INSTITUT NATIONAL DES SCIENCES APPLIQUÉES TOULOUSE

SCIENCE, TECHNOLOGY, HEALTH

MASTER CHEMICAL ENGINEERING

Engineering sciences

Targeted level of education
BAC+5

Duration
2 années

Component
INSTITUT NATIONAL DES SCIENCES APPLIQUEES TOULOUSE

Introducing

Objectives

The education programme in Chemical Engineering at INSA Toulouse aims to develop skills which are necessary for an engineer to develop, design, operate, optimise, manage or commercialise chemical or biochemical processes. These chemical engineers work in industries in the environmental sector (water/air/waste treatment) or in various other fields (chemistry, petrochemistry, food, pharmacy and cosmetics, specialised materials) and are able to take into account environmental and energetic criteria (eco-processes). The training develops: - generalist skills in Chemical Engineering which can be applied to all industries - the ability to take into account environmental contexts using a knowledge of regulations and water science and environmental engineering and associated metrologies - the ability to work in a team on multi-disciplinary projects in Chemical Engineering : design of industrial plants - the ability to manage a project integrating organisational, economic, financial, human and technical aspects In addition to the generalist skills in Chemical Engineering, the training offers two major specialisations: - Green-Processes (clean and sober Processes), which develops skills to consider environmental and energetic constraints in order to design and operate processes for all industrials sectors : design of environmental-friendly products, design and control of clean and sober processes, treatment and valorisation of industrial wastes - Eco- industries (Treatment processes), which develops skills to design or operate processes adapted to the treatment of pollutions (water, air, wastes, grounds, drinking water production).

Admissions

Access conditions

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.

Target audience

Necessary prerequisites

Recommended prerequisites

Practical info

Location(s)

Toulouse

Program

FOURTH YEAR – GPE
4th YEAR CHEMICAL ENGINEERING

SEMESTER 7_4th YEAR GPE

4th YEAR GPE INSA_SEMESTER 7

4th YEAR GPE_SEMESTER 7

OPTION CSH or IAE

Liste d'éléments pédagogiques

Improve your management abilities	4 crédits	45h

Toulouse School of Management

Liste d'éléments pédagogiques

Unit operations 1	5 crédits	56h
Unit operations 2	5 crédits	83h
Processes simulation and analysis	5 crédits	73h
Chemical and environmental engineer, define and build a project	5 crédits	79h
Heterogeneous reaction engineering	5 crédits	37h
Political sciences semester 1	3 crédits	

CHALLENGE BASED LEARNING
_SEMESTER 1

Liste d'éléments pédagogiques

[FRANCAIS] Challenge – Formation ECIU	1 crédits
[FRANCAIS] Challenge – Formation ECIU	2 crédits
[FRANCAIS] Challenge – Formation ECIU	3 crédits
[FRANCAIS] Challenge – Formation ECIU	4 crédits
[FRANCAIS] Challenge – Formation ECIU	5 crédits

SEMESTER 8_4th YEAR GPE

4th YEAR GPE INSA_SEMESTER 8

4th YEAR GPE INSA_SEMESTER 8

Liste d'éléments pédagogiques

Heat exchangers with or without phase transition and simultaneous heat and mass transfer	5 crédits	70h
Energy and Processes	5 crédits	43h
Project for research introduction	3 crédits	29h
Biological reactor engineering	2 crédits	33h
Metrology Environment and Risks	5 crédits	76h
Communication in organisations with LV2	6 crédits	

Improving one's autonomy and building one's own professional project level 2 S	4 crédits	40h
Political sciences semestre 2	3 crédits	

CHALLENGE BASED LEARNING _SEMESTER 2

Liste d'éléments pédagogiques

[FRANCAIS] Challenge – Formation ECIU	1 crédits
[FRANCAIS] Challenge – Formation ECIU	2 crédits
[FRANCAIS] Challenge – Formation ECIU	3 crédits
[FRANCAIS] Challenge – Formation ECIU	4 crédits
[FRANCAIS] Challenge – Formation ECIU	5 crédits

