# CIVIL AND ENVIRONMENTAL ENGINEERING

**ACADEMIC YEAR 2019/2020**

## The programme

<table>
<thead>
<tr>
<th>Courses</th>
<th>First Semester</th>
<th></th>
<th>Second Semester</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Hours</td>
<td>Student workload</td>
<td>ECTS Credits</td>
<td>Hours</td>
</tr>
<tr>
<td>Water Engineering Structures</td>
<td>16</td>
<td>40</td>
<td>4</td>
<td>16</td>
</tr>
<tr>
<td>Natural Risks</td>
<td>16</td>
<td>40</td>
<td>4</td>
<td>16</td>
</tr>
<tr>
<td>Mechanics for Civil Engineering</td>
<td>16</td>
<td>40</td>
<td>4</td>
<td>16</td>
</tr>
<tr>
<td>Design of Building Materials</td>
<td>16</td>
<td>40</td>
<td>4</td>
<td>16</td>
</tr>
<tr>
<td>Modelling of Structures by FE and BIM</td>
<td>16</td>
<td>40</td>
<td>4</td>
<td>16</td>
</tr>
<tr>
<td>Design of Special Structures</td>
<td>16</td>
<td>40</td>
<td>4</td>
<td>16</td>
</tr>
<tr>
<td>French language</td>
<td>16</td>
<td>60</td>
<td>3</td>
<td>16</td>
</tr>
<tr>
<td>English and Business Environment</td>
<td>16</td>
<td>60</td>
<td>3</td>
<td>16</td>
</tr>
<tr>
<td>Case study-Graduation Paper/Conferences</td>
<td>60</td>
<td>120</td>
<td>-</td>
<td>60</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>188</strong></td>
<td><strong>480</strong></td>
<td><strong>30</strong></td>
<td><strong>188</strong></td>
</tr>
</tbody>
</table>
## Table of contents

### First Semester: from September to January

- Water Engineering Structures (S119WES) .......................................................... 3
- Natural Risks (S119NRI) ...................................................................................... 4
- Mechanics for Civil Engineering (S119MCE) ....................................................... 5
- Design of Building Materials (S119DBM) .............................................................. 6
- Modelling of Structures by FE and BIM (S119MST) .............................................. 8
- Design of Special Structures (S119DSS) .............................................................. 9
- French Language (S119FRL) ............................................................................. 10

### Second Semester: from February to May

- Water Engineering Structures (S219WES) ......................................................... 12
- Natural Risk (S219NRI) ..................................................................................... 13
- Mechanics for Civil Engineering (S219MCE) ..................................................... 14
- Design of Building Materials (S219DBM) .......................................................... 15
- Modelling of Structures by FE and BIM (S119MST) ........................................... 16
- Design of Special Structures (S119DSS) ............................................................ 17
- French Language (S219FRL) .......................................................................... 18
- English and Business Environment (S219ENL) ................................................ 19

---

École Centrale de Nantes, 1 rue de la Noë. BP 92101. F 44321 Nantes cedex 3 – Tel. +33 (0)2 40 37 16 00 – www.ec-nantes.fr
First Semester: from September to January
**Course Information**

**Code:** S119WES  
**Responsible:** Frédéric GRONDIN  
**Contact:** frederic.grondin@ec-nantes.fr  
**Department:** Mechanics, Material and Civil Engineering  
**Language:** English  
**Credits (ECTS):** 4  
**Number of hours:** 16  
**Semester:** 1  
**Recommended prerequisites:** None  
**Evaluation:** Final exam  
**Organization:** Seven 2-hours lectures, 2-hours exam.  
**Link:** Hippocampus

**Objective**

The objective of this course is to give students skills in theoretical and practical use of mechanical tools required in advanced water engineering structures. The first semester is dedicated to the water flow in the environment. Students will have to know how to calculate the underground water flow.

**Content**

- Mechanics of continuum and porous media.  
- Introduction to aquifer.  
- The Darcy and Dupuit laws.

**References:**

## Natural Risks (S119NRI)

### Course Information

**Code:** S119NRI  
**Responsible:** Giulio SCIARRA  
**Contact:** giulio.sciarra@ec-nantes.fr  
**Department:** Mechanics, Material and Civil Engineering  
**Language:** English  
**Credits (ECTS):** 4  
**Number of hours:** 16  
**Semester:** 1  
**Recommended prerequisites:** None  
**Evaluation:** Final exam  
**Organization:** Seven 2-hours lectures, 2-hours exam, with personal homework.  
**Link:** –

### Objective

The course aims to provide quantitative methods of risk analysis within the framework of civil engineering; explicit reference will be done to the notion of partial safety factor.

