

CIVIL AND ENVIRONMENTAL ENGINEERING

ACADEMIC YEAR 2019/2020

The programme

Courses	First Semester			Second Semester		
	Hours	Student workload (hours)	ECTS Credits	Hours	Student workload (hours)	ECTS Credits
Water Engineering Structures	16	40	4	16	40	4
Natural Risks	16	40	4	16	40	4
Mechanics for Civil Engineering	16	40	4	16	40	4
Design of Building Materials	16	40	4	16	40	4
Modelling of Structures by FE and BIM	16	40	4	16	40	4
Design of Special Structures	16	40	4	16	40	4
French language	16	60	3	16	60	3
English and Business Environment	16	60	3	16	60	3
Case study-Graduation Paper/Conferences	60	120	-	60	120	-
Total	188	480	30	188	480	30

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First Semester: from September to January

Water Engineering Structures (S119WES)

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:

- [1] B. Cushman-Roisin, Introduction to geophysical fluid dynamics, Prentice Hall, 1994.
- [2] R. A. Freeze, J. A. Cherry, Groundwater, Prentice-Hall, 1979.
- [3] S. L. Polevoy, Water science and engineering, Chapman et Hall, 1996.

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 unrelated variables; (iii) MS functions dependent on Gaussian and non-Gaussian variables. Reliability of systems: series and parallel.

References:

[1] Ditlevsen O., Madsen H.O., Structural Reliability Methods, Wiley 2005.

Mechanics for Civil Engineering (S119MCE)

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

Stress. Strain and deformation. Theory of elasticity. Hooke's law. Mohr's circles. Energy balance. Principle of virtual displacements. Traction. Tension and compression. Uniaxial problems. Castigliano's theorem. Menabrea's theorem. Static equilibrium. Strain energy. Deflections of beams. Frames and truss structures.

References:

[1] Stephen H. Crandall, Norman C. Dahl and Thomas J. Lardner, An introduction to the mechanics of solids, 2nd edition, McGraw-Hill Sciences, 1999, 604 p.

[2] James M. Gere, Mechanics of materials, 8th edition, CENGAGE Learning Custom Publishing, 1056 p.

[3] David W. A. Rees, Mechanics of Solids and Structures: Second Edition, 2nd edition, ICP, 848 p.

[4] Russell C. Hibbeler, Mechanics of materials, 10th edition, Pearson, 2016, 896 p.

Design of Building Materials (S119DBM)

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:

[1] Aysen, A., Soil mechanics: basic concepts and engineering applications. CRC Press, 2002.

[2] Neville, A.M., Properties of Concrete, 5th Edition, Prentice Hall, 2011.

Modelling of Structures by FE and BIM (S119MST)**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:

[1] H. Oudin. Méthode des Éléments Finis (<https://meefi.pedagogie.ec-nantes.fr/MEF/MEF.htm>)

[2] C. Felippa. Introduction to Finite Element Methods (<https://www.colorado.edu/engineering/CAS/courses.d/IFEM.d/Home.html>)

Design of Special Structures (S119DSS)

Course Information

Code: S119DSS

Responsible: Emmanuel ROZIERE

Contact: emmanuel.rozriere@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: Hippocampus

Objective

The main objective of this course is to understand the principle of structural design through 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

General description. Eurocode 4 provisions for buildings. Compression: verification of columns. Bending: verification of beams. Verification of columns under combined effects of compression and bending.

References:

[1] EN 1990:2002, Eurocode — Basis of structural design

[2] EN 1991-1-1, Eurocode 1: Actions on structures - Part 1-1: General actions - Densities, self-weight, imposed loads for buildings

[3] EN 1994-1-1 (2004) (English); Eurocode 4: Design of composite steel and concrete structures – Part 1-1: General rules and rules for buildings

[4] Moore D., Bailey C., Lennon T. and Wang, Y. Designers' Guide to EN 1991-1-2, EN 1992-1-2, EN 1993-1-2 and EN 1994-1-2, Thomas Telford, London, 2007

[5] Johnson R.P. and Anderson D. Designers' Guide to EN 1994-1-1: Eurocode 4: Design of Composite Steel and Concrete Structures, Part 1-1: General Rules and Rules for Buildings, Thomas Telford, London, 2004

French Language (S119FRL)

Course Information

Code: S119FRL

Responsible: Sylvia ERTL

Contact: sylvia.ertl@ec-nantes.fr

Department: Communication, languages and business

Language: French

Credits (ECTS): 3

Number of hours: 30

Semester: 1

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://centraleftle.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**Code:** S119ENL**Responsible:** Christine EVAIN**Contact:** christine.evain@ec-nantes.fr**Department:** Communication, languages and business**Language:** English**Credits (ECTS):** 3**Number of hours:** 30**Semester:** 1**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:

- 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

Design of dam. Design of dikes. Modelling of flood risks.

References:

[1] L. Zhang, M. Peng, D. Chang, Y. Xu, Dam Failure Mechanisms and Risk Assessment, Wiley, 2016.

[2] R.B. Jansen, Advanced Dam Engineering for Design, Construction and Rehabilitation, Van Nostrand Reinhold, 2012.

Natural Risk (S219NRI)**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:

Ang A. H-S., Tang W.H., Probability concepts in engineering planning and decision. Vol. II Decision Risk and Reliability, Wiley 1990.

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:

[1] Stephen H. Crandall, Norman C. Dahl and Thomas J. Lardner, An introduction to the mechanics of solids, 2nd edition, McGraw-Hill Sciences, 1999, 604 p.

[2] James M. Gere, Mechanics of materials, 8th edition, CENGAGE Learning Custom Publishing, 1056 p.

[3] David W. A. Rees, Mechanics of Solids and Structures: Second Edition, 2nd edition, ICP, 848 p.

[4] Russell C. Hibbeler, Mechanics of materials, 10th edition, Pearson, 2016, 896 p.

Design of Building Materials (S219DBM)**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:

[1] Aysen, A., 2002. *Soil mechanics: basic concepts and engineering applications*. CRC Press.

[2] Loukili, A., *Self-Compacting Concrete*, Willey, 2011.

Modelling of Structures by FE and BIM (S119MST)

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: S219DSS

Responsible: Emmanuel ROZIERE

Contact: emmanuel.rozriere@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 through semi-probabilistic approach such as Eurocodes, and for semester 2: Analysis of basic steel structures according to Eurocode 3.

Content

Steel structures

Actions and environmental influences. Modelling of structures. Material properties and requirements. Classification of cross sections. Tension. Compression. Bending moment. Shear.

References:

[1] Eurocode 3: Design of steel structures - Part 1-1: General rules and rules for buildings

French Language (S219FRL)

Course Information

Code: S219FRL

Responsible: Sylvia ERTL

Contact: sylvia.ertl@ec-nantes.fr

Department: Communication, languages and business

Language: French

Credits (ECTS): 3

Number of hours: 30

Semester: 2

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://centraleftle.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

English and Business Environment (S219ENL)

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.