PEOPLE'S DEMOCRATIC REPUBLIC OF ALGERIA

MINISTRY OF HIGHER EDUCATION AND SCIENTIFIC RESEARCH

Compliance Canevas

Formation Offer

L.M.D.

ACADEMIC BACHELOR DEGREE

Institution	Faculty / Institut	Department
University Djilali Bounaama Khemis Miliana	Faculty of Natural and Life Sciences and Earth Sciences	Ecology and Environment

Domain	Field	Speciality
Sciences of Nature and Life	Ecology and Environment	Ecology and Environment

SUMMARY

Contexte et objectifs de la formation

A – Organisation générale de la formation : position du projet

B - Objectives of the course

The objectives of the Bachelor's degree in "Ecology and Environment" are to provide students with a scientific education in the field of soil sciences in their agro-environmental context. This training privileges, from a quantitative physical, chemical and biological approach of the natural and anthropic processes, the development of the integrated observation of the natural "objects" involved in the environmental processes.

The main axis of the training is centred on the knowledge and awareness of the importance of the environmental component as a non-renewable resource that is an integral part of natural and agricultural ecosystems.

Two points make this Licence an original training:

(1) A strong interdisciplinarity around a quantitative and qualitative approach to the natural processes involved in soil quality constitutes the originality of this degree. All the modules offered in the third year are based on this approach, with openings to other specialities (ecology, agronomy, hydrogeology, hydrology, biogeochemistry). It therefore allows students to choose their degree of openness from their basic discipline, which is highly multidisciplinary and clearly visible in the common core of the Natural and Life Sciences field.

(2) A strong complementarity in terms of analysis and statistical processing tools is introduced in the course to enable students to acquire the necessary capacities and means leading to a new approach based on autonomy and project construction by the students.

C - Targeted profiles and skills:

The Licence "Ecology and Environment" is developed in close relation with the scientific policy of the University Djilali Bounaama Khemis Miliana. This speciality which is original by its novelty will largely involve the teachers-researchers of the establishment who constitute one of the assets of this training by the existing competences in the Institute in geosciences and agronomy. Another asset lies in the existence of an accredited, equipped and functional "Water, Rock and Plant" research laboratory with multidisciplinary teams whose field of interest is the interaction between pedology, agronomy and ecology.

Moreover, the students who graduate will have the necessary basis and the skills required to embark on a Master's degree or to move into working life.

D - Regional and national employability potential

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 concern various aspects, in particular those linked to

the physico-chemistry and biology of the environment, with a view to the omnipresent perspective of sustainable development: soil degradation and erosion, soil and water pollution, integrated management of ecosystems.

There are many possibilities for integration into the working world at national and regional level. The skills acquired during this training allow graduates to apply for jobs in the agricultural, hydraulic and environmental sectors. All of these sectors (administrative, development and research) exist at different levels in the region, starting with the wilaya's chief town, the daïras and the communes. As an example, we can cite

- Environmental sector;
- Agricultural sector
- Health sector
- Industrial sector;
- Wastewater treatment plant;
- National Agency for Dams ;
- Hydraulic division of the wilaya;
- Hydraulic services of the communes.

E - Bridges to other specialities

At the end of their training, the students who have graduated in "Ecology and Environment" will have the possibility to contin TU their studies in Master in the same speciality or to go towards other Masters close to this one such as the Masters: water and environment, water and bioclimatology, environmental protection...

F - Expected performance indicators of the training

The objective of the system is to diversify the methods of control in order to evaluate as widely as possible the students' skills. In this context, the following will be assessed: (1) student empowerment; (2) regular monitoring of knowledge acquisition; (3) acquisition of oral expression; (4) acquisition of teamwork and synthesis skills; (5) control of student skills and not just knowledge.

I – Semester organization sheet for lessons

Common Core of the Sciences of Nature and Life Field

First Semester

Teaching units	Matter		Credits	Coefficients	Hourly volume per week			VHS (15 weeks)	Other*	Evaluation method			
	Code	Title			Course	TD	TP			CC*		Review	
TU Fundamental Code : TUF 1.1 Credits : 18 Coefficients : 9	FTU 1.1.1	General and organic chemistry	6	3	1h30	1h30	1h30	67h30	82h30	x	40%	x	60%
	F TU 1.1.2	Cellular biology	8	4	1h30	1h30	3h00	90h00	110h00	x	40%	x	60%
	FTU 1.1.3	Mathematics Statistics	4	2	1h30	1h30	-	45h00	55h00	x	40%	x	60%
TU Methodology Code : TUM 1.1 Credits : 9 Coefficients: 5	M TU 1.1.1	Geology	5	3	1h30	1h30	1h00	60h00	65h00	x	40%	x	60%
	M TU 1.1.2	Communication and Expression TechniqTUs 1 (in French)	4	2	1h30	1h30	-	45h00	55h00	x	40%	x	60%
TU Discovery Code : TUD 1.1 Credits : 2 Coefficients : 2	D TU 1.1.1	Working Methods and Terminology 1	2	2	1h30	1h30		45h00	5h00	x	40%	x	60%
Transversal TUCode : TUT 1.1 Credits : 1 Coefficients : 1	TTU 1.1.1	Universal History of BiologicalSciences	1	1	1h30	-	-	22h30	2h30	-	-	x	100
Total Semester 1			30	17	10h30	9h00	5h30	375h00	375h00				

Other* = Additional work in semester consultation ; CC* = Continuous Controls.

Second Semester

Teaching units	Matter		Credits	Coefficients	Hourly volume perweek			VHS	Other*	Evaluation method			
	Code	Title			Course	TD	TP			CC*		Review	
T U Fundamenta le Code: TUF 2.1 Credits : 18 Coefficients : 9	FTU 2.1.1	Thermodynamics and solutionchemistry	6	3	1h30	1h30	1h30	67h30	82h30	x	40%	x	60%
	FTU 2.1.2	Plant Biology	6	3	1h30	-	3h00	67h30	82h30	x	40%	x	60%
	FTU 2.1.3	Animal Biology	6	3	1h30	-	3h00	67h30	82h30	x	40%	x	60%
T U Methodology Code : TUM 2.1 Credits : 9 Coefficients : 5	MTU 2.1.1	Physics	5	3	1h30	1h30	1h00	60h00	65h00	x	40%	x	60%
	MTU 2.1.2	Communication and ExpressionTechniqTUs 2 (in English)	4	2	1h30	1h30	-	45h00	55h00	x	40%	x	60%
T U Discovery Code : TUD 2.1 Credits : 2 Coefficients : 2	DTU 2.1.1	Life sciences and socio-economicimpacts	2	2	1h30	1h30	-	45h00	5h00	x	40%	x	60%
T U Transversal Code : TUT 2.1 Credits : 1 Coefficients : 1	TTU 2.1.1	Working Methods and Terminology 2	1	1	1h30	-	-	22h30	2h30	-	-	x	100%
Total Semester 2			30	17	10h30	6h00	8h30	375h00	375h00				

Other* = Additional work in semester consultation ; CC = Continuous Controls

Third Semester

Teaching unit	Matter	Credit	Coefficient	Weekly hourly volume			semester hourly volume	* Other	Evaluation method			
				C	directed work	practical work			Continuous Control		Exam	
Fundamental Unit	Zoology	6	3	3h00		1h30	67h30	**82h30**	x	40%	x	60%
	Environment and Sustainable Development	6	3	3h00	1h30		67h30	**82h30**	x	40%	x	60%
	Genetics	6	3	3h00	1h30		67h30	**82h30**	x	40%	x	60%
Methodological unit	Communication and Expression TechniqTUs	4	2	1h30	1h30		45h00	**55h00**	x	40%	x	60%
	Biophysics	5	3	1h30	1h30	1h00	60h00	**65h00**	x	40%	x	60%
Discovery unit	Plant physiology	2	2	1h30		1h30	45h00	**5h00**	x	40%	x	60%
Transversal Unit	Ethics and University Deontology	1	1	1h30			22h30	**2h30**	-	-	x	100%
Total Semester		**30**	**17**	**15h00**	**7h30**	**2h30**	**375h00**					

***Other**: Complementary work in semi-annual consultation

Fourth Semester

Teaching unit	Matter	Credit	Coefficient	Weekly hourly volume			semester hourly volume	* other	Evaluation method			
				C	directed work	practical work			Continuous control		Exam	
Fundamental Unit	Botanical	6	3	3h00		1h30	67h30	82h30	x	40%	x	60%
	General ecology	8	4	3h00	1h30		90h00	110h00	x	40%	x	60%
	Study and inventory methods of fauna and flora	4	2	1h30	1h30		45h00	55h00	x	40%	x	60%
Methodological unit	Microbiology	4	2	1h30		1h30	45h00	55h00	x	40%	x	60%
	Biostatistics	5	3	1h30	1h30	1h00	60h00	65h00	x	40%	x	60%
Discovery unit	Pedology	2	2	1h30	1h30		45h00	5h00	x	40%	x	60%
Transversale Unit	Computer Sciences Tools	1	1	1h30			22h30	2h30	-	-	x	100%
Total Semester		30	12	13h30	7h30	4h00	375h00					

***Other** : Complementary work in semi-annual consultation

Fifth semester

Teaching unit	Matter	Credit	Coefficient	C	TD	TP	HV
Fundamental Unit: **(TUF 3.1.1(O/P)) Mesology (Environmental characterisation)**	**Matter** 1:Bioclimatology	4	2	1h30	1h30	-	55h
	Matter 2:Ecopédology	6	3	3h	1h30		82h30
	Matter 3:Géomorphology	2	1	1h30	-	-	27h30
Fundamental Unit: **TUF 3.1.2(O/P) Ecosystems pathologies**	**Matter** 1:Environmental pollution	4	2	1h30	1h30	-	55h
	Matter 2:Environmental analysis and protection	2	1	1h30	-	-	27h30
Methodological unit	**Matter1**: Statistics and Data Analysis	5	3	1h30	1h30	1h	65h
	Matter 2:Maping	4	2	1h30	1h30	-	55h
Discovery unit	**Matter 1**:Plant Ecophysiology	2	2	1h30	-	1h30	45h
Transversale Unit	**Matter 1**:Scientific English	1	1	1h30	-	-	22h30

Sixth semester

Teaching unit	Matter	Credit	Coefficient	C	TD	TP	HV
TUF 3.2.1(O/P) (Population and community ecology)	**Matter** 1: Biology of populations and organisms	6	3	3h	1h30	-	82h30
	Matter 2: Biogeography	6	3	3h	1h30	-	82h30
	Matter 3: Biodiversity and Global Change	4	2	1h30	1h30	-	55h
	Matter 4: Conservation and sustainable development	2	1	1h30	-	-	27h30
Methodological unit	**Matter1**: Methods of studying plant populations and stands	4	2	1h30	1h30	-	55h
	Matter 2: GIS and Remote Sensing	5	3	1h30	1h30	1h	60h
Discovery unit	**Matter 1**: Bioeconomy and legislation	2	2	1h30	1h30	-	45h
Transversale Unit	**Matter 1:**introduction to geostatistics	1	1	1h30	-	-	22h30

II-Detailed program by subject from semesters S1 to S6

Semester 1
Fundamental T U
Code : FTU 1.1
Credits : 18
Coefficients : 9
FTU 1.1.1 : Fundamental Teaching Unit

Subject 1 : General and organic chemistry

Teaching objectives
This subject consists in teaching the fundamental bases of the organization and the chemical structure of the matter. It is a complement to the other subjects as it serves to facilitate the chemical understanding of biological phenomena.
Recommended prior knowledge (brief description of the knowledge required to follow this course - maximum 2 lines).
The student must master the basic notions of general and organic chemistry, namely the structure of the atom, atomic bonds and redox reactions.

