2018/2019

Masters in Environmental Engineering

Courses taught in English 1st year - Spring Semester

January through May	ECTS	Semester 8 Course Titles
Mathematics & IT S08_MATHS_INFO	4	Data Base Design
		Geographic Information Systems
		Applied Statistics
Life Sciences S08_SC_VIE	6	Compost Processes
		Ecotoxicology
		Microbiology
Environmental Engineering S08_GIE	6	Solid Waste Management
		ICPE Facility Regulations (optional) in French
		Environmental Management
		Water Treatment Networks
Environmental Sciences S08_GIE_INGE	4	Treatment and Recovery of Agricultural Waste
		Waste Treatment & Valorization
		Wastewater
		Membrane Processes
English S08_ANGLAIS	1	English
Eco Design Management CR 503E	6	Eco-Design Case Study
		Corporate Strategy and Eco-Design
		Eco-Design Management
Project S08_TRAV_PERS	3 to 6	Environmental Science Project

Course code: 18_ING_S08_BDD **Teacher:** GAULTIER Olivier

Semester: Semester 8

Module: Math & IT

Course title: Data Base Design

Coefficient: 1

Course	TD	TP	Conf. ext.	TD ext.	TP ext.	Project work	Visit
6	3	9					

Course prerequisites:

None

Course objectives:

The aim of this course is to learn how to design a simple database with Microsoft Access software.

Learning outcomes:

At the successful completion of this course, students will: know how to:

design a database with the Entity Relationship data model convert the model to schemas

code the schemas in the SQL language

be able to:

design a complete database including graphic display

Course content:

Entity relationship model

Table design

SQL language

Graphic design

Course code: 18_ING_S08_SIG **Teacher:** DUFOSSE Karine

Semester: Semester 8

Module: Math & IT

Course title: Geographic Information Systems

Coefficient: 1

Course	TD	TP	Conf. ext.	TD ext.	TP ext.	Project work	Visit
		9					

Course prerequisites:

Basics in geography

Course objectives:

To be able to speak about Geographic Information Systems and apply GIS on simple case studies

Learning outcomes:

To know what GIS are and why they are useful
To know the different mapping options and their uses
To be able to use (basic functions) of GIS software (QGIS)
To be autonomous to answer a simple question through GIS
To present GIS results

Course content:

Short theoretical course about concepts

Practical case studies with QGIS

Course code: 18_ING_S08_STAT **Teacher:** DO PACO Wilfried

Semester: Semester 8

Module: Math & IT

Course title: Applied Statistics

Coefficient: 1

Course	TD	TP	Conf. ext.	TD ext.	TP ext.	Project work	Visit
9		6					

Course prerequisites:

Basics of probabilities, Descriptive Statistics, Hypothesis Tests

Course objectives:

This course is an introduction to Applied Statistics for engineering students. The objectives of this course are to give students confidence in manipulating and drawing conclusions from data and provide them with a critical framework for evaluating study designs and results. It will help students develop skills in thinking and analyzing problems from a probabilistic and statistical point of view.

They should also acquire the skills to perform statistic calculations using statistic computing packages (mainly Excel).

Learning outcomes:

Upon successful completion of the requirements for this course, students will be able to:

Have a working knowledge of Excel.

Fit simple and multiple linear regression models and interpret model parameters

Summarize and analyze relationships between a response variable and a covariate or covariates.

The objective is intended for students to solve some practical problems by statistical methods.

Course content:

Correlation between variables.

Simple and multiple linear regression.

Linear models

Practical applications: implementation of methods using Excel.

Course code: 18_ING_S08_COMPOSTAGE **Teacher:** LORANS Anne

Semester: Semester 8

Module: Life Sciences

Course title: Compost Processes

Coefficient: 1

Course	TD	TP	Conf. ext.	TD ext.	TP ext.	Project work	Visit
3	3					15	

Course prerequisites:

Basic knowledge in Microbiology, and Biochemistry

Course objectives:

To learn knowledge about composting process, related with regulation

Learning outcomes:

To be able to analyze composting processes

to know involved microbial and biochemical mechanisms

to interpret rules

to design and to monitor physical chemical parameters

Course content:

Transformation of organic compounds in soils and compost
Principles, main stages, and parameters of composting
Composting process
Nuisances caused by composting
Regulation

Course code: 18_ING_S08_ECO_TOX **Teacher:** LORANS Anne

Semester: Semester 8

Module: Life Sciences

Course title: Ecotoxicology

Coefficient: 1

Course	TD	TP	Conf. ext.	TD ext.	TP ext.	Project work	Visit
7.5	1.5						

Course prerequisites:

