same year group) in lecture theatres. Apart from the presence of a large number of students, lectures are characterized by the fact they are given by a teacher who defines the structure and the teaching method. Although its content is the result of a collaboration between the teacher and the rest of the educational team, each lecture reflects the view of the teacher giving it.

TD : TUTORIALS

Tutorials are work sessions in smaller groups (from 25 to 40 students depending on the department) led by a teacher. They illustrate the lectures and allow students to explore the topics deeper.

TP : PRACTICALS

Teaching methods allowing the students to acquire hands-on experience concerning the knowledge learned during lectures and tutorials, achieved through experiments. Practical classes are composed of 16 to 20 students. Some practicals may be partially supervised or unsupervised. On the other hand, certain practicals, for safety reasons, need to be closely supervised (up to one teacher for four students).

PROJECT

A project involves putting into practice in an autonomous or semi-autonomous way knowledge acquired by the student at the university. It allows the verification of the acquisition of competences.

FIELD CLASS

Field classes are a supervised teaching method consisting of putting into practice knowledge acquired outside of the university.

INTERNSHIPS

Internships are opportunities enabling students to enrich their education with hands-on experience and to apply lessons learned in the classroom to professional settings, either in industry or in research laboratories. Internships are strongly regulated and the law requires, in particular, a formal internship convention established between the student, the hosting structure and the university.

UNIVERSITÉ TOULOUSE III PAUL SABATIER

Université de Toulouse