PEOPLE'S DEMOCRATIC REPUBLIC OF ALGERIA

MINISTRY OF HIGHER EDUCATION AND SCIENTIFIC RESEARCH

Compliance framework

TRAINING OFFER L.M.D.

ACADEMIC LICENSE

2017 - 2018

Establishment	Faculty/Institute	Department
Djilali Bounaama University of Khemis Miliana	**Faculty of Science of Nature and Life and of Earth Sciences**	**Agricultural Sciences**

Field	Branch	Specialty
Nature and Life Sciences	**Agricultural Sciences**	**Soil and Water**

الجمهورية الجزائرية الديمقراطية الشعبية

وزارة التعليم العالي و البحث العلمي

نموذج مطابقة

عرض تكوين
ل. م . د

ليسانس أكاديمية

2018-2017

المؤسسة	الكلية/ المعهد	القسم
جامعة الجيلالي بونعامة خميس مليانة	كلية العلوم الطبيعة والحياة وعلوم الأرض	العلوم الزراعية

الميدان	الفرع	التخصص
العلوم الطبيعية والحياة	العلوم الزراعية	التربة والماء

SUMMARY

I – Identity of the License

1 - Location of the course

Faculty: Natural and Life Sciences and Earth Sciences;

Department: Agricultural Sciences;

Licenseauthorization order references (attach copy of the order): 115 of 20/06/2007

2- External partners

The realisation of this license is placed under the responsibility of the faculty of sciences of nature and life and earth sciences with the following partners:

- Other partner institutions

- National High School of Agronomy, El-Harrach (ENSA) ;
- University of Blida;
- National High School of Hydraulics- Blida (ENSH);
- University of Hassiba Ben Bouali, Chlef.

- Institutes and Laboratories

- Faculty of Technological Sciences, Djilali Bounaama University of Khemis Miliana;
- Water – Roch -Plant Laboratory at Djilali Bounaama University of Khemis Miliana;
- Laboratory «Agricultural production and sustainable exploitation of natural resources» of the University of Djilali Bounaama of Khemis Miliana.

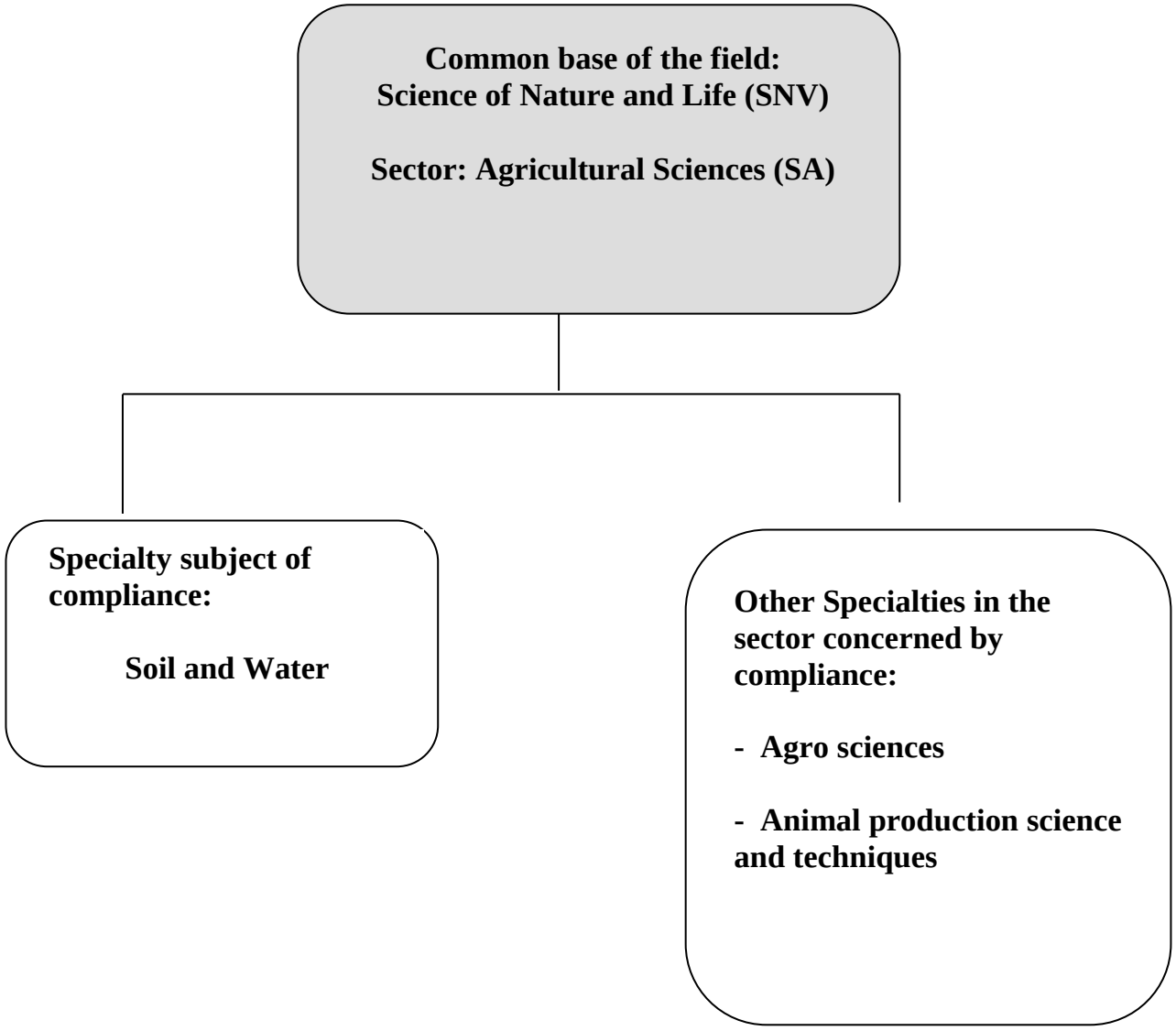
- Enterprises and other socio-economic partners

- The National Agency for Hydraulic Resources (ANRH);
- The National Office of Irrigation and Drainage (ONID);
- The directorates and subdivisions of the water resources of the Wilayas;
- The Environment Directorates;
- The National Agency for Dams and Transfers (ANBT);
- The National Board of Sanitation (ONA);
- The Watershed Agency (ABH);
- ITGC Khemis Miliana ;
- The National Institute for Forest Research (I.N.R.F);
- Private Research Offices;
- Pilot Farms;
- Chambers of Agriculture.

3 – **Training Context and Objectives**

A – General organization of training: project position (Required field)

If several licenses are proposed or already supported at the level of the institution (same training team or other training teams), indicate in the following diagram, the position of this project in relation to the other routes.



B - Training objectives (Mandatory field)
(Target skills, knowledge acquired at the end of the training- maximum 20 lines)

Water is the indispensable element for living beings. It is one of the major drivers of wealth creation in the agricultural sector. Irrigation is an ancient technique adopted by human civilizations to intensify agricultural production. Water should be considered an economic commodity of value. Its use by the various sectors therefore requires preliminary studies of economic optimization and profitability. It would therefore be possible to ensure a sustainable and rational use of this resource and to allow the regular renewal of the financial means necessary for its remobilization and management.

Irrigation, by satisfying the water requirements of crops, allows farmers to reach the best production potential, provided that other factors are optimized. In arid and semi-arid areas, characterized by a rainfall deficit, irrigation provides satisfactory production thresholds, ensuring good productivity and thus the regular supply of markets.

The University of Djilali Bounaama Khemis Miliana is located in the perimeter of the upper Chelif, considered as one of the great irrigated perimeters of Algeria. This perimeter was created in 1941, covering June area of 37,000 ha including 20,300 ha equipped. It belongs to a semi-arid bioclimatic stage with an average annual rainfall of less than 400 mm. While the average irrigation water modules vary from 400 to 600 mm depending on the speculations.

The perimeter is supplied by four major dams: Ghrib dam, Deurdeur dam, Harraza dam and recently the Arib dam. An important alluvial layer extends from the municipality of Djendel in the east to the threshold of Djelida in the south. It is currently an important source of drinking water and irrigation. The perimeter is crossed by the famous Oued Cheliff which divides it into two large parts: left and right bank. This Wadi is also an important irrigation water resource for farmers.

The water is a double-edged blade, it must be provided in a reasoned quantity because the response of the cultures is negative in case of insufficient inputs but also in case of inputs to the needs generating saturated soils favorable to the asphyxiation of the roots.

Thus, the practice of irrigation in semi-arid and arid zones systematically leads to the salinization of agricultural soils. The protection of the soil against this phenomenon in order to guarantee sustainable development at the level of the irrigated perimeters requires a rational management of irrigation accompanied by a leaching and drainage of the soils of these.

Among the major problems requiring skills and know-how in the field of irrigation in this region are:

1- The severe drought that increasingly characterizes this perimeter and requires a use of water in order to meet the increased water needs of crops;

2- The increase in agricultural areas in an intensive system as a result of support from the several irrigation projects in the Wilaya under the PNDA. ;

3- Siltation of dams where we should find alternatives such as small hydraulics (wedges);

4- Water quality is not always satisfactory. Electrical conductivities exceeding 2.5 ds/m and SAR values greater than 5 were used to classify these waters in C4S1. The risks of salinization of soils by these waters are therefore note and risks of physiological stress in irrigated crops;

5- Problems of surface water pollution, mainly the Oued Cheliff due to various discharges and groundwater pollution due to intensive agriculture, are not excluded. Any use without risk to humanhealth therefore requiresregular physico-chemical and microbiological characterizations of these waters.

In order to meet the need for skills to address the above-mentioned problems by future managers in the sector, we have just presented this preliminary project of opening a licence in agricultural hydraulics.

This three-year license allows the training of specialists in agricultural hydraulics. These managers will be able to set up irrigation networks and drainage, their rational management. They will acquire sufficient knowledge for the good choice of the most advantageous irrigation systems for each situation. They will be also capable of contributing to a rational and efficient use of water. The Commission's proposal for a Directive on the protection of the environment and the protection of the environment from the risks to human health.

This training therefore allows a professional integration or evolution in the activities following:

- Mobilization and protection of water resources;
- Establishment and management of irrigation and development projects;
- Water resource management and expansion;
- Combating climate drought and temporary floods;
- Combating water pollution in the agricultural sector;
- Better use of these waters by better control of irrigation on the plotto achieve satisfactory levels of economic profitability;
- Ensure the sustainable development of irrigated areas by protecting the soil from theirsalinization and structural degradation.

C – Profiles and Competencies Covered (Required Field) *(maximum 20 lines):*

Rural engineering and land development is one of the priorities forthe state in the face of the reduction in the useful agricultural area in the country following the extension of the inhabitant sector. It has become more urgent to develop new agricultural areas and the creation of other irrigated areas throughout the country where the conditions are suitable as the Chelif valley. This concern requires significant financial resources and human skills in this field in general and particularly in agricultural hydraulicsto better guarantees the reliability of such projects:

As part of the new LMD system, we propose a course in agronomic training, focusing on water sciences and rural engineering, namely the development of
land, management of irrigated perimeters and agricultural drainage.

This basic training allows access to other more in-depth courses in this field. It is reserved for students enrolled in the common core of the natural and life sciences and possessing a baccalaureate in:

- Experimental Sciences;
- Exact sciences;
- Civil engineering;
- Mechanical engineering;
- Electrical engineering;
- Building and public works;
- Chemical Engineering.

At the end of the second year, decisions taken by theevaluation and guidance committee.

D – Regional and national employability potential (Required field)

Algeria has large irrigated areas in the North and South that play a role in the development of the country's economy.

The European Union has a major role to play in agriculture and job creation. The perimeter of Haut Chellif is among the largest of these perimeters. It belongs to the Wilaya of Ain-Defla. He's

connected to the other two perimeters; medium and low Cheliff, forming together the Cheliff valley. The valley bet the administrative territory of the wilayas de chlef and Relizane.

At the wilaya level, there is an important administrative system and public or in the rural engineering sector. This training can provide the required skills by these structures. Future graduates are therefore eligible for jobs in following:

- The water resources directorates;
- The environmental departments;
- Subdivisions of water resources;
- The municipalities;
- The National Water Resources Agency;
- The National Agency of Dams and Transfers;
- The Watershed Agencies;
- The design offices;
- The production companies;
- The National Office of Irrigation and Drainage;
- The Agricultural Directorates of the Wilaya;
- Environmental inspections of the wilaya.

E – Gateways to other specialties (Required field)

Graduates of the academic license in agricultural hydraulics will be able to continue their studies Master's and PhD in Irrigation,Drainage, Environment, Quality of irrigation water, water pollution… These future routes must be gradually

pre-project Master's and PhD preparation by the University of Khemis-Miliana in conjunction with other higher education institutions in Algeria.

F – Performance indicators expected from the training (Mandatory field)

(Viability criteria, success rate, employability, follow-up of graduates, skills achieved…)

The Soil and Water (SE) degree aims to train students in agricultural hydraulics and soil and water resources in the agricultural sector in general. At regional level, this training leads to many jobs in the field of environmental, soil and water management.

The curriculum of this training is well designed with a good sequence between the different teaching units (EU), which allows a good progression during the year in the approach of the required skills (evaluated by continuous monitoring and examination). The content is intentionally multidisciplinary in order to be able to meet the requirements of a large panel of specialties of masters offered at national level. Indeed, the rate of continuation of study in master's degree is around 60%.

In terms of occupational integration, the examples of courses offered are also interesting because of the diversity of the reception structure. The duration of 01 (one) month for a student allows a good practice and a good immersion in the professional world. This ensures the field approach, to increase the chances of recruitment for the targeted trades.

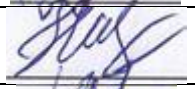
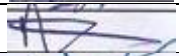
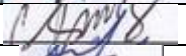
In addition, the follow-up of graduates is carried out at different scales, by the training managers (head of specialty, of the sector and of the field) and the institution (administration).

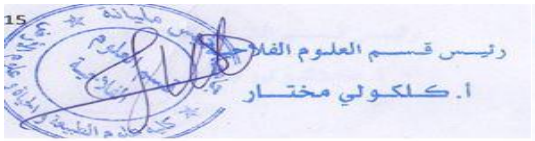
The management of the training is provided by a group of about ten university people (see table internal and external management team). The training manager ensures the coherence of the training in relation to the various managers of other licenses in the agronomic and biological sciences.