Basic knowledge of toxicology and general ecology

Course objectives:

To know and to understand the adverse effects of pollutants on ecosystems

Learning outcomes:

To be able to analyze the effects of pollutants on ecosystems

To be able to understand chemical and biological monitoring

Course content:

Biosphere pollution: principles, pollutants dispersion, pollutants transfers and biomass contamination, bioconcentration and biomagnification of pollutants

Ecotoxicity evaluations, principles of ecotoxicity tests, biodegradability tests Eco toxicological Parameters

Effects of pollutants on ecosystems

•Biomonitoring of pollutants, bioindicators, biomarkers

Prediction of pollutants adverse effects on ecosystems

Course code: 18_ING_S08_MICROBIOLOGIE **Teacher:** LORANS Anne

Semester: Semester 8

Module: Life Sciences

Course title: Microbiology

Coefficient: 2

Course	TD	TP	Conf. ext.	TD ext.	TP ext.	Project work	Visit
9	0	9					

Course prerequisites:

Basic knowledge in Microbiology, Biochemistry, general ecology

Course objectives:

To learn knowledge about environmental microbiology, and more precisely about sewage and waste biological treatments

To learn principles of microbiological analysis

Learning outcomes:

To be able to use microorganisms in biological treatments of water and sewage, soils and waste.

To be able to understand principles of health risk

To be able to make and interpret a microbiological analysis of surface water.

Course content:

Environmental microbiology: microorganisms, biofilms...

Air microbiology: microorganisms, aero-bio contamination, quality control

Soil microbiology: microorganisms, biodegradations, bioremediation

Water microbiology: Microorganisms, self-purification, microorganisms of fecal contamination, principles of analysis

Microbiology of activated sludge

Course code: 18_ING_S08_DECHET **Teacher:** HENRION Thierry

Semester: Semester 8

Module: Environmental Engineering

Course title: Solid Waste Management

Coefficient: 1

Course	TD	TP	Conf. ext.	TD ext.	TP ext.	Project work	Visit
9	3						

Course prerequisites:

None

Course objectives:

This module should allow the student to:

- Know the various waste treatment channels.
- Understand industrial practices.
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Learning outcomes:

At the end of the course, the student must be able to: Describe waste treatment pathways Discuss industrial practices and their evolutions Analyze waste treatment issues. Evaluate possible strategies for waste treatment

Course content:

Course 1 Recycling (Technical and Regulatory Aspects) General introduction to the course, Vocabulary and definition.
Recycling: Technical aspects (Selective collection, pneumatic, inert waste)
Recycling: Economic and Regulatory Aspects

Course 2: Biological treatment (technical and regulatory aspects) Agronomic valorization and spreading, Composting Methanisation, Mechanical-Biological-Treatment

Course 3: Energy recovery (Technical and regulatory aspects) Incineration of non-hazardous waste: techniques Energy, by-products, waste,
Other energy treatment (pyrolysis, RDF ...)

Course 4: Non-Hazardous Waste Storage Center (Technical and Regulatory Aspects), Construction principles Management, Biogas and Leachate Management

Course 5: Hazardous waste treatment, Recycling (some examples), Heat treatment Stabilization and Storage

Course 6: Treatment of polluted soils Containment, Leaching Biopile,
Heat treatment

TD 1: Mapping of household waste treatment systems from a city

TD 2: Landfill or incineration? Current situation / Comparison of sectors / Perspectives

Course code: 18_ING_S08_ICPE **Teacher:** HENRION Thierry

Semester: Semester 8

Module: Environmental Engineering

Course title: ICPE Facility Regulations

Coefficient: 1

Course	TD	TP	Conf. ext.	TD ext.	TP ext.	Project work	Visit
1.5	1.5						

Course prerequisites: French environmental regulations basics

Course objectives:

This module aims at making students understand what an Installation Classified for the Protection of the Environment (ICPE) is. They learn the general regulatory context and find out about the various classification plans. They can use the specifications for classified facilities and help build a case for an application to obtain an operating license in the scope of Facilities Classified for Environmental Protection (ICPE).

Learning outcomes:

The students know the different documents composing a case for an application to obtain an operating license and the administrative process for an application to get an operating permit to the Prefecture. They know the composition of an Environmental Impact Study and from the Hazard Assessment. They can identify the potential headings of an ICPE categorization out of technical data from a company and offer a registration to the authorization and declaration departments.

