PEOPLE'S DEMOCRATIC REPUBLIC OF ALGERIA

MINISTRY OF HIGHER EDUCATION AND SCIENTIFIC RESEARCH

HARMONIZATION

MASTER TRAINING OFFER

ACADEMIC/PROFESSIONAL

Establishment	Faculty / Institute	Department
MOHAMED KHEIDER BISKRA UNIVERSITY	EXACT SCIENCES AND SCIENCES OF NATURE AND LIFE	AGRONOMIC SCIENCES

Domain: NATURAL AND LIFE SCIENCES

Sector : AGRONOMIC SCIENCES

Specialty: HYDROPEDOLOGY

Academic year: 2016/2017

الجمهورية الجزائريةالديمقراطية الشعبية

وزارةالتعليم العالي والبحث العلمي

مواءمة

عرض تكوين ماستر

أكاديمي/مهني

المؤسسة	الكلية/ المعهد	القسم
جامعة محمد خيضر بسكرة	كلية العلوم الدقيقة و علوم الطبيعة و الحياة	العلوم الزراعية

الميدان: علوم الطبيعة و الحياة

الشعبة:الزراعة

التخصص:علم التربة والمياه

السنة الجامعية:2016-2017

SUMMARY

I – Master's identity sheet
(All fields must be completed)

1 - Location of the training:

Faculty (or Institute): Exact Sciences and Natural and Life Sciences

Department : Agricultural Sciences

2- Training partners *:

-other academic establishments:

University of Batna, University of Annaba, ENSA of Elharrach

-businesses and other socio-economic partners:

CRSTRA--ITDAS--DSA--INPV—INRAA -EAC- EAI- DGF- -CRBt-ITGC- ONA batna-ONID

Farmers; Date packaging units

-International partners:

Universities and research institutes, CIRAD FRANCE. University of RENNE; PADOVA ITALY University;

* = Present the conventions in the appendix to the training

3 – Context and objectives of the training

A – Access conditions*(indicate the license specialties which can give access to the Master)*

Hold a license in Aridoculture and Soil Diagnostics in arid regions, License in Agronomy (depending on course followed).

B - Training objectives*(skills targeted, educational knowledge acquired at the end of the training - maximum 20 lines)*

The soils of arid regions have been the subject of several development projects; they are subject to an aggressive climate which practically limits dry cultivation. The development of agriculture still poses many problems of halomorphy of soils, their deficient water regime and the cultivation techniques practiced. Currently the combined presence of soil and mineralized layers have favored the expansion of agriculture, however cultivation under irrigation inevitably leads to salinity and sodicity of the soil if irrigation is poorly controlled.
About it ; the sustainability of production systems in these arid regions is one of the major concerns of agricultural research. Scientists have already focused their attention on the soil-plant-water status. In fact, soil and water qualities combined with drainage water disposal possibilities are key elements of sustainable agriculture. It is for this reason that it seems that monitoring the chemical and hydrochemical facies of soils and irrigation water represents an important diagnostic tool.

About it ; to address the multiple problems of land development in arid regions and the multiple constraints facing agriculture, as well as to satisfy the need to increase our understanding of soil functioning problems and their impacts on agricultural production and the measures to be taken capable of improving our production system by relying on agronomic research for the implementation of sustainable eco-development projects.
We need a category of engineer or master's degree with particular skills in the field of hydro-pedology, morpho-pedogenesis, soil conservation, bio-geo-chemistry, physics of gypsum soils. limestone and salt, fertilization and organo-mineral amendment, control of irrigation and drainage of dirty water and mapping of soils for their development.
On this subject, we propose the opening of the specialty: "HYDROPEDOLOGY" as a master's degree within the framework of agronomic training of the agronomy department of Biskra whose objectives are:

- ✔ *To situate the soils in their ecological context for a better understanding of the state of fertility and to understand the very particular water functioning of these soils;*
- ✔ *Take inventory of soils and respond to the various problems of water and soil development;*
- ✔ *Delineation of suitability classes and agricultural vocation for better land use;*

- ✔ *Better management of irrigation water, groundwater and drainage water;*
- ✔ *Agricultural recovery of domestic wastewater;*
- ✔ *Control and fight against soil salinization;*
- ✔ *Control of fertilization and soil amendment*

Taking into account all these considerations, particular attention must be paid to justify the merits of this proposal.

a) In arid regions, the development of sustainable agriculture faces problems:

1. *Salinity, sodicity and even alkalinity of soils.*
2. *An arid climate with a deficient water regime.*
3. *A rise in loaded aquifers (salty, sulphated and polluted)*
4. *A heterogeneous topography made the gravity evacuation of water very difficult.*
5. *Poor management of irrigation using mineralized water*
6. *Poor drainage*

The cumulative effects of these different factors increase the risks of salinity and the degradation of soil fertility, thus limiting agricultural activity and land abandonment.

b) Arid regions remain the considerable environment for phoenicicultural production and intercropping with an expansion of market gardening, especially plasticulture. Hence the need to understand the three aspects linked to:

   1. *The response of crops to soil and climatic conditions;*
   2. *The simultaneous transport of water and salts;*
   3. *Adaptation and tolerance of crops to saline conditions.*

c) On a practical level, due to the biodiversity and agricultural potential of these regions, we underline the interest of such a proposal both at the applied level and at the research and training level;

d) These themes fit perfectly into the reflections and development projects carried out by the various institutions and agronomic research centers, for a better way of using land.

C – Targeted job profiles and skills*(in matters of professional integration - maximum 20 lines):*

Access to the hydropedology master's degree is open to holders of a degree in aridoculture and environment in arid regions and soil diagnosis. After four semesters of theoretical and practical courses; candidates will be able to take charge of the problem of the sustainability of dry farming through the control of the arid environment and the integrated management of natural resources, namely water and soil; better water and soil development of irrigated areas and reasoned optimization of agronomic techniques.

The diploma at the end of this training will have fairly broad skills in line with all the know-how required for sustainable agriculture such as:

- ✔ *Soil and water management;*
- ✔ *Synchronization of water applications with the most sensitive growing periods and better drainage for controlling piezometric levels of groundwater levels;*
- ✔ *Use cultural methods and agronomic practices that reduce water evaporation;*
- ✔ *Design water saving techniques;*
- ✔ *To participate in the development of techniques and research programs with a view to strengthening the resistance system of plants in arid environments, to salinity and aridity;*
- ✔ *Study of the vulnerability of soils and water tables to the risks of pollution by fertilizers and pesticides.*

D- Regional and national employability potential of graduates

1-Ministries and local and central public administrations:

- ✔ *Institutions under the supervision of the Ministry of Agriculture DSA, INPV, DGF, ONID,*
- ✔ *Technical institutes to conduct applied research*
- ✔ *National parks, nature reserves, botanical gardens…*
- ✔ *Local institutions like nurseries and APCs*

2-Small and medium-sized private and public companies working in the field of agriculture;

- ✔ *Design and consultancy offices and expertise in the fields of agriculture and forestry;*
- ✔ *Company for creating green spaces and reforestation and forest management company;*
- ✔ *Analysis laboratories (water, soil, etc.)*

3- Recruitment in Training and Professional Development Centers;

4- Access to university structures, research centers, units and research laboratories (INRAA; CRSTRA; .INRF…..);

E – Gateways to other specialties

The fundamental knowledge acquired during the preparation of the Master allows candidates to apply to national and international universities; to laboratories and university research organizations; for mobility with a view to preparing Doctorates in the following areas:

- ✔ *Ecopedology;*
- ✔ *Land development;*
- ✔ *Irrigation and drainage;*
- ✔ *Vegetable production ;*
- ✔ *Hydrogeology;*
- ✔ *Mapping and remote sensing of soil and water*
- ✔ *Soil conservation; …etc.*

F – Training monitoring indicators

1- *Continuous monitoring and permanent monitoring of student achievement in the form of written questions, reports and presentations;*
2- *Exams at the end of each semester.*
3- *Internship report at the end of the training cycle.*

G – Supervisory capacity(give the number of students that can be supported)

Between 15 and 30 students

4 – Human resources available

A: Teachers from the establishment working in the specialty:

Last name First Name	Graduation diploma + Specialty	Diploma Post graduation + Specialty	Grade	Type of intervention *	Registration
BELHAMRA Mohamed	Ecology	Ecology	Pr.	**Courses, TD, TP, Memory supervision**	
MASMOUDI Ali	Soil science	Soil science	MC (A)	**Courses, TD, TP, Memory supervision**	
BENZIOUCHE Salah eddine	Economy and rural development	Economy and rural development	MC (A)	**Courses, TD, TP, Memory supervision**	
BOUKHALFA Hassina hafida	Agricultural mechanization	Agricultural mechanization	MC (B)	**Courses, TD, TP, Memory supervision**	
BOUMAARAF Belgacem	Soil science	Soil science	MC (B)	**Courses, TD, TP, Memory supervision**	
BECHAR M. Farouk	Soil biology	Soil biology	MC (B)	**Courses, TD, TP, Memory supervision**	
BOUKEHIL Khaled	Agricultural mechanization	Agricultural mechanization	MA (A)	**Courses, TD, TP, Memory supervision**	
KASSAI Abla	Soil science	Soil science	MA (A)	**Courses, TD, TP, Memory supervision**	
KHACHAI Salim	Soil science	Soil science	MA (A)	**Courses, TD, TP, Memory supervision**	
GUIMER Kamal	Soil science	Soil science	MA (A)	**Courses, TD, TP, Memory supervision**	
MABREK Naîma	Agricultural hydraulics	Agricultural hydraulics	MA (A)	**Courses, TD, TP, Memory supervision**	
HAIOUANI Fatima	Soil science	Soil science	MA (A)	**Courses, TD, TP, Memory supervision**	

*** = Courses, tutorials, practical work, internship supervision, dissertation supervision,**

B: External supervision:

Home establishment:

Last name First Name	Graduation diploma + Specialty	Diploma Post graduation + Specialty	Grade	Type of intervention *	Registration
Prof. HALITIM Amor			PhD	Internship supervision, Dissertation supervision, other	
Pr. Hamdi aissa			PhD	Course ; Internship supervision, Dissertation supervision, other	
Ben Massoud Hassan			PhD	Course ; Internship supervision, Dissertation supervision, other	
Abd Eslam Salah			PhD	Course ; Internship supervision, Dissertation supervision, other	
Prof. Cheloufi abdelhamid			PhD	Course ; Internship supervision, Dissertation supervision, other	

Home establishment:

Last name First Name	Graduation diploma + Specialty	Diploma Post graduation + Specialty	Grade	Type of intervention *	Registration

Home establishment:

