

PEOPLE'S DEMOCRATIC REPUBLIC OF ALGERIA

MINISTRY OF HIGHER EDUCATION AND SCIENTIFIC RESEARCH

HARMONIZATION MASTER TRAINING OFFER ACADEMIC

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

Field: Natural and Life Sciences

Branch: Agricultural Sciences

Speciality: Plant production

Academic year: 2015-2016

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I – Identity card of the Master

1 - Location of the training:

- **Faculty (or Institute):** Nature and Life Sciences and Earth Sciences

- **Department:** Agricultural Sciences

2- Training Partners*:

- Other academic institutions:

-INA

- Chlef University

- Companies and other socio-economic partners:

- I.T.G.C.

- O.A.I.C.

- AinDefla DSA

- I.T.A.F of Boufarik

- I.N.C.C.

- Pilot farms

- S.R.P.V of Chlef

- I.N.P.V of ElHarrach

- Private operators

- Chamber of Agriculture

- Specialized associations

-INRA

- International partners:

- I.N.A.T of Tunis

* = Present the agreements as an appendix to the training

3 – Context and objectives of the training

A – Conditions of access

This specialty is open to the “Plant Production” Masters and other similar specialties, namely:

- License in Plant Production

B – Training objectives

This master's degree in "Plant production" is part of an approach to setting up sustainable agriculture and a competitive and quality food industry.

This specialty is an original training that deals with the entire fruit and vegetable sector from production (cultivation management, phytoprotection, post-harvest conservation) to consumption, taking into account the qualitative, nutritional, organoleptic and environmental aspects of plant production.

C – Targeted business profiles and skills

As part of the new LMD system, we offer agronomic training based on the acquisition of the main fundamental notions related to plant production, plant physiology, phytopathology, ecotoxicology as well as modern agricultural techniques and allows students to deepen their knowledge. In the field of phytoprotection and the quality of fruits and vegetables as well as in the sector of the regulation of agri-food productions and therefore to acquire a double competence. This allows the training of executives with multidisciplinary skills (modern languages, economics and legislation) and more specific skills meeting current and future needs in terms of research in agricultural sciences and thus guaranteeing sustainable development, in particular for the quality of agricultural products.

D- Regional and national employability potential of graduates

The region has significant potential in the multi-purpose agricultural field. Despite the potential of the region, yields and quality remain below the desired objectives. As such, university education can play a key role in the development of the agricultural sector through the improvement of the specialty "Plant production" which is one of the pillars of all agronomic sectors.

The wilaya of AinDefla, and the region of KhemisMiliana more particularly are for agricultural purposes, since they are located in the plain of Haut Chélif and in its irrigated perimeter. This area has many farms, both state and private, practicing different agricultural activities (cereal growing, market gardening and fruit growing and others).

These farms are therefore called upon to play a major future role in supplying the food and agri-food sector and the market in general, with cereals, potatoes and pulses and other agricultural products.

It is in this context that this quality training fits in with a view to providing high-level skills, capable of taking charge of concerns in the field of production of all crops at the level of Haut Chélif.

E – Gateways to other specialties

Through this specialty, students can opt for other agronomic gateways offered by other specialties in the same sector or other compatible (defined) sectors; perennial crops; plant improvement; phytopharmacy and plant protection.

F – Training monitoring indicators

The student during the university course, must make presentations and reports for each subject, as well as visits to farms, agricultural companies and agri-food structures.

In this context, we will assess:

- 1- The empowerment of the student;
- 2- Regular monitoring of knowledge acquisition;
- 3- The acquisition of oral expression;
- 4- The acquisition of teamwork and synthesis skills;
- 5- Checking the student's abilities and knowledge.

The distribution between the different forms of knowledge control is as follows:

Knowledge check: 40%

Oral expression: 20%

Personal work: 20%



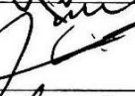

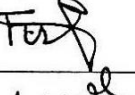
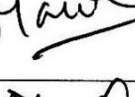

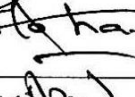
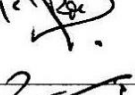
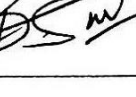
Capacity for analysis and synthesis: 20%

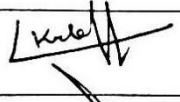
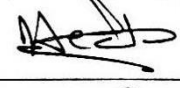
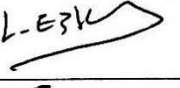


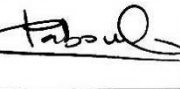
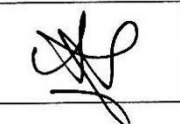
G – Supervisory capacity

The number of students that can be supported is 40, i.e. 02 groups of 20.

4- Available human resources

A - Teachers intervening in the specialty

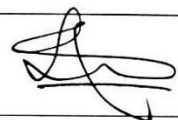
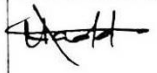
Nom, prénom	Diplôme graduation + Spécialité	Diplôme Post graduation + Spécialité	Grade	Type d'intervention *	Emargement
M ^r . Mokabli Aïssa	Ingénieur d'état Zoologie	Professeur Zoologie	Prof	Cours, TD, TP, Encadrement de stage, Encadrement de mémoire	
M ^r . Merouche AEK	Ingénieur d'état Hydraulique agricole	Docteurat Hydraulique agricole	MCB	Cours, TD, TP, Encadrement de stage, Encadrement de mémoire	
M ^r . Djeddar Meliani	Ingénieur d'état Aquaculture	Docteurat Aquaculture	MCB	Cours, TD, TP, Encadrement de stage, Encadrement de mémoire	
M ^r . Kara Hacane Tahar	Ingénieur d'état Entomologie	Docteurat Zoologie	MCB	Cours, TD, TP, Encadrement de stage, Encadrement de mémoire	
M ^{me} Tirchi Nadia	Ingénieur d'état Zoologie	Docteurat Zoologie	MCB	Cours, TD, TP, Encadrement de stage, Encadrement de mémoire	
M ^r . Maroc Mohamed Amine Mohamed	Ingénieur d'état Agronomie	Docteurat Agronomie	MCB	Cours, TD, TP, Encadrement de stage, Encadrement de mémoire	
M ^{me} Hallouz Faiza	Ingénieur d'état Sciences de la terre	Docteurat Sciences de la terre	MCB	Cours, TD, TP, Encadrement de stage, Encadrement de mémoire	
M ^r . Mékhati Mohamed	Ingénieur d'état Zootechnie	Magister Zootechnie	MAA	Cours, TD, TP, Encadrement de stage, Encadrement de mémoire	
M ^{me} Mohamed Bouziane Rafika	Ingénieur d'état Protection des végétaux	Magister Protection de végétaux	MAA	Cours, TD, TP, Encadrement de stage, Encadrement de mémoire	
M ^r . Bousalhih Ibrahim	Ingénieur d'état Agronomie	Magister Agronomie	MAA	Cours, TD, TP, Encadrement de stage, Encadrement de mémoire	

