

**COURSES TAUGHT  
IN ENGLISH  
AT INSA  
TOULOUSE**

**2023 | 2024**

**FOR EXCHANGE STUDENTS**



## INTRODUCTION

Founded in 1963, **INSA Toulouse is an international and multidisciplinary public engineering school** that offers a 5-year higher education degree programme leading to the “Engineering Degree”, equivalent to a Master of Science or MEng.

The curriculum is divided into three phases:

- > **Year 1:** a common track for all engineering students to acquire fundamental knowledge
- > **Year 2 and 3:** 4 pre-specializations
- > **Year 4 and 5:** 8 specializations within 7 departments

The curriculum was designed to develop the autonomy of the students, letting them build their own professional projects step by step while acquiring robust scientific knowledge and developing both specific and transversal skills. INSA Toulouse students are given the opportunity to discover different activities and jobs by visiting companies, completing short to medium-term internships, and attending conferences and meetings.

Education at INSA Toulouse is closely linked to **top-level research**, seeking to enhance its students’ ability to imagine and develop the technologies of the future. As part of its commitment to the research policy of the University of Toulouse, INSA Toulouse:

- > has laboratories linked to each engineering department;
- > has academics and researchers carrying out dynamic research in internationally recognized laboratories (CNRS, INRA, MESR);
- > provides research training for all its engineering students throughout their curriculum (<http://www.insa-toulouse.fr/en/recherche.html>).

INSA Toulouse is a member of the **ECIU University**, the first European university where learners, teachers and researchers cooperate with cities and businesses to **solve real-life challenges** (<https://www.eciu.org/>).

INSA Toulouse has also been awarded the “**Welcome to France**” label, which rewards the quality of service for international students.





## BECOMING AN EXCHANGE STUDENT AT INSA TOULOUSE:

All students may be exchange students at INSA Toulouse, provided that their home institution signed a Cooperation Agreement (Erasmus + or bilateral agreement) with INSA Toulouse. Exchange students are welcome to all INSA Toulouse departments **for up to 2 semesters**.

Students are required to **choose the majority of their courses in one department** in order to prevent scheduling conflicts. 1 ECTS credit represents around 30 hours including in-class lectures and personal academic work. The learning agreement for one semester cannot exceed 30 ECTS credits and must be set up in close collaboration with the international academic coordinator of the host department.

**For further information regarding the application, the preparation of the Learning Agreement and contacts details**, please visit: <https://international.insa-toulouse.fr/en/international-students/exchange-semester/apply/>

**Contact:** [relint.incoming@insa-toulouse.fr](mailto:relint.incoming@insa-toulouse.fr)

### **French as a Foreign Language, Foreign Languages and English-taught Humanities**

INSA Toulouse offers 2 types of French language courses for its international students: in August as a **Summer School** and **throughout the year** via its Humanities Department (CSH). **Students are advised to choose FLE courses even if they only follow courses taught in English.**

INSA Toulouse also offers its international students foreign languages courses (Chinese, German, Italian, Portuguese, and Spanish) and other English-taught courses - listed at the end of this brochure.

**For further information**, please consult: <https://csh.insa-toulouse.fr/fr/international.html>

**Contact:** [relint.incoming@insa-toulouse.fr](mailto:relint.incoming@insa-toulouse.fr)





## **ECIU University** **The European Consortium of Innovative** **Universities:**

If you need to complete your learning agreement, or simply wish to widen your experience, you can apply to ECIU University challenges and join an international and multidisciplinary team to tackle concrete challenges and develop innovative solutions, under the guidance of a teamcher who has the task of facilitating communication. The challenges originate from a city, region, company or a public institution.

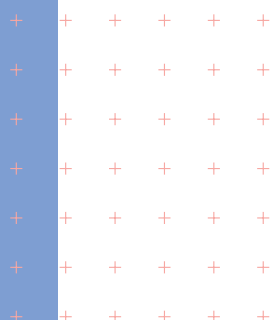
You will also get the opportunity to sign up for ECIU University micro-modules that will help you acquire the knowledge and skills you need to solve the challenge and/or deepen specific knowledge.

