



COURSE CATALOGUE 2026-27

ENGINEERING UNDERGRADUATE PROGRAM

SOMMAIRE

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Introduction

This document provides a structured overview of the courses delivered in Efrei's Engineering Undergraduate Programs.

This overview is followed by a comprehensive listing of the courses offered within each Track (Undergraduate) and each Major (Graduate), including the number of teaching hours per course and the number of ECTS credits per teaching unit.

The undergraduate programs available at Efrei are:

1. Paris Campus

- French track (P1, P2, ING1): all courses delivered in French
- English track (P1INT, P2INT, ING1INT): all courses delivered in English
- Biology-Computer Science French track (P1BN, P2BN, ING1BN): all courses delivered in French

2. Bordeaux Campus

- French track (P1, P2, ING1) : all courses delivered in French



Please note that all courses are offered subject to availability . Efrei reserves the right to modify course offerings , schedules , teaching methods , or programme content without prior notice .

Scientific and Technical Training

The Scientific and Technical Training bloc encompasses the core scientific and technical competencies required of future engineers. It is organized into the following main disciplines: Mathematics, Computer Science, Physics and Electronics and Biology (Biology-CS track).

General Education

This component mainly includes courses in the humanities, communication, and languages, as well as subjects related to the corporate environment, such as management, economics, business administration, and French law.

Undergraduate Program

Overview of Modules over the first 3 years of the program :

Mathematics

The teaching of Mathematics in the preparatory cycle has three main objectives:

- to strengthen structured reasoning,
- to acquire and develop technical skills,
- to lay the foundations for further applications and independent study.

The first year focuses on the fundamental technical pillars: Analysis, General Algebra, and Linear Algebra. These modules consolidate and extend the knowledge acquired in high school by providing a stable conceptual framework open to further developments.

In the second year, students begin to explore the wide range of applications of mathematics through courses in Probability, Multivariable Functions, Data Analysis, Numerical Modeling, and Mathematics for Computer Science. Students will be introduced to a variety of analytical tools and methods that enable them to extract information, organize it, and develop critical thinking.

In the third year, mathematics courses allow students to engage concretely with applications through modules such as Mathematics for Cryptography, Graph Theory, Operations Research, and Mathematics for Machine Learning.

➤ Learning Outcomes :

- **Ability to structure reasoning and argumentation** : identify a problem, analyze it, reformulate or simplify it, and experiment with examples.
- **Ability to compute and use symbolic language** : manipulate expressions involving symbols, organize the different steps of complex calculations, perform computations either manually or using appropriate tools (calculator, software, etc.), and verify results.
- **Ability to communicate effectively, both in writing and orally** : understand mathematical statements written by others, produce rigorous solutions, and present and defend mathematical work.

Computer Science

In this module, students progressively master three programming languages (Python, C, and Java) and strengthen their knowledge in various fields: algorithms and complexity, advanced data structures (linked lists, stacks, queues, trees), object-oriented programming, web development (HTML, CSS, JavaScript, and JavaScript frameworks), databases, Linux systems, networks and communication protocols, as well as an introduction to three major contemporary topics: machine learning, cybersecurity, and cloud computing.

Learning follows a progressive approach adapted to different levels, from beginner to advanced, and is supported by an online platform that enables autonomous work and personalized, collaborative supervision.

The pedagogy strongly emphasizes project-based learning, encouraging the direct application of knowledge and teamwork from the first year.

By the end of this cycle, students become designers and developers capable of solving complex and diverse problems, able to think beyond coding alone in terms of solutions and computational performance, while being aware of collaborative practices and the contemporary challenges of green IT.

➤ Learning Outcomes

- Ability to design and solve complex computing problems
- Ability to program and implement software solutions
- Ability to understand and leverage computing infrastructures
- Ability to work collaboratively
- Awareness of the challenges of sustainable digital technology

Physics / Electronics

The objective of this module is to provide a broad scientific foundation in physics and electronics, covering both experimental aspects (projects, laboratory work) and theoretical components (lectures, tutorials). The program is designed to progressively develop mastery of the various elements of physical sciences that are essential for engineers in digital sciences and computer science.

Teaching is therefore primarily focused on the definition of information (in electrical, electromagnetic, acoustic, optical, or light forms), its processing, its modes of propagation, and its storage.