FIFTH YEAR – GPE

5th YEAR CHEMICAL ENGINEERING

SEMESTER 9_5th YEAR GPE

5th YEAR GPE INSA_SEMESTER 9

5th YEAR GPE_SEMESTER 9

5th YEAR GPE_OPTION 1

Liste d'éléments pédagogiques

Water supply and waste water treatment	5 crédits	
Rational use of energy	5 crédits	22h

5th YEAR GPE_OPTION 2

Liste d'éléments pédagogiques

Waste treatment and valorization	5 crédits	63h
Advanced Separation processes for new water-uses, valorisation and new resources	5 crédits	15h

5th YEAR GPE_OPTION 3

Liste d'éléments pédagogiques

Process control & optimization	5 crédits	63h
Reactor design and multiphase flow modelling	5 crédits	63h

Liste d'éléments pédagogiques

Human relations	6 crédits	78h
Design and environmental assessment of processes	9 crédits	64h

5th YEAR THEME ENERGY

OPTION THEME ENERGY _SEMESTER 9

Liste d'éléments pédagogiques

Energy production from renewable resources	5 crédits	32h
Technologies and architectures for the conversion and storage of electrical energy	5 crédits	47h
Innovative materials for the energy	5 crédits	15h

Liste d'éléments pédagogiques

Combination of multi-sources of energy platform	9 crédits	161h
The different generation technologies and energy management	5 crédits	7h
Human relations	6 crédits	78h

5th YEAR THEME URBAN ENGINEERING_SEMESTER 9

Liste d'éléments pédagogiques

Urban engineering and decision making	8 crédits	62h
Urban ecology	8 crédits	156h
Urban project	8 crédits	190h
Human relations	6 crédits	78h

5th YEAR THEME RISK ENGINEERING

Liste d'éléments pédagogiques

Qualitative Approach	4 crédits	45h
Quantitative Approach	5 crédits	45h
Designing for safety	5 crédits	42h
Process Safety	5 crédits	45h
Functional Safety		
[FRANCAIS] Structural Safety		
Human relations	6 crédits	78h
Toxic risks	5 crédits	42h

CHALLENGE BASED LEARNING _SEMESTER 1

Liste d'éléments pédagogiques

[FRANCAIS] Challenge – Formation ECIU	1 crédits
[FRANCAIS] Challenge – Formation ECIU	2 crédits
[FRANCAIS] Challenge – Formation ECIU	3 crédits
[FRANCAIS] Challenge – Formation ECIU	4 crédits
[FRANCAIS] Challenge – Formation ECIU	5 crédits

SEMESTER 10_5th YEAR GPE

INSTITUT NATIONAL DES SCIENCES APPLIQUÉES TOULOUSE

Liste d'éléments pédagogiques

Training period 4th year	9 crédits
Training period 5th year	21 crédits

Improve your management abilities

ECTS
4 crédits

Hourly volume
45h

Management I3CCGE51

Introducing

Objectives

At the end of this module, the student will

¿ Know the legal environment and responsibilities of a business
activity
¿ Be able to objectively assess the financial health of a company and evaluate the rentability of an investment
¿ Realize a market diagnosis (benchmarking) and a business diagnosis in order to make decisions and set goals and strategies
¿ Collect the market data and put in action a business plan adapted to the means and goals of the company
Module L 2
The objectives, defined in reference to the CEFRL for the 5 language activities, are specific for 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

Necessary prerequisites

Practical info

Location(s)

Toulouse

INSA INSTITUT NATIONAL DES SCIENCES APPLIQUÉES TOULOUSE

Toulouse School of Management

Practical info

Location(s)

Toulouse

Unit operations 1

ECTS
5 crédits

Hourly volume
56h

Introducing

Objectives

At the end of this module, the student will have understood and be able to explain (main concepts):
- the basic concepts concerning intermolecular and interfacial interactions
- Different ways to perform filtration processes
- basic concepts of deep-bed filtration and membrane separation (UF/MF/NF)
- dimensionless numbers to characterise physical phenomena involved in mixing and separation operations
- design tools for unit operation of filtration and mixing

