PEOPLE'S DEMOCRATIC REPUBLIC OF ALGERIA
MINISTRY OF HIGHER EDUCATION
AND SCIENTIFIC RESEARCH

University Djilali Bounaama from Khemis-Miliana.

Educational Programme

in
Academic Bachelor degree

Field

Science of Nature and Life
Branch

Marine and Continental Hydrobiology

PEOPLE'S DEMOCRATIC REPUBLIC OF ALGERIA

MINISTRY OF HIGHER EDUCATION
AND SCIENTIFIC RESEARCH

ACADEMIC MASTER

TRAINING OFFER

Establishment	Faculty	Department
Khemis Miliana University	***Faculty of Nature, Life and Earth Sciences***	***Ecology***

Field	Branch	Speciality
Natural and Life Sciences	**Marine and Continental Hydrobiology**	**Applied Hydrobiology**

2018 - 2019

A – Conditions.

Access to the Applied Hydrobiology Master's degree in the Marine and Continental Hydrobiology sector is open, after study of the file, to holders of a license or an equivalent diploma in the specialties of the Marine and Continental Hydrobiology sector (HBMC): Planning *and protection of coastal and continental zones - Aquaculture and Pisciculture - Biology and ecology of aquatic environments - Fisheries.*

However, if bridges are defined and established between the HBMC course and the other courses in the SNV field, graduates from the latter are admitted to this master's degree.

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

The Master's training offer ***"Applied Hydrobiology"*** (Marine and Continental Hydrobiology sector), functional since 2013 at the Faculty of Natural and Life Sciences and Earth Sciences

(FSNV-ST) of Djilali University Bounaama de KhemisMiliana , is a formation in the sciences of life and the vital processes of water.

This training offer responds to a lack of generalists in the field of water who must solve and manage in an integrated and global manner the problems related to both the fishing and aquaculture sectors, industry and agriculture, drinking water and the environment.

This training offer focuses on the biological and biochemical analysis of water, the functioning and exploitation of aquatic ecosystems, management of marine and freshwater bioresources , aquaculture, water treatment and environmental protection. Its implementation meets scientific, economic and social needs. Among these needs we will cite the constraint Water as a vital element of life, component of exploitation and generator of biological resources as well as all the aspects of quality which are linked to it.

This specialty, which is already functional with the academic license in aquaculture and fish farming, aims to train students through and for research in the knowledge, methods and tools, and concepts necessary for the progression of knowledge and their applications in the field of hydrobiology and aquaculture, for the management and monitoring of natural and artificial hydrosystems as well as the exploitation of their aquatic bioresources .

This training offer, which is part of the development plan of the Djilali Bounaama University of Khemis-Miliana, aims to identify all matters relating to aquatic farming techniques, aquaculture engineering, hydrobiological and hydroecological sciences , microbiology, fisheries, aquatic zoology integrating ichthyology, planktonology, benthology and bioclimatology, which, combined with statistical analysis and modeling tools, are at the heart of the multidisciplinary training offered. This contributes to the development of the sustainable development of our territories and our landscapes. This mention will offer a training space on a national scale and particularly adapted to the particular context of the region based on integrative approaches to objects (hydro-dams, aquaculture farms, landscapes, etc.) and complex issues related in particular to food self-sufficiency which goes through the evaluation, exploitation and management of natural bioresources considering the context of sustainable development, climate change and environmental nuisances….

C – Targeted business profiles and skills:

The outlets targeted are essentially research, research and development and the professional field.

The training aims to train Hydrobiologists, researchers and executives in order to support the dynamics of research in water-related sectors (fisheries and aquaculture, agriculture, industry, drinking water and environment) and to acquire theoretical knowledge on the main analysis, exploration, evaluation and remediation techniques in the field of water.

The demographic evolution on the labor market in general, in research and research/development organizations in particular as well as in the professional field, remains insufficient and requires the training of researchers, technicians, scientific experts and professionals. At the same time, the challenges facing research at the national level, in particular because it is an essential element for achieving sustainable development, increasingly require not only the production of analytical knowledge, but also skills on the integration of this knowledge when studying complex systems.

The Applied Hydrobiology Master's is intended to train professionals and skills well initiated in research and therefore precedes the Doctorate.

The graduating student must be able to practise, set up and complete follow-up programs linked to: - the quality of urban and rural water, - aquaculture farms and the monitoring of hydrosystems . He must be able to carry out sampling, identify and carry out physico-chemical, biochemical, microbiological, hydrobiological and physiological analyzes on water and animal species in order to achieve the objectives set out by the research/development programs, production and operation. It will also be able to define and determine the origins of physico-chemical and biological pollution of environments and study their impact on the environment. Finally, he will be able to implement techniques for the evaluation, production and exploitation of aquatic bioresources in keeping with the environment.

D- Regional and national employability potential of graduates

The choice of this training will represent a compromise between the different areas of water. At the end of their training, graduates will be able to intervene in all activities related to the water sector, aquaculture, fishing and fisheries resources as well as the environment. Their interventions relate to various aspects in particular those related to physico-chemistry, to the biology of the environments, to the evaluation and the exploitation of aquatic bioresources as well as to the preservation of the environment: the relationship between biodiversity , water pollution and eutrophication.

Graduates of this training will have the vocation to ensure the coordination of a team within a research institution, an experimental or production platform.

Regional level: University, research laboratories, experimental stations, hydraulics department, fisheries and aquaculture department, agriculture department, environment department.

National level: Universities and research centers, CNRDPA, INRAA.

E – Gateways to other specialties

To allow mobility between the different specialties of/between the natural and life sciences courses, bridges are necessary. These bridges which are in adequacy can possibly exist between this master and the masters of the agronomy biology courses and all the specialties of the natural and life sciences.

