

CIVIL ENGINEERING



Niveau d'étude
visé
BAC +5



Durée
2 année(s)



Composante
INSTITUT
NATIONAL
DES SCIENCES
APPLIQUEES
TOULOUSE



plugin.odf:Domaine
régional
Urbanisme et
construction,
Énergétique
- Énergétique
de l'habitat,
Génie civil -
Travaux publics
- Bâtiment

Présentation

Objectifs

An engineer in Civil engineering is able to design and size buildings and their services within a transverse training.

Specialities of the 4th year ("Building and Public Works" and "Building Services") provide deepened knowledge in sizing methods and design in the domain of buildings for the first one and in the domain of building services for the other one.

Specialities during the 5th year allow the student to choose his own way among public works, building engineering, town planning, high environmental quality, renewable energy and global energetic analysis.

Moreover, an "Architecture" module followed by about 12 students gives some necessary knowledge for entering the 4th year in further studies in an architecture school.

Et après

Conditions d'accès

Diplôme d'ingénieur habilité par la commission des titres d'ingénieur, 5 années d'études après la fin des études secondaires, confère le grade de Master.

Baccalauréat ou équivalent pour une admission en première année

Admission sur titre possible en année 2, 3 ou 4.

Admission

A tous les niveaux, l'admission aux INSA s'effectue par concours sur titres, dossier et éventuellement entretien ; le dossier rassemble des éléments d'évaluation obtenus par ailleurs par le candidat.

Plus de renseignement sur : <http://www.insa-toulouse.fr/fr/admissions.html>

Et après

Poursuite d'études

Une formation à la recherche est assurée en 5ème année, à travers la réalisation d'un projet recherche, en liaison avec les problématiques traitées au « Laboratoire Matériaux et Durabilité des Constructions » (LMDC).

La formation à la recherche est réalisée par l'Ecole Doctorale « Matériaux - structures - mécanique » dans le cadre du Master Recherche, en parallèle avec la 5ème année INSA, puis du doctorat.

Un Master Recherche commun avec l'UPS est aussi envisageable. (voir le paragraphe cycle doctoral, recherche).

Une initiation à la recherche est intégrée à l'enseignement de 4ème année (présentation des outils de la recherche et projet de recherche tutoré).

Insertion professionnelle

Emplois dans le secteur privé

-Bureaux d'études techniques et d'ingénierie, de contrôle et de méthode, d'assistance maîtrise d'oeuvre

- Entreprises de bâtiment, de travaux publics ou de gestion de l'énergie

-Industries des matériaux, des procédés de construction et des matériels de chauffage et de conditionnement d'air (ex : VINCI, COLAS, SCETAUROUTE, EGIS, MALET, EUROVIA, FAYAT, DV Construction...)

Emplois dans le secteur public

-Services techniques des administrations nationales et des collectivités locales

-Grandes entreprises de l'Etat telles qu'EDF, RFF, SNCF

-Sociétés concessionnaires d'autoroutes pour leurs activités d'infrastructures

Ils peuvent aussi devenir enseignants-chercheurs dans les établissements d'enseignement supérieur, après l'obtention d'un Doctorat.

Infos pratiques

Lieu(x)

 Toulouse

Programme

FOURTH YEAR INSA TOULOUSE

Autumn semester

Concrete structures 1	6 crédits	68h
Indoor building physics	4 crédits	65h
Improve your management abilities	4 crédits	45h
Quality Safety Environment, Sport	6 crédits	86h
Geotechnics 2	4 crédits	47h
Advanced non linear and computational structural and solid mechanics	6 crédits	51h

Concrete structures 1	6 crédits	68h
Indoor building physics	4 crédits	65h
Improve your management abilities	4 crédits	45h
Quality Safety Environment, Sport	6 crédits	86h
Building networks (hot and cold water networks, aeraulics)	5 crédits	66h
Building devices (thermodynamic devices, electricity)	5 crédits	70h

Spring semester

Building project	5 crédits	74h
Construction environment 2	3 crédits	36h
Initiation to research	3 crédits	45h
Improving autonomy and building a professional project	4 crédits	39h
Communicating within organizations	6 crédits	75h
Steel & timber structures	4 crédits	86h
Prestressed concrete structure & bridges	5 crédits	67h

Air conditioning	5 crédits	66h
Equipments Acoustics	4 crédits	48h
Building project	5 crédits	74h
Construction environment 2	3 crédits	36h
Initiation to research	3 crédits	45h
Communicating within organizations	6 crédits	75h
Improving autonomy and building a professional project	4 crédits	39h

FIFTH YEAR INSA TOULOUSE

Autumn semester

Human Resources Management and Group Work	6 crédits	75h
HVAC - Building physics	7 crédits	99h
Future buildings	6 crédits	72h
Methods and English	6 crédits	
Human Resources Management and Group Work	6 crédits	75h
Bridge Project & Conferences	7 crédits	115h
Road engineering and structures	6 crédits	70h
Methods and English	6 crédits	