The student will be able to:
- identify interactions between compounds or interface/ compounds involved in filtration and mixing operations
- identify main membrane fouling phenomena for a given
application
- operate some filtration units at lab or pilot scale
--select the required unit operation and technology for a filtration or a mixing operation
- write the mass balances
- design a deep-bed filter
- design a membrane operation (MF, UF, NF)
- design a stirred tank and a static mixer

Necessary prerequisites

Hydraulics and dispersed systems (I3BETF21)
Fluid properties (I3BEPF12)
Heat and mass transfer (I3BETF32)
Thermodynamics
Basic concepts of Chemistry and Physics

Practical info

Location(s)

Toulouse

Unit operations 2

ECTS
5 crédits

Hourly volume
83h

Introducing

Objectives

At the end of this module, the student will have understood and be able to explain (main concepts):
- Phase equilibrium diagrams
- General concept for mass transfer unit operations (Ideal stages, operating linesż). Kinetic limitations and theirs effects on separation
- Different ways to perform separation processes (single contact, cross-current and counter-current contactors)
- design tools for separators.

The student will be able to:
- use the equilibrium diagrams
- choose the required technology for a separation
- choose the contact mode
- write the mass balance
- design a multistage separation device (extraction, distillation, adsorption, absorptionż)
- then propose a contactor technology.

Necessary prerequisites

Hydraulics and dispersed systems (I3BETF21)
Fluid properties (I3BEPF12)
Heat and mass transfer (I3BETF32)
Thermodynamics

Basic concepts of Chemistry and Physics

Practical info

Location(s)

Toulouse

Processes simulation and analysis

ECTS
5 crédits

Hourly volume
73h

Introducing

Objectives

At the end of this module, the student will have understood and be able to explain (main concepts):
- the basics of chemical engineering process simulation tools at various scales
- the life cycle and carbon balance principles
- the basics of multidimensional analysis
- the elementary notions about process optimisation

The student will be able to:
- select the appropriate simulation tool with respect to the scale of investigation
- synthesize their knowledge to analyze the results of a commercial simulation tool
- simulate industrial processes in steady state
- perform the Life Cycle Analysis of an existing process
- use the FLUENT software to simulate single phase flows
- use the PROSIM Plus software to simulate general steady state processes
- use the UMBERTO software to perform a global analysis of a process within its environment.
- gather knowledge from various fields to choose the modelling approach, perform the set-up of the simulation and analyse the results
- perform an optimisation study with PROSIM
- set up simulations of unsteady state processes with PROSIM Batch and FLUENT

Necessary prerequisites

Modelling and numerical methods for transport phenomena (momentum, mass and energy) and thermodynamics
Basic concepts for Unit Operation
Technology and design of Unit Operation
Hydraulic and dispersed systems
Transport and reaction in fluid medium

Practical info

Location(s)

Toulouse

Chemical and environmental engineer, define and build a project

ECTS
5 crédits

Hourly volume
79h

Practical info

Location(s)

Toulouse

Heterogeneous reaction engineering

ECTS
5 crédits

Hourly volume
37h

Introducing

Objectives

Know and explain the concepts of
- chemical catalysts
- heterogeneous reaction mechanisms and associated kinetic laws
- limiting step(s) in heterogeneous reactions
- apparent (overall) reaction rate
- dimensionless numbers (Hatta, Biot, Thiele, Weiss)
- effectiveness factor and enhancement factor

Establish an intrinsic kinetic law
Determine the limiting process(es) in a heterogeneous chemical reaction
Express dimensionless numbers used in heterogeneous reactions (Hatta, Biot, Thiele, Weisz) and explain their meaning
Express the apparent global rate of a chemical reaction depending on the working conditions
Select and design the most suitable reactor to perform a given reaction
Integrate and prioritize the mechanisms in order to model heterogeneous chemical reactors (batch or continuous)

Necessary prerequisites

Chemical reaction Engineering I (I2BERR12)
Chemical reaction Engineering II (I3BERR12)
Heat and mass transfer (I3BETF32)

Thermodynamics (I2BETH11)
Fluid properties (I3BEPF12)

Practical info

Location(s)

Toulouse

Political sciences semester 1

ECTS
3 crédits

Hourly volume

Practical info

Location(s)