Biology (microbiology, biochemistry) – Agronomy (animal and plant production) – Ecology – earth sciences.

F – Training monitoring indicators

The objective of the training follow-up system is to diversify the methods of control in order to assess as widely as possible the skills of the students. Within this framework, 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 synthetic work skills; (5) the control of the capacities of the student and not of his 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 – Supervision capacity (give the number of students that it is possible to support)

The number of students is 20.

Supervision depends above all on human and material resources. It is important to know that apart from the educational and technical means available in the specialized laboratories of our faculty (FSNVT-ST), five (05) dam lakes and several hill reservoirs as well as a vast and dense hydrographic network are located at close to our university. The latter are considered an open-air laboratory and also constitute an unparalleled opportunity in the field of applied hydrobiology and aquaculture; moreover, these hydrosystems have always been the subject, on the part of our students and teacher-researchers, of explorations and studies in the form of end-of-study projects or research projects of the CNEPRU and PNR type.

The recent establishment of the experimental fish farm of Harreza (Ministry of Agriculture and Fisheries) bordering our university as well as the project of the educational aquaculture farm which

is in progress in our faculty, give more support and guarantee a quality course of this Master's "Applied hydrobiology".

First Semester

Teaching unit	Matter	Credit	Coefficient	C	TD	PW	HV
Fundamental Unit	Applied chemistry	6	3	1h30	1h30	1h30	67h30
	Applied biochemistry	4	2	1h30		1h30	45h00
	Applied microbiology	4	2	1h30		1h30	45h00
	Bioclimatoloy and environment	4	2	1h30	1h30		45h00
Methodological unit	Geology, topography, hydrology, cartography	4	2	1h30	1h30		45h00
	Biostatistics	5	3	1h30	1h30	1h00	60h00
Discovery unit	Molecular biology	2	2	1h30	1h30		45h00
Transversale Unit	Communication	1	1	1h30			22h30

Second semester

Teaching unit	Matter	Credit	Coefficient	C	TD	PW	HV
Fundamental Unit	Aquatic zoology	6	3	1h30	1h30	1h30	67h30
	Functioning of hydrosystems	4	2	1h30		1h30	45h00
	Fischeries and fischeries management	4	2	1h30	1h30		45h00
	Aquaculture engineering	4	2	1h30	1h30		45h00
Methodological unit	Water treatment	4	2	1h30	1h30		45h00
	GIS and cartography	5	3	1h30	1h30	1h00	60h00
Discovery unit	Marine and aquatic technology	2	2	1h30	1h30		45h00
Transversale Unit	Legislation	1	1	1h30			22h30

Third semester

Teaching unit	Matter	Credit	Coefficient	C	TD	PW	HV
Fundamental Unit	Ecolosion process and rearing	6	3	1h30	1h30	1h30	67h30
	Reproductive biology	4	2	1h30		1h30	45h00
	nutrition	4	2	1h30		1h30	45h00
	Food technology	4	2	1h30	1h30		45h00
Methodological unit	Laboratory management	4	2	1h30	1h30		45h00
	Introduction to research	5	3	1h30	1h00	1h00	60h00
Discovery unit	Sedimentolgy	2	2	1h30		1h30	45h00
Transversale Unit	entrepreneurschip	1	1	1h30			22h30

Fourth Semester

Internship in a company sanctioned by a thesis and a defense.

	VHS	Coeff	Crédits
Personal Work	187h30	5	9
Internship in a company	62h30	2	3
Seminars			
Other (Supervision)	500h00	10	18
Total Semester 4	750	17	30

Detailed program by subject.

Title of the Master: Applied Hydrobiology
Semester: I
Title of UEF1: Fundamental (Applied Hydrosciences)
Subject title: Applied Chemistry
Credits: 6
Coefficients: 3

Teaching objectives.
The course allows students to acquire the basics in chemistry applied to water and sediments to understand the chemical processes that take place in water-sediment interface.

Recommended Prior Knowledge:
General notions of dynamical properties of water and its unique and diverse role in biological and chemical processes.

Courses content:

-Introduction to water and environmental chemistry.
-Sediment and water quality (hydrosystems, marine ecosystems,water reservoir – drinking and waste water).
-Water and sediment analysis (pH, dissolved oxygen, hardness, the complete alkalimetric title (CAT), phosphorus, nitrogen…, BOD, COD……)

Assessment method : Final examination**,** Continuous assessment, (practical work, directed studies ,Personal work) ,.
(The weighting is left to the appreciation of the training team)
Personal work : Mini project: sampling – analysis – results – presentation of the work

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

- Claus Bliefert, Robert Perraud, (2008): Environmental Chemistry, Air, Water, Soil and Waste, De Boeck, 478 p.
- Jean Rodier, Bernard Legube, NicoleMerlet, (2009): Water analysis, Natural waters, waste water, sea water, Dunod, 1530 p.
- Douglas A. SKOOG, Stanley R. CROUCH, F. James HOLLER, Donald M. WEST, (2012): Analytical Chemistry, DE BOECK, 1350p.

Title of the Master: Applied Hydrobiology

Semester: I

UEF1 title: Applied hydrosciences

Subject title: Applied biochemistry

Credits: 4

Coefficients: 2

Teaching objectives.

Learn about the techniques of bioanalysis and control of aquaculture and aquaculture products – learn to use biochemical components as biomarkers in the tracing and routing of energy and matter. Know the aspects of quality control.