More information about where to apply for ECIU University learning opportunities can be found under: <https://engage.eciu.eu/>

**For further information**, please consult: <https://international.insa-toulouse.fr/fr/etudiants-insa/eciu-university/>

<https://engage.eciu.eu>

**Contact:** Ms Noelle BILLON: [billon@insa-toulouse.fr](mailto:billon@insa-toulouse.fr)





# TABLE OF CONTENTS

## 1- SCIENTIFIC COURSES

### UNDERGRADUATE / BACHELOR LEVEL

- Applied Mathematics (Modeling, Computer Science and Communication)
- Applied Physics (Materials, Components and Systems Engineering)
- Industrial Biotechnology (Chemical, Biochemical and Environmental Engineering)

### MASTER LEVEL

- Applied Mathematics
- Applied Physics
- Industrial Biotechnology
- Electrical and computer engineering (includes Automatic Control and Electronics & Computer Science and Networks)
- Chemical Engineering: Water, Energy, Environment
- Civil Engineering
- Mechanical Engineering

## 2- HUMANITIES

- Foreign languages & English-taught humanities
- French as a Foreign Language

*The courses are categorised according to the language of instruction:*

- *FULL ENG : course taught in English, Q&A in English, teaching materials in English*
- *MIX : course taught in French, Q&A in English, teaching materials in English*
- *FACE TO FACE: autonomous student projet fully supervised in English*

# APPLIED MATHEMATICS

The rise of Machine Learning and Artificial Intelligence (AI) has reinforced the ever-growing need of Computer Science and Applied Mathematics skills to process, exploit and analyze this data, perform numerical simulations, gain a deeper understanding of complex systems and high-tech products, and predict their behavior. Data Science and AI are increasingly sought after by the transportation, environment, security, health, e-commerce, and insurance sectors, among others.

To this end, the training provides:

- > A broad spectrum of methods and techniques in Applied Mathematics
- > Long-lasting fundamentals and a solid culture of engineering sciences
- > A deep mastery of IT tools
- > Thorough knowledge of management techniques



## KEY:

**CC:** Core Curriculum

**Opt. 1/2** > Choose 1 course among 2

**Opt. 2/4** > Choose 2 courses among 4

**Opt. 3/8** > Choose 3 courses among 8

## UNDERGRADUATE (MODELING, COMPUTER SCIENCE AND COMMUNICATION - MIC)

SEMESTER 1 September - January	Course title	Teaching languages	Course code	ECTS
	> Analysis 1	MIX	I2MIAN10	5
> Linear algebra	MIX	I2MIAL10	4	

SEMESTER 2 January - June	> Analysis-Algebra 2	MIX	I2MIAA20	5
	> Signal 1	MIX	I2MISI20	2
	> Function approximation: CAD and machine learning	MIX	I3MIAF20	3
	> Modeling with Partial Differential Equations 1	MIX	I3MIDP20	3
	> Signal 2	MIX	I3MISG20	3

**CONTACT :** [cantin@insa-toulouse.fr](mailto:cantin@insa-toulouse.fr)

## 4<sup>TH</sup> YEAR | MASTER 1

SEMESTER 1 September - January	Organi- zation	Course title	Teaching languages	Course code	ECTS
	CC	> Optimization	MIX	I4MATCOP11	5
CC	> Elements of Statistical Modeling	MIX	I4MATCEMS11	5	
CC	> High Performance Computing, IT Development	MIX	I4MATCINFO11	5	
CC	> Reading Seminar or Challenge Based Learning (ECIU)	FACE TO FACE	I4MATCCRS11	3	
CC	> Quality, Security, Environment	MIX	I4MATCQSE11	2	
Opt. 1/2	> Partial Differential Equations II	MIX	I4MAOPEDP11	3	
Opt. 1/2	> Advanced Probabilities	MIX	I4MAOPPA11	3	

SEMESTER 2 January - June	CC	> Signal	MIX	I4MATCSI21	5
	CC	> Research Project	FACE TO FACE	I4MATCPRO21	5
	CC	> Machine learning (ML)	MIX	I4MATCML21	5
	Opt. 2/4	> Finite Element Methods & Model Reductions	FULL ENG	I4MAOPEF21	5
	Opt. 2/4	> Mathematical Methods for Mechanics	MIX	I4MAOPME-CAS21	5
	Opt. 2/4	> Data Analysis	MIX	I4MAOPAD21	5
	Opt. 2/4	> Stochastic Processes	MIX	I4MAOPPS21	5



