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	Speciality
Nature and Life Sciences	**Agricultural Sciences**	Plant Production

وزارة التعليـم العالـي و البحـث العلمـي

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	الإنتاج الفلاحي

SUMMARY

I – Identity of the License

1 - Location of training: Djilali Bounaama University of Khemis Miliana

Faculty: Natural and Life Sciences and Earth Sciences

Department: Agricultural Sciences

References of the order authorizing the license: Order No. 115 of June 20, 2007

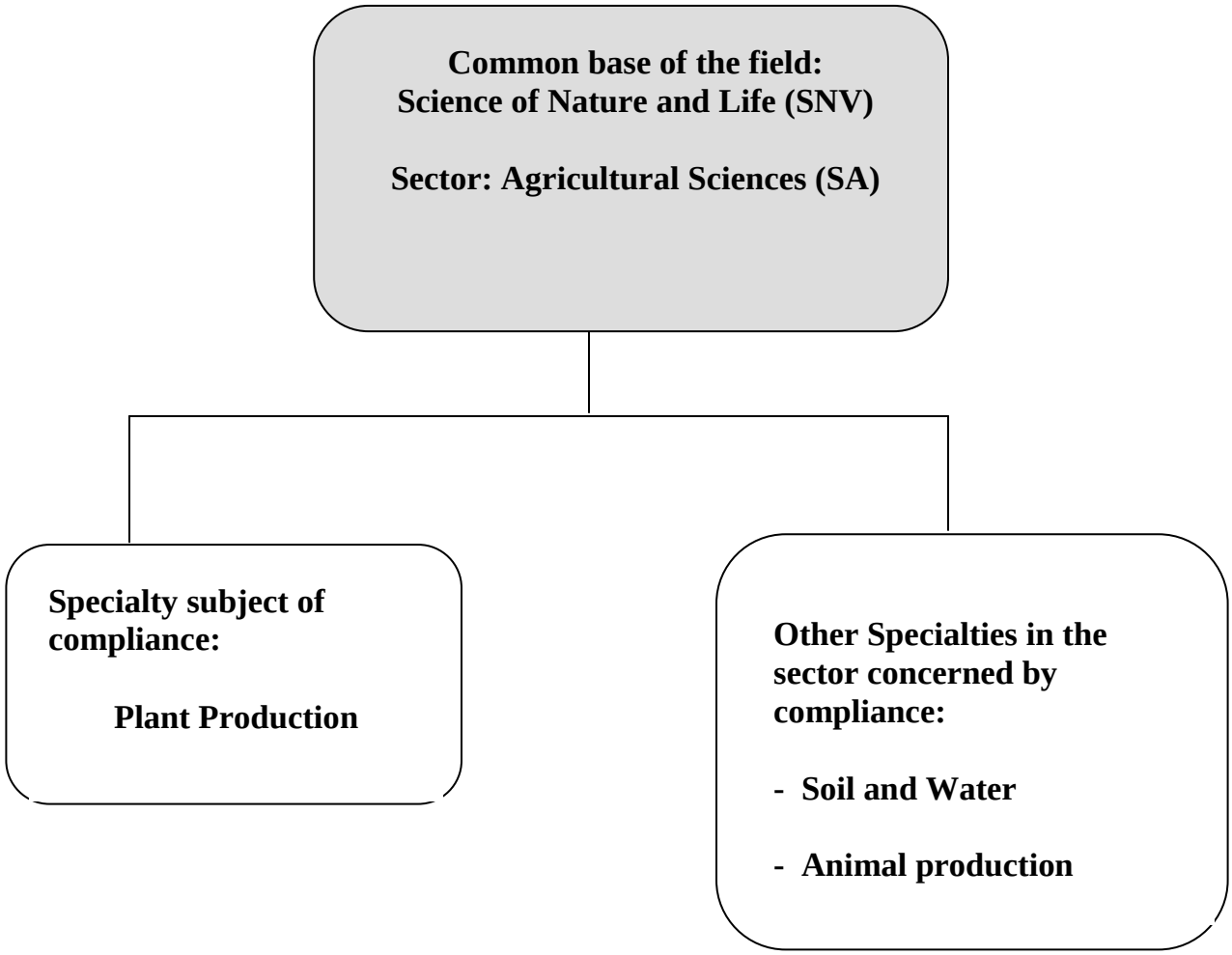
2- External partners:

- Companies and other socio-economic partners:

- The National Agency for Hydraulic Resources (A.N.R.H.)
- Directions and Subdivisions of Hydraulics of Wilaya.
- Directions of the Environment
- The National Agency for Dams (A.N.B.)
- The National Sanitation Office (O.N.A.)
- The Watershed Agency
- Office of Irrigated Perimeters
- Private Design Offices
- The National Forest Research Institute (I.N.R.F.)
- Pilot farms
- Directions of agricultural services.
- INRA in Algiers.
- El-Harrach INPV
- Boufarik's ITAF
- Nurseries
- ONAB; ORLAC, ENASUCRE, etc.
- Technical institute of field crops of Khemis-Miliana (ITGC)
- OAIC

3 – Training Context and Objectives

A – General organization of training: project position



B - Training objectives

Algerian agriculture, long below its capacity and probably still, for several years, has known, since the application of the national fund for regulation an agricultural development (FNRDA), unprecedented positive spin-offs, bringing hope. The globalization of the economy is a delicate adventure for peoples who can adapt to its requirements, but a disaster for those who will not make the effort to adjust necessary.

Only a high-level scientific training, in all fields, and in particular, in the agricultural sciences, will allow our economy to take advantage of the benefits of this new situation.

This license aims to give students a high-level training in agronomic sciences oriented towards a modern and developed agriculture based on improving water quality and management, developing cropping systems to sustainable agriculture, the development of plant genetic resources, the creation of variety adapted to the conditions of the environment, the quantitative and qualitative improvement of plant production and the design of productivity requirements. Also to bring to students of both theoretical, practical and applied knowledge in various fields.

Through this license, we have the ambition to train specialists in the field of Agro Sciences capable of solving agro-technical problems by implementing a multidisciplinary approach.

C – Targeted profiles and skills:

The field of plant production is one of the priorities for the state in the face of the reduction in agricultural yields in the country following the extension of the housing sector: It has become more urgent the development of new agricultural areas and the creation of other tillage perimeters and the improvement of yields in all regions of the country where the conditions lend themselves to it as the case of the Wilaya of Ain Defla. This precaution requires significant financial resources and human skills in this area in general and particularly in agricultural production and this to better guarantee the reliability of such projects:

As part of the new LMD system, we are offering a course in the agronomic training, interested in agronomic sciences, namely: land development, management of new agricultural techniques.

This basic training allows access to other more in-depth courses in this field. domain.

This training is reserved for students enrolled in the common core of natural and life sciences. and with a bachelor's degree in:

- Experimental science
- Exact Sciences
- Civil engineering
- Mechanical Engineering
- Electrical Engineering
- Construction and public works
- Chemical engineering

The orientation towards this course will be made at the end of the second year by the decisions of the evaluation and guidance committee.

