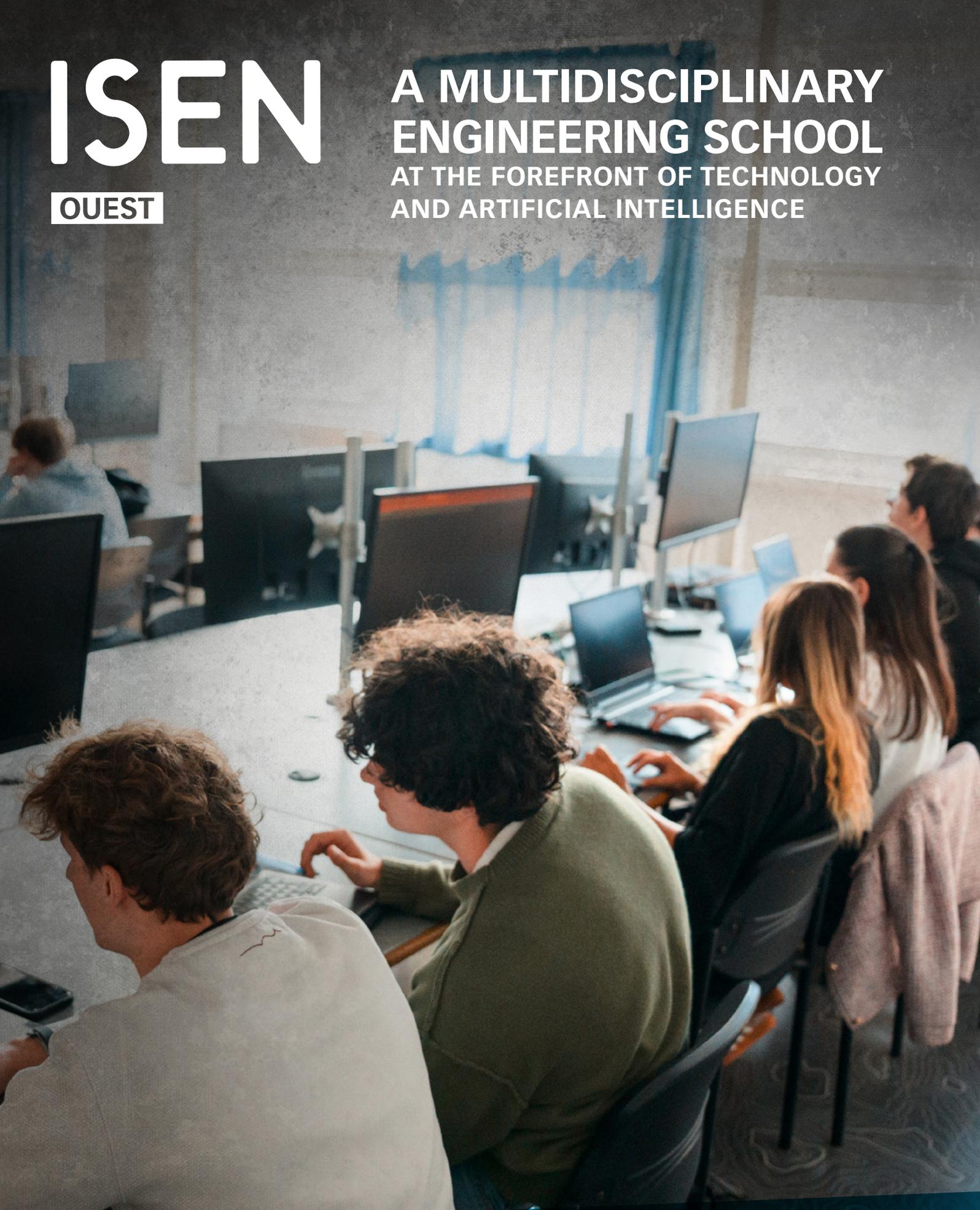


# ISEN

**OUEST**

**A MULTIDISCIPLINARY  
ENGINEERING SCHOOL  
AT THE FOREFRONT OF TECHNOLOGY  
AND ARTIFICIAL INTELLIGENCE**



**COURSE  
OFFERING IN ENGLISH**

**BREST - NANTES**



# Who are we ?

**ISEN Ouest is an engineering school with 5 campuses located in Brest, Caen, Nantes, Paris and Rennes.**

As a French "Grande École" Engineering School, we provide high level scientific training delivered by faculty with both research and professional expertise.

International students join their French counterparts in small-sized class groups which enhance student-teacher interaction and enable students to gain valuable cross-cultural skills as they work together in mixed nationality teams.

- More than 1400 students (2025)
- 13 000 alumni in France and across the world

**Students can choose to study in Brest or Nantes depending on their choice of major.**

## Travelling to ISEN Ouest

International airports and high speed trains connect Brest and Nantes both nationally and internationally.



