PEOPLE'S DEMOCRATIC REPUBLIC OF ALGERIA

MINISTRY OF HIGHER EDUCATION AND SCIENTIFIC RESEARCH

TRAINING OFFER

Preparatory Training in Marine Sciences

Establishment	Faculty / Institute	Department
National School of Marine Sciences and Coastal Planning (ENSSMAL)		**Preparatory Training Department**

Field: Natural and Life Sciences (SNV)

Academic year: 2024-2025

الجمهورية الجزائرية الديمقراطية الشعبية

وزارة التعليم العالي والبحث العلمي

عرض تكوين

التكوين التحضيري في العلوم البحرية

المؤسسة	الكلية/ المعهد	القسم
المدرسة الوطنية العليا لعلوم البحر و تهيئة الساحل		التكوين التحضيري

الميدان : علوم الطبيعية والحياة

السنة الجامعية: 2024-2025

SUMMARY

I – Identity sheet

1 - Location of the training:

Ecole Nationale Supérieure des Sciences de la Mer et de l'Aménagement du Littoral

Department: Preparatory Training

Coordinator:
Name & surname: FEZAA Nacima
Grade: Professor
Tel/fax : 0771953000
E-mail : nassima.fezaa@enssmal.edu.dz

2 - Context and objectives of the training

A – Conditions of access

The course is intended for students who have been admitted to the BAC and who have a minimum average of access to the ENSSMAL Preparatory Training in Marine Sciences.

B - Objectives of the training

The objective of the courses deployed in the ENSSMAL Integrated Marine Sciences Preparatory Training of the first cycle is to provide students with the necessary prerequisites to undertake studies in the different specialties of the second cycle of ENSSMAL belonging to the SNV, STU and ST fields. These are the following specialties: 1) for the SNV field: Marine Biotechnology (BM), Ecosystem-Based Fisheries Management (GEP), Aquaculture Management (AM), Marine Environmental Engineering and Ecosystem Protection (IEMPE); 2) for the STU field: Coastal Engineering and Coastal Development (GCAL); 3) for the ST area: Wastewater Treatment and Reuse (WWT).

C - Bridges to other training courses

The Preparatory Training in Marine Sciences of the ENSSMAL is an integrated training course whose specific objective, at the end of the 1st cycle, is to train students with the necessary knowledge to undertake studies in different fields, particularly in the SNV and STU fields.

D - Training monitoring indicators

In order to ensure the functioning of the training, a Pedagogical Coordination Committee will be set up at the level of each semester with Pedagogical Coordination Committees for each subject of the semester. The Pedagogical Coordination Committee will have to monitor the progress of the courses during the semester. It meets 3 times a semester. Each meeting gives rise to minutes, decisions and proposals, which are sent to the department and to the school. A calendar will be established at the beginning of the semester for the scheduling of meetings that will be held in the Pedagogical Committee of subject and those that will take place in the Global Pedagogical Committee.

E - Supervisory capacity

300 students

3- Available human resources

The teachers of the establishment involved in the Preparatory Training are:

Name, First name	Diploma	Rank	Type of intervention	Signing in
DAHMANI Nacéra	Doctorate / HDR	Professor	Lectures, Directed work , Practical Work , Supervision	
FEZAA Nacima	Doctorate / HDR	Professor	Lectures, Directed work , Practical Work , Supervision	
GRIMES Samir	Doctorate / HDR	Professor	Lectures, Directed work , Practical Work , Supervision	
HADDAD Zoubida	Doctorate / HDR	Professor	Lectures, Directed work , Practical Work , Supervision	
KHELIFA Nedjma	Doctorate / HDR	MCA	Lectures, Directed work , Practical Work , Supervision	
KENNOUCHE Hanane	Doctorate / HDR	MCA	Lectures, Directed work , Practical Work , Supervision	
MOKRANE Zakia	Doctorate / HDR	MCA	Lectures, Directed work , Practical Work , Supervision	
ABEDDAIM Hakima	Doctorate	MCB	Lectures, Directed work , Practical Work , Supervision	
ATTIA Nourhane	Doctorate	MCB	Lectures, Directed work , Practical Work , Supervision	
BENREKAA HENDA Assia	Doctorate	MCB	Lectures, Directed work , Practical Work , Supervision	
BOUMEZBEUR Mouna	Doctorate	MCB	Lectures, Directed work , Practical Work , Supervision	
BOUZEMBRAK Meriem	Doctorate	MCB	Lectures, Directed work , Practical Work , Supervision	
CHAA Halima	Doctorate	MCB	Lectures, Directed work , Practical Work , Supervision	
DAHMANI Abdelalim	Doctorate	MCB	Lectures, Directed work , Practical	