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

General biology and biochemistry

Material content:

Basic techniques, safety - Structure, properties, metabolism and analysis of the constituents of biological fluids (water, mineral constituents, carbohydrates, lipids, proteins) - General and specific enzymology of aquatic species - Molecular biology - Hormonology, toxicology - Biological samples, control quality, automatic analysis – Biomarkers

Personal work : thematic presentation

Assessment mode: EMD + PW + Personal work

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

F. LAFONT, C. PLAS, P. CAZAUBON, (2009): Exercises in Biochemistry, General Biochemistry, Analytical and Clinical Biochemistry, Molecular Biology, DOIN, 407p.

Claude Schwartz-Gavrilovic, Jean Wallach, Michel Gavrilovic, Marie-Josèphe Maginot, (1999): MANIPULATIONS OF BIOCHEMICAL ANALYSIS. 3rd edition Doin, 453p.

Michel Gavrilovic, (1998): Manipulation of biochemical analysis, Ed. Doin, 452p.

Title of the Master: Applied Hydrobiology

Semester: I

Title of the UEF2: Climate and Environment.

Subject title: Bioclimatology and Environment

Credits: 4

Coefficients: 2

Teaching objectives .

The student must understand the issue of climate on sustainable development – the influence of climate factors on aquatic biogenesis. The relationship between water and the environment is highlighted by the aspects resulting in the degradation of the environment. The origin and nature of the various types of pollution must be taken into consideration in order to be able to act for a better quality of the water used and discharged into and by hydrosystems and aquaculture activities.

Recommended prior knowledge.

Chemistry – biology

Material content:

Definitions of climate and its parameters - The different spatial and temporal scales - Bioclimatic indices - Altitude and temperature - Altitude and precipitation - Climate change - Radiative transfers-Convective transfers - Notions of agroclimatology - Plant production processes – processes of cyclomorphosis. Effects of phytosanitary products on non-target flora and fauna - Bioconcentration, bioamplification, biotransfer, individual biomarkers: CI50, biochemical, structural and physiological disturbances.

Aquaculture and the environment. Biodiversity associated with farms - approach between sustainable continental and marine aquaculture. Aquaculture as a tool for the preservation of endangered species

Personal work: presentation – conference report

Assessment mode: EMD + TD + Personal work

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

Ramade F. (2007) Introduction to Ecotoxicology. Edt. Tec ETDOC.,

Forbes VE (1997) Ecotoxicology: Theory & application. INRA editor, 256p

Ramade F. (2007) Ecotoxicology: Foundations and applications. Edt. Tec ETDOC. 200p.
BA MONTENY JP LHOMME, (1980): Elements of bioclimatology, ORSTOM, 105p.
Fran François Le bourgeois, (2011): Bioclimatology for the use of foresters and the uses of foresters and ecologists, UFR FAM, 28p.
LEONARD O., (2002): Development of spatial indicators for monitoring natural areas. Experimentation on the territory of the Camargue National Reserve. DEA "Spatial structures and dynamics". University of Nice Sophia Antipolis, 80 p.

Title of the Master: Applied Hydrobiology

Semester: I

Title of UEM1, Methodology: Data Analysis

Subject title: Geology: Topography, Hydrology, Cartography

Credits: 4

Coefficients: 2

Teaching objectives.

The student must learn to measure natural phenomena related to rock, water and relief.

Recommended prior knowledge.

Chemistry – physics – mathematics

Material content:

Topography (15h) 1- Definition 2- Means of measurement 2-1 Conventional means 2-1-1 The theodolite (Definition, Description, Methods of observation) Angle measurements 2-1-2 The distance measuring device Distance measurements 2-2 Modern means 2-2-1 The total station 2-2-2- The GPS (Definition, Composition, Observation methods, Description of a GPS station) 2-2-3- Notions of coordinates (geographic, rectangular)

Hydrology (15 hours) Chapter 1 - Descriptive approach to the physical and natural environment - Water balance (precipitation, evaporation, runoff, infiltration,....) - Geometric characteristics: Gravelius index, equivalent rectangle.... - Topography: relief (hypsometric curve) slopes and slope indices - Hydrographic network: classification (Schumm), confluence, drainage density - Terrain (soil, mantle, substrate) - Vegetation cover (types and role) Chapter 2 -

Evolution and anthropogenic impacts - The effects of urbanization and industrial activities (hydrology) - Agricultural works (impacts on flow systems, soils, etc.) - Developments and works on watercourses (effects of dams and other reservoirs) - Developments in flood-prone areas (disruption of alluvial processes) - Deforestation and its hydrological consequences Chapter 3- Algerian wadis inflows into the sea (Evolution) - Spatiotemporal approach (quantitative) - Retrospective and prospective approach (impacts morpho-sediments at sea and in the coastal zone) Third Part: Cartography (15h) 1- Definition of a map 2- Cartographic projection systems 3- The orientation of the map (the different norths) 4- Reading a map (graphic and digital) 5- Types of maps (topographic, marine, thematic map)

Personal work: Mini project (water balance, contribution to the sea from wadis, etc.) Assessment mode: EMD + TD + Personal work

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

THIERSAULT N. and RODRIGUEZ L. (1994) - A model for predicting the spatial distribution of hydromorphic soils based on topographic criteria. DAA dissertation "Environmental Engineering, Soil and Planning option", ENSA-INRA Rennes and University of Santiago de Compostela, 64 p.
Bernard LORTIC RAPID CARTOGRAPHY MANUAL, M. BEGUIN, D. PUMAIN, La representation of geographical data. Statistics and Cartography, Cursus, Colin, Paris, 1994
R. ROULEAU, Methods of cartography, CNRS editions, Paris, 2000
Bravard, JP, Petit F. Watercourses, Armand Colin, 1997

Title of Master: Applied Hydrobiology

Semester: I

Title of UEM2 : Data Analysis

Title of subject Biostatistics:

Credits : 5

Coefficients: 3

Teaching objectives.

