

**PEOPLE'S DEMOCRATIC REPUBLIC OF ALGERIA**

**MINISTRY OF HIGHER EDUCATION  
AND SCIENTIFIC RESEARCH**

# **ACADEMIC MASTER TRAINING OFFER**

<b>Establishment</b>	<b>Faculty</b>	<b>Department</b>
<i>Khemis Miliana University</i>	<i>Faculty of Nature, Life and Earth Sciences</i>	<i>Ecology</i>

**Field : Nature and Life Sciences (NLS)**

**Branch : Ecology and Environment**

**Speciality : Ecosystems Protection**

**2015-2016**

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## **I – Master's identity sheet**

## **1 - Training location:**

**Faculty : Nature, Life and Earth Sciences**  
**Département : Ecology**

## **2- Training partners \*:**

### **- Companies and other socio-economic partners:**

- Ministry of Agriculture, Rural Development and Fisheries (MADRP): Technical Institute for Field Crops (ITGC), Directorate of Agricultural Services (DSA) of the Wilaya of Ain Defla, Algerian National Institute for Agronomic Research (INRAA) , National Plant Protection Institute (INPV); Ministry of Higher Education and Scientific Research (MESRS): El-Wancharissi University Center (CUWT);
- Ministry of Water Resources (WRM): National Hydraulic Ressources Agency (NHRA), National Center for Cleaner Production Technologies (NCNPT); Transport Ministry (TM): National Metrology Office (NMO); Algiers Water and Sanitation Company (SEAAL);
- **- International partners :**
  - Erasmus (Mobilty for learners and staff).
  - National Institut of Agronomy , Tunisia (NIAT) ;
  - Shanxi Academy of Agricultural Sciences of China (SAAS): Institute of Agricultural Environment and Resource (IAER);

## **3 – Context and objectives of the training**

### **A – Acces Conditions**

This specialty opens up to several specialized licenses in Geosciences and Biology such as: Ecology and Environment or specialties judged close.... And has masters in the same sector or sectors deemed compatible as well as diplomas from the old system following a study of the file by the teaching team of the specialty.

### **B - training Objectives**

This specialty aims to specialize students over two years in the contexts of environmental sciences in general and in the protection of ecosystems in a particular way for the purpose of academic training that opens up to scientific research.

Several types of environmental skills will be acquired at the end of the two years: Hydrogeologists, Hydrochemists, Soil scientists, Ecologists, who will complete the knowledge acquired in the license course mentioned above.

The Ecosystem Protection Master's favors the development of integrated observation of natural "objects" centered on the transfer of water and matter and their physical, chemical and biogeochemical transformations within the Atmosphere-Biosphere-Hydrosphere-Pedosphere system.

Emphasis is placed on a quantitative physical, chemical and biological approach to natural processes which correspond to the "original" training in Natural and Life Sciences (NLS) in the specialties related to water and environment.

### **C – Targeted business profiles and skills:**

One of the priorities that has strongly guided our training policy for an academic Master's degree is both the extent and the diversity of the environmental problems facing the region of Ain Defla, which is crossed by the Oued Chlef known as the largest and most important wadi in Algeria. The Chellif region is therefore an experimental site par excellence, which meets the requirements of a thorough academic training while allowing our students to acquire the skills necessary to face the world of scientific research and contribute to regional and national development.

Indeed, our approach which is original is also fundamental to train operational people in the field of the environment. The skills acquired will therefore allow students to apply to state or private companies (industrial, agricultural, design office, river basin agency... and above all to apply for high-level doctoral training), or in local authorities .

At the end of their training, graduates will be able to intervene on any environmental problem linked more or less directly or indirectly to water by predicting the impact, diagnosing the situation or proceeding to remediation. Their interventions relate to various aspects, in particular those related to the physico-chemistry and biology of the environment: water and soil pollution, management of wastewater and waste as well as the different uses of water in terms of quantity and quality for different uses.

The outgoing graduate must be able to establish an experimental protocol, practice sampling, readings and analyze samples in order to assess the quality of the environment studied. He will be able to define and determine the origins of physico-chemical and biological pollution of the environment and study their impact on the environment. Finally, he will be able to implement techniques for the prevention and treatment of the degradation of ecosystems and their pollution.

### **D-Regional and national employability potential of graduates**

At the end of their training, graduates will be able to intervene on any environmental problem related to water and/or soil, by diagnosing the situation, predicting the impact, or intervening through restoration and remediation. Their interventions relate to various aspects in particular those related to the physico-chemistry and the biology of the mediums in the concern of the omnipresent prospect of a sustainable development: Degradation and erosion of the grounds, pollution of the grounds and waters, management integrated ecosystems.

There are many opportunities for integration into working life at national and regional level. The skills acquired during this training allow graduates to apply in the sectors of agriculture, hydraulics and the environment. All of these sectors (administrative, development and research) exist at different levels in the region, starting with the capital of the wilaya, the daïras and the communes.

For example, we can cite:

- Environment sector
- Agricultural sector
- Health sector
- Industrial sector
- Wastewater treatment plant
- National Dams Agency
- Division of hydraulics of the wilaya
- Municipal water services

### **E – Gateways to other specialties**

Bridges exist between this master and the masters: “water and bioclimatology”, “water and environment”, “ecopedology and environment” and “ecology and environment”.

## **F – Training monitoring indicators**

The objective of the system is to diversify the methods of control in order to assess as widely as possible the skills of the students. In this framework, we will assess: (1) the empowerment of the student; (2) regular monitoring of knowledge acquisition; (3) the acquisition of oral expression; (4) the acquisition of teamwork and synthesis skills; (5) control of the student's abilities and not being content with his knowledge. The breakdown between the different forms of assessment is as follows:

Knowledge check: 40%

Oral expression: 20%

Personal work: 20%

Capacity for analysis and synthesis: 20%

## **G – Supervisory capacity**

In this master, a number of 20 students is sufficient to ensure quality training, and a rigorous follow-up and personalized evaluation of each student admitted as part of this training.