M ^r . Kelkouli Mokhtar	Ingénieur d'état Agronomie	Magister Agronomie	MAA	Cours, TD, TP, Encadrement de stage, Encadrement de mémoire	
M ^r . Heddad Benalia	Ingénieur d'état Agronomie	Magister Agronomie	MAA	Cours, TD, TP, Encadrement de stage, Encadrement de mémoire	
M ^r . Lakdar Ezzine Djilali	Ingénieur d'état Agronomie	Magister Agronomie	MAA	Cours, TD, TP, Encadrement de stage, Encadrement de mémoire	
M ^r . Benmokadem Nassredine	Ingénieur d'état Agronomie	Magister Agronomie	MAA	Cours, TD, TP, Encadrement de stage, Encadrement de mémoire	
M ^{me} Khouatmiani Khadidja	Ingénieur d'état Physiologie végétale	Magister Physiologie végétale	MAA	Cours, TD, TP, Encadrement de stage, Encadrement de mémoire	
M ^{me} Tabouche Aïcha	Ingénieur d'état Protection de végétaux	Magister Protection des végétaux	MAB	Cours, TD, TP, Encadrement de stage, Encadrement de mémoire	
M ^{me} Abidi Lila	Ingénieur d'état Technologie alimentaire	Magister Amélioration des productions végétales	MAB	Cours, TD, TP, Encadrement de stage, Encadrement de mémoire	

* = Cours, TD, TP, Encadrement de stage, Encadrement de mémoire, autre (à préciser)

B: External Framework


Etablissement de rattachement : I.T.A.F de Tessala El Mardja

Nom, prénom	Diplôme graduation + Spécialité	Diplôme Post graduation + Spécialité	Grade	Type d'intervention *	Emargement
LICIR Mourad	Ingénieur d'état en Agronomie Spécialité : Phytotechnie	Magister en Agronomie, spécialité : Amélioration des productions végétales	Chef de service en expérimentation	Cours, TD, TP, Encadrement de Stage et de Mémoire	
Mme HADDAD Nassima	Ingénieur d'état en Agronomie Spécialité : Zoologie + Master en Phytopharmacie	Magister en Agronomie, spécialité : Amélioration des productions végétales	Chef de service en améliorant des plantes	Cours, TD, TP, Encadrement de Stage et de Mémoire	


Etablissement de rattachement : CNCC Alger

Nom, prénom	Diplôme graduation + Spécialité	Diplôme Post graduation + Spécialité	Grade	Type d'intervention *	Emargement
Mme LAALA Samia	Ingénieur d'état en Agronomie Spécialité : Protection des végétaux	Magister en Agronomie, spécialité : Protection des végétaux	Chef de service en control sanitaire	Cours, TD, TP, Encadrement de Stage et de Mémoire	

Etablissement de rattachement : I.T.C.M.I de Staouali

Nom, prénom	Diplôme graduation + Spécialité	Diplôme Post graduation + Spécialité	Grade	Type d'intervention *	Emargement
ARAAR Hakima	Ingénieur d'état en Agronomie Spécialité : Protection des végétaux	Magister en Agronomie, spécialité : Protection des végétaux	Chef de service en contrôle de semences	Cours, TD, TP, Encadrement de Stage et de Mémoire	

Etablissement de rattachement : I.N.R.F de Bainem

Nom, prénom	Diplôme graduation + Spécialité	Diplôme Post graduation + Spécialité	Grade	Type d'intervention *	Emargement
HIMRANE Houcine	Ingénieur d'état en Agronomie Spécialité : Phytotechnie	Doctorat en sciences en agronomie, spécialité : Amélioration des plantes	Chef de département	Cours, TD, TP, Encadrement de Stage et de Mémoire	

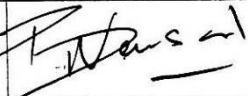
Etablissement de rattachement : I.N.P.V d'EI Harrach

Nom, prénom	Diplôme graduation + Spécialité	Diplôme Post graduation + Spécialité	Grade	Type d'intervention *	Emargement
SMAHA Djamel	Ingénieur d'état en Agronomie Spécialité : Zoologie	Magister en Agronomie, spécialité : Zoologie	Chef de service de nématodologie	Cours, TD, TP, Encadrement de Stage et de Mémoire	

Etablissement de rattachement : Université de Chleff

Nom, prénom	Diplôme graduation + Spécialité	Diplôme Post graduation + Spécialité	Grade	Type d'intervention *	Emargement
BENCHEIKH Mohamed	Ingénieur d'état en Agronomie Spécialité : Zoologie	Doctorat en Agronomie, spécialité : Amélioration des plantes	Prof	Cours, Encadrement de Stage et de Mémoire	

Etablissement de rattachement : I.N.A.T de Tunis

Nom, prénom	Diplôme graduation + Spécialité	Diplôme Post graduation + Spécialité	Grade	Type d'intervention *	Emargement
NASRAOUI Bouzid	Ingénieur d'état en Agronomie Spécialité : Protection des végétaux	Doctorat en Agronomie, spécialité : Phytopathologie	Prof	Cours, TD, TP, Encadrement de Stage et de Mémoire	

5 – Specific material resources available

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

Title of laboratories:

Biochemistry laboratories

Laboratory of microbiology and phytopathology

Chemistry and Phytopharmacy Laboratory

Laboratory of animal biology and physiology

Zoology and Nematodology Laboratory

Botany Laboratory

Student capacity: each lab can hold an average of 20 students.

Title of the laboratory:

Biochemistry

Capacity in students:

20

N°	Equipment title	Number	observation
01	hematocrit	05	
02	microscope	02	
03	Hotplate	01	
04	Electronic scale	04	
05	pH meter	List	
06	Chromatography tank	List	
07	electrophoresis	01	
08	centrifuge	03	
09	Water bath	02	

Title of the laboratory:

Microbiology and Phytopathology

Capacity in students:

20

N°	Equipment title	Number	observation
01	Manual autoclave	02	
02	Automatic autoclave	01	
03	Incubator oven	02	
04	Anse Pasteur	03	
05	Microscope	12	
06	Magnifying glass	10	
07	Bunsen burner	20	
08	Oven sterilizer	01	
09	colony counter	01	
10	Fridge	01	
11	Analytical balance	01	
12	Water bath	01	

Title of the laboratory:

Animal Biology and Physiology

Capacity in students:

20

N°	Equipment title	Number	observation
01	Microscope	20	
02	Analytical balance	06	
03	Dissection kit	12	
04	spectrophotometer	01	
05	Vertical electrophoresis tank	01	
06	thin layer chromatography	05	
07	overhead projector	02	
08	Slide device	01	
09	pH meter	06	
10	Electronic thermometer	08	
11	Hematocrit device	01	
12	Centrifuge	02	
13	Water bath	03	
14	magnifying glass	10	
15	Steamroom	02	
16	Fridge	01	
17	Balloon heater	04	
18	Hotplate	05	
19	Magnetic agitator	04	
20	Biology model	20	
21	Prepared slide	A series	
22	malasses cell	10	