D – Regional and national employability potential

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

There are many opportunities for integration into active life and this at the scale national and regional. The skills acquired during this training allow graduates to apply in the sectors of agriculture, hydraulics and the environment. All of these sectors (administrative, development and research exist at different levels in the region starting with the capital of the wilaya, daïras and municipalities. By way of example, we can cite:

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

E – Gateways to other specialties

At the end of their training, students graduating with a "Plant Production" License will have the opportunity to continue their studies in Masters in the same specialty or move towards other Masters close to this one such as the Masters: water in agriculture, water and bioclimatology…

F – Expected performance indicators of the

The objective of the device is to diversify the control methods in order to assess the student skills as broadly as possible. In this context, we will assess: (1) student autonomy; (2) regular monitoring of knowledge acquisition; (3) the acquisition of oral expression; (4) the acquisition of teamwork skills and synthesis work; (5) control of the student's abilities and not being satisfied with his knowledge

The breakdown between the different forms of assessment is as follows:

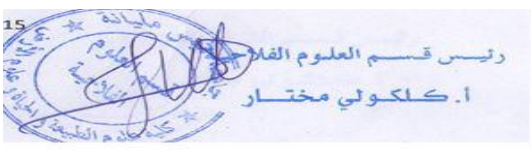
- Knowledge check: 40%
- Oral expression: 20%
- Personal work: 20%
- Capacity for analysis and synthesis: 20%

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

Grade	Internal workforce	External workforce	Total
Professor	02		02
Conference Master (A)	-		-
Conference Master (B)	01		01
Assistant Master (A)	08		08
Assistant Master (B)	02		02
Other (*)	15		15
Total	**28**		**28**

(*) Technical and support staff

5 – Material resources specific to the specialty

A- Educational Laboratories and Equipment:

Title of the laboratory: Biochemistry

Student capacity: 25

N°	Equipment Title	Number	Observation
01	Vortex mixer	**01**	**-**
02	Chlorine analyzer (comparator kit)	**01**	**-**
03	Water bath	**02**	**-**
04	Water bath with sand	**01**	**-**
05	Precision balance 1000g	**01**	**-**
06	Precision scale 10g	**01**	**-**
07	Precision scale 1200g	**01**	**-**
08	Bunsen burner	**07**	**-**
09	Dissecting box	**01**	**-**
10	Centrifuge	**01**	**-**
11	Balloon heater	**03**	**-**
12	Stopwatch	**03**	**-**
13	Conductivity meter	**01**	**-**
14	Colorimeter	**01**	**-**
15	Knife	**01**	**-**
16	Desiccator	**01**	**-**
17	17 Hydrometer 1400/1500	**02**	**-**
18	18 Hydrometer 2000	**02**	**-**
19	19 5ml Dispenser	**01**	**-**
20	20 Protein electrophoresis (vertical)	**02**	**-**
21	21 Oven	**01**	**-**
22	22 Lift + flask heater support	**02**	**-**
23	23 Hematocrit	**01**	**-**
24	24 Ventilated hood	**01**	**-**
25	25 Lactodensimeter	**01**	**-**
26	26 Halogen lamp	**01**	**-**
27	27 Safety goggles	**02**	**-**
28	28 Mask + filter	**03**	**-**
29	29 Micropipette 0-50µl	**01**	**-**
30	30 Micropipette 20-200µl	**02**	**-**
31	31 Microscopes	**07**	**-**
32	32 Caliper	**01**	**-**
33	33 pH meter	**03**	**-**
34	34 Heating plate+stirrer	**02**	**-**

Title of the laboratory: Plant biology

Student capacity: 25

N°	Equipment Title	Number	Observation
01	Precision scale carried (600g)	**01**	**-**
02	02 Barometer	**02**	**-**
03	03 Bunsen burner	**02**	**-**
04	04 Box for prepared slide	**02**	**-**
05	05 Dissecting box	**01**	**-**
06	06 Balloon heater	**03**	**-**
07	07 Metal Stopwatch	**01**	**-**
08	08 Photomicrograph binder	**01**	**-**
09	09 Dicot Stem Cutting	**01**	**-**
10	10 Monocot Stem Cutting	**01**	**-**
11	11 Dicot Root Cutting	**01**	**-**
12	12 Tape measure	**02**	**-**
13	13 Micrometer	**01**	**-**
14	14 Mo tic Microscope	**06**	**-**
15	15 Pieron Microscope	**01**	**-**
16	16 Paralux Microscope	**02**	**-**
17	17 Zeiss microscope old model	**01**	**-**
18	18 Mo tic Camera Microscope	**01**	**-**
19	19 Zeiss microscope	**05**	**-**
20	20 Micropipette	**01**	**-**
21	21 Micro-syringe	**01**	**-**
22	22 Flower Pattern	**01**	**-**
23	23 Circulation Cryostat	**01**	**-**
24	24 Dissecting bowl	**02**	**-**
25	25 Decameter	**02**	**-**
26	26 Cellular vision (meiosis)	**01**	**-**
27	27 Projector screen	**01**	**-**
28	28 Bias Set	**03**	**-**
29	29 Oven	**01**	**-**
30	30 Soldering Iron	**01**	**-**
31	31 Drainer	**01**	**-**
32	32 Flexible brush	**01**	**-**
33	33 Graft	**03**	**-**
34	34 Electric halogen lamp	**01**	**-**
35	35 Binocular magnifier old model	**01**	**-**
36	36 Mo tic binocular magnifier	**03**	**-**
37	37 Magnifier with lid	**06**	**-**
38	38 Luxy moisture meter	**01**	**-**
39	39 Handle for scalpel blade	**02**	**-**
40	40 DNA model (P.F)	**01**	**-**

41	41 Germination model of a dicotyledonous grain (pea)	**01**	-
42	Laboratory PH meter	**01**	
43	Plastic shovel	**02**	
44	Caliper	**07**	
45	Thermo hygrometer	**01**	
46	Room Thermometer	**01**	
47	Mercury thermometer	**04**	
48	Beaker Tongs	**06**	
49	Dissecting forceps	**04**	
50	Dissection trays	**02**	
51	Heating plate with stirring	**01**	
52	Heating plate	**01**	
53	Cork board	**02**	
54	Table neck potometer	**04**	
55	Microscopic preparation	**34**	
56	Rain gauge	**02**	
57	Overhead projector	**01**	
58	Abbot refractometer	**01**	
59	Sheet Structure	**02**	
60	Sieve Φ 0.05	**01**	
61	Sieve Φ 0.04	**01**	
62	Sieve Φ 0.2	**01**	
63	Sieve Φ 0.08	**01**	
64	Sieve Φ 1.6	**01**	
65	Biology essays	**01**	
66	Combined pH meter – luxmeter tester	**01**	
67	Electronic thermometer HE	**02**	
68	Max-min thermometer	**02**	
69	Electronic thermometer with probe	**02**	

Title of the laboratory: Chemistry 01

Student capacity: 25

N°	Equipment Title	Number	Observation
01	Apparatus for expansion of liquids	**01**	**-**
02	Melting point apparatus	**01**	**-**
03	Apparatus for gas expansion	**01**	**-**
04	Water bath	**01**	**-**
05	Sand bath	**01**	**-**
06	Electronic scale	**01**	**-**
07	Analytical balance	**01**	**-**
08	Bunsen burner	**03**	**-**
09	Ammonium test box	**01**	**-**
10	Calorimeter	**01**	**-**
11	Balloon heater	**03**	**-**
12	Stopwatch	**02**	**-**
13	Bench conductivity meter	**03**	**-**
14	Portable conductivity meter	**02**	**-**
15	Distiller	**01**	**-**
16	Oven	**01**	**-**
17	Shaker	**01**	**-**
18	Caliper	**01**	**-**
19	Benchtop pH meter	**03**	**-**
20	Portable Ph-meter	**01**	**-**
21	Heating plate	**02**	**-**
22	Vacuum pump	**01**	**-**
23	T junction fitting	**01**	**-**
24	Mercury thermometer	**09**	**-**
25	Electric thermometer	**04**	**-**
26	Immersion heater	**02**	**-**
27	Extractor	**01**	**-**
28	Metal cylinder for soil analysis	**10**	**-**
29	Multi parameter	**01**	**-**
30	Robinson pipette holder	**01**	**-**
31	Box of different types of soil (18 vial)	**02**	**-**
32	Auger	**02**	**-**
33	Bernard's calcimeter	**02**	**-**
34	Sieves of (2; 0.25; 0.125; 0.045)mm	**01**	**-**