# What can we offer ?

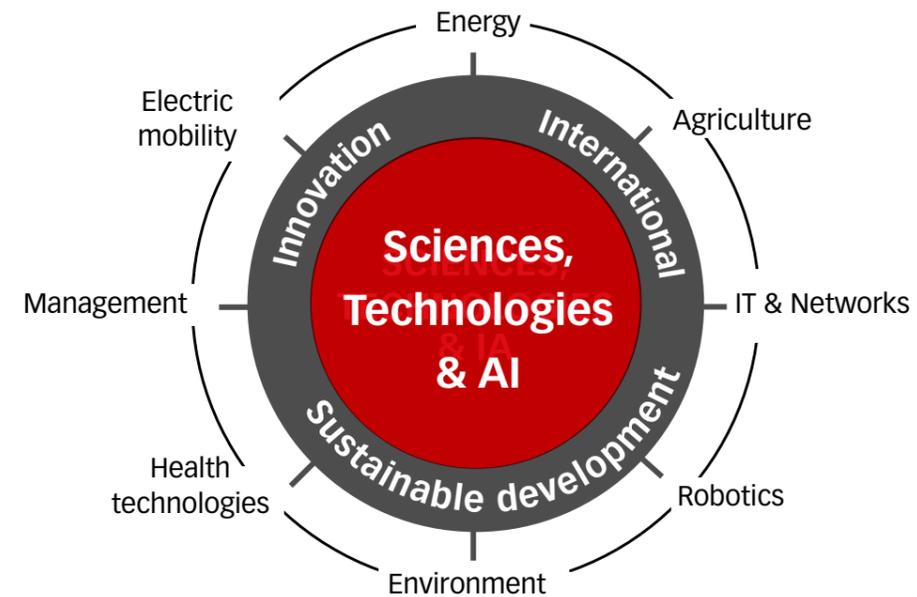
ISEN Ouest offers sixteen distinct professional profiles, but international students who do not speak French can choose amongst the following 4 graduate programmes :

- Software Engineering
- Marine Technologies
- Renewable energy & Smart Grids
- Commercial Engineering

ISEN can offer a limited number of projects that are accessible to graduate students (students pursuing a Master's degree) lasting between 3 and 4 months.

# Sciences and digital tech

**Because digital technologies are everywhere, ISEN trains engineers to meet the needs of companies in a wide range of sectors.**



# Admissions

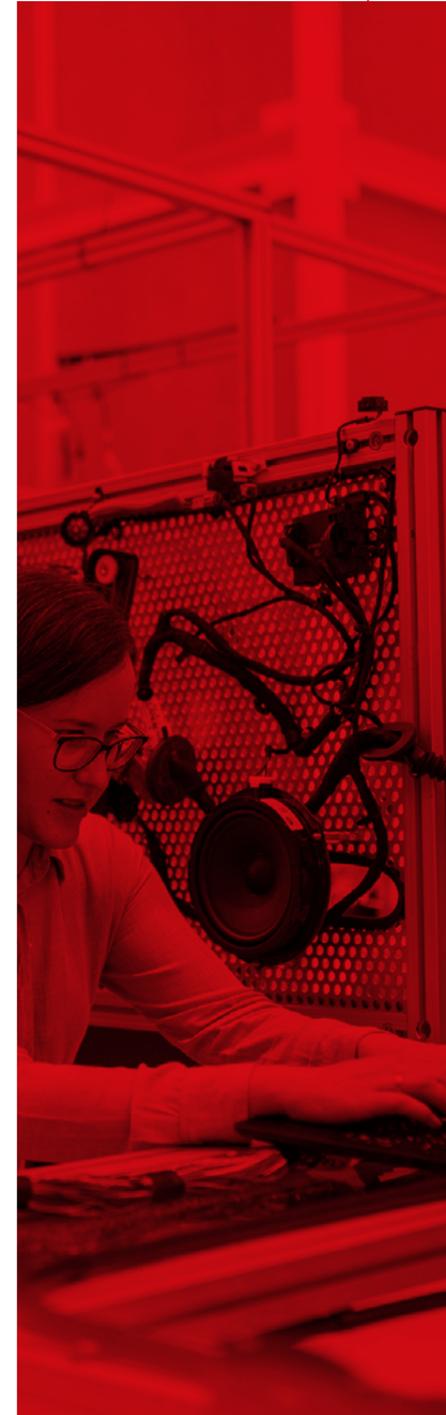
**Applications open to students from ISEN's partner universities.**