	Organi- zation	Course title	Teaching languages	Course code	ECTS
SEMESTER 1 September - January	CC	> High Dimensional and Deep Learning (HDDL)	MIX	I5MATCHDDL11	3
	CC	> Research Project-Engineering English	FACE TO FACE	I5MATCPJ11	4
	CC	> Metamodeling	MIX	I5MATCMETA11	3
	Opt. 3/6	> Variational Data Assimilation & Model Learning	FULL ENG	I5MAOPAD11	3
	Opt. 3/6	> Image	MIX	I5MAOPIM11	3
	Opt. 3/6	> Fluid and Structural Mechanics	MIX	I5MAOPMDF11	3
	Opt. 3/6	> Stochastic Calculus	MIX	I5MAOPCSTO11	3
	Opt. 3/6	> Lifetime data analysis	MIX	I5MAOPDDV12	3
	Opt. 3/6	> AI Frameworks	MIX	I5MAOPAIF11	3

**CONTACT :** [bouclier@insa-toulouse.fr](mailto:bouclier@insa-toulouse.fr)



# APPLIED PHYSICS: MICRO & NANO TECHNOLOGIES

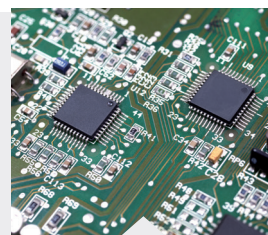
The Applied Physics specialization program trains engineers with a broad scientific spectrum to prepare them to cope with the technical and scientific challenges of tomorrow, including:

- > Energy transition (energy efficiency, energy storage and conversion, renewable energy production, etc.)
- > Digital society (quantum materials, technologies and devices)
- > Global health (micro- and nano-systems for biology, health and environmental analysis, etc.)
- > Mobility and infrastructure (materials, transportation structures and components, aeronautics and space, etc.)

The Applied Physics specialization provides students with the technical and creative knowledge to be able to:

- > Bring innovation to the field of cutting-edge technology
- > Be part of a team and contribute to responsible development
- > Easily adapt to an ever-changing industrial world

The main areas of training are the physics of materials and components, nanotechnology, sensors, instrumentation, testing and measurement.



## UNDERGRADUATE (MATERIALS, COMPONENTS AND SYSTEMS ENGINEERING - IMACS)

SEMESTER 1 September - January	Course title	Teaching languages	Course code	ECTS
	> Electromagnetic waves in matter	FULL ENG.	3MAPH31	2.5

CONTACT : guillaume.auriol@insa-toulouse.fr

## 4<sup>TH</sup> YEAR | MASTER 1

SEMESTER 1 September - January	Course title	Teaching languages	Course code	ECTS
	> Solid State physics I	FULL ENG.	I4GPPM11-1	2,5
	> Quantum Physics II	FULL ENG.	I4GPPM11-2	2,5
	> Instrumentation	MIX_2	I4GPII11	5
	> Laboratory Works 1	MIX_2	I4GPLP11	5
	> Multidisciplinary project 1	FACE TO FACE	I4GPPJ11-1	5
	> New development in Physics report	FACE TO FACE	I4GPPR	5
	> Nano Physics	FULL ENG.	I5GPNN11-1	2,5
	> Nano Chemistry	MIX_2	I5GPNN11-2	2,5

## 5<sup>TH</sup> YEAR | MASTER 2

SEMESTER 1 September - January	Course title	Teaching languages	Course code	ECTS
	> Physics Engineering: Nanofabrication, Hyper-frequencies	MIX_1	I5GPPV11	5
	> Laser Technics and scientific communication	FULL ENG.	I5GPAP11	5
	> FPGA and real time instrumentation	MIX_2	I5IPGA12 *	5
	> Innovative technologies, devices and materials	MIX_1	I5GPTI11	4
	> NanoPhysics and Nanochemistry	MIX_2	I5GPNN11	5
	> New development in Physics report	FACE TO FACE	I5GPPR	4
	<b>Workshops :</b>			
	> Micro-nano-electro-mechanical systems-nanotechnology Engineering (Workshop)	MIX_2	I5GPNM11 *	5
	> Nanobioengineering (Workshop)	MIX_2	I5GPNB11 *	5
	> Graphene (Workshop)	MIX_2	I5GPGR11 *	5
	> Instrumentation project (Workshop)	MIX_2	I5GPIA11 *	5
	> Charged Particle Optics (Workshop)	MIX_2	I5GPPC11	5

\* Students can choose one only workshop as they are run in parallel

MIX\_1: Courses in French, documents and communications in English & MIX\_2 : Courses in English, documents in French

CONTACT : andrea.balocchi@insa-toulouse.fr





# INDUSTRIAL BIOTECHNOLOGY

The objective of the Biological Engineering specialization is to train engineers who master the whole set of methodologies dealing with the biological conversion of biotic and non-biotic materials, from the laboratory to the industrial scale.