Content of the course
1. General chemistry
1.1 General information
1.1.1. Atom, nucleus, isotopy,
1.1.2. Stability and cohesion of the nucleus, binding energy per nucleon,...
1.2 Radioactivity
1.2.1. Definition
1.2.2. Natural radioactivity: main types of radiation
1.2.3. Artificial radioactivity
1.2.4. Law of radioactive decay
1.2.5. Different Types of Nuclear Reactions
1.3 Electronic Configuration of Atoms
1.3.1 Introduction of Quantum Numbers
1.3.2. Principles governing the electronic structure of an atom :
1.3.3. Energy rule (Klechkoweski rule)
1.3.4. Pauli exclusion rule
1.3.5. Hund's rule
1.4. Periodic classification
1.4.1. Group (Column), Period (Line)
1.4.2. Evolution of physical properties within the periodic table: atomic radius
radius, ionisation energy, electron affinity....
1.5. Chemical bonding
1.5.1 Introduction: strong and weak bonds
1.5.2. Representation of the chemical bond: Lewis diagram
1.5.3. Different types of strong bonds (covalent bond, ionic bond, metallic bond)
metallic bond)
1.5.4. Ionic character of a covalent bond
1.5.5. Geometry of molecules: V.S.E.P.R. theory (Gillespie rule)
2. Organic chemistry
2.1. Organic compounds, formulae, functions, nomenclature
2.1.1. Formulae of organic compounds

2.1.2. Functions, functional groups
2.1.3. Nomenclature
2.1.4 Study of organic functions
- Saturated hydrocarbons, alkenes, alkanes, benzene hydrocarbons
- Halogen derivatives, halides
- Alcohols, thiols, thiothers, phenols, amines Polyfunctional aldehydes
- polyfunctional heterocycles

2.2 Reaction mechanisms in organic chemistry
2.2.1. Resonance and mesomerism
2.2.2. Conjugation
2.2.3. Stereochemistry
2.2.4. Electronic Effects
2.2.5. Nucleophilic Substitution
2.2.6. Eliminations
2.2.7. Radical Reactions
2.2.8. Reduction Reactions
2.2.9. Oxidation Reactions

Tutorials
Practical work N°1: Fundamental notions of chemistry (atoms, molecules, gram atoms, moles, calculation of concentrations)
Practical work N°2 : Stability of the nucleus and radioactivity
TP N°3 : Electron configuration

Semester 1Elements Practical work N°4 : Chemical bonds
Practical work N°5 : Nomenclature and stereochemistry
Practical work N°6 : Reaction mechanisms

Practical work
Practical work N°1 : Principles of experimental chemistry
Objective: To evaluate the student's knowledge on the material used in chemistry experiments and the safety rules to be respected in the laboratory.
Practical work N°2 : Determination of the quantity of matter
Objective: Determine the quantity of matter (expressed in number of moles) contained in a sample and to prepare a sample containing a fixed quantity of matter
Practical work N°3: Preparation of solutions by dissolution and dilution
Objective: To prepare a solution of sodium chloride (NaCl) of normality 0.1N.
and to prepare a solution of hydrochloric acid (HCl) of normality 0.1N by dilution of a solution of HCl of normality 1N.
TP N°4: Measurement of the density of some....
Objective : We try to determine the density of a saturated salt water solution
And to determine the density of iron.
TP N°5: Search for functional groups
Objective: Identify the functional groups: alcohols and carbonyls.

Mode of evaluation
Continuous assessment and semester exams

References (Books and handouts, websites, etc.) :

1. JacqTUs Maddaluno, VéroniqTU Bellosta, Isabelle Chataigner, François Couty, et al, 2013- Chimie organiqTU. Ed. Dunod, Paris, 576 p.
2. Jean-François Lambert,Thomas Georgelin, Maguy Jaber, 2014- Mini manual de Chimie inorganiqTU. Ed. Dunod, Paris, 272 p.
3. Elisabeth Bardez, 2014- Mini Manual of General Chemistry : Chemistry of Solutions. Ed. Dunod, Paris, 256 p.
4. Paula Yurkanis Bruice, 2012- Organic Chemistry. Ed. Pearson, 720 p.
5. Jean-Louis Migot, 2014- Organic analytical chemistry. Ed. Hermann, 180 p.

Semester 1

Fundamental Teaching Unit : FTU 1.1.2.

Subject 2: Cellular biology

Objectives of the course

The objectives of this course are to introduce the students to the living world at the cellular level, to acquire the basic notions of the cell, eukaryote and prokaryote, and to study the cellular constitTUnts. These objectives are reinforced by practical sessions in the laboratory.

Recommended prior knowledge (brief description of the knowledge required to follow this course - Maximum 2 lines).

The student must have knowledge of general biology

Content of the subject

1. General

1.1 Classification and relative importance of kingdoms
1.2 Cell and cell theory
1.3 Origin and evolution
1.4. Cell types (Prokaryote, Eukaryote, Acaryote)

2. Methods of studying the cell

2.1. Optical and electron microscopy methods
2.2 Histochemical methods
2.3 Immunological methods
2.4. Enzymological methods

3. Plasma membrane: structure and function
4. Cytoskeleton and cell motility
5. Cell adhesion and extracellular matrix
6. Chromatin, chromosomes and cell nucleus
7. Ribosome and protein synthesis
8. The endoplasmic reticulum-golgi apparatus system
9. The interphase nucleus
10. The endosomal system: endocytosis
11. Mitochondria
12. Chloroplasts
13. Peroxisomes
14. Extracellular matrix
15. Plant wall

Tutorial / Practical work

1. Methods of studying cells
1.1 Separation of cell constitTUnts
1.2 Observation of cell components
1.3 Identification of cellular constitTUnts
1.4. Plant wall
2. Cell Cultures
3. Testing of physiological functions
3.1 Reconstitution of function from isolated constitTUnts
3.2. Anatomical tests: autoradiography, fluorescence labelling, green fluorescent proteins
3.3. Physiological tests: control of protein expression, mutation, overexpression

Evaluation method
Continuous assessment and semester exam

References
1. B. Albert, A. Johnson, J. Lewis, M. Raff, K. Roberts and P. Walter, 2011- Molecular biology of the cell. Ed. Lavoisier, Paris, 1601p.
2. Abraham L. Kierszenbaum, 2006- Histology and Cell Biology: Ed De Boeck, 619p.
3. Thomas Dean Pollard and William C. Earnshaw, 2004- Cell Biology. Ed. Elsevier Masson, Paris, 853p.
4. Marc Maillet, 2006- Cellular Biology. Ed. Elsevier Masson, Paris, 618p.

Semester : 1st Semester

FTU

Subject 3: Mathematics, Statistics

Objectives of the course
This subject allows the student to integrate the statistical and computer tools in the biological field, and to use numerical analysis, probability and calculation by the computer tool.
Recommended prior knowledge (brief description of the knowledge required to follow this course - Maximum 2 lines).
The student should have knowledge of functions, integrals and random variables.

Content of the subject
1. Mathematical analysis
   1.1 Functions of one variable, derivatives and integrals.
   1.2 Approximation methods.
   1.3. Series, positive term series, Rieman series.
   1.4. Functions in several variables, partial derivatives, differentials
   1.5. double and triple integrals.
   1.6. Calculation of areas and volumes.
2. Probabilities
   2.1. Random variables, BERNOULLI variables
   2.2. Statistical laws and bio-statistical applications
      2.2.1. Discrete laws (Binomial and Poisson)
      2.2.2. Continuous law (Gaussian law, reduced normal law, chi-square law, Fischer law)

2.3. Parameters and properties
2.3.1. Positional parameters (median, mode, mean,.....etc)
2.3.2. Dispersion parameters (variance, standard deviation, ...etc)
2.3.3. Shape parameters (symmetry, kurtosis,....etc)
2.4. Distribution function and density function

Mode of evaluation
Continuous assessment and semester exam

References
1. Jean Bouyer, 2000- Statistical methods: medicine-biology. Ed. Estem.
2. Gilles Stoltz and Vincent Rivoirard, 2012- Mathematical statistics in action. Ed. Vuibert, Paris, 448p.
3. Maurice Lethielleux, 2013- Descriptive statistics. Ed. Dunod, Paris, 160p.
4. Maurice Lethielleux and Céline Chevalier, 2013- Probabilités : Estimation statistiqTU. Ed. Dunod, Paris, 160p.

Semester 1

MTU: Methodological Teaching Unit 1

Subject : Geology

Objectives of the course
The subject allows the students to see the constitTUnts and the structure of the earth, the interactions between these constitTUnts, the external and internal geodynamics.
Recommended prerequisites (brief description of the knowledge required to follow this course - Maximum 2 lines).

Content of the subject
1. General geology
1.1 Introduction
1.2. The Earth's globe
1.3. The Earth's Crust
1.4. Structure of the Earth

2. External Geodynamics
2.1. Erosion
2.1.1. The action of water
2.1.2. Wind action
2.2. Deposits
2.2.1. Study methods
2.2.2. Sedimentary rocks
2.2.3. Concept of stratigraphy
2.2.4. Concept of palaeontology

3. Internal geodynamics
3.1 Seismology
3.1.1. Study of earthquakes
3.1.2. Origin and distribution
3.1.3. Soft and brittle tectonics (folds and faults)
3.2. Volcanology
3.2.1. Volcanoes
3.2.2. Magmatic rocks
3.2.3. Study of magmas
3.3. Plate tectonics

Practical work
Practical work N°1 : Topography
Practical work N°2 : Geology (Sections)
Practical work N°3 : Rocks and minerals

Evaluation method
Continuous assessment and semester exam

References (Books and handouts, websites, etc) :
1. Jean Dercourt, 1999- Geology: courses and exercises. Ed. Dunod, Paris,
2. Denis Sorel and Pierre Vergely, 2010- Initiation aux cartes et aux coupes géologiqTUs. Ed. Dunod, Paris, 115p.
3. Jean Tricart, 1965- Principles and methods of geomorphology. Ed. Masson, Paris, 496p.

Semester 1
MTU: Methodological Teaching Unit 1.2
Subject 2: Techniqtus de communication et d'expression 1

Objectives of the course (Describe what the student is expected to have achieved in terms of competences upon successful completion of this subject - maximum 3 lines).
The aim of this subject is to understand and write scientific documents in French and to use and translate scientific terms.

Recommended prior knowledge (brief description of the knowledge required to follow this course - maximum 2 lines).

Content of the subject :
1. Scientific terminology
2. Study and understanding of texts
3. Written and oral expression techniqTUs (report, synthesis, use of modern means of communication)
4. Expression and communication in a group. Study of proposed texts (observation, analysis, review, written expression)

Tutorials:
Suggested exercises related to the most important language points.