Human Resources Management and Group Work	6 crédits	75h
Frames and Composite steel and concrete structures	6 crédits	75h
Concrete structures 2 & masonry	7 crédits	105h
Methods and English	6 crédits	
Eco building & Environmental impact	5 crédits	60h
BIM Environment	5 crédits	
Project ownership assistance	5 crédits	
ID-RIMS	30 crédits	

Spring semester

Training period (5th year)	21 crédits	2h
Training period (4th year)	9 crédits	1h

Concrete structures 1



Présentation

Description

- * Basic rules of structural design for concrete structures according to Eurocodes.
 - * Actions and combinations of actions on structures.
 - * Foundations: actions on foundations, pad footings, pile caps.
 - * Choice of materials according to mechanical and environmental performance criteria.
 - * Effects of horizontal actions on bracing walls.
 - * Design and verification of simple elements:
- Vertical load-carrying components: columns and walls.
 - Horizontal load-carrying components: continuous concrete beams, floors (continuous supported slabs).
 - Bracing wall with or without windows.

Objectifs

At the end of this module, the student will have understood and be able to explain (main concepts):

Prominent design parts (bearing frames, foundations, bracing systems), and calculation of reinforced concrete buildings, submitted to vertical or horizontal loads.

The student will be able to:

Identify actions on the structures and environmental conditions, understand and predict the mechanical behavior of a structure, argue its technological choices (type of components and carrying systems, strength class of materials), design the various structural elements of a common construction and possess the needed basis to go further into particular domains, enrich a numerical model.

Pré-requis nécessaires

Structural analysis and engineering

Reinforced Concrete and prestressed concrete

Infos pratiques

Lieu(x)

➤ Toulouse

Indoor building physics

 **ECTS**
4 crédits

 **Composante**
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APPLIQUEES
TOULOUSE

 **Volume horaire**
65h

Présentation

Description

Programme (detailed contents):

- Thermal and acoustic Comfort;
- Sensitizing with RT2012, the practice of the thermal insulation, bioclimatic concepts and labels HQE, LEED, BREAM ;
- Aerolics: principles to design a network;
- Heating: heat production, distribution and emission;
- Air conditioning: moist air diagram, elementary evolutions, design the elements of a air handling unit.
- Acoustics: physical acoustics, sound insulation of buildings, acoustics of the rooms, lawful aspects.

Objectifs

At the end of this module, the student will have understood and be able to explain (main concepts):

- useful criteria to qualify comfort;

- basic knowledge for designing a system of heating, ventilating and air conditioning (HVAC);
- to be sensitized to energy saving in HVAC systems and to thermal code RT;
- basic knowledge to treat the sound insulation of buildings.

The student will be able to:

- To design a simple installation of heating and air conditioning;
- To analyze the operation of the elements of an air conditioning and heating installation;
- To calculate the sound insulation of a wall, the time of reverberation of a room and to propose a treatment;
- To calculate the direct and reverberated acoustic fields;
- To enrich a numerical model.

Expected skills :

- * design a basic HVAC installation
- * analyze the operation of the elements of a heating and air conditioning system ;

- * calculate the sound insulation of a wall , the reverberation time of a room and offer treatment

Pré-requis nécessaires

Heat transfer and Fluid Mechanics I & II

Infos pratiques

Contacts

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Lieu(x)

➤ Toulouse

Improve your management abilities

 **ECTS**
4 crédits **Composante**
INSTITUT
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DES SCIENCES
APPLIQUEES
TOULOUSE **Volume horaire**
45h

Présentation

Objectifs

At the end of this module, the student will have understood and be able to explain :

- * The basic rules of business law
- * The objectives, principles and means of marketing
- * The principles and procedures of financial diagnosis and / or investment

The student will be able to :

Apply principles and rules of management and law in simple situations. Take into account the parameters of the management (customer needs, cost effectiveness and legal compliance).

Infos pratiques

Contacts

Education manager

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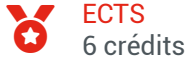
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Lieu(x)

> Toulouse

Quality Safety Environment, Sport



Présentation

Description

Acquire a culture of QSE and understand the principles of QSE management in the civil engineering construction.

- Risk prevention (E-Learning)
- Environmental Management
- Security Management
- Quality Management through LEAN Management

The conferences are given by civil engineers .

The "Risk Prevention" is an E-Learning module in partnership with OPPBTP

Implementation of a collective project, linked to the chosen physical and sports activities, through a deeper practice and knowledge of these PSAs.

Organization (process):

Part1: This teaching takes place in the form of conferences and independent projects to deepen certain key concepts (half a day / week).