4- Human resources available

A- Cashing capacity (expressed as the number of students who can be supported): 40 students

B- Internal teaching team mobilized for the specialty:

Name, first name	diploma graduation	Specialty diploma (Magister, PhD)	Grade	Subjects to teach	Signature
Mokabli Aissa	state engineer	State doctor	Pr	Soil conservation, supervision, internship	
Hallouz Faiza	state engineer	Doctorate	MCB	Topography, internship supervision	
Bensaada Mohamed	state engineer	Magister	MAA	Hydrogeology	
Merouche Abdelkader	state engineer	Magister	MAA	Irrigation-Drainage, Agro-meteorology, internship supervision	
Touil Sami	state engineer	Magister	MAA	Statistics, Geostatistics, internship supervision	
Kadir Mokrane	state engineer	Magister	MAA	Water quality, soil conservation, internship supervision	
Bouaichi Ilhem	state engineer	Magister	MAA	Water and irrigated perimeters, internship supervision	
Karahaçane Hafsa	state engineer	Magister	MAB	Climate change and its impacts, internship supervision	
Abdessalem Boualem	state engineer	Magister	MAA	General pedology	
Amokrane Athmane	state engineer	Magister	MAA	Soil mapping	
Belouazni Ahmed	state engineer	Magister	MAB	Climate change and its impacts	
Boucefiane Abdelkader	state engineer	Magister	MAA	General hydraulics	
Bouderbala Abdelkader	state engineer	Magister	MAA	General hydraulics	
Sadeuk Benabbes	state engineer	Magister	MAA	Hydrology / Hydrogeology	



C: External pedagogical team mobilized for the specialty: (to inform and to make target by the faculty or institute)

Name, first name	Home institution	Graduation diploma	Specialty degree (Magister, PhD)	Grade	Teaching material	Emargement

Department visa **Faculty or Institute Endorsement**

D: Overall summary of human resources mobilized for the specialty (L3)

Grade	Internal workforce	External workforce	Total
Professor	01		01
Conference Master (A)			
Conference Master (B)	01		01
Assistant Master (A)	10		10
Assistant Master (B)	02		02
Other (*)	15		15
Total	**29**		**29**

(*) Technical and support staff

5 – Equipment specific to the specialty

A- Pedagogical Laboratories and Equipment: Sheet of existing pedagogical equipment for the planned training (1 sheet per laboratory)

Laboratory Title: Physics
Student capacity: 20

N°	Equipment Title	Number	Observation
01	Uncertainties	05	
02	Newton's Second Law	02	
03	Rectilinear motion	02	
04	The stiffness of a spring	05	
05	Freefall	01	
06	Electricity uncertainty	04	
07	Fields and electrical potential	04	
08	Oscilloscope	04	
09	Ohm law	04	
10	Charging and discharging a capacitor	04	
11	Circuits R.L.C	04	

Laboratory Title: Chemistry
Student capacity: 20

N°	Equipment Title	Number	Observation
01	Laboratory ph meter	03	
02	Laboratory conductivity meter	02	
03	Portable ph meter	02	
04	Portable conductometer	02	
05	Oven	01	
06	Flame photometer	01	
07	Balloon heater	02	
08	Hot plate	02	
09	Portable scale	02	
10	Analytical balance	01	
11	Electronic thermometer	04	
12	Vacuum pump	02	
13	Visible UV spectrophotometer	01	
14	Gas chromatography	01	
15	Portable oximeter	01	
16	Water bath	01	
17	Case for water analysis	01	

Laboratory Title: Biochemistry

N°	Equipment Title	Number	Observation
01	Hematocrit	05	
02	Microscope	02	
03	Hot plate	01	
04	Electronic scale	04	
05	Ph meter	List	
06	Chromatography tank	List	
07	Electrophoresis	01	
08	Centrifuge	03	
09	Water bath	02	

Student capacity: 20

Laboratory Title: Plant Biology

N°	Equipment Title	Number	Observation
01	Autoclave	02	
02	Water bath	01	
03	Incubator oven	02	
04	Chromatography tank	03	
05	Microscope	12	
06	Magnifying glass	10	
07	Microtome	20	
08	Oven	01	
09	Potometer	01	
10	Distiller	01	
11	Analytical balance	01	
12	Water bath	01	

Student capacity: 20

Laboratory Title: Plant Biology and Physiology
Student capacity: 20

N°	Equipment Title	Number	Observation
01	Microscope	20	
02	Analytical balance	06	
03	Dissection kit	12	
04	Spectrophotometer	01	
05	Vertical electrophoresis tank	01	
06	Thin-layer chromatography	05	
07	Overhead projector	02	
08	Slide device	01	
09	PH meter	06	
10	Electronic thermometer	08	
11	Hematocrit apparatus	01	
12	Centrifuge	02	
13	Water bath	03	
14	Magnifying glass	10	
15	Oven	02	
16	Refrigerator	01	
17	Balloon heater	04	
18	Hot plate	05	
19	Magnetic stirrer	04	
20	Biology model	20	
21	Prepared blade	A series	
22	Clumsy cell	10	

Laboratory Title: Hydraulics
Student capacity: 20

N°	Equipment Title	Number	Observation
01	Venturi tube	01	
02	Apparatus for measuring loss of load	02	
03	Rain simulator	01	
04	Rolling speed measuring device (Reynolds)	01	
05	Hydraulic channel	01	
06	Centre of thrust	01	
07	Apparatus for measuring flow through holes	01	
08	Constant load permeometer	01	
09	Field Infiltometer	01	
10	Variable load permeometer	01	
11	Pércision scales	01	

Laboratory Title: Geology, Mapping
Student capacity: 20

N°	Equipment Title	Number	Observation
01	Manual curvometer	05	
02	Digital curvometer	02	
03	Planimeter	01	
04	Compass	04	
05	Geological maps	List	
06	Topographic maps	List	
07	Double decameter	01	
08	Caliper	03	
09	Electrical probe	02	
10	Digitization table	01	
11	Manual curvometer	05	
12	Digital curvometer	02	
13	Planimeter	01	
14	Compass	04	
15	Geological maps	List	
16	Topographics maps	List	
17	Double decameter	01	
18	Vernier Caliper	03	
19	Electrical Probe	02	
20	Digitization table	01	

Laboratory Title: Soil
Student capacity: 20

N°	Intitulé de l'équipement	Nombre	Observation
01	Auger	02	
02	Shredder	01	
03	Precision scale	01	
04	Robinson's pipette	01	
05	Mechanical shaker	01	
06	Magnetic stirrer	01	
07	Centrifuge	01	
08	Field Infiltrometer (double ring)	01	
09	Sphygmomanometers	01	
10	PH meter	01	
11	Flame photometer	09	
12	Mineralizer	01	
13	UV Spectrophotometer	01	
14	Series of sieves	02	
15	Conductivity meter	02	
16	Nitrogen dosing logs	03	
17	GPS	01	

B- Training courses and company training courses (see agreements/ agreements section)

Internship location	Number of students	Duration of the internship
Units of the National Office of Irrigation and Drainage (ONID)	10	01 month
Directions of the National Water Resources Agency (ANRH)	10	01 month
Experimental stations of the Higher Institute of Irrigation and Drainage (INSID)	10	01 month
Directions of Agricultural Services (Pilot farm in the wilaya)	10	01 month
National Agency for Dams and Transfers (ANBT)	10	01 month
The River Basin Agency (ABH)	10	01 month

C- Documentation available at the institution specific to the proposed training (Required field):

The library has extensive documentation in the following disciplines:
Statistics, experimentation, physics, chemistry, biochemistry, microbiology, electricity, biology, plant and animal physiology, anatomy, genetics, general hydrostatics, hydrogeology, agronomy, irrigation-drainage, pedology, economics, remote sensing and GIS, economics law, english, french and dissertation.

D- Personal workspaces and ICT available at departmental and faculty level:

- Experimental station of the faculty ;
- The faculty's set of teaching laboratories ;
- Research laboratory of the "Water, Rock and Plants" institutes
- Institute's research laboratory
- Laboratoire de recherche de l'Institut : Agricultural Production and Natural Resources Development ;
- Audio – visual services.

II – Semi-annual organisation sheet of the courses of the specialty (S1, S2, S3, S4, S5 and S6)

(Include the annexes to the orders of the common bases of the domain and the sector)

Common Foundation in the Field of Nature and Life Sciences

Semestre 1

Teaching unit	Matter		Credit	Coefficient	Hourly volume weekly			VHS (15 weeks)	Other*	Evaluation method			
	Code	Entitled			Cours	TD	TP			CC*		Exam	
Fundamental Unit Code : UEF 1.1 Credit : 18 Coefficient : 9	F 1.1.1	General and organic chemistry	6	3	1h30	1h30	1h30	67h30	82h30	x	40%	x	60%
	F 1.1.2	Cellular biology	8	4	1h30	1h30	3h00	90h00	110h00	x	40%	x	60%
	F 1.1.3	Mathematics and statistics	4	2	1h30	1h30	-	45h00	55h00	x	40%	x	60%
Methodological unit Code : UEM 1.1 Credit : 9 Coefficient: 5	M 1.1.1	Geology	5	3	1h30	1h30	1h00	60h00	65h00	x	40%	x	60%
	M 1.1.2	Technique of communication and expression 1 (French)	4	2	1h30	1h30	-	45h00	55h00	x	40%	x	60%
Discovery unit Code : UED 1.1 Credit : 2 Coefficient : 2	D 1.1.1	Working method and terminology 1	2	2	1h30	1h30		45h00	5h00	x	40%	x	60%
Transversale Unit Code : UET 1.1 Credit : 1 Coefficient : 1	T 1.1.1	Universal History of Biological Sciences	1	1	1h30	-	-	22h30	2h30	-	-	x	100
Total Semestre 1			30	17	10h30	9h00	5h30	375h00	375h00				

Other* = Additional work in semi-annual consultation ;CC* = Continuous control.

Common Foundation in the Field of Nature and Life Sciences

Semestre 2

Teaching unit	Matter		Credit	Coefficient	Hourly volume weekly			VHS (15 weeks)	Other*	Evaluation method			
	Code	Entitled			Cours	TD	TP			CC*		Exam	
Fundamental Unit Code : UEF 2.1 Credit : 18 Coefficient : 9	F 2.1.1	Thermodynamics and chemistry of solutions	6	3	1h30	1h30	1h30	67h30	82h30	x	40%	x	60%
	F 2.1.2	Vegetal biology	6	3	1h30	-	3h00	67h30	82h30	x	40%	x	60%
	F 2.1.3	Animal biology	6	3	1h30	-	3h00	67h30	82h30	x	40%	x	60%
Methodological unit Code : UEM 2.1 Credit : 9 Coefficient : 5	M 2.1.1	Physic	5	3	1h30	1h30	1h00	60h00	65h00	x	40%	x	60%
	M 2.1.2	Communication and Expression Techniques 2 (English)	4	2	1h30	1h30	-	45h00	55h00	x	40%	x	60%
Discovery unit Code : UED 2.1 Credit : 2 Coefficient : 2	D 2.1.1	Life sciences and socio-economic impacts	2	2	1h30	1h30	-	45h00	5h00	x	40%	x	60%
Transversale Unit Code : UET 2.1 Credit : 1 Coefficient : 1	T 2.1.1	Working method and terminology 2	1	1	1h30	-	-	22h30	2h30	-	-	x	100%
Total Semestre 2			30	17	10h30	6h00	8h30	375h00	375h00				

Other* = Additional work in semi-annual consultation ; CC* = Continuous control.

Annex to the teaching program for the second year of the bachelor's degree
Field of Natural and Life Sciences; « Agricultural Sciences branch »

Semestre 3

Teaching unit	Matter	Credit	Coefficient	Hourly volume weekly			VHS (15 weeks)	Other*	Evaluation method			
	Entitled			Cours	TD	TP			CC*		Exam	
Fundamental Unit Code : UEF 2.1.1 Credit : 6 Coefficient : 3	Zoology	4	2	1h30	-	1h30	45h00	55h00	x	40%	x	60%
	animal physiology	2	1	1h30	-	-	22h30	27h30	-	-	x	60%
Fundamental Unit Code : UEF 2.1.2 Credit : 12 Coefficient : 6	Biochemistry	6	3	3h00	1h30	-	67h30	82h30	x	40%	x	60%
	Genetic	6	3	3h00	1h30	-	67h30	82h30	x	40%	x	60%
Methodological unit Code : UEM 2.1.1 Credit : 4 Coefficient: 2	Communication and expression techniques (In English)	4	2	1h30	1h30	-	45h00	55h00	x	40%	x	60%
Methodological unit Code : UEM 2.1.2 Credit : 5 Coefficient: 3	Biophysics	5	3	1h30	1h30	1h00	60h00	65h00	x	40%	x	60%
Discovery unit Code : UED 2.1.1 Credit : 2 Coefficient : 2	Environment and Sustainable Development	2	2	1h30	1h30	-	45h00	5h00	x	40%	x	60%
Transversale Unit Code : UET 2.1.1 Credit : 1 Coefficient : 1	Ethics and university deontology	1	1	1h30	-	-	22h30	2h30	-	-	x	100 %
Total Semestre 3		30	17	15h00	7h30	2h30	375h00	375h00				

Other* = Additional work in semi-annual consultation ; CC* = Continuous control.

Annex to the teaching program for the second year of the bachelor's degree
Field of Natural and Life Sciences;Agricultural Sciences branch

Semestre 4

Teaching unit	Matter	Credit	Coefficient	Hourly volume weekly			VHS (15 weeks)	Other*	Evaluation method			
	Entitled			Cours	TD	TP			CC*		Exam	
Fundamental Unit Code : UEF 2.2.1 Credit : 8 Coefficient : 4	Agronomy I	4	2	1h30	1h30	-	45h00	55h00	x	40%	x	60%
	Agronomy II	4	2	1h30	1h30	-	45h00	55h00	x	40%	x	60%
Fundamental Unit Code : UEF 2.2.2 Credit : 10 Coefficient : 5	Microbiology	6	3	1h30	1h30	1h30	67h30	82h30	x	40%	x	60%
	Botanical	4	2	1h30	-	1h30	45h00	55h00	x	40%	x	60%
Methodological unit Code : UEM 2.2.1 Credit : 4 Coefficient: 2	Plant physiology	4	2	1h30	-	1h30	45h00	55h00	x	40%	x	60%
Methodological unit Code : UEM 2.2.2 Credit : 5 Coefficient: 3	Biostatistics	5	3	1h30	1h30	1h00	60h00	65h00	x	40%	x	60%
Discovery unit Code : UED 2.2.1 Credit : 2 Coefficient: 2	General ecology	2	2	1h30	1h30	-	45h00	5h00	x	40%	x	60%
Transversale Unit Code : UET 2.2.1 Credit : 1 Coefficient : 1	Informatical tools	1	1	1h30	-	-	22h30	2h30	-	-	x	100 %
Total Semestre 4		30	17	12h00	7h30	5h30	375h00	375h00				

Other* = Additional work in semi-annual consultation; CC* = Continuous control.