			Work , Supervision	
DAHMOUNE Bouchera	Doctorate	MCB	Lectures, Directed work , Practical Work , Supervision	
FERNANE Lounes	Doctorate	MCB	Lectures, Directed work , Practical Work , Supervision	
FOUDAD Younes	Doctorate	MCB	Lectures, Directed work , Practical Work , Supervision	
GHEZALI Katia	Doctorate	MAB	Lectures, Directed work , Practical Work , Supervision	
KHEDIMI Amina	Doctorate	MCB	Lectures, Directed work , Practical Work , Supervision	
MOKHBI Dahbia	Ph.D.	MCB	Lectures, Directed work , Practical Work , Supervision	
SALEM CHERIF Yousra	Doctorate	MAB	Lectures, Directed work , Practical Work , Supervision	
OUADAH Nadia	Doctorate	MCB	Lectures, Directed work , Practical Work , Supervision	
OUAFI Leila	Doctorate	MCB	Lectures, Directed work , Practical Work , Supervision	
AMAR IMMEN	Magister	MAA	Lectures, Directed work , Practical Work , Supervision	
AMAROUCHE Nassima	Magister	MAA	Lectures, Directed work , Practical Work , Supervision	
BOUCHHER Abdelhamid	Magister	MAB	Lectures, Directed work , Practical Work , Supervision	
BOURABAINE Fouzia	Magister	MAA	Lectures, Directed work , Practical Work , Supervision	
CHAOU Nadia	Magister	MAA	Lectures, Directed work , Practical Work , Supervision	
KAIDI Nawal	Magister	MAA	Lectures, Directed work , Practical Work , Supervision	

KAOULA Sonia	Magister	MAA	Lectures, Directed work , Practical Work , Supervision	
MEKHAZENI Fouzia	Magister	MAA	Lectures, Directed work , Practical Work , Supervision	
MERABET Narimane	Magister	MAA	Lectures, Directed work , Practical Work , Supervision	
MERRAD Anissa	Magister	MAA	Lectures, Directed work , Practical Work , Supervision	
MOUZALI Leila	Magister	MAA	Lectures, Directed work , Practical Work , Supervision	
ZERROUKI Mohamed	Magister	MAA	Lectures, Directed work , Practical Work , Supervision	

4– Specific material resources available

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

Laboratory Title : Analytical Methods Laboratory

	Designation	Quantity
1	Atmospheric Absorption Spectrometer (AAS) (Perkin Elmer-PinAAcle 900H)	1
2	High Performance Liquid Chromatograph (HPLC) (Perkin Elmer – Altus A-10)	1
3	Ion chromatograph (Shimadzu)	1
4	Gas chromatograph (Shimadzu)	1
5	Circulating Water Chiller (LAUDA-MC600)	1
6	Freeze dryer with 4 trays of 250mm diameter with vacuum pump	1
7	Hydrogen generator (HyGen 600)	1
8	NitroAir/NitroAir Combo Generator	1
9	Distiller (pure water)	1
10	Etuve (Binder)	1
11	Chemistry Host	1