Part 2: Physical and sporting activities (2h / week)

Infos pratiques

Contacts

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Lieu(x)

➤ Toulouse

Geotechnics 2



ECTS
4 crédits



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DES SCIENCES
APPLIQUEES
TOULOUSE



Volume horaire
47h

Présentation

Description

Programme :

Geotechnical:

- 5 Active and passive soil pressure.
- 6 Verification of gravity and sheet pile walls.
- 7 Principal in situ testing.
- 8 Shallows foundations.
- 9 Deeps foundations.

Special geotechnical works

Objectifs

Geotechnical design:

Design and verify foundations and earth retaining wall with Eurocode 7.

Determinate the active and passive soil pressure. Determinate forces of earth pressure.

Design a retaining wall.

Analyze famous in-situ testing.

Design shallows and deeps foundations.

Pré-requis nécessaires

Geotechnics 1

Infos pratiques

Contacts

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Lieu(x)

➤ Toulouse

Advanced non linear and computational structural and solid mechanics

 **ECTS**
6 crédits

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TOULOUSE

 **Volume horaire**
51h

Présentation

Description

Programme (detailed contents):

Use limitations of first order analysis (linear analysis)

Non linear geometry

Local buckling: buckling, Lateral buckling, Lateral torsional buckling

Global buckling : Rayleigh-Timoshenko method

Non linear behaviour of materials

Yielding : constitutive laws and criteria, cross-section yielding, limit analysis of structures

Viscoelasticity: constitutive laws, stress relaxation and creep. Long term strain calculation using Laplace transform

Finite Element Method

Variational formulation, Principe of virtual power

Discretization

Assembly of system matrices and computation

Element properties

BEAM

PLATE-SHELL

SOLID

Stationary analysis, dynamic analysis (eigenvalue calculation), buckling

Objectifs

At the end of this module, the student will have understood and be able to explain (main concepts):

The use limitations of the linear mechanic

The different phenomena of buckling corresponding to different scales : cross-section, members, global structure

Analysis of structures with plastic hinges

Viscoelastic analysis, constitutive model of viscoelasticity, application to creep, stress relaxation and calculation of long-term strain

The structure modelling using Finite Element Method

Elements properties : BEAM, PLATE and SHELL, SOLID

The student will be able to:

Calculate the global buckling of structure

Calculate the local buckling of structural members

Calculate the ultimate load bearing capacity using plastic hinge method

Calculate a structure using Finite Element Software

Pré-requis nécessaires

Structural analysis and engineering

Infos pratiques

Lieu(x)

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Building networks (hot and cold water networks, aeraulics)



ECTS
5 crédits



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Volume horaire
66h

Présentation

To approach the lawful context (RT), aeraulic modeling (CFD, diffusion...), and to present demonstrative buildings.

Description

Program (detailed contents):

- * Hot water networks

In-depth presentation of the heating system (heat production, emission, distribution, operation)

Hydro-thermal performance of a heating system

- * Hydraulics

Based on the Technical Document 60-11: sizing of indoor hot and sanitary water devices, study of Legionella problem, sizing of storage systems, of pressure maintain devices. Sizing of sewage disposal.

- * Aeraulics

Increase public awareness of an the stakes of ventilation like to the movements of air out and in a building and to their "nonfatal" use in natural ventilation (VN). To learn how to choose and dimension an installation of ventilation (VN and VMC).

Organisation:

The technologies related to the heating systems are studied during regular classroom and a visit of a real heating network is planned.

Objectifs

At the end of this module, the student will have understood and be able to explain (main concepts):

1. The hydro-thermal characteristics of a heating system
2. The pressure distribution in a network
3. The control strategies applied to heating systems used in buildings
4. How to design indoor hot and cold sanitary water devices (Building hydraulic)
5. How to design air devices: transport, supply (Building air devices)

The student will be able to:

- Design hydraulic and air networks by using the methods exposed during the seminars
- Analyse the behaviour of existing heating systems
- Design and size a heating system for collective housing

Pré-requis nécessaires

Heat transfer and Fluid Mechanics I & II

Infos pratiques

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Lieu(x)

➤ Toulouse

Building devices (thermodynamic devices, electricity)

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5 crédits **Composante**
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TOULOUSE **Volume horaire**
70h

Présentation

Description

Program:

- * Applied thermodynamic

Reminder of thermodynamic basics (1st and 2nd principles), study of the devices through their cycle: vapor turbine, thermal motors, cogeneration... Power and efficiency calculations

- * Electricity

Study of the C15-100 of the UTE C 15-105 guide. Analyze of various protections relating to the safety of electrical installations:

- protection of the circuits (choice of the protection apparatus adapted to a drain);
- protections of the people (modes of neutral, differential protection);

- * Metrology

Metrology fundamentals, basics of uncertainty calculation, calibration. Practical application to real HVAC systems.

Organization:

Thermodynamics and Electricity : Lecture, seminar

Metrology: lecture, tutorials, lab work.