Assessment method :
Continuous assessment and semester exam

References (Books and handouts, websites, etc) :
Scientific articles and dissertations

Semester 1: Discovery Teaching Unit

Subject : Working Method and Terminology 1

Teaching objectives
To help the students to conceive the methods of research and synthesis of works according to the scientific rules.
Recommended prior knowledge (brief description of the knowledge required to follow this course - Maximum 2 lines).
The student is expected to have some knowledge of bibliographic research.

Content of the subject
- Introduction to bibliographic research
- Writing a scientific report
- Introduction to reading and understanding a scientific article

Evaluation method
Continuous assessment and semester exam

References (Books and handouts, websites, etc) :

Semester 1
TU: Transversal Teaching Unit
Subject : Universal history of biological sciences
Teaching objectives

This programme should focus on the history of biology, and the qTUstion of life across eras and civilisations. It should highlight the place of technical progress in the evolution of biology.

Recommended prior knowledge (brief description of the knowledge required to follow this course - Maximum 2 lines).

Content of the subject

1. Prehistory
2. Antiquity
3. Middle Ages

3.1 In the West
3.2 In the East (Muslim civilisation)

4. Sixteenth and seventeenth centuries:
5. Eighteenth century: Darwin
6. Nineteenth century: Cell theory (microscopy), Sexuality Embryology, Molecular Molecular (DNA) Genetics

7. Twentieth century: gene therapy and cloning

Evaluation method

Semester exam

Reference

1. Denis Buican, 2008- Darwin in the history of biological thought. Ed. Ellipses, 232p.
2. Christophe Ronsin, 2005- Histoire de la biologie moléculaire. Ed. De Boeck, 106p.
3. Jean Théodoridès, 2000- Histoire de la biologie. Ed. Puf, 127p.

Semester 2

FTU: Fundamental Teaching Unit 1

Subject 1: Thermodynamics and chemistry of mineral solutions

Objectives of the course

This course allows students to acquire a certain understanding of the principles governing the transformations and interactions of matter, the principle of thermodynamics, energy equilibrium, and the kinetics of chemical reactions.

Recommended prior knowledge (brief description of the knowledge required to follow this course - Maximum 2 lines).

The student must have knowledge of redox reactions.

Content of the subject

1. Chemical equilibria

1.1 Acid-base equilibrium

1.1.1. Definition according to: Arrhenius; Bronsted; Lewis

Suggested exercises related to the most important language points.

Assessment method :
Continuous assessment and semester exam

References (Books and handouts, websites, etc) :
Scientific articles and dissertations

Semester 2: Discovery Teaching Unit

Subject : Working Method and Terminology 1

Teaching objectives
To help the students to conceive the methods of research and synthesis of works according to the scientific rules.

Recommended prior knowledge (brief description of the knowledge required to follow this course - Maximum 2 lines).
The student is expected to have some knowledge of bibliographic research.

Content of the subject
- Introduction to bibliographic research
- Writing a scientific report
- Introduction to reading and understanding a scientific article

Evaluation method
Continuous assessment and semester exam

References (Books and handouts, websites, etc) :

Semester 2

TU: Unité d'Enseignement Fondamentale

Subject 2 : General plant biology

Objectives of the course
The objective of this subject is to teach the students the fundamental principles of the tissTU organization of plants and their development.

Recommended prior knowledge (brief description of the knowledge required to follow this course - Maximum 2 lines).

The student must have some knowledge of the different parts of a plant

Content of the subject
1. Introduction to plant biology
2. Different types of tissTUs

2.1. Primary meristem (root and cell)

2.1.1. Primary tissTUs

2.1.2. Protective tissTUs (epidermis)
2.1.3. Filling tissTUs (parenchyma)
2.1.4. Supporting tissTUs (collenchyma and sclerenchyma)
2.1.5. Conductive tissTUs (primary xylem, primary phloem)
2.1.6. Secretory tissTUs
2.2 Secondary (lateral) meristems (cambium and phellogen)
2.2.1. Secondary tissTUs
2.2.2. Conductive tissTUs (secondary xylem and secondary phloem)
2.2.3. Protective tissTUs (suber or cork, phelloderma)
3. Anatomy of higher plants
3.1 Study of the root
3.2 Study of the stem
3.3 Study of the leaf
3.4. Comparative anatomy of mono- and dicotyledons
4. Morphology of higher plants and adaptation
4.1. Roots
4.2 Leaves
4.3. Stems
4.4 Flowers
4.5. Seeds
4.6. Fruits
5. Gametogenesis
5.1. Pollen grain
5.2 Ovule and embryo sac
6. Fertilisation
6.1. Egg and embryo
6.2. Notion of development cycle

Practical work :

Practical work N°1: Morphological study of Angiosperms (roots-stems-leaves-flowers)
Practical work N°2 : Morphological study of Gymnosperms (roots-stems-leaves-flowers)
Practical training #3 : Primary meristems (root and stem)
Practical work N°4 : Covering tissTUs : epidermis - piliferous base - subereous base - suberoid
Practical exercise N°5 : Parenchyma (chlorophyll-reserve-aeriferous-aquiferous)
TP N°6 : Supporting TissTUs (collenchyma-sclerenchyma)
TP N°7 : Secretory TissTUs (Hairs-Glands-Tannin Cells-Laticiferous)
Practical exercise N°8 : Primary conductive tissTUs (phloem-xylem)

Evaluation mode

Continuous assessment and semester exam

Reference

1. Alain RaveneaT Ut al, 2014- Plant biology. Ed. De Boeck, 733p.
2. Jean François Morot-Gaudry et al. 2012- Biologie végétale. Ed. Dunod, Paris, 213p**Semester: 3rd Semester**

Semester 2

TU: Unité d'Enseignement Fondamentale

Subject 3: GENERAL ANIMAL BIOLOGY

This course is designed to provide students with an understanding of the basic principles of animal biology.

The aim of this module is to introduce students to the particularities of the developmental biology of certain animal species.

Recommended prior knowledge (brief description of the knowledge required to follow this course - Maximum 2 lines).

No prerequisite

Content of the subject

Part I: Embryology

1. Introduction
2. Gametogenesis
3. Fertilisation
4. Segmentation
5. Gastrulation
6. Neurulation: fate of the leaflets
7. Delimitation: bird appendages
8. Particularities of human embryology (Cycle, nidation, evolution of annexes, placenta)

Part Two: Histology

1. Coating epithelia
2. Glandular epithelia
3. Connective tissTUs
4. Blood tissTUs
5. Cartilaginous tissTUs
6. Bone tissTU
7. Muscle tissTU
8. Nerve tissTU

Titles TP-TD

N°1 : Gametogenesis

N°2 : Fertilisation and segmentation in sea urchins

N°3 : Gastrulation in amphibians and birds

N°4 : Exercises on gastrulation and neurulation

N°5 : Neurulation in birds

N°6 : Human embryologyMode of evaluation

Continuous assessment and semester exam

References

Paul Richard W. FUNCTIONAL HISTOLOGY

Semester 2

TU: Methodological Teaching Unit

Subject 1: Physics

Objectives of the course

The objective of this course is to enable students to acquire knowledge in relation to the basic notions of physics that can be exploited in the SNV field.

Recommended prior knowledge (brief description of the knowledge required to follow this course - maximum 2 lines).

Students should have a basic knowledge of mathematics and mechanics.

Content of the subject

1. Mathematical background

1.1 Physical quantities and dimensional analysis

1.2 Calculation of errors (different types of errors, calculation of uncertainties and significant figures).

2. Optics

2.1.1 Introduction (objective of optics)

2.1.2. 2.1.2 Nature of light (spectrum of electromagnetic waves, photons, waves...)

2.2 Geometrical optics

2.2.1. Principles of geometrical optics and propagation of light.

2.2.2. Refraction (Snell-Descarte laws, boundary angle and total reflection)

2.2.2.1. Planar diopters, conjugation formula, parallel-sided blade and prism.

2.2.2.2. Spherical diopters (converging, diverging), conjugation formula and geometric construction (image construction).

2.2.2.3. Thin lenses (converging, diverging), conjugation formula, magnification, combination of two thin lenses and geometrical construction (image construction).

2.2.3. Reflection

2.2.3.1. Plane mirror (image construction)

2.2.3.2 Spherical mirror (image construction, conjugation formula)

2.2.4 Optical Instruments

2.2.4.1. The Eye

2.2.4.1. The magnifying glass and the optical microscope

3. Fluid Mechanics

3.1. The definition and characteristics of a fluid.

3.2 Hydrostatics (Fundamental relation of hydrostatics, buoyancy, float)

3.3. hydrodynamics (deed, continuity equation, Bernoulli's theorem)

4. Notion of crystallography

5. Notions of spectral analysis

Tutorials :

TD N°1. Exercises on dimensional analysis and error calculation.

TD N° 2. Exercises on the propagation of light, plane diopters and the prism

TD N° 3. Exercises on spherical diopters and thin lenses.

TD N° 4. Exercises on plane and spherical mirrors and the reduced eye.

TD N° 5. Exercises on Pascal's law and Archimedes' thrust (Hydrostatics)

TD N° 6. Exercises on Bernoulli's law (hydrodynamics)

Evaluation method

Continuous assessment (presentation + test) and semester exam.

References (Books and handouts, websites, etc.) :

1. Christophe Texier, 2015- Quantum Mechanics. Ed. Dunod, Paris.

2. Eugene Hecht, 1998- Physics. Ed. De Boeck, 1304p.

3. Michel Blay, 2015- Optics. Ed. Dunod, Paris, 452p.

Semester 2

TU: Methodological Teaching Unit

Subject 2: Techniqtus de communication et d'expression 2

Objectives of the course (Describe what the student is expected to have achieved in terms of skills upon successful completion of this subject - maximum 3 lines).

This subject complements the learning of understanding and writing scientific documents in English.

Recommended prerequisites (Brief description of the knowledge required to follow this course - maximum 2 lines).

No prerequisites

Content of the subject :

1. Scientific terminology
2. Study and understanding of texts
3. Written and oral expression techniqTUs (report, synthesis, use of modern means of communication)

4. Expression and communication in a group. Study of proposed texts (observation, analysis, review, written expression)

Tutorials:

Proposed exercises related to the language points considered most important.

Evaluation method :

Continuous assessment and semester exam

References (Books and handouts, websites, etc.) :

Scientific articles

Semester : 2nd Semester

TU: Discovery Teaching Unit

Subject : Life sciences and socio-economic impacts

Teaching objectives

To help the students to conceive the professions directly or indirectly linked to the different specialities of the natural and life sciences.

Recommended prior knowledge (brief description of the knowledge required to follow this course - Maximum 2 lines).

No prerequisites

Content of the subject

I. Animal and plant production (breeding, processing, production...)

II. Toxicology and environmental health (effect of pollutants on plant and animal life and on human health)

III. Biology and health (talk about the interest of biology in the field of health)

IV. Biotechnology and molecules of interest (pharmaceutical and food industry),

V. Biology and forensics

VI. Terrestrial and marine ecosystems (park management, ...)

VII. Technical-commercial biology (e.g. sales representative).

Evaluation method

Continuous assessment and semester exam

References (Books and handouts, websites, etc) :

Semester: 2nd Semester

TU: Transversal Teaching Unit

Subject : Working Methods and Terminology 2

Teaching Objectives

To help the students to conceive the methods of research and synthesis of works according to the scientific rules.