Annex to the teaching program for the third year of the bachelor's degree
Field of Natural and Life Sciences; Agricultural Sciences branch; Soil and Water speciality

Semestre 5

Teaching unit	VHS	Hourly volume weekly				Coefficent	Credit	Evaluation method			
	14-16 weeks	C	TD	TP	Other*			CC*		Exam	
Fundamental Unit											
UEF 3.1.1 (O/P)											
Matter 1 : General Pedology	67h30	1h30	1h30*	1h30*	82h30	3	6	x	40%	x	60%
Matter 2 : General Cartography	45h00	1h30	-	1h30	55h00	2	4	x	40%	x	60%
UEF 3.1.2(O/P)											
Matter 1 : Hydrogeology	45h00	1h30	1h30*	-	55h00	2	4	x	40%	x	60%
Matter 2 : Hydrology	45h00	1h30	1h30	-	55h00	2	4	x	40%	x	60%
Methodological unit											
UEM1 (O/P)											
Matter 1 : Agro meteorology	45h00	1h30	1h30		55h00	2	4	x	40%	x	60%
UEM2 (O/P)											
Matter 1:Statistics and data analysis	60h00	1h30	1h30	1h	65h00	3	5	x	40%	x	60%
Discovery unit											
UED1 (O/P)											
Matter 1 : Climate change and water resources	45h00	1h30	1h30		5h00	2	2	x	40%	x	60%
UED2 (O/P)											
Transversale Unit											
UET1 (O/P)											
Matter 1 : Technical English	22h30	1h30			2h30	1	1	x	40%	x	60%
Total Semestre 5	**375h**				**375h**	**17**	**30**				

Other* = Additional work in semi-annual consultation ; CC* = Continuous control ; * Scientific outings.

Annex to the teaching program for the third year of the bachelor's degree
Field of Natural and Life Sciences; Agricultural Sciences branch; Soil and Water speciality

Semestre 6

Teaching unit	VHS	Hourly volume weekly				Coefficent	Credit 14-16 weeks	Evaluation method			
	14-16 weeks	C	TD	TP	Other*			C		TD	
Fundamental Unit											
UEF 3.2.1(O/P)											
Matter 1 : General hydraulics	67h30	1h30	1h30	1h30*	82h30	3	6	x	40%	x	60%
Matter 2 : Irrigation and drainage	67h30	1h30	1h30	1h30*	82h30	3	6	x	40%	x	60%
UEF 3.2.2 (O/P)											
Matter 1 : Soil conservation	67h30	3h00	1h30		82h30	3	6	x	40%	x	60%
Methodological unit											
UEM1(O/P)											
Matter 1 :Water quality	45h00	1h30	1h30		55h00	2	4	x	40%	x	60%
Matter2 : Water and irrigated permiters	22h30	1h30*			27h30	1	2	x	40%	x	60%
UEM2(O/P)											
Matter 1 : Topography	37h30	1h30		1h	37h30	2	3	x	40%	x	60%
Discovery unit											
UED1(O/P)											
Matter 1 : Introduction to geostatistics	45h00	1h30	1h30		5h	2	2	x	40%	x	60%
UED2(O/P)											
Transversale Unit											
UET1(O/P)											
Matter 1 : Operation of a hydro-agricultural structure	22h30			1h30*	2h30	1	1	x	40%	x	60%
Total Semestre 6	**375h**				**375h**	**17**	**30**				

Other* = Additional work in semi-annual consultation ; CC* = Continuous control ; * Scientific outings.

II - Detailed program by matter

Semester 1

EU: Fundamental Teaching Unit

Matter 1: GENERAL AND ORGANIC CHEMISTRY

Credit: 6

Coefficient: 3

Teaching objectives

This subject consists of teaching the fundamental bases of the organization and chemical structure of matter. It is a complement to the other subjects because it serves to facilitate the chemical understanding of biological phenomena.

Prior knowledge recommended

The student must master the basic notions of general and organic chemistry, namely the structure of the atom, atomic bonds and oxidation-reduction reactions.

Content of the matter

1. General Chemistry

1.1. General
- 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 reaction

1.3. Electronic configuration of atoms
- 1.3.1. Introduction to quantum numbers
- 1.3.2. Principles governing the electronic structure of an atom:
- 1.3.3. Energy rule (Klechkoweski's rule)
- 1.3.4. Pauli exclusion rule
- 1.3.5. Hund's rule

1.4. Periodic table
- 1.4.1. Group (Column), Period (row)
- 1.4.2. Evolution of physical properties within the periodic table: radiusatomic, ionization energy, electron affinity….

1.5. Chemical bond
- 1.5.1. Introduction: strong bonds 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-connection metallic)
1.5.4.Ionic character of a covalent bond
1.5.5. Geometry of molecules: VSEPR theory (Gillespie's rule)

2. Organic Chemistry
2.1. Organic Compounds, Formulas, Functions, Nomenclature
2.1.1. Formulas 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
- Polyfunctional alcohols, thiols, thiothers, phenols, amine aldehydes
- heterocyclic polyfunctional compounds

2.2.Reaction mechanisms in organic chemistry
2.2.1. Resonance and mesomery
2.2.2.Conjugation
2.2.3.Stereochemistry
2.2.4. Electronic effects
2.2.5.Substitution nucleophiles
2.2.6.Eliminations
2.2.7.Free radical reactions
2.2.8.Reduction reactions
2.2.9.Oxidation reaction

Tutorials

TD N°1: Fundamental notions of chemistry (atoms, molecules, gram atoms, moles, calculation of concentrations)

TD N°2: Stability of the nucleus and radioactivity

TD N°3: Electronic configuration and periodic classification of the elements

TD N°4: Chemical bonds

TD N°5: Nomenclature and stereo-chemistry

TD N°6: Reaction mechanisms

Practical work

TP N°1: Principles of experimental chemistry

Objective: Evaluate the student's knowledge of the equipment used in chemistry experiments and the safety rules to be observed in the laboratory.

TP N°2: Determination of the amount of material

Objective: Determine the amount of material (expressed in number of moles) contained in a sample and prepare a sample containing a fixed amount of material

TP N°3: Preparation of solutions by dissolution and by dilution

Objective: This involves preparing a solution of sodium chloride (NaCl) with a normality of 0.1N and preparing a solution of hydrochloric acid (HCl) with a normality of 0.1N by diluting a solution of HCl with a normality of 1N.

TP N°4: Measurement of the density of some….

Objective: We want 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 functional groups: Alcohols and carbonyls.

Assessment method

Continuous control and semesterexamination;

References*(Booksand handouts, websites, etc.)*:

Jacques Maddaluno, Véronique Bellosta, Isabelle Chataigner, François Couty, et al., 2013- Organic Chemistry. Ed. Dunod, Paris, 576 p.

Jean-François Lambert, Thomas Georgelin, Maguy Jaber, 2014- Mini manual of inorganic Chemistry. Ed. Dunod, Paris, 272 p.

Elisabeth Bardez, 2014- Mini Manual of General Chemistry: Chemistry of Solutions. Ed. Dunod, Paris, 256 p.

Paula Yurkanis Bruice, 2012- Organic Chemistry. Ed. Pearson, 720 p.

Jean Louis Migot, 2014- Analytical Organic Chemistry. Ed. Hermann, 180 p.

Semester 1

EU: Fundamental Teaching Unit

Matter 2:CELLULAR BIOLOGY

Credit: 8

Coefficient : 4

Teaching objectives

The objectives of this course are to introduce 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 constituents. These objectives are reinforced by practical sessions in the laboratory.

Prior knowledge recommended

The student must have knowledge in General Biology

Content of the matter

1.General

- 1.1. Classification and relative importance of the 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. Otic and electron microscopy methods
- 2.2. Histochemical methods
- 2.3. Immunological methods
- 2.4. Enzymological methods

3. Plasma membrane: structure and function
4. Cytoskeletonand 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

Tutorials / Practical work

1. Methods of studying cells
    1.1. Separation of cell constituents
    1.2. Observation of cellular constituents
    1.3. Identification of cellular constituents
    1.4. Plant wall
2. Cell cultures
3. Tests of physiological functions
    3.1. Reconstruction of the function from the isolated constituents
    3.2. Anatomical tests: autoradiography, fluorescence labeling, proteinsfluorescent green
    3.3. Physiological tests: control of the expression of a protein, mutation,over expression

Evaluation method

Continuous control and semesterexamination;

References*(Booksand handouts, websites, etc.)*:

B. Albert, A. Johnson, J. Lewis, M. Raff, K. Roberts and P. Walter, 2011- Molecular Biology of the Cell. Ed. Lavoisier, Paris, 1601p.

Abraham L. Kierszenbaum, 2006- Histology and cell biology: Ed De Boeck, 619p.

Thomas Dean Pollard and William C. Earnshaw, 2004- Cell Biology. Ed. Elsevier Masson, Paris, 853p.

Marc Maillet, 2006- Cell biology. Ed. Elsevier Masson, Paris, 618p.

Semester 1

EU: Fundamental Teaching Unit

Matter 3:MATHEMATICS AND STATISTICS

Credit:4

Coefficient :2

Teaching objectives

This subject allows the student to integrate statistical and computer tools in the biological field, and to use numerical analysis, probability and calculation by computer tools.

Prior knowledge recommended

The student must have knowledge of functions, integrals and random variables.

Content of the matter

1.Math analysis
- 1.1. One-variable function, derivative and integrals.
- 1.2. Approximation method.
- 1.3. Series, series with positive terms, Rieman series.
- 1.4. Multivariate Functions, Partial Derivatives, Differentials
- 1.5. Double and triple integrals.
- 1.6. Calculation of surfaces 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 (Gauss, reduced centered normal law, chi II law, Fischer law)
- 2.3. Parameters and properties
  - 2.3.1. Position parameters (median, mode, mean,…..etc)
  - 2.3.2. Dispersion parameters (variance, standard deviation, …….etc)
  - 2.3.3. Shape parameters (symmetry, flattening,….etc)
- 2.4. Distribution function and density function

3.Computer science
- 3.1. structure of a computer
- 3.2. Numerical Systems (Binary and Decimals)

Practical works

TP N°01: Handling on a word processor
TP N°02: Use of spreadsheets

Evaluation method

Continuous control and semester examination;

References*(Booksand handouts, websites, etc.)*

Jean Bouyer, 2000- Statistical methods: medicine-biology. Ed. Estem.

Gilles Stoltz and Vincent Rivoirard, 2012-Mathematical Statistics in Action. Ed. Vuibert, Paris, 448p.

Maurice Lethielleux, 2013- Descriptive statistics. Ed. Dunod, Paris, 160p.

Maurice Lethielleux and Céline Chevalier, 2013- Probabilities: Statistical Estimation. Ed. Dunod, Paris, 160p.

Semester 1

EU: Methodological teaching unit

Matter 1: GEOLOGY

Credit: 5

Coefficient: 3

Teaching objectives

Matter allows students to see the constituents and structure of the terrestrial globe, the interactions between these constituents, the external and internal geodynamics.

Prior knowledge recommended

No prerequisites

Content of the subject

1. General geology
    - 1.1. Introduction
    - 1.2. Earth
    - 1.3. 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.The action of the wind
    - 2.2. Deposits
        - 2.2.1. Study methods
        - 2.2.2.sedimentary rocks
        - 2.2.3.Notion of stratigraphy
        - 2.2.4.Paleontology concept
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.Magma study
    - 3.3. Plate tectonics

Practical works

TP N°1: Topography
TP N°2: Geology (Cuts)
TP N°3: Rocks and minerals

Evaluation method

Continuous control and semesterexamination;

References*(Booksand handouts, websites, etc.)*:

Jean Dercourt, 1999- Geology: lessons and exercises. Ed. Dunod, Paris,

Denis Sorel and Pierre Vergely, 2010- Introduction to maps and geological sections. Ed. Dunod, Paris, 115p.

Jean Tricart, 1965- Principles and methods of geomorphology. Ed. Masson, Paris, 496p.

Semester 1

EU: Methodological Teaching Unit

Matter 2: TECHNIQUES OF COMMUNICATION AND EXPRESSION 1 (in french)

Credit: 4

Coefficient: 2

Teaching objectives

This subject aims to understand and write scientific documents in French as well as the use and translation of scientific terms.

Prior knowledge recommended

No prerequisites.

Content of the subject

1. Scientific Terminology
2. Study and comprehension of text
3. Technique of written and oral expression (report, synthesis, use of modern means of communication)
4. Expression and communication in a group. Study of proposed texts (observe, analyze, take stock, written expression)

Tutorials

Proposal of exercises related to the points of language considered the most important.

Evaluation method

Continuous control and semesterexamination;

References*(Booksand handouts, websites, etc.)*:

Scientific articles and dissertations.

Semester 1

EU: Discovery Teaching Unit

Material 1: WORKING METHOD AND TERMINOLOGY 1
Credit: 2

Coefficient:2

Teaching objectives

Help students design research methods and synthesis of work according to scientific rules.

Prior knowledge recommended

The student must have notions in bibliographic research.

Content of the matter

1. Introduction to bibliographic research
2. Writing a scientific report
3. Introduction to reading and understanding a scientific article

Evaluation method

Continuous control and semesterexamination;

References*(Booksand handouts, websites, etc.)*

Scientific articles and dissertations

Semester 1

EU: Transversale Teaching Unit

Material 1: UNIVERSAL HISTORY OF BIOLOGICAL SCIENCES

Credit:2

Coefficient:2

Teaching objectives

This program must emphasize the history of biology, and the question of life through eras and civilizations. It must highlight the place of technical progress in the evolution of biology

Prior knowledge recommended

No prerequisites.

Content of the subject

1.Prehistory

2.antiquity

3.Middle Ages

3.1. In Occident

3.2. In the East (Muslim civilization)

4.Sixteenth and seventeenth centuries:

5.Eighteenth century: Darwin

6.Nineteenth century: cell theory (microscopy), Sexuality Embryology, Molecular biology (DNA) Genetics

7. Twentieth century: gene therapy and cloning

Evaluation method

Semester examination;

References*(Booksand handouts, websites, etc.)*:

Denis Buican, 2008- Darwin in the history of biological thought. Ed. Ellipses, 232p.