Title of the laboratory: Microbiology

Student capacity: 25

N°	Equipment Title	Number	Observation
01	Magnetic stirrer 01 -	**01**	**-**
02	Vortex mixer 01 -	**01**	**-**
03	Autoclave 03 -	**03**	**-**
04	Magnetic wand 02 -	**02**	**-**
05	Water bath 01 -	**01**	**-**
06	Analytical balance 01 -	**01**	**-**
07	Bunsen burner 30 -	**30**	**-**
08	Dissection box 02 -	**02**	**-**
09	Centrifuge	**01**	**-**
10	Pressure cooker	**01**	**-**
11	Colony counter	**01**	**-**
12	Ultra low temperature freezer vertical -86°C	**01**	**-**
13	Dig in Seramic	**10**	**-**
14	Incubator	**03**	**-**
15	Binocular magnifier	**02**	**-**
16	Safety glasses	**01**	**-**
17	Micropipette 1000ul	**01**	**-**
18	Micropipette 10-100ul	**02**	**-**
19	Micropipette 5-50ul	**01**	**-**
20	Motic microscope	**06**	**-**
21	Mortar	**02**	**-**
22	Caliper	**01**	**-**
23	Heating plate with stirrer	**03**	**-**
24	Shaker	**01**	**-**
25	Mercury thermometer	**02**	**-**
26	Alcohol thermometer	**01**	**-**
27	Immersion heater	**01**	**-**
28	Sieves	**01**	**-**

Title of the laboratory: Biology 02 (Biology and Zoology)

Student capacity: 25

N°	Equipment Title	Number	Observation
01	Water bath	**01**	**-**
02	Analytical balance	**02**	**-**
03	Dissection box	**09**	**-**
04	Blade holder box	**12**	**-**
05	Insect box	**11**	**-**
06	MALASSEZ cell	**03**	**-**
07	Centrifuge refrigerated	**01**	**-**
08	Zoology Prepared Blade Box	**01**	**-**
09	Prepared histology slide set	**01**	**-**
10	Botanical Prepared Blade Box	**01**	**-**
11	Conductivity meter	**01**	**-**
12	Dissection bowl	**02**	**-**
13	Decameter	**01**	**-**
14	Oven	**01**	**-**
15	Hygrometer for rearing chamber	**01**	**-**
16	Binocular magnifier	**23**	**-**
17	Halogen lamp	**01**	**-**
18	Hand magnifier	**02**	**-**
19	Handle for scalpel blade	**02**	**-**
20	DNA model (large format)	**01**	**-**
21	Flower Organizing Mockup	**01**	**-**
22	Model of a preliminary structure of a monocot root	**01**	**-**
23	Model of a preliminary structure of a dicot root	**01**	**-**
24	Model of a pre-mayor structure of a monocot stem	**01**	**-**
25	Model of a pre-mayor structure of a dicot stem	**01**	**-**
26	Udder DNA model	**01**	**-**
27	Cell division model	**12**	**-**
28	Biological color photomicrograph	**58**	**-**
29	Microscopes	**14**	**-**
30	Micropipette 100ul	**01**	**-**
31	Micropipette 10ul	**01**	**-**
32	Ph meter	**01**	**-**
33	Caliper	**01**	**-**

Title of the laboratory: Hydraulics

Student capacity: 25

N°	Equipment Title	Number	Observation
01	Apparatus for studying head losses in pipes (bends and valves)	**01**	-
02	Test bench (01) -	**01**	-
03	Beaker (06) -	**06**	-
04	Bernoulli's theorem demonstration set (01)	**01**	-
05	Evaporometer (01) -	**01**	-
06	Water pressure gauge (01) -	**01**	-
07	Apparent density measurement (01) -	**01**	-
08	Measurement of soil density and porosity	**01**	-

F- Internship sites and in-company training:

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)

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.

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; Plant Production speciality

Semestre 5

Teaching unit	VHS	Hourly volume weekly				Coefficent	Credit	Evaluation method	
	14-16 weeks	C	TD	TP	Other*			CC (40%	Exam (60%)
Fundamental Unit									
UEF 3.1.1 (O/P)									
Matter 1 : Agro-pedology and fertilization	45h00	1h30	-	1h30	55h00	2	4	x	x
Matter 2 : Irrigation and drainage	45h00	1h30	1h30	-	55h00	2	4	x	x
UEF 3.1.2(O/P)									
Matter 1 : Genetic Improvement of plants	67h30	1h30	1h30	1h30	82h30	3	6	x	x
Matter 2 : Production of plant and seed	45h00	1h30	-	1h30	55h00	2	4	x	x
Methodological unit									
UEM1 (O/P)									
Matter 1 : Plant physiology	37h30	1h30	-	1h	37h30	2	3	x	x
Matter 2 : Plant biochemistry	22h30	1h30	-	-	27h30	1	2	x	x
UEM2 (O/P)									
Matter 1: Phytopathology	45h00	1h30	-	1h30	55h00	2	4	x	x
Discovery unit									
UED1 (O/P)									
Matter 1 : Nematodes harmful to agriculture	45h00	1h30	-	1h30	5h00	2	2	x	x
UED2 (O/P)									
Transversale Unit									
UET1 (O/P)									
Matter 1 : Analytical chemistry	22h30	1h30			2h30	1	1	x	x
Total Semestre 5	**375h00**	**13h30**	**3h00**	**8h30**	**375h00**	**17**	**30**		

Semestre 6

Teaching unit	VHS	Hourly volume weekly				Coefficent	Credit 14-16 weeks	Evaluation method	
	14-16 weeks	C	TD	TP	Other*			CC (40%)	Exam (60%)
Fundamental Unit									
UEF 3.2.1(O/P)									
Matter 1 : Field crops	67h30	1h30	1h30	1h30*	82h30	3	6	x	x
Matter 2 : Perrennial crops	67h30	1h30	1h30	1h30*	82h30	3	6	x	x
Matter 3 : Vegetable crops	67h30	3h00	1h30	1h30*	82h30	3	6	x	x
Methodological unit									
UEM1(O/P)									
Matter 1 : Agricultural machinery	45h00	1h30	-	1h30	55h00	2	4	x	x
Matter2 : Statistic and data analysis	37h30	1h30	1h00		37h30	2	3	x	x
UEM2(O/P)									
Matter 1 : Functioning of ecosystems	22h30	1h30			27h30	1	2	x	x
Discovery unit									
UED1(O/P)									
Matter 1 : Arthropods harmful to agriculture	45h00	1h30		1h30	5h00	2	2	x	x
UED2(O/P)									
Transversale Unit									
UET1(O/P)									
Matter 1 : Molecular biology	22h30	1h30			2h30	1	1	x	x
Total Semestre 6	**375h**	**12h00**	**5h30**	**7h00**	**375h00**	**17**	**30**		

***Or scientific outing.**

Overall summary of the training

VH \ UE	UEF	UEM	UED	UET	Total
Cours	517h30	315h00	135h00	135h00	1102h30
TD	315h00	172h30	90h00	00	577h30
TP	382h30	142h30	45h00	00	570h00
Others	1485h00	720h00	30h00	15h00	2250h00
Total	2700	1350h00	300	150h00	4500
Credit	108	54	12	6	180,00
% in credit for each EU	60	30	6.6	3.4	**100,0**

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 semesterexamination;

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 semester examination;

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: Determination of 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 semester examination;

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 semester examination;

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 semester examination;

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 hemo-lymph 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 semester examination;

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: Transversal 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- SOIL

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 semesterexamination;

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, 120 p.
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 test
   - 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 semester examination;

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 (UEF 3.1.1)

Matter 1: **Agro-pedology and fertilization**

Credits: 4

Coefficient: 2

Teaching objectives

Plant production results from the combination of climate, soil and fertility. The ground intervenes by its physical aptitudes and its nutritive and water capacities. In fact, the knowledge of soil and leaf fertilization is essential for students of agronomy.