## **II – Semester organization sheet for lessons**

## Semester 01

Teaching unit	Matter	Credit	Coefficient	Weekly hourly volume			semester hourly volume
				Courses	Directed work	Practical work	
Fundamental Unit	Natural territorial systems	6	3	1h30	1h30	1h30	67h30
	Degradation of the environment and ecosystems	6	3	3h00	1h30		67h30
	Environmental climatology	6	3	1h30	1h30	1h30	67h30
Methodological unit	Statistical analyzes of data	5	3	1h30	1h00	1h30	60h00
	Sampling and experimentation	4	2	1h30		1h30	45h00
Discovery unit	Renewable and non-renewable energies	1	1	1h30			22h30
	Scientific English I	1	1	1h30			22h30
Transversale Unit	Communication	1	1	1h30			22h30
Total Semester		30	17	13h00	5h30	6h00	375h00

## Semester 02

Teaching unit	Matter	Credit	Coefficient	Weekly hourly volume			semester hourly volume
				Courses	Directed work	Practical work	
Fundamental Unit	General ecotoxicology	6	3	3h00	1h30	1h30	67h30
	Waste management and treatment	4	2	3h00	1h30		45h00
	Ecological approach to land use planning	4	2	1h30	1h30		45h00
	Environmental rehabilitation techniques	4	2	1h30	1h30		45h00
Methodological unit	Spatial analysis and remote sensing	5	3	1h30	1h00	1h30	60h00
	Hydrobiogeochemical cycles	4	2	1h30	1h30		45h00
Discovery unit	Environmental impact study	2	2	1h30	1h30		45h00
Transversale Unit	environmental law	1	1	1h30			22h30
Total Semester		30	17	12h00	10h00	3h00	375h00

## Semester 03

Teaching unit	Matter	Credit	Coefficient	Weekly hourly volume			semester hourly volume
				Courses	Directed work	Practical work	
Fundamental Unit	Management of protected areas	6	3	3h00	1h30		67h30
	Applied Ecotoxicology	6	3	1h30	1h30	1h30	67h30
	Management and development of unconventional resources	6	3	1h30	1h30	1h30	67h30
Methodological unit	Applied Geostatistics	5	3	1h30	1h00	1h30	60h00
	Instrumental analyzes and good laboratory practices	4	2	1h30		1h30	45h00
Discovery unit	Environmental Economics	1	1	1h30			22h30
	Scientific English II	1	1	1h30			22h30
Transversale Unit	Entrepreneurship	1	1	1h30			22h30
Total Semester		30	17	13h30	5h30	6h00	375h00

## Semester 4

Training course in a company and/or in a university laboratory finalized by a dissertation and a defense..

	VHS	Coeff	Credit
Personal Work	450	09	18
Internship in a company	420	04	06
Workshops	75	02	03
Other (Research Laboratory)	35	02	03
Total Semester 4	750	17	30

### **III - Detailed program by Unit**

**Title of the Master : Protection of Ecosystems**

**Semester : 1**

**Title of TU : Fondamentale (FTU 1)**

**title of the Unit : Natural territorial systemsCrédits : 6**

**Coefficients : 3**

**Teaching objectives:**

Train students on the structural components of the environment and their dynamics, understood through the complementary thematic entries of hydrosystems, climate and biodiversity, as well as human/environment interfaces.

**Unit content :**

0. Introduction and theory.
1. The key notions of: environment, space, territory, region, resource, biomes and ecotones.
  - 1.1. Spaces and horizontal relations between places.
  - 1.2. Environments and vertical relations between places and physical foundations.
  - 1.3. Region concept.
  - 1.4. Ecological fallacy.
2. The global climate.
  - 2.1. Explanations for the diversity of global climates.
  - 2.2. The foehn effect.
3. The diversity of Algeria's climate.
4. Climate change.
  - 4.1. The world during the Quaternary.
  - 4.2. The current climate.
5. Glaciers.
  - 5.1. Spatial variability factors.
  - 5.2. Other types of variability.
6. Water.
  - 6.1. Water, hydrological and hydrogeological balance.
  - 6.2. Water as a resource.
  - 6.3. The major issues.
  - 6.4. Water as a risk.
7. Landscapes.
  - 7.1. Glaciers and landscape – erosion.
  - 7.2. Glaciers and landscape – sediment transport and deposition.
  - 7.3. The effects of glaciation on soil and vegetation.
8. Issues for the territory – tourism and agriculture in particular.
  - 8.1. The four issues.
  - 8.2. The state of global, regional and local tourism.
    - 8.2.1. Tourism and future changes.
    - 8.2.2. The state of agriculture.
  - 8.3. Urbanization regimes: Factors of transformation.
  - 8.4. Territory planning.

**Evaluation mode :** Continuous control, examination, etc... (The weighting is left to the discretion of the training team)

**personal work :**

Presentations/reports outside practical and practical sessions, practical reports, practical work reports, dissertations (organized argumentation exercise), consultation and reading of bibliography (books, works, articles, website, etc.), output reports , internship report.

**Title of the Master : Protection of Ecosystems**

**Semester : 1**

**Title of TU : Fondamentale (FTU 1)**

**Title of the Unit : Environmental degradation.**

**Credits : 6**

**Coefficients : 3**

**Teaching objectives:**

This unit is designed to introduce students to the assessment of the state of the environment as a first step in integrated environmental assessment and reporting since the role of man in the degradation of our environment is not more questioned.

**Unit content :**

1. Introduction: the environment, much more than natural spaces
2. History of pollution
  - 2.1. Before the 19th century
  - 2.2. In the nineteenth century
  - 2.3. In the 20th century
  - 2.4. In the 21st century
3. Environmental Sciences
  - 3.1 Observation (monitoring) of the environment
4. Causes and Sources of Pollution
  - 4.1. Causes
  - 4.2. Sources
5. Classification of different types of pollution
  - 5.1. Atmospheric pollution
    - a. Nature and sources of air pollution
    - b. Impact of air pollutants on the environment and human health
  - 5.2. Soil and water pollution
    - a. Pollutants at household level
    - b. Pollutants from intensive agriculture
      - b1. Fertilizer pollution
      - b2. Pesticide pollution
    - c. Environmental consequences
    - d. Methods of combating soil and water pollution
  - 5.3. Specific pollution
6. Human Impacts on the Environment

- 6.1. Soils
- 6.2. Water
  - 6.2.1. water resource
  - 6.2.2. Water quality
- 6.3. Air
- 6.4. Biodiversity
- 6.5. Natural resources
- 6.6. Ecological disasters
- 6.7. Human Health Effects
- 7. Consequences of Environmental Degradation

**Evaluation Mode :** Continuous control, examination, etc... (The weighting is left to the discretion of the training team)

**Personal work:**

Presentations/reports outside practical and practical sessions, practical reports, practical work reports, dissertations (organized argumentation exercise), consultation and reading of bibliography (books, works, articles, website, etc.), output reports , internship report.

**Title of the Master : Protection of Ecosystems**

**Semester : 1**

**Title of TU : Fondamentale (FTU 2)**

**Title of the Unit : Environmental climatology**

**Credits : 6**

**Coefficients : 3**

**Teaching objectives :**

Describe what skills the student is supposed to have acquired after passing this subject – maximum 3 lines).

The course allows students to acquire the basics of climatology necessary to understand natural phenomena, in particular climate change and its impact on the environment.