Christophe Ronsin, 2005- History of molecular biology. Ed. De Boeck, 106p.

Jean Théodoridès, 2000- History of biology. Ed. PUF, 127p.

Semester 2

EU: Fundamental Teaching Unit

Matter 1: THERMODYNAMICS AND CHEMISTRY OF SOLUTIONS

Credit: 6

Coefficient: 3

Teaching objectives

This course provides a certain understanding of the principles governing the transformations and interactions of matter, the principle of thermodynamics, energy balance, and the kinetics of chemical reactions.

Prior knowledge recommended

The student must have knowledge of oxidation-reduction reactions.

Content of the matter

1. Chemical balances
    1.1. Acid-base balance
        1.1.1. Definition according to: Arrhenius; Bronsted; lewis
        1.1.2. Equilibrium constant: water dissociation, acidity and basicity
        1.2.3. The pH: water, a strong monoacid, a strong monobase, ….
    1.2. Redox balance
        1.2.1. Redox reaction: electron transfer
        1.2.2. Oxidation number
        1.2.3. Writing redox reactions
        1.2.4. Electrochemical cells
        1.2.5. Redox potential
    1.3. Precipitation equilibrium: Solubility and solubility product
        1.3.1. Definition
        1.3.2. Effect of ion addition on solubility
        1.3.3. Effect of pH
2. Chemical kinetics
    2.1. Definition
    2.2. Reaction speed
    2.3. Expression of the rate law and order of a reaction
    2.4. Factors influencing reaction rate

3. Thermodynamics

3.1. Thermodynamic systems and quantities: Thermodynamic functions and transformations

3.2. First law of thermodynamics

3.2.1. Expression of work and heat

3.2.2. Expression of internal energy and enthalpy

3.3. Second law of thermodynamics

3.3.1. Expression of entropy

3.3.2. Expression of free energy and free enthalpy

3.4. Thermochemistry

3.4.1. Heat of reactions

3.4.2. Enthalpy of reactions

3.4.3. Calculating the internal energy of a reaction

3.4.5. Kincgoff's Law

3.4.6. Hess's Law

3.5. Prediction of the direction of reactions

3.5.1. Isolated systems

3.5.2. Calculation of reaction entropies

3.5.3. Reactions at constant temperature

3.5.4. Calculation of free enthalpy and free energy of a system.

4. Inorganic Chemistry

Tutorials

TD N°1: Chemical kinetics

TD N°2: Acid-base balances and precipitation balances

TD N°3: Oxido-reduction balances

TD N°4: Thermodynamics and thermochemistry

TD N°5: Organic chemistry (Reaction mechanisms)

Practical work

TP N°1: Chemical kinetics

Part 1: Experimental determination of the order of the reaction

Objective: Determination of the order of the reaction with respect to sodium thiosulfate (Na2S2O3) using the method of initial rates.

Part 2: Influence of temperature on the rate of the reaction

Objective: Determinationof reaction rates for the same concentration of reactants but for different temperatures.

TP N°2: Acid-base titrimetric analysis method. Acid-base neutralization

Part 1**:** Dosage by colorimetry

Objective: Dosageof a strong acid solution (HCl) by a strong base (NaOH), determination of the concentration of a weak acid solution (CH3COOH) by a strong base solution (NaOH).

Part 2**:**Dosage by pHmetry

Objective: Dosage of a weak acid solution (CH3COOH) with a strong base (NaOH).

TP N°3: Titration by the oxidation-reduction method. Manganimetric determination of Fe2+

*Objective:*Determination of the normality of a given solution of KMnO4, determination of the concentration of Fe2+ contained in a solution of FeSO4.

TP N°4: Identification of ions and separation of precipitates by centrifugation

*Objective:*Identify the ions present in a solution, write the chemical formulas of an ionic compound in solution, write the precipitation reactions, express the relationship between the equilibrium constant and the solubility.

Evaluation method

Continuous control and semesterexamination;

References*(Booksand handouts, websites, etc.)*:

John C. Kotz and Paul M. Treichel,2006- Chemistry of solutions. Ed. De Boeck, 376p.

René Gaborriaud et al., Thermodynamics applied to the chemistry of solutions. Ed. Ellipses, 335p.

Semester 2

EU: Fundamental Teaching Unit

Matter 2: VEGETAL BIOLOGY

Credit: 6

Coefficient: 3

Teaching objectives

The objective of this subject is to teach students the fundamental principles of the tissue organization of plants, and their development.

Prior knowledge recommended

The student must have certain notions about the different parts of a plant

Content of the matter

1. Introduction to plant biology
2. Different types of fabrics
    - 2.1. Primary meristem (root and cell)
        - 2.1.1. Primary tissues
        - 2.1.2. Protective tissues (epidermis)
        - 2.1.3. Filling tissues (parenchyma)
        - 2.1.4. Supporting tissues (collenchyma and sclerenchyma)
        - 2.1.5. Conductive tissues (primary xylem, primary phloem)
        - 2.1.6. Secretory tissues
    - 2.2. Secondary (lateral) meristems (the cambium and the phellogen)
        - 2.2.1. Secondary tissues
        - 2.2.2. Conductive tissues (secondary xylem and secondary phloem)
        - 2.2.3. Protective tissues (suber or cork, phelloderm)
3. Anatomy of higher plants
    - 3.1. Root study
    - 3.2. Stem study
    - 3.3. leaf study
    - 3.4. Comparative anatomy between mono and dicots4.
4. Morphology of higher plants and adaptation
    - 4.1. Roots
    - 4.2. Leaves
    - 4.3. Rods
    - 4.4. Flowers
    - 4.5. Seeds
    - 4.6. Fruits

5. Gametogenesis
    5.1. Pollen
    5.2. Ovum and embryo sac
6. Fertilization
    6.1. egg and embryo
    6.2. Concept of development cycle

Practical work

TP N°1: Morphological study of Angiosperms (roots-stems-leaves-flowers)

TP N°2: Morphological study of Gymnosperms (roots-stems-leaves-flowers)

TP N°3: Primary meristems (root and stem)

TP N°4: Covering fabrics: epidermis – piliferous layer – corky layer - suberoid

TP N°5: Parenchyma (chlorophyllian-reserve-aeriferous-aquifer)

TP N°6: Supporting tissues (collenchyma-sclerenchyma)

TP N°7: Secretory tissues (hairs-glands-cell with tannins-laticiferous)

TP N°8: Primary conductive tissues (phloem-xylem)

Evaluation method

Continuous control and semesterexamination;

References *(Booksand handouts, websites, etc.)*:

Alain Raveneau et al., 2014- Plant biology. Ed. De Boeck, 733p.

Jean François Morot-Gaudry et al., 2012- Plant biology. Ed. Dunod, Paris, 213p.

Semester 2

EU: Fundamental Teaching Unit

Matter 3: ANIMAL BIOLOGY

Credit: 6

Coefficient : 3

Teaching objectives

This module consists of introducing students to the particularities of the developmental biology of certain animal species.

Prior knowledge recommended

No prerequisites

Content of the matter

First part: Embryology

1. Introduction
2. Gametogenesis
3. Fertilization
4. Segmentation
5. Gastrulation
6. Neurulation: becoming sheets
7. Delimitation: bird appendages
8. Peculiarities of human embryology (Cycle, nidation, appendix evolution, placenta)

Second part: Histology

1. Lining epithelia
2. Glandular Epithelia
3. Connective tissues
4. Blood tissue
5. Cartilaginous tissues
6. Bone tissue
7. muscle tissue
8. Nervous tissues

Tutorials / Practical work

TD/TPN°1: Gametogenesis

TD/TP N°2: Fertilization segmentation in the sea urchin

TD/TP N°3: bird amphibian gastrulation

TD/TP N°4: Exercises on gastrulation and neurulation

TD/TP N° 5: neurulation appendages birds

TD/TP N° 6: Human embryology

Evaluation method

Continuous control and semesterexamination;

References *(Booksand handouts, websites, etc.)*:

Paul Richard W. FUNCTIONAL HISTOLOGY

Semester 2

EU: Methodological Teaching Unit

Matter 1: PHYSICAL

Credit: 6

Coefficient: 3

Teaching objectives

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

Prior knowledge recommended

Students must have basic notions in mathematics and mechanics.

Content of the matter

1. Math Reminder
    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.Introduction (lens of optics)
    2.2. Nature of light (spectrum of electromagnetic waves, photons, waves, etc.)
    2.3. Geometrical optics
        2.3.1. Principles of geometrical optics and propagation of light.
        2.3.2. Refraction (Snell-Descarte's laws, limiting angle and total reflection)
            2.3.2.1. Plane diopters, conjugation formula, Blade with parallel faces and Prism.
            2.3.2.2. Spherical diopters (convergent, divergent), conjugation formula and geometric construction (image construction).
            2.3.2.3. Thin lenses (convergent, divergent), conjugation formula, magnification, association of two thin lenses and geometric construction (image construction).
        2.3.3. Reflection
            2.3.3.1. Plane mirror (image construction)
            2.3.3.2 Spherical mirror (image construction, conjugation formula)

2.3.4. Optical instruments

2.3.4.1. The eye

2.3.4.1. Magnifying glass and optical microscope

3. Fluid mechanics

3.1. Definition and characteristics of a fluid.

3.2. Hydrostatics (Fundamental relationship of hydrostatics, buoyancy, float)

3.3. Hydrodynamics (loss, continuity equation, Bernoulli's theorem)

4. Concept 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. (Hydrostatic)

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

Evaluation method

Continuous monitoring (presentation + test) and semesterexamination;

References *(Booksand handouts, websites, etc.)*:

Christophe Texier, 2015- Quantum mechanics. Ed. Dunod, Paris.

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

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

Semester 2

EU: Methodological Teaching Unit

Matter 2: COMMUNICATION AND EXPRESSION TECHNIQUES 2 (English)

Credit: 4

Coefficient : 2

Teaching objectives

This subject completes learning to understand and write scientific documents in English.

Prior knowledge recommended

No prerequisites

Content of the matter

1. Scientific Terminology
2. Study and comprehension of text
3. Technique of written and oral expression (report, synthesis, use of modern means of communication)
4. Expression and communication in a group. Study of proposed texts (observe, analyze, take stock, written expression)

Tutorials

Proposal of exercises related to the points of language considered the most important.

Evaluation method

Continuous control and semesterexamination;

References*(Booksand handouts, websites, etc.)*:

Scientific papers

Semester 2

EU: Discovery Teaching Unit

Matter 1: LIFE SCIENCES AND SOCIO-ECONOMIC IMPACTS

Credit: 2

Coefficient: 2

Teaching objectives

Help students to conceive the concept of biotechnology and the fields of application.

Prior knowledge recommended

No prerequisites

Content of the subject

1. History and definition of concepts
2. Main fields of biotechnology
3. Introduction to Microbial Biotechnology
4. Introduction to Plant Biotechnology
5. Introduction to Animal Biotechnology

Evaluation method

Continuous control and semesterexamination;

References *(Booksand handouts, websites, etc.)*:

Semester 2

EU: Transversale Teaching Unit

Matter 2: WORKING METHOD AND TERMINOLOGY 2

Credit: 1

Coefficient: 1

Teaching objectives

Help students design research methods and synthesis of work according to scientific rules.

Prior knowledge recommended

The student must have notions in bibliographic research.

Content of the matter

1. Terminology
2. Writing a scientific report
3. Introduction to reading and understanding a scientific article

Evaluation method

Semester examination;

References*(Booksand handouts, websites, etc.)*:

Scientific papers

Semester 3

EU: Fundamental Teaching Unit1

Matter1: ZOOLOGY

Credit : 4

Coefficient : 2

Teaching objectives

Know the main groups of living organisms on the plans: General Architecture, Characteristics (Systematics, Morphology, Anatomy, reproduction, Ecology), constraints, adaptations, and evolution. Particular importance will be given to updating the classification and to zoological groups with an agricultural, medical, veterinary, fisheries or environmental interest.

Prior knowledge recommended

The student must have an idea about the different classes of the animal kingdom.

Content of the matter

1. Presentation of the animal kingdom
    1.1. Basics of classification
    1.2. Zoological nomenclature
    1.3. Evolution and phylogeny
    1.4. Numerical importance of the Animal Kingdom
2. Subkingdom Protozoa
    2.1. General information on protozoa.
    2.2. Classification
    2.2.1. Phylum Sarcomastigophora
    2.2.2. Phylum Ciliophora
    2.2.3. Phylum Apicomplexa
    2.2.4. Phylum Cnidosproridia
3. Metazoan sub-kingdom
    3.1. Phylum sponges
    3.2. Phylum Cnidaria
    3.3. Ctenarian branch
    3.4. Platyhelminthes phylum:
    3.5. Phylum Nemathelminthes.
    3.6. Phylum Annelids
    3.7. Phylum Molluscs
    3.8.Phylum Arthropoda
    3.9. Phylum Echinodermata
    3.10.Phylum Chordates

Practical work

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

TP N°2: Study of some flatworm type species: Moniezia expansa, Taenia hydatigena, Taenia pisiformis, Fasciola hepatica.

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

TP N°4: Study of some typical species of Arthropods: Crustaceans (Royal shrimp, Squill, morphology and biramous appendages), Chelicerates (Scorpion), Insects (Cricket, Bee).

TP N°5: Study of the mouthparts of insects: The different mouthparts and adaptation to diets, mouthparts of the crusher type (Orthoptera, Locust).

TP N°6: Study of some typical species of Echinoderms: Echinids (sea urchin), asterids (starfish).

TP N°7: Study of some typical species of Vertebrates: Fish (Carp), Birds (Pigeon), Mammals (Rat, Mouse)

Film screening: Turtles, Birds, Amphibians.

Evaluation method

Continuous control and semester examination;

References*(Booksand handouts, websites, etc.)*:

ARAB A., CHERBI M., KHERBOUCHE-ABROUS O., Amine F., BIDI AKLI S., HADDOU SANOUN G., 2013: Zoology Volume 1. Polycopie, Works and University Publications. Algeria. 152p.

ARAB A., CHERBI M., KHERBOUCHE-ABROUS O., Amine F., BIDI AKLI S., HADDOU SANOUN G., 2013: Zoology Volume 2: Practical work. Handout, Works and Academic Publications. Algeria. 224p.