Prior knowledge recommended

Notions on soil chemistry and notions on agro-pedology and in particular on the plant biology.

Content of the matter:

Part I: Agro-pedology.

Course part

Chapter 1: Water in the soil

1.1. Role of soil water

1.2. Relations between the three phases of soil

1.3. Measurement of the volumes occupied by the different phases of the soil

1.4. The forms of water in the ground

1.5. Soil water retention forces

1.6. The states of water in the soil

1.7. The potential of water in the soil

1.8. Movements of water in the soil

1.9. Soil water balance. -Plant water needs

Chapter 2: Characterization of the physical, chemical and biological properties of a soil

2.1. Ion exchanges and mineral nutrition of plants

2.1.1. The physico-chemical properties of the soil

2.1.2. Cation exchange capacity

2.1.3. The phenomena of absorption and exchange

2.1.4. Anion exchange capacity

2.1.5. The consequences of the phenomenon of exchange

2.2. Nutrients in the soil

2.2.1. Concepts of soil fertility

2.2.2. Plant nutrition

2.2.3. Major elements (N, P, K) and trace elements

2.3. Pedogenesis and classification (the focus will be on the soils of Algeria)

2.3.1. Pedogenesis (developing the factors of pedogenesis)

2.3.2. Soil classification

2.4. Introduction to mapping and soil enhancing

2.4.1. Definition of a soil map

2.4.2. Reading a soil map

2.4.3. Introduction to soil development (case of Algerian soils)

Practical work part, tutorials + 1 educational outing: (two tutorials + six practicals + one educational outing).

TW 1: Relations between the units of measurement used in soil sciences (Reminder and exercises on methods of preparation of analytical solutions; unit conversion exercise).

TW 2: Slide projection session (the different soils classifications of the CPCS and USDA).

TP 1: Apparent and real density.

Exercise 2: Measurement of soil humidity and pF.

TP 3: The cation exchange capacity.

Exercise 4: Analysis of nitrogen in the soil.

Exercise 5: Analysis of phosphorus in the soil.

TP 6: Analysis of potassium in the soil.

Part II: Fertilization

Course part

Introduction

- Plant production: problems and means of improvement.

- Role of organic and mineral fertilizers in agriculture.

Chapter 1: Amendments of limestone

Chapter 2: Amendments of humus

2.1. Definition.

2.2. Properties of humus.

2.3. Humic balance.

2.4. The various sources of humus.

2.5. Other sources of humus: household waste, industrial waste, seaweed, etc.

Chapter 3: Chemical manure (simple fertilizers and compounds)

3.1. Definition and classification of the different fertilizers.

3.2. Simple fertilizers.

3.2.1. Nitrogen and nitrogen fertilizers.

3.2.2. Phosphorus. - Phosphate fertilizers.

3.2.3. Potassium. - Potassium fertilizers.

3.3. Compound fertilizers.

3.3.1. Definition.

3.3.2. The different categories of compound fertilizers.

3.3.3. Characteristics and role of compound fertilizers.

3.3.4. The main compound fertilizers existing in Algeria.

3.3.5. Assessment and choice of a compound fertilizer.

Chapter 4: The Laws and Practice of mineral Fertilization

4.1. The different laws of mineral fertilization.

4.2. Manure in practice: general rules.

Tutorials work part

TW 1: Humic balance.

TW 2: Manure analysis and calculation sheet.

Evaluation method:

TP and-or tutorial work report and semester exam.

Bibliographic references:

- **Gauthier J. 1966.** Agriculture générale. Le Sol et sa fertilisation. Éditions De Boeck,100 p.
- **Antoine B R. 2014.** Le sol et l'amélioration des terres .Edition Quae .224p.
- **Ernest B. 1933**. L'Agriculture poitevine. La production végétale. Fascicules I et II. Les plantes et les milieux. Edition Quae, 202 p.

Semester: 5

Fundamental teaching unit 1 (UEF 3.1.1)

Matter 2: Irrigation and drainage

Credits: 4

Coefficient: 2

Teaching objectives

The students have to learn that water is the first factor in plant production and the first cause of interannual variability in yields. Plant species are more or less sensitive to lack and excess of water.

Prior knowledge recommended

Perfect knowledge of bioclimatology and the local climate, the water needs of plants and the carrying out of tillage.

Content of the matter:

Part 1: Irrigation

Chapter 1: The Basics elements

1.1. General

1.2. Watering techniques

1.3. Irrigation networks

1.4. Sizing parameters of an irrigation network

1.5. Salinity issues and crop salt tolerances

Chapter 2: Distribution to the plot

2.1. General

2.2. Gravity irrigation

2.2.1. Irrigation by runoff or spillage

2.2.2. Furrow irrigation

2.2.3. Flood irrigation

2.3. Sprinkler irrigation

2.4. Micro irrigation

2.4.1. Main micro-irrigation techniques

2.4.2. General layout of a micro-irrigation network and installation at the top

Part 2: drainage

Chapter 1: Excess water and sanitation techniques

1. Effects of excess water on plants and soil
2. Effects of excess water on crops and farms
3. Origin of excess water
4. Sanitation methods

Chapter 2: Underground Drainage

1. Principles
2. Drain pipes
3. Laying machines
4. Risks of clogging
5. Arrangement of drains

Chapter 3: Surface drainage

1. Principles
2. Terrain model
3. Water collection and disposal

Chapter 4: Soil Remediation Network

1. Layout of the collector network
2. Sizing of collectors
3. Connections
4. General effects of sanitation

Tutorials

1. Determination of crop water requirements
2. Calculation of continuous fictitious flow and corrected fictitious flow
3. Calculation of doses and watering frequencies
4. Application on ClimWat and CropWat software

Evaluation method

Continuous monitoring and half-yearly review

Bibliographic references

- **Hugues D .1990 .** Les Chemins de l'eau. Ruissellement, irrigation, drainage. EditionTerres et Vie
- **Clément Mathieu, PA, Jean-C.2007**. Bases techniques de l'irrigation par aspersion,Edition Lavoisier474 p
- **Jean-Louis C. 1984.** Eau et terre en fuite Edition Terres et vie 128 p.

Semester 5:

Fundamental Teaching Unit 2 (UEF 3.1.2)

Matter 1: Genetic improvement of plants

Credits: 6

Coefficient: 3

Teaching objectives:

This module aims to complete the part of the genetics and breeding module. It also aims to master the techniques of selection of plants and seeds as well as the criteria for the production of plant material with the skills required to meet the requirements of quality production. It allows the student to acquire the scientific bases necessary for the selection of plants.

Prior knowledge recommended

The mastery of biological, physiological and genetic data is necessary to understand the genetic module and plant improvement.