Course content:

Introduction of the module and group distribution /
Personal work
Feedback 1 Objectives: know the definition of a French Installation Classified for the Protection of the Environment, the regulatory context, understand the various classificatory schemes, get to know what an 'Application to obtain an operating License' is composed of and what the application process from the Prefecture is, know what an impact and hazard study is

Personal work
Feedback 2 (in French for French students, optional for the ERASMUS students)
Objectives: create an 'Application to obtain an operating License' table from a case study using French nomenclature
Resources: case study document - nomenclature

Feedback 3 (by ERASMUS students) Objectives: international culture: get to know the international regulations equivalent to Installations Classified for the Protection of the Environment in the home countries of the ERASMUS students
Resources: found by the students - discussion forum

Course code: 18_ING_S08_MNG_ENV **Teacher:** HENRION Thierry

Semester: Semester 8

Module: Environmental Engineering

Course title: Environmental Management

Coefficient: 2

Course	TD	TP	Conf. ext.	TD ext.	TP ext.	Project work	Visit
6	6						

Course prerequisites:

General knowledge in technical topics in environment: by-products production, waste, sewage, noise, water consumption, energy consumption, Trends and principles of European environmental regulations

Course objectives:

Knowledge of the major elements of ISO 14001 and EMAS, their interest in organizations and the principles of continuous improvement.

Learning outcomes:

To be able to understand the interest of a management system for the company, to know the vocabulary and requirements of the ISO14001 and EMAS. At the successful completion of this course, students will be able to help a supervisor to implement an environmental management system

Course content:

Course 1 Environmental Management System: Principles

The EMS: definition History and main texts
Why an EMS The main principles PDCA: Plan Do Check Act

Course 2 ISO 14001

The standard ISO 14001 and its principles
Environmental Policy / Planning / Implementation / Monitoring / Management Review
SMI and ISO 14001Certification

Course 3: EMAS (Eco Management and Audit Scheme)

Principles EMAS / ISO 14001 comparison Establishment EMAS Environmental audit
Environmental statements Environmental Auditing Registration

Course 4: Environmental analysis The first stage of certification

Step 1: Collecting global data
Step 2: Description of activities, products and services;
Step 3: identification of impacts (normal, transient, degraded and accidental)
Step 4: Scoring and ranking criteria.

Case Study: Developing an Environmental Audit TD1 Presentation of the company "test"
Compilation of aggregate data and description of activities TD2: Identification of impacts
TD3: Quotation and prioritization
TD4: ISO 14000 applied to the EME: how to initiate the process (Structuring and actor of the points
Environmental policy / Planning / Implementation / Control / Management review

Course code: 18_ING_S08_RESEAUX **Teacher:** DESHAYES Steven

Semester: Semester 8

Module: Environmental Engineering

Course title: Water Treatment Networks

Coefficient: 1

Course	TD	TP	Conf. ext.	TD ext.	TP ext.	Project work	Visit
9	3						

Course prerequisites:

Fluid mechanics, characteristics of drinking water (DW) and wastewater (WW)

Course objectives:

To know the problems related to the drinking water networks and to the sewers

Learning outcomes:

Identify materials and main components of networks.
Understand the basics (pressure, flow) of drinking water sizing, and the operating indicators
Know the self-cleaning rules, understand the installation, maintenance and renovation of DW/ WW networks

Course content:

Lessons and E-lessons:

Drinking water networks: structure, components, sizing bases.
Drinking water networks: leaks, health disorder, monitoring and network performance indicator drinking water supply.
DW/ WW networks: components and rules self-cleaning.
DW/ WW networks: installation, maintenance, rehabilitation. The factors of durability of networks
Alternative technics to the rainwater network

Tutorial classes:

Case study of drinking water (dimensioning of a network extension) or waste water (drawing up a synoptic summary of an existing study)

Course code: 18_ING_S08_DECHETS_AGRICOLES **Teacher:** HENRION Thierry

Semester: Semester 8

Module: Environmental Sciences

Course title: Treatment and Recovery of Agricultural Waste (Livestock)

Coefficient: 0

Course	TD	TP	Conf. ext.	TD ext.	TP ext.	Project work	Visit
3							

Course prerequisites:

English
Biological treatment of waste

Course objectives:

to know and to understand the stakes in the management of livestock manure:
Regulatory context
Composition of waste (Dung / Slurry ...)
Impacts on the environment
Treatment of livestock manure. (Spreading / Anaerobic digestion / Compost ....)