Laboratory title: Geology and Planning Laboratory

No.	Designation (in alphabetical order)	Type	Quantity	Mark
1	Calcimetry Apparatus		1	
2	Casagrande aircraft (landing limit)	82744/2004	1	ELE International
3	Sand equivalent equipment	S158-13	1	MATEST
4	Balance	CD-11	1	OHAUS
5	Precision Balance	adventurer	1	OHAUS
6	Van Veen Dump Truck Medium		1	HYDRO-BIOS
7	Benne Van Veen Petite		1	HYDRO-BIOS
8	Centesimal Comparator	SC 25	1	BORLETTI
9	Conductivity meter with probe	4071	1	JENWAY
10	Cooler	ICE BOX 42L	1	Fields
11	Current Meter	FP101	1	GLOBAL Water SIGMA Sport
12	Oven	42200010	1	ProLabo
13	Oven	DHG 9053A	1	Jeulin
14	Oven	UN110	1	Memmert
15	Binocular Magnifier	LFZ	2	Optech
16	Lux meter	7137	1	PHYWE
17	Probe lux meter	12107,01	1	PHYWE
18	Pressure gauges		2	
19	Geology Hammer		14	ESTWING
20	light microscope		1	Euro max
21	Oedometer (Shear device)	S260	1	MATEST
22	Hotplate	H3110	1	LGH

23	Penetrometer (liquid limit)	S165	1	MATEST
24	pH meter with probe	pH56	1	WWE
25	Proctor: Lady and Mold		1	
26	Field Scissodometer	ON 26-2261	2	TORVANE
27	Parallax bar stereometer		2	TOPCON TOPCON
28	Stereoscope	WILD ST4 / MS-3/ MS-3/ MS-3 / MS-3 / MS-3 / MS-3	7	LEICA_TOPCON / TOPCON / TOPCON / TOPCON / TOPCON / TOPCON
29	Pocket Mirror Stereoscope	319991	9	WILD HEERBRUGG
30	Stainless Steel Sieve Series	40 µm-80000 µm	35	Retsch
31	Sieving machine	AS200 basic	2	Retsch
32	Theodolite		1	SANDING
34	Theodolite	DT600	1	SHOCK
35	Theodolite		1	BOIF
36	Soil thermometer	1188	3	

Title of the laboratory: Chemistry/Physics Laboratory

No.	Designation (in alphabetical order)	Type	Quantity	Mark
1	Heated magnetic stirrer	CB162	1	STUART
2	Heated magnetic stirrer	F20500162	1	SCIENTIFIC VELP
3	Storage Cabinet (Acid Base)		1	
4	Precision Balance	ABS 220-4N	1	CORE
5	Bars		8	
6	Single-station tank heater	655	1	BY THE WAY
7	DCO	6 positions - DCO10119	1	STICK
8	DCO	6 Positions-(ECO6)	1	SCIENTIFIC VELP
9	Desiccator		1	
10	Distiller	Puranity TU 6	1	VWR
11	Oven	UN55	1	MEMMERT
12	Kitchen hood	SPL	1	ASEM
13	Gas mask		1	
14	Mixer	RW20. N	1	KIKA
15	Mortar	porcelain	5	
16	Metal clamp		2	
17	Hotplate	HB110	1	LHG
18	Vacuum pump	NO26.1.2AN.18	1	KNF
19	Propipette 20ml		7	
20	Propipette 25ml		2	