Biological engineers design and develop new biocatalysts (enzymes and microorganisms) that meet industrial constraints, and calculate and optimize the performance of biological reactors and extraction-purification processes.



## UNDERGRADUATE (CHEMICAL, BIOCHEMICAL AND ENVIRONMENTAL ENGINEERING - ICBE)

SEMESTER 2 January - June	Course title	Teaching languages	Course code	ECTS
	> Biophysics	FULL ENG.	under change	

CONTACT : jean-pascal.capp@insa-toulouse.fr

## ENGINEERING | 4<sup>TH</sup> YEAR | MASTER 1

SEMESTER 1 September - January	Course title	Teaching languages	Course code	ECTS
	> Cellular metabolism & regulation	FULL ENG	I4GBBC11	4
	> Genetic & Enzyme Engineering: tools for synthetic biology	FULL ENG	I4GBBM11	6
SEMESTER 2 January - June	> Microbial Culture	FULL ENG	I4GBBC31	6
	> Cell Culture for Biotherapies	FULL ENG	I4GBTf21	4

## ENGINEERING | MICROBIOLOGY & INDUSTRIAL BIOCATALYSIS | 5<sup>TH</sup> YEAR | MASTER 2

SEMESTER 1 September - January	Course title	Teaching languages	Course code	ECTS
	> Microbiology & biocatalysis for industry	FULL ENG	I5GBBC11	12
	> Microbiology & biocatalysis for industry: lab work	FULL ENG	I5GBBC21	12

OR

## ENGINEERING | SYSTEMS AND SYNTHETIC BIOLOGY | 5<sup>TH</sup> YEAR | MASTER 2

SEMESTER 1 September - January	Course title	Teaching languages	Course code	ECTS
	> Systems & Synthetic biology for biotechnologies	FULL ENG	I5GBBM11	12
	> Systems & Synthetic Biology: lab work	FULL ENG	I5GBBM21	12

CONTACT : jean-pascal.capp@insa-toulouse.fr



**BIOTECHECO MASTER DEGREE | 4<sup>TH</sup> YEAR | MASTER 1**

	Course title	Teaching languages	Course code	ECTS
<b>SEMESTER 1</b> September - January	> Synthetic biology 1	FULL ENG	M1BIBC11	2
	> System biology 1	FULL ENG	M1BIBC21	2
	> Enzyme System 1	FULL ENG	M1BIBC31	2
	> Biochemical engineering 1	FULL ENG	M1BIBC41	2.5
	> Upstream and Downstream Processing 1	FULL ENG	M1BITF11	2.5
	> Ethical Issues 1	FULL ENG	M1BIET11	2
	> Bioeconomy 1	FULL ENG	M1BIEC11	2
	> Practical training in research laboratory	FULL ENG	M1BIPJ11	15

**BIOTECHECO MASTER DEGREE | 5<sup>TH</sup> YEAR | MASTER 2**

	Course title	Teaching languages	Course code	ECTS
<b>SEMESTER 1</b> September - January	> Life Cycle Assessment	FULL ENG	M2BITF11	2.5
	> Ethical Issues 2	FULL ENG	M2BIET11	2.5
	> Biochemical engineering 2	FULL ENG	M2BIBC11	2.5
	> Enzyme System 2	FULL ENG	M2BIBC21	2.5
	> Entrepreneurial skills and leadership	FULL ENG	M2BILE11	2
	> Bioprocess design / Project management	FULL ENG	M2BITF21	8
	> Practical courses	FULL ENG	M2BIPJ11	10

**CONTACTS :** [lauren.arata@insa-toulouse.fr](mailto:lauren.arata@insa-toulouse.fr) & [meynial@insa-toulouse.fr](mailto:meynial@insa-toulouse.fr)



# ELECTRICAL AND COMPUTER ENGINEERING DEPARTMENT

The Electrical and Computer Engineering department offers two distinct programs within the following fields: Automatic Control and Electronics, and Computer Science and Networks.

The Electrical and Computer Engineering department is equipped with a platform dedicated to connected objects, including several USRPs (Universal Software Radio Peripherals - fully reconfigurable equipment for the implementation of wireless communications), IoT cards (ST Microelectronics, Intel, NXP, etc.), antennas, oscilloscopes, spectrum analyzers and laptop PCs. This platform is used to study, design and implement communication protocols dedicated to communicating objects, as well as the security of these protocols.