Toulouse

[FRANCAIS] Challenge – Formation ECIU

ECTS
1 crédits

Hourly volume

Practical info

Location(s)

Toulouse

[FRANCAIS] Challenge – Formation ECIU

ECTS
2 crédits

Hourly volume

Practical info

Location(s)

Toulouse

[FRANCAIS] Challenge – Formation ECIU

ECTS
3 crédits

Hourly volume

Practical info

Location(s)

Toulouse

[FRANCAIS] Challenge – Formation ECIU

ECTS
4 crédits

Hourly volume

Practical info

Location(s)

Toulouse

[FRANCAIS] Challenge – Formation ECIU

ECTS
5 crédits

Hourly volume

Practical info

Location(s)

Toulouse

Heat exchangers with or without phase transition and simultaneous heat and mass transfer

ECTS
5 crédits

Hourly volume
70h

Practical info

Location(s)

Toulouse

Energy and Processes

ECTS
5 crédits

Hourly volume
43h

Introducing

Objectives

At the end of this module, the student will have understood and be able to explain (main concepts):
- the world context of power-generating systems, which produces a net power output from a fossil, nuclear or renewable energy source.
- the legal and technical context of the various forms of renewable energy (wind, solar photovoltaic, biomass ...),
- the different thermodynamic cycles associated to the power generation systems, the refrigeration and heat pump systems and the gas liquefaction.
- the use of energy and exergy balances for these thermodynamic systems in order to optimize their operation

The student will be able to:
- design a given steam power plant, including the choice of working fluid temperatures, pressures and the determination of fluid working flows plus the pre-sizing of compressors and turbines
- design a refrigeration system, including the choice of working fluid temperatures, pressures and the determination of fluid working flows plus the preliminary design of compressors and expansion devices,
- design a gas liquefaction plant
- participate in the implementation of a wind energy area development and a site photovoltaic,
- participate in the implementation of a biogas network.

Necessary prerequisites

Thermodynamic I3BETH11

Practical info

Location(s)

Toulouse

Project for research introduction

ECTS
3 crédits

Hourly volume
29h

Introducing

Objectives

At the end of this module, the student will have understood and be able to explain (main concepts):
- the approach and tools for a good literature and patent survey
- how to develop a scientific work
- the health and safety rules in a research laboratory
- the basic methods for project management
- principles of patent right

The student will be able to:
- to delimit and deepen a scientific research project
- to draw an up-to-date inventory of knowledge on this topic and to identify the international leading research teams
- to propose and to experimentally perform a scientific approach to address a problem based upon the previous literature survey with respect to health and safety rules
- to share and communicate the results with a common scientific formalism (paper, poster)
- to perform a project management approach

Necessary prerequisites

Literature survey basic knowledge
All scientific knowledge in relation with a research project

Practical info

Location(s)

Toulouse

Biological reactor engineering

ECTS
2 crédits

Hourly volume
33h

Introducing

Objectives

At the end of this module, the student will have understood and be able to explain (main concepts):
- the different types of biological catalysts and their working modes
- the stoichiometry, kinetic laws and their combination for the description of microbial cell behaviour for growth and production,
- the description and modelling of batch, fed-batch and continuous, single or multi stage biological reactors with or without recycling.

The student will be able to:
- identify the general metabolic scheme of microbial growth
- establish the stoichiometric equations and kinetic laws for biological reactions with respect to the environment conditions
establish an intrinsic kinetic law
- integrate and prioritize the mechanisms in order to model homogenous and heterogeneous biological reactors

Necessary prerequisites

Microbiology and mass balances

Practical info

Location(s)

Toulouse

Metrology Environment and Risks

ECTS
5 crédits

Hourly volume
76h

Introducing

Objectives

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

-the principles of environmental laws in France , and what tools to access legal informations
- the choice of suitable and argued measurements either for the analysis of environmental impacts or to process design
- what are the main environmental issues and principles of waste management
- the main risks in the process industry and mechanisms linked to accidents

The student will be able to:

