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# ENGINEERING IN THE FIELD OF CONSTRUCTION AND PUBLIC WORKS

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2022-2023

Year 2

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PROGRAMME SUPERVISOR  
Jean-Sebastien LE BRIZAUT



# PROGRAMME ENGINEERING IN THE FIELD OF CONSTRUCTION AND PUBLIC WORKS - Year 2

## Year 2

Course unit	ECTS Credits	Course type	Course code	Title
UE200	20			
		Core course	BTP2_ENT	Business Skills
UE201	5			
		Core course	BTP2_APRA	Analysis of Professional Practices
		Core course	BTP2_ESE	Societal challenges for the companies
		Core course	BTP2_SSAT	Social sciences applied to work
UE202	2			
		Core course	BTP2_PSI	International Experience Project
		Core course	BTP2_TOEIC	Toeic training
UE203	5			
		Core course	BTP2_ECEN	Business
		Core course	BTP2_GEBU	Project budget
		Core course	BTP2_MAFIP	Public contracts
		Core course	BTP2_RSE	Corporate social responsibility
UE204	7			
		Core course	BTP2_BIM	Building information Model
		Core course	BTP2_DCOU	Code of work
		Core course	BTP2_PROCB	Project management
		Core course	BTP2_SECHI	Security & Environment
UE205	6			
		Core course	BTP2_MATH	Mathematics
		Core course	BTP2_MFLU	Concrete fluid mechanics
		Core course	BTP2_ROU	Roads and highways
UE206	4			
		Core course	BTP2_BA1	Reinforced concrete 1
		Core course	BTP2_RDM	Strength of materials
UE207	6			
		Core course	BTP2_BA2	Reinforced concrete 2
		Core course	BTP2_FOND	Foundations
		Core course	BTP2_TER	Earthworks
UE208	5			
		Core course	BTP2_CHAUF	Air conditioning in buildings
		Core course	BTP2_ECL	Lightning
		Core course	BTP2_THAC	Thermic and acoustic

# ENGINEERING IN THE FIELD OF CONSTRUCTION AND PUBLIC WORKS

Year 2 - UE200

## Business Skills [BTP2\_ENT]

LEAD PROFESSOR(S): Jean-Sebastien LE BRIZAUT / Marie GOUGEON

### Objectives

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### Course contents

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### Course material

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### Assessment

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Individual assessment: EVI 1 (coefficient 1)

LANGUAGE OF INSTRUCTION	ECTS CREDITS	LECTURES	TUTORIALS	LAB	PROJECT	EXAM
French	-	6 hrs	0 hrs	0 hrs	0 hrs	0 hrs

# ENGINEERING IN THE FIELD OF CONSTRUCTION AND PUBLIC WORKS

Year 2 - UE201

## Analysis of Professional Practices [BTP2\_APRA]

*LEAD PROFESSOR(S): Jean-Sebastien LE BRIZAUT / Marie GOUGEON*

### Objectives

- Objectives: To enable apprentices to move from a "student" position to a "professional" position through:
- Reflection on their learning methods and methodologies,
- Identification of efficient practices,
- An exchange between peers,
- Linking the two training centres, the school and the host company.

### Course contents

no standard plan

### Course material

### Assessment

Individual assessment: EVI 1 (coefficient 1)

LANGUAGE OF INSTRUCTION	ECTS CREDITS	LECTURES	TUTORIALS	LAB	PROJECT	EXAM
French	-	0 hrs	0 hrs	6 hrs	0 hrs	0 hrs

# ENGINEERING IN THE FIELD OF CONSTRUCTION AND PUBLIC WORKS

Year 2 - UE201

## Societal challenges for the companies [BTP2\_ESE]

*LEAD PROFESSOR(S): Jean-Sebastien LE BRIZAUT / Stéphane GUYARD*

### Objectives

The "Societal and Business Issues" module aims to acquire skills in terms of a scientific approach to analysing the functioning and evolution of companies (questioning, data collection and analysis). This acquisition is based on the realization, during the first two years of training, of a collective study (in groups of 4 or 5 apprentices) on subjects that question the relationship between contemporary issues of societies and the functioning, the evolutions of companies.