Acquire the statistical and mathematical bases to describe, analyze and interpret natural phenomena, relationships between populations and assess the risks of environmental degradation

Recommended prior knowledge.

Knowledge of mathematics and statistics

Material content:

Descriptive statistics (reminders) - Regression and correlation - Statistical estimates - Hypothesis tests - Discriminant analysis - Non-parametric tests - Multivariate statistics. Handling of software in practical work (1h00/week)

Personal work: exercises and case studies

Assessment mode: EMD + TD + Personal work

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

Legendre R and Legendre P., 1984. Digital ecology

Escofier B. and Pages J. , 1999. Simple and multiple factor analyzes Marcote D.,

2000. Processing of statistical data

Title of the Master: Applied Hydrobiology

Semester: I

UEMD title : Discovery

Title of the subject Molecular biology

Credits : 2

Coefficients: 2

Teaching objectives.

Based on a good knowledge of the structure and properties of nucleic acids, the student must have assimilated the major basic principles involved in the transmission and repair of genetic material, as well as gene expression and its regulation. .

He must be able to interpret experimental results obtained by the most common molecular biology techniques applied to hydrobiology and aquaculture research or to the exploration of genetic material by agrobiology laboratories.

The student must thus have acquired the bases necessary for the subsequent understanding of the molecular mechanisms in hydrobiological and aquacultural processes.

Recommended prior knowledge.

Biochemistry - biology - genetics Content of the subject:

Simple molecules - Nucleic acids - Biosynthesis of macromolecules - Conservation of genetic information: Replication (biochemical mechanisms properties of DNA polymerases; molecular mechanisms: initiation, elongation, termination). Repair. Expression of genetic information prokaryotic and eukaryotic aspects: Transcription (biochemical mechanisms: RNA polymerases; molecular mechanisms: initiation, elongation, termination.
Transcription regulation. RNA maturation phenomena. Translation (translation molecules, genetic code, impact of mutations on protein synthesis) - Genetic events - Evolution - DNA in the laboratory

Personal work: presentation

Assessment mode: EMD + TD + Personal work

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

D. Watson: Molecular Biology of the Gene, James. –
B. Alberts, D. Bray, J. Lewis, M. Raff, K. Roberts, JD Watson (latest edition) Molecular biology of the cell, Jean Gabert, Hervé Galons, (2011): UE1 Atoms, Biomolecules, Genome, Bioenergetics , Metabolism – QCM, Masson, 136p.
Bruce Alberts, Alexander Johnson, Julian Lewis, Martin Raff, (2011): Molecular Biology of the Cell, Medicine Sciences Publications, 1600p.
Simon Beaumont, (2010): Molecular biology UE1, Dunod, 315p.

Title of Master: Applied Hydrobiology

Semester: I

Title of the UEMT : Transversal

Subject title: Communication

Credits : 1

Coefficients: 1

Analyze the objectives of internal and external communication and present the methodologies needed to conduct the main communication actions

Prior knowledge recommended

Linguistic basics

Skills targeted: Ability to communicate well orally and in writing

- Ability to present well and speak well in public
- Ability to listen and exchange
- Ability to use professional documents for internal and external communication
- Ability to write professional internal and external communication documents

Material content:

Reinforcement of linguistic skills (-The active and passive form - The simple past - Past with its different forms - present with different forms - translation of scientific text -
Writing of scientific topics - Translation from oral to written
Communication Methods
Internal and external communication
Meeting skills
Oral and written communication
Personal work: Animation
Assessment mode: EMD + Personal work

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

BOSWORTH, 1998- Understanding scientific and technical English, Ellipse marketing

BOSWORTH, 1994- Writing scientific and technical English, Lavoisier

Title of the Master: Applied Hydrobiology
Semester: II
Title of UEF1: Fundamental (Systems and operations)
Subject title: Aquatic zoology
Credits: 6
Coefficients: 3

Teaching objectives (Describe what the student is supposed to have acquired as skills after passing this subject – maximum 3 lines).

Complete and improve the basic knowledge acquired in general zoology with emphasis on the main planktonic, benthic and ichthyic groups. In this subject, the student must be introduced to the techniques of sampling and identification of zooplanktonic, zoobenthic and ichthyic groups.

Recommended prior knowledge.

Knowledge of general zoology, ecology and biology

Material content:

Phytoplankton (descriptive reminders and place of phytoplankton in the animal world) – zooplankton (Rotifera, Cladocera and Copepoda) – zoobenthos (Molluscs, crustaceans, annelids, insects, nematodes, etc.) – ichthyofauna (Biology of exploited fish, continental and marine, horizontal and vertical distribution, sampling, systematics, dynamics, exploitation) - sampling – counting – identification and systematics – role of aquatic invertebrates in the trophic chain – invertebrates in aquaculture – bio indicators – operation.

Personal work: Mini project-sampling and counting + activity report and presentation

Assessment mode: EMD + TD+PW+Personal work

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

JACQUES, G., Ecology of plankton, Editions Lavoisiers, Paris, 2006, 283p. (Tech & Doc Collection).

AMOROS, C., 1984, Practical introduction to the systematics of organisms in French continental waters. Crustaceans Cladocera. Bulletin of the Linnean Society of Lyons 53(3):72-107; 53(4):120-144

DRENNER, RW, JR STRICKLER & WJ O'BRIEN. 1978, Capture probability: the role of zooplankton escape in the selective feeding on planktivorous fish. J. Fish. Res. Bd. Con., 35:13701373.

DUSSART, B., 1967b, The copepods of the continental waters of Western Europe.II. Cyclopoids and Biology. Boubee & Cie, Paris, 292p.

DUSSART, B., 1969, The copepods of the continental waters of Western Europe, Volume II: Cyclopoids and Biology, Edition boubée et cie, Paris -- France 264 p.