Recommended prior knowledge (brief description of the knowledge required to follow this course - maximum 2 lines).

The student is expected to have some knowledge of bibliographic research.

Content of the subject

- Terminology
- Writing a scientific report
- Introduction to reading and understanding a scientific article

Evaluation method

Semester exam

References (Books and handouts, websites, etc) :

Scientific articles

Semester : 3rd Semester

TU : Fundamental Teaching Unit 1

Subject : Zoology

Objectives of the course

To know the main groups of living organisms in terms of: general architecture, characteristics (systematics, morphology, anatomy, reproduction, ecology), constraints, adaptations, and evolution. Particular emphasis will be placed on the updating of classification and on zoological groups of agricultural, medical, veterinary, fisheries or environmental interest.

Content of the course

1. Introduction to the animal kingdom
   - Basics of classification
   - Zoological nomenclature
   - Evolution and phylogeny
   - Numerical importance of the Animal kingdom
2. Sub-kingdom of Protozoa
   - Generalities on protozoa.
   - Classification
   - Phylum Sarcomastigophora
   - Phylum Ciliophora
   - Phylum Apicomplexa
   - Phylum Cnidosproridia
3. Subdomain of Metazoa
   - Phylum Spongiaria
   - Phylum Cnidaria
   - Phylum Ctenaria
   - Phylum Plathelminthes:
   - Phylum Nemathelminthes.
   - Phylum Annelids
   - Phylum Molluscs
   - Phylum Arthropoda
   - Phylum Echinoderms
   - Phylum Chordates

Practical work

Practical work N°1 : Study of some typical species of Protozoa : Trypanosomarhodesiense, Leishmania major, Leishmania infantum, Trypanosoma gambiense, Entamoeba histolytica, Paramecium sp.

Practical training N°2 : Study of some Plathelminthes species : Moniezia expansa, Taenia hydatigena, Taenia pisiformis, Fasciola hepatica.

TP N°3 : Study of some typical Annelid species : Lumbricus terrestris, Hirudo officinalis.

Practical work N°4 : Study of some typical species of Arthropods : Crustaceans (Royal shrimp, Squilla, morphology and biramed appendages), Chelicerata (Scorpion), Insects (Cricket, Bee).

Practical training N°5 : Study of the mouth parts of insects: The different mouth apparatuses and adaptation to the food regimes, the mouth parts of the crusher type (Orthoptera, Cricket).

Practical training N°6 : Study of some typical species of Echinoderms : Echinids (Sea Urchin), Asteroids (Sea Star).

Practical work N°7 : Study of some typical species of Vertebrates : Fishes (Carp), Birds (Pigeon), Mammals (Rat, Mouse)

Projection of films

-Turtles.

-Birds

-Amphibians.

Evaluation method

Continuous assessment and semester exam

Semester: 3rd Semester

TU : Fundamental Teaching Unit 2

Subject 1 : Environment and sustainable development

Objectives of the course

This course aims to make students aware of the stakes, contents and actions of sustainable development. The aim is to make them aware that it is possible to act for the preservation of the environment, through their education, as well as at their level, on their consumption, their daily activities and their society. During their university education, whatever their specialization and their ambition for their future career, students will have the opportunity to learn and experience their knowledge of sustainable development.

Sustainable development is currently one of the responses emerging worldwide, to face the current conjunction of major ecological, economic and societal issTUs in the world.

Content of the subject

1. Definitions: Environment, components of an environment, sustainable development.
2. Meaning of development?

The main dimensions of the environmental crisis: human demography, global warming, fossil fTUls (non-renewable), depletion of natural resources, drinking water, biodiversity and agriculture

Sustainable development, why?

The Concept of Sustainable Development

The fields of sustainable development

The principles of SD and their origins: precaution, prevention, responsibility, solidarity, equity, polluter pays

Some indicators of sustainable development: ecological footprint and bio capacity, impact on the environment, environmental performance index, human development index, GDP: gross domestic product (economic) and school enrolment rate boys/girls (societal), accessibility to care (societal).

Environmental education, nature awareness and animation, environmental communication,

Program for personal work

1- Find examples in the press (international and national) illustrating the principles of sustainable development (precaution, responsibility for example). Presentation and debate.
2- Test ecological reflexes
3- Compare the life cycle of a biodegradable product and a non-biodegradable product
4- Illustrate the polluter pays principle by taking an example of a polluting company in Algeria, taking into account the national legislation.
5- To give

1- Give examples of the implementation of preservation, conservation or restoration of environments

Evaluation method

Continuous assessment and semester exam

Semester: 3rd Semester

TU : Fundamental Teaching Unit 2

Subject 2 : Genetics

Objectives of the course

This subject allows the student to acquire the notions and terminology of genetics, the transmission of traits, the structure of DNA, replication, transcription, alterations and the mechanisms of regulation of gene expression.

Content of the course

1. Genetic material
   - Chemical nature of genetic material
   - Structure of nucleic acids (DNA-RNA)
   - Replication of DNA: in prokaryotes and eukaryotes
   - Organization into chromosomes
2. Transmission of genetic characters in eukaryotes
3. Genetics of haploids
   - Independent genes
   - Linked genes
   - Establishment of genetic maps
4. Genetics of diploids
   - Independent genes
   - Linked genes
   - Establishment of genetic maps
5. Bacterial and viral genetics
   - Conjugation
   - Transformation
   - Transduction
   - Mixed infection in viruses
6. Protein synthesis
   - Transcription
   - Genetic code
   - Translation
7. Genetic mutations
8. Chromosomal mutations
   - Structural variation
   - Numerical variation (human example)
9. Gene structure and function: biochemical genetics
10. Regulation of gene expression

Lactose operon in prokaryotes

Example in eukaryotes

11. Concepts of extra-chromosomal genetics
12. Notion of population genetics Tutorial:

TD N°1: Genetic material

TD N°2: Transmission of traits

TD N°3: Mono and di hybridism (Special cases)

TD N°3: Linked genes

TD N°4: Genetic maps

TD N°5: Protein synthesis (genetic code)

TD N°6: Fine structure of the gene (intragenic recombination)

TD N°7: Conjugation and factorial map

TD N°8: Population genetics

TD N°9: DNA extraction

TD N°10: DNA assay

TD N°11: BARR corpuscle

Evaluation mode

Continuous assessment and semester exam

Semester: 3rd Semester

TU : Methodological Teaching Unit 1

Subject : Communication and Expression TechniqTUs

Objectives of the course

To learn and apply research methods and the collection of useful and essential information for the synthesis and the written formatting (report, oral, defense). Application of English grammar in a scientific context.

1. Study of proposed texts (observation, analysis, review, written expression)
2. Terminology
3. Methodology of bibliographic research.
4. Methods of writing scientific reports.

Evaluation method

Semester exam

Semester:3rd Semester

U.E: Methodological Teaching Unit 2

Subject : Biophysics

Objectives of the teaching

The general objective of the teaching of the biophysics course is to allow the students in NLS to acquire the bases in physics.

Content of the subject

I. The states of matter

Gases: elements of kinetic theory, equation of state of perfect or real gases, changes of state

Liquids: structure of water, dissolution

Solids: different structures

Intermediate states: glasses, liquid crystals, granular states, deformable polymers

II. Generalities on aqTUous solutions

Study of solutions: classification of solutions

Concentrations: molar fraction, molarity, molality, weight concentration, osmolarity, equivalent concentration.

Solubility

Electrolyte solutions: electrical conductivity, physical and chemical properties of electrolytes

III. Surface phenomena

Surface tension: definition, measurements and biological applications

Capillarity phenomenon: definition, measurements and biological applications

Adsorption

IV. Diffusion phenomenon

Diffusion

Osmosis phenomenon and osmotic pressure: definition, measurements and biological applications

Permeability: definition, measurements and biological applications

V. Study of viscosity

V.1 Laminar and turbulent flow

V.2 Viscous resistance and viscosity measurements

V.3 Sedimentation

Sound and ultrasonic waves

The sound wave and its properties: production, nature and classification of sound waves.

The Doppler effect: definition, measurements and biological applications.

Ultrasound: definition, measurements and biological applications.

Practical work: (perform at least 03 practical exercises)

Practical training N°1 : Surface tension

Practical training N°2 : Conductimetric titration

TP N°3 : Titration by PH-meter TP N°4 : Viscosity measurement TP N°5 : Spectrophotometer TP N°6 : Refractometer

Evaluation mode

Continuous control (presentation + test) and semester exam.

Semester: 3rd Semester

TU : Discovery Teaching Unit

Subject : Plant Physiology

Objectives of the course

This subject allows the students to have general notions on plant systematics (interest of classification in botany, notions of species and identification, evolution and classification of the plant kingdom), and to sharpen their sense of observation: one of the essential bases of the biologist's approach.

Content of the course Part 1 Nutrition

1. Reminder on the basic notions

   Organization of a plant

   Organization of a plant cell

2. Water nutrition (mechanism of water absorption and transit)

3. Transpiration and water balance

   Demonstration

   Location and measurement

Variation of transpiration

inflTUnce of the morphology of the plant

inflTUnce of environmental factors

Physiological determinism of transpiration

The water balance of plants

Interest of transpiration for the plant

4. Mineral nutrition (macro and trace elements)
5. Nitrogen nutrition (nitrogen cycle, transport and assimilation of nitrates)
6. Carbon nutrition (photosynthesis)

Part 2: Development

1. Formation of the seed
2. Germination
3. Growth
4. Flowering
5. Fructification

Practical work

A. Water nutrition

Practical training N°1 : Osmolarity (spectrophotometry)

Practical training N°2 : Transpiration

Practical work N°3 : Stomata

B. Mineral nutrition

Lab N°4 : Growth of bean seedlings in different nutritive solutions

C. Nitrogenous nutrition

Lab N°5 : Electrophoresis of total proteins

Lab N°6 : Respiration

Practical exercise N°7 : Separation of pigments by chromatography

D. Growth

Lab N°8 : Growth of seedlings in different solutions

Practical exercise N°9 : Tropisms

Practical exercise N°10 : Germination of grains

Mode of evaluation

Continuous assessment and semester exam

Semester:3rd Semester

U.E: Transversal Teaching Unit

Subject: Ethics and University Deontology

Objectives of the course

The general objective of this course is to enable students in the NLS program to acquire the resources of professional deontology and ethics.

Content of the subject

1. INTRODUCTION: Context of the Algerian university
2. CONCEPTS

   Moral

   Ethics

   Deontology

   Law

   Professional valTUs

   Learning and teaching

   Didactics and pedagogy
3. THE CHARTER OF ETHICS AND UNIVERSITY DEONTOLOGY

   Fundamental principles

   Rights

   Obligations and duties
4. APPLICATIONS

   Teaching: courses, evaluation of knowledge and behavior .....