The Electrical and Computer Engineering department is equipped with a hardware platform dedicated to characterizing the electromagnetic compatibility of electronic equipment. It comprises an anechoic chamber, antennas, spectrum analyzers, RF power amplifiers and TEM cells, enabling the measurement of electromagnetic emissions and immunity to electromagnetic interference between 150 kHz and 6 GHz.

The objective of the Automatic Control & Electronics specialization is to train engineers who can apply their skills to automatic control, signal processing, electronics and computer science, the design process of complex systems and the development of the automatic control subsystem or the electronic and microelectronic subsystems, while implementing the associated IT tools.



## AUTOMATIC CONTROL AND ELECTRONICS

### 4<sup>TH</sup> YEAR | MASTER 1

	Course title	Teaching languages	Course code	ECTS
<b>SEMESTER 1</b> September - January	> Analysis of Complex Systems	MIX	I4AESY11	6
	> VHDL and Reconfigurable Digital Circuits	FULL ENG	I4AESE41_02	3
	> Microcontroller & Peripheral Programming	MIX	I4AEIM11	4
	> Machine Learning	MIX	I4AEML21	3
	> Research Project	FACE TO FACE	Extension of I4AEPJ11	10

<b>SEMESTER 2</b> January - June	> Real-Time systems	MIX	I4AEIL11_02	3
	> Stochastic Process and Queuing Theory	FULL ENG	I4AESY21_02	3
	> Basic concepts of Petri Nets	FULL ENG	I4AEIL11_02	3
	> Practical Work in Control Systems	MIX	I4AEAU21	5
	> Security for IoT	MIX	(Extension of MSIO- TSEC11)	10
	> Research Project	FACE TO FACE	Extension of I4AEPJ11	10

### THEME: INNOVATIVE SMART SYSTEMS | 5<sup>TH</sup> YEAR | MASTER 2

<b>SEMESTER 1</b> September - January	> Smart Devices	FULL ENG	I5SSEN11	5
	> Communication protocols for IoT	FULL ENG	I5SSCM11	5
	> Middleware and Services	FULL ENG	I5SSIL11	5
	> Data analysis and processing / Big Data	FULL ENG	I5SSIF11	4
	> Innovative Project - Challenge Based Education	FULL ENG	I5SSRS11	5
	> Innovation and Humanity	FULL ENG	I5SSGE11	6



SEMESTER 2 January – June	Course title	Teaching languages	Course code	ECTS
	> Master Thesis (in industry or academia)	FULL ENG	under change	30

**THEME: SAFETY ENGINEERING AND MANAGEMENT | MASTER 2**

SEMESTER 1 September - January	> Qualitative Approach	FULL ENG	MSSEQL11	5
	> Quantitative Approach	FULL ENG	MSSEQT11	5
	> Toxic risk	FULL ENG	MSSEHF11	5
	> Process Safety	FULL ENG	MSSEPS11	5
	> Designing for safety	FULL ENG	MSSEDS11	5

SEMESTER 2 January – June	> Functional Safety	FULL ENG	MSSEFS11	5
	> Structural Safety	FULL ENG	MSSESS11	5
	> Safety Management	FULL ENG	MSSEMA11	5
	> Human, organizational and social factors	FULL ENG	MSSEOS11	5

**THEME: SYSTEMS ENGINEERING | 5<sup>TH</sup> YEAR | MASTER 2**

SEMESTER 2 January – June	Course title	Teaching languages	Course code	ECTS
	> Master Thesis (in industry or academia)	FULL ENG	under change	30

\* For information about our research lines, see the Institute Clement Ader website: [www.ica.cnrs.fr](http://www.ica.cnrs.fr)

**CONTACT :** alexandre.boyer@insa-toulouse.fr



# COMPUTER SCIENCE AND NETWORKS



The objective of the Computer Science & Networks specialization is to train engineers who master the software development process and the design of complex, communicating and networked-distributed computer systems, while complying with safety standards and/or real-time constraints. Engineers graduating from this program are outward-looking, able to communicate and innovate while being aware of the socio-economic complexity of the business. The Internet of Things and Artificial intelligence are considered major industrial evolutions and strategic key points for companies. It pushes the boundaries when it comes to gathering, analyzing and sharing massive digital data.