Tachet H., (2006); Freshwater invertebrates, CNRS edition, 587p.

Durantel P., (2002); Freshwater invertebrates, Artémis ed., 144p.

Lechevalie P., (1954); European aquatic insects (genera: larvae, nymphs, imagos) sp M.Amadou, M. Djitèye, 2007 - Ecology, ichthyology, zoology, and plant protection in the Sahel 13 of Sahelian Studies and Research, INSAH, 99 p.

Ajasson de Gransagne, (nd); Ichthyology, 304 p.

Master's Program Title: Applied Hydrobiology

Semester: II

Title of UEF1: Fundamental (Systems and Operations)

Subject Title: Hydrosystem functioning

Credits: 4

Coefficients: 2

Teaching Objectives (Describe the competencies that the student is expected to have acquired after successfully completing this subject - maximum 3 lines).

To enhance and improve the basic knowledge acquired in ecology with an emphasis on the functioning of hydrosystems (hydroelectric dam, lake, etc.) and their biogenic capacities.

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

Knowledge of chemistry, biology, ecology, and environment.

Subject Matter Content:

Hydrosystems - Lentic and lotic zones - Energy in the ecosystem - Water in the ecosystem - Biomass and production - Biotic interactions - Population dynamics - Energy and matter transfer.

Personal Work: Internship or Seminar or Field trip + Activity report

Evaluation mode: Written Exam + Practical Work + Personal Work

References (Books and handouts, web sites, etc.). Ecosystème. Frontier S. et Pichod-Viale D., Dunod, 1998. Ecologie de l'écosystème. Leveque. Dunod. 2001. Sol et environnement Girard et al., 2005. DUSSART, B., 1966, Limnologie : l'étude des eaux continentales, Gautier-villars, Paris 678 p. MICHA, J. C., 1992, Ecologie des eaux continentales. Notes de cours Facultés Universitaires NOTRE-DAME de la Paix NAMUR. WETZEL, R. G., 1983, Limnology, 2nd edition. Sanders collège publishing, USA, 753 p

Title of the Master: Applied Hydrobiology

Semester: II

Title of UEF2 Subject title: Fisheries and fisheries management

Credits: 4

Coefficients: 2

Teaching objectives (Describe what the student is supposed to have acquired as skills after passing this subject – maximum 3 lines).
Introduce students to fishing techniques and management of captive and exploitable populations through short-term and long-term stock assessment in order to better preserve aquaculture resources in continental and marine environments.

Recommended prior knowledge.
Knowledge in ecology and biology

Material content:
Reproduction of exploited species - Diet of exploited species - Migrations
- Age and growth - Natural mortality - Osmoregulation and excretion - Boats - Fishing gear and techniques - Stock assessment - Modelling.
Personal work: outing + activity report
Assessment mode: EMD + TD + Personal work
References (Books and handouts, websites, etc.).
FAO, 1995: Code of Conduct for Responsible Fisheries, Rome, 45 pages.
UCAD, 1998: Contribution to the development of enlightened practices for the sustainable development of coastal regions and small islands, summary report of the seminar of May 14, 1998, Dakar, 28 pages.
UNEP, 2004: Implementation of conservation measures and sustainable management of fisheries resources: the case of Senegal, Geneva, 76 pages.
Master title: Applied Hydrobiology
Semester: II
Title of UEF2: Fundamental (Systems and exploitations)
Subject title: Aquaculture Engineering
Credits: 4
Coefficients: 2

The objectivesof teaching.
Introduce students to the main aquaculture engineering tools and process used in the field aquaculture and production. The knowledge acquired must allow the student to make a hydrobiology cal assessment of aquaculture engineering.

The knowledge acquired must allow the student to make a hydrobiological assessment of aquaculture engineering.

Recommended prior knowledge (succinct description of the knowledge required to be able to follow this teaching – Maximum 2 lines).
Hydraulics - Chemistry - Biology - Zoology - Applied Sciences

Material content:

- Water conduction systems
- Pumping systems
- Aeration and oxygenation systems
- Design of hatcheries and grow-out facilities.

Personal work: outing + activity report
Assessment method: EMD + TD + Personal work

References (Books and hand-outs, websites, etc.):

- Coche, A.G. et H. van der Wal, 1983. Pisciculture continentale: l'eau, dans: collection FAO:
- Formation no 4, méthodes simples pour l'aquaculture. FAO, Rome, 111 p.
- FAO, 1984. La pisciculture en eau douce: comment débuter. Series FAO: apprentissage agricole no
- 27. FAO, Rome, 43 p.
- FAO, 1984. L'eau: d'où vient l'eau. Série FAO: apprentissage agricole no 28. FAO, Rome, 31 p.
- FAO, 2004. La pisciculture en eau douce: l'étang. Série FAO: apprentissage agricole no 29. FAO, Rome, 44 p.
- http://cedepa.wordpress.com

Title of the Master: Applied Hydrobiology
Semester: II
Title of UEM1: Methodology
Subject title: Water treatment
Credits: 4
Coefficient: 2

Teaching objectives

The course presents the fundamental bases that allow students to master and understand the different water treatment and analysis techniques (marine, freshwater)

Prior knowledge recommended

Knowledge of applied sciences (microbiology, chemistry, biochemistry)

Material content:

Polluted waters (Natural and industrial) (fresh, brackish and marine) - Water analysis (physical, chemical and biological).

-Treatment of polluted surface water

-Disinfection of polluted surface water

Water treatment stations, lagooning, integrated operation of treatment stations. Drinking water, desalination and waste water treatment

Water and biotechnology

Personal work: outing + activity report

Assessment mode: EMD + TD + Personal work

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

Bachoc A., Chebbo G., Laplace D., Bibliographical review on solids in networks sanitation, in collaboration with Cergrene and IMFT (Institute of Fluid Mechanics of Toulouse), 1992.