Title of the laboratory:

Chemistry and Phytopharmacy

Capacity in students:

20

N°	Equipment title	Number	observation
01	Laboratory pH meter	03	
02	Laboratory conductivity meter	02	
03	portable pH meter	02	
04	Portable conductivity meter	02	
05	oven	01	
06	Flame Photometer	01	
07	Balloon heater	02	
08	Hotplate	02	
09	portable scale	02	
10	Analytical balance	01	
11	Electronic thermometer	04	
12	Vacuum pump	02	
13	Visible UV Spectrophotometer	01	
14	gas chromatography	01	
15	Portable oximeter	01	
16	Water bath	01	
17	Case for water analysis	01	

Title of the laboratory:

Zoology and Nematodology

Capacity in students:

20

N°	Equipment title	Number	observation
01	Water bath	02	
02	Analytical balance	04	
03	Bunsen burner	02	
04	Dissecting box	09	
05	Blade holder box	10	
06	MALASSEZ cell	03	
07	Refrigerating centrifuge	01	
08	Zoology Prepared Blade Box	01	
09	Histology Prepared Slide Kit	01	
10	Botanical Prepared Blade Box	01	
11	conductivity meter	01	
12	Dissecting bowl	01	
13	Steamroom	01	
14	drainer	02	
15	Hygrometer for breeding chamber	01	
16	Halogen lamp	01	
17	hand magnifier	01	
18	Circulation cryostat	01	
19	Steamroom	01	
20	drainer	01	
21	Hygrometer for breeding chamber	01	
22	microscopes	14	
23	Micrometer	02	
24	Micropipette 10 µl	02	
25	pH meter	01	
26	Hotplate	02	
27	Cork dissection plate	14	
28	Pipette holder	10	
29	wooden rack	10	
30	Metal rack	07	
31	Stereoscope	01	
32	human skeleton	01	
33	Support for burette	10	
34	Sieve holder	04	
35	Sieve Series	02	
36	probe thermometer	02	

Title of the laboratory:

Botanical

Capacity in students:



20

N°	Equipment title	Number	observation
01	Projector screen	01	
02	Binocular loupes	12	
03	Optical microscopes	12	
04	Dissecting box	12	
05	Overhead projector	01	
06	spatula	10	
07	Jars 1000ml	20	
08	Beaker 400ml	20	
09	Erlenmeyer flask 250ml	14	
10	Erlenmeyer flask 500ml	10	
11	Metal rack	07	
12	Stereoscope	01	
13	human skeleton	01	
14	Support for burette	10	
15	Sieve holder	04	
16	Sieve Series	02	
17	probe thermometer	02	
18	Test tube 1000ml		
19	Test tube 500ml	20	
20	Test tube 250ml	20	
21	Bottle with cap 1000ml	10	
22	Bottle with cap 500ml	12	
23	Bottle with cap 250ml	12	
24	plastic funnel	20	
25	Glass funnels	22	
26	Packed blades	200	

B- Internship sites and in-company training:

Training place	Number of students	Training period
Farm of 10 ha at the University of KhemisMiliana	20	3 months
Pilot farms BessamiDjilali of BirOuledKhelifa W AinDefla	04	3 months
Private farms in the wilaya of AinDefla	06	3 months
Chlef SRPV	02	3 months
“Water-Rock-Plant” research laboratory	08	3 months

C- Master's support research laboratory(ies)

Chef du laboratoire : Lazali Mohamed	
N° Agrément du laboratoire	
Date : 03/12/2003	
Avis du chef de laboratoire : A.F. 	

Chef du laboratoire	
N° Agrément du laboratoire	
Date :	
Avis du chef de laboratoire:	

D- Master's support research project(s):

Title of the research project	Project code	Project start date	Project end date
Study of the bio-ecology of some animal species in agro-ecosystems and hydrosystems in the Haut Cheliff plain.	F03920130023 D04N01UN440120120012	2014	2016 [

E- Personal workspaces and ICT:

Materials/Unit	Presentations	Exits	Seminars	Conferences	Exercises at home
Semester 1					
UF					
Bioclimatology		X		X	X
Tillage and fertilization		X			
Phytoprotection	X	X	X	X	
UM					
Plant ecology		X	X	X	
Plant improvement	X	X		X	X
UD					
weed science		X		X	
UT					
Communication	X		X		
Semester 2					
UF					
General phytopharmacy	X	X	X		X
Arboriculture and viticulture	X	X	X	X	
Vegetable crops	X	X		X	
Phytopathology		X	X	X	
UM					
Big cultures	X	X	X		
Nematodology					
UD					
Working method and initiation to research		X	X		
UT					

Legislation	X				
Semester 3					
UF					
Special phytopharmacy	X	X		X	X
Arthropodology	X	X	X	X	
Toxicology and residue analysis		X	X		
UM					
Agricultural experimentation		X	X		X
computer science					X
UD					
Scientific English	X				X
UT					
Entrepreneurship		X		X	

X = personal work

II – Half-yearly lesson organization sheet

1- Semester 1:

Teaching unit	VHS	V.H weekly				Coefficient	Credit	Assessmentmethod	
	15 sem	C	TD	PracticalWork	Others			Continued	Review
Fundamentalteachingunits						9	18	40%	60%
UEF1 (O/P)									
M1: Nutrition and metabolism Plant	67h30	1h.30	1h.30	1h.30	82h30	3	6		
M2: Soil-water analysis technique	45h	1h.30		1h.30	55h	2	4		
UEF2 (O/P)									
M3: Plant-environment interaction	45h	1h.30	1h.30	-	55h	2	4		
M4: Technical crop routes	45h	1h.30	1h.30	-	55h	2	4		
Methodologyteaching units						5	9		
UEM (O/P)									
M1: Data analysis and Calculation tools	60h	3h	1h		65h00	3	5		
M2: Environmental toxicology	45h00	1h.30	1h.30		55h00	2	4		
Discoveryteaching units						2	2		
UED1 (O/P)									
phytopollution	45h00	1h.30	1h.30		5h	2	2		
Transversal teaching units						1	1		
UET1 (O/P)									
Communication	22h30	1h.30	-	-	02h30	1	1		
Total Semester 1	375h	225h00	90h00	60h00	375h	17	30		

2- Semester 2:

Teaching unit	VHS	V.H weekly				Coefficient	Credit	Assessmentmethod	
	15 sem	C	TD	PracticalWork	Others			Continued	Review
Fundamentalteachingunits						9	18	40%	60%
UEF1 (O/P)									
M1: Biotechnology	45h	1h.30	1h.30		55h	2	4		
M2: Soilless culture	45h	1h.30		1h.30	55h	2	4		
UEF2 (O/P)									
M3: Physiology of fruit development	67h30	3h	1h.30		82h30	3	6		
M4: Crop protection	45h	1h.30	1h.30		55h	2	4		
Methodologyteaching units						5	9		
UEM (O/P)									
M1: Microbiology of fruits and vegetables	60h	1h.30	1h	1h.30	65h00	3	5		
M2: Nutritional aspects and morphogenesis of fruits and vegetables	45h00	1h.30		1h.30	55h00	2	4		
Discoveryteaching units						2	2		
UED1 (O/P)									
M1: Biological control	45h00	1h.30	1h.30		5h	2	2		
Transversal teaching units						1	1		
UET1 (O/P)									
M1 : Legislation	22h30	1h.30			02h30	1	1		
Total Semester 2	375h	225h00	90h00	60h00	375h	17	30		