Last name First Name	Graduation diploma + Specialty	Diploma Post graduation + Specialty	Grade	Type of intervention *	Registration

*** = Courses, tutorials, practical work, internship supervision, dissertation supervision, other (to be specified)**

5 – Specific material resources available

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

Laboratory title: Soil physics laboratory
Student capacity:30

No.	Equipment title	Number	observations
1	Orbital shaker	02	
2	Mechanical stirrer	01	
3	Multi-parameter field analyzer (pH, conductivity, oximeter)	01	
4	Apparatus from Casa Grande	01	
5	Camera	01	
6	Sand bath 06l	01	
7	Water bath	04	
8	Electronic scale with internal calibration, range 150g/65g	02	
9	Compass	01	
10	Munsell Charter	01	
11	Digital stopwatch	05	
12	Clinometer	01	
13	Membrane hydrometer	01	
14	Universal oven	04	
15	Ceramic plate extractor; Richard's device	01	
16	Muffle furnace	01	
17	GPS III Plus	01	
18	Auger kit for sampling heterogeneous soils	01	
19	Laboratory glassware washing	01	
20	Percussion penetrometer	01	
21	Fixed and variable head permeameter	01	
22	Polar digital planimeter	03	
23	Diaphragm pump	02	
24	Electronic total station with memory	01	
25	Pocket stereoscope.	08	
26	Folding mirror stereoscope	01	
27	HP designjet 800 plotter and scanner	01	
28	Analytical sieve (gamma of 23 different mesh openings)	01	
29	Dial blood pressure monitor	01	
30	Electronic digital theodolite	01	

Laboratory title: Soil Chemistry Laboratory

Student capacity:30

No.	Equipment title	Number	observations
1	Heating magnetic stirrer	08	
2	BOD5 analyzer	01	
3	Device for studying pressure losses	01	
4	Bench-top autoclave	02	
5	Analytical balance, capacity 210g	03	
6	Precision balance, range 7200g	03	
7	Hydraulic bench	01	
8	Bunsen burner	30	
9	Plastic carboys capacity10 liters	30	
10	Mortar grinder	01	
11	Color CCD camera	01	
12	Yahita Benchtop Centrifuge	02	
13	Sigma Benchtop Centrifuge	01	
14	Colony counter	02	
15	Laboratory conductivity meter	03	
16	Water demineralization	01	
17	Ultrasonic disintegrator	01	
18	Vacuum Desiccator	05	
19	Water distiller	04	
20	Flow over a dam	01	
21	Drainer	03	
22	Thermostatic enclosure, internal temperature20°C	01	
23	Bernoulli's Theorem Proof Set	01	
24	Horizontal chamber kiln for ceramic firing	01	
25	Filter hood	02	
26	Refrigerated incubator	01	
27	Metro scope magnifying glass	05	
28	Elastic membrane manoscope	01	
29	Binocular microscope with camera and camera adapters	01	
30	Monocular microscope	10	
31	Mineralizer with heating block 06 stations	01	
32	Osborne Reynolds flow regime demonstration module	01	
33	Automatic level with straight optics	02	
34	Benchtop pH/mV meter	06	
35	Flame photometer	01	
36	Crucible tongs	30	
37	Atomic absorption photometer	01	
38	Plastic tray	10	
39	Hydrostatic pressure	01	
40	Backpack sprayer	01	
41	Mineralization ramp	01	
42	Laboratory refrigerator	01	

43	UV-VIS spectrophotometer	03	
44	Automatic universal titrator	01	
45	Dissection kits	10	
46	Laboratory turbidimeter	01	
47	Nitrogen distillation unit 06 stations	01	

B- Internship sites and in-company training:

Training place	Number of students	Training period
*ANRH*Constantine/Algiers	10	07 days
*BNEDER*Constantine/Algiers	10	07 days
*ONID*BISKRA	10	07 days
ITDAS BISKRA	10	07 days
*INRA*BISKRA / ALGIERS	10	07 days
*INPV*BISKRA / ALGIERS	10	07 days
ONA BATNA	10	07 days

C- Master's support research laboratory(ies):

Head of the laboratory: BELHAMRA Mohamed
Laboratory approval number: No. 87 of 04/14/2013
Date : **Opinion of the laboratory head: Ecosystem diversity and dynamics of agricultural production systems in arid zones**

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

Title of the research project	Project code	Project start date	Project end date
CNEPRU projects: Techno-economic analysis of the date sector in the Zibans region (Biskra)	F01420100014	2010	2013
CNEPRU projects: Study and development of water and soil resources in the Saharan region	F01420090025	2010	2012
PNR projects: Trace chemical elements in groundwater intended for AEP and irrigation in the wilaya of Biskra	08/2011	2011	2013

E- Personal work spaces and ICT:

II – Half-yearly teaching organization sheet

(Please present the forms for the 4 semesters)

1- Semester 1:

Teaching unit	VHS	Weekly VH				coefficient	Credits	Evaluation method	
	14-16 weeks	VS	T.D.	TP	Others			Continuous	Exam
Fundamental EU									
UEF1(O/P)									
Soil chemistry	45h	1h 30	/	1h 30	55	2	4	25%	75%
Soil physics	45h	1h 30	/	1h 30	55	2	4	25%	75%
Soil biology	45h	1h 30	/	1h 30	55	2	4	25%	75%
UEF2(O/P)									
Fundamental Basis of Irrigation	45h	1h 30	1h 30/15d	1h 30/15d	55	2	4	25%	75%
Water quality in agriculture1	10 p.m.	1h 30		/	27.5	1	2	25%	75%
EU methodology									
UEM1(O/P)									
Topography	33.75h	1h 30		1h 30/15d	41.25	2	3	50%	50%
Bioclimatology	33.75h	1h 30	1h 30/15d	/	41.25	2	3	25%	75%
UEM2(O/P)									
Hydrogeology	37.5h	1h 30	1h	/	37.5	2	3	25%	75%
Discovery EU									
UED1(O/P)									
Computer science	45h	1h 30	/	1h 30	5	2	2	50%	50%
Transversal EU									
UET(O/P)									
Communication	10 p.m.	1h 30	/		2.5	1	1		
Total Semester1	**375**				**375**	**18**	**30**		

2- Semester 2:

Teaching unit	VHS	Weekly VH				coefficient	Credits	Evaluation method	
	14-16 weeks	VS	T.D.	TP	Others			Continuous	Exam
Fundamental EU									
UEF1(O/P)									
Fundamental Basis of Drainage	45	1h30	1h30	/	55	2	4	25%	75%
Pedogenesis and soil classification	45	1h30	1h30/15d	1h30/15d	55	2	4	25%	75%
UEF2(O/P)									
Water quality in agriculture2	45	1h30	1h30/15d	1h30/15d	55	2	4	25%	75%
Fertilization	67.5	3	1h30	/	82.5	3	6	25%	75%
EU methodology									
UEM1(O/P)									
Biometrics	45	1h30	1h30		55	2	4	25%	75%
Methodology	37.5	1h30	1h		37.5	2	3	25%	75%
Environment and Sustainable Development	22.5	1h30	/	/	27.5	1	2	25%	75%
Discovery EU									
UED1(O/P)									
Mineralogy	45	1h30	/	1h30	5	2	2	25%	75%
Transversal EU									
UET1(O/P)									
Legislation	22.5	1h30			2.5	1	1		
Total Semester 2	**375**				**375**	**17**	**30**		

3- Semester 3:

Teaching unit	VHS	Weekly VH				coefficient	Credits	Evaluation method	
	14-16 weeks	VS	T.D.	TP	Others			Continuous	Exam
Fundamental EU									
UEF1(O/P)									
Soil development	45	1h30	1h30		55	2	4	25%	75%
Irrigation and drainage techniques and management	56.25	1h30	1h30	1h30/15d	68.75	3	5	25%	75%
UEF2(O/P)									
Water and soil conservation	45	1h30	1h30		55	2	4	25%	75%
Mapping and remote sensing	56.25	1h30	1h30/15d	1h30	68.75	3	5	25%	75%
EU methodology									
UEM1(O/P)									
Instrumental analysis	45	1h30		1h30	55	2	4	25%	75%
Professional ethics	22.5	1h30			27.5	1	2	25%	75%
Soil micromorphology	37.5	1h30		1h	37.5	2	3	25%	75%
Discovery EU									
UED1(O/P)									
Geomatics	45	1h30	1h30/15d	1h30/15d	5	2	2	25%	75%
Transversal EU									
Entrepreneurship and project management	22.5	1h30			2.5	1	1	25%	75%
Total Semester 3	**375**				**375**	**18**	**30**		

4- Semester 4:

Field: Natural and life sciences

Sector: Agronomy

Specialty: Hydropedology

Internship in a company culminating in a dissertation and a defense.

	VHS	coefficient	Credits
Personal Work (Memory)	500*	10	20
Internship in company	250**	5	10
Seminars			
Other (Thesis/Internship)			
Total Semester4	750	15	**30**

*UEF
**EMU

5- Overall summary of the training:(indicate the separate global VH in progress, TD, for the 04 semesters of teaching, for the different types of EU)

EU / V.H.	UEF	EMU	UED	UET	Total
Course	315	202.5	67.5	67.5	652.5
T.D.	157.5	63.75	11.25	0	232.5
TP	135	48.75	56.25	0	240
Personal work	742.5	360	15	7.5	1125
other (explain, list,)	500	250	0	0	750
Total	1850	925	150	75	3000
Credits	74	37	6	3	120
% in credits for each EU	61.67	30.83	5.00	2.50	100

III - Detailed program by subject

(1 detailed sheet per subject)

S1

Title of the Master: Hydropedology
Semester: 1
Title of the UEF:
Title of the subject: soil chemistry
Credits: 4
Coefficients:2

Teaching objectives
Recommended prior knowledge

Content of the subject

CHAPTER I: GENERAL CONCEPT

1- Elements of general chemistry
2- Equilibrium reactions

CHAPTER II: ION EXCHANGE PHENOMENA

1- Origin of charges
2- Exchangeability factors
3- Study method
4- Importance

CHAPTER III: THE SOIL SOLUTION

1- Study method
2- Characterization parameters

CHAPTER IV: DYNAMICS OF THE ELEMENTS

1- Salts
2- Oxides and hydroxides
3- Alteration mechanisms

B PRACTICAL WORK

- CEC and exchangeable cations
- Total limestone
- Gypsum
- Soluble salts
- pH
- Extraction and dosage of certain total and free elements
- Interpretation of chemical analysis results

Evaluation method:

- Course: EMD
- Practical work: graded report

Calculation of the average: (EMD average x 2) + TP / 3

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

- Quelles sont les ressources de la chimie verte ? Stéphane Sarrade ; Editeur : EDP Sciences ; 196 pages ; Date de Parution : 10/2008 ; ISBN : 978-2-86883-989-3
- La chimie et la nature : Jacques Amouroux ; Editeur : EDP Sciences ; 300 pages ; Collection L'Actualité Chimique Livres Date de Parution : 10/2012 ; ISBN : 978-2-7598-0754-3
- Chimie de l'environnement: Air, eau, sols, déchets/ Claus Bliefert, Robert Perraud. De Boeck Université, 2001 - 477 pages

Title of the Master: Hydropedology
Semester: 1
Title of the UEF:
Title of the subject: Soil Physics

Credits: 4
Coefficients:2

Teaching objectives

Recommended prior knowledge

Content of the subject

Subject Content

CHAPTER I: SOIL COMPONENTS

1- Different Phases
2- Soil Texture

CHAPTER II: SOIL STRUCTURE

1- Genesis and Evolution of Structure
2- Study Methods

CHAPTER III: POROSITY

1- Main Characteristics
2- Study Methods

CHAPTER IV: WATER IN THE SOIL

1- Water Potential
2- Water Retention
3- Water Movement
4- Water Balance

B. PRACTICAL WORK (30 hours)

Granulometric Analysis

Density Measurement

Structural Stability

Mechanical Properties

Moisture Characteristic Curves

Hydraulic Conductivity

Personal Work: It can take the form of presentations, reports, bibliographical research, surveys, essays, or other types of assignments.

