



École Supérieure d'Ingénieurs  
des Travaux de la Construction



# INTERNATIONAL ENGLISH SEMESTER 2021 / 2022



# SUMMARY

## CLASS : ENGINEERING PROGRAM 2ND YEAR - TC4

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## SUSTAINABLE BUILDING - TEACHING UE 5

3 ECTS

Subject Environment

Language : English

Coefficient 1

Lectures - 26 h

Autonomous work load

Responsible persons : **Joseph AKUNNA - Svetlana VUJOVIC**

Prerequisites : Null.

- Surface water/groundwater : Water Quality Parameters (Physical, Chemical and Biological parameters)
- Water pollution sources and impact : Nonpoint Source Pollution and Point Source Pollution
- European policy and regulations on drinking water quality, Urban Waste Water Directive
- Drinking water treatment technologies : Study the principles and design of water treatment processes, including coagulation, flocculation, sedimentation, filtration, disinfection (chlorination, ozonation), advanced oxidation, and membrane filtration
- Municipal Wastewater treatment technologies : Pre-treatment, Primary treatment, Secondary treatment (Trickling filter and Activated sludge), and Tertiary treatment
- Sludge treatment and disposal (overview)
- Waste, Contaminated Land & Air Pollution Regulations : European policy and regulations on land, waste management and the role of national environmental regulatory agencies. The EU Waste Management Hierarchy
- Waste Characterisation, Collection, Transport & Storage : Waste arisings by type, quantity, and disposal route. Collection and Transport options
- Waste Management & Treatment Technologies : Waste minimisation, re-use and recycling. Treatment technologies : Thermal (Incineration, Pyrolysis and Gasification); Anaerobic digestion and Composting. Landfill Technology
- Contaminated Land Management & Remediation. Ground investigation techniques. Assessment of hazards and risks. Treatment/Remediation methodologies and techniques
- Air Pollution process and impacts : Types, sources, and effects of airborne pollutants. Urban emissions, Chemistry and physics of common air pollutants, Emission inventories and standards, Enforcement and control measures. Analytical and monitoring techniques

### Project

The project consists in comparing the emissions of gas effects between different energy solutions for buildings in different countries with different energy mix.



## SUSTAINABLE BUILDING - TEACHING UE 5

Subject Hydraulics

3 ECTS

Language : English

Coefficient 1

Lectures - 25 h

Autonomous work load - 5 h

Responsible persons : **Eric BOER - Olof AKKERMAN**

Prerequisites : Operational technical knowledge of mathematics

- Introduction into water supply, basic hydraulics
- Friction losses, pipe design
- Local losses, pump design, pump operation point, pumping stations

Project

Distribution system and computer added design of drinking water supply nets





## **SUSTAINABLE BUILDING - TEACHING UE 5**

Subject Hydraulics

3 ECTS

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Coefficient 1

Lectures - 25 h

Autonomous work load - 5 h

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## SUSTAINABLE BUILDING - TEACHING UNIT 5

Subject Building and energy transition

3 ECTS

Language : FR/EN

Coefficient 1

Lectures - 17 h

Autonomous work load - 12 h

Responsible person : **Bernard BLEZ**

Prerequisites : Basic knowledge in mathematics

- Energy transition in buildings and cities: stakes and trends for the city of tomorrow (Green-house-effect gas, energy cost, air quality) in France, Europe, Asia, North America
- Energy approaches for buildings according to countries' energy mix: the place of gas, green gas, electricity, heat networks and their complementarity
- European rules and labels (BREEAM, HQE, BEPOS, Passivhaus, RE2020...)
- Energy solutions for buildings (advantages and drawbacks) :
  - Electrical solutions: heat pump, convector
  - Gas solutions (condensing boilers, mini-congenaration) and hybrid solutions.
  - Renewable energy solutions for buildings: solar energy (BIPV), biomethane, renewable heat through energy mix networks
- Digital technologies serving the energy efficiency of buildings: IOT, AI, digital simulations ...
- Taking into account users
- Autonomous buildings: myth or reality? How to store energy
- Projects presentation

### Project

The project consists in comparing the emissions of gas effects between different energy solutions for buildings in different countries with different energy mix.





