l'École des Ingénieurs de la Ville de Paris

Department Construction / Environment

Construction Division : courses

First year

Second year

Second year (after)

Third year

First year

Environment and Sustainable Development

Target skills / Learning outcomes

Understanding of the complexity of environmental issues.
Specific knowledge in areas such as: noise, odour control in wastewater treatment pl ants, landscape, sustainable management of green spaces, conservation at a nation al level, reducing onsite nuisance

Program

Lecture 1 :

- General presentation and teaching organisation

Lectures 1 and 2 :

- Planning
- Conservation

Lecture 3 :

- Sustainable urban development
- Environmental management of green spaces
- Sustainable development and urban landscapes

Lecture 4 : Landscape

- Definitions of landscape, principles
- History of gardens
- Presentation of projects

Lecture 5 : Noise considerations

- Definitions and physical characteristics of noise and sound
- Parameters influencing noise propagation
- Anatomy of the ear, physiopathology of hearing
- Physical and psychological effects of noise
- Protection for workers and work place noise regulations
- Noise stakeholders in Paris
- Principal noise regulations
- Noise classifications
- European directive 2002/49/ce, relating to the management of environmental noise
- Major principals for combatting noise
- Politics of combatting noise in Paris
- Using noise maps in planning studies of Paris
- Principles for the treatment of noise in a room
- Problems of noise from neighbours

Lecture 6 : Odour Management

- Causes of odours
- Nature and characterisation of sanitation odours
- Gas clearing in sewerage systems
- Odour removal processes in a wastewater treatment plant
- Measuring the olfactory impact of sewage on the environment

Lecture 7 : Technology for reducing urban pollution: greater acceptance in urban site

- Urban worksites
- Nuisance perception
- Nuisance management plan

Organization of the course

Number of hours : 27h
ECTS : 2
Assessment : Exam 1.5h

First year

Energy and Climate

Target skills / Learning outcomes

Understanding of current energy and climate issues.
Specific knowledge in areas such as: risk management, climate change, urban climates, energy and climate policies, the roles of transport and buildings.

Program

Lecture 0 : Overview and organisation

Lectures 1 & 2 : Risk Management

- Notion of risk
- Urban resilience

Lecture 3 : Tomorrows Climate

- Climate Change : Brief history
- Climate change : Phenomenon, impacts

Lecture 4 : Energy issues

- National and international energy and climate policies
- Renewable energy

Lecture 5 : Reducing and adapting to climate change : Paris case study

- Paris' Carbon footprint
- Climate plan for Paris
- Thermography

Lecture 6 : The role of transport : Mobility, transport and energy consumption

- Transport and climate change
- New practices and innovations

Lecture 7 : The role of buildings

- Buildings and climate change
- New practices and innovations

Organization of the course

Number of hours : 27h
ECTS : 1
Assessment : Exam 1.5h

First year

Project : Impact Study

Target skills / Learning outcomes

Put into practice skills acquired in the course “Environment and Sustainable Development”.
Understand issues of environmental impact.

Program

Class 1 : Environmental Impact Studies

Tutorials 1, 2 and 3 : Production of and environmental impact analysis for a real project.

Teachers will aid students to address issues of :

- Characterising an area
- Environmental impacts of a project (construction and operation)
- Compensation measures

Organization of the course

Number of hours : 9h
ECTS : 1
Assessment : Written report

First year

Environment Project

Target skills / Learning outcomes

In depth study of a topic related to energy and climate.
Capacity to analyse, critique and establish and argument.

Program

For the environment project the students are divided into 4 groups. The objective for each team (3-4 people) is to complete a study on a given subject, relating to the theme of “energy/climate”. Four types of project are proposed: summary in the field of water, urban resilience project, carbon footprint project, prospective vision project for the Paris area.

For each project, students must undertake the following steps :

- Understanding and formalisation of the project
- Identification of the problem to be treated in the project
- Analysis
- Proposal of “solutions”, conclusions

Organization of the course

Number of hours : 12h
ECTS : 2.5
Assessment : 50% written report, 50% presentation

First year

Thermic

Objectives

This module covers the different disciplines required to characterise the interior atmospheres of buildings, specifically here the thermal aspects. Students will become familiar with the fundamental mechanisms of heat exchange and the design rules to achieve comfort conditions in accordance with current regulations.

Target skills / Learning outcomes

Knowledge of thermal properties in buildings.