Objectifs

At the end of this module, the student will have understood and be able to explain (main concepts):

- The behavior and the design of classical thermodynamic devices used in buildings. (Applied thermodynamic)
- Protection and security techniques used in houses, collective housing or industrial buildings (Electricity)
- How to determine experimentally the energy balance of heating and cooling units (Metrology)

The student will be able to:

- Name and explain the protection and security techniques used in classical buildings
- Calculate thermodynamic devices efficiency (refrigeration, cogeneration...) and draw the corresponding cycles on thermodynamic charts
- Analyse experimental data and calculate the related uncertainty

Infos pratiques

Contacts

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Lieu(x)

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Building project



ECTS
5 crédits



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TOULOUSE



Volume horaire
74h

Présentation

Description

The students apply what they have learned during the previous semester in structural design.

The project is divided in three parts:

1) Technical equipments

Acoustic and thermal insulation, choice and design of air conditioning and heating equipments. Installation plan.

2) Structural design

Foundations: actions on foundations, pad footings, pile caps.

Vertical load carrying components: columns, concrete walls, timber walls.

Horizontal load carrying components: continuous beams, concrete floors (continuous supported slabs), timber floors

3) Environmental impacts

Mass and energy management and their environmental impacts, both during the construction process and the use period of the project.

Organisation:

Session of presentation, technical installation part, structural design part with technical conferences interspersed, environmental approach. The numerical model of the project is then updated.

Objectifs

At the end of this module, the student will have understood and be able to explain (main concepts):

Main stages of design of a concrete building for the frame as well as for the air conditioning and heating systems.

The student will be able to:

Identify and calculate actions on structure, determine the energetic demands, understand the mechanical behavior of a frame as a whole, design and calculate the main structural members and heating or air conditioning circuits, use and enrich a numerical model.

Pré-requis nécessaires

Structural analysis and engineering

Concrete structures 1

Infos pratiques

Contacts

Education manager

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Lieu(x)

➤ Toulouse

Construction environment 2



Présentation

Notions sur la logistique de chantier dans le domaine de la construction (supply chain, LEAN).

Description

The components covered are:

- Prevention and Fire Safety for buildings,
- Accessibility for disabled persons in buildings,
- Indoor Air Quality,
- General Approach of Logistics and Construction (LEAN)
- Sustainable development

A project about Prevention and Fire Safety illustrates the lessons

Courses are mostly carried out by engineers from the professional world.

Objectifs

Acquérir les approches réglementaires dans les domaines de l'Accessibilité et de la Sécurité Incendie dans les ERP. Sensibiliser aux problématiques de Qualité de l'Air Intérieur.

Infos pratiques

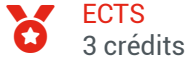
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Lieu(x)

➤ Toulouse

Initiation to research



ECTS
3 crédits



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APPLIQUEES
TOULOUSE



Volume horaire
45h

Présentation

Description

Program (detailed contents):

- How to publish a scientific paper
- How to achieve a scientific littérature review
- Fundamentals of a given scientific field
- Modelling and / or testing
- Summarizing the research project by the mean of a scientific paper and a speech
- 3 subjects are proposed each year, the student have to pick one.

Organisation:

This teaching proceeds with a single research project which includes :

- A short presentation of scientific journals and Zotero

- A lecture used to introduce the research context and the main equations
- The research project, organized by groups of 4 students
- A speech

The scientific report will be written in English during the project. English courses are tailored to help the student with this.

Objectifs

At the end of this course, the student will be able to explain :

- How the research results are disseminated / shared within the scientific community ;
- What are the main expectations of a scientific report ;
- The fundamentals of a specific scientific field (note that the topic is different every year).

The student will be able to :

- Search for a relevant scientific study in a database ;
- Use a numerical software to quote published scientific work.

- Summarize the main informations obtained during the research project by using the standards of a given scientific journal ;
- Make the information accessible to a lay audience.

Infos pratiques

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Lieu(x)

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Improving autonomy and building a professional project

 **ECTS**
4 crédits

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APPLIQUEES
TOULOUSE

 **Volume horaire**
39h

Présentation

Lieu(x)

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Objectifs

Construire une équipe projet, Approfondir ses connaissances,

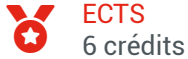
Investir le métier, les domaines d'activité, les fonctions.

L'étudiant devra être capable de :

- d'analyser avec les autres un problème posé (Identifier le problème, définir les axes d'approche dans un bilan interactif : organisation, physique, technique, stratégique, motivation, confiance...
- de décider ensemble (permettre à tout le monde d'exprimer son avis, ajuster et réguler sa conduite en fonction de l'analyse collective),
- d'identifier les ressources du groupe (sens critique, repérage des points forts et faibles de chacun).

Infos pratiques

Communicating within organizations



ECTS
6 crédits



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TOULOUSE



Volume horaire
75h

Présentation

Objectifs

The classes given in French will focus on :

- How to react to society's demand for technical and scientific information
- How to foster critical thinking in order to give appropriate answers when questioned about such issues
- How to communicate effectively in the workplace

The classes given in English will focus on the specific linguistic characteristics of English used in such contexts in order for the students to understand and master them.