**Unit content :**

Introduction to environmental climatology - Climate change - Impact of climate change - Agroclimatology

**Evaluation mode :** Continuous control, examination, etc... (The weighting is left to the discretion of the training team)

**Personal work :**

Presentations/reports outside practical and practical sessions, practical reports, practical work reports, dissertations (organized argumentation exercise), consultation and reading of bibliography (books, works, articles, website, etc.), output reports , internship report.

**Title of the Master : Protection of Ecosystems**

**Semester : 1**

**Title of TU : Methodology (MTU 1)**

**Title of the Unit : Statistical data analysis.**

**Credits : 5**

**Coefficients : 3**

**Teaching Objectives:**

Acquire the statistical bases to describe, analyze and interpret natural phenomena and the multiparametric interaction between the characteristics of the biotic and abiotic environment.

**Unit content :**

1. Reminders of descriptive statistics.
2. Simple and multiple regressions.
3. Principal component analysis.
4. Factorial analysis of simple and multiple correspondences.
5. Discriminant factor analysis.
6. Ascending hierarchical classifications and dynamic clusters.
7. Different statistical tests.
8. Time series.

**Evaluation mode :** Continuous control, examination, etc... (The weighting is left to the appreciation of the training team)

**Personal work:**

Dw reports, Pw reports, dissertations (organized argumentation exercise), consultation and reading of bibliography (books, works, articles, website, etc.), exit reports, internship report, learning about data analysis software. data.

**Title of the Master : Protection of Ecosystems**

**Semester : 1**

**Title of TU : Methodology (MTU 1)**

**Title of the Unit : Sampling and experimentation.**

**Credits : 4**

**Coefficients : 2**

**Teaching Objectives:**

Introduce students to sampling and sample collection methods, teach them how to establish an experimental protocol and properly conduct the experimental part of a project.

**Unit Content:**

**Chapter 1: Types of samples.**

- 1.1. Random (probabilistic) samples for fixed organisms.
  - 1.1.1. Simple random samples.
  - 1.1.2. Systematic samples.
  - 1.1.3. Stratified samples.
  - 1.1.4. Cluster samples.
  - 1.1.5. Two-stage samples.
  - 1.1.6. Quota samples.
  - 1.1.7. Samples of volunteers.
  - 1.1.8. Judgment samples.
  - 1.1.9. The sub-samples.
- 1.2. Sampling for mobile organisms.
- 1.3. Relations between the phases of field research.

**Chapter 2: Designs of experiments.**

- 2.1. Experimental method.
- 2.2. Experience.
  - 2.2.1. Experiment measuring a natural phenomenon.
  - 2.2.2. Controlled experiment.
- 2.3. Controlled/random factors.
  - 2.3.1. Example of controlled factors.
  - 2.3.2. Example of random factors.
- 2.4. Presentation of data.
  - 2.4.1. Simple statistical series.
  - 2.4.2. Bounds, interval, indices.
  - 2.4.3. Double statistical series.

**Chapter 3: Sampling plan.**

- 3.1. Elements of a sampling plan.
- 3.2. Goals definition.
- 3.3. Accuracy and sample sizes.
  - 3.3.1. Determination of the minimum workforce.
  - 3.3.2. Establishment of the workforce for the comparative study.
- 3.4. Comparison of methods.
  - 3.4.1. Estimation and efficiency of methods.
  - 3.4.2. Normality of sampling distributions.

**Chapter 4: Typical plan of an experimental or sampling protocol.**

**Part 1: Typical example.**

- 1. Protocol identification.
- 2. Theme of the study.

3. Objective.
4. Factors studied and to be controlled.
5. Experimental material.
6. Experimental or sampling device.
7. Variables measured.
8. Implementation.
9. Statistical processing of results.
10. Dissemination.
11. Material means.
12. Determination of necessary personnel.

**Part 2: Case study.**

**Evaluation mode :** Continuous control, exam, etc... (The weighting is left to the appreciation of the training team)

**Personal work:**

Presentations/reports outside practical work sessions, practical work reports, dissertations (organized argumentation exercise), consultation and reading of bibliography (books, works, articles, website, etc.), outing reports, internship report.

**Title of the Master : Protection of Ecosystems**

**Semester : 1**

**Title of TU : Discovery (DTU 1)**

**Unit title: Renewable and non-renewable energies**

**Credits : 1**

**Coefficients : 1**

**Teaching Objectives:**

It is a question of providing students with scientific bases and elements of reflection on the management of energy resources from a global and local point of view. Environmental problems arising from their uses nationally and internationally.

**Unit Content:**

- 1 Etymology and definitions
- 2 Types
  - 2.1 Forms of energy in mechanical physics
  - 2.2 Sources of energy
- 3 Transversal approach
  - 3.1 A “universal” magnitude
  - 3.2 History of the concept of energy
- 4 Biology
  - 4.1 From thermodynamics to ecology
  - 4.2 Storage and use of energy by living things
- 5 Energy and esotericism
- 6 Energetics: energy in human societies
  - 6.1 Fossil and renewable energies

- 6.2 Energy saving
- 7 Nuclear energy
  - 7.1 Radioactivity
  - 7.2 Nuclear reaction
    - 7.2.1 Fission
    - 7.2.2 Merging
    - 7.2.3 Comparison of nuclear and chemical energies
  - 7.3 Cost of nuclear energy
  - 7.4. Nuclear Energy Debate
- 8 Solar energy
  - 8.1 History
  - 8.2 Solar Resources
  - 8.3 Techniques for using solar energy
    - 8.3.1 Passive solar
    - 8.3.2 Solar thermal
      - 8.3.2.1 Solar energy for cooking food
    - 8.3.3 Mechanical solar
    - 8.3.4 Thermodynamic solar
      - 8.3.4.1 Thermodynamic solar power plants
      - 8.3.4.2 Stirling engine
    - 8.3.5 Solar photovoltaic
- 9 Electrical energy
  - 9.1 Energy and electric current
    - 9.1.1 Relationship between power and steady-state energy
    - 9.1.2 Unit of measurement
    - 9.1.3 Joule's Law
  - 9.2 Electrical potential energy
- 10 Thermal energy
  - 10.1 Thermal energy and balance
  - 10.2 Quantum origin
  - 10.3 Thermal energy and temperature
  - 10.4 Thermal energy and state of matter
  - 10.5 Heat transfers
  - 10.6 Difference between heat and temperature
- 11 .Wind energy
  - 11.1 History
  - 11.2 Techniques
  - 11.3 Operating characteristics of wind turbines
  - 11. 4 Economy: value, price, cost.
- 12 Fossil fuel
  - 12.1 Environmental impacts
  - 12.2 Health impacts
  - 12.3 Reservations
  - 12.4 Future
    - 12.5 Grading
      - 12.5.1 Conventionals
      - 12.5.2 Unconventional
  - 12. 6 Black taxation.