Semester 3

EU: Fundamental Teaching Unit1

Matter 2: ANIMAL PHYSIOLOGY

Credit: 2

Coefficient: 1

Teaching objectives

At the end of this course, students will have acquired the basic notions of animal physiology and the strategies used in the animal world to respond to the physical and chemical constraints of the environment.

Prior knowledge recommended

The student must have knowledge of cell physiology.

Content of the matter

1. Invertebrates.
    1.1. Circulatory system and hemolymph circulation.
    1.2. Respiration in Invertebrates.
    1.3. Nutrition in Invertebrates.
    1.4. Excretion in Invertebrates.
    1.5. Nervous system of invertebrates.
2. Vertebrates
    2.1. Physiology of the endocrine glands
    2.2. The fluid compartments of the body
    2.3. Breathing
    2.4. Blood flow
    2.5. Renal Excretion
    2.6. The digestion
    2.7. Thermoregulation

Evaluation method

Semester examination;

References*(Booksand handouts, websites, etc.)*:

Lamb JF, 1990- Handbook of Physiology. Ed. Elsevier Masson, Paris, 480p.

Easel P. and Richard D., 1999-The notion of regulation in physiology. Ed. Nathan, Paris, 128p.

Couée I., Fontaine-Poitou L. and Guillaume V., 2010-Cellular and Molecular Biology and Physiology:Transmission of knowledge and preparation for competitions. Ed. De Boeck.

Gilles R., 2006-animal physiology. Ed. De Boeck.

Semester 3

EU: Fundamental Teaching Unit2

Matter 1: BIOCHEMISTRY

Credit: 6

Coefficient: 3

Teaching objectives

This subject consists of teaching the fundamental bases of biochemistry and the notions of enzymology, and familiarizing students with biochemical techniques.

Prior knowledge recommended

The student must have some knowledge of chemical bonds (weak and strong) and of the physicochemical properties of organic molecules.

Content of the matter

1. Chemical bonds
    - 1.1. Strong links
    - 1.2. Weak bonds
2. Structure and physico-chemical properties of carbohydrates
    - 2.1. simple dares
    - 2.2. Oligosides
    - 2.3. Polysaccharides, heterosides.
3. Structure and physico-chemical properties of lipids
    - 3.1. Simple lipids
    - 3.2. Complex lipids
4. Structure and physico-chemical properties of amino acids, peptides and proteins
    - 4.1. Amino acids, peptides, proteins
    - 4.2. Structure (primary and secondary, tertiary and quaternary)
    - 4.3. Properties and effect of treatments (solubility, electrophoretic behavior, denaturation.)
    - 4.4. Protein separation
5. Notions of enzymology
    - 5.1. Definition, classification
    - 5.2. Mechanisms of action
    - 5.3. Active website
    - 5.4. Enzyme kinetics and types of representation
    - 5.5. Enzymatic inhibition
    - 5.6. Allostery phenomenon
6. Notions of bioenergetics
    - 6.1. Types of chemical reaction

6.2. The respiratory chain and energy production
6.3. Phosphorylation and redox reaction

7. Carbohydrate metabolism
    7.1. Catabolism (glycolysis, glycogenolysis, pentose phosphate pathway, Krebs cycle, energy balance)
    7.2. Anabolism (gluconeogenesis and glycogenesis)
    7.3. Regulation
8. Lipid metabolism
    8.1. Catabolism of fatty acids (Beta-oxidation)
    8.2. Sterol catabolism
    8.3. Biosyntheses of fatty acids and triglycerides
    8.4. Sterol biosynthesis
    8.5. Regulation
9. Peptide and Protein Metabolism
    9.1. Catabolism of amino groups
    9.2. Catabolism of carboxylic groups
    9.3. Side chain catabolism
    9.4. Glucoforming and ketogenic acids
    9.5. Biosynthesis of essential amino acids
    9.6. Nitrogen removal, urea cycle
    9.7. Example of peptide biosynthesis (case of peptides with biological activity)
    9.8. Example of protein biosynthesis
    9.9. Regulation
10. Structure and metabolism of other compounds of biological interest
    10.1. vitamins
    10.2. hormones

Evaluation method

Continuous control and semester examination;

References*(Booksand handouts, websites, etc.)*:

Cathérine Baratti-Elbaz and Pierre Le Maréchal, 2015- Biochemistry. Ed. Dunod, Paris, 160p.

Norbert Latruffe, Françoise Bleicher-Bardelett, Bertrand DucloS and Joseph Vamecq, 2014- Biochemistry. Ed. Dunod, Paris.

Serge Weinman and Pierre Méhul, All biochemistry. Ed. Dunod, Paris, 464p.

Françoise Lafont and Christian Plas, 2013- Biochemistry exercises. Ed. Doin, Paris, 410p.

Semester 3

EU: Fundamental Teaching Unit2

Matter 2: GENETIC

Credit: 6

Coefficient: 3

Teaching objectives

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

Prior knowledge recommended

The student must have knowledge of nucleic acids and Mendelian genetics.

Content of the matter

1. Genetic material
    1.1. Chemical nature of genetic material
    1.2. Structure of nucleic acids (DNA-RNA)
    1.3. DNA Replication: in Prokaryotes and Eukaryotes
    1.4. Chromosome organization
2. Transmission of genetic characters in eukaryotes
3. Haploid Genetics
    3.1. independent genes
    3.2. Related genes
    3.3. Establishment of genetic maps
4. Genetics of diploids
    4.1. independent genes
    4.2. Related genes
    4.3. Establishment of genetic maps
5. Bacterial and viral genetics
    5.1. Conjugation
    5.2. Transformation
    5.3. Transduction
    5.4. Mixed infection in viruses
6. Protein Synthesis
    6.1. Transcription
    6.2. Genetic code
    6.3. Translation
7. Gene Mutations
8. Chromosomal mutations

8.1. Structural variation
8.2. Numerical variation (human example)
9. Gene structure and function: biochemical genetics
10. Regulation of gene expression
10.1. Lactose operon in prokaryotes
10.2. Example in eukaryotes
11. Notions of extra-chromosomal genetics
12. Concept of population genetics

Tutorials

TD N°1: Genetic material
TD N°2: Transmission of characters
TD N°3: Mono and di hybridism (Special cases)
TD N°3: Linked genes
TD N°4: Genetic maps
TD N°5: Synthesis of proteins (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 method

Continuous control and semester examination;

References*(Booksand handouts, websites, etc.)*:

Pasternak JJ, 2003- Human Molecular Genetics. Ed. De Boek, 522 p.

Harry M., 2008-Molecular and evolutionary genetics. Ed. Maloine.

Watson J., Baker T., Bell S., Gann A., Levine M. and Losick R., 2010- Molecular Biology of the Gene. Ed. Pearson.

Henry JP and Gouyon PH, 2003- Summary of Population Genetics. Ed. Dunod.

Semester 3

EU: Methodological Teaching Unit

Matter 1: COMMUNICATION AND EXPRESSION TECHNIQUES (IN ENGLISH)

Credit:4

Coefficient:2

Teaching objectives

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

Prior knowledge recommended

Certain notions of terminology and research methodology acquired in L1.

Content of the matter

1. Study of proposed texts (observe, analyze, take stock, written expression)
2. Terminology
3. Bibliographic research methodology.
4. Methods of writing scientific reports.

Evaluation method

Semester examination;

References*(Booksand handouts, websites, etc.)*

Research papers

Semester 3

EU: Methodological Teaching Unit

Matter 2: BIOPHYSICS

Credit: 5

Coefficient: 3

Teaching objectives

The general objective of teaching the biophysics course is to enable SNV students to acquire the basics in biophysics.

Prior knowledge recommended

The student must have some notions of physics acquired in L1.

Content of the matter

I. The states of matter
- I.1. Gases: elements of kinetic theory, equation of state of ideal or real gases, changes of state
- I.2. Liquids: structure of water, dissolution
- I.3. Solids: different structures
- I.4. Intermediate states: glasses, liquid crystals, granular states, deformable polymers

II. General information on aqueous solutions
- II.1. Study of solutions: classification of solutions
- II.2. Concentrations: molar fraction, molarity, molality, concentration by weight, osmolarity, equivalent concentration.
- II.3. Solubility
- II.4. Electrolyte solutions: electrical conductivity, physical and chemical properties of electrolytes

III. Surface phenomenon
- III.1. Surface tension: definition, measurements and biological applications
- III.2. Capillarity phenomenon: definition, measurements and biological applications
- III.3. Adsorption

IV. Diffusion phenomenon
- IV.1. Diffusion
- IV.2. Osmosis phenomenon and osmotic pressure: definition, measurements and biological applications
- IV.3. 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

VI. Sound and ultrasonic waves

VI.1. The sound wave and its properties: production, nature and classification of sound waves.

VI.2. The Doppler effect: definition, measurements and biological applications.

VI.3. Ultrasound: definition, measurements and biological applications.

Practical works

TP N°1: Surface tension

TP N°2: Conductometric titration

TP N°3: Titration by PH-meter

TP N°4: Viscosity measurement

TP N°5: Spectrophotometer

TP N°6: Refractometer

Evaluation method

Continuous monitoring (presentation + test) and semesterexamination;

References*(Booksand handouts, websites, etc.)*:

F. Grémy and J. Perin. Elements of Biophysics.Volume 1 and 2. Flammarion. Paris.

C. Bénézech and J. Llory. Physics and Biophysics.Mason and Co. Paris, 1973.

Y.THOMAS, 2000, Biophysics for the use of students in biological sciences, Bréal, Paris.

A. Bertrand, D. Ducassou and JC. Healy. Biophysics.Medical use of radiation – Vision – Hearing.

Semester 3

EU: Discovery Teaching Unit

Matter 1: ENVIRONMENT AND SUSTAINABLE DEVELOPMENT

Credit: 2

Coefficient: 2

Teaching objectives

This teaching aims to make students aware of the issues, content and actions of sustainable development. It is a question of making them aware that it is possible to act for the preservation of the environment, through their training, as well as at their level, on their consumption, their daily activities and their society. During his university education, whatever his specialty and his ambition for his future professional orientations, the student will have the opportunity to learn and experience his knowledge of sustainable development.
Sustainable development is currently one of the responses that is emerging around the world, to deal with the current conjunction of the world's major ecological, economic and societal challenges.

Prior knowledge recommended

No prerequisites

Content of the matter

1. Definitions: Environment, components of an environment, Sustainable development.
2. Meaning of development
    - 2.1. The main dimensions of the environmental crisis: human demography, global warming, fossil fuels (non-renewable), depletion of natural resources, drinking water, biodiversity and agriculture
    - 2.2. Durable development, why?
    - 2.3. The Concept of Sustainable Development
    - 2.4. The domains of sustainable development
    - 2.5. SD principles and their origins: precaution, prevention, responsibility, solidarity, equity, polluter pays
    - 2.6. Some indicators of sustainable development: ecological footprint and biocapacity, impact on the environment, environmental performance index, human development index, GDP: gross inferior product (economic) and enrollment rate boys / girls (societal), accessibility to care (societal).
    - 2.7. Environmental education, awareness and nature animation, environmental communication.

Tutorials

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 discussion.

2-Test ecological reflexes

3-Comparison of 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 national legislation.

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

Evaluation method

Continuous control and semester examination;

References*(Booksand handouts, websites, etc.)*

Semester 3

EU: Transversale Teaching Unit

Matter 1: ETHICS AND UNIVERSITY DEONTOLOGY

Credit: 1

Coefficient: 1

Teaching objectives

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

Prior knowledge recommended

No prerequisites

Content of the matter

1. Introduction: Contexts of the Algerian University
2. concepts
   - 2.1 Moral
   - 2.2 Ethics
   - 2.3 Deontology
   - 2.4 Right
   - 2.5 Professional values
   - 2.6 Learning and teaching
   - 2.7 Didactics and pedagogy
3. The charter of ethics and university deontology
   - 3.1 Fundamental principles
   - 3.2 Rights
   - 3.3 Obligations and duties
4. Apps
   - 4.1 Teaching: courses, assessment of knowledge and behavior
   - 4.2 Scientific research: research methodology, plagiarism, copyright, scientific writing…….

Evaluation method

Continuous control and semester examination;

References*(Booksand handouts, websites, etc.)*:

Bergadaà, M., Dell'Ambrogio, P., Falquet, G., Mc Adam, D., Peraya, D., & Scariati, R. (2008). The ethics-plagiarism relationship in the realization of personal work by students.

Charter of ethics and university deontology, Algiers, May 2010 www.mesrs.dz

Gilbert Tsafak, Ethics and Deontology of Education Collection Sciences of Education Presses Universitaires d'Afrique, 1998

Gohier, C., & Jeffrey, D. (2005). Teaching and training in ethics. Laval University Press.

Jaunait, A. (2010). Ethics, morals and deontology. Pocket-Ethical Space, 107-120.

Semester 4

EU: Fundamental Teaching Unit 1

Matter 1: AGRONOMY I (WATER, SOIL)

Credit: 4

Coefficient: 2

Teaching objectives

The student must know the notions and terminology of water and the different soils, mode of study and analysis in correlation with the different ecosystems.

Prior knowledge recommended

No prerequisites

Content of the smatter

1. Introduction
   - Definition of the ground and the
   - Role of water in soil sciences

A- THE GROUND

2. Constituent elements of the soil - Mineral constituents - Organic constituents - Colloidal complexes
3. Morphological organization of soils - Elementary organizations - Soil horizon - Soil profiles - Soil cover - Soil and water - Soil atmosphere - Soil temperature - Soil color
4- Chemical and biological properties of the soil
   - Ion exchange phenomena
   - Electro-ionic properties of soil
5- Soil organisms - Transformations of microbial origin
6- Classification of soils (Notions) - The different classifications (Russian, American, French) - Overview of the soils of Algeria and their relationship with climate and geomorphology.

B- WATER

- Role of soil water.
- Relations between the three phases of soil.
- Measurement of the volumes occupied by the different phases of the soil.
- The forms of water in the ground.
- The forces of water retention by the soil.
- The states of water in the ground.
- The water potential in the soil.
- The movements of water in the ground.
- Soil water balance.
- Water requirement of plants.

Tutorials

TD N°1: Relations between the units of measurement used in soil sciences (Reminder and exercises on the methods of preparing analysis solutions; unit conversion exercise).

TD N°2: Exercises on the physical aspect of the ground (three-phase system)

TD N°3: Slide projection session (the different soils of the CPCS and USDA classifications).

Evaluation method

Continuous control and semester examination;

References*(Booksand handouts, websites, etc.)*:

LIM H., 1982- Modern agronomy. Physiological and agronomic basis of plant production.Ed. Masson.