- find and use legal informations (from legacy context) related to environmental law (ICPE , TGAP , environmental impacts, ...)
- choose and apply relevant method (s) in order to characterize the compounds and / or pollutants in complex environments or matrix doing a critical analysis of the methodology and the experimental results
- analyze a case of risk for Environment , to identify the categories of impacts, to describe pollution from the origin (=source) to the environmental targets
- analyze a situation of industrial risk, to identify and to calculate physico-chemical parameters of the involved phenomena and to propose technical solutions

Necessary prerequisites

General Chemistry
Biological reactors
Chemical engineering unit operations
Mass and energy balances

Practical info

Location(s)

Toulouse

Communication in organisations with LV2

ECTS
6 crédits

Hourly volume

Introducing

Objectives

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

-How to answer the demand of the civil society for technical and scientific information
-How to carry out critical analysis in order to give appropriate answers when questioned about such issues
-How to consider the circulation and content of information within the organizations in which they will be hired

The classes given in English will focus on the specific linguistic characteristics of the English used in scientific contexts in order for the students to understand and master them.
The students will also be made aware of the specificities of scientific English as relates to publications in his specific field of research.

Module L 2
The objectives, defined in reference to the CEFRL for the 5 language activities, are specific for the language studied ¿ Chinese, German, Spanish ¿ and the level of the student.
They can be consulted on :
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In certain cases, students may be authorised to follow an English module instead of another language

Necessary prerequisites

Necessary knowledge:
For classes in English : understanding of scientific English

Practical info

Location(s)

Toulouse

Improving one's autonomy and building one's own professional project level 2 S

ECTS
4 crédits

Hourly volume
40h

Practical info

Location(s)

Toulouse

Political sciences semestre 2

ECTS
3 crédits

Hourly volume

Practical info

Location(s)

Toulouse

[FRANCAIS] Challenge – Formation ECIU

ECTS
1 crédits

Hourly volume

Practical info

Location(s)

Toulouse

[FRANCAIS] Challenge – Formation ECIU

ECTS
2 crédits

Hourly volume

Practical info

Location(s)

Toulouse

[FRANCAIS] Challenge – Formation ECIU

ECTS
3 crédits

Hourly volume

Practical info

Location(s)

Toulouse

[FRANCAIS] Challenge – Formation ECIU

ECTS
4 crédits

Hourly volume

Practical info

Location(s)

Toulouse

[FRANCAIS] Challenge – Formation ECIU

ECTS
5 crédits

Hourly volume

Practical info

Location(s)

Toulouse

Water supply and waste water treatment

ECTS
5 crédits

Hourly volume

Introducing

Objectives

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

1. Understand and be able to explain:

- Notions of resources, water uses, access to water, pollution of receiving environments
- Who are the water stakeholders
- The role of unit operations (OPU) and advanced technologies in the drinking water production and wastewater treatment sectors

2. Know how to find information on the quality of a water resource and be able to assess whether the water is drinkable based on legislation

3. Propose and size treatment lines for producing drinking water from fresh waters and for purification of domestic wastewater, that are adapted to the quality of the resource, respectful of human health and the receiving environments and economical in energy and resources or able to valorize resources. In particular, the student will be able
3.1 designing an appropriate treatment line for the production of drinking water from fresh water, sizing its major unit operations and computing its energy consumption
3.2 comparing several processes for wastewater and sludge treatment
3.3 sizing an activated sludge treatment plant for the removal of major pollutants and choosing a sludge drying technology
3.4 sizing a sludge methanisation equipment

Necessary prerequisites

Unit operations 3A and 4A (sedimentation, filtration, membranes) (I4PETF32), Reaction engineering 3A ICBE (I3BERR12), Metrology/environment/risks (I4PEQS11), Biochemical reaction engineering (I4PERB11)

Practical info

Location(s)

Toulouse

Rational use of energy

ECTS
5 crédits

Hourly volume
22h

Introducing

Objectives

At the end of this module, the student will have understood and be able to explain (main concepts):
*How to establish energy and exergy balances on energy production or energy consumption scenarios. Critical analysis of the obtained results.
*Identify dysfunctions in a system and to propose optimal solutions. To propose new scenarios considering energy aspects.
*How to establish a life cycle analysis on energy production processes and different energy use scenarios; to use a software (Umberto) and the appropriate databases. Use of results for process eco-design.
* Pinch analysis for improving energy use in a process.
*Other optimization methods (numerical methods) depending on the case study for process ecodesign.