### Course contents

Year 2: Conduct of the survey

### Course material

Stéphane Beaud, Florence Weber, Guide de l'enquête de terrain : produire et analyser des données ethnographiques, Paris : Éd. la Découverte, coll. « Guide repères », 1997

### Assessment

Individual assessment: EVI 1 (coefficient 1)

LANGUAGE OF INSTRUCTION	ECTS CREDITS	LECTURES	TUTORIALS	LAB	PROJECT	EXAM
French	-	0 hrs	0 hrs	20 hrs	0 hrs	0 hrs

# ENGINEERING IN THE FIELD OF CONSTRUCTION AND PUBLIC WORKS

Year 2 - UE201

## Social sciences applied to work [BTP2\_SSAT]

*LEAD PROFESSOR(S): Fabien THOMAS / Jean-Sebastien LE BRIZAUT*

### Objectives

Acquire a rational approach to questioning within the framework of a practice related to human work; acquire a methodology of data collection adapted to this questioning; appropriate knowledge related to a practice related to human work; make join "practical" and "theories" based on the professional experience of engineering students in apprenticeship (in conjunction with the practice analysis sessions); transforming this knowledge into professional know-how

### Course contents

Legal and social environment of the management function; Working in a team; Evaluate the work; General methodology of the Master's degree thesis

### Course material

Henri MINTZBERG, Danièle LINHART, Frédéric MISPELBLOM-BEYER, Eric DELAVALLEE, Frédéric LORDON, Thomas PIKETTY, Renaud SAINSAULIEU, Vincent DE GAULEJAC, Jean-François DORTIER, Mathew CRAWFORD, Alain DENEULT, Marie-Anne DUJARIER, Barbara STIEGLER, Marie PEZE, Christophe DEJOURS, etc.

### Assessment

Individual assessment: EVI 1 (coefficient 1)

LANGUAGE OF INSTRUCTION	ECTS CREDITS	LECTURES	TUTORIALS	LAB	PROJECT	EXAM
French	-	0 hrs	0 hrs	49 hrs	0 hrs	0 hrs

# ENGINEERING IN THE FIELD OF CONSTRUCTION AND PUBLIC WORKS

Year 2 - UE202

## International Experience Project [BTP2\_PSI]

*LEAD PROFESSOR(S): Alan BALL / James RATCLIFF*

### Objectives

Analyse what student has learnt from work experience abroad.  
Validate foreign work experience.

### Course contents

Enable students to produce an analytical evaluation of their experience abroad.  
Coach students to produce a financial dossier.  
Oversee project and assist students to produce a foreign internship report in video format.

### Course material

### Assessment

Individual assessment: EVI 1 (coefficient 1)

LANGUAGE OF INSTRUCTION	ECTS CREDITS	LECTURES	TUTORIALS	LAB	PROJECT	EXAM
French	-	4 hrs	0 hrs	8 hrs	0 hrs	0 hrs

# ENGINEERING IN THE FIELD OF CONSTRUCTION AND PUBLIC WORKS

Year 2 - UE202

## Toeic training [BTP2\_TOEIC]

LEAD PROFESSOR(S): James RATCLIFF

### Objectives

Objectives:

- prepare students to apply for internship in English-speaking country
- prepare students for life in a company in English-speaking country
- prepare students for living abroad, integrating with English-speakers
- prepare students for TOEIC test (grammar, vocabulary, listening, reading) - required level 785

### Course contents

The Training program/syllabus :

Communicative approach:

- CVs in English
- Cover Letters in English
- Video CV scripts
- Describing companies and responsibilities within companies
- Job interview practice
- Telephoning for job interviews. Leaving a message
- Telephoning: arranging a meeting.
- Describing processes
- Numbers, figures, prices, measurements, alphabet, graphs, charts etc.
- Question forms
- Communication activities in various contexts - professional, social, current affairs
- Grammar review according to individual needs
- Vocabulary for TOEIC
- Professional emails
- Professional role-plays
- Presentations skills & practice
- Case studies
- Meetings language
- Social English
- Cultural Differences – working in UK, US, Australia etc

Regular Mock T.O.E.I.C practice tests

### Course material

Barron's TOEIC Test 6th Edition

English Grammar in Use with answers - Raymond Murphy

Collins Practice Tests for the TOEIC Test

### Assessment

Individual assessment: EVI 1 (coefficient 1)



LANGUAGE OF INSTRUCTION	ECTS CREDITS	LECTURES	TUTORIALS	LAB	PROJECT	EXAM
English	-	0 hrs	28 hrs	0 hrs	0 hrs	0 hrs