DUCHAUFOUR P., 1994- Pedology, soil, vegetation, environment. Ed. Masson.

BLONDEL J., 1979- Biogeography and ecology. Ed. Masson

Semester 4

EU: Fundamental Teaching Unit1

Matter 2: AGRONOMY II (Plants, Animals)

Credit: 4

Coefficient: 2

Teaching objectives

The lessons on the animal part provided in this part aim to give students the basics necessary to master the nutrition and feeding of animals. Also, at the end of the module, students should be able to:

- Know the methods and efficiency of food digestion
- Know the fate of the main nutrients within the animal body: water, carbohydrates, lipids, proteins, minerals including trace elements, vitamins.
- Know the origin of the different needs of animals, the importance of their coverage through the general consequences of imbalances, and their units of expression.
- Know the methods of calculating the nutritional value of food for the main domestic animals.

Those of the plant part aim to provide students with the common bases for all plant production

Prior knowledge recommended

No prerequisites

Content of the matter

It is highly desirable for this subject to be taught by two teams or two teachers, a phytotechnician for part 1 and a zootechnician for part 2.

Part 1: Animals

1. Use and composition of food
    a. Food and diet concept
    b. Comparative anatomy of the digestive system
2. Digestive actions of different animal species
    a. In ruminants-
    b. At the hen
    c. At the rabbit
3. Energy supply
    a. Importance
    b. Dietary needs
    c. Effects of nutritional deficiency or excess
4. Nitrogen supply
    a. Importance
    b. Dietary needs
    c. Effects of nutritional deficiency or excess
5. Mineral and vitamin food

a. Importance
b. Dietary needs
c. Effects of nutritional deficiency or excess

Part 2: Vegetal

1. The agricultural plant
   a. Relations between cultivated plants: rotation and rotation
   b. Seeds: (Classification, Morphology and physiology, Qualities of a good seed, Seed preparation
   c. The vegetation cycle of a plant: (the main stages of vegetation: germination-active growth-flowering-fruiting-maturation.)
   d. The cultivation cycle
   e. "Plant – microflora" nutrient associations

2. The plant grown in its environment
   a. The management of a culture.
   b. Crop yield and its components
   c. Soil preparation
   d. The establishment of culture

3. The main cultural care
   a. Fertilization
   b. Weed control-
   c. The fight against crop pests

4. Harvest

5. Fertilization
   a. General notions
   b. Amendments
   c. Mineral fertilizers.

Tutorials

TD N° 1: Characterization of livestock feed (grains and feed concentrates-cakes-protein crops-fodder and preservation methods)

TD N°2: Principle of animal rationing (dairy, growing and fattening)

Evaluation method

Continuous control and semester examination;

References *(Booksand handouts, websites, etc.)*:

Dominique Soltner, 2015- Guide to the new agriculture. Ed. Agricultural Sciences and Techniques, 120p.

JM Meynard, A. Messéan and coordinators, 2014- Crop diversification. Ed. Quae, 103p.

Martine and Yannick Croisier, 2014- Animal feed. Ed. Educagri, 110

Semester 4

EU: Fundamental Teaching Unit2

Matter 1: MICROBIOLOGY

Credit: 6

Coefficient: 3

Teaching objectives

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

Prior knowledge recommended

The student must have a global notion of pathogens.

Content of the matter

1. The Microbial World

1.1. Historical

1.2. Place of microorganisms in the living world

1.3. General characteristics of the prokaryotic cell

2. The Bacterial Cell

2.1. Bacterial Cell Observation Techniques

2.2. Cell morphology

2.3. Wall

2.3.1. Chemical composition

2.3.2. Molecular structure

2.3.3. Functions

2.3.4. Gram stain

2.4. The plasma membrane

2.4.1. Chemical composition

2.4.2. Structure

2.4.3. Functions

2.5. The cytoplasm

2.5.1. Ribosomes

2.5.2. Reserve substances

2.6. The chromosome

2.6.1. Morphology

2.6.3. Chemical replication

2.6.4. Structure

2.7. Plasmids

2.7.1. Structure

2.7.2. Replication

2.7.3. Properties
2.8. Pilli
2.8.1. Structure
2.8.2. Function
2.9. The capsule
2.9.1. Morphology
2.9.2. Chemical composition
2.9.3. Functions
2.10. Cilia and flagella
2.10.1. Highlighting
2.10.2. Structure
2.10.3. Functions
2.11. the spore
2.11.1. Morphology
2.11.2. Structure
2.11.3. Sporulation phenomena
2.11.4. Properties
2.11.5. Sprouting3.
3. Bacterial classification
3.1. Phenetic classification
3.2. Phylogenic classification
3.3. Bergey classification
4. Bacterial Nutrition
4.1. Basic needs
4.2. Growth factors
4.3. Trophic types
4.4. Physico-chemical parameters (temperature, pH, O2 and aW)
5. Bacterial growth
5.1. Growth measurement
5.2. Growth Parameters
5.3. Growth curve (batch culture)
5.4. Bacterial culture
5.5. Antimicrobial agents.
6. Notions of mycology and virology
6.1. Mycology (yeast and mold)
6.1.1. Taxonomy
6.1.2. Morphology
6.1.3. Reproduction
6.2. Virology
6.2.1. Morphology (capsid and envelope)
6.2.2. Different types of viruses

Practical work

TD N°1: Introduction to the microbiology laboratory
TD N°2: Method of studying micro-organisms and the different sterilization processes
TD N°3: Sowing methods;
TD N°4: Microscopic study of bacteria, simple staining
TD N°5: Morphological study of the different bacterial colonies on culture medium
TD N°6: Colouring of gram
TD N°7: Culture media
TD N°8: Study of bacterial growth
TD N°9: Criteria for the biochemical identification of bacteria
TD N°10: Yeasts and cyanobacteria
TD N°11: Growth inhibitors, antibiogram
TD N°12: Isolation of the total and specific flora of certain products (water, milk, etc.).

Evaluation method

Continuous control and semester examination;

References *(Booksand handouts, websites, etc.)*:

Henri Leclerc, Jean-Louis Gaillard and Michel Simonet, 1999- General microbiology. Ed. Doin, Paris, 535p.

Jerome Perry, James Staley and Stephen Lory, 2004- Microbiology-Course and review questions. Ed. Dunod, Paris, 889p.

Jean-Pierre Dedet, 2007- Microbiology, from its origins to emerging diseases. Ed. Dunod, Paris, 262p.

Semester 4

EU: Fundamental Teaching Unit2

Matter 2: BOTANICAL

Credit: 4

Coefficient: 2

Teaching objectives

This subject aims to initiate the classification and anatomical characterization of the major groups of the plant kingdom. The teaching provided also attempts to provide students with the means of reproduction.

Prior knowledge recommended

The student must have knowledge of plant biology (morphology, anatomy, physiology).

Content of the matter

Introduction to Botany

Definitions, concepts and classification criteria. Systematics of the major groups of the "plant" kingdom

FIRST PART: Algae and Mushrooms

1. Algae
   - 1.1. Prokaryotic Algae (Cyanophytes / Cyanobacteria)
   - 1.2. Eukaryotic Algae
     - 1.2.1. Morphology
     - 1.2.2. Cytology
     - 1.2.3. Reproduction (concept of gamy, development cycle)
   - 1.3. Systematics and particularities of the main groups
     - 1.3.1. Glaucophyta
     - 1.3.2. The Rhodophyta
     - 1.3.3. Chlorophya and Streptophyta
     - 1.3.4. The Haptophyta, Ochrophyta, Dinophyta, Euglenozoa, Crytophyta, Cercozoa
2. Fungi and lichens
   - 2.1. Problems posed by the classification of fungi
   - 2.2. Structure of the thalli (mycelia, stroma, sclerotia)
   - 2.3. Reproduction
   - 2.4. Systematics and peculiarities of the main groups of fungi
     - 2.4.1. Myxomycota
     - 2.4.2. The Oomycota

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

2.5. A particular algae-fungus association: lichens

2.5.1. Morphology

2.5.2. Anatomy

2.5.3. Reproduction

SECOND PART: Embryophytes

1. The Bryophytes: Morphology and reproduction of the different branches
   1.1. Marchantiophytes
   1.2. Hookworms
   1.3. Bryophytes s. str.
2. Pteridophytes: Morphology and reproduction of the different branches
   2.1. Lycophytes
   2.2. Sphenophytes (= equisetinated)
   2.3. Filicophytes
3. Gymnosperms sensu lato
   3.1.The Cycadophytes: concept of ovule
   3.2. Ginkgophytes
   3.3. Coniferophytes: concept of flower, inflorescence and seed
   3.4. The Gnetophytes: hinge group
4. Angiosperms
   4.1. Vegetative apparatus and notion of morphogenesis: growth of stems, leaves androots
   4.2. Floral morphology (organization of the flower, inflorescences)
   4.3. Floral biology: microsporogenesis and macrosporogenesis
   4.4. Seeds and fruits
   4.5. Notion of modern systematics, cladogenesis and main taxa. Presentation classifications (Engler 1924, APG II)

Practical work

TP N° 1: Algae (Phycophytes), Morphology and reproduction of some species such as Ulva lactuca and Cystoseira mediterranea.

TP N° 2: Fungi (Fungi), Morphology and reproduction of Rhizopus nigricans (Zygomycetes), Agaricus campestris (Basidiomycetes)

TP N°3: Lichens, Morphology of the 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 (Gymnospermes sensu stricto), Morphology and reproduction of Pinus halepensis and Cupressus sempervirens

TP N°8 and 9: Monocotyledonous and Eudicotyledonous Angiosperms. Illustration of the notion of trimery and pentamery, of the notion of actinomorphy and zygomorphy; dialypetaly, gamopetally, hypogynous flower, epigynous flower... .

TP N°8. Floral morphology of Monocotyledonous Angiosperms on examples such as Asphodelus (or Allium)

TP N°9. Floral morphology of Eudicotyledonous Angiosperms on examples such as Lathyrus or Vicia

TP N°10: Sexual reproduction in Angiosperms, Pollen grain, pollination and fertilization in Angiosperms, Types of fruits and types of seeds.

Evaluation method

Continuous control and semester examination;

References*(Booksand handouts, websites, etc.)*:

APG II. 2003. An update of the Angiosperm Phylogeny Group classification for the orders andfamilies of flowering plants: APG II. Bot. J. Linnean Society 141:399–436.

APGIII. 2009. An update of the Angiosperm Phylogeny Group classification for the orders andfamilies of flowering plants: APG II. Bot. J. Linnean Society 161:105–121.

Lecointre G. and Le Guyader H. 2001. Phylogenetic classification of living organisms. Ed. Belin.

Reviers de B. 2002.Biology and Phylogeny of Algae.Volume 1 and 2. Ed. Belin.

Meyer S., Reeb C. and Bosdeveix R. 2004. Botany: Plant Biology and Physiology. Ed. Maloine.

Dupont F., Guignard JL 2012.Botany Plant families. Ed. Elsevier-Masson

Semester 4

EU: Methodological Teaching Unit

Matter 1: PLANT PHYSIOLOGY

Credit: 4

Coefficient: 2

Teaching objectives

This subject allows 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 the sense of observation: one of the essential bases of the biologist's approach.

Prior knowledge recommended

The student must master concepts in Botany and Plant Physiology.

Content of the matter

Part I. Nutrition

1. Reminder of the basic concepts
    1.1. Organization of a plant
    1.2. Organization of a plant cell
2. Water nutrition (mechanism of water absorption and transit)
3. Perspiration and water balance
    3.1. Highlighting
    3.2. Location and measurement
    3.3. Change in perspiration
        3.3.1. Influence of plant morphology
        3.3.2. Influence of environmental factors
    3.4. Physiological determinism of perspiration
    3.5. The water balance of plants
    3.6. Interest of transpiration for plants
4. Mineral nutrition (macro and trace elements)
5. Nitrogen nutrition (nitrogen cycle, transport and assimilation of nitrates)
6. Carbon nutrition (Photosynthesis)

Part II: Development

1. Seed formation
2. Germination
3. Growth
4. Bloom
5. Fruiting

Practical work

A. Water nutrition

TP N°1: Osmolarity (spectrophotometry)

TP N°2: Sweating

TP N°3: Stomata

B. Mineral nutrition

TP N°4: Growth of broad bean seedlings in different nutrient solutions

C. Nitrogen nutrition

TP N°5: Electrophoresis of total proteins

TP N°6: Breathing

TP N°7: Separation of pigments by chromatography

D. Growth

TP N°8: Growth of seedlings in different solutions

TP N°9: Tropisms

TP N°10: Seed germination

Evaluation method

Continuous control and semester examination;

References *(Booksand handouts, websites, etc.)*:

Béraud J., 2001- The biological analysis technician. Theoretical and practical guide. Ed. Tec and Doc, Paris, 208p.

Dupont G., Zonszain F. and Audigié C., 1999- Principles of biochemical analysis methods. Ed. Doin, Paris, 207p.

Burgot G., Burgot JL, 2002-Instrumental methods of chemical analysis and applications: Chromatographic methods, electrophoresis and spectral methods. Ed. Tec and Doc, Paris, 306p.

Heller R., Esnault R. and Lance C., 2005- Plant Physiology: Volume 1, Nutrition. Ed. Dunod, Paris, 209p.

Morot-Gaudry JF, Moreau F. and Prat R., 2009-Plant biology: Nutrition and metabolism. Ed. Dunod, Paris, 224p.

Semester 4

EU: Methodological Teaching Unit

Matter 1: BIOSTATISTICS

Credit: 5

Coefficient: 3

Teaching objectives

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

Prior knowledge recommended

The student must have notions of probability and numerical analysis already seen in the first year.

Content of the matter

1. Reminders
   - 1.1. Reminders on descriptive statistics
     - 1.1.1. Position parameters
     - 1.1.2. Dispersion Parameters
     - 1.1.3. Shape Parameters
2. Reminders on the main distribution laws: laws: normal and log normal, Student, Pearson, Fischer-Snedecor…
3. Statistical Inference: Hypothesis Testing
   - 3.1. Compliance testing
   - 3.2. Comparison test
   - 3.3. Independence test
4. Correlation study and Regression
   - 4.1. Correlation coefficient
   - 4.2. Correlation significance test
   - 4.3. Simple linear regression
     - 4.3.1. Regression line (least squares method)
     - 4.3.2. Confidence interval of regression estimate
     - 4.3.3. Significance test of the regression coefficients
5. One-way and two-way analysis of variance

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

Tutorials

Series of exercises on each chapter of the course

Evaluation method

Continuous control and semester examination;

References*(Booksand handouts, websites, etc.)*:

BENZEON JP, 1984- Data analysis. Ed. Bordas, Volumes I and II.