## 4<sup>TH</sup> YEAR | MASTER 1

	Course title	Teaching languages	Course code	ECTS
<b>SEMESTER 1</b> September - January	> UML Design (selection of this course implies selection of course Advanced Programming in Java (I4IRIL11_02))	MIX	I4IRIL11_01	3
	> Advanced Programming in Java (selection of this course implies selection of course UML Design (I4IRIL11_01))	MIX	I4IRIL11_02	6
	> Security for IT	MIX	I4IRRS11	3
	> Fundamentals in Computer Science	MIX	I4IRIF11	7
	> Microcontroller & Peripheral Programming	MIX	I4IRIF31	4
	> Transmission Systems	MIX	I4IRTC11	7
	> Research Project	FACE TO FACE	Extension of I4IRPJ11	10

<b>SEMESTER 2</b> January - June	> Real-Time systems	MIX	I4IRTR11_02	3
	> Machine Learning	FULL ENG	I4IRML21	3
	> Research Project	FACE TO FACE	Extension of I4IRPJ11	10
	> Software and Hardware Architecture for Computer Systems	FULL ENG	I4IRIM11	7
	> Security for IoT	MIX	Extension of MSIO- TSEC11	10

## THEME: INNOVATIVE SMART SYSTEMS | 5<sup>TH</sup> YEAR | MASTER 2

	Course title	Teaching languages	Course code	ECTS
<b>SEMESTER 1</b> September - January	> Smart Devices	FULL ENG	I5SSEN11	5
	> Communication protocols for IoT	FULL ENG	I5SSCM11	5
	> Middleware and Services	FULL ENG	I5SSIL11	5
	> Data analysis and processing / Big Data	FULL ENG	I5SSIF11	4
	> Innovative Project – Challenge Based Education	FULL ENG	I5SSRS11	5
	> Innovation and Humanity	FULL ENG	I5SSGE11	6

	Course title	Teaching languages	Course code	ECTS
<b>SEMESTER 2</b> January - June	> Master Thesis (in industry or academia)			30

**CONTACT :** alexandre.boyer@insa-toulouse.fr



# CHEMICAL ENGINEERING: WATER, ENERGY, ENVIRONMENT

The aim of the GP3E training is to train engineers able to deal with the major societal challenges of water, energy and the environment, so that they can become proactive players in today's socio-economic world and the leaders of energy transition, circular economy and adaptation to climate change.

In order to address the Water, Energy and Environment challenges, its engineers must be proficient in basic sciences and have an in-depth understanding of the basic concepts of chemical engineering, in addition to social and communication skills, and the ability to manage and lead professional teams at both the national and international stages.

The department trains its students into becoming expert engineers in: Drinking water production and water treatment; Processes & energy; Eco-design; Environment; Methanization; Carbon accounting; Renewable energies and energy efficiency; Waste treatment and valorization; and Sustainable chemical engineering.



## 4<sup>TH</sup> YEAR | MASTER 1

	Course title	Teaching languages	Course code	ECTS
<b>SEMESTER 1</b> September - January	> Unit operations for industrial processes	FULL ENG	M4FELF16	8
	> Transport and transfer Phenomenon	FULL ENG	M4FELF 17	5
	> Research Project	FULL ENG	M4FELF15	5
<b>SEMESTER 2</b> January - June	> Ecoconception and life cycle analysis	FULL ENG	M4WAT21	4
	> Biological processes for water treatment	FULL ENG	M4WAT22	6
	> Introduction to Research (Project)	FULL ENG	I4PEPJ11_01	5
	> B-Membrane Processes	FULL ENG	M4WAT24	3

## 5<sup>TH</sup> YEAR | MASTER 2

	Course title	Teaching languages	Course code	ECTS
<b>SEMESTER 1</b> September - January	> Drinking water and circular water economy	FULL ENG	M5WAT01	8
	> Reactor design and flow assurance	FULL ENG	I5PETF11_01	5
	> Process Dynamic, optimization and control	FULL ENG	I5PECS11_01	5

**CONTACTS:** [etienne.paul@insa-toulouse.fr](mailto:etienne.paul@insa-toulouse.fr) & [dominique.bastoul@insa-toulouse.fr](mailto:dominique.bastoul@insa-toulouse.fr)



# CIVIL ENGINEERING



The teaching and research missions of the Civil Engineering department are geared towards the construction sciences. The department trains managers who can operate at all stages of a construction project.

**INSA Toulouse civil engineers intervene in the following areas:**

- > Building: structural systems, technical and comfort equipment, etc.
- > Public works: infrastructures, bridges, roads, earthworks, etc.
- > Urban planning: spaces, public roads, clean-up campaigns, networks, etc.

**In 4<sup>th</sup> year (MSc1), students must choose one major:**

- > Structural Engineering: structural design for buildings, infrastructure, design and production of civil engineering structures, geotechnical design

- > HVAC and Building physics: understanding and design of technical and comfort elements: heating, acoustics, energy, electricity and smart homes.