## Nomination and application deadlines

Autumn: May 30 / Spring: October 30

## Language Level:

Level B2 in English required



## SOCIAL LIFE / AT ISEN OUEST

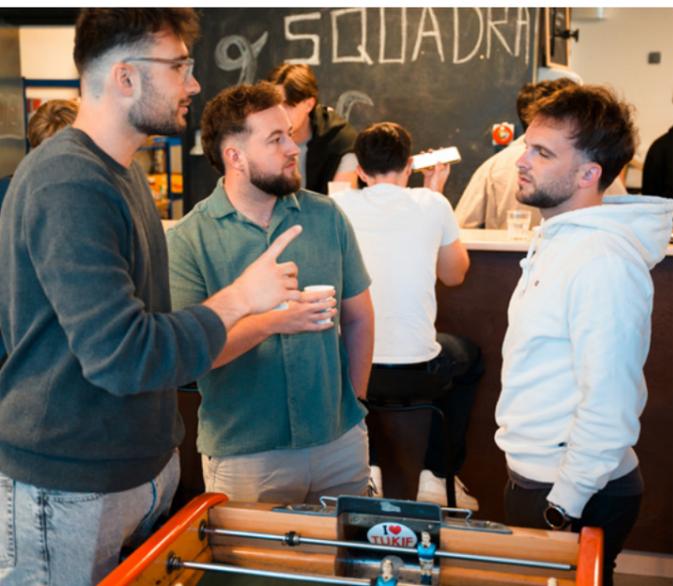
ISEN Ouest enjoys a very dynamic student life with over 30 clubs: "Junior Entreprise", music, robotics, electronics, sports clubs etc, and with a very active Students' Union organizing a wide variety of activities.

### ISEN halls of residence

A limited number of studio apartments are available on campus or nearby. Each studio has good transport connections to the city center. Incoming students receive help from our international office to find accommodation. Please note that accommodation may be scarce and expensive in both cities

### Restaurants and cafeterias

Relatively close to ISEN, several university restaurants are open for lunch and dinner: self-service restaurants with different choices of menu. Cafeterias are available on each campus or nearby.



## OVERVIEW OF ACADEMIC COURSE / OFFER IN ENGLISH\*

\*Subject to change.

**Master's (M2) level** : All classes take place in the final year of ISEN's programme

### Autumn Semester Overview

#### CAMPUS DE NANTES

MAJOR	AUTUMN NAME OF CLASS	ECTS
Software Engineering	Web Development Node JS	3
	Operations Research	1.5
	Artificial Intelligence	1.5
	Introduction to Video Games Development	3
	Hardware Security Cortex	3

ISEN ACADEMIC OFFER	ECTS
Technical Subjects	12
Technical Project (related to major)	10
French and Intercultural Classes	8
<b>TOTAL</b>	<b>30</b>

#### CAMPUS DE BREST

MAJOR	AUTUMN NAME OF CLASS	ECTS
Renewable Energy and Smart Grids	Electrical Machines & Drives	3
	Renewable Energies	3
	Project	3
	Energy market: Issues and challenges in the energy industry	3
Marine Technologies	Signal Processing: Wireless Communication in Maritime Systems	3
	Embedded Systems: Ocean Sensors	3
	Signal Processing: Atypical Communication Systems	1.5
	Applications : Multi agent systems	4.5
Commercial Engineering	Corporate Social Responsibility	3
	Advanced Information Systems Management	3
	Project Management	3
	Management of Change	3

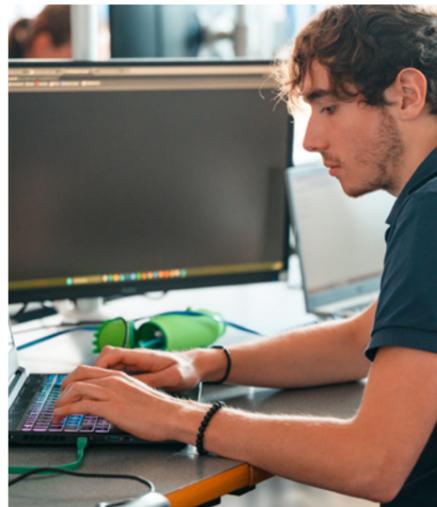
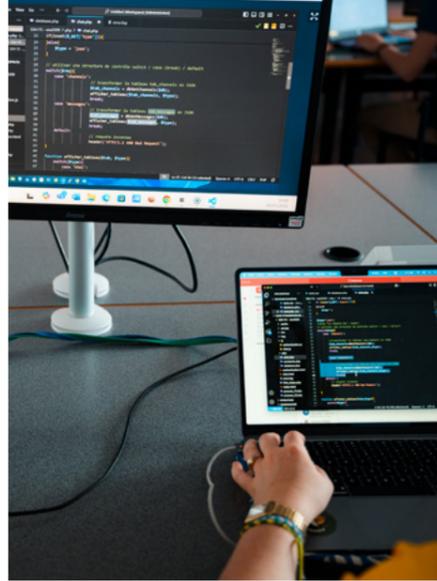