3- Semester 3:

Teaching unit	VHS	V.H weekly				Coefficient	Credit	Assessmentmethod	
	15 sem	C	TD	PracticalWork	Others			Continued	Review
Fundamentalteachingunits						9	18	40%	60%
UEF1 (O/P)									
M1: Secondary Metabolism and Regulation	45h	1h.30	1h.30		55h	2	4		
M2: Conservation and transformation technique	45h	1h.30	-	1h.30	55h	2	4		
UEF2 (O/P)									
M3: Production of seedlings andseed	45h	1h.30	1h.30	-	55h	2	4		
M4: Crop diseases	67h30	03h	1h.30	-	82h30	3	6		
Methodologyteaching units						5	9		
UEM (O/P)									
M1: Physico-chemical analysis of fruits and vegetables	60h	1h.30	1h	1h.30	65h00	3	5		
M2: Computer science	45h	1h.30	1h.30		55h	2	4		
Discoveryteaching units						2	2		
UED1 (O/P)									
M1: Aromatic and medicinal plants	45h00	1h.30	1h.30		5h	2	2		
Transversal teaching units						1	1		
UET(O/P)									
M1: Entrepreneurship	22h30	1h.30			02h30	1	1		
Total Semester 3	375h	225h00	90h00	60h00	375h	17	30		

4- Semester 4:

Field: Natural and Life Sciences

Branch: Agricultural Sciences

Speciality: Plant production

Internship in a company sanctioned by a dissertation and a defence.

	VHS	Coefficient	Credit
Personal Work			
Internship in a company	250	05	10
Seminars			
Other (Supervision)	500	10	20
Total Semester 4	750	15	30

5- Overall summary of the training: (the separate overall Hourly Volume in Courses, TD, Practical Work for the 04 teaching semesters, for the different types of TU)

TU VH	FTU	MTU	DTU	TTU	Total
Courses	315	157.5	67.5	67.5	607.5
TD	225	67.5	67.5	00	360
Practical Work	67.5	90	00	00	157.5
Personal Work	742.5	360	15	7.5	1125
Others (Supervision /internship)	500	250			750
Total	1850	925	150	75	3000
Credit	74	37	6	3	120
% in credits for each teaching unit	61.67%	30.83%	5%	2.5%	100%

III - Detailed program by matter

Title of the Master: Plant production

Semester 1

Title of teaching unit: Fundamental teaching unit

Matter title: Plant nutrition and metabolism

Credits: 6

Coefficients: 3

Teaching objectives:

The objective of this module is to study the nutrition and metabolism of plants as well as the factors (internal and external) involved.

Recommended prior knowledge:

Know mineral nutrition and water nutrition, interaction between the two nutrients, importance of external factors in nutrition as well as basic notions on metabolism.

Material content:

Interception of light energy, photochemical reactions, carbon metabolism, distribution of assimilates, regulation of photosynthetic activity.

Water supply (absorption, transport), water status, carbon nutrition and mineral nutrition.

Effects of stress on measurements of photosynthesis, respiration, transpiration, stomatal conductance, water and osmotic potential.

Assessment method: Examination and continuous monitoring

Personal work: Presentations

References:

- Jean –François Morotet *al.*, 2012. Biologie végétale. 2ème ed. Dunod,
- Laval D.,MAZliac M. et P., 1995. Physiologie végétale. « Nutrition et métabolisme »,Vol I.

Title of the Master: Plant production

Semester: 1

Title of teaching unit: Methodology teaching unit

Matter title: Soil-water analysis technique

Credits: 4

Coefficients: 2

Teaching objectives:

The objective of this module is to study the characteristics of soil quality, techniques for improving its properties. Study of the dynamics of water in the soil.

Recommended prior knowledge:

Know the composition of the soil and the influence of the physico-chemical properties on plant development, study of the dynamics of water and nutrients and the techniques of soil analysis and water quality.

Material content:

Mechanisms of mobility of major elements: soil composition and influence on physico-chemical properties, role of organic matter, role of the rhizosphere, study of water and nutrient dynamics.

Soil and fertilization

Soil quality characterization tools: crop profile, physico-chemical analyses, tools for evaluating biological activity, establishment of an agronomic diagnosis on the potential of a soil.

Technique and equipment for improving the physical, chemical and biological properties of soils: organic amendments, basic amendments, tillage, soil protection, etc. Methods of reasoning tools and management of fertilization, main fertilizers and selection criteria, methods of contributions. Environmental aspects of fertilization (vulnerable zone...). Case study.

Mastery of water

Reminder on: states of water in the ground, reserves, availability, climatic demand, etc. Notions of fluid mechanics and applied hydrology.

Methods for estimating irrigation doses and frequencies (water balance, tensiometer)

Personal work: Presentations

Assessment method: Examination and continuous monitoring

References:

- Claude Cardot - Ellipses-Marketing. Les traitements de l'eau : procédés physico-chimiques et biologiques, cours et problèmes résolus.

Title of the Master: Plant production

Semester: 1

Title of teaching unit: Fundamental teaching unit

Matter title: Plant-environment interaction

Credits: 4

Coefficients: 2

Teaching objectives:

Demonstrate the existing relationship between the environment (soil, climate) and the development of the plant; the soil-root interaction as well as the importance of these interactions.

Recommended prior knowledge:

Know the different biogeochemical cycles, the interactions between climate-plant-soil.

Material content:

- Bioclimate: Plant-climate interactions (evapotranspiration, temperature, CO₂ exchanges)
- Soil physics: Physical soil-root interactions (soil structure and development of root systems, water flow in soils and uptake by plants).
- Soils and biogeochemical cycles: main cycles (nitrogen, carbon, phosphorus, potassium) bioavailability for plants

Assessment method: Examination and continuous monitoring

Personal work: Presentations

References :

- Duthion, C. 1972. Les réactions des plantes aux excès d'eau. Bulletin technique d'information - Assainissement et drainage (second volume) Ministère de l'agriculture, France, No 273--274: p. 1071-1076.
- Relation sol-climat-plante. Duris Daniel.,2015. CIRAD-IRCC, 4 p
- Support de Cours :
- Adaptation des végétaux aux conditions variées des milieux
- Les végétaux et l'eau.
- Relation eau – sol- plante.
- Site Internet : kha-tastophique de Kha

Title of the Master: Plant production

Semester: 1

Title of teaching unit: Fundamental teaching unit

Matter title: Technical itineraries of cultures

Credits: 4

Coefficients: 2

Teaching objectives:

The aim of this module is to study the different methods used to develop cultures, which influence the quantity and quality of the final product.