Evaluation Method:

Lectures: End-of-module exam (EMD)

Practical Work: Graded report

Personal Work

References (Books and Handouts, Websites, etc.):

- Physique du sol ; André Musy, Marc Soutter - 1991 ;
- Problèmes de la physique du sol ; N. A. Katchinsky, A. A. Yarilov - 1934 – Extraits
- Le profil cultural: principes de physique du sol **;** S. Hénin – 1960.

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

- Soil physics;André Musy,Marc Soutter- 1991;
- Problems in soil physics; NA Katchinsky,AA Yarilov- 1934 – Excerpts
- The crop profile: principles of soil physics**;**S. Hénin– 1960

Title of the Master: Hydropedology
Semester: 1
Title of the UEF:
Title of the subject:soil biology

Credits: 4
Coefficients:2

Teaching objectives

Recommended prior knowledge

Content of the subject

CHAPTER I: ORGANIC CONSTITUENTS

1- Living organisms
2- Organic compounds

CHAPTER II: THE BIOLOGICAL ACTIVITY OF SOILS

1- Study method
1- Areas of application

CHAPTER III: BIOCHEMICAL CYCLES

1- Carbon
2- Nitrogen
3- Sulfur

b. PRACTICAL WORK (15 hours)

- Seeding and compaction
- Measurement of biological activity
- Strains isolation
- Fractionation of organic compounds

Personal work: it can be: Presentations, reports, bibliographic research, surveys, essays, others.

Evaluation method:

- Course: 2 EMD
- Practical work: graded report

-Personal work

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

- Le sol vivant: Bases de pédologie, Biologie des sols ; Jean-Michel Gobat, Michel Aragno, Willy Matthey - 2010
- La biologie du sol: Cours Biologie générale, destiné aux étudiants section SIE; Hauke Harms - 2002
- La biologie des sols ; Yvon Dommergues – 1968

Title of the Master: Hydropedology
Semester: 1
Title of the UEF:
Title of the subject:fundamental basics of irrigation

Credits: 4
Coefficients: 4

Teaching objectives introduce students to irrigation management and calculations for irrigation projects.
Recommended prior knowledge

Content of the subject
IRRIGATION FUNDAMENTALS
PART I - FUNDAMENTAL PRINCIPLES OF IRRIGATION WATER NEED
CHAPTER 1: GENERAL
CHAPTER 2: WATER REQUIREMENTS OF CROPS
2.1 Influence of climate on crop water requirements 2.2 Influence of crop type on crop water requirements
2.2.1 Influence of crop types on harvesting daily water requirements 2.2.2 Influence of crop type on water requirements of seasonal crops
2.3 Influence of crop growth phase on crop water requirements 2.4 Determination of crop water requirements
CHAPTER 2: CONCEPT OF EFFECTIVE RAIN
CHAPTER 3: IRRIGATION WATER NEEDS
PART II - DETERMINATION OF IRRIGATION WATER REQUIREMENTS
CHAPTER 1: GENERAL
CHAPTER 2: CLIMATE AND CULTURE
2.1 Main climatic zones 2.2 Main growing zones
CHAPTER 3: WATER NEEDS OF CROPS
3.1 INFLUENCE OF CLIMATE ON CROPS' WATER REQUIREMENTS (ETO)
3.1.1 Introduction 3.1.2 Method of measuring evaporation
- direct measurements: Evaporation tank (class A) - The Colorado tank - The ORSTOM tank - The floating tanks - The evaporometers
- empirical methods
- analytical methods: Water balance method.

3.1.3 Method for measuring evapotranspiration
- direct in situ measurements; (LYSIMETER)
- analytical, based on water balance or energy balance;
- empirical, based on the statistical analysis of observations.

3.2 INFLUENCE OF CROPPING TYPE ON CROP WATER REQUIREMENTS (Kc)
3.2.1 Introduction
3.2.2 Determination of the total vegetation period
3.2.3 Determination of growth Steps
3.2.4 Determination of crop factors
3.3 CALCULATION OF CROP WATER REQUIREMENTS

3.3.1 Presentation
3.3.2 crop water requirement Example of calculation
3.3.3 Special cases
3.3.4 Indicative values of crop water needs

CHAPTER 4: IRRIGATION WATER NEEDS

4.1 INTRODUCTION
4.2 DETERMINATION OF EFFECTIVE RAIN
4.3 CALCULATION OF IRRIGATION WATER REQUIREMENTS
4.4 NEED FOR IRRIGATION WATER(CASE STUDY)

CHAPTER 5: CALCULATION EXAMPLE

IV. STUDY OF THE IRRIGATION PROJECT

B. DIRECTED WORK

Study of the irrigation project (application of the course)

C. PRACTICAL WORK (9 hours)

TP1

a/ Determination of soil humidity level

b/ Determination of apparent density

TP2 Management of lysimetric tanks or evapotranspirometers

Personal work: it can be: Presentations, reports, bibliographic research, surveys, essays, others.

Evaluation method: EMD + PERSONAL WORK

Références *(Livres et polycopiés, sites internet, etc).*

- Traité pratique de l'irrigation des prairies Flor. Joseph Keelhoff – 1856
- Etudes et prospections pédologiques en vue de l'irrigation ; Fao - 1990

Title of the Master: Hydropedology
Semester: 1
Title of the UEF:
Title of the subject:water quality in agriculture 1

Credits: 2
Coefficients: 1

Teaching objectives The relationship between water and the environment must be well understood by today's engineer. In agricultural hydraulics, this notion meets the dual objective: (1) to increase the potential for drinking water and (2) to meet agricultural needs. This program must lead the student to master the parameters allowing the use of lower quality water in agriculture.

Recommended prior knowledge

Content of the subject

I. GENERAL INFORMATION ON WATER QUALITY

1. Water from a physical point of view (molecule, physical properties)
2. Water chemistry

- Water solvent (solubility, hydrophilation, ionization)
- Redox

3. Water and biology

- Cellular metabolism
- Microbial life, nutrients

4. Comparative study between the properties of sea water, lagoon and dam wadi

II. QUALITY INDICATORS

1. Turbidity, suspended solids
2. pH
3. Chemical oxygen demand
4. Biochemical oxygen demand
5. Salinity indices of water (units and methods of measurement)
6. Toxicity and quality criteria around the world

III. ACTION OF WATER ON HYDRO AGRICULTURAL WORKS

- Action of carbon dioxide
- Calco-carbon balance in water
- Secondary corrosion parameters
- Influence of mineralization, temperature, microorganisms, pH
- Total hardness, carbonated hardness, non-carbonated hardness: (concept of corrosiveness and aggressivenessof water)

IV. CONFERENCE ON WATER QUALITY IN ALGERIA (CONFERENCE + PRESENTATIONS) (3 HOURS)

CONVENTIONAL RESOURCE (RESERVOIR, DAM, WELL, SPRING, FOGGARAS) AND NOTCONVENTIONAL (WASTE WATER, DRAINAGE WATER, BRAISY WATER, SEA WATER ... ETC.)

1. Conventional and unconventional water needs of agriculture
2. Quality of the different waters encountered in Algeria
3. Reuse of purified wastewater in irrigation (potentialities, situation of WWTPs, cropping systems, appropriate irrigation techniques, etc.)

b. PRACTICAL WORK

1. Measurement of salinity, pH and water distillation
2. Measuring the chemical oxygen demand of polluted water
3. Measuring the biochemical oxygen demand of polluted water
4. Determination of the alkalimetric titer of water
5. Dosage of nitrates, nitrites in water

vs. TUTORIALS

- Calculation of alkalimetric titers of water
- Calculation of BOD and COD
- Classification of irrigation water compared to standards

Personal work: it can be: Presentations, reports, bibliographic research, surveys, essays, others.

Evaluation method:

- Course: Number of EMD = 1
- Practical and/or supervised work: 1 TD + 1 TP + PERSONAL WORK

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

- Topographie opérationnelle: Mesures, calculs, dessin, implantations ; Michel Brabant – 2011
- Topographie ; Guy Weelen - 1983
- Cours complet de topographie et de géodésie ; Benoit (Philippe-Martin-Narcisse, M.) – 1822

Title of the Master: Hydropedology
Semester: 1
Title of the EMU:
Title of the subject:topography

Credits: 3
Coefficients:2

Teaching objectives The objective of this module is to teach students to use the instruments necessary to produce maps and topographical surveys.

Recommended prior knowledge

Content of the subject

I. MISCELLANEOUS CONCEPT
l-1-Object of topography
l-2-Maps, plans
l-3-Subdivisions of topography
l-4-Plane coordinates
l-5-Concept of azimuth and bearing
l-6-Notions about mistakes and errors
II. PLANNING
II-1-Measuring distances
ll-1-1-Definition
ll-1-2-Direct measurement
ll-1-2-1-Definition
II-1 -2-2-Staking-alignment
ll-1-2-3-Chaining
ll-1-2-3-1-Chaining on flat ground
ll-1-2-3-2-Chaining on inclined terrain
ll-1-3-Indirect measurement of distances
II-1-3-1-Definition
ll-1-3-2-Optical measurement
II-1-3-2-1-Parallactic measurement
ll-1-3-2-2-Stadimetric measurements
ll-1-3-2-2-1-Principle of stadimetry
ll-1-3-2-2-2-Horizontal aim

ll-1-3-2-2-3-Angled aim

ll-1-3-3-Electronic measurements

ll-2-Measuring angles

ll-2-1-Definition

ll-2-2-Measurement of horizontal angles ll-2-3-Measurement of vertical angles

ll-3-Planimetric processes (Plan survey methods)

11-3-1-The meter process or by decomposition into triangles

ll-3-2-The “abscissa and ordinate” process

ll-3-3-The polygonal path

ll-3-3-1-The goniometric mode

ll-3-3-2-The declined mode ll-3-4-The radiation.