21	Fridge	HS-208F	1	MIDEA
22	Spectrophotometer	2120UV	1	OPTIZEN
23	Mercury thermometer		4	
24	Ultrason	2510	1	BRANSON

Laboratory title: Chemistry/Pollution Laboratory

No.	Designation (in alphabetical order)	Type	Quantity
1	Decanter bulb agitator	06 Agitlec workstations	1
2	Balance Kern	Core	1
3	Sigma Centrifuge	Sigma	1
4	Balloon heater	Mono 'Found'	1
5	Balloon heater	3 'BI' positions	1
6	Balloon heater	BI 03 workstations	1
7	Balloon heater	Found Mono	1
8	Conductivity Meter	Hanna instruments EC214	3
9	Conductivity Meter	pile bag WTW inolab 1103	1
10	Benchtop Conductivity Meter	WTW inolab	1
11	Hanna Conductivity Meter	Hanna	2
12	Crucible with lid	Porcelain	12
13	Desiccator		1
14	Distiller includes 01 balloon heater of 06 stations, 06 flat bottom flasks of 250ml, 06 refrigerant tubes and 06 columns of vigreux	Wisetherme	1
15	Etuve Memmert UM600		
16	Flame Photometer	Jenway	1
17	Muffle oven	FH05080318001	1
18	Wise Therm Muffle Oven	Wise Therm	1
19	Micropipettes bio-Controlde 100-1000µl	Bio control	3
20	Micropipettes bio-Controlde 10-100µl	Bio control	0
21	Micropipettes bio-Controlde 5-50µl	Bio control	3
22	Micropipettes Smart de 100-1000µl	Smart	0
23	Mortar	Porcelain	0
24	Benchtop Oximeter	WTW inolab	1
25	Hanna pH meter	Hanna	1
26	Tongs		5
27	GM Griddle	Heating	1
28	Fisher Magnetic Heating Plate	Magnetic Heating	1
29	KIKAmag werke Magnetic Heating Plate	magnetic	1
30	Stuart Magnetic Heating Plate	Magnetic Heating	2
31	Neuberger Pmax KnF Vacuum Pump	No. 22AN18	
32	Racks	plastic	0

33	Racks	stainless steel	4
34	Filter station with receiver tank	Nalgene	1
35	Propipettes	25ml Pobel	1
36	Propipettes	10ml Pobel	6
37	03 station filtration rail	stainless steel 03 stations	1
38	Plastic filter rail	plastic	1
39	DCO 06-station reactor has 5 cooling tubes, 6 DCO reactor tubes	VELP Scientific	1
40	refrigerator condor RDC 450		1
41	Spatulas	stainless steel	6
42	Lab Spectrophotometer & Accessories		1
43	Spectrophotomètre UV-Visible	Shimadzu	1
44	Metal base stand for office	in metal	2
45	Digital thermometer	Hanna	1
46	Benchtop turbidity meter	Hanna	1
47	Vortex TopMix	Fisher	1

B- Personal work spaces and ICT:

The school has:

- A library rich in documentation necessary for pedagogical support, with a reading room with a capacity of 100 seats.
- Multimedia room with a capacity of 40 workstations + Wifi
- 04 computer room with a capacity of 25 seats/ room equipped with 25 computers + Wifi.

II – Semester organization sheets for teaching

1- Semester 1

Teaching Unit	VHS	V.H weekly				Coeff	Credits	Evaluation method	
	15 weeks	C	DW	PW	Other			Continuous Control	Examination
Fundamental TU									
FTU1									
Subject 1: Cell Biology	60h	1h30	1h30	1h		3	6	50%	50%
FTU2									
Subject 1: Geology-Structure and Internal Geodynamics of the Earth	60h	1h30	1h30	1h		3	6	50%	50%
Subject 2: Chemistry-Structure of Matter	60h	1h30	1h30	1h		3	6	50%	50%
Methodology TU									
MTU(O/P)									
Subject 1: Physics-Geometric Optics	52h30	1h30	1h30	30mins		2	4	50%	50%
Subject 2: Mathematics-Mathematical Analysis 1	52h30	1h30	2 h			2	3	50%	50%
Subject 3: Descriptive statistics	45h	1h30	1h30			2	3	50%	50%
Transversal TU									
TTU(O/P)									
Subject 1: Office automation	3h			1h		1	1	100%	
Subject 2: General English	30h		2h			1	1	50%	50%
Total Semester 1	**375h**	**9h**	**11h30**	**4h30**		**17**	**30**		

2- Semester 2

Teaching Unit	VHS	V.H weekly				Coeff	Credits	Evaluation method	
	15 weeks	C	DW	PW	Other			Continuous Control	Examination
Fundamental TU									
FTU1									
Subject 1: Animal biology (Embryology-Histology)	45h	1h30		1h30		2	4	50%	50%
Subject 2: Plant biology	45h	1h30		1h30		2	4	50%	50%
FTU2									
Subject 1: Geology-Petrography	60h	1h30		2h30		3	6	50%	50%
Subject 2: Chemistry -Chemistry of Solutions	60h	1h30	1h30	1h		3	6	50%	50%
Methodology TU									
MTU1 (O/P)									
Subject 1: Physics-Electricity and Magnetism	45h	1h30	1h30			2	3	50%	50%
Subject 2: Mathematics - Mathematical Analysis 2	45h	1h30	1h30			2	3	50%	50%
Subject 3: General Oceanography	45h	1h30	1h30			2	3	50%	50%
Transversal TU									
TTU1 (O/P)									
Subject 1: Academic English	30h		2 h			1	1	50%	50%
Total Semester 1	**375h**	**10h30**	**8h**	**6h30**		**17**	**30**		