**In 5<sup>th</sup> year (MSc2), four professional orientations are available:**

- > Civil Engineering
- > Structural Engineering
- > HVAC and Building physics
- > Durability of Construction

As well as three interdisciplinary programs: Urban Engineering, Energy and Risk engineering.

The Civil Engineering department also prepares researchers and teacher-researchers to join public or private research laboratories of major companies.

## 4<sup>TH</sup> YEAR | MASTER 1

SEMESTER 1 September - January	Course title	Teaching languages	Course code	ECTS
	> Concrete and timber structures – part “Reinforced Concrete”	FACE TO FACE	I4GCBA12 (submodule)	3
SEMESTER 2 January – June	> Sustainable building – part “Sustainable materials”	FULL ENG	A4GCEC21 (submodule)	2
	> Sustainable building – part “International Civil engineering”	FULL ENG	A4GCEC21 (submodule)	2
	> Initiation to research + English	MIX	I4GCRE11 + I4DHUM42	2 + 3

## 5<sup>TH</sup> YEAR | MASTER 2

SEMESTER 1 September - January	Course title	Teaching languages	Course code	ECTS
	> Buildings of the future - part “Renewable energy in buildings”	FULL ENG (lecture) & MIX (project)	I5GCNR12 (submodule)	2
	> Urban Engineering workshop*	MIX	I5PTGU35	8

\*limited number of students

## ID-RIMS MASTER DEGREE (INGÉNIERIE DE LA DURABILITÉ – RECHERCHE ET INNOVATION EN MATÉRIAUX ET STRUCTURES) | MASTER 2

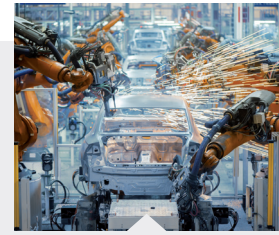
SEMESTER 1 September - January	Course title	Teaching languages	Course code	ECTS
	> ID-RIMS Durability of construction materials - part “Physical Chemistry of Durability of cement based materials”	FULL ENG	KGCD9ABU (submodule)	2
	> ID-RIMS Durability of construction materials - part “Thermo-hydro-chemo-mechanical couplings for predicting the durability of concrete structures”	MIX	KGCD9ABU (submodule)	2
	> ID-RIMS Binders and concretes. Mix design and environmental impact – part “Mix design”	MIX	KGCD9AVU (submodule)	1.5

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# MECHANICAL ENGINEERING



The objective of the Mechanical Engineering specialization is to train general engineers with a proper balance of scientific, technological and systems knowledge.

The training offered by this program takes into account all the data related to the life of a product or system, from its preliminary design to its production and potential recycling, all within a concurrent engineering approach.

- > The 4<sup>th</sup> year of Mechanical Engineering is devoted to furthering knowledge of mechanical engineering (systems architecture, automatic control, thermodynamics, fluid mechanics, computational mechanics, design, industrialization, etc.).
- > The 5<sup>th</sup> year provides all the extra tools to ensure a perfect transition towards the job market. Students will choose a major: Structures, Eco-design, Fluids Engineering or Manufacturing.

## THEME: MECHANICAL ENGINEERING | 4<sup>TH</sup> YEAR | MASTER 1

<b>SEMESTER 1</b> September – January	Course title	Teaching languages	Course code	ECTS
	> Finite Elements (FEM)	MIX	I4GMCS71_1	2,5
	> Nondestructive tests	MIX	I4GMMA71_1	1
	> Bibliography review for research	FACE-TO-FACE	I4GMCS71_3	1
	> High Speed Machining	MIX	I4GMFA72_1	2

<b>SEMESTER 2</b> January – June	> Heat transfer 2	MIX	I4GMMF81_E1	2,5
	> Fluid mechanics 2	MIX	I4GMMF81_E2	2,5
	> Composites	MIX	I4GMCS81_1	2
	> Composites Project Design	FACE-TO-FACE	I4GMCS81_2	1
	> Finite Elements Project	FACE-TO-FACE	I4GMCS81_3	2
	> Advanced Mechanical Modelling	MIX	I4GMPJ82_1	3
	> Ecodesign project	FACE-TO-FACE	I4GMPJ82_2	3
	> Lean Manufacturing	FULL ENG	I4GMFA82_2	1
	> Research Project (Individual Project in the lab)*	FACE-TO-FACE	I4GMPR82_Ind	up to 6