   Scientific research: research methodology, plagiarism, copyright, scientific writing

Evaluation method

Semester exam

Semester: 4th Semester

U.E: Fundamental Teaching Unit 1

Subject : Botany

Pedagogical objectives of the course

The objective of this subject is to introduce the classification and the anatomical characterization of the main groups of the plant kingdom. The teaching also attempts to provide the students with the modalities of reproduction.

Content of the subject

Introduction to botany

- Definitions, notions and criteria of classification. Systematics of the major groups of the plant kingdom

PART ONE: Algae and Fungi

1. The Algae

   Prokaryotic algae (Cyanophytes / Cyanobacteria)

   Eukaryotic algae

   Morphology

   Cytology

   Reproduction (notion of gamie, development cycle)

   Systematics and particularities of the main groups

   Glaucophyta

   Rhodophyta

   Chlorophyta and Streptophyta

   Haptophyta, Ochrophyta, Dinophyta, Euglenozoa, Crytophyta, Cercozoa

2. Fungi and lichens

   Problems in the classification of fungi

   Structure of the thallus (mycelia, stroma, sclerotia)

   Reproduction

   Systematics and characteristics of the main groups of fungi

   The Myxomycota

   The Oomycota

   Eumycota (Chrytridiomycota, Zygomycota, Glomeromycota, Ascomycota, Basidiomycota)

   A particular alga-fungus association: the lichens

   Morphology

   Anatomy

   Reproduction

PART TWO: Embryophytes

1. The Bryophytes : Morphology and reproduction of the different phyla

   Marchantiophytes

   Anthocerotophytes

   Bryophytes s. str.

2. Pteridophytes : Morphology and reproduction of the different phyla

   Lycophytes

   Sphenophytes (= Equisetinae)

   Filicophytes

3. Gymnosperms sensu lato

   Cycadophytes: notion of ovule

   Ginkgophytes

   Coniferophytes: notion of flower, inflorescence and seed

   Gnetophytes: pivotal group

4. Angiosperms

   Vegetative apparatus and notion of morphogenesis: growth of stems, leaves and roots

   Floral morphology (organization of the flower, inflorescences)

   Floral biology: microsporogenesis and macrosporogenesis

   Seeds and fruits

Concept of modern systematics, cladogenesis and main taxa. Presentation of classifications (Engler 1924, APG II)

Practical work (3 weeks) :

PRACTICAL WORK N° 1. Algae (Phycophytes)

Morphology and reproduction of some species like Ulva lactuca and Cystoseira mediterranea.

PRACTICAL WORK N°2. Mushrooms (Fungi)

Morphology and reproduction of Rhizopus nigricans (Zygomycetes), Agaricus campestris (Basidiomycetes)

TP N°3. Lichens

Morphology of different types of lichens and study of Xanthoria parietina

TP N° 4. Bryophytes

Morphology and reproduction of Bryum sp.

TP N°5. Pteridophytes

Morphology and reproduction of Polypodium vulgare and Selaginella denticulata

TP N°6. Cycadophytes

Morphology and reproduction of Cycas revoluta

TP N°7. Coniferophytes (Gymnosperms sensu stricto)

Morphology and reproduction of Pinus halepensis and Cupressus sempervirens

TP N°8 and 9 : Angiosperms Monocotyledons and Eudicotyledons.

Illustration of the notion of trimeria and pentameria, of the notion of actinomorphy and zygomorphy; dialypetaly, gamopetaly, hypogynous flower, epigynous flower... .

TP N°8. Floral morphology of Angiosperms Monocotyledons on examples like Asphodelus (or Allium)

PRACTICAL WORK N°9. Floral morphology of Eudicotyledonous Angiosperms on examples like Lathyrus or Vicia

PRACTICAL WORK N°10. Sexual reproduction in Angiosperms

Pollen grain, pollination and fertilization in angiosperms Types of fruits and types of seeds

Evaluation method

Continuous assessment and semester exam

Semester: 4th semester

U.E: Fundamental Teaching Unit 2

Subject : General ecology

Objective of the course

The objective of the subject is to make the students understand the concept of ecosystem, the abiotic and biotic factors and the interactions between these factors, the components of the ecosystem and its functioning.

Content of the subject

Chapter I

Definition of the ecosystem and its constitTUnts (Notions of biocenosis and ecological factor.) Areas of intervention

Chapter II: Environmental factors

2.1. Abiotic factors - Climatic _ Edaphic

Hydric

Biotic factors

Competitions

Pests and Predators

Interaction of cooperation and symbiosis

Parasitism

Interaction of environments and living beings

Role of ecological factors in the regulation of populations

Notion of ecological optimum

Ecological valence

Ecological niche.

Chapter III: Structure of ecosystems

Structure of food chains; relationships between producers (autotrophs) and their dependence on nutrients and light or chemical energy.

Consumers (Heterotrophs) which are linked to the producers and finally the decomposers who ensure the recycling and mineralization of organic matter.

Chapter IV: Functioning of ecosystems

Energy flows in the biosphere:

Notions of ecological pyramids, production, productivity and bioenergy yield

Circulation of matter in ecosystems and main bio-geochemical cycles

InflTUnce of human activities on biological balances and particularly on the disturbance of bio geochemical cycles (conseqTUnces of the pollution of aquatic environments and atmospheric pollution (eutrophication, greenhouse effect, ozone, acid rain.)

Chapter V: Summary description of the main ecosystems

Forest, grassland, surface water, ocean

Evolution of ecosystems and notion of climax

Tutorial :

The tutorials concern the methods used to study the environment.

Practical work: field trips, evaluation of certain parameters (biomass measurements, etc.)

Evaluation method

Continuous assessment and semester exam

Semester: 4th semester

U.E: Methodological Teaching Unit 1

Subject 1: Microbiology

Objective of the course

The student must acquire the notions of the microbial world, the techniqTUs used to observe microorganisms, bacterial growth and classification.

Content of the course

The Microbial World

History

Place of microorganisms in the living world

General characteristics of the prokaryotic cell

2. The bacterial cell

Observation techniqTUs of the bacterial cell

Cell morphology

The cell wall

Chemical composition

Molecular structure

Functions

Gram staining

The plasma membrane

Chemical composition

Structure

Functions

The cytoplasm

Ribosomes

The reserve substances

The chromosome

Morphology

CompositionChemical replication

Structure

The plasmids

Structure

Replication

Properties

Pilli

Structure

Function

The capsule

Morphology

Chemical composition

Functions

Cilia and flagella

Highlighting

Structure

Functions

The spore

Morphology

Structure

Sporulation phenomena

Properties

Germination3.

3. Bacterial classification

   Phenetic classification

   Phylogenetic classification

   Bergey's classification

4. Bacterial nutrition

   Basic needs

   Growth factors

   Trophic types

   Physico-chemical parameters (temperature, pH, O2 and aW)

5. Bacterial growth

   Measurement of growth

   Growth parametersGrowth curve (batch culture)

   Bacterial culture

   Antimicrobial agents.

6. Concepts of mycology and virology

   Mycology (yeast and mold)

   Taxonomy

   Morphology

   Reproduction

   Virology

   Morphology (capsid and envelope)

   Different types of viruses

Practical work :

Practical training N°1 : Introduction to the microbiology laboratory

Practical work N°2 : Method of study of microorganisms and the different processes of sterilization

Practical work N°3 : Inoculation methods;

Practical training N°4 : Microscopic study of bacteria, simple staining

Practical training N°5 : Morphological study of different bacterial colonies on culture medium

Practical training N°6 : Gram staining

Practical exercise N°7 : Culture media

Practical training N°8 : Study of bacterial growth

Practical training N°9 : Criteria of biochemical identification of bacteria

Practical exercise N°10 : Yeasts and cyanobacteria

TP N°11 : Growth inhibitors, antibiogram

Practical training N°12 : Isolation of the total and specific flora of some products (water, milk...).

Mode of evaluation

Continuous control and semester exam

Semester: 4th Semester

U.E: Methodological Teaching Unit 1

Subject 2: Methods of study and inventory of fauna and flora

Teaching objective

The content of this subject will allow the student to acquire the different techniqTUs of sampling of fauna and flora, especially in the forest environment.

Content of the course

Introduction

1. Sampling

General principles

* Classification of descriptors

* Choice of descriptors

* Observation scales

Types of sampling

* Subjective sampling

* Probabilistic sampling (random, systematic, stratified, exhaustive analysis,

Mixed sampling)

2. Vegetation sampling and classification methods

Physiognomic methods

Dynamic methods

Phytosociological methods

3. Fauna sampling methods

Mammals

Birds

Amphibians and reptiles

Arthropods (mainly insects)

Aquatic fauna

4. Collection and analysis of fauna and flora data

Presentation of the data

Applications of different methods for the estimation of density and specific richness (Shannon index, equitable index)

Statistical processing of data and application of multivariate methods for the identification of species groups

05 practical exercises will be scheduled to complete the course

Evaluation method: Continuous control and semester exam

Semester: 4th semester

U.E: Methodological Teaching Unit 2

Subject: Bio statistics

Objective of the course

The objective of this course is to provide some methodological tools classically used to describe and test biological phenomena.

Content of the subject

1. Reminders

Recall of descriptive statistics

Position parameters

Dispersion parameters

Shape parameters

2. Recall the main distribution laws: normal and log normal, Student, Pearson, Fischer-Snedecor...

3. Statistical inference: Hypothesis testing

Conformity test

Comparison test

Test of independence

4. Correlation and Regression Studies

Correlation coefficient

Significance test of the correlation

Simple linear regression

Regression line (least squares method)

Confidence interval of the regression estimate

Significance test of the regression coefficients

5. One and two factor analysis of variance

The use of software such as Statistica or SAS as TP for each chapter which will be covered in detail in the third year.

Tutorial :

Series of exercises on each chapter of the course

Evaluation method

Continuous assessment and semester exam

Semester: 4th Semester

U.E: Discovery Teaching Unit

Subject : Pedology

Objective of the course

The objective of this course is to provide some concepts on the nature and constitTUnts of soils.

Content of the subject

1. Soil constitTUnts

- Mineral constitTUnts

- Organic constitTUnts

- Colloidal complexes

2. Morphological organization of soils

- Elementary organizations

- Soil horizon
- Soil profiles
- Soil cover
- Soil and water
- Soil Atmosphere
- Soil temperature
- Soil color

3. Chemical and biological properties of soil

- Ion exchange phenomena
- Soil electro-ionic properties
- Soil organisms

4. Transformations of microbial originClassification of soils (Notions)

- The different classifications (Russian, American, French)
- Overview of Algerian soils and their relationship with climate and geomorphology.

Tutorial

Series of exercises on each chapter of the course

Evaluation mode

Continuous assessment and semester exam

Semester: 4th semester

U.E: Transversal Teaching Unit

Subject : Computer tools

Teaching objective

Introduction to the basic definitions of the operating system of computer resources. At the end of this course, the student will be able to design documents and tables in Word and Excel.

Content of the subject

I. Discovering the operating system

- Definition of an OS
- Different existing OS: Windows, Linux and Mac OS.

II. Discovery of the office suite

- Designing documents with WORD.

- Designing tables with EXCEL.

- Designing a presentation with Powerpoint.

- Introduction to Latex.

II. Software and Algorithms

- Definition of a software.