III. LEVELING

lll-1-Direct or geometric leveling

lll-1-1-Principle of leveling

lll-1-2-Procedures

lll-1-2-1-Compound or path leveling

lll-1-2-2-Leveling by radiation

lll-1-2-3-Mixed leveling

lll-2-Indirect leveling

lll-2-1-Geodesic leveling

lll-2-2-Trigonometric leveling

lll-3-Surface leveling

lll-3-1-Winning of curves

lll-3-2-Griding

lll-3-3-Sowing points

lll-3-4-Long and cross profiles

IV. TOPOMETRIC CALCULATIONS

IV-2-Calculation of the distance between two points

IV-3-Coordinate conversion

- Calculation of the bearing of a direction
- Calculation of areas

B. PRACTICAL WORK

- Distance measurements (direct and indirect)
- Radiation survey
- Survey by decomposition into triangles

- Leveling by path (long and cross profile)
- Surface leveling

C. DIRECTED WORK

-Calculation on deposits

- Determination of coordinates

Personal work: it can be: Presentations, reports, bibliographic research, surveys, essays, others.

Evaluation method:

- Course: Number of EMD = 1
- Practical and/or supervised work
- Personal work

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

- Topographie opérationnelle: Mesures, calculs, dessin, implantations ; Michel Brabant – 2011
- Topographie ; Guy Weelen - 1983
- Cours complet de topographie et de géodésie ; Benoit (Philippe-Martin-Narcisse, M.) – 1822

Title of the Master: Hydropedology
Semester: 1
Title of the EMU:
Title of the subject:Bioclimatology

Credits: 3
Coefficients:2

Teaching objectives : Objective of this subject is to present certain fundamental principles of bioclimatology: namely: radiative and convective transfer
It allows students to follow the exchanges that occur between the plant or plant community and its environment and interactions between the environment and living beings and whose impact has a medium and long term impact.

Recommended prior knowledge

Content of the subject

Introduction:
Definition and objectives of bioclimatology
Chapter.1: RADIATIVE TRANSFERS
1. Definitions and basic laws
3. Short wavelength radiation
4. Assessment of long wavelengths and the radiative balance on the ground
- Energy balance at ground level

Chapter 2. Plant evapotranspiration

- definition of ET
- Concept of ETP, ETM, ETR
- ET estimation methods
-a) Direct methods (class A evaporation pan , Lysimeter)
b) Indirect methods

Chapter 3: PLANT PRODUCTION PROCESSES
- Concept of characteristics and Architecture of a plant cover
- Concept of LAI (leaf area index)
- Plant productivity
- . The water stress of the plant
- Concept of drought and water stress for the plant
9. Relationship between productivity and water consumption

CHAPTER 4: CLIMATE CLASSIFICATION SYSTEMS
1-climatic factors
2-Climate approaches
3-Bioclimatic approaches

b. GUIDED WORK (10 p.m.)
- Calculation of FTE by direct and indirect methods
- Comparison of ETP, ETR ETM
- Water balance

- Determination of climate (climate synthesis)

Personal work: it can be: Presentations, reports, bibliographic research, surveys, essays, others.

Evaluation method: EMD + Continuous control of knowledge + personal work

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

- Bioclimatology: Concepts and applications;Sané de Parcevaux,Laurent Huber– 2007
- The Basics of Bioclimatology: training week, Méribel, March 19-23, National Institute of Agricultural Research (France). Department of Bioclimatology– 1986
- Mediterranean bioclimatology: org study days in Montpellier from May 18 to 20, 1983; proceedings of the Mediterranean Bioclimatology Conference; Gilbert Long - 1985

Title of the Master: Hydropedology
Semester: 1
Title of the EMU:
Title of the subject:hydrogeology

Credits: 3
Coefficients:2

Teaching objectives

Recommended prior knowledge

Content of the subject

CHAPTER I: SURFACE WATER

1- The flows
2- Hydrographic networks
3- Watershed
4- Gauging station

CHAPTER II: GROUNDWATER

1- Reservoir systems
2- the main aquifers in Algeria
3- Fundamental laws of groundwater flow
4- Laws of diffusion in porous media
5- Hydraulics of water wells
6- Practical use of variable speed

Water pumping tests

CHAPTER III: IRRIGATION WATER

1- Quantitative assessment of resources
2- Qualitative assessment

B. DIRECTED WORK

- Interpretation of hydrochemical data
- Series of exercises on free and confined sheet flow
- Water Pumping Exercise Series

vs. PRACTICAL WORK (15 hours)

- Use of piezometric maps
- Hydrodynamic characteristics of aquifers

- Permeability measurement
- One day outing in Algeria

Personal work: it can be: Presentations, reports, bibliographic research, surveys, essays, others.

Evaluation method:EMD

- Practical work: questioning for each practical work and an output report

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

- Bulletin d'hydrogéologie ; Université de Neuchâtel. Centre d'hydrogéologie
- Hydrogéologie - 3ème édition - Objets, méthodes, applications ; Eric Gilli, Christian Mangan, Jacques Mudry – 2012
- Hydrogéologie, géologie de l'ingénieur ; France. Bureau de recherches géologiques et minières – 1984.

Title of the Master: Hydropedology
Semester: 1
Title of the UED:
Title of the subject:Computer science

Credits: 2
Coefficients:2

Teaching objectives To do this, they will need to become familiar with two basic IT tools:

- A tool allowing them to manage their data.
- A tool allowing them to carry out statistical analyzes on their data.

This is why this module will be focused exclusively on the presentation of two types of software widely used by our students and available at the computing center:

- Spreadsheet software
- STATISTICAL software: STATITCF

Recommended prior knowledge

Content of the subject

FIRST PART: IT introduction

PART TWO: THE STATITCF STATISTICAL TOOL

I. GENERAL PRESENTATION OF STATITCF

M-Introduction

I.2.- Presentation of the STATITCF organization chart

I.3.- Use of function keys

I.4.- Some advice

I.4.1.- How to answer the questions

I.4.2.- How to choose the working file

I.5.- How to use the Programs

I.5.1.-General

I.5.2.- Data management option

1.6.- Limits of some programs

II. CARRYING OUT THE VARIANCE ANALYSIS

II.1.- Data management for analysis of variance

II.1.1.- Introduction

II.1.2.- Development of files compatible with variance analysis

II.1.3.- Data entry

II.2.- Carrying out the variance analysis

III. Databases

PART TWO: main statistical software

a- STATISTICA

b- SPSS

c- c- R software

B. GUIDED WORK (15 hours)

4.- Creation and manipulation of files under STATITCF

5.- Carrying out the analysis of variance under STATITCF

Personal work: it can be: Presentations, reports, bibliographic research, surveys, essays, others.

Evaluation method: Course: Number of EMD: 1

- Practical and/or supervised work

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

Title of the Master: Hydropedology
Semester: 1
Title of the UET:
Title of the subject:Communication
Credits: 1
Coefficients: 1

Teaching objectives

Recommended prior knowledge*English*

Content of the subject

1. Introduction to Soil Sciences
- Reading and comprehension
- Rephrasing
- Relationships between statements: consequence
- General statements of function

2. Soils as part of the environment
- Reading and comprehension
- Grammar: The forms of definitions

The impersonal passive

3. Soils as natural phenomena
- Reading and comprehension
- Rephrasing
- Relationships between statements: contrast

4. Factors of soil formation (1) Parent material
- Reading and comprehension
- Grammar: Time expressions

Expression of degree

5. Factors of soil formation (2) Climate
- Reading and comprehension
- Rephrasing
- Relationships between statements: exemplification
- Making tables from descriptions

-Writing descriptions of tables

6. Factors of soil formation (3) Topography
- Reading and comprehension
- Grammar: Comparative sentences

Contrastive sentences

- Making comparisons by inference

7. Water movement in soils

- Reading and comprehension
- Rephrasing
- Relationships between statements: reinforcement and similarity

8. Physical processes

- Reading and comprehension
- Definitions of processes
- General statements of process
- Statements and functions of process

- Definitions and descriptions of processes

9. Chemical processes

- Reading and comprehension
- Conclusions based on observations
- Generalizations
- Recommendations

-Predictions

10. Biological processes

- Reading and comprehension
- Classification and definitions
- Definition, description and identification
- Classification in diagrams and paragraphs
- Classification according to defining characterization

Personal work: it can be: Presentations, reports, bibliographic research, surveys, essays, others.

Evaluation method: EMD + personal work

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

Agronomist's handbook; France. Ministry of Foreign Affairs – 2002

S2

Title of the Master: Hydropedology
Semester: 2
Title of the UEF:
Title of the subject: Fundamental basics of drainage
Credits: 4
Coefficients:2

Teaching objectives In this module, we detail the design of horizontal drainage in shallow soil. We will first define the drainage modes, the network and its components, the studies necessary for the projection of a network then we will present the bases of hydrological and hydraulic modeling of agricultural drainage. A second part is devoted to the fight against salinity, particularly on techniques for leaching agricultural soils.