Program

The course content is as follows :

- Heat transfer elements (conduction, convection, radiation) and losses in buildings
- Concept of thermal comfort, different modes of heat emission
- Building ventilation : Objectives, calculations
- Thermal regulations : Historical, RT2005-RT2012, Ubat
- Calculations of heating consumption
- Air-conditioning

Organization of the course

Number of hours : 15h
ECTS : 1.5
Assessment : Thermal section of Engineering Construction Project

First year

Materials

Target skills / Learning outcomes

Allows the future engineer to choose the most appropriate material for the problem and the techno-economic context in which it is situated. The student will gain awareness of innovation and research in the field of civil engineering materials.

Program

General Introduction

Hydraulic Concrete :

- Composition
- Fresh concrete, from unset concrete to hardened concrete
- Deformation and rupture of hardened concrete, durability
- Special use concrete: fibre concrete, high and very high strength concretes
- Major standardised concrete tests

Metals :

- Manufacturing, structure, corrosion
- Metal deformation and failure

Resins and polymers :

- Polymer structures
- Physical and mechanical properties of polymers
- Area of application and sustainability

Pavement materials :

- Aggregates, bitumen, hydrocarbon materials
- Hydraulic binders and untreated cementitious materials

Geosynthetics :

- Material presentation, functions, principal uses
- Implementation and control, material durability
- Standardisation, certification, CE marking (European Conformity)

Organic matrix composites :

- Manufacturing of various composites
- Mechanical properties of composites, composite failure

Organization of the course

Number of hours : 45h
ECTS : 2
Assessment : Final Exam

First year

Solid Mechanics

Target skills / Learning outcomes

The subject will enable students to acquire basic skills that will form the scientific foundation of their later engineering studies. Fundamental concepts covered relate to mechanics, particularly continuum mechanics. This course is a preparatory course for further applications of mechanics and civil engineering (material strength, soil mechanics, ...).

Program

Principles of mechanics :

- Generalities, basic kinematics
- Concept of stress, definition of power and work
- Principle of virtual work

Mechanics of discrete systems :

- Kinematics, kinetics, degree of freedom of a system
- Lagrange's equation, equilibrium of a system
- Problem formulation and implementation in equations
- Stability around a position of equilibrium in a system

Continuum mechanics :

- Kinematics, strain tensor
- Small deformations hypothesis, compatibility equations
- Stress Tensor, principle of virtual work
- Equilibrium equations, boundary conditions
- Stress vectors, Mohr's circles, principal stresses
- Hooke's law
- Formulation in Cartesian, cylindrical and spherical coordinates
- Navier's equation
- Plane elasticity (planar stress and strain)
- Airy's function, applications
- Dimensioning criteria (Tresca, von Mises), general compatibility

Organization of the course

Number of hours : 51h
ECTS : 3.5
Assessment : 1 end of subject exam

First year

Acoustics

Target skills / Learning outcomes

This subject covers the various disciplines that allow one to characterise acoustic environments inside buildings. Students will learn the fundamentals of acoustics and calcuation rules to chaieve comfort conditions in accordance with regualtions.

Program

- General concepts of acoustics : Propagation equation, speed, wavelength, sound pressure level, spectrum, sound field
- Building acoustics : Interface between two materials, transmission, insulation, absorption, dissipation, reverberation, practical solutions
- Outdoor acoustics : Free field, space and obstacles, screens, road and rail noise, calculation methods, noise and urban planning
- Regulations

Number of hours : 18h
ECTS : 1.5
Assessment : Engineering Construction Project Report , acoustic section

Organization of the course

First year

Waste Management

Objectives

This module is composed of two distinct parts :

- The first enables students to understand the general context of household waste management (legal and regulatory, socio political, economic and technical)
- The second enables students to build the skills for treatment and upcycling of waste.

Program

- National waste policy : Legislation and regulations regarding collection, treatment and recycling of waste
- The socio-political context : Historical sociology of waste, French political and administrative organisation
- The economic context : The systems and techniques for waste treatment
- Creating units for water treatment, case study: SYCTOM for the Paris region
- Preventing household waste
- Management of household waste and sustainable development: the energy problem
- Mobilising factors of management strategies for household waste

Organization of the course

Number of hours : 18h
ECTS : 1.5
Assessment : Summary notes

First year

Fluid Mechanics

Objectives

This subject will introduce the fundamentals of mechanics of incompressible Newtonian fluids (physical properties, general theories, equations and models, solving methods) in order to prepare students for this important area of urban planning. However, this subject isn't only limited to theory but will also allow students to make real applications to existing problems (predimensioning, estimating of order of magnitude, calculating forces, etc.)