Recommended prior knowledge:

Know the main cultivation techniques for the various crops

Material content:

Mainly notions of technical itinerary, cultural techniques (objectives, possible choices, field crops, arboriculture, market gardening), in relation to the physical and biological nature of nutritional supports, water and mineral resources, and the nutritional requirements of plants.

Personal work: Educational outing

Assessment method: Examination and continuous monitoring

References :

- Prévost p., 1990. Les bases de l'agriculture moderne. Lavoisier, 261p .

-CIVAM AGROBIO 47 et CIVAM AGROBIO 33. Association de développement de l'Agriculture Biologique de Lot et Garonne., 2009 .Guide technique des grandes cultures.

Title of the Master: Plant production

Semester: 1

Title of teaching unit: Methodology teaching unit

Matter title: Data analysis and calculation tools

Credits: 5

Coefficients: 3

Teaching objectives:

Mastery of the statistical tool and its use in scientific research (classic statistical calculation and in relation to the computer tool).

Recommended prior knowledge:

Know the methodologies of experimental research.

Material content:

- Introduction to Experimental Research Methodology: Weighing problem.
- Definitions: factors, responses, experimental matrices, experimental plans, main effects, interactions.
- Screening of a large number of factors: Experiment matrices, Hadamard.
- Study of the influence of factors: Matrices of complete and fractional level factorial experiences, Matrix of aliases (merged effects), relationship of the definition, generators, independents, block effects, interaction diagrams for a model of the second degree.
- Composite matrices

Personal work: Presentations

Assessment method: Examination and continuous monitoring

References :

- Michel V., 1999. Méthodes expérimentales en agronomie. Pratique et analyse.

Title of the Master: Plant production

Semester: 1

Title of teaching unit: Fundamental teaching unit

Matter title: Environmental toxicology

Credits: 4

Coefficients: 2

Teaching objectives:

The knowledge acquired allows students to understand the effects of pollutants (pesticides) on plants. The impact of pollutants on agroecosystems.

Recommended prior knowledge:

Concepts of toxicology, the student must master a certain number of concepts in pollution, impact of pollutants on the agro-ecosystem.

Material content:

- Definitions (Eco toxicology and Toxicology, toxic intoxication, xenobiotic, ecosystem, pollutant and contaminant).
- Sources of contamination. Classification of pollutants. Physico-chemical properties of pollutants. Become pollutants in the environment.
- Lethal and sublethal effects and their natures.
- Population distribution of the sensitivity of individuals to toxic substances.
- Impact of pollutants on the agroecosystem.
- Action of pollutants in organisms and notion of Bio-indication. Contribution of omics sciences to bio-indication. Population effects of pollutants. Target and non-target species (for pesticides). Risk Assessment.

Personal work: Presentations

Assessment method: Examination and continuous monitoring

References :

- Livre de toxicologie.
- Charpin, D., 2004. L'air et la santé. Paris, Médecine-Sciences Editions Flammarion: 305p.
- CCI Marseille Provence, ADEME, *et al.* 1999. Guide régional du recyclage et de l'élimination des déchets. Marseille.

Title of the Master: Plant production

Semester: 1

Title of teaching unit: Discovery teaching unit

Matter title: Phytopollution

Credits: 2

Coefficients: 2

Teaching objectives

The objective of this module is to allow the student to know the importance and the impact of pesticides on the culture and on the environment.

Prior knowledge recommended

Know the role of pesticides in agriculture, impact of these pesticides on the environment. The importance of bioindicators.

Material content:

Definition of phytoextraction, phytodegradation, phytofiltration of organic pollutants and heavy metals.

Pesticides

Definition and history of pesticides.

The different classes of pesticides.

Active substances and plant protection preparations.

The different types of phytopharmaceutical treatments.

Physico-chemical characteristics of pesticides.

Modes of penetration of pesticides into organisms.

Fate of pesticides in organisms and the environment. Notions of residues, pre-harvest interval, limit of detection and limit of quantification.

Notions of primary and secondary targets, notions of target and non-target organism.

Assessment of risk, toxicity and efficacy.Registration of pesticides.

Bioindicators

Overview of the action of a pesticide in an organism.

Concept of environmental availability and bioavailability.

Interaction of a pesticide with its biological target

Traces left by a pesticide in an organism.

Concepts of biomarker.

Bio-indicator concept.Bio-indicator species.Population effects and biocenotic interactions.

Personal work: Mini-project

Assessment method: Examination and continuous monitoring

References :

- LPO Loire-Atlantique.,2008. Municipalité et protection de la nature. 56 p.

- Conseil Général Loire Atlantique.,2007. Pesticides : Quels dangers ? Quelles alternatives ? 27 p.

Title of the Master: Plant production

Semester: 1

Title of teaching unit: Cross-curricular teaching unit

Subject title: Communication

Credits: 1

Coefficients: 1

Teaching objectives:

The primary objective is to remove inhibitions and blockages in the presentation and defense of a work. For this, the students will be put in practical situations throughout this course.

Material content:

- Learning scientific English through the reading of specialized articles, the viewing of films and programs of a scientific and technical nature, the hearing of English-speaking speakers and the production and presentation of presentations in English.
- Learning and mastering the language will specifically target the use of international scientific and technical English.

Personal work: Presentations

Assessment method: Examination and continuous monitoring

References :

- LARREYA, Paul et Claude RIVIERE, Grammaire explicative de l'anglais, Longman Université, 1999 (nouvelle édition).
- JONES, D., 2003. English Pronouncing Dictionary, Cambridge University Press. - WELLS, J.C., 2000. Longman Pronunciation Dictionary, Longman.
- John R., 201 Market Leader. Business English Practice File. Cambridge University.

Title of the Master: Plant production

Semester: 2

Title of teaching unit: Fundamental teaching unit

Subject title: Biotechnology

Credits: 4

Coefficients: 2

Teaching objectives:

Know the different biotechnologies in varietal creation and mass propagation of plant species.

Recommended prior knowledge:

Know the different stages of plant production as well as the interest of using biotechnology.

Material content:

- Interest of plant biotechnologies in agronomy.
- Reminder of the main techniques, micro propagation, somatic embryogenesis, cell culture, embryo rescue, anther culture, induced mutagenesis, haploidization.
- Micropropagation is studied in detail, with a view to a technical itinerary, and the accent is placed on floral horticultural species.

Personal work: Presentations

Assessment method: Examination and continuous monitoring

References :

- J.-P. Baudoin 1997. Biotechnologie, Agronomie, Société et Environnement (B.A.S.E)
- O.C.D.E., 2001. Les Biotechnologies au service de la durabilité industrielle,
- O.C.D.E., 2004. Les Biotechnologies au service d'une croissance et d'un développement durable.
- O.M.S., 2005 . Biotechnologie alimentaire moderne, santé et développement : étude à partir d'exemples concrets. Département sécurité sanitaire des aliments.
- CEZARD., 2009. Biotechnologies en 26 fiches. Dunod, 160 p. ISBN 978-2-10-052221-7.