## THEME: MECHANICAL ENGINEERING | 5<sup>TH</sup> YEAR | MASTER 2

<b>SEMESTER 1</b> September – January	Course title	Teaching languages	Course code	ECTS
	> System Modelling and simulation	MIX	I5GMSY91	2
	> Mechanical Engineering Project	FACE-TO-FACE	I5GMME91	8
	> Major Courses A - Structures (homogenization of architected and biological materials, topology optimization, materials characterization and plasticity) B - Eco-design (Optimization in mechanical engineering, eco-design and industry 4.0) C - Fluids Engineering (microfluidics and numerical Fluid mechanics) D - Manufacturing (Advanced machining, Additive manufacturing and eco-manufacturing)	MIX	I5GMMJ91A I5GMMJ91B I5GMMJ91C I5GMMJ91D	7



# MECHANICAL ENGINEERING

SEMESTER 1 September - January	Course title	Teaching languages	Course code	ECTS
	> Major Research Project (Individual Project in the lab)*	FACE-TO-FACE	I5GMPR91_Ind	up to 10

\* For information about our research themes, see the Institute Clement Ader website: [www.ica.cnrs.fr](http://www.ica.cnrs.fr)

## THEME: SYSTEMS ENGINEERING | 5<sup>TH</sup> YEAR | MASTER 2

SEMESTER 1 September - January	Course title	Teaching languages	Course code	ECTS
	> Reliability	FULL ENG	I5ISGR22_1	2
	> Industrialization	FULL ENG	I5ISPR22_1	2
	> Systems on a Chip	FULL ENG	I5ISEC11	5
	> Numerical Simulation in Thermo Fluid Mechanics	MIX	I5ISTH12_1	2
	> Introduction to Thermo machines	MIX	I5ISTH12_2	2
	> Modelling Thermo systems	MIX	I5ISTH12_3	2
	> Research Project (Individual Project in the lab) *	FACE-TO-FACE	I4MPR81_Ind	up to 10

\* For information about our research theme, see the Institute Clement Ader website: [www.ica.cnrs.fr](http://www.ica.cnrs.fr)

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# HUMANITIES



The Humanities Department (CSH) courses aim to develop both specific knowledge and soft skills in French, English and another foreign language:

In years 1, 2 and 3, students develop general skills in professional communication: oral presentations, report writing, documentary research, document synthesis, etc.

In years 4 and 5, students acquire skills in group facilitation and scientific and technical communication: communication in the context of project management and

conflict management, presentation and synthesis of technical or scientific data, etc. Language teaching also includes interculturality.

The main goal of the teaching teams is to prepare students for the job market and to put their actions into perspective by taking into account social, economic, ethical and cultural contexts.

The courses in French as a Foreign Language (FLE) aim to support students in the acquisition of the French language.

## FOREIGN LANGUAGES & ENGLISH-TAUGHT HUMANITIES

### BACHELOR LEVEL

SEMESTER 1 September - January	Course title	Teaching languages	Course code	ECTS
	> Cultural Modules & Presentation Skills	FULL ENG	I2CCGE31	2
	> Job Search	FULL ENG	I3CCGE11	2

SEMESTER 2 January - June	> Debating & Summary Writing	FULL ENG	I2CCLA31	2.5
	> Professional English (with Economics Course in French)	FULL ENG	I3CCGE41	2

### MASTER LEVEL

SEMESTER 1 September - January	Course title	Teaching languages	Course code	ECTS
	> Scientific project in English (with department)	FULL ENG	I5CCGE21	2

SEMESTER 2 January - June	> Scientific English - Publishing your research (with department)	FULL ENG	I4CCLA11	2.5
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### FRENCH AS A FOREIGN LANGUAGE (FLE)

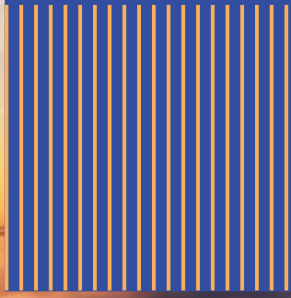
The courses in French as a Foreign Language (FLE) aim to support students in the acquisition of the French language. **Students are advised to choose FLE courses even if they only follow courses taught in English.**

SEMESTER 1 September - January	Course title	Teaching languages	Course code	ECTS
	> French as a Foreign Language (FLE)	FRENCH	ERASLF21	3

SEMESTER 2 January - June	> French as a Foreign Language (FLE)	FRENCH	ERASLF21	3
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