## SUSTAINABLE BUILDING - TEACHING UNIT UE 5

Subject Sustainable city

3 ECTS

Language : FR/EN

Coefficient 1

Lectures - 23 h

Autonomous work load - 10 h

Responsible person : **Franck FAUCHEUX**

Prerequisites : Knowledge in worksite organization and building methods / Basics in sustainability

- What is a sustainable city?
- Studies before setting an urban development project: What is at stake?
- How to manage sustainable urban development
- Eiffage strategy: 3 field trips to sustainable worksites with discovery reports and final group presentations.



## SUSTAINABLE BUILDING - TEACHING UNIT UE 5

Subject Environmental stakes in building

3 ECTS

Language : FR/EN

Coefficient 1

Lectures - 21 h

Autonomous work load - 10 h

Responsible persons : **Amor BEN FRAJ - Adélaïde FERAILLE - Myriam SAADÉ**

Prerequisites : Knowledge in building materials / Reinforced concrete calculation- Dimensioning

- Course 1 (3h): concretes made of alternative materials ie: recycled granules
- Project - session 1 (4h): Presentation of a building project with 2 dimensioning alternatives
- Course 2 (3h): Environmental and regulatory stakes in the building field
- Project - session 2 (4h) : simplified environmental evaluation
- Course 3 (3h): introduction to Lifecycle analysis
- Projet - session 3 (4h) : simplified environmental evaluation





## ECO-FRIENDLY BUILDING - TEACHING UNIT UE 5

Subject Research and innovation project

3 ECTS

Language : FR/EN

Coefficient 2

Lectures - 7 h

Autonomous work load - 30 h

Responsible persons : Sabrina PERLO - Thouraya SALEM - Svetlana VUJOVIC - Philippe PAVIS d'ESCURAC

Prerequisites : Basic knowledge in building engineering

- This project follows the project of bibliographical research of Semester 7
- Developing an application linked to the bibliographical research
- Analyzing and interpreting results

3 deliverables are expected at the end of the project (project advancements evaluated but not marked):

- A report
- An oral presentation
- A poster

### Project

Topics are linked to 3 themes taught at ESITC Paris: Eco-friendly building, Agile building and 4.0 building and developed in ESITC Paris laboratories (LE3, LASSi et ESILab)

These projects can be suggested by laboratories, start-ups, companies, researcher- professors from ESITC Paris



## AGILE BUILDING - TEACHING UNIT UE 6

Subject Works planning

3 ECTS

Language : FR/EN

Coefficient 1

Lectures - 28 h

Autonomous work load - 4 h

Responsible person : **Jean GOH**

Prerequisites : Works organization and planning

- Day 1

What is « planning »?

Planning basics

Introduction to IMSProject

- Day 2

Exercise MSProject / Practical work

- Day 3

Project on MSProject

- Day 4

Projet sur MSProject

- Day 5

Project advancement

Project hand-in

Project

Planning works on computer





## AGILE BUILDING - TEACHING UNIT UE 6

Subject Dynamics of Soils and Structures

3 ECTS

Language : FR/EN

Coefficient 1

Lectures - 28 h

Autonomous work load - 5 h

Responsible person : **Lucas LENTI - Jean-François SEMBLAT**

Prerequisites : Basic knowledge in physics / Methods for solving differential equations

- Single Degree Of Freedom (SDOF) oscillator: equation of motion, free and forced vibrations, seismic response of SDOF system
- Seismic ground motion: response of layered soils: 1D transfer function, 1D/2D amplification
- Multiple Degree Of Freedom (MDOF) system: equation of motion, structure and properties of the stiffness matrix, lumped mass matrix, free and forced vibrations
- Seismic response of MDOF systems: equation of motion, modal decomposition, time integration, modal forces, maximum response, maximum forces

### Project

- Introduction to the FEM software CESAR-LCPC
- Simple framed structure: closed form solution and numerical analysis
- Analysis of the seismic response of a 1D soil column: transfer function, ground motion
- Two DoFs structure: modal characterization in the lab
- Two DoFs structure: numerical analysis of the seismic response from 1D ground motion.