Recommended prior knowledge

Content of the subject

FIRST PART: Drainage of agricultural lands

1. 2 Soil Texture
1. 3 Soil Structure

CHAPTER II DRAWBACKS MOISTURE

2. 1 Characteristic of moisture soils
2. 1.1 Impermeability to air of moisture soils
2. 1.2 Lowering of temperature in moieture soils
2. 1.3 Plowing work resistance
2. 1.4 Root penetration resistance
2. 1.5 Drawbacks consequences on the production

CHAPITRE III DRAIN OBJECTIVES

3. 1 Drain importance
3. 2 Drain mechanism according to groundwater
   3. 2.1 Groundwater and drain
3. 3 Drain mechanism according to the vegetation
3. 4 Policy instrument
   3. 4.1 Outfitting
   3. 4.2 Drying
   3. 4.3 Drain types
      3.4. 3.1 Open trenches
      3.4. 3.2 Underground tubing
      3.4. 3.3 Mole plough Drains
      3.4. 3.4 Holding tanks

CHAPTER IV BASIS OF CALCULATION OR BASIS INFORMATION FOR DRAIN NEEDS QUANTIFICATION

4. 1 Basic Information
    4. 1.1 Optimal Level of the Groundwater
    4. 1.2 Flooding : Damage caused-Eligible duration
    4. 1.3 Critical rain
    4. 1.4 Average
4. 2 Underground drain
    4. 2.1 Subsurface flow to the drains
    4. 2.2 Experimental investigation of groundwater shape and water movement in drained soils
    4. 2.3 Sustainbale study of drained soils by using pipe lines
        4. 2.3.1 Drain positions
        4. 2.3.2 Drain spacing for the particular case : unconfined water and confining impermeable layers
        4. 2.3.3 General case
4. 3 Drained soil survey by using open trenches

CHAPTER IV Confined drain works

5. 1 Piping drain nature
5. 2 Premilinary studies : Basic data
5. 3 Drain patterns
    5. 3.1 Site topography strudies
    5. 3.2 General provision
    5. 3.3 Small drain management
    5. 3.4 Manifolds
    5. 3.5 Particular cases
        5. 3.5.1 Belt drainage
        5. 3.5.2 Site small depression forming a funnel
        5. 3.5.3 Sourcer site
5. 4 System depth –Drainage spacing
5. 4.1 Depth
5. 4.2 Spacing drainage
5. 5 Small drains Lenght and diameter

CHAPTER VI PIT DRAINAGE

6. 1 General Conception
6. 2 Ring road works
6. 2.1 Canal Belt Characteristics and pattern
    6. 2.1.1 Debit
    6. 2.1.2 Profile and slope
6. 3 Small trenches
6. 4 Manifold
6. 5 Working conditions

6. 6 Advantages et drawbacks

CHAPTER VII PUMPED DRAINAGE

CHAPITRE VIII EQUIPEMENTS AND MACHINES FOR DRAINAGE

8. 1 Manuel Equipment material
8. 2 Mechanical execution material

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

PART TWO: AGRICULTURAL DRAINAGE AND SALINITY

I. GENERAL INFORMATION ON SALINE SOILS

II. SALINE SOILS

11.1. Soil types

- Saline soils, saline alkaline soils
- Salinity indices

11.2. Classification

III. IRRIGATION WATER

- Total salinity of water (measurement, unit)
- Classification of water with regard to salinity
  - Alkalinity risk
  - Risk with regard to chlorides
  - Boron risk
  - Risk with regard to carbonates
  - Salinity tables
- Saltwater/Freshwater Mixture Formulas

IV.SALINE BALANCE AND LEACHING FRACTION

IV. 1. Salt balance equation

- Assumption
- Calculation of leaching fraction
- Applications

IV.2. Other laundry formulas.

v. TECHNIQUES FOR IMPROVING SALINE SOILS

V.1. Problem position

V.2. List of techniques

- Main methods
- Related methods

V.3. Necessary investigations for choosing a method

- Useful data
- Useful investigations
- Experimentation

-Modelization

B-P RACTICAL WORK

- soil particle size analysis
- Measurement of soil porosity, density
- Calculation of hydraulic conductivity

vs. TUTORIALS

- Tutorial: Calculation of the characteristic flow (1h30)
- Tutorial: Calculation of flows in RP and variable regime (3h)
- TD: Choice of length and depth of drains (1h30)
- TD: Salinity of irrigation water (1h30)
- Tutorial: Soil leaching problems (1h30)

Personal work: it can be: Presentations, reports, bibliographic research, surveys, essays, others.

Evaluation mode: EMD + TP +TD + PERSONAL WORK

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

- Drainage des terres agricoles : premier cour national post-gradue sur l'irrigation et le drainage et la gestion des ressources hydrique. Déjean Bélizair, 1945
- Ingénierie des eaux et du sol: Processus et aménagements ; Marc Soutter, André Mermoud, André Musy - 2007
- Premier Cours National Post-Gradue Sur L'Irrigation, Le Drainage ; Saraohin, H.L. – IICA Haití
- La conception des réseaux de drainage ; Organisation des Nations Unies pour l'alimentation et l'agriculture - 1984

Title of the Master: Hydropedology
Semester: 2
Title of the UEF:
Title of the subject:pedogenesis and soil classification

Credits: 4
Coefficients:2

Teaching objectives
Recommended prior knowledge
Content of the subject

CHAPTER: PEDOGENETIC FACTORS

1- The climate
2- The rock
3- Slope
4- The vegetation
5- The man

CHAPTER: PEDOGENETIC PROCESSES

1- Alterations
2-The additions
3- The loss
4- The transfers

CHAPTER: THE ASSESSMENT OF ALTERATIONS

1- The mineral fraction
2- The organic fraction
3- Organo-mineral complexes

CHAPTER: THE MAIN PEDOGENETIC TRAITS

1- Brunification and isohumism
2- Rubefaction
3- Hydromorphy
4- Salinization
5 -Podzolization

CHAPTER: SOIL MORPHOLOGY

1- Soil-surrounding environment relationship
2- The different types of overlays
3- The objectives of characterization
4- Profile description
5- Description sheets
6- Sampling

CHAPTER: SOIL CLASSIFICATION

1- Principles and objectives
2- The CPCS classification
3- USDA classification
4- Other classifications
5- CPCS-USDA differences
6- Classification of the main soils of Algeria

CHAPTER: MICROMORPHOLOGY

1- Goals
1- Sample preparation steps

CHAPTER: STUDY METHODS

1- Description methods
2- The micromorphometric approach

CHAPTER: SPECIFIC DATA

1- Identification of constituents
2- Pedological features
3- The microstructure
4- Data interpretation

b. TUTORIALS

- Study of Algerian soils
- Exercise on soil classification
- Observation of thin sections, microscopic studies

vs. EXITS

Personal work: it can be: Presentations, reports, bibliographic research, surveys, essays, others.

Evaluation method: Course: EMD1
Practical work: EMD2

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

- Pédogenèse et classification ; Philippe Duchaufour, Bernard Souchier – 1977
- Dynamique du sol ; Albert Demolon - 1966 – Extraits
- Guide des analyses en pédologie: choix, expression, présentation, interprétation ; Denis Baize ; Pédologie. Vol. 1 : pédogenèse et classification. 2e édition. Masson, Paris. 491

Title of the Master: Hydropedology
Semester: 2
Title of the UEF:
Title of the subject:water quality in agriculture 2

Credits: 4
Coefficients:2

Teaching objectives The relationship between water and the environment must be well understood by today's engineer. In agricultural hydraulics, this notion meets the dual objective: (1) to increase the potential for drinking water and (2) to meet agricultural needs. This program must lead the student to master the parameters allowing the use of lower quality water in agriculture.

Recommended prior knowledge

Content of the subject

I. CLASSIC WATER TREATMENT PROCESSES
- Pretreatment (desanding, screening, de-oiling, etc.)
- Primary treatment:

decantation: principle, calculation of a
decanter clarification: sedimentation
speed of a particle

- Secondary physicochemical treatment:
  - flocculation coagulation
  - oxidation, disinfection
  - filtration (types of filters, calculation of a multi-layer filter bed, etc.)
- Tertiary treatment:

biological oxidation
oxidation by
bacterial beds
lagooning technique

- Complementary treatments:

dephosphatization
correction treatments: dsorption on activated carbon, softening by ion exchange resins, etc.

II. DISCHARGES OF SLUDGE AND TREATED WATER INTO THE ENVIRONMENT

- Sludge treatment
  aerobic digestion, anaerobic digestion
  thickening
  bed drying
  Agricultural valorization
- Discharge of treated effluent into the environment
- Recharge of a water table discharged into a watercourse

IIIUNCONVENTIONAL WATER TREATMENT TECHNIQUES

- Desalination of water by reverse osmosis,

-Different applications of resins for the correction of quality indices

b. GUIDED WORK (9 hours)

-Calculation of a decanter and the sedimentation speed of a particle

- Calculation of pretreatment works
- Calculation of a filter and a multi-layer filter bed

-Dosage of coagulants and water disinfection agents

- Calculation of the exchange capacity of an exchange resin
- Applications of water desalination techniques

vs. EXITS Visit to a Water Treatment and Purification Plant

Personal work: it can be: Presentations, reports, bibliographic research, surveys, essays, others.

Evaluation method:EMD

- Practical and/or supervised work: 1 tutorial + exit report

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

- Agriculture intensive et qualité des eaux ; Claude Cheverry - 1998
- Indicateurs Environnementaux pour l'Agriculture: Méthodes et Résultats ; 2001
- Ingénierie des eaux et du sol: Processus et aménagements ; Marc Soutter, André Mermoud, André Musy - 2007

Title of the Master: Hydropedology
Semester: 2
Title of the UEF:

Title of the subject:fertilization

Credits: 6
Coefficients: 3

Teaching objectives This is one of the main areas of application of soil science to plant production. This teaching provides the information necessary to optimize the root environment and the effectiveness of the practice of mineral fertilization and organic amendments.

Recommended prior knowledge
Content of the subject

CHAPTER I: THE MAIN NUTRIENTS

1- The major elements
2- Minor elements

CHAPTER II: THE DEFINITION OF FUTURE

1- Evaluation of soil supply
2- Calculation of manure
3- The practice of smoking
4- The profitability of manuring

CHAPTER III: FERTILIZER PRODUCTION

1-Nitrogen
2- Phosphates
3- Potassium

CHAPTER IV: ORGANIC AMENDMENTS

1- Origin and characteristics
1- Consequences on the soil-plant system

CHAPTER V: PROPERTIES AND FUNCTION OF ROOTS

1- Physiology of nutrition
2- Simulation of root absorption

CHAPTER VI: SOIL-ROOT RELATIONS

1- Physical and chemical relationships

2- Biological relationships

b. TUTORIALS

- Calculation of fertilizers, amendments
- Observation of deficiency symptoms
- Fertilizer identification
- Exercise on simulation models
- Study of root profiles.

Personal work: it can be: Presentations, reports, bibliographic research, surveys, essays, others.

Evaluation method:*EMD + TD*

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

- Guide de la fertilisation raisonnée: Grandes cultures et prairies ; Christian Schvartz, Jacques Decroux, Jean-Charles Muller – 2005
- Fertilisation et amendements: dossier d'autoformation ; Sylvie Deblay – 2006
- Engrais: Guide pratique de la fertilisation ; André Gros – 1960

Sol et fertilisation en arboriculture fruitière ; Serge Trocmé, Raymond Gras - 1964

Master's Title: Hydropedology
Semester: 2
Title of the Fundamental Teaching Unit (UEF):
Subject Title: Biometrics
Credits: 4
Coefficients: 2

Teaching objectives: The aim of this course is to teach students the different stages of an experimental approach. It provides the basis for defining an experimental protocol in order to answer the various questions asked of the experimenter:
- How to set the objectives for an experimental trial?
- What are the means to be implemented to carry out this test?
- How to follow the test and acquire the experimental results?
- How to analyze and interpret the results obtained?