Title of the Master: Plant production

Semester: 2

Title of teaching unit: Fundamental teaching unit

Matter title: Soilless culture

Credits: 4

Coefficients: 2

Teaching objectives:

Know the technique of soilless cultivation, its advantages and disadvantages as well as the different stages of horticultural production, integrating the specific constraints of each actor in the sector. Its major advantages and its own difficulties are addressed in the context of the globalization of trade.

Recommended prior knowledge:

Know the different stages of plant production, have notions of fertilization as well as the interest of using soilless.

Material content:

- Definitions soilless culture
- The role of soilless greenhouses will finally be particularly developed in horticulture.
- Greenhouses, their climate, their modelling: development, main types, main climatic modifications, the main types of exchange, the determinism of aeration, the main types of modeling exchange, simplified single-zone models, multi-models -zones, fluid mechanics models.
- Air conditioning and greenhouse control: winter and summer air conditioning, fertigation control, greenhouse control, command control.

Personal work: Educational outing

Assessment method: Examination and continuous monitoring

References :

- Pierre Combriset *al.*, 2007 Fruits et légumes dans l'alimentation .Enjeux et déterminants de la consommation. Expertise scientifique.Inra.
- D.Blandet André J.P.,1985. Les cultures hors sol. Ed. Inra.
- Couteaudier Y.et Lemanceau P., 1989 ; Culture hors sol et maladies parasitaires.

Title of the Master: Plant production

Semester: 2

Title of teaching unit: Fundamental teaching unit

Subject title: Physiology of fruit development

Credits: 6

Coefficients: 3

Teaching objectives:

Know the physiological and biochemical principles involved in fruit development and the cellular and molecular mechanisms involved in formation and maturation.

Recommended prior knowledge:

Physiological factors and environmental effects affecting the growth, development and nutritional quality of fruits and vegetables.

Material content:

- The physiological factors and the environmental effects intervening on the growth, the development and the notional quality of fruits and vegetables (hydric food, carbonaceous food (filling of the fruit), nutrition, mineral, source/sink relationship, etc.).
- The physiological factors involved in maturation (the climatic process, the degradation of the wall, synthesis of secondary metabolites).

Personal work: Presentations

Assessment method: Examination and continuous monitoring

References :

- Vallade D.1999. Strudture et développement du fruit.
- Physiologie végétale. Tome 2.ed ;Dunod.
- Bloesch B. et Viret O., 2013. Stades phénologiques du développement du fruit. Revuearboriculture,vol. 45(2) : 128- 131.
- Mazliak P.,1998. Physiologie végétale II. Croissance et Développement.. Hermann ed.Dunod.
- Heller R., Esnault R., Lance C.. 2000. Physiologie végétale. 2. Développement. 6ème édition Dunod..

Title of the Master: Plant production

Semester: 2

Title of teaching unit: Fundamental teaching unit

Matter title: Crop protection

Credits: 4

Coefficients: 2

Teaching objectives

Deepening of the mechanisms involved in the development of diseases and main pests, mechanisms involved in methods of combating crop enemies.

Prior knowledge recommended

Know the main pests that attack crops and the mechanisms involved in the fight.

Material content:

- Notions of physiopathology
- Principles for identifying the main plant pathogens
- Principles for identifying the main pests
- Mechanisms involved in methods of fighting against viruses, bacteria and major pests.

Personal work: Educational outing

Assessment method: Examination and continuous monitoring

References :

- Pierre Ferron., 2000. Bases écologiques de la protection des cultures gestion des populations et aménagement de leurs habitats . Courrier de l'environnement de l'INRA n°41.
- Jean-Philippe Deguine, Pierre Ferron, Derek Russell, Protection des cultures : de l'agrochimie à l'agroécologie 2008, 187 p.)
- Sibylle Bui et Claire Lamine, Repenser la protection des cultures : Innovations et transitions 2011, 250 p.

Title of the Master: Plant production

Semester: 2

Title of teaching unit: Methodology teaching unit

Matter title: Microbiology of fruits and vegetables

Credits: 5

Coefficients: 3

Teaching objectives

Study of the food microflora and its elements making it possible to control the microbiological quality of plant products.

Prior knowledge recommended

Know the main food microorganisms and the methods of detecting these microorganisms.

Material content:

- Main microorganisms present in food
- The impact of microorganisms on the quality
- Mechanisms of microbiological spoilage of food
- Ecology of the main pathogenic microorganisms transmitted by food
- Interactions between micro-organisms in food ecosystems. Impact on the development of pathogenic or spoilage microorganisms.
- Methods for the detection and typing of pathogenic microorganisms in food
- Physico-chemical conditions determining the growth and survival of microorganisms in food.

Personal work: Presentations

Assessment method: Examination and continuous monitoring

References :

- BONNEFOY C., GUILLET F., LEYRAL G., VERNE-BOURDAIS E. Microbiologie et qualité dans les IAA, Coll Biosciences et Techniques - Coédition CRDP Aquitaine/ DoinEd, 2002
- BRANGER A., RICHER M.-M., ROUSTEL S., Microbiologie et alimentation, EducagriEd., 2007
- BRANGER A ., RICHER M.-M., ROUSTEL S., Alimentation, sécurité et contrôles microbiologiques, Educagri Ed., 2007

Title of the Master: Plant production

Semester: 2

Title of teaching unit: Methodology teaching unit

Matter title: Nutritional aspects and morphogenesis of fruits and vegetables

Credits: 4

Coefficients: 2

Teaching objectives

Knowledge of nutritional analysis techniques. The effect of preservation technology on the nutritional quality of fruits and vegetables.

Prior knowledge recommended

Provide the student with essential knowledge on the nutritional composition of fruits and vegetables, nutritional analysis techniques and the relationship between health and nutrition.

Material content:

Presentation of nutritional analysis techniques and their purposes.

Nutrition and health: Nutritional balance and imbalance, Fruits and Vegetables and health effects (epidemiological studies), health effects of fruits and vegetables and the role of their components.

Raw material review: (i) Overall composition, total protein, total ash, total reductant, crude fiber, antioxidant power. (ii) The specific components of fruits and vegetables: fibres, micronutrients, microconstituents. (iii) Nutritional analysis versus other analyses: objectives of nutritional analysis: overall effectiveness of a nutrient.

Study of bioavailability: establish the bioavailability and overall effectiveness of a nutrient.

Nutritional diagnosis (approach, regulations, etc.).

Impact of preservation and processing technologies on the nutritional quality of fruits and vegetables.

Innovations in fruit and vegetables and health.

Personal work: Educational outing

Assessment mode: Examination and continuous

References :

- LE GOFF Lilian, Alimentation bio-logique et équilibre nutritionnel, nourrir la vie, Roger Jollois, Paris, 1997.
- GREEN (Groupe de Recherche en Éducation Nutritionnelle), Aliments, alimentation etsanté, (Questions- réponses), TEC & DOC Ed, 2ème éd 2002, 512 p.