The student will be able to:

*Mobilise knowledges in chemical engineering in order to solve complex problems in the field of matter and energy processing.
*Conception, design, modelling, conducting and optimizing (for technical and economical criteria) installations in the field of chemical engineering
* Considering safety, energy efficiency and management of environmental impacts in the early step of process design and in functioning of unit processes and processes.
*Conception of new unit processes and processes in different industrial fields like Ecoindustry, Energy, Environment, in order to reduce the climate change threat and contribute to energy transition.

Necessary prerequisites

Energetic thermodynamics
Process simulation and assessment
Processes and energy

Practical info

Location(s)

Toulouse

Waste treatment and valorization

ECTS
5 crédits

Hourly volume
63h

Introducing

Objectives

At the end of this module, the student will have understood and be able to explain:
- the legal and usual definitions of wastes in France.
- the strategies for waste treatment
- the principles of unit operations and processes commonly used in solid waste reduction, treatment or valorisation (chemical, biochemical or thermal processes).

The student will be able to:
- identify basic rules and policies for an environmental problem, and use it to define a technical problem or to propose an adapted solution
- quantify the dispersion of air pollutants from industrial sources
- determine the valorisation potential for an industrial waste (or gas effluent or wastewater)
- analyse and design processes the treatment or valorisation of solid wastes

The student will be able to:
- identify basic rules and policies for an environmental problem, and use it to define a technical problem or to propose an adapted solution
- quantify the dispersion of air pollutants from industrial sources
- determine the valorisation potential for an industrial waste (or gas effluent or wastewater)
- analyse and design processes the treatment or valorisation of solid wastes

Necessary prerequisites

Good knowledge of the basis of chemical engineering

Practical info

Location(s)

Toulouse

Advanced Separation processes for new water-uses, valorisation and new resources

ECTS
5 crédits

Hourly volume
15h

Introducing

Objectives

At the end of this module, the student will have understood and be able to explain (main concepts):
- to know the context of the new resources for water and compounds of interest (sea/brine waters, secondary effluent, food bio products)
- To know specific processes for water production (desalination, reuse, ultrapure water, water for industrial use ..)
- principle and design of sorption unit operations (ion exchange, preparative chromatography, adsorption)
- principle and design of advanced membrane separation operations (reverse osmosis, electromembrane processes)
- principle and design of unit operations based on a phase transition (precipitation, crystallization,¿)

The student will be able to:
- to design processes for domestic wastewaters tertiary reuse
- to design desalination processes
- to design design processes for ultrapure water production or specific water for utilities
-to design processes for N , P and C recovery
- identify new resources
- conceive and design systems for these new resource use
- apply the knowledge to other case studies

Necessary prerequisites

Unit operation I4PETF31
Chemistry I1ANBC11
Energy and mass balance I3BEGP11
2AICBE Numerical Methods of resolution

Practical info

Location(s)

Toulouse

Process control & optimization

ECTS
5 crédits

Hourly volume
63h

Toulouse

Introducing

Objectives

At the end of this module, the student will have understood and be able to explain (main concepts):
1. how to proceed for the simulation and regulation of dynamic systems via an open programming platform and a dynamic system analyzer (Simulink)
2. how to formulate and solve an optimization problem (single-objective or multi-objective) through suited methods (derivative-based or evolutionary)

The student will be able to:
3. compare different methods for the regulation and optimization of a dynamic industrial case study (Waste Water Treatment Plant ¿ WWTP)

Necessary prerequisites

Process control
Balance equations in reactive systems
Programming (Matlab)

Practical info

Location(s)

Reactor design and multiphase flow modelling

ECTS
5 crédits

Hourly volume
63h

Toulouse

Introducing

Objectives

At the end of this module, the student will have understood and be able to explain the use and the development of conservation equations describing multiphase systems. He will be initiated to the multiscale approach for process engineering in three steps:
- Knowledge integration from local entity (inclusion, pore, interface) to the multiphase process.
- Development of closure relations from isolated object to dense media with interactions.
- Sensitivity to scale up and scale down criteria in function of time and space range (heterogeneity, one way/two way or no coupling problems).