Electronics is an applied branch of physics, mainly based on electricity and the use of specific materials. It is fundamental to information science technologies, as it enables the physical representation of analog and digital signals (sensors, encoders), the implementation of processing systems (filters, processors), communication (transmission, reception), and the storage of information (registers, memory).

➤ Learning Outcomes :

- **Ability to solve classical theoretical problems** in physics (electricity, mechanics, thermodynamics, quantum physics, etc.) and electronics.
- **Ability to analyze information** (modeling, processing, and transmission); design logical circuits and electronic systems (CAD); analyze systems for the transmission and reception of electromagnetic waves.
- **Ability to analyze and exploit acoustic and visual signals.**

Humanities and Communication

The Department of Humanities and Communication is an integral part of the general education of engineering students and is delivered across both cycles, preparatory and engineering.

The teaching approach emphasizes interactive pedagogy and is structured around three main areas:

- intellectual training (analytical and critical thinking skills),
- verbal communication,
- non-verbal communication.

The aim is to develop students' competencies and personal qualities—in other words, a broad humanistic education that fosters a deeper understanding of complex situations: building strong cultural references, structuring discourse, contextualizing situations, analyzing complex phenomena, synthesizing ideas, problematizing issues, formalizing concepts and challenges, and persuading effectively in both written and oral forms.

Accordingly, these courses place significant emphasis on general knowledge, methodology, and creativity. Students engage in rigorous analysis of thematic case studies, study key essays, and practice exercises such as dissertations and pitch presentations.

In addition, various individual and team-based projects punctuate the curriculum, engaging and motivating students while sharpening their academic and professional goals. These projects also foster teamwork, creativity, sensitivity, and reflection on values.

The department also offers two distinctive modules: History of Science in the first preparatory year and the Anthropocene in the second preparatory year, both aimed at structuring key contemporary issues related to these fundamental fields.

➤ Learning Outcomes :

- Ability to adapt to diverse situations
- Ability to communicate effectively
- Ability to structure and formalize one's thinking
- Ability to exercise critical thinking
- Openness of mind
- Creativity
- Sense of commitment and responsibility

Business and Management Studies

The aim of this module is to optimize technical solutions while taking into account the economic and managerial challenges faced by organizations, as well as integrating user needs and practices. The economic performance of technology is therefore a core component of engineering competencies.

The department's scope is structured around five main learning areas:

- Understanding the Economic Ecosystem
- Fundamental economic principles aimed at understanding the mechanisms influencing corporate behavior and market dynamics.
- Economic and financial literacy, enabling students to assess the impact of technical decisions on project costs, overall company performance, and profitability.
- Innovation, Marketing, and Business Models (2nd year of the engineering cycle)
- Introduction to strategic analysis in the context of innovation.
- Key concepts related to markets, business models, and product/service life cycles, supported by analytical tools.
- Application through projects focused on developing value propositions (designing offers that meet identified needs, differentiation through technical innovation, and value creation).

➤ Project Management

- Learning both traditional and agile project management methodologies to operate effectively in project-based environments.
- Integration of the quality–cost–delivery (QCD) triangle.
- Development of teamwork skills, understanding team dynamics, and communicating project progress effectively.

➤ Organization, Corporate Culture, and Management

- Understanding how organizations function, including structure and culture.
- Developing a systemic view of organizational challenges beyond technical aspects.
- Understanding collaboration and interaction mechanisms to work effectively in interdisciplinary teams.
- Gaining insight into management principles and their role in performance (motivation, leadership, delegation, etc.).

➤ Corporate Social Responsibility (CSR)(3rd year of the engineering cycle)

- Training engineers to be aware of the environmental impact of their technical solutions.
- Encouraging critical reflection on the social implications of digital technologies.
- Contributing positively to contemporary societal and environmental challenges.

Languages

The foreign languages program aims to support the international development of engineering students and to make them progressively operational in their target languages. Programs are designed not only to develop written and oral competencies but also to enrich general culture and raise awareness of professional and intercultural communication issues.

English (LV1) modules are compulsory. At the beginning of each academic year, a diagnostic TOEIC test is used to group students by level. Each semester focuses on distinct themes and learning objectives.

French as a Foreign Language (FLE) courses are mandatory for non-French-speaking students from P1 to the first year of the engineering cycle.