## **AGILE BUILDING - TEACHING UNIT UE 6**

Subject Bridge building project

2 ECTS

Language : FR/EN

Coefficient 1

Lectures - 15 h

Responsible person : Erica CALATOZZO

Prerequisites : Knowing the main orders of magnitude of civil engineering structures

- Bearings and foundations. Building on shoring and falseworks
- Concrete bridges. Beam bridges
- Cantilever bridges. Truss bridge. Mixed bridges
- Big civil engineering structure





## ADAPTABLE BUILDING - TEACHING UNIT UE 6

Subject Risk management

2 ECTS

Language : FR/EN

Coefficient 1

Lectures - 9 h

Responsible person : Xavier TOUZE

Prerequisites : Basic principles regarding the building contracts and the main actors involved in a construction project

- This course will deliver knowledge of the risk exposure and advice for structuring an efficient risk management approach, with an understanding of the contractors' liabilities
- Specificity of a project
- Identifying project risks
- Quantifying the risk
- Treatment: accept, avoid, mitigate, share, transfer
- Contingency plan
- Insurance solutions



## TE 4.0 BUILDING - ACHING UNIT UE 7

Subject Management de Projet

3 ECTS

Language : FR/EN

Coefficient 1

Lectures - 35 h

Autonomous work load - 10 h

Responsible person : **Hubert DULAURROY - Marc POUPINEL**

Prerequisites : Project management in groups

- Definition and Lifecycle
- Initiating a project
- Carrying out and finalizing a project
- Management of the different parties
- Project managers 'approach

### Project

Project management simulation. In groups of 4, students will have to develop an innovation project: cooperative habitat with low carbon footprint and positive energy





#### 4.0 BUILDING - TEACHING UNIT UE 7

Subject BIM -SIG-BIM Convergence

2 ECTS

Language : FR/EN

Coefficient 1

Lectures -12 h

Autonomous work load - 5 h

Responsible person : **Hervé HALBOUT**

Prerequisites : Basic IT skills

- Basics :

SIG: from 2D to 3D

SIG, 3D modelling, BIM/MN: Who and what for

BIM and SIG stakes: convergence et complementarity

Data structure and formats for integration

Exchange formats: standards

Software

Impacted jobs

Project

Project SIG-BIM / Tools for information management

Project mixing SIG, CAO/DAO and BIM/MN data



#### 4.0 BUILDING - TEACHING UNIT UE 7

Subject - BIM - Information management Tools

2 ECTS

Language : FR/EN

Coefficient 1

Lectures - 12 h

Autonomous work load - 5 h

Responsible person : **Benoît MARECHAL**

Prerequisites : Basics CAD and BIM

- 3D Tools and collaborative methodology :

Collaborative platform

Platforms: Who and what for?

Types of platforms: Cloud / Private / Public

Trimble Quadri elements

Structuring a collaborative modelling

Task concept, open management of multi-editor data

Project

Project SIG-BIM / Tools for information management

Project mixing SIG, CAO/DAO and BIM/MN data

- Using Quadri Server/ Quadri Desktop / Easy Access

- Integrating exported filtered data





#### 4.0 BUILDING - TEACHING UNIT UE 7

Subject - Asset Management

3 ECTS

Language : FR/EN

Coefficient 1

Lectures -18 h

Autonomous work load - 10 h

Responsible person : **Ahmed SBARTAI**

Prerequisites : BIM and SIG-BIM tools

Introduction to asset management :

- Origin, birth and needs of asset management
- Assets and services
- Municipal world and urban planning
- Strategies and models of asset management over a life cycle
- Funding methods
- Directions and standards
- Risk management and optimized decision making

Projet

Building asset Management plan using BIM tools





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