3- Semester 3

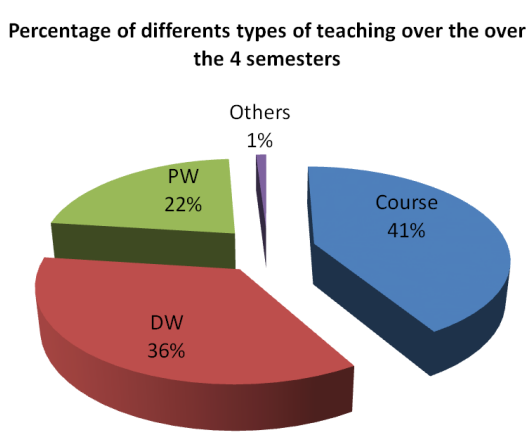
Teaching Unit	VHS	V.H weekly				Coeff	Credits	Evaluation method	
	15 weeks	C	DW	PW	Other			Continuous Control	Examination
Fundamental TU									
FTU1									
Subject 1: Zoology	60h	1h30	1h	1h30		3	6	50%	50%
Subject 2: Biochemistry	45h	1h30	1h	30mins		2	4	50%	50%
FTU2									
Subject 1: Mineral Chemistry	60h	1h30	1h30	1h		3	6	50%	50%
Subject 2: Marine Geology	45h	1h30		1h30		2	4	50%	50%
Methodology TU									
MTU1 (O/P)									
Subject 1: Physics - Fluid Mechanics	45h	1h30	1h30			2	3	50%	50%
Subject 2: Mathematics-Linear Algebra and Mathematical Analysis	60h	1h30	2h30			2	4	50%	50%
Transversal TU									
TTU1 (O/P)									
Subject 1: General ecology	45h	1h30	1h30			2	2	50%	50%
Discovery TU									
DTU1 (O/P)									
Subject 1: Marine resources	3h	1h				1	1		100%
Total Semester 1	**375h**	**11h30**	**9h**	**4h30**		**17**	**30**		