➤ Learning Outcomes

- Ability to use specialized vocabulary and adapt language registers to context
- Ability to use syntax and logical connectors to structure coherent sentences, paragraphs, and ideas
- Ability to communicate orally with clear and appropriate pronunciation and intonation
- Ability to structure an essay, discussion, or presentation around a defined issue with well-developed arguments
- Ability to infer meaning from context, including unfamiliar words or implicit ideas

Year 1– Semester 1

Courses available as follows :

- **French track** (Paris and Bordeaux campuses): P1, P2, ING1 (all courses delivered in French)
- **English track** (Paris campus): P1INT, P2INT, ING1INT (all courses delivered in English)

ID	Name	Contact hours	ECTS
UE11	Mathematics	90	8
SM101	Calculus 1	45	
SM102	General Algebra	45	
UE12	Computer Science	90	8
TI101	Programming in Python	45	
TI102	Algorithmics	45	
UE11	Physics and Electronics	90	8
SP106	General Electricity	45	
SP107	General Physics	45	

Students may choose to complete their 30 ECTS, the general education component in either French or English, depending on the campus.

Courses available in:

- **French track** (Paris and Bordeaux campuses): P1, P2, ING1 (all courses delivered in French)

UE17	General Education	60	6
FH101	Argumentation & Oral Communication	30	
FL101	English 1 – Technology and Society	30	

Courses available in:

- **English track** (Paris campus): P1INT, P2INT, ING1INT (all courses delivered in English)

UE17	General Education	60	6
FLFLE	French as a Foreign Language	60	

Year 1 – Semester 2

Courses available as follows :

- **French track** (Paris and Bordeaux campuses): P1, P2, ING1 (all courses delivered in French)
- **English track** (Paris campus): P1INT, P2INT, ING1INT (all courses delivered in English)

ID	Name	Contact hours	ECTS
UE21	Mathematics	90	7
SM201	Calculus 2	30	
SM202	Linear Algebra	60	
UE23	Computer Science	90	7
TI202	Data Structures & Programming 1	75	
TI205	Algorithmic complexity	15	
UE25	Physics and Electronics	90	7
SP201	From Atom to Microchip	30	
TE201	From System to Functions	30	
TE203	Digital Signals and Information	30	
UE27	General Education	75	5
FHS201	History of Science	15	
FH201	Tolerance essai et ecriture créative in French only	30	
FL201	English 2 - Issues in the English-Speaking World	30	
UE28	Interdisciplinary Project	15	2
TI250	Earth tech Project	15	
UE29	Internship to be defined	15	2

Students may choose to complete their 30 ECTS, the general education component in either French or English, depending on the campus.

- **English track** (Paris campus): P1INT, P2INT, ING1INT (all courses delivered in English)

UE27	General Education	30	2
FLFLE	French as a Foreign Language	30	

Year 2 – Semester 3

Courses available as follows :

- **French track** (Paris and Bordeaux campuses): P1, P2, ING1 (all courses delivered in French)
- **English track** (Paris campus): P1INT, P2INT, ING1INT (all courses delivered in English)

ID	Name	Contact hours	ECTS
UE31	Mathematics	90	8
SM301	Probability	45	
SM302	Multivariate Analysis	45	
UE33	Computer Science	90	8
TI302	Data Structures & Programming 2	45	
TI305	Networks 1 : basic concepts	30	
TI307	Introduction to Linux	15	
UE35	Physics and Electronics	90	8
SP301	Electromagnetic Fields	30	
TE303	Modern physics	30	
TE202	Digital Systems	30	

Courses available in: **French track** (Paris and Bordeaux campuses): P1, P2, ING1 (all courses delivered in French)

UE37	General Education	90	6
FHS301	Democracy & Authority: Essay writing and political interviews	30	
FHS301	Anthropocene	15	
FL101	English 3– Scientific and technical English	30	
LXP	Learning XP		
TI350	Delivery project N°1 - from idea to project validation	15	

Courses available in:

- **English track** (Paris campus): P1INT, P2INT, ING1INT (all courses delivered in English)

UE37	General Education	60	6
FLFLE	French as a Foreign Language	60	

Year 2 – Semester 4

Courses available as follows :

- **French track** (Paris and Bordeaux campuses): P1, P2, ING1 (all courses delivered in French)
- **English track** (Paris campus): P1INT, P2INT, ING1INT (all courses delivered in English)

