

## OPTION 2

Waste treatment and valorization	5 credits	76h
Separation processes for specific quality water production and new resource exploitation	5 credits	51h

# Waste treatment and valorization



ECTS  
5 credits



Component  
INSTITUT  
NATIONAL  
DES SCIENCES  
APPLIQUEES  
TOULOUSE



Number of  
hours  
76h

## Presentation

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### Description

Programme (detailed contents):

French and European legal definition of waste. Strategies for wastes elimination (source reduction, valorisation and treatment). Legal policies.

Air pollution control.

Treatment and valorisation of industrial and urban solids wastes. Energy valorization and material recovery.

Introduction to soil pollution and soil risk assessment. Soil treatment processes.

Organisation:

This training is organised as an active learning. Different activities with a common interest (a specific industrial activity) will allow students to approach various aspects of the waste treatment problem. Specific lectures will be proposed, including conferences of industrial partners.

### Objectives

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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. Waste characterisation
- the strategies for waste control
- the principles of unit operations and processes commonly used in waste (gas effluent, wastewater and solids waste) reduction, treatment or valorisation (chemical, biochemical and thermal processes).
- the principles of the French methodology for polluted soils risk assessment, the basis of soil treatment 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)
- select and design processes for air pollution control and for the treatment or valorisation of industrial water and solid wastes
- understand the risk assessment report of a site

## Pre-requisites

All the basic Chemical Engineering courses

Physical, chemical, biological and mathematical fundamentals

Metrology, environment and risks

## Useful info

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### Place

› Toulouse

# Separation processes for specific quality water production and new resource exploitation

 **ECTS**  
5 credits

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TOULOUSE

 **Number of  
hours**  
51h

## Presentation

### Description

Programme (detailed contents):

#### 1 New resources for human, agricultural or industrial use

Sea water /brine Waters

Secondary effluents

Nitrogen, Phosphorus

(bio) products from wastewaters

#### 2 Processes for specific quality water production

Reuse

Desalination

Water for process (conditioning)

##### 1. Recycling (water in the process)

#### 1. Design of unit operations

- ion exchange, chromatography, adsorption/  
desorption

- Reverse osmosis, electrodialysis

- decarbonation, precipitation, crystallization

Organisation:

L/T/Lab work/project

### 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
- identify new resources
- conceive and design systems for these new resource use
- apply the knowledge to other case studies

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## Pre-requisites

Basic concepts for unit operations

Technology and design of unit operations

Heat transfer and reactors

Basis of chemistry

## Useful info

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### Place

➤ Toulouse