The students will also be made aware of the specificity of professional communication within the English-speaking world

Module L2

The objectives, defined in reference to the CEFR for the 5 language activities, depend on the language studied - Chinese, German, Spanish - and the level of the student.

They can be consulted on :

<https://moodle.insa-toulouse.fr/course/view.php?id=44>

In certain cases, students may be authorised to follow an English module instead of another language.

Pré-requis nécessaires

For classes in English : mastery of general English.

Infos pratiques

Lieu(x)

> Toulouse

Steel & timber structures

 **ECTS**
4 crédits **Composante**
INSTITUT
NATIONAL
DES SCIENCES
APPLIQUEES
TOULOUSE **Volume horaire**
86h

Présentation

Description

Programme (detailed contents):

- * Review of industrial branches timber and steel.
- * Properties of used materials (timber, wood products, steel).
- * Influence of environmental conditions on timber and wood products properties.
- * Classification and geometrical features of cross-sections.
- * Construction systems and frames (horizontal and vertical bearing members).
- * Structural behavior and effect of connections between members.
- * Actions and action combinations, principles of verification.
- * Consideration of structural imperfections.
- * Verification of resistance ultimate limit states of cross-sections.
- * Verification of stability ultimate limit states of members and shells.
- * Verification of serviceability limit states.
- * Principles and calculation of bracing systems and members.
- * Technology and calculation of main types of connection.
- * Verification of fire resistance.

Organisation:

Lectures, aided works, demonstrative lab works

Objectifs

At the end of this module, the student will have understood and be able to explain (main concepts):

The principles of design and calculation of steel structures and timber structures according to Eurocodes.

The student will be able to:

Analyse the structural behaviour of a timber or steel structure, justify the technological structural choices and materials, design the structural bearing and bracing members.

Pré-requis nécessaires

Analyse des structures statiques et dynamiques

Structures Béton Bois

Mécanique Avancée

Infos pratiques

Lieu(x)

➤ Toulouse

Prestressed concrete structure & bridges



ECTS
5 crédits



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Volume horaire
67h

Présentation

Description

Programme (detailed contents):

Prestressed concrete structures

Design rules (EC2): minimum requirements towards cracking, stress limitation, minimum reinforcement and various layouts, calculation of the minimum prestress force, calculation of the prestress losses – Tensioning stages – Stress control – Calculation of the stresses in cracked cross-section under serviceability limit state – Calculation of the reinforcement areas.

Bridges

Terminology, bridge classification – Data for the project, design procedure – Technical regulation – Foundations: design and execution – Supports: piers and abutments – Superstructures: wearing surfaces, barrier walls, bearings, pavement joint, drainage, sidewalks – Concrete bridges: materials, field of use, pre-design, execution – Steel bridges: materials, field of use, joints, classification, pre-design, execution.

Organisation:

Lecture, tutorials project.

Objectifs

At the end of this module, the student will have understood and be able to explain (main concepts):

- * Technology, design and calculations of a prestressed concrete structure;
- * Technology and design of metallic, concrete or composite bridges.

The student will be able to:

- * State the required assumptions;
- * Calculate a prestressed concrete structure;

Define the technical choices for designing a bridge.

Pré-requis nécessaires

Reinforced Concrete and prestressed concrete

Structural analysis and engineering

Infos pratiques

Lieu(x)

➤ Toulouse

Air conditioning



ECTS
5 crédits



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TOULOUSE



Volume horaire
66h

Présentation

Description

This teaching provides additional elements on several parts of air conditioning (HVAC) topic :

- Calculation of thermal balances of rooms and buildings ;
- Principal air conditioning systems (HVAC) ;
- Air filtration ;
- Regulation of air conditioning installations.

Tutorials, labworks and project are realised during this formation. A visit on site is proposed.

Objectifs

Main goal of this teaching is to allow student to learn conception elements and also best practices rules of air conditioning installations.

Expected skills :

* Analyze an air conditioning installation (HVAC) from the schematic drawing and determined specifications;

* Design main elements of an HVAC installation;

Identify and prioritize main elements of the control system from an installation;

Pré-requis nécessaires

Indoor building physics

Infos pratiques

Contacts

Education manager

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Lieu(x)

➤ Toulouse

Equipments Acoustics

 **ECTS**
4 crédits

 **Composante**
INSTITUT
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DES SCIENCES
APPLIQUEES
TOULOUSE

 **Volume horaire**
48h

Présentation

Description

Programme (detailed contents):

Diffuse field, direct field

Different sound absorbers

Determination of absorption coefficient

Auditorium acoustics

Acoustic power of building services

Design methods

Objectifs

At the end of this module, the student will have understood and be able to explain (main concepts):

- Diffusion of sound waves inside and outside rooms
- Transfer of acoustic waves along ductworks
- Transfer of vibrations generated by building services