Content of the matter

Course part

Part 1: Theoretical bases of plant breeding

1.1. The elusive genes: modalities and significance of polygenic heritability

1.1.1. Definition of mean effects

1.1.2. Dominance effects

1.1.3. Forms of epistasis

1.1.4. Expression of variances

1.2. Biological significance of additivity: linkats

1.2.1. Selective values and equilibria in recombination rates between two Genes.

1.2.2. Linkats

1.3. Heterozygosity: inbreeding and heterosis

1.3.1. Definitions

1.3.2. Measurement of inbreeding or heterozygosity levels

1.3.3. Heterosis and inbreeding

1.4. Value of an individual in crossbreeding

1.4.1. heritabilities

1.4.2. Genetic balances

1.4.3. Combination skills

1.4.4. Methods for assessing the value of an individual in crossbreeding

1.5. Natural population structures

1.5.1. Structure of a natural population in an autogamous species

1.5.2. Structure of a natural population in an allogamous species

Part 2: Improvement of annual and fruit species

2.1. Improvement of annual species

2.2. Improvement of fruit species

Part 3: Selection

3.1. Selection of autogamous species

3.2. Selection of allogamous species

3.3. Selection of vegetatively propagated species (clonal selection)

Part 4: Cytogenetics

4.1. Types of Chromosomes in Eukaryotes

4.ϯ. Euploidy in Eukaryotes

4.3. Pseudopolyploidy

4.4. The natural and artificial diploidization of polyploids

4. Aneuploidy and its role in evolution

Part 5: Quantitative genetics

5.1. Reminder of some statistical notions

5.2. The heritability of a trait

5.2.1. Kinship and heritability

5.2.2. Calculation of heritability

5.2.3. Determination of the number and location of genes

5.2.4. In-depth analysis of variance

5.2.5. Use of heritability and breeding and improvement

5.3. Evolution of heterozygosity over the generations

5.4. The phenomenon of heterosis

5.4.1. Definition

5.4.2. Hypotheses or mechanisms

5. Evolution of heterosis over generations

Practical work

No. 1. Study of the pollen of different annual and fruit species

No. 2. Directed pollination on two annual species

No. 3. Directed pollination on two fruit species

Tutorials

No. 1. Calculation of heritability

No. 2. Hayman diallel analysis (graphical method)

No. 3. Analysis of the variance of diallel tables according to Hayman

No. 4. Analysis of the variance of diallel tables according to Griffing

No. 5. Calculation of gene frequency (Hardy-Weinberg law)

Evaluation method:

Continuous assessment (TP and-or TW) and Semester examination

Bibliographic references (Books and handouts, websites, etc.):

Quote at least 3 to 4 classic and important references.

Semester 5

Fundamental Teaching Unit 2 (UEF 3.1.2)

Matter 2: Production of plant and seed

Credits: 4

Coefficient: 2

Teaching objectives

The objective of this module is to give the student basic notions on the production in nurseries of fruit plants (olive, apple, apricot, date palm) and field seeds (wheat, barley, corn), and the different steps necessary to obtain these plants and seeds.

Recommended prior knowledge:

The student must have basic knowledge of perennial crops and field crops.

Content of the matter:

First part: Woody plants

1. General information on woody plant propagation techniques

2. Scientific bases of plant and seed production

2.1. Plant physiology

2.2. Seed physiology

3. Propagation of fruit trees and vines

3.1. The different multiplication methods

3.2. Establishment of a plant material propagation chain

3.3. Steps in the chain of propagation of quality plant material

4. Production in open ground nurseries

4.1. Installation of an open ground nursery

4.2. Choice of seeds

4.3. Sowing

4.4. Grafting of fruit trees and vines

5. Production in a soilless nursery under cover

6. Control and certification of plants and seeds

6.1. Purpose of control and certification

6.2. Definitions

6.3. Status of plant material

6.4. Approvals

6.5. Control

7. Production scheme for certified seedlings

7.1. Selection for promotional quality

7.2. Production of initial material

7.3. Certification of plants and seeds

7.4. Control of the production of wood and vine plants

7.5. Certified propagation material

7.6. Production of rootstocks and cuttings

7.7. Control and certification of mother plants

7.8. Harvesting and certification of rootstocks, layers and cuttings

7.9. Certified plants

Second part: Herbaceous plants

1. Relationship between breeding and seed production

2. Types of seeds

2.1. Breeder seeds

2.2. Foundation seeds

2.3. Certified seeds.

2.4. Self-breeding lines

2.5. F1 Hybrid Seeds

2.6. Seeds of synthetic varieties

3. Seed production fields

3.1. Choice

3.2. Inspection

3.3. Standards

3.4. Preparation

4. Harvesting and packaging

4.1. Harvest stage

4.2. Conditioning

5. Quality control

5.1. Standards

5.2. Sampling

5.3. Purity analysis

5.4. Germination test

6. Case study

6.1. Wheat

6.2. The corn

6.3. Perennial alfalfa

6.4. Potato

Practical work

N° 1. Preparation of the substrate: disinfection, mixing, neutralization, basic fertilization

N° 2. Sowing: stratification in cold room, execution of sowing

N° 3. Multiplication in the nursery: grafting of fruit trees and vines (different methods)

Evaluation method:

Continuous monitoring (TP) and Semester review

Bibliographic references (Books and handouts, websites, etc.):

Quote at least 3 to 4 classic and important references.

Semester: 05

Methodological teaching unit 1 (UEM3.1.1)

Matter: Plant physiology

Credits: 3

Coefficient: 2

Teaching objectives:

Plant physiology is the study of the mechanisms that govern the functioning and development of plants. This part of plant physiology deals with: The mechanisms for the transition from the seed (state of slowed life) to the reproductive state (plant cycle: growth and development).

Prior knowledge recommended

Notions of biochemistry, plant biology (cytology, plant histology, reproduction of Spermaphytes).

Content of the matter:

GENERAL INTRODUCTION

I- Definition.

II- The different plants.

III- Particularities of plants

Chapter 1: PLANT GROWTH.

1- Sites and forms of growth.

2- Kinetics of growth and variation in growth.

Chapter 2: MOLECULAR DEVELOPMENTAL MEDIATORS

I- Phytohormones.

- Auxins
- Gibberellins
- Cytokinins
- Brassinosteroids
- Ethylene
- abscisic acid

II- Phytochrome.

Chapter 3: PLANT MOVEMENTS.

1 - Tropisms.

2- Tactics.

3 - The nasties.

4- Nutations.

Chapter 4: ORGANOGENESIS AND MORPHOGENESIS.

I- The cycle of development of the spermaphytes.

II- Embryonic development: germination.

III- The differentiation of the other organs.

IV- The organogenesis capacities of plants.

V- Reproductive development (physiology of flowering).

Practical work part:

Practical work n° 1 - Study of seeds

Practical work n° 2 - Study of germination

Practical work n° 3 – Appearance of reducing sugars during germination and Demonstration of amylase activity

Practical work n° 4 – Osmotic pressure, suction and membrane pressure

Practical work n° 5 - Growth regulators (gibberellic acid or GA3)

Evaluation method:

Continuous monitoring (TP) and Semester examination

Bibliographic references:

- **William-G Hopkins .2003.** Physiologie végétale, Edition De Boeck, 360 p.
- **Robert Esnault, Claude Lance2004.**Physiologie végétale Tome 1 et2 –Croissance et développement, Edition Dunod.
- **Robert E, René H, Claude L.1998.** Physiologie végétale, Edition Dunod, 323 p.

Semester: 05:

Methodological Subject Unit 2 (3.1.1)

Matter: Plant biochemistry

Credits: 2

Coefficient: 1

Teaching objectives:

Fundamental knowledge of plant biochemistry and its applications in the agricultural field and knowledge of the notions of biochemical ecology. the study of the adaptation and responses of plants to their environment. Special case of Host-Pathogen interaction.

Recommended prior knowledge:

Mastery of the more detailed notions of plant biochemistry.

Content of the matter:

- Specificity of the plant kingdom - General: The bases of autotrophy.
- Structural products (wall compounds) and their metabolism: Cellulose and polysaccharides. Lignin. Surface compounds: Cutin, waxes, suberin...Proteins.
- Separation of the different forms of peroxidase by electrophoresis under non-denaturing conditions.
- Determination of the kinetic parameters of alkaline phosphatase.
- Extraction and identification of leaf lipids and lipids from seeds
  - Separation of lipids by thin layer chromatography and revealed by iodine
  - Characterization for a quantitative and qualitative study
- Reserve products and their metabolism:

  Secondary metabolic products: Aromatic compounds. Terpenes. Alkaloids. Glycosides. Organic acids in plants. Biochemical ecology concept. Study of the adaptation and responses of plants to their environment. Special case of the Host - Pathogen interaction.