**Evaluation mode :** Continuous control, exam, etc... (The weighting is left to the appreciation of the training team)

**Personal work:**

Presentations/reports outside practical work sessions, practical work reports, dissertations (organized argumentation exercise), consultation and reading of bibliography (books, works, articles, website, etc.), outing reports, internship report.

**Title of the Master : Protection of Ecosystems****Semester : 1****Title of TU : Discovery (DTU 1)****Unit title: scientifique english I.****Credits : 1****Coefficients : 1****Teaching objectives :**

This module will allow students to acquire the necessary knowledge of scientific English and to develop all of their linguistic skills.

**Unit Content:**

- Systematic training in written and oral comprehension will be carried out, particularly in the multimedia room.
- The work will also focus on the grammatical and syntactical specificities of scientific communication, both in writing and orally.
- The lexical fields covered will be those of the various scientific disciplines and their applications to biology.

**Evaluation mode :** Continuous control, exam, etc... (The weighting is left to the appreciation of the training team)

**Personal work:**

Presentations/reports outside practical work sessions, practical work reports, dissertations (organized argumentation exercise), consultation and reading of bibliography (books, works, articles, website, etc.), outing reports, internship report.

**Title of the Master : Protection of Ecosystems**

**Semester : 1**

**Title of TU : Transverse (TTU1)**

**Unit Title : Communication.**

**Credits : 1**

**Coefficients : 1**

**Teaching Objectives:**

Analyze the objectives of internal and external communication and present the methodologies needed to conduct the main communication actions.

**Unit Content:**

- Reinforcement of language skills.
- Communication methods.
- Internal and external communication.
- Meeting techniques.
- Oral and written communication.

**Evaluation mode :** Continuous control, exam, etc... (The weighting is left to the appreciation of the training team)

**Personal work :**

Oral presentations, workshop facilitation in the presence of teachers, simulation of meeting arrangements, carrying out surveys with citizens as part of the various modules.

**Title of the Master : Protection of Ecosystems**

**Semester : 2**

**Title of TU : Fondamentale (UTF 1)**

**Unit Title : General Ecotoxicology.**

**Credits : 6**

**Coefficients : 3**

**Teaching Objectives:**

Studying the behavior and effects of "polluting" agents on ecosystems, whether agents of artificial origin (including drugs, endocrine disruptors, etc.) or natural agents whose distribution and/or cycles in the different compartments of the biosphere.

**Unit Content:**

- 1 Elements of definition
- 2 History of ecotoxicology
- 3 General information on ecotoxicology and the different types of toxicity.
- 4 Become pollutants in the environment and organisms.
- 5 Ecotoxicity assessment methods.
- 6 Biomonitoring of ecosystems.

7 Basics of genotoxicity, carcinogenicity and reprotoxicity and evaluation tests.

8 Basics of environmental risk assessment.

9 Risk assessment[8]

10 Ecotoxicology and the time dimension

11 Environmental Protection

**Evaluation mode :** Continuous control, exam, etc... (The weighting is left to the appreciation of the training team).

**Title of the Master : Protection of ecosystems**

**Semester : 2**

**Title of the UE : Fundamental (UEF 1)**

**Subject Title : Waste Management and Treatment**

**Credits : 4**

**Coefficients : 2**

**Teaching objectives :**

To make the students aware of the importance of waste recycling in the framework of the protection of ecosystems and sustainable development.

**Content of the subject:**

1. Typology of waste and treatment and elimination channels.
  - 1.1 Typology of waste (municipal, industrial).
  - 1.2 Collection, elimination channels of household waste (incineration, landfill).
  - 1.3. Biological treatment processes (composting and methanization).
  - 1.4. Innovative technologies (OVH, pyrolysis...).
  - 1.5. Energy recovery.
  - 1.6. Agronomic use of the products - Monitoring of the effects - Control of the quality of the products.
  - 1.7 Management of common and dangerous industrial waste.
  - 1.8. Regulations relating to waste in France and Europe. Role of the different actors involved in Algeria, Europe and the world: local authorities, elected officials, private companies.
2. Treatment of fumes and odors.
  - 2.1. Standards and regulations on gaseous and odorous discharges.
  - 2.2. Odor measurement (jury, electronic nose), and characterization of nuisances.
  - 2.3 Treatment of odors and fumes: thermal and catalytic oxidation; condensation; adsorption on solid phase and absorption in liquid phase; membrane separation; bio-filter.
3. The impact of our waste on our environment and our health.
4. The symbols of recycling
5. Visits.
6. Case study.

**Evaluation method:** Continuous assessment, exam, etc. (The weighting is left to the discretion of the training team)

**Title of the Master : Protection of ecosystems**

**Semester : 2**

**Title of the UE : Fundamental (UEF 2)**

**Title of the subject : Ecological approaches to land use planning.**

**Credits : 4**

**Coefficients : 2**

**Teaching objectives :**

To understand the stakes of the concept of sustainable development of the territory in relation with its ecosystem.

**Content of the subject :**

Chapter 1: Generalities

1. The fundamental principles of land use planning.

2. The development of the master program.
  - 2.1. Step One: The Policy Framework
  - 2.2. Step Two: The Policy Framework.
  - 2.3 Step 3: The draft policy program.
  - 2.4. Step Four: Implementation.
3. A fundamental orientation: sustainable development.
  - 3.1. The definition of sustainable development.
  - 3.2. The strong points of sustainable development of the territory.

## Chapter 2: Towards a sustainable development of the territory

### Part 1: The basic elements

1.1. The main development trends

1.2. The framework

1.3. Beyond the borders

### Part 2: Policy directions and objectives

2.1. Policy objectives

2.2. Towards the spatial integration of action

2.3 Integration into European perspectives

### Part 3: Priorities for a sustainable development of the territory

3.1. The five main areas of intervention

3.2. Support strategies

3.3. Monitoring of measures

3.4. Communication and awareness-raising in the field of spatial planning

## Chapter 3: Implementation of the master plan - catalog: detailed measures, actions and projects

1. Urban and rural development

2. Transport and telecommunications

3. Environment and natural resources

## Chapter 4: Legal aspects of planning.

1. Environmental legislation: definition and scope.

2. Current legal status of land use planning and environmental protection and management (study of the various laws relating to the protection of ecosystems, protection of natural resources, etc.).

**Evaluation method:** Continuous control, exam, etc.

### **Personal work :**

Presentations/reports outside of the practical sessions, TD reports, dissertations (organized argumentation exercise), consultation and reading of bibliography (books, works, articles, website...), field trip reports, internship report.