Bachoc A., Mouchel J.-M., Chebbo G., Urban stormwater discharge pollution: distribution, its characteristics, some information on its origins and its interpretation, study report, 1992.

BLANCHET F., SOYEUX E. , DEUTSCH J.-C., DE ROECK YH, Impact of permanent or temporary sanitation discharges on the quality of bathing water, Techniques, sciences and methods No. 3, March 2007.

BRESSY A., Flows of micropollutants in urban runoff. Effects of different stormwater management methods, thesis conducted at CEREVE, 2010.

FORRO H., Rainwater filtration and disinfection methods, Professional thesis, Specialized Master in Water Engineering at Polytech'Lille, Saint-Dizier environment study report, 2014.

Maurel. Desalination of seawater and brackish water and other unconventional processes for supplying fresh water. Lavoisier Tec&Doc. 2001.

P. Danis. Desalination of sea water. Engineering Techniques, J 2700. June 2003.

M. Chartier, Desalination prices, Freshwater tide, Hydroplus, 121, March 2002, p.24 to 39

Title of the Master: Applied Hydrobiology

Semester: II

Title of UEM1: Methodology

Subject title: GIS and cartography

Credits: 5

Rating: 3

Teaching objectives.

This course is an introduction to the field of geomatics. Emphasis is placed on the application of the GIS tool to the management of natural resources and land use planning. An important part of the course is reserved for practical applications which allow students to become familiar with GIS and mapping software

Recommended prior knowledge (brief description of the knowledge required to be able to follow this course – Maximum 2 lines). Knowledge acquired in computer science and mathematics

Material content:

Introduction – Georeferencing - Data acquisition - Visualization and presentation of data - Data analysis - GIS software - Management of a GIS Personal work: application exercises + report

Assessment mode: 1 EMD+TD+PW+Personal work

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

Paegelow M., 2000. Cartographic expression.

Poudry G., 2005. Digitization and image enhancement

Girard MC, Girard CM, 1999. Processing of remote sensing data

Title of the Master: Applied Hydrobiology

Semester: II

Title of UEM1: Discovery

Subject title: Marine and Aquatic Technology

Credits: 2

Coefficient: 2

Teaching objectives (Describe what the student is supposed to have acquired as skills after passing this subject – maximum 3 lines).

The student must become familiar with tools for navigation and exploration of marine and continental environments. He must discover the technologies used in the field of analysis and research used in oceanography and limnology.

Recommended prior knowledge (brief description of the knowledge required to be able to follow this course – Maximum 2 lines).
Fisheries, ecosystem functioning, physics and applied sciences

Material content:
Means of navigation and exploration (Boats and their different types and specificities (transport, scientific, yachting, fishing, military, etc.); Submarines; Scuba diving (history and evolution, basic principles of scuba diving) - Means exploitation and fishing Gear and tools for industrial, artisanal and recreational fishing (trawls, seines, various fishing nets, traps, longlines, pots, etc.)
Technological means used in the field of fishing (sonar, GPS, etc.) , the typology of ports - Means of monitoring the marine environment, In situ sampling and measurement equipment. - Means of coastal protection, Works to combat coastal erosion (dikes, groynes, breakwaters, etc.).

Personal work: Presentation

Assessment mode: 1 EMD+TD+ Personal work

References (Books and handouts, websites, etc.):
Aminot A. and Kérouel R., 2004. Hydrology of marine ecosystems: parameters and analyses. Ifremer, Plouzané, 335 p.
Calderaro N. and Lacrouts J., 2005. The coastline: protection, enhancement and development of coastal areas. 2nd edition, Ed. Le Moniteur, Paris, 553 p.
FAO, 1985. Small steel fishing boats. Food & Agriculture Org., Rome, 38 p.
FAO, 1986. Definition and classification of fishing and associated vessels. Food & Agriculture Org., Rome, 60 p.
MEEDDM, 2010. Coastline management. Ed. Quae, France, 290 p.
Recouvrance S. and Le Treust D., 2000. History of boats and sailors. Ed. Jean-Paul Gisserot, Paris, 45 p.
Rodier J., Legube B., Merlet N. and Brunet R., 2009. Water analysis. 9th edition. Ed. Dunod, Paris, 1600 p.
Rossi R., 2005. The great encyclopedia of boats. Ed. Casterman, Paris, 93 p.

Title of the Applied Hydrobiology Master's degree

Semester: II

Title of the UET1: Transversal

Subject title: Legislation

Credits: 1

Coefficients: 1

Teaching objectives

Introduce the learner to regulatory concepts, definitions and origins of legal texts and knowledge of criminal consequences.

Prior knowledge recommended

Training Content Packages

Targeted skills :

Ability to read and understand a legal text

Ability to apply regulations

Material content:

General notions of law (introduction to law, criminal law).

Presentation of Algerian legislation (www.joradp.dz, text references).

General regulations (consumer protection law, hygiene, labeling and information, food additives, packaging, brand, safety, conservation). Specific regulations (personal work, presentations).

Inspection bodies (DCP, CACQUE, hygiene office, ONML). Standardization and accreditation (IANOR, ALGERAC).

International standards (ISO, codex alimentarius, NA, AFNOR)

Personal work: Presentation

Assessment mode: 1 EMD+ Personal work

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

-Official newspapers

-National and international constitutions relating to maritime domains and continental waters

Title of the Master: Applied Hydrobiology

Semester: III

Title of the UEF1

Title of the subject: Process of hatchery and aquaculture farms

Credits: 6

Coefficients: 3

Teaching objectives .