The student will be able to:

- Calculate walls absorption to restrict noise dose absorption by workers
- Reduce noise propagation in ducts
- Define noise proof walls to protect the surrounding
- Size vibration pads

Pré-requis nécessaires

Indoor building physics

Infos pratiques

Lieu(x)

➤ Toulouse

Human Resources Management and Group Work

 **ECTS**
6 crédits

 **Composante**
INSTITUT
NATIONAL
DES SCIENCES
APPLIQUEES
TOULOUSE

 **Volume horaire**
75h

Présentation

Lieu(x)

➤ Toulouse

Objectifs

At the end of this module, the student will have understood and be able to explain (main concepts) :

Human Resource Management

Aims and organisation of a Human Resources position, job analysis and forecasting, recruiting, work motivation, skills, salary, training, career management, conflict mitigation, work contract

Social Psychology

Groups, what they are, their influences and dynamics

The student will be able to analyse a group situation

Pré-requis nécessaires

None

Infos pratiques

HVAC - Building physics



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Volume horaire
99h

Présentation

Description

Teaching handles on conception of air conditioning installations devoted to a specific application (hotel supermarket, swimming pool, etc...). It is an Organised Project which is divided into several phases as thermal balances, Summary Request for Proposal (SRQ), Final Request for Proposal (FRQ). An economic analyze is also included in the project.

Student work in groups of three or four persons and and little by little their requirements they receive informations during the project session.

Objectifs

At the end of this formation unit, the student will be able to dimension, to conceive and to propose a pertinent regulation of varied air conditioning installations.

Expected skills :

- * Design an air conditioning installation (HVAC) from determined specifications

- * Design a control system to optimize this facility
- * Design main elements of the installation

Infos pratiques

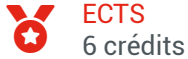
Contacts

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Lieu(x)

➤ Toulouse

Future buildings



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Volume horaire
72h

En bref

› **Langue(s) d'enseignement:** Français, Anglais

Présentation

Description

This teaching is divided into three modules.

- The High Environmental Quality (HQE)..... on quality norm (ISO 9000) en environmental norm (ISO 14001). It mainly describes targets devoted to hygrothermal comfort and to management of energy.
- The renewable energies mainly used in the building sector: thermal solar, geothermics, biomass and photovoltaic.
- The Building Technical Management which enters upon concepts of bus and communication networks (main functionalities, advantages in terms of energy savings, etc..)

These different units are teach under lectures and projects and are completed by installation visits.

Teachers :

S. Ginestet, Professionals (DeltaDore, GA, Tecsol, etc.)

Objectifs

This teaching describes some of the great concepts of building and of running of buildings of the future. Namely, High Environmental Quality (HQE), Renewable Energies and Technical Management of Buildings (TMB).

Main goal of this teaching is to make student sensitive to these different concepts.

At the end of this module, the student will have understood and be able to explain (main concepts):

- Targets and areas of HQE , how to take them into account in the labeling of a building project
- The main principles of the methods of controlling an air conditioning system , and the operation of control systems in the HVAC industry
- The physical principles of different renewable energy sources (solar , geothermal, biomass , etc.) and associated technologies

The student will be able to:

- carry out a HQE study on a simplified building
- describe and analyze a control system of an HVAC installation
- calculate and design a renewable energy system design for a real building project

Expected skills :

- * calculate energy coming from renewable sources from a CCTP, design the hydraulic and / or ventilation pattern of an HVAC plant using renewable energy
- * implement the HQE method on a building project

- * design a control system of an HVAC installation

Macro-skills evaluated : 2_1, 2_2, 2_3, 3_1, 3_2, 3_6, 3_8

Pré-requis nécessaires

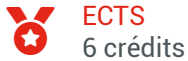
- General lectures of semesters 7 and 8 of climatic engineering - year 4 ;
- Basic physic.

Infos pratiques

Lieu(x)

> Toulouse

Methods and English



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TOULOUSE

Présentation

Description

Programme (detailed contents):

Methods:

Preparing sites and roadworks – Defining missions and assignments – Site facilities – Temporary works – Special formworks (piles, deck) – Lifting apparatus – Production means – Operating methods and special equipments

Planning:

Cycles and phases study – Equipment and workforce saturation – Implementation.

Budget and site management:

Type a call for tenders in public works – Project manager approach – Enterprise approach – Establishing selling price from cost price - Price study (quantities, sub-details, organization, cost prices, selling prices) – Budget and financial margin.

Lean Management applied to Construction

Lean construction, management of operations and quality, organization and management of flows, logistics

English :

Through targeted activities (contextual presentations, experience reports, projects) students will learn and use English for civil engineering projects

Organization:

Lecture, projects, workshops

Main difficulties for students:

Managing the set of data and information related to the project, performing a complex calculation in several stages.