# Software Engineering



## Web development NODE JS

| Autumn (S9) | 30h | ECTS 3



### Objectives :

- **Understand the differences between the Node JS framework and other web backend solutions. Understand and take advantage of the asynchronous programming model to make an efficient and secure web application backend.**
- **Set up a suitable development environment for a NodeJS project and ability to deploy that project in the cloud.**

Students are expected to work in pairs during practical classes and develop a project for the final evaluation. The project application requirements will be provided by the teacher.

## PREREQUISITES

Knowledge of web applications components and architecture (frontend / backend). Knowledge of Javascript Programming; Object oriented programming. Event-Based programming knowledge is a plus.

## PROGRAMME

**This module mixes courses and practical sessions to overview the main concepts of NodeJS development. Each session has a theoretical and a practical part. The class is organized as follows**

**Class 0:** Review JS programming and OOP in JS

Review Javascript programming and in particular Object-Oriented Programming in Javascript. Review of event-based programming and the use of callbacks

**Class 1:** NodeJS and Environment Setup

Discovery of the Node JS framework and its differences with other approaches such as Apache/PHP

**Class 2:** Modules, NPM

Description of Javascript Modules, how to import them, use other people's 'modules' through NPM and write Modules and packages.

**Class 3:** Streams

Streams are a useful tool for handling files or data streams in Javascript. Practice through the development of a minimal video streaming example

**Class 4:** Express JS

Express JS is a lightweight framework built on top of NodeJS that helps to write web applications and APIs. This class provides an overview of Express JS functionalities.

**Class 5:** Promises and Databases

Promises are a useful mechanism in JS to simplify asynchronous programming and avoid "callback hell". This class shows the usage of promises and illustrate these principles through building the connection from a webapp to a database

**Class 6:** Web Sockets

Web Sockets allow bi-directional communication between client and server and can help to build interactive services such as chat or games

**Practice:** JWT and Deployment

JSON Web Tokens are standardized technology for authentication in web apps. Their usage allows secure transfer of authorizations. This is an important requirement for deploying any application online.

## Operations Research

| Autumn (S9) | 15h | ECTS 1.5

**This course deals with integer linear modelling. After reviewing the basics of optimizations models, we will especially detail the branch and bound method that is applied to optimally solve integer linear programs. The second main part of this course concerns classical scheduling optimization models solved in industry.**

**We will review and apply some well-known heuristics and meta-heuristics.**

**The last part of the course addresses flows and multicommodity flows models. After discussing key mathematical proofs related to flow modelling in graphs, the algorithms of Ford-Fulkerson and Busacker and Gowen are implemented and tested.**

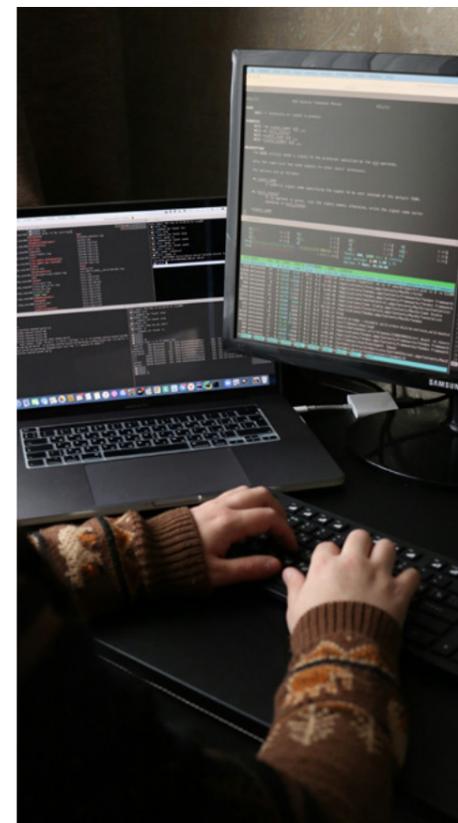
## PREREQUISITES

Basics of algorithm design in computer science  
Introduction to graph theory  
Basics of programming (C, Java or Python)

## PROGRAMME

**This module mixes courses and practical sessions to overview the main concepts of NodeJS development. Each session has a theoretical and a practical part. The class is organized as follows**

integer linear modelling  
Reviewing basics of optimization models  
Classical scheduling optimization models solved in industry  
Application of heuristics and meta-heuristics  
Floss and multicommodity flows models



## Introduction to Video Games Development

| Autumn (S9) | 30h | ECTS 3

This course will explore the fundamentals of video games programming. Students will learn about game engines, GPU graphics programming, with a focus on hardware resource management.