# ENGINEERING IN THE FIELD OF CONSTRUCTION AND PUBLIC WORKS

Year 2 - UE203

## Business [BTP2\_ECEN]

*LEAD PROFESSOR(S): Jean-Sebastien LE BRIZAUT*

### Objectives

- â Understanding the challenges of today's economy, and the associated policy decisions,
- ∅ resituating the stakes of companies in CSR,
- ∅ identify and understand the company's strategies,
- ∅ understand the operational implementation of a strategy,
- ∅ integrate these dimensions into its EFP

### Course contents

Part 1. Decision-making in times of crisis

- A/ Economy: an exceptional situation for more than one reason
- B/ Economy and political decisions
- C/ Policy responses

Part 2. The business strategy

- A/ Strategy & vocabulary
- B/ Strategy & operationality
- C/ Basic tools

Part 3. CSR & performance measurement

- A/ CSR/ Sustainable development
- B/ CSR & performance

Part 4. The economic dimension within the EFP

- A/ The principle of economic synthesis
- B/ The content of the economic summary

### Course material

<http://sabbar.fr/economie-2/>

### Assessment

Individual assessment: EVI 1 (coefficient 1)

LANGUAGE OF INSTRUCTION	ECTS CREDITS	LECTURES	TUTORIALS	LAB	PROJECT	EXAM
French	-	16 hrs	0 hrs	0 hrs	0 hrs	0 hrs

# ENGINEERING IN THE FIELD OF CONSTRUCTION AND PUBLIC WORKS

Year 2 - UE203

## Project budget [BTP2\_GEBU]

*LEAD PROFESSOR(S): Benoit HILLOULIN / Françoise DAVIAUD*

### Objectives

- Understanding construction management through knowledge of the parameters of works contracts.
- Understanding the elements that initiated the construction of the works contract
- Practice the process of a tender response to understand the nature and scope of the response to effectively and qualitatively manage future construction
- Understand the principles of bid evaluation to effectively and qualitatively manage future construction.

### Course contents

Introduction

Those involved in the construction operation

The stages of the construction operation

Consultation of enterprises

- Preparation of the consultation

- Price study and supply setting

(Project response to a call for tenders)

- Receipt and evaluation of tenders

Conclusion and introduction of the following year's course.

### Course material

### Assessment

Individual assessment: EVI 1 (coefficient 1)

LANGUAGE OF INSTRUCTION	ECTS CREDITS	LECTURES	TUTORIALS	LAB	PROJECT	EXAM
French	-	16 hrs	0 hrs	0 hrs	0 hrs	0 hrs

# ENGINEERING IN THE FIELD OF CONSTRUCTION AND PUBLIC WORKS

Year 2 - UE203

## Public contracts [BTP2\_MAFIP]

*LEAD PROFESSOR(S): Jean-Sebastien LE BRIZAUT*

### Objectives

Objectives:

At the end of this teaching the learner must be able to:

Know and apply the general rules on the award and monitoring of public contracts (works and intellectual services).

### Course contents

Training Program:

The legal framework governing the award and performance of public works contracts, (Public Procurement Code, case law).

The Competitive Principles - Contracting and Devolution.

Preparation and award of a public works contract.

Drafting of the CLD (Act of Commitment - CCAC - Consultation Regulation - Appendices).

The main principles of competition.

The contract award phase: The examination of tenders - the development of tenders (administrative study of the tender).

Knowledge Check:

1 evaluation of 1 hour.

### Course material

### Assessment

Individual assessment: EVI 1 (coefficient 1)

LANGUAGE OF INSTRUCTION	ECTS CREDITS	LECTURES	TUTORIALS	LAB	PROJECT	EXAM
French	-	16 hrs	0 hrs	0 hrs	0 hrs	0 hrs

# ENGINEERING IN THE FIELD OF CONSTRUCTION AND PUBLIC WORKS

Year 2 - UE203

## Corporate social responsibility [BTP2\_RSE]

LEAD PROFESSOR(S): Emmanuel ROZIERE / Patrice PALIOTTI

### Objectives

Understand the main mechanisms of climate change

Acquire basic knowledge on the concept of sustainable development and CSR, in particular:

- The history of its development
- The topics covered (definitions, principles and central questions)
- The elements of its implementation based in particular on the identification of social and environmental impacts and dialogue with stakeholders as well as the associated reporting and communication.

Aim for a global approach to optimize the ecological footprint of a construction project:

- Lay the foundations of general knowledge of eco-construction and bioclimatic architecture, as well as knowledge of ecological and innovative materials.
- Acquire knowledge on the implementation of the various construction systems and the overall energy balance of a building.
- Become aware of the diversity of jobs according to the specialty or the quality of the actors of an eco-construction file.