Learning outcomes:

At the successful completion of this course, students will be able to understand the issues of the management of livestock effluents on 3 axes
From the farmer's point of view (Fertilization, waste management)
From the legislator's point of view
From an environmental point of view

Course content:

Course 1: Livestock in France
- Data
- Livestock / Production areas

Departmental Sanitary Regulations (RSD) and ICPE (Installations classified for the protection of the environment)
Livestock effluents Definition / Types Regulatory Agricultural value

Course 2:
- Benefits of effluents
- Environmental impacts of spreading NPK pollution
- Pathogens
- Nuisances
- How to optimize the circular management of manure

Course code: 18_ING_S08_DECHETS_TRAIT **Teacher:** HENRION Thierry

Semester: Semester 8

Module: Environmental Sciences

Course title: Waste Treatment & Valorization

Coefficient: 1

Course	TD	TP	Conf. ext.	TD ext.	TP ext.	Project work	Visit
6	9						

Course prerequisites:

-To know how to classify the different sets of wastes
-To know the requirements of the regulations relative to waste in France and the European Union
-To know the principles of waste treatment and recycling

Course objectives:

This module should allow the student to

Practice the dimensioning of waste treatment processes
Know innovative processes
Study in detail certain regulatory and practical aspects.

Learning outcomes:

At the successful completion of this course, students will: Know how to identify the best solution of treatment or recycling Be able to recognize and to classify sets of wastes

Course content:

Course 1: Introduction to the course

General data on the cost of waste treatment
Construction of a price: Investments / Amortization - Operating expenses - Margin

Course 2: Deposit and actors

Characterization of a deposit
The main providers.

Course 3: Waste: a framed resource

ICPE regulation: asset or constraint?
Public Sector / Public contract - Public Private Partnership / Public Service Delegation

Course 4: Processing tools / Main cost elements Recycling

Organic recovery Incineration Storage

TD 1: Treatment of green waste, Technical-economic study of a composting unit

TD 2: Waste Storage Center, Establishment of a biogas network and a specific alveolus. Impact on cost of treatment

TD 3: Methanation, Adaptation of the tool to the bio-waste deposit

TD 4: Incineration, Development of a grid of choice for the treatment of fumes

TD5: Response to a public contact (1/2) Reading the tender and choosing the solution

TD6: Response to a public contract (2/2) Written reply

Course code: 18_ING_S08_EAUX_USEES **Teacher:** DJELAL Hayet

Semester: Semester 8

Module: Environmental Sciences

Course title: Wastewater

Coefficient: 2

Course	TD	TP	Conf. ext.	TD ext.	TP ext.	Project work	Visit
7.5	3						

Course prerequisites:

Process engineering (Reactors theory)

Water management

Course objectives:

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

understand and comment on the results describing the characteristics of urban and industrial wastewaters,

process data in order to measure pollution flows and various dimensioning parameters,

know the main treatment schemes and select the right one of them (the combination of adapted unitary operations) in function of on the characteristics of the water that needs to be treated,

measure intensive biological processes (carbon, nitrogen and phosphorus pollutions).

Learning outcomes:

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

understand how a biological water treatment plant works,

choose a treatment scheme according to the characteristics of raw water,

interpret results of water analyses and make a review,

apply the calculation rules from various works in order to measure the biological basin of a water treatment plant.

Course content:

Urban wastewater: characteristics, rules and introduction of existing processes

Activated sludge and treatment of carbon pollution

Biological nitrification

Biological denitrification

Physical-chemical and biological removal of phosphates

Dimensioning of a biological basin of an urban water treatment plant

Application to industrial effluent treatments

Course code: 18_ING_S08_PROC_MEMB **Teacher:** KANE Abdoulaye

Semester: Semester 8

Module: Environmental Sciences

Course title: Membrane Processes

Coefficient: 1

Course	TD	TP	Conf. ext.	TD ext.	TP ext.	Project work	Visit
1	3						

Course prerequisites:

basic concepts of chemical engineering: filtration and mass transfer

Course objectives:

To see the potential of membrane technologies for the treatment of drinking water and wastewater.

To learn the basic knowledge for the calculation of membrane separation processes.

Learning outcomes:

This module offers students the principles and methodology to know how to explain: the notions of selectivity, retention capacity of a membrane, permeability, know the main membrane processes used in water treatment (microfiltration, ultrafiltration, nanofiltration, reverse osmosis); membrane materials and modules; understand the notion of concentration polarization; reverse osmosis effect. Students must have the necessary background for the sizing of membrane processes applied to drinking water treatments and wastewater treatment.