Title of the Master: Plant production

Semester: 2

Title of teaching unit: Discovery teaching unit

Matter title: Biological Control

Credits: 2

Coefficients: 2

Teaching objectives

Discovery and recognition of the main pests encountered in crops under cover, auxiliaries used in crops under cover and outdoors, the quality of auxiliaries, phytosanitary products: accounting. Antagonistic fungi and release programs (eggplant, peppers, strawberries, cucumbers, flowers, etc.).

Prior knowledge recommended

Know the importance of using auxiliaries and antagonistic microorganisms to control pests.

Material content:

- The main pests encountered in crops under cover.
- Auxiliaries used in crops under cover and outdoors.
- The quality of auxiliaries.
- Phytosanitary products: accounting.
- Antagonistic fungi.
- The release programs (eggplant, peppers, strawberries, cucumbers, flowers, etc.).

Personal work: Presentations

Assessment mode: Examination and continuous

References :

- Lepoivreph., 2003 .Phytopathologie. Phytopathologie : bases moléculaires et biologiques des pathosystèmes et fondements des stratégies de lutte Bruxelles.
- Bertrand J., 2001. Agriculture et biodiversité – un partenariat à valoriser. Ed. Educagri,

Title of the Master: Plant production

Semester: 2

Title of teaching unit: Cross-curricular teaching unit

Matter title: Legislation

Credits: 1

Coefficients: 1

Teaching objectives

Recognition of environmental regulations. Understand the behaviors, strategies and performance of companies within the sectors.

Prior knowledge recommended

Know the regulations and environmental policy and the level of state intervention within companies

Material content:

- Voluntary instruments of environmental policies and environmental regulations (economic approach to the environment).
- Pathways to environmental qualification in production (farm levels and producer organizations: organic, integrated agriculture).
- Concepts of quality in the agri-food sectors.
- Implementation of the standard in farms.
- Analyze the structures of agri-food chains.
- Studies of examples: an example in the fruit and vegetable agri-food sector. An example of state intervention in variety and seed quality control, and varietal innovation.

Personal work: Mini-project

Assessment method: Examination and average of Practical Work

References :

- MOLL M. et MOLL N. Sécurité alimentaire du consommateur, Tec et Doc Ed, Coll Sciences et Techniques Agroalimentaires, 2ème éd 2002, 472 p
- LAMY DEHOVE : Recueil des textes réglementaires concernant les produits alimentaires
- LAGRANGE L., TROGNON L., AMBLARD C., Produits alimentaires de terroir- signes de qualité et réglementation La transformation carnée à la ferme en trois ouvrages, collectif, Educagri éd., 2005, 262p.

Title of the Master: Plant production

Semester: 3

Title of teaching unit: Fundamental teaching unit

Matter title: Secondary metabolism and regulation

Credits: 4

Coefficients: 2

Teaching objectives

To study secondary metabolisms in plants and the relationship between secondary metabolism and production.

Prior knowledge recommended

The student must know the different secondary metabolisms; the interaction between primary, secondary metabolism and production.

Material content:

Secondary metabolism in plants (biochemistry, synthetic pathway, regulation).

Regulation, interactions between primary and secondary metabolism, carotenoids, phenolic compounds – Secondary metabolism and production.

Personal work: Presentations

Assessment method: Examination and continuous monitoring

References :

- Hopkins W.G., Physiologie Végétale, De Boeck Université, 2e édition, 2003
- Roland J.C et F, Atlas de biologie végétale, T2 : Organisation des plantes à fleurs, Dunod, 8e édition, 2001
- support de cours : Antoine Gravot, 2008: Introduction au métabolisme secondaires des végétaux.

Title of the Master: Plant production

Semester: 3

Title of teaching unit: Fundamental teaching unit

Matter title: Conservation and processing techniques

Credits: 4

Coefficients: 2

Teaching objectives

The objective of this module is to allow the student to know the methods of preserving fresh products (fruits and vegetables).

Prior knowledge recommended

Knowledge of the sector of food preparations based on fruits and vegetables with a reduced shelf life

Material content:

- Definition of new fresh plant products
- The various manufacturing operations, from the receipt of raw materials to the packaging of finished products: description and influences on the products.
- Interest in respecting the cold chain.
- Main preservation methods (in particular preservation under modified atmosphere).
- The transformation of products and the impact of innovative heat treatments on their quality and their microbiological lifespan.
- Role of packaging in the preservation of products.
- Structures of flexible and rigid packaging intended for new expenses.

Personal work: Educational outing

Assessment method: Examination and continuous monitoring

References :

- BRANGER A ., RICHER M.-M., ROUSTEL S., Alimentation et processus technologiques.Educagri Ed., 292p, 2007
- BRANGER A ., RICHER M.-M., ROUSTEL S., Alimentation, processus technologiques et contrôles- Manuel pour les élèves, Educagri Ed., 2009
- BRANGER A ., RICHER M.-M., ROUSTEL S., Alimentation, processus technologiques et contrôles- Livret de l'enseignant, Educagri Ed., 2009
- CHEFTEL J .C., CHEFTEL C., BESANÇON P., Introduction à la biochimie et à la technologie des aliments - 2 vol. -Tec et doc, Lavoisier, 1977 GRET, réseau produits fermiers, transformer les produits laitiers à la ferme, Educagri Ed., 2002.

Title of the Master: Plant production

Semester: 3

Title of teaching unit: Methodology teaching unit

Matter title: Production of seedlings and seeds

Credits: 4

Coefficients: 2

Teaching objectives

The objective is to master the techniques of plant and seed multiplication as well as the criteria for the production of quality plant material, in order to obtain healthy plant material.

Prior knowledge recommended

The student must have prior knowledge of the physiology of plants and seeds and a basic knowledge of the methods of multiplication of woody and herbaceous plants.

Material content:

- General information on woody plant propagation techniques
- Scientific bases for the production of seedlings and seeds
- Multiplication of fruit trees and vines
- Production in open-ground and above-ground nurseries
- Control and certification of plants and seeds
- Production scheme for certified seedlings
- Relationship between breeding and seed production
- Types of seeds
- Seed production fields
- Harvesting and packaging
- Quality control
- Case study: wheat, corn, alfalfa, potato

Assessment method: Continuous assessment examination

Personal work: Educational outing

References:

-MACIEJEWSKI Jean, 2013. Semences et plants (2^o Éd.) (Coll. Agriculture d'Aujourd'hui), Éditions Lavoisier, 216 p

-BOUTHERIN Dominique, BRON Gilbert, 2013. Multiplication des plantes horticoles (3^o Éd.), 276 p.

-TURNER Michae, 2013. Les semences, Presse Universitaire de Gembloux, 222 p

-Wolfgang Kawollek, M Kawollek, Stephan Cuzenic ; 2010. Tout sur la multiplication des plantes : Les techniques pour toutes les plantes de A à Z. Edit. Eugen Ulmer Eds

Title of the Master: Plant production

Semester: 3

Title of teaching unit: Fundamental teaching unit

Matter title: Crop diseases

Credits: 6

Coefficients: 3

Teaching objectives:

Study of crop diseases affecting fruits and vegetables, disease epidemiology.