### Course contents

Introduction to climate change and CSR

CSR

- Lesson 1: About the concept of Sustainable Development
- Lesson 2: How does ISO 26000 define social responsibility?
- Lesson 3: Planning your social responsibility approach and Identifying your partners
- Lesson 4: Implementing the social responsibility approach with ISO 26000
- Lesson 5: Integrating SR into the heart of your organization, in your best practices

Eco-construction:

- Building and sustainable development, impacts of the building sector
- Energetic performance
- Glazing and joinery, building materials
- Renewable energies
- Bioclimatic design
- Waste Management and Recycling

### Course material

### Assessment

Individual assessment: EVI 1 (coefficient 0.5)  
EVI 2 (coefficient 0.5)

LANGUAGE OF INSTRUCTION	ECTS CREDITS	LECTURES	TUTORIALS	LAB	PROJECT	EXAM
French	-	32 hrs	0 hrs	0 hrs	0 hrs	0 hrs

# ENGINEERING IN THE FIELD OF CONSTRUCTION AND PUBLIC WORKS

Year 2 - UE204

## Building information Model [BTP2\_BIM]

LEAD PROFESSOR(S): Anne-Solène DRIS / Jean-Sebastien LE BRIZAUT

### Objectives

GIS: Discovery of GIS through learning free software, QGIS. The aim is for students to see the usefulness of these tools in managing a project, monitoring and evaluating it. At the end of the course, students must have bases to work with data in a geographical form. A gateway to the BIM universe is evoked at the end of the cycle even if for the moment, the link between the 2 universes remains to be built

BIM:

### Course contents

GIS: Theoretical part at the beginning of the course and implementation in the form of TD with a tutorial to follow for QGIS. Students (1 per position) also gradually take control of the tool while integrating the concepts seen at the beginning of the course. Final evaluation and projects in pairs to be returned.

BIM:

### Course material

Systemes d'information géographique, pouvoir et organisations . Géomatique et stratégies d'acteurs ; H. Pornon, 1998, édition l'Harmattan ; Roche Sebastian. Les SIG : un regard nouveau sur l'espace et sa gestion. In: Espace géographique, tome 26, n° 1, 1997. pp. 60-66.

### Assessment

Collective assessment: EVC 1 (coefficient 0.5)  
EVC 2 (coefficient 0.5)

LANGUAGE OF INSTRUCTION	ECTS CREDITS	LECTURES	TUTORIALS	LAB	PROJECT	EXAM
French	-	16 hrs	0 hrs	16 hrs	0 hrs	0 hrs

# ENGINEERING IN THE FIELD OF CONSTRUCTION AND PUBLIC WORKS

Year 2 - UE204

## Code of work [BTP2\_DCOU]

LEAD PROFESSOR(S): Jean-Sebastien LE BRIZAUT

### Objectives

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Mastering the rules of urban planning

### Course contents

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Introduction

- . Place of urban planning law in the French legal system;
- . Development of French urban planning law;

Chapter 1. Planning documents

Section 1. General rules

- I. The NRU
- II. The Limited Constructability Rule
- III. The DTADD

Section 2. The territorial coherence scheme (SCOT)

Section 3. The Local Planning Plan (PLU)

Section 4. The Community Map

Chapter 2. Tools of Operational Planning

Section 1. Collaborative Development Areas (CAZ)

Section 2. Subdivisions

Chapter 3. Planning Authorizations

Section 1. The Planning Certificate (UC): The Backgrounder

Section 2. Building permits and prior declaration of works

- I. Floor Surface and Floor Right-of-Way
- II. New construction work
- III. Work on existing buildings

Section 3. Other planning authorizations

- I. The permit to demolish
- II. Development Permit

Section 4. The Procedure for Obtaining a Planning Authorization  
Applicant, content of application, decision, appeal, etc.

Section 5. Construction Completion and Compliance with Authorities

- I. Period of validity of planning authorizations

## II. Construction Completion and Compliance Monitoring

Conclusion

Update on recent... past and future reforms

### Course material

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### Assessment

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Individual assessment: EVI 1 (coefficient 1)

LANGUAGE OF INSTRUCTION	ECTS CREDITS	LECTURES	TUTORIALS	LAB	PROJECT	EXAM
French	-	22 hrs	0 hrs	0 hrs	0 hrs	4 hrs



# ENGINEERING IN THE FIELD OF CONSTRUCTION AND PUBLIC WORKS

Year 2 - UE204

## Project management [BTP2\_PROCB]

LEAD PROFESSOR(S): Benoit HILLOULIN

### Objectives

Objectives:

The learner will be able at the end of this module of 112 H to prepare, organize, execute a project. Coordinate the bodies of states and the different stakeholders of a project.