**Title of the Master : Protection of ecosystems**

**Semester : 2**

**Title of the UE : Fundamental (UEF 2)**

**Subject Title : Environmental Rehabilitation Techniques**

**Credits : 4**

**Coefficients : 2**

**Teaching objectives:**

The objective of this module is to teach the students the rehabilitation techniques applicable to particular cases. However, the techniques presented are not exhaustive (important and rapid progress in research and development suggest many other possibilities).

**Content of the subject :**

1. Introduction
2. Soil remediation
  - 2.1 Excavation, sorting, particle size separation (Hydrosplit)
  - 2.2 Soil washing
  - 2.3 Physical and chemical stabilization
  - 2.4 In situ treatment (venting, bioventing, ISCR,...)
  - 2.5 Biodegradation on site (biotertre, landfarming...)
  - 2.6 Containment
  - 2.7 Thermal treatment (thermal desorption,...)
  - 2.8 Off-site treatment: evacuation in approved channels
3. On-site or "in situ" groundwater treatment (pumping/treatment)
  - 3.1 Skimming, separator-coalescer
  - 3.2 Stripping, air-sparging
  - 3.3 Chemical treatment (oxidation, reduction, ...)
  - 3.4 Membrane treatment (Ultrafiltration, reverse osmosis, ...)
4. Preventing and fighting environmental pollution
  - 4.1 The principle of pollution control
  - 4.2 The implementation of pollution control techniques
  - 4.3 Global waste management
  - 4.4 Priority to prevention
5. The management of air pollution

**Evaluation method :** Continuous control, exam, etc

**Personal work:**

Presentations/reports outside the TD sessions, TD reports, dissertations (exercise of organized argumentation), consultation and reading of bibliography (books, works, articles, web site...), reports of outings, report of internship.

**Title of the Master : Protection of ecosystems**

**Semester : 2**

**Title of the UE : Methodology (UEM 1)**

**Subject Title : Spatial analysis and remote sensing.**

**Credits : 5**

**Coefficients : 3**

**Teaching objectives :**

The theoretical and technical knowledge that students will have at the end of the learning process are related to the skills of engineering of the treatment of geographical information and the use of the remote sensing tool with a concrete situation on applications of the surface states of the grounds.

**Content of the course:**

Introduction to geomatics.

Part 1: Spatial analysis.

Introduction Spatial analysis and history.

Chapter 1: Elements of definition.

1. Spatial analysis and history of natural sciences.
2. Objects of spatial analysis.
3. Two modes of analysis.

Chapter 2 : Sources.

1. Diversity.
2. Iconography and cartography.
3. Developing sources, preparing documents.

Chapter 3: Methods and tools.

1. Analyze the documentation.
2. Produce artifacts.
3. Computer tools.

Chapter 4: Practicing spatial analysis.

1. The game of time passing.
2. Restoring structures.
3. Questioning the differences.
4. Spatial analysis as a synthetic indicator.

Chapter 5: Spatial databases.

Part 2: Remote sensing.

Chapter 1: Remote sensing.

1. Definition
2. History of remote sensing.
3. Areas of application.
4. Examples of applications.

Chapter 2: Principles of remote sensing, elements of radiation physics.

1. Electromagnetic radiation
2. Radiation and matter.
3. Applications in remote sensing.
4. Radiation and the atmosphere.
5. Electromagnetic radiation and remote sensing.

Chapter 3: The sensors, operation and performance.

1. Photographic sensors.
2. Imaging radiometers.
3. Active sensors.

Chapter 4: Satellites and orbits.

1. Elements of satellite mechanics.
2. The two main types of orbits used in remote sensing.
3. Orbit perturbations and their consequences

Chapter 5: From data acquisition to applications, introduction to digital processing methods for remote sensing data.

1. Image processing.
2. Classification.

Some practical work :

TP n°1 : NOAA image.

Practical work n°2 : The different corrections of a satellite image.

Lab #3: High spatial resolution SPOT-HRV and LANDSAT-TM earth observation satellite images of the Bas-Chélif plain\_ From spectral signature analysis to thematic mapping.

Practical work n°4 : LANDSAT and SPOT images of the Bas-Chélif plain within the framework of a GIS (use of IDRISI software for example).

Evaluation method : Continuous control, exam, etc...(The weighting is left to the discretion of the training team)

#### **Personal work :**

Presentations/reports outside of the practical sessions, practical reports, dissertations (organized argumentation exercise), consultation and reading of bibliography (books, works, articles, web site...), field trip reports, internship report and elaboration of GIS databases in mini-projects

**Title of the Master : Protection of ecosystems**

**Semester : 2**

**Title of the UE : Methodology (UEM 1)**

**Subject title : Hydro-biogeochemical cycles**

**Credits : 4**

**Coefficients : 2**

#### **Teaching objectives :**

The objective of this module is to make the students understand a global approach of an ecosystem by integrating its various levels. The vision will focus on the circulation of energy and elements within the whole ecosystem. The focus will be on synthesizing the relationships between the physical and chemical aspects of the environment and the biological aspects.

#### **Content of the subject:**

- Hydrological functioning of natural subsurface and surface systems and biogeochemical structuring.
- Microbial processes in soils and aquifers.
- Physicochemical and biological controls of biogeochemical cycles (carbon, nitrogen, phosphorus, sulfur, oxygen).
- Geochemical and isotopic tools.

**Evaluation method:** Continuous assessment, exams, etc.

**Title of the Master : Protection of ecosystems**

**Semester : 2**

**Title of the UE : Discovery (UED 1)**

**Title of the subject : Environmental Impact Assessment (E.I.A).**

**Credits : 2**

**Coefficients : 2**

**Teaching objectives :**

To teach students how to take into account environmental problems in land use planning and to show them the need to make an E.I.E to protect natural, urban and rural areas in the context of sustainable development.

**Content of the subject:**

1. Introduction: why E.I.E.? In which context?
2. Principles and functions of environmental impact assessments
  - 1.1. Definitions.
  - 1.2 Typology of impacts
2. The EIA procedure.
3. Structure and function of an EIA report.
4. Impact assessment tools.
5. Compliance of EIAs.
  - 5.1. To texts and directives.
  - 5.2. To the TOR.
  - 5.3. Evaluation criteria.
6. Background & world situation.
7. The EIA framework in Algeria.
8. World Bank guidelines.
9. EIA & project cycle.
10. Case studies (presentation by professionals, films, document analysis).

**Evaluation method:** Continuous assessment, examination, etc.

**Title of the Master : Protection of ecosystems**

**Semester : 2**

**Title of the UE : Transversal (UET 1)**

**Subject Title : Legislation.**

**Credits : 1**

**Coefficients : 1**

**Teaching objectives :**

To initiate the student to the regulatory notions, the definitions and origins of the legal texts and the knowledge of the penal consequences as well as the capacity to read and understand a legal text and the capacity to apply a regulation.