### PREREQUISITES

Good knowledge of object oriented programming (preferably C++ and C#)

## Artificial Intelligence

| Autumn (S9) | 15h | ECTS 1.5

Objectives of this course are to : understand the basics of neural networks and machine learning solution approach, and program, test and fine tune those basics.

Artificial intelligence covers following topics:

Neural network theory (perceptron and multi-layers perceptron)  
Gradient and stochastic gradient descent algorithms  
Study of hyperparameters selection for machine learning  
Python programming for neural networks

### PREREQUISITES

Python programming and Mathematics for engineering schools

## Hardware Security Cortex M

| Autumn (S9) | 30h | ECTS 3

Understand the various hardware protections available on new microcontrollers.

### PREREQUISITES

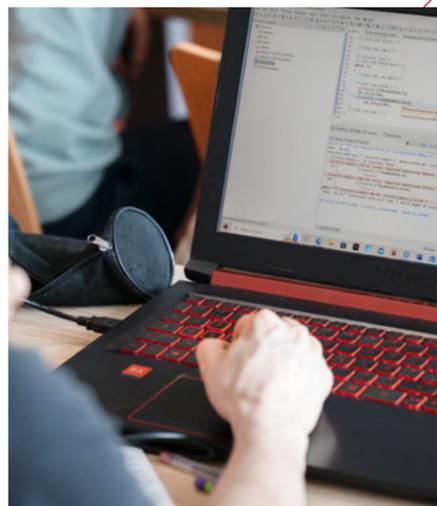
Language C

### PROGRAMME

Understanding of Cortex M core: simple programs in assembly language and encoding.  
SRAM and Flash memory technology. Program organisation (.text, .data, .bss and stack sections)  
Compilations C program. Link between variable declaration and location in memory  
Write and read protection of memory (from memory to memory, bootloader, debug...)  
PCROP Protection  
Firewall protection  
TrustZone (concepts of SAU, IDAU? Secure, non-secure, callable and non-secure memory and application with a programme.

**Evaluations:** Report | Written exam on basic concepts

**Bibliography:** Based on ST Microelectronics documents



# Marine Technologies



## SIGNAL PROCESSING Wireless Communication in Maritime Systems

| Autumn (S9) | 30h | ECTS 3

Successful students will understand the wireless communication technologies for above surface and underwater data transmission.

### PREREQUISITES

Signal processing. Digital communication basics, Matlab

### PROGRAMME

Digital communications theory	Telecommunication platforms.
Wireless communication channels	Physical layers.
Maritime communication	Telecommunication algorithms.
Underwater acoustic modem	Hands-on implementation.

## EMBEDDED SYSTEMS Ocean Sensors

| Autumn (S9) | 30h | ECTS 3

This course will present the electronic design techniques for in-situ instruments recording Essential Ocean Variables (EOV), focused on accurate sensor reading, low-power techniques with a conservative design philosophy.

### PREREQUISITES

Analog electronics design, Analog to Digital Conversion

### PROGRAMME

Marine Environment Constraints  
Sensor and Calibration Theory  
Sensor Conditioning  
Lab experimentation



## SIGNAL PROCESSING

### Atypical Communications Systems

| Autumn (S9) | 15h | ECTS 1.5

**Successful students will understand the fundamentals of digital communication applied to different physical layers.**

Understand the role of diversity combining, equalization, noise cancellation and coding.

Know how to choose algorithms depending on the specifics of the physical layer.

Experience implementing algorithms

Evaluate performances and provide critical thinking about technical choices.

#### PREREQUISITES

Basics of Signal Processing, Matlab

#### PROGRAMME

Telecommunication platforms.

Physical layers.

Telecommunication algorithms.

Hands-on implementation.

## APPLICATIONS

### Multi agent Systems

| Autumn (S9) | 45h | ECTS 4.5

#### PREREQUISITES

Basic skills in object-oriented programming

#### PROGRAMME

Agent based modelling

Geographical and environmental data



# Renewable Energy and Smart Grids



## Electrical Machine and Drives

| Autumn (S9) | 30h | ECTS 3

**Objectives :**

**Understand the operating principles of electric drives.**

**Learn the characteristics, and be able to model an electromechanical conversion system in steady state and transient behaviours.**