Evaluation method: Continuous monitoring (TP) and Semester examination

Bibliographic references:

Jean-L .G. 2004. Biochimie végétale. Edition DUNOD, 300 p.

Charles A. 2008. Biochimie alimentaire. Edition DUNOD, 322 p.

René. B. 1977. Biochimie du développement végétal - Tome 1 Edition. Albert Blanchard 298p.

Bernard M. 1980. Les polymères végétaux. Edition Dunod 345p.

Semester: 05

Methodological teaching unit 2 (UEM3.2.1)

Matter: Phytopathology

Credits: 4

Coefficient: 2

Teaching objectives:

Study of cryptogamic diseases, viral infections, bacteriosis and phytoplasmosis Mycology: Epidemiology (effects of different factors and parameters, modelling).

Prior knowledge recommended:

The student must know the methods of disease control, the pathogenic effect on physiological functions, the defense mechanisms of plants, the main fungal diseases of vegetable crops and field crops (Symptoms, damage).

Content of the matter:

I. The causative agents of plant diseases

II. General characteristics of the diseases they cause

A. Fungi. General characteristics of mycoses

1. General

2. Organs of Fungi

3. Development cycles of fungi

4. Major groups of fungi and types of mycoses

B. Bacteria and Mycoplasmas. General characteristics of bacteriosis and mycoplasmosis

1. Bacteria and bacteriosis

2. Mycoplasma and mycoplasmosis

C. Viruses. General characteristics of viruses

III. Disease development and epidemiology

A. Notions of epidemiology

B. Applications of epidemiology

IV. General methods of controls

A. Control through cultural practices

1. Methods to reduce the amount of inoculums at the beginning of culture

2. Effect of crop rotations

3. Fertilizers and amendments

4. Other cultural practices

B. Genetic control

1. The variation of phytopathogenic organisms

2. The two main types of resistance

3. Effect of resistance types on the development of epidemics

4. Strategies for using resistors

C. Chemical control, mainly against fungal infections

1. General characteristics of substances active against phytopathogenic organisms

2. The main classes of fungicides and their modes of action

3. The main uses of fungicides

4. Resistance of fungi to fungicides

D. Biological control

1. Cross protection

2. Antagonism of Trichoderma

3. "Resistant" soils

E. Specific virus control methods

1. Sanitary selection

2. Regeneration of varieties

F. Conclusion: Integration of control methods

General characters of pathogens and diseases.

General methods of control

Evaluation method:

Continuous monitoring (TP) and Semester review

Bibliographic references:

- **Philipe lepoivre. 2003 .** Phytopathologie. Edition DoeBck 427P.
- **Roger Corbaz. 1993.** Principes de phytopathologie et de lutte contre les maladies des plantes. Presses Polytechniques et Universitaires Romandes.
- **Roger L .1953.** Phytopathologie Des Pays Chauds Tome II. Edition, Paul Lechevalier 322 p.

Semester: 05

Discovery teaching unit 1 (3.2.2)

Matter: Nematodes harmful to agriculture

Credits: 2

Coefficient: 2

Teaching objectives:

Impregnation to the students of the group of phytophagous nematodes (identifications, observation, classification, its damage, means of control)

Prior knowledge recommended:

The student must know the different groups of harmful nematodes, some examples of nematodes and their development cycle

Content of the matter:

1. General information on harmful nematodes.

2. Place of nematodes in the animal kingdom.

3. Classification

4. Biological cycles of phytophagous nematodes

- 4 .1 Nematodes of the aerial part

- 4.2 Root Nematodes

- 4.2.1 Root-knot nematodes

- 4.2.2 Cyst nematodes

5. Favorable factors for the development of nematodes

a. Temperature

b. Humidity

c. Soil

d. Host plants

2. Nematode damage to plants

a. Direct damage or direct harm

b. Indirect damage or indirect harmfulness

3. Some examples of phytophagous nematodes

4. Methods of control

a. Preventive methods

8.1 Cultivation methods

8.3 Physical methods

8.4 Biological methods

8.5 Chemical methods

8.6 Integrated methods

Evaluation method:

Continuous monitoring (TP) and Semester review

Bibliographic references:

- **M Ritter. 1971**. Les nématodes des cultures, Edition Issoudun, 321p.
- **R . Kumar. 1991.** Lutte contre les ravageurs, Edition insect Pest control, 190 p.
- **M Ritter.1971.** La pomme de terre maladies et nématodes**,** Edition Issoudun, 321p

Semester: 05

Transversal teaching unit 1 (3.3.1)

Matter: Analytical Chemistry

Credits: 1

Coefficient: 1

Teaching objectives:

A training in analytical chemistry now to have a thorough mastery of analytical chemistry techniques.

Prior knowledge recommended:

The main analytical methods in situ and in the laboratory, processing of analysis results, Equipment and analysis conditions.

Content of the matter:

• Hydrochemistry

Sampling and analyses, sampling techniques, sample preservation, representativeness of the measurement, the main analytical methods in situ and in the laboratory, processing of analysis results.

• Analysis techniques:

Chromatography (Liquid phase, gas phase), Capillary zone electrophoresis: main fundamental quantities, detectors, analysis conditions, equipment. Mass spectrometry.

Evaluation method:

Continuous monitoring (TP) and Semester review

Bibliographic references:

- **Martine Beljean-Leymarie .2006**. Chimie analytique, Edition Elsevier Masson, 151p.
- **Christine Herrenknecht-Trottmann. 2011**. Exercices de Chimie analytique, Edition Dunod, 3OOp.
- **Skoog. 2012.** Chimie analytique, Edition De Boeck, 1200 p.

Semester: 06

Fundamental teaching unit 1 (UEF 3.2.1)

Matter 1: Field crops

Credits: 6

Coefficient: 3

Teaching objectives:

This is to show future agronomists the system of cultivation for large productions, such as cereals, Industrial and forage crops in arid and semi-arid regions and also the importance of annually crops in the production system.

Prior knowledge recommended:

To acquire these notions, knowledge of general agronomy (tillage, fertilization) and agro-pedology and bioclimatology as well as plant physiology are indispensable.

Content of the matter:

Chapter 1: Cereal Crops

1. General.

1.1. Economic data, cultivation areas, production, surfaces, yields, consumption needs.

1.2. Definition and origin of cereals. The main cultivation cereals

1.3. Varieties cultivated in Algeria-

1.4. Use and composition of grain.

2. Morphological characters

2.1. The seed.

2.2. The vegetative apparatus.

2.3. The reproductive system.

3. Biological characters.

3.1. Description of the development cycle.

3.2. Vegetative period.

3.3. Reproductive period.

3.4. Ripening period.

4. Technical itinerary

4.1. Choice of cropping system.

4.2. Soil work.

4.3. Sowing.

4.4. Water (irrigation)

4.5. Nutrients (fertilization)

• Protection against diseases and pests and control of weeds.

-The harvest.

Chapter 2: Forage Crops

1. Introduction.

1.1. Definition

1.2. The different fodder (forage) production zones.

1.3. Situation in Algeria.

2. Some data on the exploitation and conservation of fodder. -Exploitation - Conservation.

3. Forage crops

3.1. Associations.

3.2. Definition and some examples

3.3. Fodder poaceae. Some examples

3.4. Forage Fabaceae. Some examples.

3.5. Protein crops. Some examples

3.6. Trees and shrubs.

3.7. Interest of trees and shrubs. some examples

3.8. Permanent grassland. -Importance. -Situation. -Use.

3.9. Itinerary, forests, steppe zones, Pre-Saharan zones and Saharan zones.

Chapter 3: Industrial crops

1. General.

1.1. Agro-economic importance.

1.2. Historical.

1.3. Technical classification.

2. Industrial crops

2.1. Sugar beet.

2.2. Biology.

2.3. Ecological requirements.

2.4. Production technical itinerary.

2.5. Oilseeds.

2.6. Sunflower.

2.7. Oilseed rape.

2.8. Aromatic species.

2.9. Tobacco.

3. Edible legumes (Pulses).

-Food and agro-economic interest. -The lens. - The chickpea.