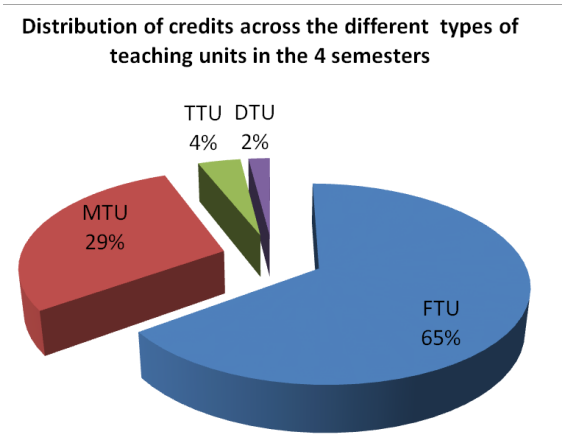
4- Semester 4

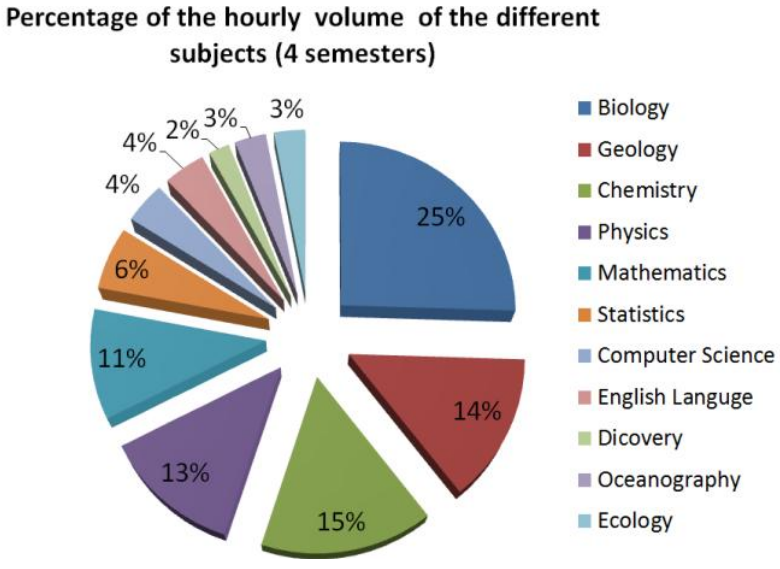
Teaching Unit	VHS	V.H weekly				Coeff	Credits	Evaluation method	
	15 weeks	C	DW	PW	Other			Continuous Control	Examination
Fundamental TU									
FTU1									
Subject 1: Microbiology	45h	1h30		1h30		2	4	50%	50%
Subject 2: Botany	45h	1h30		1h30		2	4	50%	50%
Subject 3: Genetics	37h30	1h30	1h			2	4	50%	50%
FTU2									
Subject 1: Organic Chemistry	52h30	1h30	1h30	30mins		2	4	50%	50%
Subject 2: General hydrology	45h	1h30		1h30		2	4	50%	50%
Methodology TU									
MTU1(O/P)									
Subject 1: Marine Physics	45h	1h30	1h30			2	3	50%	50%
Subject 2: Statistics-Probability and Random Variables	45h	1h30	1h30			2	3	50%	50%
Subject 3: Computer Science - Algorithmics and Programming	45h		1h30	1h30		2	3	50%	50%
Discovery TU									
DTU1(O/P)									
Subject 1: Thematic outings	3h				3h	1	1	100%	
Total Semester 1	**375h**	**10h30**	**7h**	**6h30**	**1h**	**17**	**30**		

5- Overall summary of the training: (indicate the separate global VH in progress, Directed work and practical work for the 04 semesters of teaching, for the different types of TU)

TU / VH	FTU	MTU	TTU	DTU	Total
Course	360	225	22.5	15	622.5
DS	180	270	82.5	0	532.5
PW	285	30	15	0	330
Personal work	825	525	120	30	1500
Other (Releases)	0	0	0	15	15
Total	1650	1050	240	60	3000
Credits	78	35	5	2	120
% in credits for each UE	65%	29.16%	4.17%	1.67%	100%







III – Detailed programme by subject
(1 detailed sheet per subject)

SEMESTER 1

Title of the training: Preparatory Training in Marine Sciences		
Semester : 1		
Teaching Unit: FTU1		
Subject Title: Cell Biology (Cytology)		
Hourly volume: 60 hours	**Credits: 5**	**Coefficients: 3**

Teaching objectives:

Cell biology, also known as cytology, is an important educational subject, and has links with almost every other branch of natural science. Cell biology is a scientific discipline that studies cells, both structurally and functionally. She is interested in the different organelles, and the different life processes. Many cellular and molecular concepts will then be addressed to understand the various activities of this living unit and the relationships with its environment.

This course is reinforced by tutorial sessions and practical work in the laboratory. It is intended for students in the first year FP1-ENSSMAL.

At the end of this course, the student should be able to:

- Know the fundamental notions of General Biology on a theoretical and practical level.
- Acquire specialized training in cytology, which is necessary for the pursuit of graduate studies.
- Understand the structure, ultra structure, and functions of the cell.
- Knowledge of the principle and concepts of study methods specific to biological fields.

Recommended prior knowledge:

The student must have knowledge that facilitates the understanding of the essential basics of general biology. (From the natural sciences programmes of middle and secondary education).