### Content

Basic concepts of reliability theory. Safety and critical state of a system: margin safety (MS). Estimation of the probability of the critical event: (i) linear and non-linear analysis (FORM, SORM methods); (ii) MS functions dependent on correlated and uncorrelated variables; (iii) MS functions dependent on Gaussian and non-Gaussian variables. Reliability of systems: series and parallel.

### References

# Course Information

**Code:** S119MCE  
**Responsible:** Benoît HILLOULIN  
**Contact:** benoit.hilloulin@ec-nantes.fr  
**Department:** Mechanics, Material and Civil Engineering  
**Language:** English  
**Credits (ECTS):** 4  
**Number of hours:** 16  
**Semester:** 1  
**Recommended prerequisites:** None  
**Evaluation:** Final exam  
**Organization:** Seven 2-hours lectures, 2h exam and personal homework.  
**Link:** Hippocampus

## Objective

The objective of this course is to give students skills in theoretical and practical use of mechanical tools required in Civil engineering. The first semester is dedicated to Mechanics of materials backgrounds.

## Content


## References:

# Course Information

**Code:** S119DBM  
**Responsible:** Dr. Anne-Laure Fauchille, Prof. Ahmed Loukili  
**Contact:** anne-laure.fauchille@ec-nantes.fr, ahmed.loukili@ec-nantes.fr  
**Department:** Mechanics, Material and Civil Engineering  
**Language:** English  
**Credits (ECTS):** 4  
**Number of hours:** 16  
**Semester:** 1  
**Recommended prerequisites:** Materials Sciences  
**Evaluation:** Practical work reports.  
**Organization:** 4x 2-hours lectures, 2 x 4-hours practical works, with personal homework  
**Link:** Hippocampus

## Objective

The objective of this course is to give students skills in identification and design of building materials for concrete structures and foundations. Concrete mix-design and various types of soils and rocks commonly present in geotechnics are presented. The characterization of important mechanical properties of building materials are presented as practical works in the laboratory.

## Content

Sandy and clayey soils, hard and soft rocks, applications in geotechnics. Water content, elasticity limits of soils and applications.  
Mix-design principles of ordinary concrete and High-performance concrete.

## References

## Course Information

**Code:** S119MST  
**Responsible:** Panagiotis KOTRONIS  
**Contact:** Panagiotis.Kotronis@ec-nantes.fr  
**Department:** Mechanics, Material and Civil Engineering  
**Language:** English  
**Credits (ECTS):** 4  
**Number of hours:** 16  
**Semester:** 1  
**Recommended prerequisites:** Continuum mechanics  
**Evaluation:** Final exam  
**Organization:** Seven 2-hours lectures, 2-hours exam, with personal homework.  
**Link:** Hippocampus

## Objective

The objective of this course is to give students skills in theoretical and practical use of the finite element method to solve problems in civil engineering.

## Content

- Truss finite elements  
- Beam finite elements  
- Shells and plates  
- 2D finite elements

## References:


[https://www.colorado.edu/engineering/CAS/courses.d/IFEM.d/Home.html](https://www.colorado.edu/engineering/CAS/courses.d/IFEM.d/Home.html)
# Design of Special Structures (S119DSS)

<table>
<thead>
<tr>
<th>Course Information</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Code:</strong> S119DSS</td>
</tr>
<tr>
<td><strong>Responsible:</strong> Emmanuel ROZIERE</td>
</tr>
<tr>
<td><strong>Contact:</strong> <a href="mailto:emmanuel.roziere@ec-nantes.fr">emmanuel.roziere@ec-nantes.fr</a></td>
</tr>
<tr>
<td><strong>Department:</strong> Mechanics, Material and Civil Engineering</td>
</tr>
<tr>
<td><strong>Language:</strong> English</td>
</tr>
<tr>
<td><strong>Credits (ECTS):</strong> 4</td>
</tr>
<tr>
<td><strong>Number of hours:</strong> 16</td>
</tr>
<tr>
<td><strong>Semester:</strong> 1</td>
</tr>
<tr>
<td><strong>Recommended prerequisites:</strong> None</td>
</tr>
<tr>
<td><strong>Evaluation:</strong> Final exam</td>
</tr>
<tr>
<td><strong>Organization:</strong> Seven 2-hours lectures, 2-hours exam, with personal homework.</td>
</tr>
<tr>
<td><strong>Link:</strong> Hippocampus</td>
</tr>
</tbody>
</table>

## Objective

The main objective of this course is to understand the principle of structural design though semi-probabilistic approach such as Eurocodes, and for semester 1: Plastic analysis of composite steel and concrete sections according to Eurocode 4.