- Definition of algorithmic.

- Use of algorithmic in biology.

Evaluation method:

Semester exam

Semester: 5
Fundamental teaching unit 1 (TUF 3.1.1): Mesology (Environmental characterisation)
Subject 1: Bioclimatology
Credits: 4
Coefficient: 2
Objectives of the course
This module aims at introducing the student to bioclimatology (including meteorological aspects) and to the dynamics of ecological systems. This teaching provides the student with a synthetic vision of ecological diversity and emphasizes the study of processes and their own dynamics, the interactions between the components of the ecosystem and the abiotic factors controlling these interactions.
Recommended prior knowledge:
Bio statistics, computer science and mathematics**.**

Content of the subject:
INTRODUCTION: Definition, Bibliography

1. General Climatology

- Meteorology, climatology, relationship between the two sciences
- Weather and weather types

2. Climatological data

Data sources, data processing, their applications, satellite images (Meteosat).

- Surface measurements
  * Rainfall
  * Temperatures
  * Atmospheric pressure
  * Relative humidity
  * Sunshine
  * Cloudiness
  * Wind

- Measurements at altitude

* Atmospheric pressure
* Wind
* Temperature

3. Mechanisms of the general circulation of wind systems: Trade winds, west winds, polar winds.

4. Air and the structure and dynamics of the layers:

- Troposphere, stratosphere and ionosphere

5. Heat balance at the Earth's surface

- Net radiation at the Earth's surface
- Geographical variations in the radiation budget
- Energy balances
- Special problems related to CO2, greenhouse effect, ozone Atmospheric (and terrestrial).

6. Physical climate classification

- Temperature based
- Based on temperature and rainfall

7. Aridity

- The different aridity indices
- Their evolution
- Arid regions in the world, in Africa, in the Maghreb

8. Hydrology

- Surface hydrology
- Underground hydrology
- Water balances
- Specific problems in forests
- Problems specific to the steppes
- Problems specific to the Sahara

9. Water balances

- Actual evapotranspiration
- Potential evapotranspiration
  * Measurement method
  * Calculation methods for ETP, ETR
- Discussions

10. Methods for characterising the Mediterranean climate

- EMBERGER's method
- Derived methods
- Discussions

11. Use of bioclimatic syntheses for applied ecology problems. Notion of scales.

- Aridity and anthropogenic degradation

12. Vegetation-climate relationships

13. Biological classification of climates

14. Climatic and bioclimatic mapping

Assessment method:

Continuous assessment and semester exam

Bibliographical references.

1. Bagnouls F. and Gaussen

Semester: 5
Fundamental teaching unit 1 (TUF 3.1.1): Mesology (Environmental characterisation)
Subject 2: Eco pedology
Credits: 6
Coefficient: 3
Teaching objectives:
This module allows to understand the soil as an important component of the ecosystem. The elements constituting the soil, its physical, chemical and biological properties are analysed. The different classifications of soils as well as soil-vegetation relationships are also studied.

Recommended prior knowledge:
In general, it is necessary to have followed the general ecology modules as well as the MTT module in the 2nd year. A general knowledge of the environment is also welcome**.**

Content of the subject:
1. Introduction: Definition of soil and purpose of pedology
2. Soil constitTUnts
- Mineral constitTUnts
- Organic constitTUnts
- Colloidal complexes

3. Morphological organisation of soils
- Elementary organisations
- The soil horizon
- Soil profiles
- Soil cover
- Soil and water
- Soil atmosphere
- Soil temperature
- Soil colour

4. Chemical properties of the soil
- Ion exchange phenomena
- Electronic properties of the soil

5. Biological properties of soil
- Soil organisms
- Microbial transformations

6. Soil classification
- Soil classification
- The different classifications (Russian, American, French)
- Soils in Algeria and their relationship with climate and geomorphology

7. Relationships between soils and vegetation

Evaluation method:

Control and semester exam

Bibliographical references.

1. Duchaufour Ph., 1977- Pedology 1. Pedogenesis and classification. Ed. Masson, Paris, 477p.
2. Duchaufour Ph., 1988- Pédologie. Ed. Masson, Paris, 224p.
3. Duchaufour Ph., 1995- Pédologie. Soil, vegetation, environment. Ed. Masson, Paris, 317p.

Semester: 5
Fundamental teaching unit 1 (TUF 3.1.1): Mesology (Environmental characterization)
Subject 3: Geomorphology
Credits: 2
Coefficient: 1
Objectives of the course:
After a reminder of the notions of tectonics and lithology, the morphological systems of Algeria are studied as well as the processes which are at the origin of them.
Recommended prior knowledge:
In general, it is necessary to have followed the modules of general ecology as well as that of MTT, in the 2nd year. A general knowledge of the environment is also welcome.
Content of the subject:
1. General
- Introduction
- Geomorphological-ecological relations
- Talwegs and interfluves
- Erosion, lithology, structure

2. The structure
- InflTUnce of lithology
- General structure of the globe
- Classification of rocks

3. Tectonic deformations
- Isostatic equilibrium
- Continental drift and plate tectonics
- Formation of reliefs
- Tectonic accidents
- Tectonic data: syncline, anticline
- Reliefs of simple structures: cTUstas
- Evolution of the Jurassic forms
- Reliefs of complex structures

4. External factors of the morphology
- Modalities of erosion
- Erosion processes
- Areal erosion

- Slope profiles
- Linear erosion: terraces
- Periglacial erosion
- Karstic model
- Aeolian erosion: eolian formations
- Hydroeolian basins: Daia
- Anthropogenic action and morphogenesis

5. Azonal climatic geomorphology

- Climatic variations: the Quaternary
- Morphological system of Algeria
    * Wet domain
    * Arid domain
    * Desert or Saharan domain
    * Forms common to arid areas
- Evolution of forms in the three domains

6. Ecological preponderance of the geomorphological factor

Mode of evaluation:

Continuous assessment and Semester examination.

Bibliographical references.

1**. CoqTU R**., 2002- Geomorphology. Ed. Armand Colin, collection cursus.

2. **Delaloye R., 2004**- Contribution à l'étude du permélisol de montagne en zone marginale. Geofocus series, volume 10, Department of Geosciences, Geology, University of Fribourg, 240 p.

3. Hauck C. and Kneissel C., 2008- Applied Geophysics in Periglacial Environments. Cambridge University Press.

4. Holzmann C., Lambiel C., Philipps M. and Reynard E., 2006- Légende géomorphologiqTU de l'IGUL. Lausanne, Institut de Géographie (http://www.unil.ch/igul/page19238.html).

5. Lowe J.J. and Walker M.J.C., 1997- Reconstructing quaternary environments. Walker Harlow Essex, Prentice Hall.

6. Riser J., 1999- Le Quaternaire, géologie et milieux naturels. Ed. Dunod, Paris.

7. Schoeneich P., Reynard E. and Pierrehumbert G., 2008- Geomorphological mapping in the Swiss Alps and Prealps. Wiener Schriften zur Geographie und Kartographie, 11: 145-153.

Semester: 5
Fundamental teaching unit 2 (TUF 3.1.2): Ecosystems pathologies
Subject 1: Environmental pollution
Credits: 4
Coefficient: 2
Teaching objectives:
The teaching of the subject "Environmental Pollution" aims to make students aware of the extent of the seriousness of the damage already perceptible on a planetary scale and which shows the worrying dimensions reached nowadays by the "global environmental crisis". The degradations may be of natural origin but are often anthropogenic.
Recommended background knowledge:
Different types of ecosystems, compartments of the biosphere (water, soil, atmosphere), fauna, flora, bioclimatology, ecopedology and Biocenotics.

Content of the subject:
1- Pollution and ecological implications
Nature and modalities of the pollution of the biosphere: Current causes of pollution, definition of pollution, classification of pollution
2- Mechanism of dispersion and circulation of polluting substances in the biosphere
2.1- Physical properties
2.2- Life span of substances
2.3- Biogeochemical processes: atmospheric circulation of pollutants, movements of the hydrosphere, transfers of substances in the soil;
2.4- Accumulation;
2.5- Distribution of pollutants;
2.6- Transfer and concentration of pollutants in biomass;
2.7- Elimination, Decomposition, Persistence.
3- Atmospheric pollution
3.1- Origin of the main atmospheric pollutants
3.2- Polluting substances (different types of pollutants, organic compounds, metallic trace elements, particles, chlorofluorocarbons)
3.3- The effects of the different substances
4- Soil pollution
4.1- Definition
4.2- Modalities and conseqTUnces of soil pollution by modern agriculture (Pollution by fertilizers; Pollution by pesticides)
4.3- Pollution by contaminants of industrial origin
5- Water pollution
5.1- Introduction: water resources
5.2- Different sources of water pollution
5.3- Main types of pollutants (fermentable organic matter, mineral nutrients NO3 and PO4, trace metals, synthetic organic compounds, hydrocarbons)
5.4- Domestic and urban pollution
5.5- Agricultural pollution
5.6- Atmospheric pollution
5.7- Natural pollution
6- Nuclear pollution

Evaluation method:
Continuous assessment (presentations + field trip reports + test) and Final examination

Bibliographical references.
1. Afnor, 2003- Analytical Chemistry. Tome I and II.
2. Amiard J-C., 2011- Les risqTUs chimiqTUs environnementaux- Méthodes d'évaluation et impacts sur les organismes, Ed. Tec et Doc Lavoisier, Paris.
3. Amiard-TriqTUt C., 2008- Les biomarqTUurs dans l'évaluation de l'état écologiqTU des milieux aquatiqTUs. Ed. Tec et Doc Lavoisier, Paris
4. Baize D., 2000- Guide des analyses en pédologie. Ed. INRA.
5. Environnement code 2011- Collection of legislative and regulatory texts related to environmental law. Ed. BERTI, Algiers.

Semester: 5
Fundamental teaching unit 2 (TUF 3.1.2): Pathologies of Ecosystems
Subject: Environmental analysis and protection
Credits: 2
Coefficient: 1

Teaching objectives:
The content of this subject allows the student to get acquainted with the methods of physico-chemical and biological analyses of the various compartments in the context of the evaluation, the monitoring of the quality and the protection of the environment.

Recommended prior knowledge:
Different types of ecosystems, compartments of the biosphere (water, soil, atmosphere), fauna, flora, chemistry Different types of ecosystems, compartments of the biosphere (water, soil, atmosphere), fauna, flora, chemistry

Content of the subject: Analysis and protection of the environment
Chapter 1: Physico-chemical analyses
1- Objectives of environmental analyses
2- Matrices analysed
2.1- Water
2.2- Sediments
2.3- Soils, sludge and composts
2.4- Biological samples
2.5- Atmospheric samples
2.6- Other types of matrices
3-Parameters determined
3.1- Physico-chemical parameters
3.2- Inorganic parameters
3.3- Metallic chemical forms
3.4- Organic parameters
3.5- Examples of regulated substances
4- Types of methods
4.1- Primary methods
4.2- Relative methods
4.3- Comparative methods

Chapter 2: Biological Analyses

1. Relationships of organisms to environmental conditions

1.1- Concepts of bio-indicators.