This is why the course is subdivided into two main parts:
- A first part dealing with the definition of an experimental protocol.
- A second part relating to the analysis of the results through two methods:

- Variance analysis
- Linear regression

Module Content

A. COURSE
I- Definition of an experimental protocol
I.1.- Goals and conditions of an experiment
I.2.- Study factors
1.2.1.- Case of a single factor experiment
I.2.2.- Case of an experiment with two or more faders
I.3.- Choice of experimental units
I.3.1.- Concepts of experimental units
I.3.2.- Dimensions and shapes of experimental units
I.3.3.- Sampling and number of repetitions
I.3.4.- Missing data problem
I.4.- Definition of observations
1.5.- Experimental devices
1.5.1- Completely random experiments
I.5.2.- Complete random block experiments
I.5.3.- Latin square experiments
II. Analysis of experimental results
II.1.- Reminders on certain statistical concepts
II.1.1.- Frequency distribution
II.1.2.- Arithmetic average and weighted average

II.1.3.-Mode and median
II.1.4.- Variance, standard deviation and coefficient of variation
II.2.- Linear regression
II.2.1.- Introduction to linear regression
II.2.2.- Regression models
II.2.3.- Carrying out the regression
a.- The different stages of regression
b.- Regression significance tests
c.- The dangers of regression
II.3.- Analysis of variance
II.3.1.- Introduction to variance analysis
II.3.2.- Models in analysis of variance
II.3.3.- Carrying out the variance analysis
a.- The different stages of variance analysis
b.- Interpretation of the analysis of variance

B. TUTORIALS

1- Frequency distribution and statistical parameters
2.- Simple linear regression
3.-Analysis of variance with a single classification criterion:
- orthogonal planes (equal samples)
- non-orthogonal plans (unequal samples)

4.- Analysis of variance with two classification criteria
- Without repetitions
- With repetitions

5.- Mini - project: Processing data from an engineering dissertation with presentation

Personal work: it can be: Presentations, reports, bibliographic research, surveys, essays, others.

Evaluation method: EMD + Practical and/or supervised work

Travail personnel : il peut être : Exposés, rapports, recherches bibliographiques, enquêtes, essais, autres.

Mode d'évaluation : EMD + Travaux pratiques et/ou dirigés

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

- La Biométrie Techniques et Usages ; Jean LEROUX LES JARDINS, Philippe LAMADELAINE, Bernadette DORIZZI, Claudine GUERRIER
- Eléments de biométrie ; Alfred Martinet – 1921
- Introduction à la biométrie ; Pierre Jolicoeur – 1991.

Title of the Master: Hydropedology
Semester:2
Title of the EMU:
Title of the subject:Methodology
Credits: 3
Coefficients:2

Teaching objectives

Recommended prior knowledge

CHAPTER I: LITERATURE REVIEW

1- Methodological Approach

2- Media and Channels for Information Dissemination

CHAPTER II: WRITING

1- a thesis

2- an article

Personal Work: It can take the form of presentations, reports, bibliographical research, surveys, essays, or other types of assignments.

Evaluation Method: End-of-Module Exam (EMD)

References (Books and Handouts, Websites, etc.): [Please provide specific references if available.]

- Introduction à la Méthodologie de la Recherche: Guide Pratique ; Mounir M. Touré – 2007
- Abrégé sur les méthodes de recherche et la recherche expérimentale ; Louis Laurencelle – 2005
- Méthodologie de la thèse et du mémoire ; Sophie Boutillier, Alban Goguel d'Allondans, Dimitri Uzunidis – 2005.

Personal work: it can be: Presentations, reports, bibliographic research, surveys, essays, others.

Evaluation method:*EMD*

Title of the Master: Hydropedology
Semester: 2
Title of the EMU:
Title of the subject: Environment and Sustainable Development

Credits: 2

Coefficients: 1

Teaching Objectives

Recommended Prerequisite Knowledge

Subject Content

Overview of Ecotoxicology and Sustainable Development

Chapter I: Environment and Pollution

Definition of Concepts: Environment - Pollution

Historical Overview of Pollutions

Causes and Sources of Pollution

3.1 Causes

3.2 Sources

Classification of Different

Types of Pollution

4.1 Atmospheric Pollution

a. Nature and Sources of Atmospheric Pollution

b. Impact of Atmospheric Pollutants on the Environment and Human Health

4.2 Pollution of Soils and Waters

a. Household Pollutants

b. Pollutants from Intensive Agriculture

b1. Pollution from Fertilizers

b2. Pollution from Pesticides

c. Consequences on the Environment

d. Measures to Combat Soil and Water Pollution

4.3 Specific Pollutions

Chapter II: Alternatives to the Use of Fertilizers and Pesticides in Agriculture

Alternatives to the Improper Use of Fertilizers

Alternatives to the Improper Use of Pesticides Analysis of Agro-Environmental Measures on Production

2.1. Phytosanitary Measures Adapted to the Ecological Environment

2.2. Preventive Cultural Techniques for Crop Protection

Biological and Biotechnical Alternatives for Crop Protection

3.1. Biopesticides

3.2. Organic Fertilizers

3.3. Biotechnology

Positive Impacts on Health

Strategy for Determining Health Standards

Personal Work: It can take the form of presentations, reports, bibliographical research, surveys, essays, or other types of assignments.

Evaluation Method: End-of-Module Exam (EMD) + Personal Work

References (Books and Handouts, Websites, etc.): [Please provide specific references if available.]

- Environnement et développement durable: enjeux et défis ; Azzouz Kerdoun – 2000
- Vers un développement durable. Indicateurs d'environnement ; 1998
- Dictionnaire de l'environnement et du développement durable ; Olivier DELBARD - 2011

Title of the Master: Hydropedology
Semester: 2
Title of the UED:
Title of the subject:Soil mineralogy

Credits: 2
Coefficients:2

Teaching objectives

Recommended prior knowledge

Content of the subject

CHAPTER I: SOIL MINERALS

1- Primary minerals
2- Secondary minerals
3- Weathering of minerals '

CHAPTER II: CLAYS

1- The main types
2- Origin and evolution
3- Study method
4- Importance

b. PRACTICAL WORK

Study of the clay fraction by different methods

Personal work: it can be: Presentations, reports, bibliographic research, surveys, essays, others.

Evaluation method:*EMD + TP*

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

- Le sol: propriétés et fonctions - Volume 1 ; Raoul Calvet – 2003
- Les grands sols du monde ; Jean-Paul Legros - 2007
- Cours de Minéralogie ; Nicolas Jolyclerc - 1802

Title of the Master: Hydropedology
Semester: S2
EU Title:Transverse
Title of the subject:Legislation
Credits: 01
Coefficients: 01

Teaching objectives: The course will mainly focus on environmental regulations in Algeria

Recommended prior knowledge:
Law, environment, legislation.

Content of the material:

1. General introduction.
1.1. Overview of all the legislation in this area.
1.2. Application of environmental law.
1.3. Citizen participation.
2. The main legal instruments.
2.1. Plans in land use planning.
2.2. Limited interference and emission values.
2.3. Impact studies: procedure and legal consequences.
2.4. Inventories: protected landscapes, sites and biotopes.
3. National regulations.
3.1. The environmental code.
3.2. Decrees and application circulars.
4. The laws of conservation and classification on the scale of the biosphere.

Personal work : Seminar, outing (National parks: Tonga El-Kala, Belezma Batna)

Mevaluation code:examination, continuous assessment and practical work.
Rreference:

S3

Title of the Master: Hydropedology
Semester: 3
Title of the UEF:
Title of the subject: land reclamation

Credits: 4
Coefficients:2

Teaching objectives

Recommended prior knowledge

Content of the subject

1- Causes of salt accumulation in soils

2- Salinity and sodicity

3- Methods for developing salty and sodic soils

- Leaching needs and salt balance

- Amendments

- Choose tolerant plants

4- Soils of arid regions and agricultural problems

- Sandy soils

- Limestone soils

- Gypsum soils

5- Management of irrigation in salty environments

B. DIRECTED WORK

Exercises and calculations on salt amendments and leaching

Personal work: it can be: Presentations, reports, bibliographic research, surveys, essays, others.

Evaluation method:*EMD + TD + PERSONAL WORK*

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

- Quelques problèmes pédologiques de mise en valeur des sols du delta central nigérien (Soudan français) ; George Aubert - 1952
- Conservation et mise en valeur des ressources forestières tropicale ; Food and Agriculture Organization of the United Nations – 1983
- Conservation des sols et des eaux dans les zones semi-arides ; Norman W. Hudson - 1990

Title of the Master: Hydropedology
Semester: 3
Title of the UEF:
Title of the subject: Techniques and Management of Irigation and Drainage

Credits: 5
Coefficients: 3

Teaching objectives: The problems of piloting methods remain conditioned by the material means available. The management methods make it possible to rationalize the dates and doses of irrigation.

The objective of the course is to make the student very aware of the problem of irrigation. It should allow the student to ask themselves a certain number of questions. What logic, for example, links the different water status indicators? Can we explain the joint dynamics of the indicators using a theoretical approach? Can we reconstruct the dynamics of the plant's water functioning using simple modeling?
This educational unit describes all irrigation techniques from the oldest to the most modern. Two mini projects aim to introduce the student to the classic methods used in engineering studies. The latter is confronted with different technical variants which he must learn to analyze and classify according to technical and economic requirements.