**Content of the course:**

- General notions of law (introduction to law, criminal law).
- Presentation of Algerian legislation (references of texts).
- General regulations (law on consumer protection, hygiene, labeling and information, food additives, packaging, brand, safety, conservation).
- Specific regulations (personal work, presentations).

- Control bodies (DCP, CACQUE, hygiene office, ONML).
- Standardization and accreditation (IANOR, ALGERAC).
- International standards (ISO, codex alimentarius, NA, AFNOR, phytosanitary and toxic substances codex...)

**Evaluation method :** Continuous control, exam, etc

**Personal work:**

Presentations/reports and essays (organized argumentation exercise), consultation and reading of bibliography (books, works, articles, web site...) examination of legislative texts and executive laws of the environment, internship report.

**Title of the Master : Protection of ecosystems**

**Semester : 3**

**Title of the UE : Fundamental (UEF 1)**

**Subject Title : Management of protected areas**

**Credits : 6**

**Coefficients : 3**

**Teaching objectives :**

To initiate the students to the sense of eco-responsibility of the man.

**Content of the subject:**

- 1 History and global view
- 2 Classification of protected areas
  - 2.1 Degrees of protection
  - 2.2 The case of marine areas
- 3 Protected area management categories
  - 3.1 Strict Nature Reserve
  - 3.2 Wilderness Area
  - 3.3 National park
  - 3.4 Monument or natural feature
  - 3.5 Habitat or species management area
  - 3.6 Protected Landscape or Seascape
  - 3.7 Protected area with sustainable use of natural resources
- 4 Protected area in the world
  - 4.1 In Europe
  - 4.2 In America
  - 4.3 In Africa
  - 4.4 In Algeria
- 5 Interests and limits
- 6 Regulations
- 7 Monitoring

**Evaluation method :** Continuous control, exam, etc

**Personal work:**

Presentations/reports outside of PT sessions, PT reports, essays (organized argumentation exercise), consultation and reading of bibliography (books, works, articles, website...), field trip reports, internship report and elaboration of GIS databases in mini-projects.

**Title of the Master : Protection of ecosystems**

**Semester : 3**

**Title of the UE : Fundamental (UEF 1)**

**Subject Title : Applied Ecotoxicology**

**Credits : 6**

**Coefficients : 3**

**Teaching objectives :**

To know the basics of toxicokinetics and its regulation as well as toxicodynamics, genotoxicity and their regulation as well as to give the students an idea on ecotoxicological tools (among others, bioassays, bioindicators, biomarkers, biosensors and biotracers)

**Subject Content:**

In-depth Ecotoxicology

- General information on ecotoxicology
- Ecotoxicology of aquatic environments:
- Aquatic in vivo and in vitro toxicity tests
- Genotoxicity in fish
- Impact of wastewater on the aquatic environment
- Impact of endocrine disruptors on aquatic ecosystems
- Ecological quality of aquatic environments
- Ecotoxicology of terrestrial environments :
- Terrestrial in vivo toxicity tests
- Bioavailability and accumulation of metals in soils/transfer to water
- Indirect effects of pollutants on the functioning of food webs
- Ecological factors of dispersion and circulation of pollutants
- Mechanism determining the self-purification of air
- Transfer dynamics of pollutants in food webs

Metabolism of xenobiotics

- Introduction
- Reactions and enzymes of xenobiotic metabolism
- Definition of the main parameters in metabolism
- Variability in metabolism
- In Vitro Metabolism Study Models
- Models of In Vivo metabolism studies

Bioindicators

- Definition of bioindicators
- Concept and use of bioindicators of environmental quality
- Bioindicators: from concepts to biomonitoring networks
- Adaptation of populations to pollutants: tolerance and resistance
- Characteristics and limitations of bioindicators
- Water quality bioindicators
- Soil quality bioindicators
- Air quality bioindicators

Biomarkers

- Definition of Biomarkers
- The main types of biomarkers
- Use of biomarkers in different types of ecosystems
- Biomarkers and ecological impact assessment of pollutants

**Evaluation method:** Continuous assessment, examination, etc.

**Personal work:**

Presentations/reports outside the sessions of TD and TP, reports TD and TP, dissertations (exercise of organized argumentation), consultation and reading of bibliography (books, works, articles, Web site...), reports of outings, report of training course.

**Title of the Master : Protection of ecosystems**

**Semester : 3**

**Title of the UE : Fundamental (UEF 2)**

**Title of the subject : Management and development of non-conventional resources**

**Credits : 6**

**Coefficients : 3**

**Teaching objectives :**

This master approaches the management of the resources under all its aspects: origin and organization of the diversity, societal stakes, devices of conservation, methods of characterization, place in the production systems.

**Content of the subject:**

Introduction: a global energy revolution

Generalities

1. Non-conventional hydrocarbons

1.1. Shale gas

1.2. Unconventional oil

1.3. Bedrock hydrocarbons

1.4. Compact reservoir hydrocarbons

1.5. Coalbed gas

2. Unconventional waters

2.1. Treated wastewater

2.2. Desalinated brackish water

2.3. Artificial groundwater recharge

3. Other resources

**Evaluation method :** Continuous control, exam, etc

**Personal work:**

Presentations/reports outside of the TD and TP sessions, TD and TP reports, dissertations (organized argumentation exercise), consultation and reading of bibliography (books, works, articles, web site...), field trip reports, internship report.

**Title of the Master : Protection of ecosystems**

**Semester : 3**

**Title of the UE : Methodology (UEM 1)**

**Title of the subject : Applied Geostatistics.**

**Credits : 5**

**Coefficients : 3**

**Teaching objectives :**

To teach the students the analyses of the spatial structure of natural phenomena, to proceed to correct spatial estimations and to evaluate the quality of the accuracy of the elaborated map.

**Content of the subject:**

1. History and some reminders.
2. Notations of shapes.
3. Theory : inferring a spatial law.
  - 3.1 Comparing classical statistics and geostatistics.
  - 3.2 Hypotheses on a random function.
4. Analysis of spatial structures.
  - 4.1. Stationarity.
  - 4.2 Estimators of spatial dependencies.
  - 4.3. Anisotropy and drift.
5. Modeling of spatial structures.
  - 5.1. Fits.
  - 5.2. Choice of models.
6. Estimation.
  - 6.1 Interpolation by Kriging.
    - 6.1.1. Properties of linear Kriging.
    - 6.1.2. Results of Kriging.
  - 6.2. Estimation by Kriging.
    - 6.2.1. Universal Kriging.
    - 6.2.2 Ordinary Kriging.
  - 6.3. Simulation.
    - 6.3.1. Unconditional simulation.
    - 6.3.2. Conditional simulation.
    - 6.3.3. Example : the LU method.