The student will be able to ;
- Choose the right scale to describe the multiphase process and the appropriate tool to design the reactor.
- Incorporate transport phenomena and couple them in consistency with the chosen scale
- Simulate the multifunctional behaviour of multiphase system (work project) and insure the value of the results by balance estimation.

Practical info

Location(s)

Human relations

ECTS
6 crédits

Hourly volume
78h

Introducing

Location(s)

Toulouse

Objectives

L'étudiant devra être capable de :
-Analyser des situations de groupe avec des concepts issus de la psychologie sociale
-Identifier les dimensions éthiques de ces situations et prendre position
-Repérer et comprendre des informations liées aux RH
-Analyser une situation de management d¿équipe en référence à un cadre théorique
-Formuler et argumenter des solutions managériales
-Agir dans un milieu naturel : analyser, décider, agir ; mettre en œuvre la sécurité, utiliser du matériel spécifique. découvrir un site.
-Respecter et s'intégrer dans un environnement différent de ses habitudes
-S'engager avec cohérence dans le projet d'activités
-Prendre part activement au collectif
-Valider son projet professionnel et construire une stratégie pour trouver un emploi

Necessary prerequisites

None

Practical info

Design and environmental assessment of processes

ECTS
9 crédits

Hourly volume
64h

Practical info

Location(s)

Toulouse

Energy production from renewable resources

ECTS
5 crédits

Hourly volume
32h

Practical info

Location(s)

Toulouse

Technologies and architectures for the conversion and storage of electrical energy

ECTS
5 crédits

Hourly volume
47h

Practical info

Location(s)

Toulouse

Innovative materials for the energy

ECTS
5 crédits

Hourly volume
15h

Practical info

Location(s)

Toulouse

Combination of multi-sources of energy platform

ECTS
9 crédits

Hourly volume
161h

Practical info

Location(s)

Toulouse

The different generation technologies and energy management

ECTS
5 crédits

Hourly volume
7h

Practical info

Location(s)

Toulouse

Human relations

ECTS
6 crédits

Hourly volume
78h

Introducing

Location(s)

Toulouse

Objectives

L'étudiant devra être capable de :
-Analyser des situations de groupe avec des concepts issus de la psychologie sociale
-Identifier les dimensions éthiques de ces situations et prendre position
-Repérer et comprendre des informations liées aux RH
-Analyser une situation de management d¿équipe en référence à un cadre théorique
-Formuler et argumenter des solutions managériales
-Agir dans un milieu naturel : analyser, décider, agir ; mettre en œuvre la sécurité, utiliser du matériel spécifique. découvrir un site.
-Respecter et s'intégrer dans un environnement différent de ses habitudes
-S'engager avec cohérence dans le projet d'activités
-Prendre part activement au collectif
-Valider son projet professionnel et construire une stratégie pour trouver un emploi

Necessary prerequisites

None

Practical info

Urban engineering and decision making

ECTS
8 crédits

Hourly volume
62h

Introducing

Objectives

This course will gradually implement three levels:
1. Lectures to analyze the role of experts, from the point of view of technicians and the techniques they use, in urban decision-making and action.
2. Tutorials to deepen the multi-thematic modeling of the city (socio-demographic and economic data, water management, energy-microclimate, mobility, architecture)
3. An inter-universities workshop in the form of a 5-day intensive to compare knowledge related to various universities (engineering, architecture, geography, visual arts, political sciences, economics, communication) on a joint urban project with Toulouse Métropole.