Objectifs

At the end of this module, the student will have understood and be able to explain (main concepts):

- * Elaborating means, planning and budget of a construction operation
- * Main techniques and methods in various sectors (building, bridges and roads)
- * Principles of Lean Management applied to Civil Engineering projects
- * Use specific vocabulary of Civil Engineering to complete reports and discuss key elements of a project

The student will be able to:

- * Elaborate methods.
- * Estimate a budget and establish a planning of works.
- * Pilot a project referring to Lean Management concepts
- * Communicate in English civil engineering environment

Infos pratiques

Contacts

Education manager

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Lieu(x)

➤ Toulouse

Bridge Project & Conferences

 **ECTS**
7 crédits **Composante**
INSTITUT
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DES SCIENCES
APPLIQUEES
TOULOUSE **Volume horaire**
115h

Présentation

Description

Programme (detailed contents):

Lecture

Technical regulations – Loading: Eurocode 1 part 2 – Foundations: volume 61 part V of the general technical clauses notebook; soil-structure interaction modelling – Concrete-steel composed and steel bridge decks: French regulation and Eurocodes; accounting for fatigue effects – Concrete bridge decks: transversal load distribution and transversal flexure of girder and slab bridges; special verification and provisions for bridges constructed by incremental launching or segmental cantilever.

Project:

Defining the main components from plan (spans and footings type) – Calculation of applied loads – Calculation of the minimum prestress force according to Fauchart method – Verification of the deck under SLS and ULS – Minimum reinforcement – Calculating forces on piles – Design and calculation of foundations – Cost estimate.

Organisation:

Lecture, project in 3 parts (deck, foundations, cost estimate)

Objectifs

At the end of this module, the student will have understood and be able to explain (main concepts):

Main steps in design and calculation of a prestressed concrete bridge.

The student will be able to:

Define and calculate the main structural components of a concrete bridge.

Pré-requis nécessaires

Prestressed Concrete Structures & Bridges

Infos pratiques

Lieu(x)

> Toulouse

Road engineering and structures



ECTS
6 crédits



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APPLIQUEES
TOULOUSE



Volume horaire
70h

Présentation

Description

Programme (detailed contents):

Road technics:

Mechanical behaviour and design of all types of pavements – Basic components, requirements and quality control (gravels, binding and fines) – Laboratory study (composition, mechanical performances, durability) – Production and processing (roles, tender spots and normalization request) – Quality tests of pavements – Work compliance and control processes - Maintenance of pavements: inspection, design, specific techniques.

Tunnels:

Different types of works - Main technics of boring and types of tunnel boring machines – Microtunnels – End works – Retaining structures and underground hydraulics – Safety in underground works – Case studies.

Management of infrastructures:

Inventory and classification of bridges – Condition state estimation (inspection, diagnosis) – IQQA method – Ranking and planning of maintenance works – Global approach to identification and estimation of risks – Principles of risk-based maintenance.

Organisation:

Lectures, projects, conferences

Objectifs

At the end of this module, the student will have understood and be able to explain (main concepts):

- * Main road techniques.
- * Methods for boring tunnels
- * Practice and stakes of bridge management

The student will be able to:

- * Design of a structural pavement.
 - * Elaborate methods for boring tunnels.
 - * Participate to bridge management process
-

Pré-requis nécessaires

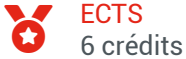
Cours de matériaux de génie civil.

Infos pratiques

Lieu(x)

➤ Toulouse

Frames and Composite steel and concrete structures



ECTS
6 crédits



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APPLIQUEES
TOULOUSE



Volume horaire
75h

Présentation

Description

Programme (detailed contents):

Steel and timbers structures and frames:

Studying the main framework, and stability system -
Determining wind and snow loads - Designing certain structural
components: roof components, joists, slab beams, gable posts,
column and girder of the portal frame, stability members -
Fire resistance of timber members - Designing connections -
Calculating loads applied on foundations.

Composite steel and concrete structures: Technology of
composite steel and concrete structures, benefits in case of fire,
design of columns, beams and slabs according Eurocode 4.

Organization: lecture, project.

Objectifs

At the end of this module, the student will have understood and
be able to explain (main concepts):

- * Elaborating methods, planning and budget for a
construction project.

- * Designing and calculating an steel structure and timber
component

The student will be able to:

- * Foresee the execution methods.
- * Establish a projected budget and planning
- * Design the framework and stability of a steel structure
- * Calculate members and components according to EC3
and EC5.

Pré-requis nécessaires

Steel & timber structures

Infos pratiques

Lieu(x)

> Toulouse

Concrete structures 2 & masonry

 **ECTS**
7 crédits

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DES SCIENCES
APPLIQUEES
TOULOUSE

 **Volume horaire**
105h

Présentation

Description

Programme (detailed contents): Calculation and design of buildings in seismic area according to Eurocode 8, design of beams, walls with and without openings, foundations, design project.