Recommended prior knowledge:

Know the etiology, epidemiology and control methods used against pests and the main cryptogamic, bacterial, viral diseases of crops and conservation diseases.

Material content:

- Reminder on the objective of phytopathology
- Importance of plant diseases in agriculture
- Notion of disease etiology
- Notion of epidemiology
- Reminder on the classification of diseases
- Agents of infectious diseases
- Physiological diseases
- Cryptogamic diseases of vegetable crops and fruit trees:
 - Airborne diseases: gray rot, powdery mildew, mildew, etc.
 - Telluric diseases: Fusarium wilt, verticillium wilt, collar diseases, etc.
- Bacterial diseases of fruits and vegetables
- Viral diseases of vegetable and fruit crops.
- Storage diseases.
- Study of the mechanisms of pathogenesis
- Genetic interactions between plants and their pathogens

Personal work: Presentations

Assessment method: Examination and continuous monitoring

References :

- Livre : Pathologie végétale
- Roger CORBZ, 1990. Principes de phytodépollution et lutte contre les maladies des Plantes. Collection biologie.
- Vincent Charles, Bernard Panneton, et Francis Fleurat-Lessard, La lutte physique en phytoprotection, Paris, INRA 2000, 347 p.
- Gérard Raynal, Jean Gondran, René Bournoville et Michel Courtillot, Ennemis et maladies des prairies : maladies, ravageurs et parasites animaux, plantes parasites, troubles de la nutrition, Paris, INRA, coll. « Du Labo au terrain » 1989, 249 p.

Title of the Master: Plant production

Semester: 3

Title of teaching unit: Methodology teaching unit

Matter title: Physico-chemical analysis of fruits and vegetables

Credits: 5

Coefficients: 3

Teaching objectives

Acquire and use the chemical and physical techniques that make it possible to assess the nutritional and organoleptic qualities of a fruit or vegetable.

Prior knowledge recommended

Know the chemical and physical technique to assess the nutritional qualities of a fruit and a vegetable.

Material content:

- Composition of fruits and vegetables: in amino acids (essential amino acids), lipids and saturated and unsaturated fatty acids, in polysaccharides (starch, cellulose, pectins).
- Water and A_w (activity water). Determination of water content. A_w measurement; determination of sorption isotherms.
- Use of volumetric, optical and spectrophotometric, enzymatic, and chromatographic methods (HPLC, GC, CIHP) in the determination of the chemical composition of fruits and vegetables: assays of organic acids, reducing sugars, proteins and micronutrients: fat-soluble vitamins and water-soluble, provitamins, polyphenols, mineral salts.
- Study of aromatic molecules: extraction, purification, characterization, dosage (head-space methods, solvent extraction, steam distillation, fractionation, CPG); aromas as quality markers.
- The dosage of pesticide residues of other exogenous pollutants (heavy metals) and endogenous toxic substances.

Personal work: Educational outing

Assessment method: Examination and continuous monitoring

References :

- Les industries agroalimentaires .Selection 2014.Lavoisier. - www. Lavoisier.frGénie industriel alimentaire,Tome 1 : Les procédés physiques de conservation, Tec et Doc, 1991, 293p.
- BRANGER A ., RICHER M.-M., ROUSTEL S., Alimentation, sécurité et contrôles microbiologiques, Educagri Ed., 2007.

Title of the Master: Plant production

Semester: 3

Title of teaching unit: Methodology teaching unit

Matter title: Computer science

Credits: 4

Coefficients: 2

Teaching objectives

Master the use of computer tools

Prior knowledge recommended

Know the theoretical and practical bases in computer science

Material content:

- Computer operating systems
- Introduction to the use of software

Personal work: Presentations

Assessment method: Examination and continuous monitoring

References:

- Emmanuel Lazard, 2006. Architecture de l'ordinateur. Synthèse de cours et exercices corrigés . 247p.
- Michel Volle, 2006. De l'Informatique : savoir vivre avec l'automate, Economica.
- David Fayon, 1999. L'informatique, Vuibert.

Title of the Master: Plant production

Semester: 3

Title of teaching unit: Discovery teaching unit

Matter title: Aromatic and medicinal plants

Credits: 2

Coefficients: 2

Teaching objectives

The objective is to familiarize the student with the main aromatic and medicinal species cultivated and used in Algeria. The student will learn how to cultivate and multiply them and finally will know the technological principles of transformation in order to be able to choose the technical route that leads to the desired products.

Recommended prior knowledge: Plant Biology, Plant Taxonomy

Material content:

- History
- Production areas
- Study of species (Jasmine, Lavender and Lavandin, Perfumed Rose, Geranium, Rosat, Perfumed Mimosa, Mint, Lemon Verbena, Bigaradier)
- Cultivation techniques
- Harvesting and packaging
- Extraction and transformation processes

Personal work: Setting up a collection of aromatic plants

Assessment method: Examination and continuous monitoring

References:

- Eberhard Teuscher, Robert Anton, Annelise Lobstein, 2005. Plantes aromatiques : épices, aromates, condiments et leurs huiles essentielles, Éditions Lavoisier.
- Sofowora A. 1996. Plantes médicinales et médecine traditionnelle d'Afrique. 2ème édition, Editions Karthala : Paris, France ; 378p.
- Pousset JL. 1989. Plantes médicinales africaines - Utilisation pratique. Ellipses, ACCT : Paris
- Ake-Assi L, Guinko S. 1992. Plantes utilisées dans la médecine traditionnelle en Afrique de l'Ouest. Editions Roche-Basel: Switzerland;

Title of the Master: Plant production

Semester: 3

Title of teaching unit: Cross-curricular teaching unit

Matter title: Entrepreneurship

Credits: 1

Coefficients: 1

Teaching objectives

Using sector analysis tools, it is a matter of understanding the behavior and performance of companies based on the structure of the sector. Implement a systemic approach to business and its relationship with unstable environments. Know the main financial indicators of companies in terms of performance and solidity. Present the main management theories and understand current developments in corporate governance.

Assessment method: Continuous assessment examination

References:

- Xavier Lecocq, Benoît Demil, Vanessa Warnier ,2006, « Le Business Model, un modèle d'analyse stratégique », L'Expansion Management Review, no 123, hiver.
- Denis Dauchy, 2010. 7 étapes pour un Business Model solide, Dunod.
- Bernard Maître, Grégoire Aladjidi, Les Business Models de la nouvelle économie, Dunod 1999
- Henri Fayol, 1916, Administration industrielle et générale, Dunod.
- Jack Duncan, 1997. Les grandes idées du management. Des classiques aux modernes, Afnor, pp. 82-87.
- Henri Fayol,2003. Numéro spécial de la revue Entreprise et Histoire n° 34
- Peaucelle, ArizaMontès, Beaudoin, Boyns, Morales Gutierrez, Retière, Sasaki, Smith, Henri Fayol, 2003. inventeur des outils de gestion, Économica,