Introduce students to hatchery techniques, to the handling of broodstock, spawn, and larvae – to production techniques in the nursery phase.

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

Biology – chemistry-hydraulics

Material content:

Additional crops - Production techniques. - Histology of larval development - Phytoplankton culture - Larval rearing techniques - Recent advances in larval feeding. Fish farms (nursery, management of ponds and cages), shellfish, carciniculture Personal work: outing + activity report

Assessment mode: 1 EMD+ TD+TP+Personal work

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

Marie-Roberte Guichaoua, Louis Bujan, Jean-François Guérin, Sylvianne Hennebicq, (2011): Biology of reproduction and development, Ellipses Marketing, 137p.

J. Bruslé & JPQuignard, (2001): Biology of European Freshwater Fishes, Tec & Doc, Lavoisier, Paris, 625 p.

Anonymous, (2011): biology of reproduction and development, Ellipses, 352p. Jean-Jacques ALBARET (nd): Fish, Biology and populations

ftp://ftp.fao.org/fi/CDrom/FAO_Training/FAO_Training/General/x6709f/x6709f09.htm

Bernard BACHASSON, (2012): Development of ponds, TEC AND DOC / LAVOISIER.

Gérard-B.MARTIN, (2009): The fishing and aquaculture industry, LAVAL UNIVERSITY PRESS, 791p.

JY.LE GALL, (2008): Gear, techniques and methods of sea fishing, TEC AND DOC / LAVOISIER, 368p.

JP.PROTEAU, O.SCHLUMBERGER, P.ÉLIE, (2008): Catfish gleans Biology, ecology, breeding, QUAE, 221p.

Horvath M., (1999): Fish farming manual – Cyprinidae, Percidae, Siluridae-Sarvach, 240p.
Christiane FERRA, (2008): Aquaculture, VUIBERT, 1264p.
J.LAZARD, B.JALABERT, T.DOUDET, (1990): Tilapia aquaculture from development to research, CIRAD, 122p.

Title of the Master: Applied Hydrobiology
Semester: III
Title of UEF1: Fundamental
Subject title: Reproductive biology of aquaculture species
Credits: 4
Coefficients: 2

Teaching objectives (Describe what the student is supposed to have acquired as skills after passing this subject – maximum 3 lines).
To provide the essential bases to introduce students to the natural and controlled reproduction processes of aquatic species.

Recommended prior knowledge (brief description of the knowledge required to be able to follow this course – Maximum 2 lines).
Biology, physiology, biochemistry

Material content:
Physiology and control of reproduction in molluscs and crustaceans - Physiological mechanisms regulating reproduction in teleosts - Induced reproduction in decapod crustaceans and bivalve molluscs - Induced reproduction in teleosts - Management of fish broodstock - Design of the installation - Food and nutritional needs of broodstock
Personal work: Internship + outing or seminar + activity report

Assessment mode: 1 EMD+ TD+TP+Personal work

References (Books and handouts, websites, etc.).
Marie-Roberte Guichaoua, Louis Bujan, Jean-François Guérin, Sylvianne Hennebicq, (2011): Biology of reproduction and development, Ellipses Marketing, 137p.

J. Bruslé & JPQuignard, (2001): Biology of European Freshwater Fishes, Tec & Doc, Lavoisier, Paris, 625 p.
Anonymous, (2011): biology of reproduction and development, Ellipses, 352p. Jean-Jacques ALBARET (sd): fish, biology and populations
ftp://ftp.fao.org/fi/CDrom/FAO_Training/FAO_Training/General/x6709f/x6709f09.htm

Title of the Master: Applied Hydrobiology

Semester: III

UEF2 title: Fundamental

Subject title: Nutrition

Credits: 4

Coefficients: 2

Teaching objectives (Describe what the student is supposed to have acquired as skills after passing this subject – maximum 3 lines).

Give the essential bases of the nutrition of captive aquatic species, in order to allow a better understanding of the production processes.

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

Biology, biochemistry

Material content:

Physiology of nutrition - Nutritional needs and dietary ingredients: lipids, proteins, carbohydrates, vitamins and minerals, nutritional energy.

Personal work: Presentation

Assessment mode: 1 EMD+ TP+Personal work

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

J.GUILLAUME, S.KAUSHIK, P.BERGOT, R.MÉTAILLER, (1999): Nutrition and feeding of fish and shellfish, INRA / IFREMER, 490p.
JP.PROTEAU, O.SCHLUMBERGER, P.ÉLIE, (2008): Catfish gleans Biology, ecology, breeding, QUAE, 221p.
Horvath M., (1999): Fish farming manual – Cyprinidae, Percidae, Siluridae-Sarvach, 240p.
Christiane FERRA, (2008): Aquaculture, VUIBERT, 1264p.

J.LAZARD, B.JALABERT, T.DOUDET, (1990): Tilapia aquaculture from development to research, CIRAD, 122p.

Title of the Master: Applied Hydrobiology

Semester: III

UEF2 title

Subject title: Food Technology

Credits: 4

Coefficients: 2

Teaching objectives (Describe what the student is supposed to have acquired as skills after passing this subject – maximum 3 lines).

Introduce the students to the techniques of making livestock feed. Conservation, processing of aquaculture products

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

Biology- Biochemistry- Physiology

Material content:

Nutritional requirements of species – Food formulation – Preservation and processing of fishery and aquaculture products

Personal work: internship or outing or seminar + activity report

Assessment mode: 1 EMD+ TD+Personal work

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

Mr. AMERIO FAO Food quality control in fish farming.

JJ SABAUT FAO Industrial production of compound feed for marine species.