## Content

**Principles of structural design**

Forensics engineering. General requirements. Principles of limit states design. Semi probabilistic approach. Design values of actions and material or product properties.

**Determination of actions on structures**

Classifications of actions and design situations. Self-weight. Imposed loads.

**Basics of composite steel and concrete structures**


## References:

## Course Information

<table>
<thead>
<tr>
<th>Code: S119FRL</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Responsible:</strong> Sylvia ERTL</td>
</tr>
<tr>
<td><strong>Contact:</strong> <a href="mailto:sylvia.ertl@ec-nantes.fr">sylvia.ertl@ec-nantes.fr</a></td>
</tr>
<tr>
<td><strong>Department:</strong> Communication, languages and business</td>
</tr>
<tr>
<td><strong>Language:</strong> French</td>
</tr>
<tr>
<td><strong>Credits (ECTS):</strong> 3</td>
</tr>
<tr>
<td><strong>Number of hours:</strong> 30</td>
</tr>
<tr>
<td><strong>Semester:</strong> 1</td>
</tr>
</tbody>
</table>

**Recommended prerequisites:** None

**Evaluation:** 25% continuous assessment, 25% oral exam, 25% final exam, 25% project work (booklet)

**Organization:** French for beginners/intermediate level. The students are dispatched into different groups according to their level.

**Link:** [https://centralefle.wordpress.com/](https://centralefle.wordpress.com/)

## Objective

The main objective is to familiarize the learner with the French language and French culture through an entertaining task-based communicative language teaching, focused on speaking combined with:

- Phonetics
- Self-correcting exercises on our pedagogical platform
- Learning Lab activities
- Project work
- Tutoring

Course objectives include the acquisition and reinforcement of vocabulary, syntax, and pronunciation by both traditional means and through the use of digital resources.

After completing this course, the students will be able to communicate in spoken and written French, in a simple but clear manner on familiar topics in the context of study, hobbies etc. Another important goal of this course is to introduce to French culture.

## Content

A full range of practical communication language exercises is used: reading comprehension, listening comprehension, written expression, oral expression.

Educational projects are adapted to the level of the group:

- **Main project**: Log book project “One year at Centrale Nantes” (Booklet)
- France vs China/Nantes vs Hometown project
- French way of life project (traditions, housing, iconic objects...)
- Photo-Babble project
- Field studies and interviews
- Flipped classroom – grammar project
- Family tree project
# Course Information

<table>
<thead>
<tr>
<th>Code:</th>
<th>S119ENL</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Responsible:</strong></td>
<td>Christine EVAIN</td>
</tr>
<tr>
<td><strong>Contact:</strong></td>
<td><a href="mailto:christine.evain@ec-nantes.fr">christine.evain@ec-nantes.fr</a></td>
</tr>
<tr>
<td><strong>Department:</strong></td>
<td>Communication, languages and business</td>
</tr>
<tr>
<td><strong>Language:</strong></td>
<td>English</td>
</tr>
<tr>
<td><strong>Credits (ECTS):</strong></td>
<td>3</td>
</tr>
<tr>
<td><strong>Number of hours:</strong></td>
<td>30</td>
</tr>
<tr>
<td><strong>Semester:</strong></td>
<td>1</td>
</tr>
<tr>
<td><strong>Recommended prerequisites:</strong></td>
<td>None</td>
</tr>
</tbody>
</table>

**Evaluation:** 50% continuous assessment (class participation), 30% oral exam (presentation), 20% final exam (TOEIC practice exam)

**Organization:** The students are dispatched into different groups according to their level.

**Link:** pedagogical server (https://hippocampus.ec-nantes.fr; anglais LVO)

## Objective

In this course, you will learn how to:

- Develop an understanding of inter-cultural practice
- Develop oral and written communication adapted to different contexts (mainly inter-cultural situations)
- Organize, lead and participate in a meeting
- Strengthen self-confidence and level of conviction
- Work on professional documents in English
- Acquire presentation skills
- Express feelings and practice assertiveness
- Develop active listening and understanding to reformulate, explain and argue
- Develop well-being at work and a sense of responsibility
- Negotiate, innovate and propose innovative solutions
- Enhance team work

## Content

Those objectives will be achieved by doing:

- **English:** full range of practical communication language exercises (reading comprehension, listening comprehension, written expression, oral expression)
- **Business English:** introduction to marketing and business practices

Educational projects are adapted to the level of the group (scenarios, role plays, simulations).