The expected scientific skills are as follows:
¿ awareness of the diversity of urban, architectural, landscape, economic, social, environmental and regulatory approaches
¿ ability to integrate a multidisciplinary teams (understand the interplay of actors and the underlying issues)
¿ set up a project method on an urban scale (multi-criteria and multi-scale diagnosis, positioning, iterative design approach)
¿ use GIS software for urban projects, use image processing software to make sense of project information

Practical info

Location(s)

Toulouse

Urban ecology

ECTS
8 crédits

Hourly volume
156h

Location(s)

Toulouse

Introducing

Objectives

Cities are places of high density of people, of goods and of services but also places of high resources consumption. This class will address this peculiar situation by thematic entry points in the complexity of the urban system, to develop a common methodological knowledge on urban ecology.
The entry points selected are: Energy and the city, Water and the City, Transport and mobility, urban waste and contaminated soil. All these courses are mandatory.
Knowledge on energy will focus on energy management in the city, eco-districts, and the link between urban form and energy consumption; on urban water management; on management of urban processes and key characteristics of urban waste.
Expected competencies are to be able:
- to develop comprehensive approaches to take into account the complexity of the city and urban networks,
- to evaluate the energy consumption of a neighbourhood,
- to scale various water networks, and systems management of storm water,
- to design strategies of urban mobilities
- or to be able to participate in the organization of waste management for communities, knowing the key recovery and treatment processes.

Practical info

Urban project

ECTS
8 crédits

Hourly volume
190h

Introducing

Objectives

This course allows crossing advanced technical knowledge on various key areas addressed in the other classes, in an urban project linked to the development of a neighborhood in the urban area of Toulouse. It is about understanding how technical constraints can become an element of design. It is also a question of integrating interdisciplinary approaches to make a global diagnosis, define territorial issues, and make coherent development proposals.

2. This workshop helps to understand the process of developing an urban project, from the diagnosis to the public space design. In particular, it involves understanding two important elements: the interference of scales (the need to work at the same time on a large and a small scale) and the issue of an iterative work process (need to pose early working hypotheses, project "intuitions" at the same time as a diagnosis is drawn up).

Practical info

Location(s)

Toulouse

Human relations

ECTS
6 crédits

Hourly volume
78h

Introducing

Location(s)

Toulouse

Objectives

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-Valider son projet professionnel et construire une stratégie pour trouver un emploi

Necessary prerequisites

None

Practical info

Qualitative Approach

ECTS
4 crédits

Hourly volume
45h

Practical info

Location(s)

Toulouse

Quantitative Approach

ECTS
5 crédits

Hourly volume
45h

Practical info

Location(s)

Toulouse

Designing for safety

ECTS
5 crédits

Hourly volume
42h

Practical info

Location(s)

Toulouse

Process Safety

ECTS
5 crédits

Hourly volume
45h

Practical info

Location(s)

Toulouse

INSA INSTITUT NATIONAL DES SCIENCES APPLIQUÉES TOULOUSE

Functional Safety

Practical info

Location(s)

Toulouse

[FRANCAIS] Structural Safety

Practical info

Location(s)

Toulouse

Human relations

ECTS
6 crédits

Hourly volume
78h

Introducing

Location(s)

Toulouse

Objectives

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Necessary prerequisites

None

Practical info

Toxic risks

ECTS
5 crédits

Hourly volume
42h

Practical info

Location(s)

Toulouse

[FRANCAIS] Challenge – Formation ECIU

ECTS
1 crédits

Hourly volume

Practical info

Location(s)

Toulouse

[FRANCAIS] Challenge – Formation ECIU

ECTS
2 crédits

Hourly volume

Practical info

Location(s)

Toulouse

[FRANCAIS] Challenge – Formation ECIU

ECTS
3 crédits

Hourly volume

Practical info

Location(s)

Toulouse

[FRANCAIS] Challenge – Formation ECIU

ECTS
4 crédits

Hourly volume

Practical info

Location(s)

Toulouse

[FRANCAIS] Challenge – Formation ECIU

ECTS
5 crédits

Hourly volume

Practical info

Location(s)

Toulouse

INSA INSTITUT NATIONAL DES SCIENCES APPLIQUÉES TOULOUSE

Training period 4th year

ECTS
9 crédits

Hourly volume

Practical info

Location(s)

Toulouse

INSA INSTITUT NATIONAL DES SCIENCES APPLIQUÉES TOULOUSE

Training period 5th year

ECTS
21 crédits

Hourly volume

Practical info

Location(s)

Toulouse