### Course contents

Training Program:

#### 1. Preparation, Organization

History, table of contents,  
Principle of work analysis,  
Production of industrial type,  
Productivity,  
Production and public works,  
General information on site preparation,  
Conduct of the studies,  
Critical analysis of a project,  
Simulation of operation,  
Constructive mode,  
Comparative study,  
Crane load,  
Formwork and shoring equipment,  
Rotations - process and application,  
Construction site installation,  
The times,  
Elaboration of elementary times,  
The judgment of pace,  
Coefficient of rest and synchronisation,  
Exploitation of the measures,  
Breakdown of the works,  
Establishment of the implementing budget,  
Diagram daily balancing of tasks,  
Types and definitions of schedules,  
The bar chart or Gantt,  
The railway schedule,  
The case schedule,  
The synoptic schedule,  
Planning software learning: PROJECT (initial planning and follow-up),  
Launch of the teams,  
The incentive pay.

#### 2. Coordination - Enforcement

Decision planning,  
Monitoring of the schedule,  
Summary plans,  
Management of execution documents.

Knowledge Check:

Evaluation of 4 H in the second year.

Evaluation of a project developed during the third year.

## Course material

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## Assessment

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Collective assessment: EVC 1 (coefficient 1)

LANGUAGE OF INSTRUCTION	ECTS CREDITS	LECTURES	TUTORIALS	LAB	PROJECT	EXAM
French	-	52 hrs	0 hrs	0 hrs	0 hrs	0 hrs

# ENGINEERING IN THE FIELD OF CONSTRUCTION AND PUBLIC WORKS

Year 2 - UE204

## Security & Environment [BTP2\_SECHI]

*LEAD PROFESSOR(S): Benoit HILLOULIN*

### Objectives

The objective of the Fire Safety Seam is to present the various regulations applicable to guarantee users or residents vis-à-vis the Fire risk in buildings.

We will present the outlines of these regulations in order to quickly define the technical and architectural constraints to be applied.

### Course contents

1st course: Presentation of current texts

2nd course: Regulation in Housing

3rd course: Regulation in a public institution.

4th course: practical application for a subject Habitation and Establishment receiving from the public.

### Course material

Existing regulations

### Assessment

Individual assessment: EVI 1 (coefficient 1)

LANGUAGE OF INSTRUCTION	ECTS CREDITS	LECTURES	TUTORIALS	LAB	PROJECT	EXAM
French	-	0 hrs	0 hrs	16 hrs	0 hrs	0 hrs

# ENGINEERING IN THE FIELD OF CONSTRUCTION AND PUBLIC WORKS

Year 2 - UE205

## Mathematics [BTP2\_MATH]

*LEAD PROFESSOR(S): Jean-Sebastien LE BRIZAUT*

### Objectives

Acquire the mathematical bases necessary for the training of a future construction engineer

### Course contents

Analysis  
integer series, Fourier series, Laplace transformation, applications to differential Equations  
Probability and Statistics

### Course material

### Assessment

Individual assessment: EVI 1 (coefficient 0.5)  
EVI 2 (coefficient 0.5)

LANGUAGE OF INSTRUCTION	ECTS CREDITS	LECTURES	TUTORIALS	LAB	PROJECT	EXAM
French	-	28 hrs	0 hrs	0 hrs	0 hrs	4 hrs

# ENGINEERING IN THE FIELD OF CONSTRUCTION AND PUBLIC WORKS

Year 2 - UE205

## Concrete fluid mechanics [BTP2\_MFLU]

*LEAD PROFESSOR(S): Alban LEROYER*

### Objectives

Following the module of Continuum Mechanics BTP1 focused on the basics of fluid mechanics, the main objective of this module is to grasp the complexity of the problems raised in urban hydraulics and to be able to bring relevant technical solutions.