Evaluation method:

Continuous monitoring (TP and/or TW) and Semester examination

Bibliographic references:

- **Dominique Soltner. 2004**. Les grandes productions végétales, Edition Sciences et Techniques Agricoles, 225 p.
- **Dominique Soltner. 2002** Les Bases de la production végétale, Edition Sciences et Techniques Agricoles, 472 p.
- **Antoine Bernard R. 2014**. Sociologie des grandes cultures , Edition Quae, 332 P.

Semester: 06

Fundamental teaching unit 1 (UEF 3.2.1)

Matter 2: Perennial crops

Credits: 6

Coefficient: 3

Teaching objectives:

Is to teach students practical knowledge about improvement techniques of fruit and viticultural production.

Recommended prior knowledge:

Knowledge of agronomic and biological concepts are essential for this module.

Content of the matter:

PART 1: Arboriculture

1. General

2. Creation of a fruit nursery

2.1. Introduction

2.2. Necessary conditions for a successful nursery

2.3. Organization of the nursery

3. Multiplication of fruit trees

3.1. Introduction

3.2. The different multiplication methods

4. Grafting fruit trees

4.1. Introduction

4.2. Conditions for successful grafting

4.3. The different grafting methods

4.4. Care to be given to grafts after grafting

5. Study of rootstocks

5.1. Rootstock of pome rosaceae

5.2. Rootstock of rosaceae with stone

5.3. Citrus rootstock

5.4. Criteria for choosing rootstocks

6. Creation of an orchard

6.1. Introduction

6.2. Establishment of an orchard according to the technical elements

6.3. Maintenance of a young plantation

7. Study of the different fruit species

7.1. Citrus

7.2. Olivier

7.3. Date palm

7.4. Fig tree

7.5. Pome rosaceae

7.6. Stone rosacea

PART 2: Viticulture

1. Introduction

2. Modes of vine propagation

2.1. Sexual multiplication

2.2. Asexual multiplication

3. Establishment of a vineyard

3.1. Land preparation

3.2. .Planting

3.3. Planting techniques

3.4. Planting methods

3.5. Maintenance of a young plantation

3.6. Method of managing

3.7. The pruning of vine

4. Study of the main rootstocks

5. Study of the main grape varieties

5.1. Table grapes used

5.2. Wine grape varieties

5.3. Drying grape varieties

Tutorials

Presentations on current topics

Educational outing

1. Visit to a fruit nursery

2. Visit to a fruit farm

3. Visit to a production vineyard and an ampelographic collection

Evaluation method:

Continuous monitoring (TP and/or TW) and Semester examination

Bibliographic references:

- **François R.2013.** Cultures pérennes tropicales : Enjeux économiques et écologiques de la diversification, édition Quae, 301 p.
- **François R. 2012 .**Cultures pérennes tropicales, Edition Quae , 312 p.
- **Dominique M. 1999.** Les maladies des cultures pérennes tropicales, Edition Cirad 287p.
- **Dominique M. 1996.** Lutte intégrée contre les ravageurs des cultures pérennes tropicales, Edition Cirad 206p.

Semester: 06

Fundamental teaching unit 1 (UEF 3.2.1)

Matter 3: Vegetable crops

Credits: 6

Coefficient: 3

Teaching objectives:

Make known the techniques of production of plants in the nursery, the concept of crops protected crops, soilless crops, and we end with the most special market vegetable crops. produced in Algeria.

Recommended prior knowledge:

Notions of vegetable crop production techniques require knowledge on general agronomy, bioclimatology as well as plant biology and physiology.

Content of the matter:

Chapter 1: Production of seedlings in the nursery:

1.1. Nursery Concept,

1.2. Seedling production methods,

1.3. Rootball production techniques,

1.4. The growing medium,

1.5. Container,

1.6. Cultivation management,

1.7. Control of aerial growth and root growth

1.8. Transplanting seedlings,

1.9. Preservation of plants,

1.10. Programming the production of seedlings,

1.11. Transplanting seedlings

Chapter 2: Protected crops:

2.1. Introduction,

2.2. Protection mode,

2.3. Basic principles of crop protection,

2.4. Exchanges, of energy between the shelter and the outside,

2.5. Improvement of the energy balance,

2.6. New energies to heat greenhouses,

2.7. Profitability of greenhouse crops

Chapter 3: Soilless crops:

3.1. Historical,

3.2. Definition,

3.3. Application domain,

3.4. The different soilless cropping systems,

3.5. The substrates,

3.6. nutrient solutions,

3.7. Water Supply Control,

3.8. Phytosanitary and environmental aspects in soilless cultivation

Chapter 4: Special Vegetable Crops:

4.1. Install crops

4.2. Choice of speculations

4.3. Choice of installation mode

4.4. Proper sowing, transplanting or planting.

4.5. Cultivate crops

4.6. Precise diagnosis of problems (weeds, diseases, insects, nutritional deficiencies

, bioclimatic stress)

4.7. Proper planning of maintenance based on diagnosis

4.8. Execution of maintenance work.

Chapter 5: Harvest and post-harvest

5.1. Harvest the culture

5.2. Determine the harvest period

5.3. Correct execution of the harvest

5.4. Correct evaluation of yield

5.5. Packaging harvest products

5.6. Correct choice of packaging

5.7. Correct layout of the site according to the type of product

5.8. Correct execution of transport

5.9. Respect of storage conditions

5.10. Correct storage of the product.

Practical work will be carried out according to the means or provided on educational outings

No. 1: Production of seedlings in the nursery

N°2: Know how to make plank

No. 3: Know how to install and monitor crops.

No. 4: Protected crops

No. 5: Soilless crops

No. 6: Potato

No. 7: Tomato

No. 8: Substrate disinfection

No. 9: Setting up and covering a greenhouse

Evaluation method:

Continuous evaluation (TP and/or TW) and Semester examination

Bibliographic references:

- **J G Moreau. 2010.** Manuel Pratique de La Culture Maraichère de Paris, Edition large type edition, 386p .
- **Raymond Krol .2003.** Les cultures maraichères, Edition CTA.
- **Magnollay Mottier.1971.**Culture maraîchère. Edition Spes, 176p.

Semester: 06

Teaching Unit Methodology 1

Matter 1: Agricultural machinery

Credits: 3

Coefficient: 2

Teaching objectives: The targeted objectives are:

- The initiation of future agronomists to the knowledge and use of agricultural tools.

- To be able to make a reasoned choice of machines involved in a technical itinerary.

- Knowledge of the optimal use of agricultural attachments.

- To have sufficient knowledge to carry out maintenance and repairs.

Recommended prior knowledge:

Have knowledge of physics, mathematics, mechanics and general agronomy.

Content of the matter:

A-Course

1-Reminder of the main operations of the technical itinerary of a crop

(ploughing TP 01: Functional elements of the tractor, cultivation techniques, preparation soil, maintenance, treatment, harvest, etc.).

1- Main agricultural machinery

- Introduction

- Plowing equipment

- Materials for resumption of plowing

- Materials in superficial ways

- Sowing equipment, planting transplants

- Fertilization equipment

- Treatment and maintenance equipment

- Harvesting equipment (Grains, fodder and tubers)

2-Agricultural tractors

-Introduction

- Different types of tractor

- Types of grip (skating, sliding)

- Hydraulic lift and three-point hitch system

- Power Take-off

- Differential

B-**Practical work and educational outings**:

TP 01: Farming equipment

TP 02: Functional elements of the tractor

TP 03: Seeders, planters, fertilizer spreaders and sprayers.