Content of the subject

A. COURSE

1. General information on irrigation techniques (irrigation systems)
2. Definition of an irrigation system
3. Definition of an irrigation subsystem

I. SUBMERSION IRRIGATION

1. Definition
2. Development of submergence basins
2.1. Impoundment of the submergence basin
3. Sizing of submergence basins
3.1. Relationship between the slope and the nature of the soil on the dimensions of the basin
4. Submersion irrigation systems
4.1. Natural submergence
4.2. Artificial submergence
4.2.1. Ordinary artificial flooding
4.2.2. Artificial submergence with water renewal (case of rice fields)
5. Survey shaping
6. Sizing of submergence basins
7. Advantages and Disadvantages of Flood Irrigation

II. RUN-OFF OR SPILL IRRIGATION

1. Definition
2. Conditions for trickle irrigation
2.1. Type of soil
2.2. Slope of the land

2.3. Sizing of runoff boards
2.4. Unit runoff rate
2.5. Runoff speed
3. Trickle-down theory
3.1. Fundamental relationships
4. Natural trickle irrigation methods
4.1. Watering by boards and wedges
4.2. Watering by level channels
4.3. Watering by shavings
4.4. Watering by spreading floods and runoff
5. So-called artificial methods
5.1. Ordinary inclined plane irrigation
5.2. Tiered inclined plane irrigation
5.3. Irrigation by teenagers
6. Advantages and disadvantages of trickle irrigation

III. INFILTRATION IRRIGATION

1. Definition of infiltration irrigation,
2. General practical rules
2.1. Watering duration
2.2. Spacing of furrows or lines
2.3. Furrow slope
2.4. Type of soil
2.5. Profile across furrows
2.6. Unit flow
3. The different infiltration irrigation systems
3.1. Irrigation by superficial open channels
3.1.1. In arable land
3.1.2. In market gardening
3.1.3. In shrub and vine cultivation
3.1.4. Irrigation by corrugations
3.1.5. Level channels without spillage
3.2. Infiltration irrigation in the basement
3.2.1. Deep ditch irrigation
3.2.2. Irrigation by rainwater channels
3.2.3. Irrigation by open drains
3.3. Irrigation by underground pipes
3.3.1. Californian system
3.3.2. Irrigation by underground drains
4. Advantages and disadvantages of infiltration irrigation
5. Mechanization and automation of furrow irrigation
4.1. Mechanization
4.1.1. The siphons
4.1.2. Gate ramps
4.1.3. Perforated flexible
4.1.4. Calibrated orifices
4.2, Automation
4.2.1. Transirrigation system
4.2.2. Three-way valves
4.2.3. Automation by butterfly valves

4.2.4. Greenhouse: Automation by slide valve

IV. SPRINKLER IRRIGATION

1. Definition of sprinkler irrigation
2. Structure of a perimeter

2.1. The collective network
2.2. The individual network
2.3. Irrigation equipment on the plot
2.3.1. Pipes and fittings
2.3.1.1. Mobile rigid tubes
2.3.1.2. Semi-mobile rigid tubes
2.3.1.3. Fixed tubes
2.3.1.2. Flexible pipes
2.3.2. Sprinklers
2.3.2.1. Low-pressure fixed-station sprinklers
2.3.2.2. Medium-pressure fixed-station sprinklers
2.3.2.3. High-pressure fixed-station sprinklers
2.3.2.4. Slow rotating sprinklers
2.3.2.5. Reaction rotation sprinklers
2.3.2.6. Other types of sprinklers
2.3.2.7. Structure of a sprinkler
2.3.2.8. Characteristics of a sprinkler
2.3.4. Self-propelled sprinklers
2.3.5. Giant self-propelled ramps
2.3.5.1. The pivoting ramp (pivot)
2.3.5.2. The front travel ramp
2.3.6. Towed ramps
2.3.7. Trailed ramps
2.3.8. Non-rotating sprinklers
2.3.8.1 Fixed head sprinklers or micro sprinklers
2.3.8.2. Perforated ramps
2.4. Frost protection equipment
2.5. Other uses of sprinkler equipment
2.6. Automation of fixed-station watering
3. The different types of installation
3.1. Classic equipment
3.1.1. Equipment with rigid ramps
3.1.1.1. Partial coverage
3.1.1.3. Partial coverage with position on hold Total coverage by grid
3114. Full coverage with ramp, sprinklers and valves
3.2.Equipment with cannons or giant sprinklers at a fixed station
3.2.1. Partial coverage
322.Total coverage in ramps with one device per ramp
3.3. Equipment with self-propelled sprinklers
3.4. Criteria for choosing an installation
3.4.1 Technical constraints
3.4.2. Agronomic constraints
3.4.3. Practical constraints
3.4.4. Economic constraints

3.4.5. The solutions adopted
4. Calculation of plot irrigation
4.1. Watering dose
4.2. Watering frequency
4.3. Watering shift duration
4.4. Duration of watering per day (number of waterings per day)
4.5. Sprinkler flow
4.6. Flow rate of the watering boom (carrying boom - sprinklers)
4.7. Approach pipe flow
4.8. Area irrigated per day
4.9. Total number of sprinklers
5. Irrigation uniformity
5.1. Christiansen expression
5.2. Expression of CTGREF
6. Irrigation efficiency
7. The limits of using sprinkling
8. The advantages and disadvantages of ace
9. Pressurization installations

V. LOCALIZED IRRIGATION OR MICRO-IRRIGATION

1. Definition of microirrigation
2. Micro-irrigation around the world
3. Scope of use of micro - irrigation
4. The different micro-irrigation systems
4.1. Drip system
4.2. System using diffusers
4.3. System using nozzles
5. What does an irrigation network consist of?
5.1. Pressurization station
5.2. Primary, secondary and tertiary pipes
5.3. Head station
5.3.1. Shut-off valves
5.3.2. Flow and pressure limiters
5.3.3. Pressure gauges
5.3.4. The fertilizer mixer and injector
5.3.5. The filter(s)
5.4. Distribution ramps
5.5. Distributor or dripper holder ramps
5.6. Secondary material
5.7. The distributors
5. The different types of distributors
6.1. Different types of classification
7. The different types of ramps
7.1. Fixed ramps
7.2. mobile ramps
7.3. Aerial ramps,
7.4. underground ramps
8.1. Irrigation water quality
8.1.1. Salt water
8.1.2. Dirty water

8.2. The phenomenon of clogging and its control
8.2.1. Field control
8.2.2. Control by calculation (the uniformity coefficient)
8.2.3. Origins of blockages and blockages
8.2.3.1. Mineral particles
8.2.3.2. Organic materials
8.2.3.3. Chemical elements
8.2.3.4. Others
8.3. Means of combating clogging and blockage
8.3.1. Filtration
8.3.2. Treatments
Rational use of a localized irrigation network
9.1. Irrigation management
9.1.1. By blood pressure monitors
9.1.2. By other methods
9.2. Fertigation - Chemigation
9.3. Irrigation quality
9.4. Controls of the flow - pressure law
9.5. Maintenance
9.6. Automation and programming of irrigation 10Advantages and disadvantages of micro – irrigation
10 Example of calculation of a localized irrigation network

MINI PROJECTS I IN THE FORM OF DIRECTED WORK SIZING OF A DRAINAGE NETWORK TO FIGHT AGAINST EXCESS WATER
I- SIZING A DRAINAGE NETWORK TO FIGHT AGAINST EXCESS WATER
- Methodological reminders
- Frequency study of rainfall and calculation of project rainfall
- Release of characteristic flow values
- Statistical study of saturated hydraulic conductivity measurements; estimation of hydraulic conductivities per batch; average hydraulic conductivity on a site
- Study of piezometric data; calculation of direct groundwater recharge
- Calculation of characteristic flow rates based on recharge intensity
- Estimated characteristic flow based on: rainfall, net recharge and the nature of the natural drainage network (with discussion)
- Choice of drain depths based on agronomic conditions
- Calculation of spacings for different drain depths and for different characteristic flow rates
- Basics of the layout of a drainage network; concept of topography
- Projection of an agricultural drainage network in batches
- General report
mini projects ii in the form of directed work study of the influence of salinity on the performance of a drainage network
II. STUDY OF THE INFLUENCE OF SALINITY ON THE PERFORMANCE OF A DRAINAGE NETWORK
-General theory on the statistical explanation of variables
- Application to the study of the relationship between soil salinity, drain spacing or drain depth on the one hand and agronomic yield on the other hand; hypothesis testing of variances and means
- Analysis of technical variants and choice of a variant to retain

- General report

B. PRACTICAL WORK
TP1: Measurement of a flow or module
a/ at a terminal
b/ at the level of a sprinkler
cl at the level of a dripper or microsprinkler
TP2: Measuring the operating pressure
a/ at the level of a main or secondary pipe
b/ at the level of a sprinkler
cl at the level of a dripper
TP3: determination of irrigation uniformity
a/ as a sprinkler
b/ drip by drop
C. DIRECTED WORK
TD1: Calculation of an economic diameter
a/ as a sprinkler
b/ drip by drop
TD2: Layout of a sprinkler irrigation network
TD3: Layout of a localized or drip irrigation network

Personal work: it can be: Presentations, reports, bibliographic research, surveys, essays, others.

Evaluation method: EMD + TD + TP + PERSONAL WORK

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

- • Irrigation ; Léopold Rieul, Pierre Ruelle – 2003
- La Tensiométrie pour piloter les irrigations: une gestion raisonnée …; Gérard Tron, Carole Isbérie, Pierre Chol - 2000
- Ouvrages de régulation et de distribution de l'eau ; Van Den Bosch, B.E., Brouwer, C., Snellen, W.B. – 1994.

Title of the Master: Hydropedology
Semester: 3
Title of the UEF:
Title of the subject:Water and soil conservation
Credits: 4
Coefficients:2

Teaching objectives This concerns the protection of soil and land resources, knowing that soil is a non-renewable resource.

Recommended prior knowledge

Subject Content
CHAPTER I: EROSION PHENOMENON
1- Factors of Erosion
2- Mechanisms
3- Study Methods
4- Consequences
CHAPTER II: METHODS OF WATER AND SOIL CONSERVATION
1- Biological and Cultural Methods
2- Mechanical Methods
3- Watershed Management

B. DIRECTED STUDIES
Case Study
Erosion Pre-detection Method
Quantification Method

Personal Work: It can take the form of presentations, reports, bibliographical research, surveys, essays, or other types of assignments.
Evaluation Method: End-of-Module Exam (EMD) + Directed Studies (TD).

References (Books and Handouts, Websites, etc.): [Please provide specific references if available.].

- Conservation des sols et des eaux dans les zones semi-arides ; Norman W. Hudson – 1990
- Les Techniques de conservation des eaux et des sols dans les pays du Sahel ; J. C. J. Vlaar, Interafrican Committee for Hydraulic Studies, Landbouwuniversiteit Wageningen – 1992
- Techniques traditionnelles de conservation de l'eau et des sols en Afrique ; Chris Reij, Ian Scoones, Camilla Toulmin – 1996.

Title of the Master: Hydropedology
Semester :
Title of the UEF:
Title of the subject:Mapping and remote sensing
Credits: 5
Coefficients: 3

Teaching objectives This is a set of methods and techniques necessary to implement to carry out an inventory of land resources, and define the modalities of their development within the framework of sustainable agriculture.