### Course contents

- Main parts of water distribution and sewage networks,
- Roles of urban hydraulics facilities, main parts of a urban hydraulics system
- Pumps; technology, characteristics curves, adjustment, priming procedure, inlet conditions
- Adduction in water pipelines: penstock pipes and hydraulics channels
- Type of water pipes, dimensioning, installation, water hammer and protection
- Water tanks: capacity, installation, building, equipment
- Water distribution network: standards, installation, load losses, modeling of a meshed network
- Sewage network: objectives, type of water to exhaust, installation, dimensioning method

### Course material

### Assessment

Individual assessment: EVI 1 (coefficient 1)

LANGUAGE OF INSTRUCTION	ECTS CREDITS	LECTURES	TUTORIALS	LAB	PROJECT	EXAM
French	-	18 hrs	0 hrs	0 hrs	0 hrs	0 hrs

# ENGINEERING IN THE FIELD OF CONSTRUCTION AND PUBLIC WORKS

Year 2 - UE205

## Roads and highways [BTP2\_ROU]

LEAD PROFESSOR(S): Jean-Sebastien LE BRIZAUT / Juliette BLANC

### Objectives

Objectives:

Knowledge and mastery of road and highway design in the following aspects:

materials (composition, formulation, manufacture and implementation, tests and controls),  
sizing (choice of materials and thickness calculation, frost check).

### Course contents

Training Program:

1. The Basis of the Pavement Design Method:
    - 1.1- Large families of structures, their modes of operation and damage
    - 1.2- Factors taken into account in the design basis (materials, traffic, climate, MO strategy)
  2. The surface layers:
    - 2.1- Functions and objectives to be considered for the surface layer,
    - 2.2- Surface characteristics: performance, tests and controls,
    - 2.3- Choice of surface layer type.
  3. The pavement support platform:
    - 3.1- Classification functions and criteria,
    - 3.2- Mechanical characterization and performance for sizing,
    - 3.3- The shape layers.
  4. The materials:
    - 4.1- Basic constituents: aggregates, hydrocarbon binders, hydraulic binders and pozzolans,
    - 4.2- Elements common to the different pavement materials, vis-à-vis the behaviour and performance taken into account in the choice and sizing of structures,
    - 4.3- Hydrocarbon materials: classification, composition, formulation, dimensioning performance, testing, selection and control,
    - 4.4- Materials treated with hydraulic binders: same presentation as 4.3,
    - 4.5- Pavement concrete: same layout as 4.3.
  5. Highway Pavement Design Documents.
- Knowledge Check:  
2 supervised assignments.

### Course material

### Assessment

Individual assessment: EVI 1 (coefficient 1)

LANGUAGE OF INSTRUCTION	ECTS CREDITS	LECTURES	TUTORIALS	LAB	PROJECT	EXAM
French	-	28 hrs	0 hrs	0 hrs	0 hrs	4 hrs

# ENGINEERING IN THE FIELD OF CONSTRUCTION AND PUBLIC WORKS

Year 2 - UE206

## Reinforced concrete 1 [BTP2\_BA1]

*LEAD PROFESSOR(S): Ahmed LOUKILI*

### Objectives

Reinforced concrete structures: introduction to the calculation, verification and dimensioning of reinforced concrete elements (BAEL 91 and Eurocode2).

### Course contents

- General information on the design of reinforced concrete structures.
- Works security concepts.
- Evaluation of the stresses, limit load and operation.
- Principle justifications of the ultimate limit state (ULS) and service (ELS).
- Calculation of elements in simple compression and bending.
- Justification of the steel-concrete adhesive bonding, anchorage and training.
- Construction provisions.

### Course material

Polycopiés Ecole - Les bétons, base de données pour les formulations (Editions. Eyrolles) - Règles BAEL 91 et Eurocode 2 - Béton Armé Guide de calcul (J. LAMIRAULT, H.RENAUD - Editions Foucher) - Pratique du BAEL 91 (J.PERCHAT, J.ROUX Editions Eyrolles) - Techniques de l'Ingénieur Béton Armé (J.PERCHAT).

### Assessment

Individual assessment: EVI 1 (coefficient 1)

LANGUAGE OF INSTRUCTION	ECTS CREDITS	LECTURES	TUTORIALS	LAB	PROJECT	EXAM
French	-	20 hrs	0 hrs	0 hrs	0 hrs	0 hrs

# ENGINEERING IN THE FIELD OF CONSTRUCTION AND PUBLIC WORKS

Year 2 - UE206

## Strength of materials [BTP2\_RDM]

LEAD PROFESSOR(S): Ahmed LOUKILI / Nordine LEKLOU

### Objectives

Objectives:

At the end of this teaching the learner must be able to:

formalise in stresses and deformations the simultaneous action of several stresses (M+T,  $M_y+M_z$ , M+N). The compound bending will be particularly thorough for its application to prestressed concrete, formalise the reference values useful for the regulatory study of instabilities, to control hyperstatic problems and in particular to determine at any point of the structure (beam or gantry) the values of the stresses and the displacements, characterize the behaviour of a structure when an element becomes plastic (rod or ball joint), Operate an influence line to determine the envelope values of the stresses an element will receive a structural element (isostatic or hyperstatic).