TP 04: Harvesting equipment and driving a coupling (to be removed).

01 educational outing

Evaluation method: EMD+TP

References

- Les bases de la production végétale Sol Climat Plante (I et II) Soltner D
- Agronomie : Des bases aux nouvelles orientations ENITA de Bordeaux
- Les machines agricoles,
- Internet

Semester: 06

Methodological teaching unit 2 (UEM 3 .2 .2)

Matter: Statistics and data analysis

Credits: 3

Coefficient: 2

Teaching objectives:

Understanding the facts of plant production through the analysis of numerical data

Recommended prior knowledge:

This teaching requires the mastery of statistics and mathematics, sampling methods and general notions on surveys.

Content of the matter:

. Data and descriptors in crop production. Matrices, operations and calculations

. Association measures

. Abundance distributions

. Variable transformations, regression and similarity models

. Ordering and grouping

. Design, realization and conduct of an experiment and test

. Sampling methods

. Sampling practice

. General notions on surveys.

Evaluation method:

Written exam at the end of the semester and a TD exam

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

- DAGET., 1987. Les modèles mathématiques en écologie. Editeur : Masson. Collection: Collection d'Ecologie. 172p. ISBN-10: 2225440557
- LEGENDRE L., 2007. Ecologie numérique t1. le traitement multiple des données écologiques. Editeur : Masson. Collection : Ecologie. ISBN-10: 2225801320
- LEGENDRE L., 2000. ECOLOGIE NUMERIQUE T.1. Editeur: Masson. Collection : Collection d'écologie. ISBN-10: 2225624143.

Semester: 06

Discovery teaching unit 3 (UED 3.1.1)

Matter 1: Global functioning of ecosystems

Credits: 2

Coefficient: 1

Teaching objectives:

At the end of this course, the student will be able to study the ecosystem and their functioning.

Prior knowledge recommended

Have basic notions of the ecosystem, the functioning of the ecosystem and the biological rhythm of the ecosystem.

Content of the matter:

1- Concepts in Ecology (Ecology, History of ecology, Definitions of the concepts of bases)

2- Structure and Organization of biocenoses (Definition, Metabolism, Quantitative and qualitative expression of biocenoses)

3- Interaction within the biotic component of the biocenosis (Ecological niche, competition intra-specific reactions, interspecific, ecological niche)

4- The trophic structure of biocenoses

5-Biomass and ecosystem productivity, energy flow.

6 - Functional diversity of ecosystems

7- Cycle of matter: Biogeochemical cycles (carbon, nitrogen, sulphur, etc.)

Evaluation method:

Half-year report and review

Bibliographic references

1- B .ROBERT.2008. Ecologie générale structure et fonctionnement de la biosphère – 6ème édition.

2- Guillaud. Y.2007. Biodiversité et développement durable.

3- LAMY. M. 1999.La biosphère, la biodiversité, et l'homme.

4- Ramade F., 1994- Eléments d'écologie. Ecologie fondamentale.

5- Ozenda P., 1982- Les végétaux dans la biosphère.

6- Peguy Ch., 1970- Précis de climatologie.

Semester: 06

Methodological subject unit 2 (3.2.2)

Topic: Arthropods harmful to agriculture

Credits: 2

Coefficient: 2

Teaching objectives:

Students will be introduced to the main concepts in groups of invertebrates and molluscs, pest studies, insects and bees.

Prior knowledge recommended:

General knowledge in general Arthropods is desirable in particular on morphology, immature stage, biology, physiology, biogeography and ethology.

Content of the matter:

I. 1- General and Definitions

- Definitions: Depredation-Predation-Parasitism-Harmfulness and threshold of harmfulness
- Place of nematodes in the animal kingdom
- Morphology
- Ecology and Biology

2. General classification

- Insects
- Arachnids
- Myriapoda
- Crustaceans

3. Main groups of arthropod pests

- Arthropods harmful to crops: Cereal crops-Crops Vegetable crop-Fruit growing-Other crops
- Arthropods harmful to farm animals: Sheep-Bovines-Bees-Camels-Equidae
- Arthropod vectors of viruses and diseases

4. Damage and symptoms attributed to Arthropods

5. Means of control

- Preventive means

- Cultivation methods
- Biological methods
- Chemical control
- Autocide control
- Integrated control

Evaluation method:

Continuous monitoring (TP) and Semester review

Bibliographic references

1. Bournier A 1983- Les thrips : Biologie-Importance agronomique. Ed. INRA, Paris,121p
2. Anonyme 1988- Médiateurs chimiques : Comportement et systématique des lépidoptères. Ed. Collo, INRA, Paris, 189p
3. Ayral H 1978- Zoologie agricole. Ed. J.B. Bailli7re, Vol I, II et III, Paris, 384p
4. Balachowsky A.S 1969- Entomologie appliquée à l'agriculture. Ed. Masson et cie,Tom I, Paris, 1387p
5. MMegavin G 2000- Insectes Araignées et autres arthropodes terrestres. Ed. Bordas, Cambridge, 255p
6. Khelil M.A 1995- Abrégé d'entomologie. Ed. OPU, Alger, 103p
7. Pihan J.C 1986- Les Insectes. Ed. Masson, Paris, 156p
8. Ehano R, Canard A et Tiberghien G sd- Les Insectes. Ed. Ouest.France, 63p
9. Aguilar j, Coutin R, Fraval A, Guilbot R et Villemant V 1996- Les illustrations entomologiques. Ed. INRA, Paris, 153p
10. Anonyme 1985- Les ravageurs des céréales. Ed. ITCF, Algérie, 25p
11. Anonyme SD – Les pucerons des cultures. Ed. Jour.Etud. Inform, Paris, 347p
12. Winkler J.R 1969- Les Coléoptères. Ed. Collec. Grund, 234p
13. Kumar R 1991- La lutte contre les insectes ravageurs. Ed. Karthaca, Paris, 310p

Ouvrages, revues, publications, sites Internet etc.

Semester: 06

Discovery teaching unit 4 (UED 3.1.1)

Matter 3: Molecular biology

Credits: 1

Coefficient: 1

Teaching objectives:

Fundamental knowledge of molecular biology.

Recommended prior knowledge:

Knowledge of cell biology, genetics and biochemistry are necessary.

Content of the matter:

1. Molecular cloning

2. Nucleic acid electrophoresis

- DNA and RNA electrophoresis in agarose gel

- Polyacrylamide gel electrophoresis

- Other electrophoresis techniques

3. In vitro DNA amplification technologies (PCR)

- Classic PCR

- Real-time PCR

- Quantitative PCR

- Complementary DNA synthesis by reverse transcription and PCR (RT-PCR)

4. Nuclear probes and hybridization techniques

5. DNA sequencing

- The Sanger method

- Automated sequencing

- Sequencing strategies

6. Molecular markers (AFLP, RAPD, AFLP, SSR, microsatetelites, etc.)

7. DNA banks

- Genomic DNA and complementary DNA banks: obtaining, interests

Evaluation method: Continuous monitoring and EMD

References

- **Denis T. 1999.** Principes des techniques de biologie moléculaire. Editions Quae, 131 p.

- **Luchetta P. 2013.** Biologie moléculaire en 30 fiches – 2ème édition. Editions Dunod, 160 p.
- **Lodish H, Darnell JE. 1997.** Biologie moléculaire de la cellule. Editions De Boeck, 1344 p.
- **O'Connell J. 2002.** RT-PCR protocols. Methods in molecular biology.
  Humana Press Inc, 394 p.