ID	Name	Contact hours	ECTS
UE41	Mathematics	90	7
SM401	Mathematical Modeling	30	
SM402	Finite Automata & regular Expressions	30	
SM403	Data Analysis	30	
UE43	Computer Science	90	8
TI402	Web Programming1:HTML, CSS, JS	30	
TI403	Java 1: Fundamentals of OOP	30	
TI404	Databases 1 : Basic concepts	30	
UE45	Physics and Electronics	90	7
SP401	Electromagnetic Propagation	30	
TE402	Thermodynamics	30	
TE403	Transmission channels	30	

Students may choose to complete their 30 ECTS, the general education component in either French or English, depending on the campus. Courses available in:

- **French track** (Paris and Bordeaux campuses): P1, P2, ING1 (all courses delivered in French)

UE47	General Education	75	4
FE402	Economics	15	
FH401	Democracy & Engagement: Essay and Advocacy	30	
FL101	English 3– Scientific and technical English	30	
LXP	Learning XP		
UE48	Multidisciplinary project	15	2
TI350	Delivery project N°2 - project design	15	
UE49	Internship to be defined	15	2

Courses available in:

- **English track** (Paris campus): P1INT, P2INT, ING1INT (all courses delivered in English)

UE47	General Education	90	8
FLFLE	French as a Foreign Language	90	

Year 3 – Semester 5

Courses available as follows :

- **French track** (Paris and Bordeaux campuses): P1, P2, ING1 (all courses delivered in French)

ID	Name	Contact hours	ECTS
UE51	Applied Mathematics	65	6
SM501	Automates finis, graphes, expressions rationnelles	35	
SM502	Recherche Opérationnelle	30	
UE52	Développement Logiciel	105	8
TI503N	Bases de Données 1 : concepts de base	30	
TI504N	Programmation Web 1: HTML, CSS, JS	30	
TI505N	Java 1 : fondamentaux de la POO	30	
TI507N	Introduction au système Linux	15	
UE53	Physique & Electronique	65	6
TE506	Conception de systèmes numériques en VHDL 1	35	
TE508	Systèmes de transmission	30	
UE54	Harmonisation Informatique	45	3
TI500N	Algorithmique et Programmation	45	
UE55	Harmonisation Sciences	45	3
SM505	Probabilités	15	
TE503	Électronique	30	
UE57	Formation Générale	75	5
FE507	Culture Economique et Financière de l'Ingénieur 1	15	
FE508	Théorie des Organisations et Culture d'Entreprise	30	
FH501	Culture d'Entreprise, valeurs et RSE - Dissertation et Interview d'un ingénieur	30	
FL501	English 5 : Job Market Skills	30	
LXP	Learning XP		
UE58	Projet Transverse	15	2
TI550	Outils et Méthodes de la Recherche appliquée aux Projets Transverses	15	

Year 3 – Semester 6

Courses available as follows :

- **French track** (Paris and Bordeaux campuses): P1, P2, ING1 (all courses delivered in French)
- **English track** (Paris campus): P1INT, P2INT, ING1INT (all courses delivered in English)

ID	Name	Contact hours	ECTS
UE61	Mathematics Mobility	35	4
SM603M	Mathematics for Cryptography	35	
UE62	Systems and networks	95	9
TI602M	Network and Protocols	35	
TI604M	Computer Architecture and Operating Systems	30	
TI609N	Fundamentals of Cloud Computing	15	
TI630V	Introduction to Cybersecurity	15	
UE63	Software Development	140	9
TI605M	Java Programming	35	
TI608M	Introduction to Machine Learning	35	
TI610M	Advanced Web Programming	35	
TI615M	Object-Oriented & design with UML	35	
UE64	General Education	30	3
FL601M	English 6 - Language & Culture	30	
EU 66	Mastercamp in French	155	3
FG601	Methodology, Management & Communication in French	30	
FT601	Solution delivery in French	95	
TI620	Workshop in French	30	
UE69	Orientation Seminar in French	15	2
FE601	Orientation Seminar		

Students may choose to complete their 30 ECTS, the general education component in either French or English, depending on the campus. Courses available in:

- **English track** (Paris campus): P1INT, P2INT, ING1INT (all courses delivered in English)

UE67	General Education	35	5
FLFLE	French as a Foreign Language	35	