### Course contents

Training Program:

Compound stresses: complex bending, deflected bending, compound bending (central core).  
 Instabilities: buckling (critical load of EULER), spillage (analysis of a simple case).  
 Solving Hyperstatic Problems: Force Method. Search for hyperstatic unknowns, stress diagrams, search for displacements (PASTERNAK theorem).  
 Plasticity. Elasto-plastic models. Normal force case. Bending case. Plastic neutral axis. Plastic ball joints. Step-by-step method of analysis.  
 Influence lines. Definition. Interest. Convoys. Case of isostatic beams (BARRE theorem). Case of hyperstatic beams. Enveloped curves.

Knowledge Check:

1 evaluation of 3 hours.

### Course material

### Assessment

Individual assessment: EVI 1 (coefficient 1)

LANGUAGE OF INSTRUCTION	ECTS CREDITS	LECTURES	TUTORIALS	LAB	PROJECT	EXAM
French	-	14 hrs	8 hrs	0 hrs	0 hrs	3 hrs



# ENGINEERING IN THE FIELD OF CONSTRUCTION AND PUBLIC WORKS

Year 2 - UE207

## Reinforced concrete 2 [BTP2\_BA2]

*LEAD PROFESSOR(S): Syed Yasir ALAM*

### Objectives

Design and justify by calculation of the main elements of reinforced concrete structures.

### Course contents

Continuation of the course (reinforced concrete 1),  
 Special studies (slabs and miscellaneous)...  
 EC2 regulations  
 Design and justification of beams in slabs at ELS and ELUR  
 Shear checks  
 Concrete steel bond  
 Advanced Bending

### Course material

### Assessment

Individual assessment: EVI 1 (coefficient 1)

LANGUAGE OF INSTRUCTION	ECTS CREDITS	LECTURES	TUTORIALS	LAB	PROJECT	EXAM
French	-	20 hrs	0 hrs	6 hrs	0 hrs	0 hrs

# ENGINEERING IN THE FIELD OF CONSTRUCTION AND PUBLIC WORKS

Year 2 - UE207

## Foundations [BTP2\_FOND]

*LEAD PROFESSOR(S): Giulio SCIARRA / Luc THOREL*

### Objectives

Know how to calculate deep foundations under vertical and horizontal loading according to French regulations.  
Know how to calculate a support according to the French regulations, as well as a slope stability.

### Course contents

7 sessions of 4 hours divided into 2 equal parts (foundation/support), alternating lectures and tutorial sessions.  
Each part is assessed and contributes 50% each to the overall grade.

### Course material

Frank R., Cuiria F., Burlon S., 2019 Fondations profondes. Techniques de l'Ingénieur. C 248v2.  
Schlosser F. 2020. Murs de soutènement, Techniques de l'Ingénieur C244 V2 "

### Assessment

Individual assessment: EVI 1 (coefficient 0.5)  
EVI 2 (coefficient 0.5)

LANGUAGE OF INSTRUCTION	ECTS CREDITS	LECTURES	TUTORIALS	LAB	PROJECT	EXAM
French	-	28 hrs	0 hrs	0 hrs	0 hrs	0 hrs

# ENGINEERING IN THE FIELD OF CONSTRUCTION AND PUBLIC WORKS

Year 2 - UE207

## Earthworks [BTP2\_TER]

*LEAD PROFESSOR(S): Giulio SCIARRA / Valéry FERBER*

### Objectives

Choose the earthwork equipment best suited to the work to be carried out,  
Forecast and plan site work according to its geographical adaptation and environmental constraints (road network, accessibility, natural constraints),  
Plan and define the means of monitoring and acceptance of the work carried out.

### Course contents

Drainage,  
Topography applied to earthworks,  
Volume calculations, quantity survey,  
Geology for engineers,  
The terracing workshops and their cadences,  
The means to be put in place to carry out a project (materials, techniques),  
Planning of different tasks according to constraints:  
- overall organization,  
- climate,  
- geography,  
- deadline for completion,  
The price sub-details,  
Task supervision,  
Monitoring and maintaining equipment,  
Acceptance tests.

Assessment:

Examination.