Analysis of a short story or an extract of a novel in order to explain the cultural components of the text.

Projects in a cultural context “Ted talk presentation”, “Edge.org assignment”, etc.
Second Semester: from February to May
Water Engineering Structures (S219WES)

**Course Information**

**Code:** S219WES  
**Responsible:** Frédéric GRONDIN  
**Contact:** frederic.grondin@ec-nantes.fr  
**Department:** Mechanics, Material and Civil Engineering  
**Language:** English  
**Credits (ECTS):** 4  
**Number of hours:** 16  
**Semester:** 2  
**Recommended prerequisites:** None  
**Evaluation:** Final exam  
**Organization:** Five 2-hours lectures, three 2-hours practical work.  
**Link:** Hippocampus

**Objective**

The objective of this course is to give students skills in theoretical and practical use of mechanical tools required in advanced water engineering structures. The second semester is dedicated to the design of dams and dikes. Students will have to know which type of dam or dike to be designed according to the environment and the flood risk.

**Content**


**References:**

# Course Information

**Code:** S219NRI  
**Responsible:** Frédéric GRONDIN  
**Contact:** frederic.grondin@ec-nantes.fr  
**Department:** Mechanics, Material and Civil Engineering  
**Language:** English  
**Credits (ECTS):** 4  
**Number of hours:** 16  
**Semester:** 2  
**Recommended prerequisites:** None  
**Evaluation:** Final exam  
**Organization:** Seven 2-hours lectures, 2-hours exam, with personal homework.  
**Link:** Hippocampus

## Objective

The course aims to provide quantitative methods of risk analysis within the framework of civil engineering; explicit reference will be done to the notion of partial safety factor.

## Content

**Ordinary differential equations.**

Probabilistic approach to the method of partial safety factors.

**References:**

# Mechanics for Civil Engineering (S219MCE)

## Course Information

**Code:** S219MCE  
**Responsible:** Benoît HILLOULIN  
**Contact:** benoit.hilloulin@ec-nantes.fr  
**Department:** Mechanics, Material and Civil Engineering  
**Language:** English  
**Credits (ECTS):** 4  
**Number of hours:** 16  
**Semester:** 2  
**Recommended prerequisites:** None  
**Evaluation:** Final exam  
**Organization:** Four 4-hours practical sessions, with personal homework.  
**Link:** Hippocampus

## Objective

The objective of this course is to give students skills in theoretical and practical use of mechanical tools required in civil engineering. The second semester is dedicated to Mechanics of materials applications through practical sessions.

## Content

Experimental and/or numerical practical sessions. Sections comparison, statically indeterminate beams, frame and truss structures, combined bending.

## References

## Course Information

**Code:** S219DBM  
**Responsible:** Dr. Anne-Laure Fauchille, Prof. Ahmed Loukili  
**Contact:** anne-laure.fauchille@ec-nantes.fr, ahmed.loukili@ec-nantes.fr  
**Department:** Mechanics, Material and Civil Engineering  
**Language:** English  
**Credits (ECTS):** 4  
**Number of hours:** 16  
**Semester:** 2  
**Recommended prerequisites:** Materials Sciences  
**Evaluation:** Practical work reports.  
**Organization:** 4 x 4-hours practical works (8h on geotechnics, 8h on concrete)  
**Link:** Hippocampus

## Objective

The objective of this course is to give students' skills in experimental geotechnics, to determine important soil's parameters used for foundation design and public works.

## Content

- Mechanical and physical properties of concrete constituents.  
- Friction angle of soils, permeability tests of soils with different compaction rates. Application in geotechnics.

## References

## Course Information

**Code:** S219MST  
**Responsible:** Syed Yasir ALAM  
**Contact:** syed-yasir.alam@ec-nantes.fr  
**Department:** Mechanics, Material and Civil Engineering  
**Language:** English  
**Credits (ECTS):** 4  
**Number of hours:** 16  
**Semester:** 2  
**Recommended prerequisites:** None  
**Evaluation:** Final project  
**Organization:** Two 2-hour lectures, three 4-hour practical.  
**Link:** Hippocampus

## Objective

The objective of this course is to give students the relevant knowledge and capabilities to achieve best practice in Building Information Modelling (BIM).

Developed in conjunction with leading industry consultants and trends, this course provides the most relevant and up-to-date information. You will learn how to effectively manage information across all stages of your construction projects.