**Evaluation method :** Continuous control, exam, etc

**Personal work:**

Presentations/reports outside of the TD and TP sessions, TD reports, TP reports, dissertations (organized argumentation exercise), consultation and reading of bibliography (books, works, articles, website...), field trip reports, internship report and mini-projects.

**Title of the Master : Protection of ecosystems**

**Semester : 3**

**Title of the UE : Methodology (UED 1)**

**Subject Title : Instrumental Analysis and Good Laboratory Practices (GLP).**

**Credits : 4**

**Coefficients : 2**

**Teaching objectives:**

To initiate students to take charge of research laboratories, to become familiar with measuring devices, to acquire the various precautions to obtain reliable and coherent values in the field of chemical, physicochemical and microbiological analyses of soils and waters.

**Content of the course:**

Part 1: Instrumental analysis.

1. General introduction on the instrumental analysis in laboratory.
2. Conductimetry.
3. Ion-selective potentiometry.
4. Acid-base titration.
5. Redox titration.
6. Spectrophotometry.
7. Determination of the pKa of a substance.
8. Spectrophotometric determination (iron, sulfates and others).
9. Atomic spectroscopy.
10. Flame emission determination (potassium and sodium).
11. Zone electrophoresis.
12. Gas chromatography.
13. Determination of methyl salicylate.
14. Determination of fatty acids.
15. High performance liquid chromatography (HPLC).
16. Determination of dyes.
17. Other assays.

Part 2: Good Laboratory Practice (GLP).

1. Introduction.
  - 1.1 Scope of application.
  - 1.2 Terminology.
    - 1.2.1. Good laboratory practice.
    - 1.2.2 Terms related to the organization of a test facility.
    - 1.2.3 Terms related to non-clinical safety studies related to health and the environment.
    - 1.2.4 Terms related to the test item.
2. Principles of Good Laboratory Practice.
  - 2.1. Test facility organization and personnel.
    - 2.1.1. Test facility management responsibilities.
    - 2.1.2. Responsibilities of the Study Director.
    - 2.1.3. Responsibilities of the Principal Investigator.
    - 2.1.4. Responsibilities of the study staff.
  - 2.2. Quality assurance program.
    - 2.2.1. General information.
    - 2.2.2. Responsibilities of quality assurance personnel.
  - 2.3 Facilities
    - 2.3.1 General
    - 2.3.2 Test system facilities.

- 2.3.3. Test item and reference handling facilities.
- 2.3.4. Archive rooms.
- 2.3.5. Waste disposal.
- 2.4. Equipment, materials and reagents.
- 2.5. Test systems.
  - 2.5.1. Physical and chemical.
  - 2.5.2. Biological.
- 2.6. Test and reference elements.
  - 2.6.1. Reception, handling, sampling and storage.
  - 2.6.2. Characterization.
- 2.7. Standard Operating Procedures.
- 2.8. Performance of the study.
  - 2.8.1. Study design.
  - 2.8.2. Content of the study design.
  - 2.8.3. Conduct of the study.
- 2.9. Preparation of the report on the results of the study.
  - 2.9.1. General information.
  - 2.9.2. Content of the final report.
- 2.10. Storage and conservation of archives and materials.

**Evaluation method :** Continuous control, exam, etc

**Personal work:**

Presentations/reports outside of the practical sessions, practical reports, essays (organized argumentation exercise), consultation and reading of bibliography (books, works, articles, website...), field trip reports, internship report.

**Title of the Master : Protection of ecosystems**

**Semester : 3**

**Title of the Unit : Discovery (UED 1)**

**Subject Title : Environmental Economics.**

**Credits : 1**

**Coefficients : 1**

**Teaching objectives :**

This course is designed to give the fundamental references in environmental economics, in particular to apply economic principles to public policies in environment and natural resources management, with an emphasis on economic analyses of impacts and costs/benefits. It strives to both develop critical thinking and expand analytical reasoning skills.

**Subject Content:**

1. The natural heritage resulting from the interactions between economics and ecology.
  - 1.1. The relationship between ecology and economy.
  - 1.2. Pressure factors on the biosphere.
  - 1.3. The hypothesis of the environmental Kuznetz curve (CKE).
  - 1.4. The services provided by the natural heritage and their evolution.
2. Environmental assets and market failures.
  - 2.1. Property rights, incomplete markets, Coase's theorem.

- 2.2 Externalities.
- 2.3 Non-exclusion and management of the commons.
- 2.4. Non-rivalry and environmental public goods.
- 3. Non-renewable resources.
  - 3.1 Optimal exploitation, exogenous and endogenous exploitation costs with stock effect.
  - 3.2 Competitive and monopolistic industries.
  - 3.3 Scarcity indicators.
- 4. Renewable resources.
  - 4.1. Growth functions, maximum equilibrium withdrawal.
  - 4.2 Optimal harvesting, optimal investment strategy.
  - 4.3 Private management, open access management.
- 5. Environmental assessment.
  - 5.1. Theoretical framework.
    - 5.1.1. Legitimacy of the approach, various types of values.
    - 5.1.2. Compensated measures of surplus.
    - 5.1.3. Quantity variations with supply quotas.
    - 5.1.4. Complementarity and substitutability relationships, weak complementarity.
  - 5.2. The methods.
    - 5.2.1. The travel cost method.
    - 5.2.2. The contingent valuation method.
    - 5.2.3. The hedonic pricing method.
    - 5.2.4. Methods related to the production function.
- 6. The integration of environmental costs and benefits in CBA.
  - 6.1. Impact studies. Cost-benefit analysis extended to the environment.
  - 6.2. The Krutilla-Fisher model.
- 7. Instruments for regulating pollution.
  - 7.1. Instruments when resolution by bargaining is not possible.
  - 7.2. Pigovian tax (partial and general equilibrium).
  - 7.3. The standard (emission standards, technological standards).
  - 7.4. Emission taxes and pollution control subsidies.
  - 7.5. Pollution permit market.
  - 7.6. Liability mechanisms.
  - 7.7. Environmental taxation and the double dividend issue.
- 8. Environment and development.
  - 8.1. Concepts of sustainability.
  - 8.2. Weak sustainability and Hartwick's rule.
  - 8.3. Weak sustainability and intergenerational equity: maximin, Chichilnisky rule.
  - 8.4. Hicksian national income.
  - 8.5. Strong sustainability and critical natural capital.
  - 8.6. Accounting for natural capital.

**Evaluation method:** Continuous assessment, examination, etc.

**Personal work:**

Presentations/reports outside of class sessions, reports, dissertations (organized argumentation exercise), consultation and reading of bibliography (books, works, articles, website...), field trip reports, internship report and mini-projects and simulation of business creation, projects.