Course content:

Session1:

Membrane processes for water and wastewater treatment
Membrane filtration characteristics and its influencing factors
Different membrane geometries

Session2:

Membrane materials for water treatment
Characterization of membranes

Session3:

Examples for Applications of Membrane Processes
Membrane fouling
Membrane regulatory context (French legislation)

Two sessions of TD (1h30 / session) will be given and mainly focus on the following points:

Membrane water permeability
Factors to improve flux
optimal module arrangement
Estimating the cake resistance
Membrane design for wastewater treatment

Course code: 18_ING_S08_ANGLAIS **Teacher:** POMMET Nelly

Semester: Semester 8

Module: English

Course title: English

Coefficient: 1

Course	TD	TP	Conf. ext.	TD ext.	TP ext.	Project work	Visit
	12					12	

Course prerequisites:

Post High School English level B2

Course objectives:

To prepare students for oral communication on best practices, and negotiations of professional solutions
To enhance students' general English including, oral comprehension, writing skills, vocabulary and grammar
To maintain or improve the English level and fluency acquired abroad and prepare students for professional life

Learning outcomes:

By the end of this module, students should be at a strong B2 level and be able to:
cope adequately with professional oral activities such as group discussion,
understand and use a range of techniques for giving oral presentations
extract the general meaning and detailed information from a range of reading texts
converse at a good level on a wide range of general topics, and speak English acceptably
have accurate pronunciation, give a ten-minute oral presentation
handle structures, functions, notions and vocabulary with acceptable accuracy
write with minimal errors in usage

Course content:

Listening and speaking activities Current events & General vocabulary
Review of sentence structure & grammar Listening & reading comprehension
Pronunciation
2 sessions in computer labs
Debates, negotiations & discussions about environmental, scientific and technical issues
Presentations of best practices & cultural differences of Erasmus+ destinations Other sessions will be defined according to the level of each group

Course code: 18_MSC_S02_CR503E_CIK **Teacher:** CIKANKOWITZ Anne

Semester: Semester 2

Module: Eco-Design Management

Course title: Eco-Design case study

Coefficient: 1

Course	TD	TP	Conf. ext.	TD ext.	TP ext.	Project work	Visit
1.5			6				

Course prerequisites:

Life Cycle Assessment (LCA)
Environmental regulation
Best Available Techniques (BAT)

Course objectives:

To discover the main steps of an eco-design management system
To understand how to implement eco-design
To play different roles / to mix skills (marketing, environmental management)
To deepen the knowledge on BAT, LCA & sustainability

Learning outcomes:

To be able to understand, define and analyze an eco-design management system

To be able to put your work into perspective: what about the linkage between BAT, LCA, sustainability and eco-design?

Course content:

Eco-design & sustainability / sustainable development to work in groups.
The way to learn: flipped classrooms.
First: Sum-up of a scientific paper relative to eco-design management system Then: choose a product of your choice & read other technical documents to deepen your knowledge on eco-design management
Finally: by taking different roles (for each working group): business consultant expert in sustainable development management, environmental engineer & « product manager », you have to convince a company (jury = teacher) to implement environmental improvement through a product (of your choice) development.
It is also important to underline that all of the above ideas are intertwined. How?

Course code: 18_MSC_S02_CR503E_DUFOSSE **Teacher:** DUFOSSE Karine

Semester: Semester 2

Module: Eco-design management

Course title: Corporate strategy and eco-design

Coefficient: 1

Course	TD	TP	Conf. ext.	TD ext.	TP ext.	Project work	Visit
12							

Course prerequisites:

None

Course objectives:

Corporate Environmental strategy and Eco-Design

Setting up the Eco-Design approach in a company:

Learning outcomes:

Students should acquire the knowledge and skills related to:

“Product” Environmental Management

Eco-Design and Eco Innovation

Corporate motivation and stakes

possible levers and barriers

Eco-Design organization

Course content:

Standardized and sector specific Eco-design methodology

Carrying out an Eco-design analysis

Course code: S08_TRAV_PERS **Teacher:** Research team

Semester: Spring semester

Module: Environmental Science Project **3 to 6 ects**

Course title: Environmental Science Project

Coefficient: 1

Course	TD	TP	Conf. ext.	TD ext.	TP ext.	Project work	Visit
tbd						tbd	

Course prerequisites:

Undergraduate work in Environmental Science or Environmental Engineering

Course objectives:

To complete a project in coordination with a UniLaSalle researcher, possible objectives include:

To evaluate the relevance of a scientific process/issue

To do a literature review of the state of the art of a scientific process/issue

To write a report on the subject

To present findings

Learning outcomes:

To understand thoroughly an environmental science issue

Course content:

To be determined, in coordination with the Head of Research at UniLaSalle Rennes