HUET S., JOLIVET E. and MESSEON A., 1992- Nonlinear regression: methods and applications in biology. Ed. INRA.

TROUDE C., LENOUR R. and PASSOUANT M., 1993- Statistical methods under Lisa - multivariate statistics. CIRAD-SAR, Paris, PP: 69-160.

Semester 4

EU: Discovery Teaching Unit

Matter 1: GENERAL ECOLOGY

Credit: 2

Coefficient: 2

Teaching objectives

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

Prior knowledge recommended

No prerequisites

Content of the matter

Chapter I

1.1. Definition of the ecosystem and its constituents (Notions of biocenosis and ecological factor.)

1.2. Areas of intervention

Chapter II: Environmental Factors

2.1. Abiotic factors

2.1. Climatic

2.2. Edaphic

2.3. Waterborne

2.2. Biotic factors

2.2.1. Competitions

2.2.2. Pests and Predators

2.2.3. Cooperation and symbiosis interaction

2.2.4. Parasitism

2.3. Interaction of environments and living beings

2.3.1. Role of ecological factors in population regulation

2.3.2. Concept of ecological optimum

2.3.3. Ecological Valencia

Chapter III: Structure of ecosystems

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

3.2. The consumers (Heterotrophs) who are linked to the producers and finally the decomposers that ensure the recycling and mineralization of matter organic.

Chapter IV: Functioning of ecosystems

4.1. Energy flow at the biosphere level:

4.2. Concepts of ecological pyramids, production, productivity and yieldbioenergetics

4.3. Circulation of matter in ecosystems and main bio cyclesgeochemical

4.4. Influence of human activities on biological balances and particularlyon the disruption of bio-geochemical cycles (consequences of the pollution of aquatic environments and atmospheric pollution (eutrophication, greenhouse effect, ozone, acid rain.)

Chapter V: Summary description of the main ecosystems

5.1. Forest, grassland, surface water, ocean

5.2. Evolution of ecosystems and notion of climax

Tutorials

The tutorials concern the methods applied for the study of the environment.

Evaluation method

Continuous control and semesterexamination;

References*(Booksand handouts, websites, etc.)*:

DAJET P. and GORDAN M., 1982- Frequency analysis of the ecology of the species in the communities. Ed. Masson.

RAMADE F., 1984- Elements of ecology: Fundamental ecology. Ed. McGraw-Hill.

Semester 4

EU: Transversale Teaching Unit

Matter 1: INFORMATICAL TOOLS

Credit: 1

Coefficient: 1

Teaching objectives

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

Prior knowledge recommended

No prerequisites

Content of the matter

1. Discovery of the operating system
   - Definition of an OS
   - Different existing OS: Windows, Linux and Mac OS.
2. Discovery of the office suite
   - Design documents on WORD.
   - Design tables with EXCEL.
   - Design of a presentation with Powerpoint.
   - Introduction to Latex.
3. software and algorithms
   - Definition of software.
   - Definition of algorithmic.
   - Use of algorithms in biology.

Evalutaion method

Semester examination;

III- Detailed program by semester matter (S5 and S6)

(1 detailed sheet by matter, all fields are mandatory)

Semester: 5 ; Fundamental Teaching Unit 1
Matter 1: GENERAL PEDOLOGY

SKILLS

A theoretical and practical knowledge in pedology allowing a better classification of soils.

Total hourly volume of the matter in the unit

Course: Hourly volume	TD: hourly volume	TP: hourly volume
22h30	22h30	22h30

Nature TD/TP

Directed work, personnel and manipulation in the field and in the laboratory.

Credit

6

Prior knowledge recommended

Notions of ecology

Teaching objectives

Acquisition of knowledge on soil constituents and their organization, as well as the chemical and biological properties of soils and the different classifications available on soils.

Content items

- General notions on pedology
- Soil constituent
- Soil morphology
- soil chemistry
- Soil classification
- Soil and vegetation

Content

Chapter 1: Introduction, definition of soil and object of pedology
Chapter 2: The constituent elements of the soil
- 2.1. Mineral constituents
- 2.2. Organic constituents
- 2.3. Colloidal complexes

Chapter 3: The morphological organization of soils
- 3.1. Elementary organizations
- 3.2. The soil horizon
- 3.3. Soil profiles
- 3.4. Soil cover
- 3.5. soil and water
- 3.6. The ground atmosphere
- 3.7. Ground temperature
- 3.8. The colour of the floor

Chapter 4: The chemical properties of the soil
- 4.1. Ion exchange phenomena
- 4.2. The electro-ionic properties of the soil

Chapter 5: The biological properties of the soil
- 5.1. Soil organisms
- 5.2. Transformations of microbial origin

Chapter 6: Classification of soils

6.1. Soil classification

6.2. The different classifications (Russian, American, French)

6.3. Algerian soils and their relationship with climate and geomorphology.

Chapter 7: Soil-vegetation relationships

Tutorials

TD N°01: Ground system: three-phase system. Mass – Volume relationship. Start of physical analysis: porosity, permeability, bulk density and soil sieving

TD N°02: Structural and crystallochemical characterization of the main mineralogical species. Various types of clays.

TD N°03: Method for studying clay minerals: RX, ATD, ATG, IR.

TD N°04: Soil solutions (Liquid transfers in the soil: the equations of the flow of water in the soil.)

TD N°05: The dynamics of ions in the soil: calcium-magnesium, sulphur, nutrition and physico-chemical properties.

TD N°06: The dynamics of ions in the soil: nitrogen, phosphorus, potassium.

TD N°07: The soils of Algeria, use of various classifications, classification documents and cartography.

TD N°08: Study of some classes of soils, calci-magnesic and ferralitic soils.

TD N°09: Structure of minerals, clays, notions of crystallography.

Practical work

TP N°01: Field trip: description of some profiles and sampling for analysis.

TP N°02: Reminders of analytical chemistry.

TP N°03: Calcimetry - active limestone.

TP N°04: Nitrogen – carbon – pH.

TP N°05: Study of the absorbent complex

TP N°06: Complexometry: Ca^{++} and Mg^{++}

TP N°07: Photometry: Na+ and K+ exchange capacity.

TP N°08: Granulometry.

TP N°09: Study of salty soils.

TP N°10: Conductivity

TP N°11: Ionic balance: Ca^{++}, Mg^{++}, Na^{+}, K^{+}, chlorides, sulphates, carbonates.

TP N°12: Synthesis of results and interpretation.

TP N°13: Determination of soil types.

Key words / concepts

Pedology, Soil, Morphology, Chemistry, Classification.

Pedagogical recommendations	Evaluation method
Theoretical and practical study in situ.	Continuous control (TP and TD) and Semester examination

Semester: 5 ; Fundamental Teaching Unit 1
Matter 2: GENERAL CARTOGRAPHY

SKILLS

A theoretical and practical knowledge in general cartography.

Total hourly volume of the matter in the unit

Course: Hourly volume	TD: hourly volume	TP: hourly volume
22h30	00h	22h30

Nature TD/TP

Directed work, personal and application on microcomputer

Credit

4

Prior knowledge recommended

Notions of cartography

Teaching objectives

Acquire processing techniques and processes that allow understanding and analysing geographic, cartographic and satellite information.

Content items

- Mapping Basics
- Practical applications of cartography
- Introduction to geographic information system.

Content

Introduction

Chapter 1 :Map elements

1.1. Principle and objectives of cartographic representation
1.2. Mapping rules.
1.3. Map production scales.
1.4. Map skin

Chapter 2:The projection systems
Chapter 3: Application Examples and Map Analysis.
Chapter 4: Creating maps by interpolation
Chapter 5: Notions of Computer-Assisted Cartography

Tutorials

A tutorial for each chapter

Key words / concepts

Map, projection, representations, interpolation, GIS.

Pedagogical recommendations	Evaluation methods
Theoretical and practical study of the content.	Continuous control and semester examination.

Semester: 5 ; Fundamental Teaching unit 2
Matter 1: HYDROGEOLOGY

SKILLS

A theoretical and practical knowledge in hydrogeology

Total hourly volume of the matter in the unit

Course: Hourly volume	TD: hourly volume	TP: hourly volume
22h30	22h30	00h

Nature TD/TP

Personal, directed work and visit to a water drilling site.

Credit

4

Prior knowledge recommended

Knowledge of basic hydrology and geology

Teaching objectives

Allow students to have knowledge of the state of water in geological materials, properties of aquifer materials, typology of acquired materials and underground flows

Content items

- Ground water
- Description of aquifers
- Underground flows and fundamental laws.

Content

Chapter 1 :Introduction to hydrogeology
Chapter 2: Aquifer systems
Chapter 3: Elements of underground hydrodynamics.
Chapter 4:Pumping tests
Chapter 5:Aquifer mapping
Chapter 6:Drilling techniques and groundwater collection.
Chapter 7:Groundwater pollution and protection.

Tutorials

TD 01: Initiation to the development and commentary of hydrogeological sections.
TD 02: Calculation of hydrodynamic parameters.
TD 03: Interpretation of pumping tests
TD 04: Development and interpretation of piezometric maps
TD 05: Study of the technical characteristics of a water well.
TD 06: Delimitation of protection perimeters.

Key words / concepts

Aquifer, groundwater, hydrogeology, groundwater flow.

Pedagogical recommendations	Evaluation method
Theoretical and practical study of the content	Continuous control and semester examination.

Semester: 5 ; Fundamental Teaching unit 2
Matter 2: HYDROLOGY

SKILLS

A theoretical and practical knowledge in hydrology

Total hourly volume of the matter in the unit

Course: Hourly volume	TD: hourly volume	TP: hourly volume
22h30	22h30	00h

Nature TD/TP

Directed work, staff and field visit.

Credit

4

Prior knowledge recommended

Knowledge of geology, fluid mechanics, probability and statistics.

Teaching objectives

The course presents the fundamental notions of hydrology which allow students to master and understand the different functioning of hydrological processes in a catchment area.

Content items

- Basics of hydrology
- Description of watersheds
- Surface flows
- Hydro-climatic balance

Content

Chapter 1 :Introduction to hydrology
Chapter 2 :Water cycle and water balance
Chapter 3:The watershed and its complex
Chapter 4:The precipitations
Chapter 5:Infiltration and evaporation
Chapter 6:Flows

Tutorials

A tutorial for each chapter

Key words / concepts

Hydrology, watershed, surface runoff.

Pedagogical recommendations	Evaluation method
Theoretical and practical study of the content.	Continuous control and semester examination.

Semester: 5 ; Methodological Teaching Unit 1
Matter 1: AGRO-METEOROLOGY

SKILLS

A theoretical and practical knowledge in agro-meteorology.

Total hourly volume of the matter in the unit

Course: Hourly volume	TD: hourly volume	TP: hourly volume
22h30	22h30	00h

Nature TD/TP

Directed work, staff and visit to climatic stations

Credit

4

Prior knowledge recommended

General Biology, Physics and General Chemistry

Teaching objectives

Agro-meteorology is a discipline that aims to make the best use of meteorological conditions in various agricultural activities. This course aims to give basic notions in agro-meteorology which are essential for a good understanding of operational applications. The student will be introduced to certain processes observed in atmospheric physics, soil physics and agronomy which are the basis of agro-meteorological interventions

Content items

- General notions on the climate
- Areas of use of agro-meteorology
- Instruments and measurements of meteorological parameters
- Climate-plant relationship

Content

Chapter 1: What is agro-meteorology?
- Climatic factors and parameters
- Agro-meteorology in the agriculture of the future

Chapter2: Impact of climatic conditions on plant growth
- Heat requirements
- Light requirements, photoperiodism
- Freeze
- Evapotranspiration
- Crop water requirements
- Soil water content (monitoring and estimation)
- Impact of water stress on plant growth and yield

Chapter3 : Instrumentation in agro-meteorology
- Ground instruments
- Air and space instruments

Tutorial
- Spreadsheet exercises and observation of crop phenology in the field
- Measurement of climatic parameters

Sientific outing
- Visit to a classic working weather station
- Visit to an automatic working weather station

Key words/concepts

Climate, parameters, growth, impact.

Pedagogical recommendations	Evaluation method
Theoretical and practical study of the content.	Continuous control and semester examination.

Semester 5; MethodologicalTeaching Unit 2
Matter 2: STATISTICS AND DATA ANALYSIS

SKILLS

Analysis and interpretation of statistical data

Total hourly volume of the matter in the unit

Course: Hourly volume	TD: hourly volume	TP: hourly volume
22h30	22h30	15h00

Nature TD/TP

Directed work, personal and manipulation on computer.

Credits

5

Prior knowledge recommended

Knowledge of applied mathematics.

Teaching objectives

Description of the characters studied, processing and analysis of the variables

Content items

- Statistical characters
- Statistical parameters
- Data Analysis and Interpretations

Content

Univariate and bivariate descriptive statistics (Parameters of position of parameters dispersion regressions statistics) statistical tests analysis of variance.

Tutorials

TD N°01 : Position parameters
TD N°02 : Dispersion Parameters
TD N°03 : Statistical regressions
TD N°04 : Statistical test
TD N°05 : Variance analysis

Practical work

Application of tutorials on computer software

Key words/concepts

Statistics, analysis, variance, statistical tests, regression

Pedagogical recommendations	Evaluationmethod
Theoretical study and applications on practical examples.	Continuous control and semester examination.

Semester 5; Discovery teaching unit1
Matter 1: CLIMATE CHANGE AND WATER RESOURCES

SKILLS

Basic knowledge of climatology and environmental interactions.

Total hourly volume of the matter in the unit

Course: Hourly volume	TD: hourly volume	TP: hourly volume
22h30	22h30	00h

Nature TD/TP

Directed work, personal and computer application

Credits

2

Prior knowledge recommended

General climatology, geology, physics, chemistry, agro-pedology

Teaching objectives

Enable the student to understand the main relationships between the climate and the physical environment.

Content items

- Concept of climate change
- Effects of climate change
- Adaptations to climate change

Content

The course provides the student with a summary of current and future climate change, as well as its impact on the environment and human societies. It contains two main parts:

First part: Climate changes

1. The conception of past and future climate change
2. Greenhouse effect and radiative forcings
3. Carbon cycle and greenhouse gas balances
4. The impacts of climate change (environmental degradation, soil degradation, hydrology, sea level, terrestrial ecosystems, human societies)

Second part: How to adapt to climatic variations in arid and semi-arid zones and their influence on desertification processes?