1.2- Biological methods and bio indicators

2. Main types of biological methods currently used

21- Biological methods (Biochemical, Ecotoxicological, Biocenotic methods)

2.2- Index methods

- using plant populations (e.g. diatomic index)
- using animal populations (e.g. biotic index based on benthic macroinvertebrates)

Chapter 3: Environmental protection: Algerian regulations

1. Environmental legislation: definition and scope

2. Current legal status in terms of environmental protection and management (study of the different laws relating to environmental protection, protection of natural resources, etc.).

Evaluation method:

Continuous assessment (presentations + field trip reports + test) and Semester examination.

Bibliographical references.

1. Ramade F., 2011- Introduction to ecochemistry - Chemical substances from the ecosphere to man. Ed. Tec et Doc Lavoisier, Paris.

2. Ramade F., 2010- Encyclopaedic dictionary of pollution: De l'environnement à l'homme. Ed. Dunod, Paris.

3. Rodier J. et al, 2005- L'analyse de l'eau: Eaux naturelles, Eaux résiduaires, Eau de mer. Ed. Dunod, Paris.

4. Standard methods for the examination of water and wastewater, 1980. Ed. APHA-AWWA-WPCF.

Semester: 5

Teaching Unit Methodology 1:

Subject: Statistics and data analysis

Credits: 5

Coefficient: 3

Teaching objectives (Describe what the student is supposed to have acquired as competences after the success of this subject - maximum 3 lines).

To enable students to acquire the necessary skills to process, analyses and interpret data from the physical environment statistically.

Recommended prior knowledge (brief description of the knowledge required to be able to follow this course - Maximum 2 lines).

Basic knowledge of mathematics and statistics.

Content of the subject:

INTRODUCTION: Definition, importance of the discipline

1- **Generalities on statistics**

1.1- Basic terminology: statistical data, tables, numbers, graphs, histograms, etc.

1.2- Statistical variables: qualitative and quantitative.

1.3- Statistical series and distributions.

2- **Univariate descriptive statistics.**

2.1- Positional parameters.

2.1.1- Arithmetic mean.

2.1.2- Mode.

2.1.3- The median.

2.1.4- Other quantiles: percentiles and deciles.
2.1.5- Other averages: harmonic, weighted, geometric and quadratic.
2.2- Dispersion parameters.
2.2.1- Range.
2.2.2- Interquartile distance.
2.2.3- Variance of the population and the sample.
2.2.4- Standard deviation.
2.2.5- The mean absolute deviation.
2.2.6- The absolute median deviation.
2.2.7- Coefficient of variation.
2.3- Statistical moments
2.4- Shape parameters
2.4.1- Fisher's skewness coefficient.
2.4.2- Other skewness coefficients: Pearson and Yule.
2.4.3- Kurtosis parameter.
2.5- Change of origin and unit: centring, reduction and centring and reduction of data.
2.6- Means and variances in groups.
2.7- Some shape parameters.
2.7.1- Stem and leaf plot.
2.7.2- The boxplot.
3- **Bivariate descriptive statistics.**
3.1- Bivariate statistical series.
3.2- Two quantitative variables.
3.2.1- Graphical representation of two variables.
3.2.2- Analysis of variables.
3.2.3- Covariance.
3.2.4- Linear correlation and determination.
3.2.5- Simple linear regression line.
3.2.6- Residuals and fitted valTUs.
3.2.7- Sums of squares and variances.
3.2.8- Variance decomposition.
3.3 Two Qualitative Variables.
3.3.1- Observed data.
3.3.2- Contingency table.
3.3.3- FreqTUncy table.
3.3.4- Row and column profiles.
3.3.5- Theoretical numbers and chi-square.
4- **Analysis of variance or ANOVA.**
4.1- Definition and general approach.
4.2- Verification of the normality of samples.
4.3- Homoscedasticity of variances by Hartley's test.
4.4- One factor analysis of variance for independent samples.
4.4.1- Principle.
4.4.2- Some examples.
4.5- ANOVA with repeated measures on the same individuals.
4.5.1- Variance decomposition.
4.5.2- Important remark.

Evaluation method: 1 EMD of 1,5 h, TD, TP, personal work

References (Books and handouts, websites, etc):

1. Dagnelie P. [2013]. Theoretical and applied statistics. Tome 1. Descriptive statistics and bases of statistical inference. Brussels, De Boeck, 517 p. ISBN 978-2-8041-7560-3.
2. **Escofier B & Pagès J. [1997]**. Initiation aux traitements statistiqTUs: méthodes, méthodologie. Presses Universitaires de Rennes, 263 p. ISBN: 2-86847-231-1.
3. **Härdle W & Simar L. [2007].** Applied Multivariate Statistical Analysis, 2nd edition. Berlin, Springer, 458 pp. ISBN 978-3-540-72243-4.
4. Lebart L., Morineau A., Piron M. [2006]. Multidimensional exploratory statistics, 4th edition. Paris, Dunod, 480 p. EAN13: 9782100496167.
5. **Veysseyre R. [2006].** Aide-mémoire: StatistiqTT Ut probabilités pour l'ingénieur, 2nd edition. Paris, Dunod, 475 p. ISBN 2-10-049994-7.
6. http://jellevy.yellis.net/Classes/2nde/StatistiqTUs/Cours/Cours_statistiqTU.htm

Semester: 5
Teaching Unit Methodology 2
Subject: Cartography
Credits: 4
Coefficient: 2

Teaching aim: To enable students to read and draw up thematic maps
(e.g. vegetation map, pastoral map) which are of primary interest in ecology.
Introduction
1- **History of cartography**
2- General cartography -
- General concepts
- Cartographic projections
- Classification of maps
- Topographic Map
- Thematic Mapping
- Definitions
- Thematic and polythematic mapping
- Field Mapping
- Data types
- Problems of prior information in vegetation mapping
- Sources and types of information
- Mapping keys
- Levels of perception
- Forms and modes of cartographic expression
- Main vegetation and environmental themes
- Chorology
- Vegetation carpet
- Vegetation series
- Association
- Ecological conditions: soil, climate, geomorphology...
- Specificity of ecological maps

3- **TechniqTUs for mapping vegetation and environments**
- Aerial and ecological photography

- Definition of aerial photography
- Characteristics of aerial photography
- Method of interpretation
- Examples of application: land use map, vegetation and ecological conditions map, forestry map, pastoral map, development maps
- Digital orthophotos
- Digital terrain model (DTM)
- Satellite images and derived products

Evaluation method: 1 EMD of 1,5 h, TD, personal work

References (Books and handouts, websites, etc):

1. **Battistoni-Lemière A & Nonjon A. [2013]. Cartes en mains - Méthodologie de la cartographie, 2nd edition. Paris, Ellipses Marketi**ng , 237 p. ISBN 978-2-7298-8168-9.
2. **Bertin J. [2013].** Sémiologie graphiqTU - Les diagrammes, les réseaux, les cartes. Paris, EHESS , 452 p. ISBN 978-2-7132-2417-1.
3. **Béguin M & Pumain D. [2014].** La représentation des données géographiqTUs - StatistiqTT Ut cartographie, 3rd edition. Paris, Armand Colin, 255 p. ISBN 978-2-200-29307-9.
4. **Cartographie, Vol1**: Sémiologie cartographiqTT Ut conception cartographiqTU ; IGN, mars 1999, 140 p.

Semester: 5
Teaching unit Discovery:
Subject 1: Plant ecophysiology
Credits: 2
Coefficient: 2

Teaching aim: This module deals with aspects related to growth, nutrition and adaptation of plants to environmental constraints.

1. Development and growth
- Introduction:
- Development cycle
- germination
- Growth
- Flowering
- Examples applied to the main Algerian forest species
-Plant movements
-Hormones

2. Nutrition
- Carbon nutrition
- Photosynthesis
- Respiration

3. **Mineral and nitrogen nutrition**
- Water and the plant

- Adaptations

4. Adaptations to water constraints
5. Adaptation to saline soils
6. Adaptation to sandy soils

Evaluation method: 1 EMD of 1,5 h, TD, personal work

References (Books and handouts, websites, etc):

1**. Heller R. Esnault R. Lance C. [2004].** Physiologie végétale: Tome 1, Nutrition, 6e édition. Paris, Dunod , 324 p. ISBN 2100487108.
2. **Hopkins W. Rambourg S. Evrard C-M [2003].** Plant physiology. Paris, De Boeck, 514 p. EAN13: 9782744500893.
3**. Prat R. [2007].** Experimentation in Plant Biology and Physiology. Paris, Hermann, Quae, 296 p. EAN13: 9782705666903
4. http://biophile.free.fr/Cours_pdf/L2_PhysioV.pdf
5. http://www.ebiologie.fr/cours/s/106/cours-de-physiologie-vegetale-ii

Semester: 5
Cross-curricular teaching unit
Subject 1: Scientific English
Credits: 1
Coefficient: 1

Teaching aim: this unit offers an opportunity to the student to improve his linguistic competence in terms of comprehension ; also an acquisition of the scientific language appropriate to the speciality.
scientific language appropriate to the speciality.

Recommended prior knowledge: having followed a course in the subject.

Content of the subject:
I. **Review of basic English concepts**
II. Work on scientific terminology
III. Reading, comprehension and translation of texts from English to French
IV. Workshop and debates
Evaluation method:
Continuous assessment and semester exam
Bibliographical references (Books and handouts, websites, etc.):
- **David Crystal, 1995**. The Cambridge Encyclopedia of the English Language, Cambridge Cambridge University Press,
- **David Crystal**, English as a Global Language, Cambridge University Press, 2nd ed.
- **Henriette Walter, 1994**. L'aventure des langTUs en occident, Robert Laffont editions, the chapter onchapter on Germanic languages.
- **Henriette Walter, 2001**. Honni soit qui mal y pense, éditions Robert Laffont, on the back and forthback and forth between English and French.
- **J-P Vinay and J. Darbelnet, 1958**. Comparative stylistics of French.

Semester: 6
Fundamental teaching unit 1 (TUF 3.2.1): Population and Community Ecology
Subject: Population and organism biology
Credits: 6
Coefficient: 3

Teaching objectives:
The main objective of these courses is to familiarize the student with population ecology. To understand that the population is the fundamental unit of any biocenosis. That the animal and plant communities specific to each ecosystem are the expression of the gathering of a large number of populations belonging to one or other of the major kingdoms of living beings that interact with each other and that a population has its own characteristics.

Recommended prerequisites:
The basic notions of plant and animal biology and mathematics.

Content of the course:
1- Concepts in Ecology (Ecology, Ecologism, History of ecology, Methodology, Definitions of basic concepts)
2- Population dynamics: Main population parameters (density and abundance, birth and death rates, sex ratio, age pyramid); growth law (intrinsic rate of increase, growth as a function of limiting factors, fluctuation over time, spatial distribution); population regulation (notion of density-dependence, density-independent and density-dependent factors, role of biotic factors)
3- Structure and Organisation of biocenoses (Definition, Metabolism, Quantitative and qualitative expression of biocenoses)
4- Interaction within the biotic component of the biocenosis (interspecific competition, ecological niche)
5- Evolution of biocenoses.
- Notion of succession
- Notion of climax

- Notion of ecotone, ecocline
- Concepts of ecological succession: model and succession. Characteristics of the evolution of biocenoses

6- The main continental biocenoses of the biosphere

- Introduction: Reminders, definitions, forest biomes, non-forest biomes
- Characterisation of the major biomes
    * Zonality of biogeocenoses and climates
    * Zonality of biogeocenoses and altitudes
    * Biogeocenosis zonation and soil types
    * Biogeocenosis zonation and productivity
- Ecological characteristics, particularity, specific diversity (flora-fauna), structure, Biomes and production
- Forest biomes
- Non-forest biomes

Mode of evaluation:
Continuous assessment and semester exam

Bibliographical references.