Program

- Session 1 : Introduction : Why study fluid mechanics ?
Lecture : Generalities of fluid mechanics. Notations, assessments, introduction to continuum mechanics, law of the behaviour of incompressible viscous fluids, NavierStokes equation, Poiseuille's laminar flow.

- Session 2 : Generalities of fluid mechanics
Energy balancing, perfect fluid model, dissipation, boundary layer, forces on solids, dimensional analysis, reduced model theory.

- Session 3 : Introduction to turbulent flows
Instability, turbulence phenomenon, Reynolds equation, turbulent viscosity, Kolmogorov analysis, mixing length model.

- Session 4 : Calculation of energy losses
Poiseuille turbulent flow, linear energy losses, singular energy losses, dimensioning of pipe networks.

- Session 5 : Workshop n°1

- Session 6 : Marine Flows
Introduction to geophysical flows. Coriolis forces, Saint-Venant's equations in 2D, wind modelling, friction modelling, dissipation modelling.

- Session 7 : River and open channel flow
Flow assumptions, Saint-Venant's equations in 1D, friction modelling, permanent and near permanent flows in rivers and channels.

- Session 8 : Modelling of sediment transportation in the environment
Equation for the transport-diffusion of a scalar, turbulent diffusion, critical stresses, sediment transportation calculations, hydraulic simulations.

- Session 9 : Workshop No. 2

Number of hours : 30h
ECTS : 2
Assessment : Quiz (20%) and final exam (80%)

Second year

Reinforced Concrete

Objectives

The objective of the course is to present a summary of the principles of design and implementation of elements of reinforced concrete structures.

Target skills / Learning outcomes

Master the design, sizing and implementation principles of elements of reinforced concrete structures.
Design a basic structure using specialised software.

Program

- Lecture 1 : History of reinforced concrete, materials, and principles of reinforced concrete
- Lecture 2 : Anchors, durability and structural arrangements
- Lecture 3 : Load reduction
- Lecture 4 : Design of reinforced concrete structures
- Lecture 5 : Cross ties
- Lecture 6 : Centred compression in columns
- Lecture 7 : Beams in bending, design for ultimate limit state
- Lecture 8 : Beams in bending, design for serviceability limit state
- Lecture 9 : T-beams in bending, design for ultimate limit state
- Lecture 10 : Beams, design for shear forces
- Lecture 11 : Continuous beams, design for ultimate limit state
- Lecture 12 : Slabs in bending
- Lecture 13 : Columns in combined bending, buckling
- Lecture 14 : Superficial foundations
- Lecture 15: Concrete walls
- Lecture 16 : Supports

- Tutorial 1 : Introduction to Autodesk Robot Structural Analysis Professional
- Tutorial 2 : Introduction to Autodesk Robot Structural Analysis Professional
- Tutorial 3 : Introduction to Autodesk Robot Structural Analysis Professional

Organization of the course

Number of hours : 39h
ECTS : 3.5 (with Eurocodes and RDM refresher course)
Assessment : 3h Exam

Second year

Prestressed Concrete

Target skills / Learning outcomes

Students will acquire the basic concepts to identify areas of use of prestressed concrete and will be able to follow any conventional project using this technique

Program

- Principle and realisation of prestressing
- Assessment of the prestressing force
- Normal stresses in an isostatic beam for the ultimate limit state
- Study of continuous beams with different types of cables, justification of normal stresses for limit states
- Resistance to shearing, concepts of ultimate moment
- Case studies, application in reservoirs

Organization of the course

Number of hours : 16.5h
ECTS : 1
Assessment : 1 Exam

Second year

Metallic Construction

Target skills / Learning outcomes

In this class students will learn the procedures for steel construction and the regulations for using this material. They will gain the knowledge for preliminary sizing in buildings constructed in metal..

Program

Steel construction :

- Structural steels
- The work of structural steels
- Steel products (beams, standard flat and hollow sections)
- Regulations
- Assembly methods

Framed structures :

- Floors (simple, mixed concrete-steel)
- Roofing
- Facades
- Columns

Horizontal and vertical stability

Load bearing beams

Organization of the course

Number of hours : 22.5h
ECTS : 1
Assessment : 1 Exam

Second year

Eurocodes

Target skills / Learning outcomes

To master the concepts of reliability and the fundamental principles of structural safety introduced by the Eurocodes.
Model and calculate the forces acting on a basic structure.