Title of the Master: Applied Hydrobiology

Semester: III

Title of UEM1: Methodology

Subject title: Laboratory management

Credits: 4

Coefficient: 2

Teaching objectives (Describe what the student is supposed to have acquired as skills after passing this subject – maximum 3 lines).

Give the essential bases to introduce students to the standardized operation of laboratories and their accreditations; so that the results from analyzes are recognized by the international scientific and technical community.

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

Applied sciences – Legislation -

Material content:

Typology of laboratories – operating networks: energy (gas and electricity),
hydraulics (running water and sanitation), analysis gases, waste, safety. – Equipment – Management of chemicals and reagents – Metrology - Homologation – Accreditation – Certification – ISO standardization

Personal work: Mini project + activity report

Assessment mode: 1 EMD+ TD+Personal work

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

http://www.algerac.dz/index.php/component/content/?view=featured
Cofrend: Endoscopy operators: good practices
The official annals of Cofrend certification
Reliability, diagnosis and predictive maintenance of systems

Title of the Master: Applied Hydrobiology

Semester: III

Title of UEM1: Methodology

Title of the subject: Introduction to research

Credits: 5

Coefficients: 3

Teaching objectives (Describe what the student is supposed to have acquired as skills after passing this subject – maximum 3 lines).

The student must acquire notions on the various documentary collections, bibliographic research, bibliographic writing, databases and the use of bibliography software as well as on the management of research projects. The student must be initiated and prepare for the fields of research/development

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

All training contents, Knowledge in general and scientific culture, in languages (English, French, Arabic)

Material content:

The different types of libraries, Bibliographic files (subject, authors and indexes), Bibliographic research techniques and documentation-thematic research, issues and keywords, APA system, MLA and Vancouver.

Handling of software in practical work (1h00/week)

Project planning - data exploitation - processing, interpretation and presentation of data.

Personal work: exercises and case studies

Assessment mode: EMD + TD + Personal work

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

Theses and recent articles

http://www.legifrance.gouv.fr/affichCode.do;jsessionid=C93EFDC5AA393E623DECA949E663F8EC.tpdjo16v_3?cidTexte=LEGITEXT000006069414&dateTexte=20120110

http://guides.bib.umontreal.ca/disciplines/247-Citer-selon-le-style-Vancouver
http://www.univ-reims.fr/site/bibliotheques/memoires-ettheses/gallery_files/site/1
/1697/20119/20141/20144/20166.pdf http://www.mla.org/style
http://guides.bib.umontreal.ca/disciplines/20-Citer-selon-les-normes-de-l-APA?tab=106

Title of the Master: Applied Hydrobiology
Semester: III
Title of UED1: Discovery
Subject title: Sedimentology
Credits: 2
Coefficients: 2

Teaching objectives.
This course in sedimentology emphasizes the characterization of sedimentary environments. The analytical study of the constituents and of the sedimentary rocks (sedimentary petrography) must also be carried out, particularly within the framework of practical work.

Recommended prior knowledge.
All course contents, Hydrogeology, limnology, general and aquatic zoology, biology, biochemistry

Material content:
Sediments and sedimentary rocks - Sedimentation environments - Continental erosion and soil formation - Transport of materials - Continental deposits - The marine domain - Silico-clastic coastal sedimentation - Carbonate coastal sedimentation - Slope and ocean basin - Estuaries and deltas - Evaporitic sedimentation.

Personal work: presentation
Assessment mode: EMD + PW + Personal work

References (Books and handouts, websites, etc.).
CAMPY M. and MACAIRE JJ (1989) - Geology of superficial formations. Mason.
CAMPY M. and MACAIRE JJ (2003) - Surface geology. Dunod.
COJEAN I. and RENARD M. (1999) - Sedimentology. Dunod.
POMEROL C., RENARD M. and LAGABRIELLE Y. (2000) - Elements of geology. Dunod.
READING H. (1996) - Sedimentary environments: processes, facies and stratigraphy. Blackwell.

REINECK HE and SINGH IB (1980) - Depositional sedimentary environments. Springer-Verlag.
TUCKER ME (2001) - Sedimentary petrology. Blackwell.

Title of the Master: Applied Hydrobiology

Semester: III

Title of the UET1: Transversal

Subject title: Entrepreneurship

Credits: 1

Coefficient: 1

Teaching objectives

Introduce the learner to the setting up of a project, its launch, its follow-up and its realization.

Prior knowledge recommended

Training Content Packages

Targeted skills :

- Understanding of the organization and operation of a business - Ability to set up a business creation project - launched and manage a project - Ability to work methodically - Ability to plan and meet deadlines - Ability to work in team - Ability to be reactive and proactive

Material content:

-Business and business management (Business definition, Business organization) -Supply management (Purchasing management, Inventory management, Organization of stores)

-Production management (Mode of production, Production policy)

-Commercial and Marketing Management (Product Policy, Pricing Policy, Advertising, Techniques and Sales Team)

Setting up a business creation project (Definition of a project, Project specifications, Project financing methods, The different phases of project implementation, Project management, Time management, Management of quality, cost management, task management)

Personal work: presentation

Assessment mode: EMD + Personal work

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

ARMAND C., BONNIEUX, F., 1999. Value of wild fish and social profitability of fish management plans. Paper presented at the Days “Economics of the Environment” (Strasbourg 2-3 December 1999), 23 p.

BONNIEUX F., DESAIGUES B., 1998. Environmental economics. Dalloz, Paris, 328 p.

HOLL M., AUXIETRE JP, undated. Fish management and management plans: design and practice. “Mise au point” collection, High Council for Fisheries, Paris, France, 240 p.

Éloi Laurent, Jacques Le Cacheux, (2012): Environmental economics and ecological economics, Armand Colin.

Vincent Martinez, (2012): Fundamental principles of economics and management.