1. Ozenda P., 1982- Plants in the biosphere.
2. Peguy Ch., 1970- Précis de climatologie.

3. Ramade F., 1994- Elements of ecology. Ecologie fondamentale.

Semester: 6
Fundamental teaching unit 2 (TUF 3.2.1): Population and Community Ecology
Subject 2: Biogeography
Credits: 6
Coefficient: 3
Teaching objectives:
Study of the distribution of organisms on the surface of the globe and the causes that govern this distribution, with emphasis on descriptive biogeography, methods and description of the major biomes and their distribution on a global scale as well as the contributions of paleontology and the theory of continental drift

Recommended prior knowledge:
Biocenotics, climatology, pedology, plant taxonomy, animal taxonomy

Content of the subject:
Chapter I: Elements of biogeography
A. Introduction
1. Historical overview of biogeography

2. Ecological Biogeography
3. Elements of geodynamics

B. Chorology

1. Study of areas (delimitation, type of areas, areas of different taxonomic ranks)
2. Territories and floristic communities (concepts, communities, floristic richness, floristic divisions floristic divisions of the world, regions, domains and sectors)
3. Chronological variations in areas

Chapter II: Phytogeography and floristic analysis

1. Reminder of the distribution of the plant kingdom
2. Methods of classification of Angiosperms
3. The main lines of evolution in the Angiosperms
4. Angiosperm classification system
   - Classical data
   - Recent data based on the study of DNA seqTUnces

5. Description and particular characters of families of evolutionary and economic systematic interest.

6. Element of botanical geography

6.1. General distribution of the world's plant formations

Chapter IV: Distribution of plant and animal species in Algeria

Chapter III: Zoogeography

1. Geographical distribution areas
2. Faunal empires and their distributions
3. Causes of the current distribution of living things
4. Island faunas

Mode of evaluation:

Continuous assessment and semester exam

Bibliographical references.

1. Lacoste A. et Salanon R., 2001- Elément de biogéographie et d'écologie. Ed. Nathan, Paris, 269 p.
2. Blondel J., 1995- Biogéographie. Approche écologiqTT Ut évolutive. Ed. Masson, Paris, 320p.
3. **BraqTUt Paris R., 1987**- Biogéographie des continents. Ed. Masson, Paris, 470p.
4. **El Hai H., 1978**- Biogéographie. Ed. Colin, Paris, 406p.

Semester: 6
Fundamental teaching unit 1 (TUF 3.2.1): Population and Community Ecology
Subject 3: Global Biodiversity and Change
Credits: 4
Coefficient: 2
Teaching objectives:

This course is a pedagogical and awareness-raising support, allowing to give the concept of biodiversity as well as the impact of current global changes on the alteration of the latter.

Recommended prior knowledge:

Notions of ecological factors, environment, biological types and vegetation stages

Content of the subject:

1/ Elements of biodiversity

- Definition and concept of biodiversity
- Role of biodiversity (heritage role, role in the functioning of ecosystems, ecosystem services)
- Evaluation of biodiversity (quantitative, qualitative and economic evaluation)
- Factors of variation in biodiversity
- The different dimensions of biodiversity
- Inventory of species
- State of biodiversity in the world, in Africa, in Algeria
- Legal status of biodiversity

2/Global changes

- Notion of global changes
- Climate change
- Impact of changes on the environment and vegetation

Assessment method:

Continuous assessment and semester exam

Bibliographical references.

1**. EMBERGER L, 1955** - A biogeographical classification of climates. Trav. Lab. Bot. Zool, Fac. Scie. Bot, Montpellier, 7: 3-43.

2. **RAMADE F., 2002**- Encyclopedic Dictionary of Ecology and Environmental Sciences, 1075p.

Semester: 6
Fundamental teaching unit 1 (TUF 3.2.1): Population and community ecology
Subject 4: Biodiversity conservation and sustainable development
Credits: 2
Coefficient: 1
Teaching objectives:
The knowledge acquired in this module will enable the student to know precisely the causes of biodiversity erosion (abiotic and biotic factors) and the conseqTUnces on the ecosystems of the globe in general and North Africa in particular as well as the measures to be taken urgently (case study).

Recommended prerequisites:
A knowledge of the ecological factors that govern the distribution of species is necessary (bioclimatic, phytogeographic, orotopographic factors etc.)

Content of the subject:
1. The main causes of species extinction
2. Fragmentation of habitats
3. ConseqTUnces of species invasions on biodiversity
- Voluntary biological invasions
- Unintentional biological invasions
- Invasion processes of alien species

4. ConseqTUnces of over-exploitation of species on biodiversity
- Organic pollution on animal and plant species
- Chemical pollution
- Species threatened by pollution (examples)

5. Sustainable development
- Notion of sustainable development
- Conservation of biodiversity (in situ and ex situ)
- Examples of protected areas in the world, in the Mediterranean and in Algeria
- Combating biodiversity erosion and desertification.

6. Sustainable development
7. Management of genetic resources of wild and domesticated populations
8. Socio-economic aspects of conservation and management of biological resources
Mode of evaluation:
Continuous assessment and semester exam
Bibliographical references
1. Akcakaya H., S. Butchart, G. Mace, S. Stuart, and C. Hilton-Taylor, 2006- Use and misuse of the IUCN Red List Criteria in projecting climate change impacts on biodiversity. Global Change Biology, 12: 2037-2043.
2. **IUCN, Species Survival Commission, "Numbers of threatened species by major groups of organisms (1996-2004)".**
3. **DAJOZ R., 1985-** Précis d'écologie. Ed. Dunod, Paris, 505 p.
4. **INTERNET SITES**
www.coursdiderot.com/
www.ccfd-terresolidaire.org/COP
www.developpement-durable.gouv.fr/
www.agirpourlenvironnement.org/
www.cnrs.fr/inee/

Semester: 6
Teaching unit Methodology
Subject 1: Methods of studying plant populations and stands
Conservation of biodiversity and sustainable development
Credits: 4
Coefficient: 2
Teaching aim: This module enables the study of sampling and data analysis strategies at different scales of perception.

1. Vegetation and the environment

- Study of the flora: reminders and generalities
- Structure of the vegetation in the environment
- Objectives and issTUs related to the study of vegetation

2. sampling

- General principles
- Classification of descriptors
- Choice of descriptors
- Observation scales
- Types of sampling
- Subjective sampling
- Probabilistic sampling (random, systematic, stratified, exhaustive analysis, mixed sampling) Quantitative vegetation sampling.
- Quantitative sampling of vegetation.

3. Data processing

- Structure of ecological data -
Reduced species ordering
- Differential analysis
- FreqTUncy analysis

4. Classification of vegetation types

- Physiognomic methods
- Dynamic methods
- Phyto-sociological methods

5**. Methodological approaches to ecologically based management**

- General principles
- Ecological standard
- Differences with other methods

Assessment method:
Continuous assessment and semester exam
Bibliographical references
1. Barbault M. [1997]. Population and settlement ecology: Des théories aux faits. Paris, Dunod, 200 p. ISBN-13: 978-2225682445.
2. De Beissinger S-R. & McCullough D-R. [2002]. Population Viability Analysis. University Of Chicago Press, 577 p. EAN 9780226041780.

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Semester: 6
Teaching unit methodology 1:
Subject 2: GIS and Remote Sensing
Credits: 5
Coefficient: 3

Objectives of the course
This course is an introduction to the field of geomatics. The emphasis is on the application of GIS and remote sensing to the management of natural resources and land use planning. An important part of the course is reserved for practical applications that allow students to become familiar with GIS and remote sensing software.
Recommended prerequisites
Knowledge of applied computer science is required.
Content of the course:
- Introduction
- Digital Mapping
- GIS
- Remote sensing
- Fieldwork: spatial analysis at the scale of a catchment area

Evaluation method: 1 EMD of 1,5 h, TD, personal work
References (Books and handouts, websites, etc):
1. Caloz R., and Collet C., 2011. Analyse spatiale de l'information géographiqTU. Ed: Presses PolytechniqTUs et Universitaires Romandes (PPUR), 384 p, EAN13: 9782880749026.
2. Correia P., 2012. Guide pratiqTU du GPS. Ed: Eyrolles, Paris, 246 p, EAN13: 9782212133677.
3. Girard M.C., Girard C.M., 1999. Remote sensing data processing.
4. Joerin F, et al., 2011. Les SIG au service du développement territorial. Ed: Presses PolytechniqTUs et Universitaires Romandes (PPUR), 360 p, EAN13: 9782880749194.
5. Paegelow M., 2000. Cartographic expression.
6. Servigne S and Zeitouni K., 2009. Information systems and geolocation. Ed: Hermès - Lavoisier, Paris, 130 p. EAN13: 9782746225336.

Semester: 6
Teaching unit Discovery 1:
Subject 1: BIOECONOMICS AND LEGISLATION
Credits: 2
Coefficient: 2

Teaching objectives: In this module the basic notions of economics and its relation with ecology will be treated; and environmental legislation will be highlighted.
1. General concepts 2.
2. pastoral economics
- Pastoral products - Trade flows - Pastoral bioeconomy

3. Pastoral sociology
4. forestry economics
- Forestry products - Trade flows

Agrosylvopastoral bioeconomy
5**. Basics of mountain sociology**
6. Case studies

- Forest: cases of silvopastoral, silvicultural or industrial units
- Steppe: cases of pastoral or agro-pastoral units

7. Importance of regulation 8.
8. evolution of conservation laws
9. International regulation - case study
10. National regulations - The environmental code - Decrees and application circulars
11. Conservation and classification laws on a global scale
12. Algeria's place and adherence to the various international conventions

Semester: 6
Transversal teaching unit 1:
Subject 1: Introduction to geostatistics
Credits: 1
Coefficient: 1

Objectives of the course
As soon as we are confronted with the mapping of soils which vary from one point of the geographical space to another and this on the morphological, physical, chemical or biological level, the use of the traditional statistical and deterministic methods often prove to be insufficient for a good spatial estimation of their characteristics. Geostatistics, which is a probabilistic method of spatial estimation, can often improve these estimates by taking into account the spatial structure of natural phenomena.

Recommended prior knowledge
Knowledge in: Digital cartography, GIS, statistics

Content of the subject:
_ Introduction and history
- variography
- Ordinary kriging
- Other types of kriging.

Evaluation method: 1 EMD of 1.5 h, practical work, personal work

References (Books and handouts, websites, etc)
Journel 1977. La géostatistiqTU minière
Jamagne et al, 1995. Geographical databases of French soils. EGS, 2(3).
Girard et al, 2005. Soil and Environment, Dunod, Paris.