**Identify their operating mode.**

#### PROGRAMME

Electromechanical conversion

Characteristics of industrial loads and their modelling

Electrical machines: steady state modelling and energy balance

Speed control and adjustable speed drives: dynamic and transient modelling

Sizing of an electric drive system

Industrial standards

## Smart Grids

| Autumn (S9) | 30h | ECTS 3

**Understand the architecture, operation and issues in an electrical network with high penetration of renewables.**

**Acquire skills in managing electrical energy in a renewable energies context**

#### PROGRAMME

**Operation of an electricity network:**

Structure of transmission and distribution networks

Organisation and technology of overhead/underground networks

Other technical and economic characteristics

**Challenges of electricity networks:**

Electricity and climate change

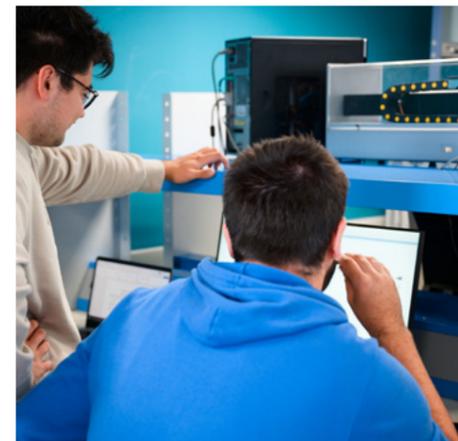
Increasingly complex and decentralised management

Presentation and characteristics of a smart grid

Solutions and case studies

#### PREREQUISITES

Fundamental electricity and magnetism



#### PREREQUISITES

Fundamental electricity, power electronics



## Renewable energies

| Autumn (S9) | 30h | ECTS 3

Understand the principles of electrical energy production from renewable resources. Acquire the skills to design a hybrid energy production system.

### PREREQUISITES

Energy transformation

### PROGRAMME

Introduction to renewable energy  
Wind energy: wind turbines  
Solar energy: photovoltaics  
Marine energy: Waves, tidal and marine currents  
Energy storage systems

## Energy market: Issues and challenges in the energy industry

| Autumn (S9) | 15h | ECTS 1.5

Understand the cross-cutting issues related to the energy industry. Acquire a transversal vision of an industrial activity.

### PREREQUISITES

Geopolitics of energy, Physical order of magnitude, Climate and biodiversity, Planetary resources.

### PROGRAMME

**Introduction:** History and types of energy used by human beings, Technologies, energy efficiency and orders of magnitude, Choice of an energy or industrial sector by the students (in connection with their career objectives if possible), split class in work group of 3-4 students.

**Energy / climate - biodiversity issues:**

Workshop "The Climate Fresk", Feedback focused on energy and climate, Introduction to CO2 / Other Greenhouse Gas footprint, Group work: investigation and discussion on the ecological and climatic consequences of the chosen sector.

**Economic and geopolitical issues:** Economy opportunities: the electricity market in Europe, Geopolitical issues: example with an oil & gas region,

Group work: research on economic opportunities and geopolitical challenges in the chosen industry.

**Planetary limits - Pressure on resources:**

Introductions to planetary limits and raw material availability, Peak oil - energy return rate - known reserves and production forecasts, Group work: find documentation related to resource limits for the chosen sector.