Recommended prior knowledge
Content of the subject

FIRST PART

Reminder on reliefs

CHAPTER I: INTRODUCTION TO AERIAL PHOTOGRAPHY

1- Historical reminders
2- Goals
3- Fields of application
4- Types of photography

CHAPTER II: THE GENERAL PRINCIPLES OF PHOTO-INTERPRETATION

1- Photography data
2- Collecting qualitative information
1- Collecting quantitative information

CHAPTER III: INTRODUCTION TO REMOTE SENSING

1- Historical reminders
2- Goals
3- Fields of application

4.Space remote sensing systems

CHAPTER IV: PHYSICAL DATA

1-Acquisition of information
2- Image processing

CHAPTER V: SOIL MAPPING

1- The methods used

2- Interpretation of images
3- Digital procedures

CHAPTER VI: AUTOMATIC CLASSIFICATION1-Locating and sampling

2- Classification methods
3- Training areas
4- Analysis of reflectance curves
5- Vegetation indices, soil line

b. PRACTICAL AND GUIDED WORK

- Exercises on aerial photographs
- Exercises on satellite images

SECOND PART

CHAPTER I: PEDOLOGY MAPPING

1- Historical
2- Goals

CHAPTER II: THE SCALE OF THE SOIL MAP

1- Relationship with the objective
2- Consequence on precision

CHAPTER III: METHODOLOGICAL APPROACH

1- Use of basic documents
2- Prospecting
3- Limits and typical profiles
4- Drawing of the minute card
5- Creation of the map and instructions

CHAPTER IV: CARTOGRAPHIC REPRESENTATION TECHNIQUES

1- Mapping in isodifferentiation curves
2- Monoparametric mapping
3- Other techniques and state of the art

b. PRACTICAL WORK

- Card reading (TD)
- Geostatistics, assisted mapping (TD)
- Creation of a soil map (mapping course)

Personal work: it can be: Presentations, reports, bibliographic research, surveys, essays, others.

Evaluation method:*EMD+TD+ personal work*

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

- Télédétection et Systèmes d'Information Géographique:; Nations Unies. Bureau des affaires spatiales, United Nations, Nations Unies. Centres régionaux de formation aux sciences et techniques spatiales – 2003
- Traitement des données de télédétection - 2ème édition ; Michel-Claude Girard, Colette-Marie Girard – 2010

La cartographie ; Fernand Joly – 1976

Title of the Master: Hydropedology
Semester: 3
Title of the EMU:
Title of the subject:Instrumental analysis

Credits: 4
Coefficients:2

Teaching objectives To understand the physicochemical phenomena which constitute the basis of chromatography (liquid and gas) and electrophoresis to develop analytical methods using chromatography (GC, HPLC) to use the main techniques independently of instrumental analysis.

Recommended prior knowledge*Some notions of physics and chemistry.*

Content of the subject

1 pH meter
2 Conductivity meter
3 Calorimeter and spectrophotometer
4 Flame and atomic absorption photometer
5 Auto analyzer

6. Others

Personal work :it can be: Presentations, reports, bibliographic research, surveys, essays, others.

Evaluation method:

- Course: Number of EMD: 1
- Practical and/or supervised work

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

Title of the Master: Hydropedology
Semester:3
Title of the EMU:
Title of the subject:Professional Ethics الأخلاق المهنية
Credits: 4
Coefficients:2

Teaching objectives The objective is to teach the student the main values for the development of the human being. Therefore, prepare him for practical life to serve our country and our community without corruption.

Recommended prior knowledge

Content of the subject

I- Definition of ethics, indicators, sources and status

1- Definition of ethics
2- Indicators
3- Source ofethics, is it innate or acquired?
4- Status of ethics, is it fixed or relative?

II- Values, bases of professional ethics ة

1- Community values
- loyalty, solidarity, dialogue, commitment, interdisciplinarity, collaboration

2- Professional values
- competence, diligence, scientific integrity, intellectual property, probity, transparency, continuity, efficiency, diligence, conformity, balance, disinterestedness, confidentiality, accountability,

III- Professional ethics, nature, importance and impact in reality

1- What is professional ethics?
2- Importance of professional ethics?

3- Effects of Ethics in the Workplace

IV- Professional ethics in certain jobs

1- Relationship between regulations, decisions and ethical standards in the company

2- Examples of ethics for some functions and professions

3- How to develop professional ethical commitment in the individual?

1- Importance of application and implementationprofessional ethics

2- Concrete suggestions for the development of professional ethics

3- Cognitive suggestions for the development of professional ethics

Personal work: it can be: Presentations, reports, bibliographic research, surveys, essays, others.

Evaluation method:*EMD+PERSONAL WORK*

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

Title of the Master: Hydropedology
Semester: 3
Title of the EMU:
Title of the subject:Soil micromorphology

Credits: 3
Coefficients:2

Teaching objectives Microscopic observation constitutes the common denominator of soil biology and pedology. The objective of this module is to show the interest in the use of micromorphology in pedological sciences, to introduce the student to the use of microscopy, to characterize the state of the microstructure of soils on undisturbed clods as well as identify the soil, geological and sedimentary processes involved

Recommended prior knowledge

Content of the subject

I-Notions on microscopy and fields of application
1. binocular magnifier
2. Polarizing microscope
3. scanning electron microscope (SEM)
4. scanning electron microscope (TEM)
5. examples of the fields of application and use of microscopy (soil biology, cultural practices, pedogenesis, geology, etc.)

II-Techniques for consolidating oriented clods
1. freeze drying
2. consolidation.

III. observation and description of thin sections
1. microstructure and micro-organization of materials
2. modes of particle assembly
3. Characterization of the pore space (size, connection and orientation of macroporisity)
2. basal material
3. skeleton
2.pedotrait (cutaneous, fabrics, plasma)
TP 1- description and interpretation of the microstructure of undisturbed clods
TP2 – description and interpretation of the microstructure of disturbed clods

Personal work: it can be: Presentations, reports, bibliographic research, surveys, essays, others.

Evaluation method:EMD+TP

References(Books and handouts, websites, etc.).
Micromorphologie des sols. AFS, 1987

Title of the Master: Hydropedology
Semester: 3
Title of the UED:
Title of the subject:Geomatics
Credits: 2
Coefficients:2

Teaching objectives This involves the application of knowledge relating to the soil and the physical environment to define better land use.

Recommended prior knowledge

Content of the subject

HAS. COURSE

CHAPTER I: GENERAL PRINCIPLES

1- Goals

2- Land use planningCHAPTER II: RESOURCES

1- Natural resources

1- Socio-economic resources

CHAPTER III: EVALUATION METHODS

1- In rainfed agriculture
2- In irrigated agriculture
3- Other uses

CHAPTER IV: INTRODUCTION TO GIS

1- Historical
2- Goals
3- The concepts

CHAPTER V: THE MAIN FUNCTIONS OF A GIS

1- Data acquisition
2- Data preparation
3- Data entry and updating
4- Data processing/analytical mapping

5- Data output

CHAPTER VI: PRESENTATION OF ARC/INFO AND IDRISIW

1- The main functions of Arc/info and Idrisiw

2- Advantages and disadvantages

b. TUTORIALS

- Application of different evaluation methods
- Data preparation
- Introduction of graphic data
- Introduction of semantic data
- Cartographic analysis
- Output of documents on screen and on paper

Personal work: it can be: Presentations, reports, bibliographic research, surveys, essays, others.

Evaluation method:*EMD+TD+PERSONAL WORK*

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

- Systèmes d'information géographique, pouvoir et organisations ; Henri Pornon - 1998
- SIG La dimension géographique du système d'information ; Henri Pornon - 2011
- Géomatique et gestion environnementale du territoire ; IETI Consultants - 1998

Title of the Master: Hydropedology
Semester: 3
Title of the UET:
Subject title: Entrepreneurship and project management
Credits: 1
Coefficients: 1

Teaching objectives

The objective in Entrepreneurship is therefore to offer students a global vision of the different facets of entrepreneurship, its challenges, its risks and its characteristics.

Recommended prior knowledge

Management, Economics-statistics

Chapter 1: The notion of entrepreneur and entrepreneurship

- Definition of Entrepreneurship
- Entrepreneur characteristics:
- Entrepreneurship in the economy
- GEM Case Studies

Chapter 2: The entrepreneurial approach

- What is an opportunity?
  - Innovation
  - Why innovate and the obstacles to innovation
  - Key drivers of innovation
- Market analysis

Chapter 3: The evolution of the company

- The growth
- The internationalization of the company

Chapter 4: Idea, creation, development and after?

- The transmission
- Recovery
- Failure and second chances

Chapter 5: The business plan and partners

- The Business Plan
- The partners
- Analysis of an entrepreneurial theme with groups of students

Personal work: it can be: Presentations, reports, bibliographic research, surveys, essays, others.

-Analysis of an accounting balance sheet- Preparation of technical sheets –

Calculates costs and cost prices and margins

Concept of yield and productivity and value

Mevaluation code:continuous monitoring + examination

References

Entrepreneuriat, Michel Coster, Pearson Education, 2009

Soparnot R., 2012-Organisation et gestion de l'entreprise

Collection: Les Topos , Dunod - 2ème édition - 128 p.

Soparnot R., 2009- Management des entreprises, Stratégie. Structure. Organisation.

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V- Agreements or conventions

Yes

NO

(If yes, transmit the agreements and/or conventions in the paper training file)

STANDARD LETTER OF INTENT

(In the case of a master's degree co-sponsored by another university establishment)

(Official paper on the header of the university establishment concerned)

Subject: Approval of co-sponsorship of the master's degree entitled:

The university (or university center) hereby declares that it co-sponsors the above-mentioned master's degree throughout the accreditation period of this master's degree.

To this end, the university (or university center) will assist this project by:

- Giving his point of view in the development and updating of teaching programs,
- Participating in seminars organized for this purpose,
- By participating in defense juries,
- By working to pool human and material resources.

SIGNATURE of the legally authorized person:

FUNCTION :

Date :

STANDARD LETTER OF INTENT

(In the case of a master's degree in collaboration with a company in the user sector)

(Official company letterhead)

OBJECT : Approval of the project to launch a master's degree course entitled:

Dispensed to:

The company hereby declares its willingness to demonstrate its support for this training as a potential user of the product.

To this end, we confirm our support for this project and our role will consist of:

- Give our point of view in the development and updating of educational programs,
- Participate in seminars organized for this purpose,
- Participate in defense juries,
- Facilitate as much as possible the reception of interns either as part of end-of-study theses or as part of tutored projects.

The means necessary to carry out the tasks incumbent on us to achieve these objectives will be implemented on a material and human level.

Mr. (or Madam)…….is designated as external coordinator of this project.

SIGNATURE of the legally authorized person:

FUNCTION :

Date :

OFFICIAL STAMP or COMPANY SEAL