Calculation of structures in case of fire according the eurocodes: combinations of actions, behaviour of warm materials, design of columns, beams and slabs, verification on reinforcements, technology.

Technology of masonry structures, French and European standards, design of masonry walls according to Eurocode 6.

Organisation:

Lectures, TD and project in earthquake engineering.

Objectifs

At the end of this module, the student will have understood and be able to explain (main concepts):

The principles of design for building concrete structures under earthquake and under fire, the principles of design of masonry structures according to EC6.

The student will be able to:

Design and check simple concrete structures in case of fire, or built in seismic zone.

Write a calculation note and justify the structural elements.


Know the limite of EUROCODE 6 and justify a masonry wall. Calculation and design of buildings in seismic area according to Eurocode 8, design of beams, walls with and without openings, foundations, design project.

Infos pratiques

Contacts

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Lieu(x)

➤ Toulouse

Eco building & Environmental impact

 **ECTS**
5 crédits **Composante**
INSTITUT
NATIONAL
DES SCIENCES
APPLIQUEES
TOULOUSE **Volume horaire**
60h

Présentation

Description

Programme (detailed contents):

- Thermal dynamic simulation of buildings: bioclimatic design; heat transfer in unsteady state; use of a software to carry out a thermal dynamic simulation of a buildings and a sensitivity factor analysis (PLEIADES+COMFIE)
- Environmental Indicators for life cycle analysis (LCA); application to buildings and their integration in a district ; use of a LCA software dedicated to building (NovaEQUER)
- Principles of the Bilan Carbon method and application on an example;
- Diagnosis of energy performance (DPE): principles and application to a study project.

Organisation:

This teaching proceeds with projects. Some full-classes courses and conferences are given to present the key-concepts useful to carry on the projects.

Objectifs

At the end of this module, the student will have understood and be able to explain (main concepts):

- Interest and principles being used to establish a diagnosis of energetic performance (DPE).
- Interest and the principle of a thermal dynamic simulation for buildings to help with the design - renovating of the buildings in a bioclimatic approach
- Interest and principles of methods to evaluate global environmental impacts in a project of new or renovated building; life cycle analysis (LCA), Bilan Carbone and other methods.

The student will be able to:

- carry out the DPE and the thermal dynamic simulation of a project of building, analyze results obtained and propose improvements with the studied project
- analyze and take into account a study report on the environmental impacts of a project
- carry out a simplified LCA to study a building

Expected skills :

- * To optimize a building according to bioclimatic principles, using a dynamic thermal simulation software
- * To assess the environmental impact of a building (or part of a building) via LCA and / or a Carbon Footprint analyze.

Infos pratiques

Contacts

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Lieu(x)

➤ Toulouse

BIM Environment



Présentation

Description

Programme (detailed contents):

- * Principles and elaboration of a BIM project
- * Responsibilities of the stakeholders
- * Making of the numerical model
- * BIM design / BIM project / BIM works
- * Work on a real multisite collaborative project.

Objectifs

At the end of this module, the student will have understood and be able to explain (main concepts):

- * Organisation of a collaborative work thanks to the numerical model
- * Role, limit and responsibilities of the stakeholders in a BIM project

The student will be able to:

- * Give principles of the process for elaborating the numerical model as function of the invitation to tender
- * Participate to a BIM construction project
- * Know how to interact with the participants of a BIM construction project

Infos pratiques

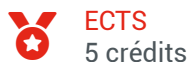
Contacts

Education manager

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Project ownership assistance



ECTS
5 crédits



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Infos pratiques

Contacts

Education manager

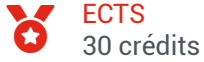
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ID-RIMS



ECTS
30 crédits

Présentation

Description

- Unit 1: Formulation and microstructure (4 ECTS)
- Unit 2: Transfers in unsaturated environments, Thermal transfers (4 ECTS)
- Unit 3: Physico-chemistry of durability (6 ECTS)
- Unit 4: Mechanics of materials and buildings (5 ECTS)
- Unit 5: Physics of non-destructive testing (5 ECTS)
- Unit 6: Maintenance of civil engineering buildings (5 ECTS)
- Unit 7: English (2 ECTS)

Please find more information regarding the program and admission conditions : [✉ http://geniecivil.univ-tlse3.fr/M2_IDRIMS.htm](http://geniecivil.univ-tlse3.fr/M2_IDRIMS.htm)

Infos pratiques

Contacts

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Training period (5th year)

 **ECTS**
21 crédits

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APPLIQUEES
TOULOUSE

 **Volume horaire**
2h

En bref


➤ **Langue(s) d'enseignement:** Français, Anglais

Infos pratiques

Lieu(x)

➤ Toulouse

Training period (4th year)

 **ECTS**
9 crédits

 **Composante**
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TOULOUSE

 **Volume horaire**
1h

En bref

➤ **Langue(s) d'enseignement:** Français, Anglais

Infos pratiques

Lieu(x)

➤ Toulouse