1. Desertification process: history, context and definitions
2. Soil salinization process
3. The fight against desertification and soil salinization

Tutorials

TD N°01: Natural and additional radiation balance
TD N°02: Atmospheric aerosols and climate change
TD N°03: Agricultural Weather Indices
TD N°04: Extreme Climate Indices of temperature
TD N°05: Extreme Climate Indices of precipitation

Key words/concepts

Climate change, process, adaptation

Pedagogical recommendations	Evaluation method
Theoretical study and illustration by examples in the world.	Continuous control and semester examination.

Semester 5 ; Transversale teaching unit
Matter 1: TECHNICAL ENGLISH

SKILLS

- Mastery of scientific vocabulary and grammar.
- Understanding of scientific texts
- Introduction to scientific writing

Total hourly volume of the matter in the unit

Course: Hourly volume	TD: hourly volume	TP: hourly volume
22h30	00h	00h

Nature TD/TP

Credits

1

Prior knowledge recommended

Fundamentals of English

Teaching objectives

The student masters the vocabulary of the field of soil and water sciences in English; He is able to :

· Introduce yourself and your work informally.
Read a scientific article with an understanding of 80%
Understand a seminar type presentation with an understanding of 60%
Deepen the knowledge of grammar in order to avoid elementary mistakes
· Write an abstract (250 words)

Content items

- Basics of scientific vocabulary relating to the specialty
- Basics of grammar
- Principles of translation and writing of scientific texts

Content

1. Study of proposed scientific texts (observe, analyze, take stock, written expression)
2. Basic terminology relating to the soil and water specialty
3. Technique and methodology of bibliographic research.
4. Learn to write scientific reports

Key words/concepts

Soil, water cycle, irrigation, drainage, climate change, climatology, pedology.

Pedagogical recommendations	Evaluation method
Text study in the field of agriculture	Continuous control and semester examination.

Semester 6 ; Fundamental Teaching Unit 1
Matter 1: GENERAL HYDRAULICS

SKILLS

Understanding of the necessary theoretical bases of general hydraulics and agricultural hydraulics in particular. Mastery of the basic principles of the calculations of irrigation and drainage systems.

Total hourly volume of the matter in the unit

Course: Hourly volume	TD: hourly volume	TP: hourly volume
22h30	22h30	22h30

Nature TD/TP

Directed and personal work

Credit

6

Prior knowledge recommended

Knowledge of physics and mechanics of fluids

Teaching objectives

Acquire the necessary theoretical bases entering different areas of agriculture in general and agricultural hydraulics in particular, areas ranging from pressure (manometers, tensiometers ... etc.), to water supply and its evacuation in the event of excess (pipes, canals, irrigation and drainage systems, flow measurements, ancillary hydrotechnical works, etc.)

Content items

- General Principles of Hydrostatics
- Application of forces on flat surfaces (case of dams)
- Principles of flows under pressure and in the open air

Content

Chapter 1 : Hydrostatic (Reminder)
Chapter 2 : Force of pressure of a liquid on a surface
Chapter 3: Fundamental hydrodynamic equation
Chapter 4: Liquid flow regimes:
4.1. In closed pipes
4.2. In the open channels

Tutorials

A tutorial for each chapter

Practical work

TP N°01: Flow measurement
TP N°02: Flow in open channels

Key words/concepts

Hydrostatics, pressure, flow, flow

Pedagogical recommendations	Evaluation method
Network calculation bases	Continuous control and semester examination.

Semester 6 ; Fundamental Teaching Unit 2
Matter2: IRRIGATION AND DRAINAGE

SKILLS

Mastery of irrigation management and introduction to calculations of irrigation and drainage networks. Understanding of soil protection methods and techniques against salinity and flooding.

Total hourly volume of the matter in the unit

Course: Hourly volume	TD: hourly volume	TP: hourly volume
22h30	22h30	22h30

Nature TD/TP

Credit

6

Prior knowledge recommended

Teaching objectives

Initiation of students to irrigation management and preliminary calculations for irrigation projects. The objective is to explain to the students the design of horizontal drainage in shallow soil. Definitions will be given on the modes of drainage, the network and its components and the studies necessary for the projection of a drainage network. A part is devoted to the fight against salinity, in particular on agricultural soil leaching techniques.

Content items

- Water in agriculture
- Basis of calculation and management of irrigations
- Concept of agricultural drainage
- Irrigation and salinity issues
- Basis of calculation of the agricultural drainage network

Content

I - FUNDAMENTAL BASIS OF IRRIGATION
Chapter 1: Water in irrigation
Chapter 2: Basic irrigation techniques
Chapter 3: rational management of irrigations.
Chapter 4: Study of the irrigation project.

II - FUNDAMENTAL BASIS OF DRAINAGE

Chapter 1: Agricultural drainage, definition and basic principle
Chapter 2: The drainage network and its components
Chapter 3: Study to be carried out for the design of a drainage network.

Tutorials :
TD N°01: Calculation of an Irrigation Project
TD N°02: Agricultural drainage and excess water
a. Calculation of the characteristic flow
b. Calculation of flows and permanent regime and in variable regime
c. Choice of length and depth of drainage

Practical work
TP N°01: Soil moisture measurement (different methods)
TP N°02: Soil Bulk Density Measurement

Scientific outings
Visit of an irrigated perimeter
Visit a drainage site or a company specializing in the field.

Key words/concepts
Irrigation, drainage, network, salinity, leaching

Pedagogical recommendations	Evaluation method
Introduction to the calculations of irrigation and drainage networks.	Continuous control (TD, TP) and semester examination.

Semester 6 ; Fundamental Teaching unit 2
Matter 1: SOIL CONSERVATION

SKILLS

Understanding of soil degradation processes. Acquire knowledge on the types of erosion and means of control such as the operation of the works.

Total hourly volume of the matter in the unit

Course: Hourly volume	TD: hourly volume	TP: hourly volume
22h30	22h30	00h

Nature TD/TP

Credit

6

Prior knowledge recommended

Knowledge of soil science, irrigation and drainage and erosion.

Teaching objectives

This module will provide an introduction to the process of soil degradation, the different types of erosion and the ways to fight against these natural phenomena.

Content items

- Soils and degradation processes
- Types of erosion and their effects
- Basics of operation of the works

Content

1. Introduction

2. Land degradation, processes and factors

- 2.1 - Definition
- 2.2 - Visible effects of erosion
- 2.3 - Soil degradation processes and factors

3. Water erosion

- 3.1 - Definition
- 3.2 - Origin and mechanism
- 3.3 - Forms of erosion
- 3.4 - Types of damage
- 3.5 - Effect on agricultural production
- 3.6 - Factors of water erosion
- 3.7 - Estimation of land loss
- 3.8 - Prevention and control methods

4. Runoff control procedures

- 4.1- Introduction
- 4.2 - Current works

5. Sizing runoff control devices

- 5.1 - Empirical approach
- 5.2 - Calculation of spacing between structures of a SWH network
- 5.3 - Sizing of structures according to the water balance

6. The fight against erosion in the Ravine

- 6.1- Runoff rates
- 6.2- Types of waterways or evacuation

7. Wind erosion

7.1- Definition
7.2- Origins and mechanisms of wind erosion
7.3- Effects and importance of wind erosion
7.4- Estimation of wind erosion and method of prevention

Tutorials

TD N°01: Case study
TD N°02: Erosion pre-detection method
TD N°03 : Quantification method

Key words/concepts

Soil, degradation, erosion, conservation, work

Pedagogical recommendations	Evaluation method
Observation of degradation processes and quantification of erosion.	Continuous control (TD) and semester examination

Semester 6 ; MethodologicalTeaching Unit 1
Matter 1: WATER QUALITY

SKILLS

Acquire knowledge in the evaluation of water quality and its use within a framework of sustainable development

Total hourly volume of the matter in the unit

Course: Hourly volume	TD: hourly volume	TP: hourly volume
22h30	22h30	00h

Nature TD/TP

Credit

4

Prior knowledge recommended

Teaching objectives

Physicochemical characterization of irrigation water for its safe usefor the plant and the soil.

Content items

- Quality Parameters (Salinity, Alkalinity)
- Effect of quality on soil and plant
- Raw water treatment and its uses in agriculture
- Irrigation Water Quality Standards and Interpretation

Content

1. Physicochemical properties of water, role of water in the plant, irrigation water resources,
2. Physical quality indicators and standards, chemical and biochemical quality indicators and standards,
3. Microbiological quality indicators and standards, classifications of irrigation water, crop tolerance, impact of water quality on the plant and soil, overview of the treatment and reuse of wastewater in irrigation.
4. Actions of water on hydro-agricultural structures

Tutorials

TD N°01: Unit systems and conversions

TD N°02: Applications of water characterization diagrams

TD N°03: Calculation of SAR and classification of irrigation water

Scientific outings

Water treatment and purification station**(**STEP)

Key words/concepts

Water, quality, parameters, impact, salinity, alkalinity.

Pedagogical recommendations	Evaluation method
Sampling, analysis and interpretation	Continuous control (TD) and semester examination.

Semester 6 ; Methodological Teaching Unit 1
Matter 2: WATER AND IRRIGATED PERIMETERS

SKILLS

Acquire theoretical and practical knowledge on the operation, monitoring and maintenance of hydro-agricultural equipment.

Total hourly volume of the matter in the unit

Course: Hourly volume	TD: hourly volume	TP: hourly volume
22h30	00h	00h

Nature TD/TP

Credit

2

Prior knowledge recommended

Fundamental bases of irrigation, pedology, general hydraulics, applied mathematics

Teaching objectives

Understand the operation and monitoring of hydro-agricultural equipment in an irrigated area

Content items

- Water resources and irrigation
- Hydro-agricultural equipment
- Basic techniques used in monitoring irrigation networks
- Irrigation Module Tracking

Content

Chapter 1: General information on the situation of water and irrigated perimeters in Algeria
- Situation of Irrigation in Algeria;
- The GPI and PMH in Algeria;
- Water Resources in Algeria.

Chapter 2: Developments of a PI
- Definition of some basic concepts;
- Hydraulic diagram of an irrigation system and ancillary works;
- Hydraulic diagram of an irrigation network;

Chapter 3: Irrigation equipment and connection techniques
- The irrigation equipment of a PI;
- Techniques for connecting the equipment of a PI;

Chapter 4: Structure of a PI and transited flows
- Structure of an irrigated perimeter;
- Transited flows and service to the irrigation tower;
- Transferred speeds and on-demand service;
- Transited flows and continuous service.

Scientific outings Visit of a functional irrigated perimeter

Key words/concepts

Water, irrigated area, equipment, operation

Pedagogical recommendations	Evaluation method
Field visit and case study.	Continuous control and semester examination.

Semester 6 ; MethodologicalTeaching Unit 2
Matter 1: TOPOGRAPHY

SKILLS

- Mastery of measurement processes
- Mastery of measuring instruments
- Making the cards

Total hourly volume of the matter in the unit

Course: Hourly volume	TD: hourly volume	TP: hourly volume
22h30	00h	15h00

Nature TD/TP

Credit

3

Prior knowledge recommended

Basics of geometry and applied mathematics

Teaching objectives

Teach students the use of topographic instruments for the development of maps and plans necessary for the layout of irrigation and drainage networks

Content items

- Mastery of calculation methods and measurement procedures
- Establishment of topographic maps

Content

General notions on topography, distance measurements, angle measurements, planimetric processes, levelling, topometric calculations

Practical work

TP N°01: Distance measurement (direct and indirect)
TP N°02: Survey by radiation
TP N°03: Triangular Decomposition Survey
TP N°04: Traverse leveling (long and cross profile)
TP N°05: Surface leveling

Key words/concepts

Topography, distance, measurement, processes, map

Pedagogical recommendations	Evaluation method
Carry out topographical surveys and establishment of maps.	Continuous control (TP) and semester examination

Semester 6 ; Discovery Teaching unit 1
Matter 1: INTRODUCTION TO GEOSTATISTICS

SKILLS

- Acquire the fundamental bases of geostatistics

Total hourly volume of the matter in the unit

Course: Hourly volume	TD: hourly volume	TP: hourly volume
22h30	22h30	00h

Nature TD/TP

Credit

2

Prior knowledge recommended

Digital cartography, GIS, statistics

Teaching objectives

Understanding of the essential bases of spatial interpolation methods and an overview of the geostatistical approaches

Content items

- Concept of geostatistics
- Principle of spatial analysis
- Basic techniques of geostatistics

Content

Generalities and history, spatial interpolation methods, variography, ordinary kriging, indicator kriging.

Tutorials

Application of geostatics for spatial analysis and mapping of different specialty parameters

Key words/concepts

Geostatistics, interpolation,kriging

Pedagogical recommendations	Evaluation method
Application on case studies	Continuous control and semester examination.

Semester 6 ; Transversale Teaching Unit 1
Matter 1: OPERATION OF A HYDRO-AGRICULTURAL STRUCTURE

SKILLS

Total hourly volume of the matter in the unit

Course: Hourly volume	TD: hourly volume	TP: hourly volume
00h	00h	22h30

Nature TD/TP

Credit
2

Prior knowledge recommended

General culture on administrative and economic laws in Algeria.

Teaching objectives

Impregnation of students with know-how within a hydro-agricultural structure

Content items

- Detail of an organization chart and understand its objectives
- Operation and coordination of the services of the structure
- Overview of the budget (forecast and balance sheet)

Content

Under the direction of a supervisor, the student must achieve:

- Organization chart and operation of the structure
- Participation in tasks under the guidance of a supervisor
- Overview of Budget Development and Management
- Preparation of a final report

Key words/concepts

Structure, operation, budget, balance sheet

Pedagogical recommendations	Evaluation method
Regular practice in an economic structure chosen at the beginning of the teaching of the matter.	Continuous control (Internship report and defense)

Overall summary of the training

(Indicate the global VH separated in courses, TD, TP..., for the 06 semesters and for the different types of teaching units)

VH \ UE	UEF	UEM	UED	UET	Total
Cours	540	292.5	135	112.5	1080
TD	337.5	225	135	-	697.5
TP	337.5	112.5	-	22.5	472.5
Others (outhing+Intership)	1485	720	30	15	2250
Total	2700	1350	300	150	4500
Credit	108	54	12	6	180,00
% in credit for each EU	60	30	6.6	3.4	**100,0**