## Content

- BIM fundamentals  
- BIM implementation  
- BIM processes and Procedures  
- BIM information management  
- Time and Cost Management  
- Clashes
## Design of Special Structures (S119DSS)

### Course Information

**Code:** S119DSS  
**Responsible:** Emmanuel ROZIERE  
**Contact:** emmanuel.roziere@ec-nantes.fr  
**Department:** Mechanics, Material and Civil Engineering  
**Language:** English  
**Credits (ECTS):** 4  
**Number of hours:** 16  
**Semester:** 2  
**Recommended prerequisites:** None  
**Evaluation:** Final exam  
**Organization:** Seven 2-hours lectures, 2-hours exam, with personal homework.  
**Link:** Hippocampus

### Objective

The main objective of this course is to understand the principle of structural design though semi-probabilistic approach such as Eurocodes, and for semester 2: Analysis of basic steel structures according to Eurocode 3.

### Content

**Steel structures**  

### References:

French Language (S219FRL)

<table>
<thead>
<tr>
<th>Course Information</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Code:</strong> S219FRL</td>
</tr>
<tr>
<td><strong>Responsible:</strong> Sylvia ERTL</td>
</tr>
<tr>
<td><strong>Contact:</strong> <a href="mailto:sylvia.ertl@ec-nantes.fr">sylvia.ertl@ec-nantes.fr</a></td>
</tr>
<tr>
<td><strong>Department:</strong> Communication, languages and business</td>
</tr>
<tr>
<td><strong>Language:</strong> French</td>
</tr>
<tr>
<td><strong>Credits (ECTS):</strong> 3</td>
</tr>
<tr>
<td><strong>Number of hours:</strong> 30</td>
</tr>
<tr>
<td><strong>Semester:</strong> 2</td>
</tr>
<tr>
<td><strong>Recommended prerequisites:</strong> None</td>
</tr>
</tbody>
</table>

**Evaluation:** 25% continuous assessment, 25% oral exam, 25% final exam, 25% project work (booklet)

**Organization:** French for beginners/intermediate level. The students are dispatched into different groups according to their level.

**Link:** [https://centralefle.wordpress.com/](https://centralefle.wordpress.com/)

**General course objective**

The main objective is to familiarize the learner with the French language and French culture through an entertaining task-based communicative language teaching, focused on speaking combined with:

- Phonetics
- Self-correcting exercises on our pedagogical platform
- Learning Lab activities
- Project work
- Tutoring

Course objectives include the acquisition and reinforcement of vocabulary, syntax, and pronunciation by both traditional means and through the use of digital resources.

After completing this course, the students will be able to communicate in spoken and written French, in a simple but clear manner on familiar topics in the context of study, hobbies etc. Another important goal of this course is to introduce to French culture.

At the end of course (60 hours), the complete beginners can achieve the level A1 and some aspects of A2 of The Common European Framework of Reference for Languages. More advanced students may aim the levels B1/B2.

**Content**

A full range of practical communication language exercises is used: reading comprehension, listening comprehension, written expression, oral expression.

Educational projects adapted to the level of the group:

- Main project: Log book project “One year at Centrale Nantes” (Booklet)
- French way of life project (traditions, housing, iconic objects...)
- Expressing emotions and theatre project
- Photo-Babble project
- Field studies and interviews
- Flipped classroom - grammar project
Course Information

Code: S219ENL
Responsible: Christine EVAIN
Contact: christine.evain@ec-nantes.fr
Department: Communication, languages and business
Language: English
Credits (ECTS): 3
Number of hours: 30
Semester: 2
Recommended prerequisites: None

Evaluation: 50% continuous assessment (class participation), 30% oral exam (presentation), 20% final exam (TOEIC practice exam)

Organization: The students are dispatched into different groups according to their level.
Link: pedagogical server (https://hippocampus.ec-nantes.fr; anglais LVO)

Objective

In this course, you will learn how to:

- Understand the general concepts of business English and marketing principles
- Build a professional project and explore international opportunities
- Develop strategies for inter-cultural practice
- Develop oral and written communication adapted to different contexts
- Organize, lead and participate in a meeting
- Work on professional documents in English
- Acquire a professional lexicon
- Understand the principles of corporate business models
- Acquire notions of corporate culture and values
- Develop well-being at work and a sense of responsibility
- Negotiate, innovate and propose innovative solutions

Content

Those objectives will be achieved by doing:

- English: full range of practical communication language exercises
- Business English: exercises to explore in practice the areas of management and marketing

Educational projects adapted to the level of the group (scenarios, role plays, simulations).
Analysis of a short story or an extract of a novel in order to explain the cultural components of the text.
Projects in a professional context "Start-up simulation", "marketing assignment", "advertising assignment", etc.