### Course material

### Assessment

Collective assessment: EVC 1 (coefficient 1)

LANGUAGE OF INSTRUCTION	ECTS CREDITS	LECTURES	TUTORIALS	LAB	PROJECT	EXAM
French	-	24 hrs	0 hrs	0 hrs	0 hrs	0 hrs

# ENGINEERING IN THE FIELD OF CONSTRUCTION AND PUBLIC WORKS

Year 2 - UE208

## Air conditioning in buildings [BTP2\_CHAUF]

LEAD PROFESSOR(S): Frédéric GRONDIN / Hubert BLACHIER

### Objectives

At the end of this teaching, the learner must be able to:

- apply a rigorous method of designing an air handling system (from the air preparation phase to the definition of the operating logic).
- Explain the basic technological concepts on the components of a heating system.
- Knowledge of boiler and solar, biomass and heat pump technologies.
- Acquire the fundamental principles of the design and sizing of heat networks (heating, ECS).

### Course contents

- Basic conditions of an air treatment project (thermophysiology, basic indoor and outdoor conditions)
- Wet air technique
- Space thermal and water loads
- Basic air treatments
- Facility Design Methodology
- Different air conditioning systems
- Technology aspects on boilers, boilers, burners, expansion, safety, emitters
- Heat pump, solar and biomass technology
- Heat System Design and Sizing: One Tube and Twin Tube Distribution, CIC, Hydrowired, Heated Floor
- Regulation of heating systems
- Consumption calculation and financial and environmental analysis
- Reading a CRCC (draft)

### Course material

### Assessment

Individual assessment: EVI 1 (coefficient 1)

LANGUAGE OF INSTRUCTION	ECTS CREDITS	LECTURES	TUTORIALS	LAB	PROJECT	EXAM
French	-	24 hrs	0 hrs	0 hrs	0 hrs	0 hrs

# ENGINEERING IN THE FIELD OF CONSTRUCTION AND PUBLIC WORKS

Year 2 - UE208

## Lightning [BTP2\_ECL]

*LEAD PROFESSOR(S): Jean-Sebastien LE BRIZAUT / Marta CHOINSKA*

### Objectives

At the end of the course, the student should be able to:

- Measure photometric quantities: illuminance and luminance
- Calculate the electrical power requirements of an interior or urban lighting project
- Understand the fundamental relationships of light, the relationships between photometric quantities, the definition of white light, the concept of color temperature and color rendering index
- Fully understand interior lighting standard and urban lighting standard requirements
- Fully understand the work flows in an interior or urban lighting project
- Fully understand the energy challenges of a lighting project

### Course contents

1. General
  - 1.1. Wave and light (definitions, behaviour laws)
  - 1.2. Photometric quantities
  - 1.3. Light sources (types, visual rendering, energy consumption)
2. Urban lighting
3. Interior lighting
- 4: Applications under Dialux (free access professional software for lighting design)
  - 4.1. Urban lighting mini-project
  - 4.2. Interior lighting mini-project

### Course material

References are in French only.

### Assessment

Individual assessment: EVI 1 (coefficient 1)

LANGUAGE OF INSTRUCTION	ECTS CREDITS	LECTURES	TUTORIALS	LAB	PROJECT	EXAM
French	-	14 hrs	0 hrs	0 hrs	0 hrs	2 hrs

# ENGINEERING IN THE FIELD OF CONSTRUCTION AND PUBLIC WORKS

Year 2 - UE208

## Thermic and acoustic [BTP2\_THAC]

LEAD PROFESSOR(S): Frédéric GRONDIN / Philippe POUILLAIN

### Objectives

Thermal: At the end of this teaching, the learner must be able to:

- Perform the thermal balance of a building
  - Provide criteria to demonstrate a vessel's compliance with thermal regulations
  - Explain the hygrothermal operation of a building in static and dynamic regimes
- Concepts, concepts worked: thermal resistance, thermal capacity, static and dynamic properties of buildings, thermal regulation, heat transfer, steam transfer.

Acoustics: Ease of use of basic quantities (sound pressure level, reverberation time, attenuation index, standardised insulation, dB(A), etc.)

Simple room patch processing

Know how to predict isolation and in case of insufficient isolation, propose improvement solutions

Understanding of the regulations

### Course contents

### Course material

### Assessment

Individual assessment: EVI 1 (coefficient 0.5)  
EVI 2 (coefficient 0.5)

LANGUAGE OF INSTRUCTION	ECTS CREDITS	LECTURES	TUTORIALS	LAB	PROJECT	EXAM
French	-	32 hrs	0 hrs	0 hrs	0 hrs	4 hrs