

OPTION 1

Engineering of drinking water production and water treatment	86h
Rational use of energy	75h

Engineering of drinking water production and water treatment



Component
INSTITUT
NATIONAL
DES SCIENCES
APPLIQUEES
TOULOUSE



Number of
hours
86h

In brief

› **Teaching language(s):** Français, Anglais

Presentation

Description

Programme (detailed contents):

- fresh water resources, availability, quality and uses
- pollutions due to the conventional waste water treatment line
- regulations on potable water (national and international level) and on waste waters
- the drinking water production lines, role of unit operations and history of these lines – design of coagulation, settling, ultrafiltration, removal of iron and manganese, ozonation and chlorination steps
- the waste water treatment lines – design of an activated sludge system – sludge methanisation (digestion, treatment and valorisation of biogas) – sludge treatment : wetting and wet air oxidation)

Organisation:

Lecture-conferences, a project, tutored problems based on complex and real examples and lab-work (on a biological system for waste water treatment and on a membrane process). The project focuses on the design of a WW treatment plant in the framework of a real situation renewed each year.

Objectives

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

- the notions of resources and uses of water, of pollutions of receiving waters
- the european and french regulations on potable water and on waster water treatment
- the main treatment lines for drinking water production and for waste water treatment and the function of unit operations in these lines
- the more recent technologies that are mainly used in these lines and the principle of their operation

The student will be able to:

- elaborate a document concerning the treatment plant definition and construction
- propose a drinking water production line (from fresh waters) and designing the main operations in this line as well as the energetic consumption
- compare different processes for waste water and sludge treatment
- design a wastewater treatment plant for the removal of major pollutants and choosing a technology for sludge treatment
- design a sludge digestion system

Pre-requisites

Hydraulics and dispersed systems

Heat transfers and real reactors

Thermodynamic properties of real fluids and mass transfer

Basic concepts for unit operations

Unit operations : technology and design

Basis on chemistry and biochemistry

Useful info

Place

➤ Toulouse

Rational use of energy



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Number of
hours
75h

Presentation

Description

Program (detailed contents):

This training will introduce the general concept of « rational use of energy ». Scientific approaches (LCA, energetic balance, exergetic balance) able to answer the requirements for an efficient use of energy will be revised and applied to energy production/consumption systems and to industrial plants. New concepts such as Pinch analysis and numerical optimization, will be developed for completing the global approach for energy-use assessment and optimization.

Organisation:

Lectures, tutorials, projects. During projects, the students will apply the different methods for energy-use assessment to energy-production and consumption systems. Dysfunctions must be identified and optimal solutions will be proposed. Students will so understand the advantages and the drawbacks of these different assessment methods.

Objectives

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

- *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.
- *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.

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.

Pre-requisites

Energetic thermodynamics

Process simulation and assessment

Processes and energy

Heat transfer : unit operations and simultaneous heat and mass transfer

Useful info

Place

➤ Toulouse