Program

- Lecture 1 : Presentation of the Eurocodes
- Lecture 2 : Reliability of structures
- Lecture 3 : Live loads, dead loads, temporary loads
- Lecture 4 : Loads from fire, accidents or seismic activity
- Lecture 5 : Snow loading
- Lecture 6 : Wind loads

Organization of the course

Number of hours : 6h
ECTS : 3.5 (with reinforced concrete and RDM refresher course)
Assessment : 1 Exam

Second year

Foundations

Target skills / Learning outcomes

Students will learn the necessary basics of this engineering science for the variety of problems and the complexity of soils they will encounter in order to provide the best solutions (foundation choice) with a minimum cost and giving the best security for designed structures.

Program

- Calculation of stresses imposed by structures
- Calculation of settlement using oedometer tests and results from pressure meters
- Calculation of superficial foundations (static method)
- Calculation of superficial and deep foundations (Menard's method)
- Calculation of retaining structures
- Calculation of specific structures
- Slope stability

Organization of the course

Number of hours : 16.5h
ECTS : 1
Assessment : 1 Exam

Second year

RDM refresher cours

Organization of the course

Number of hours : 9h
ECTS : 3.5 (with Eurocodes and reinforced concrete)

Geotechnics

Organization of the course

Number of hours : 4.5h
ECTS : 3 (with soils mechanics)

Soils mechanics

Organization of the course

Number of hours : 30h
ECTS : 3 (with geotechnics)

Second year

Hydrology

Objectives

Provide a basic understanding of hydrology (general ideas about water resources, concept of draining basins, surface and underground hydrological processes).
Give an overview of hydrology problems faced by engineers.
Manipulate conventional tools to solve these problems.

Program

Each session will be illustrated by examples and will include application exercises (simple calculations doable with a calculator). Wherever possible, lecturers will choose examples relating to the subject of the project.

- Water resources and risks : Discussion of some accepted ideas
  To address through a few simple questions the major issues related to water and the problems faced by engineers. Give an overview of the models.

M.-H. RAMOS, 3 hours

- Drainage basins, hydrological cycle and processes
  Explain the idea of drainage basins and review the surface hydrological processes (rain, evapotranspiration, runoff) using the principal techniques for measuring and/or estimating.

M.-H. RAMOS, 3 hours

- Groundwater and water tables
  Describe the infiltration process, the flow mechanisms in saturated and unsaturated zones, using associated models. Introduction to pumping.

J. TOURNEBIZE, 4,5 hours

- Adjustment laws for the predetermination of rainfall and runoff
  Introduce and manipulate statistical tools for estimating rainfall and flow.

C. PERRIN, 3 hours

- Tools for the engineer
  Present some formulas or tools for solving practical problems, in particular the case of ungauged basins. Complete a comparison exercise for a case study.

C. PERRIN, 3 hours

- Exam: 1,5 hours

Organization of the course

Number of hours : 18h
ECTS : 1
Assessment : Exam

Second year

Potable Water

Program

- Sessions 1 and 2 : Dimensioning of potable water networks
- Sessions 3 and 4 : Dynamic modelling of potable water networks (tutorial using PICCOLO software in 2 groups)
- Session 5 : Water purification

Organization of the course

Number of hours : 33h
ECTS : 2.5
Assessment : Exam

Decontamination

Program

- Sessions 1 and 2 : Dimensioning of sewerage networks
- Sessions 3 and 4 : Dynamic modelling of sewerage networks (tutorial using CANOE software in 2 groups)
- Session 5 : Devices for stormwater management, in 2 groups
- Session 6 : Pollutant flow and wastewater treatment, in 2 groups
- Sessions 7 and 8 : Site visits: alternative management techniques for rainwater in an urban environment, and waste water treatment plant. In 2 groups
- Session 9 : Sludge treatment

Water decontamination project

Organization of the course

Number of hours : 30h
ECTS : 5

Third year

Air Quality Management

Target skills / Learning outcomes

Knowledge of the techniques for measuring and remedying air pollution

Program

This course aims to enable students to learn the techniques for measuring and remedying air pollution. It includes the following elements :

- The physico-chemical principles of air pollution
- Air quality
- Regulations

Organization of the course

Number of hours : 15h
ECTS : 0.5
Assessment : Air quality study section of Urban Space project
Course Manager : Gérard THIBAUT