## Case studies in Power Converters

| Autumn (S9) | 15h | ECTS 1.5

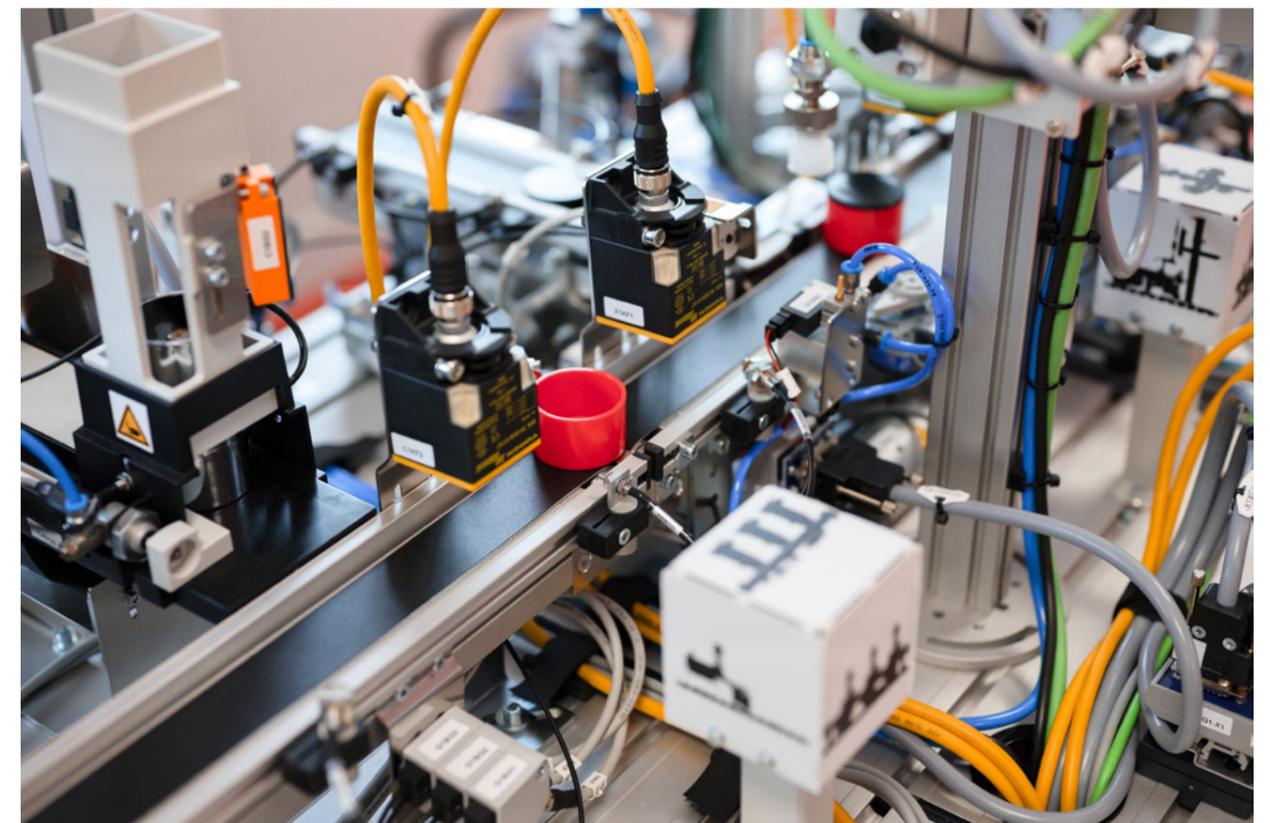
Give future engineers an experimental training in power electronics and electrical machines by enabling them to:  
**Handle measurement equipment.**  
**Discover electrical systems in practice**  
**Develop skills for the implementation and realization of a practical test bench.**

### PREREQUISITES

Electrical machines and drives (S9) Power electronics (S8)

### PROGRAMME

Rectifier DC/AC with diodes  
Power Buck converter DC/DC with IGBT and diodes  
Characterisation of a solar panel and the associate  
Boost DC/DC converters  
Insulated power transfer by FlyBack converters  
Inverter DC/AC with 4 IGBTs  
Unitary power factor rectifier



# Commercial Engineering



## Corporate Social Responsibility

| Autumn (S9) | 30h | ECTS 3

This module supports the learning outcomes related to students being able to: **Integrate sustainability practices into company management and policies, thus creating sustainable value. Manage organizational change and innovation, as building CSR into the company's management often requires significant change.** This module enables students to find responsible solutions to business problems by finding innovative solutions taking into consideration international and interdisciplinary differences.

### PREREQUISITES

Students are expected to have a business undergraduate degree and to have a good knowledge of corporate policy, strategy and of management in all its dimensions.

### PROGRAMME

**Introduction to CSR and sustainability.** CSR concepts and theories. Stakeholder theory and management. The institutional environment of CSR. CSR, sustainability and corporate strategy.



## Advanced Information Systems Management

| Autumn (S9) | 30h | ECTS 3

**Acquire a thorough understanding of the foundations of information systems and their relationships to contemporary business strategy, operations processes and relevant internal and external data. Understand the role of information technologies and data in supply chain management. Model data and manage relevant enterprise and external information. Explore the current and emerging best practices in data modelling and analytics.**

### PROGRAMME

Relationships between Organizational Strategy, Structure, Processes, Data and Analysis / Data Types and Sources / Data Modelling and Sourcing / Use Case, Process/Swim Lane, Data Flow and Data Dictionary Models / Database Analysis and Design Techniques / Structured Data and the Relational Model / Object Database Management Systems and Big Data / Big Data organization and analytical tools / Web Data Management and Business Alignment / Business Intelligence: Strategic, Operational and Tactical Approaches / Issues in Data Management: Privacy, Security, Ethics

### PREREQUISITES

Introductory courses in information systems management

## Project Management

| Autumn (S9) | 30h | ECTS 3

**Explain and assess project requirements (and evaluate the associated techniques). Analyze project quality and project risks (and evaluate associated techniques). Explain the alternative options - traditional or agile - to plan, monitor and control a project. Explain the purpose of performance management in projects (and evaluate the associated techniques). Apply generic project tools (and evaluate the associated techniques). Explain the nature of project information and communication (and evaluate the associated techniques).**

### PREREQUISITES

An Organizational Behavior course. Students should be familiar with the various departments of a company. They should have sufficient computer skills to use Microsoft Project or similar software

### PROGRAMME

The global transitions leading to and shaping projects in the business environment  
The main features of business projects / The project environment / Project management methods and approaches / Missions and profiles of the project manager / Project team management  
Time & resources management in a project / Risk management / Success & performance in a project.

