

École Supérieure d'Ingénieurs des Travaux de la Construction

INTERNATIONAL ENGLISH SEMESTER 2021 / 2022

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SUSTAINABLE BUILDING - TEACHING UE 5 3 ECTS Suject Environment Language : English Coefficient 1 Lectures - 26 h Automous work load Responsible persons : Joseph AKUNNA - Svetlana VUJOVIC

Prerequisites : Null.

· Surface water/groundwater : Water Quality Parameters (Physical, Chemical and Biological parameters)

 \cdot Water pollution sources and impact : Nonpoint Source Pollution and Point Source Pollution

 \cdot 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

 \cdot 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 Hierarch

 \cdot 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 Automous 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

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SUSTAINABLE BUILDING - TEACHING UNIT 5

Subject Building and energy transition 3 ECTS Language : FR/EN Coefficient 1 Lectures - 17 h Automous 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, Europ, 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 \dots
- 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 Automous work load - 10 h Responsible person : Franck FAUCHEUX

Prerequisites : Knowledge in worksite organizatiion 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 Automous 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 evalution
- Course 3 (3h): introduction to Lifecycle analysis
- Projet session 3 (4h) : simplified environmental evalution



ECO-FRIENDLY BUILDING - TEACHING UNIT UE 5

Subject Research and innovation project 3 ECTS Language : FR/EN Coefficient 2 Lectures - 7 h Automous 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 Automous 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

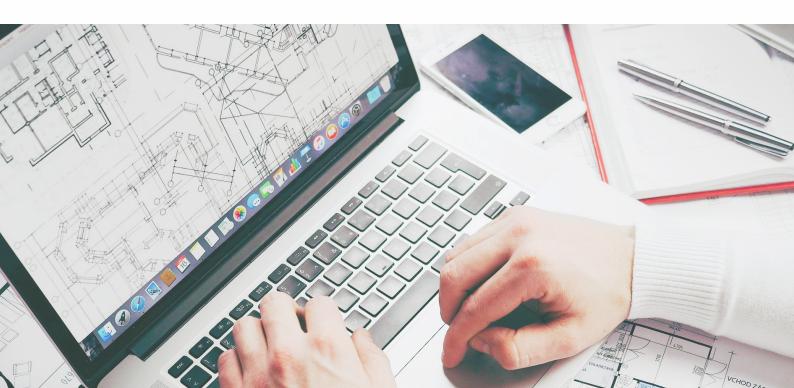
- Day 4

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 Automous 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

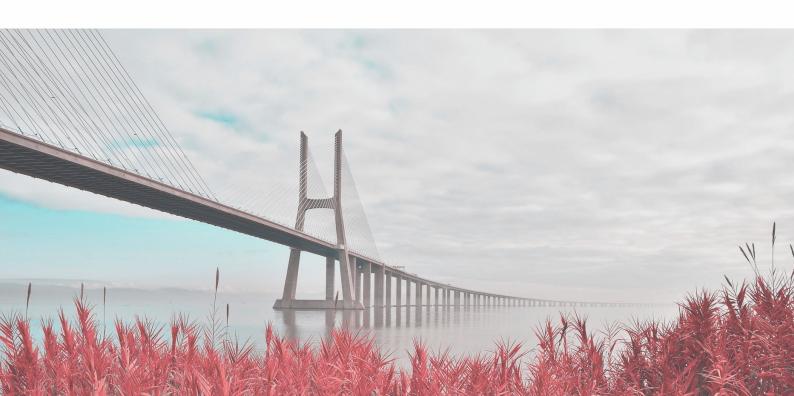
- Introduction to the FEM software CESAR-LCPC
- Simple framed structure: closed form solution and numerical analysis
- Analysis of the seismic response of a 1D soil column: transfer function, ground motion
- Two DoFs structure: modal characterization in the lab
- Two DoFs structure: numerical analysis 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 Automous work load - 10 h Responsible person : **Hubert DULAUROY - 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 Automous 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 Automous 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 Automous work load - 10 h Responsible person : **Ahmed SBARTAI**

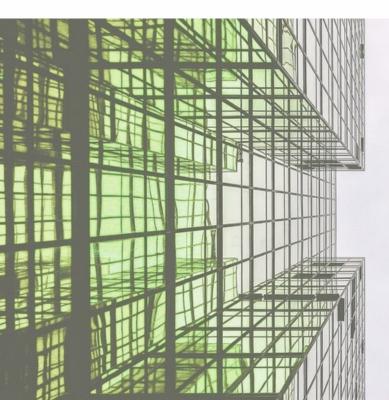
Prerequisites : BIM and SIG-BIM tools

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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