**Title of the Master : Protection of ecosystems**

**Semester : 3**

**Title of the UE : Discovery (UED 1)**

**Subject Title : Scientific English II.**

**Credits : 1**

**Coefficients : 1**

**Teaching objectives :**

This module proposes a particular approach to the improvement of reading and writing skills in English used in the scientific discursive genre specific to the theme of environmental sciences and to teach students the reading of scientific texts, listening comprehension, note taking and lectures.

**Content of the subject:**

- Address detailed comprehension of a structured argumentative text.
- Understanding and using advanced grammatical concepts.
- How to find the appropriate vocabulary for each context.
- How to write structured argumentative texts.
- Work on the analysis and writing of a scientific article. Methodology, vocabulary.
- Preparation of abstracts and posters.
- Preparation and presentation of a mini oral communication (article or project presentation).
- Working with English-speaking partners,
- Searching for an international job (writing a CV and a cover letter, preparing for a job interview).

**Evaluation method:** Continuous assessment, exams, etc.

**Personal work:**

Oral presentations/reports in the presence of the module teacher, reports, essays (organized argumentation exercise), consultation and reading of bibliography (books, works, articles, website...), writing of reports.

**Title of the Master : Protection of ecosystems**

**Semester : 3**

**Title of the UE : Transversal (UET 1)**

**Title of the subject : Entrepreneurship.**

**Credits : 1**

**Coefficients : 1**

**Teaching objectives :**

To initiate the student to the setting up of a project, its launching, its follow-up and its realization.

**Content of the subject :**

Introduction

1. Economic and legal environment

1.1 Key concepts

1.1.0 Introduction

1.1.1 Fundamentals

1.1.2 Innovation, the new engine of growth

1.1.3 Innovative business creation - facts and figures

- 1.2 Social and solidarity-based entrepreneurship: a field to be explored
  - 1.2.0 Introduction
  - 1.2.1 A rich history
  - 1.2.2 An evolving institutional and legal framework
- 1.3 The choice of a legal status for the enterprise - criteria...
  - 1.3.0 Introduction
  - 1.3.1 Going it alone or with partners
  - 1.3.2 Risks for the entrepreneur and his relatives
  - 1.3.3 Social status of the entrepreneur
  - 1.3.4 Cost and difficulty of building the business
  - 1.3.5 Administration and management of the enterprise
  - 1.3.6 Evolutivity of the structure
- 2. Approach of the innovative creator
  - 2.1 Methods and good practices to innovate effectively
    - 2.1.1 Innovation
    - 2.1.2 Project management
    - 2.1.3 Legal aspects
    - 2.1.4 Economic intelligence
    - 2.1.5 Being convincing
    - 2.1.6 Examples
  - 2.1 ukflag Methods and best practices for innovating efficiently
    - 2.1.1 Innovation
    - 2.1.2 Project management
    - 2.1.3 Legal matters
    - 2.1.4 Business intelligence
    - 2.1.5 Be convincing
    - 2.1.6 Examples
  - 2.2 From research results to innovation
    - 2.2.0 Introduction
    - 2.2.1 Project cycle
    - 2.2.2 Identifying applications
    - 2.2.3 Example 1
    - 2.2.4 Example 2
  - 2.3 Creator profile - personal project, motivating factor...
    - 2.3.0 Introduction
    - 2.3.1 Sociological approach to business creation
    - 2.3.2 Social "embedding" of the innovative project
    - 2.3.3 Factors of success or failure - the importance of networks...
    - 2.3.4 Particularities of innovative business creation
- 3. Building a commercial offer
  - 3.1 Market access strategies
    - 3.1.1 Reading and understanding your market
    - 3.1.2 From innovation to product - a non-linear process
    - 3.1.3 Identifying targets and partners
  - 3.2 Technology marketing - methodological tools
    - 3.2.0 Introduction
    - 3.2.1 Marketing mix approach
    - 3.2.2 Market - segmentation
    - 3.2.3 Functional analysis
    - 3.2.4 Competitive analysis
    - 3.2.5 Economic model
    - 3.2.6 Value and price

- 3.2.7 Turnover and break-even point
- 4. Accounting Tools and Financial Forecasting
  - 4.1 Key concepts
    - 4.1.0 Introduction
    - 4.1.1 Financing Requirements
    - 4.1.2 Balance sheet - step by step
    - 4.1.3 Financial balance of a company
    - 4.1.4 Conclusion
  - 4.2 Business plan
    - 4.2.1 A tool to convince
    - 4.2.2 Drawing up a business plan
  - 4.3 In-depth analysis
    - 4.3.0 Introduction - profitability and risk analysis
    - 4.3.1 Intermediate management balances (IMB)
    - 4.3.2 Break-even point
    - 4.3.3 Ratios
    - 4.3.4 Scoring
    - 4.3.5 Case studies
- 5. Securing a project legally
  - 5.1 Introduction to the chapter - Project maturation
  - 5.2 Protectable innovations and protection methods
    - 5.2.1 General overview
    - 5.2.2 Third party rights
  - 5.3 Intellectual property strategy
    - 5.3.0 Introduction - management of IP rights
    - 5.3.1 Secret and patent protection
    - 5.3.2 Intellectual Property Tools
  - 5.4 Company / Research Institution Relationship
    - 5.4.0 Introduction
    - 5.4.1 Contractual Relationship
    - 5.4.2 Ownership of Inventions
    - 5.4.3 Assignment and licensing
- 6. Project Funding
  - 6.1 Public funding mechanisms
    - 6.1.0 Introduction
    - 6.1.1 Maturation funds in Brittany
    - 6.1.2 Ministry of Higher Education and Research competition
    - 6.1.3 Emergys Incubator
    - 6.1.4 Other funding
  - 6.2 Financing chain
    - 6.2.1 Main players
    - 6.2.2 Business angels
    - 6.2.3 Venture capitalists
    - 6.2.4 Conclusion
- 7. Support systems
  - 7.1 Regional support systems - examples from Brittany
    - 7.1.1 Rennes Atalante - technology park
    - 7.1.2 Genesis and objectives of the Emergys incubator
  - 7.2 National scheme - OSEO
    - 7.2.0 Introduction
    - 7.2.1 Innovation
    - 7.2.2 Guarantee

- 7.2.3 Financing
- 8. Closing round table - feedback
  - 8.1 Presentation of the entrepreneurs
  - 8.2 Links between the company and the university
  - 8.3 Strengths and weaknesses of the project
  - 8.4 Business plan
  - 8.5 Life of the project
  - 8.6 Construction of the commercial policy

**Evaluation method:** Continuous assessment, exam, etc.

**Personal work:**

Presentations/reports outside of class sessions, reports, dissertations (organized argumentation exercise), consultation and reading of bibliography (books, works, articles, website...), field trip reports, internship report and mini-projects and analysis of economic articles of ecological and environmental aspect.