## Management of change

| Autumn (S9) | 30h | ECTS 3

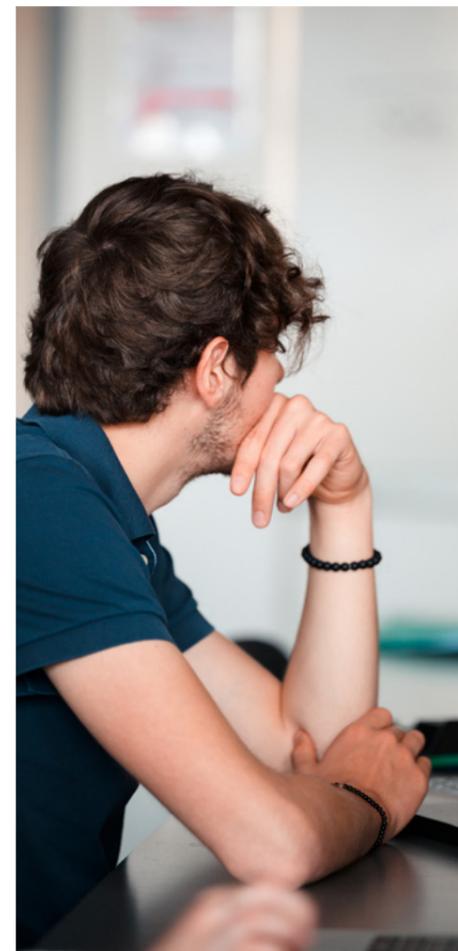
**To prepare and drive change in an organisation.**

### PREREQUISITES

An Organizational Behaviour course. Students should be familiar with the various departments of a company. They should have sufficient skills to use Microsoft Project or similar.

### PROGRAMME

Identification and analyse the relevant data to characterize the context: culture of the organisation, resistance to change,  
Proposing a strategy for change based on analysis and synthesis of secondary data and theory  
Designing and planning of a change project including a communication plan,  
Evaluate, justify and support options and decisions addressing managerial issues and lead the change process.



# French language & intercultural classes



| Autumn (S9) | ECTS 8

## Introduction to French

Enable students to acquire up to B1 level in oral and written communication.

### PROGRAMME

Alphabet and pronunciation / Basic greetings and expressions  
Introducing oneself / Numbers and basic vocabulary  
Describing people and places / Introduction to the present tense  
Expressing likes and dislikes / Asking questions  
Daily life and activities / Introduction to the past tense  
Family and relationships / Planning future activities

**Assessment:** Short multiple choice test on vocabulary and grammar. Oral tests

**Bibliography:** Teachers' own worksheets.



## Multiculturality

### PREREQUISITES

None, but experience of travel or study in another country is preferable and will be useful.

### PROGRAMME

Introduction : What is culture/cross-culture? Definitions and impacts of culture in our lives.  
Body language in cross-cultural situations. Cultural gestures and greetings. Exchanging business cards in Asia. The impact of cross-cultural eye contact and proxemics.  
Cultural attitudes to time: monochronic/polychronic: definitions, characteristics and case studies  
Cultural attitudes to rules and regulations: universalist/ particularist attitudes and characteristics. Analysis of critical incidents  
High and low context communication. Definitions and the theoretical concept (E.T. Hall). Identifying our preferred personal style of communication and a preferred style of communication in France. Identification of key characteristics: understanding when yes, means yes or no.  
Hofstede's cultural value dimensions : power distance uncertainty avoidance, masculinity/femininity, collectivist/individualist values. Examples, analysis of critical incidents.  
Student project and presentations.

**Assessment:** an oral presentation and a report.

# Project



| Autumn (S9) | 100h | ECTS 10

The purpose of a research project is to help students develop analytical, writing and methodological skills, while applying academic tools to real-world management and engineering issues.

### PROGRAMME

A research project is an academic project that involves studying a specific topic in depth using a structured and methodological approach. In the field of management sciences, research focuses on analyzing how organizations function and how decisions are made and implemented.

**Assessment:** Produce a written document that presents the results of such a study in a clear and organized way, using theories and data.



# ISEN

**OUEST**

[isen-ouest.fr](http://isen-ouest.fr)



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**ISEN Ouest has been awarded the “Bienvenue en France” label with a two-star distinction by Campus France.**

This label recognizes the excellence of our services dedicated to international students, particularly in the areas of recruitment, admission, integration, and support both during and after their studies.

Today, 65% of international students choose a labeled institution to pursue their education. This distinction enhances the value of our academic offer and reaffirms our commitment to providing both high-quality education and a rewarding student experience.