Content of the material:

Course program (22h30):

Chapter I: Introduction to Cell Biology (3h)

- History of Cell Biology _ Cell Theory
- Origin and evolution of life_ Classification of living beings
- Cell types (eukaryotes – prokaryotes
- Viruses

(Development in DW 1)

Chapter II: Plasma membrane (3h)

- Characteristics of biological membranes: structures and functions
- Ultra-structural appearance and chemical composition of the plasma membrane.
- Membrane permeability and the different modes of membrane transport

(Development in DW 2)

Chapter III: Endomembrane System - Golgi Apparatus (1h30)

- Constituents and characteristics of the endomembrane system
- Endoplasmic reticulum; Golgi apparatus; Lysosomes and endosomes
- Physiological roles of each compartment

(Development in DW 3)

Chapter IV: Hyaloplasma & Cytoskeleton (3h)

- Composition and physiological role of hyaloplasma

- Structural and functional aspects of cytoskeletal networks (MFA, FI, MT)

Chapter V. The Cellular Environment: Extracellular Matrix-Plant Wall (3h)
- Structure and composition of the MEC and the basal lamina
- Functions of the MEC and the Basal Lamina

(Development in S2 Animal Histology)

Chapter VI: Cell adhesion (3h)
- Global morphology and classification of cell junctions
- Adhesion molecules
- Cell-to-cell communication

Chapter VII: Interphase Nucleus (3h)

(Structural and functional characteristic)
- The elements that make up the core.
- Chromatin,
- The metaphase chromosome
- Nuclear pores and nucleocytoplasmic exchanges
- Structure and role of the nucleolus

(Development in DW7)

Chapter VIII. Division and the cell cycle (3h)
- Molecular and cellular events characteristic of mitosis and meiosis.

(Development in DW8)

Practical work program (15 hours):

PW1. Introduction to microscopy (3h)
- How to report
- Contact with the Microscope
- Observation and development test

PW2. Methods of cell study (3h)
- Histological techniques
- Cytochemical Techniques: Separation of Cell Constituents (Cell Fractionation and Centrifugation)

PW3. Microorganism Observation (3h)
- Observation *in vivo* using microscopy.
- Observation of animal and plant planktonic unicellular organisms (living or fixed).

PW 4. Cellular exchanges (the phenomenon of osmosis) (3h)
- Preparation and observation of the osmosis phenomenon:
- Turgidity and plasmolysis in a plant cell (e.g. onion.)
- Haemolysis and plasmolysis of red blood cells.

PW 5. Cell cycle / Mitosis (3h)
- Microscopic observations of cells in mitotic division (division of a plant cell; budding in yeast.)

Directed work program: (22.5 h)

DW1: Methods of cell study (3h)
- Methods of optic and Electron Microscopy
- Histochemical and cytochemical methods.

DW2: Membrane permeability and different modes of cytotic transport across the plasma membrane (3h)

DW3: Physiological roles of the Endomembrane System and the Golgi Apparatus (3h)
DW4: Ribosomes and protein synthesis (3h)
DW5: Mitochondria and Peroxisomes: Structural and Functional Description (3h)

- Role of cellular respiration; The ATP molecule and the energetic role of mitochondria

DW6: Plastids and photosynthesis (chloroplasts) (1:30h)
DW7: Chapter Interphase Nucleus (3h)

- Genetic material, chromatin, chromosomes
- DNA replication and transcription

DW8: Cell cycle / Mitosis / Meiosis (3h)

Method of evaluation:
End-of-semester exam (50%).
Continuous assessments (50%): (Evaluations by chapter and by part; Practical work reports; research and presentations).

Title of the training: Preparatory Training in Marine Sciences		
Semester : 1		
Teaching Unit: FTU2		
Subject Title: Geology-Structure and Internal Geodynamics of the Earth		
Hourly volume: 60 hours	**Credits: 6**	**Coefficients: 3**

Teaching objectives:

This subject provides the student with knowledge of the physical and chemical characteristics of the surface and internal envelopes of the terrestrial globe. It provides insight into the motions and processes that affect the Earth's interior and their results on the Earth's surface. Indeed, plate tectonics, which is the manifestation of the dynamics that affect the center of the Earth, is at the origin of major geological phenomena such as earthquakes, volcanoes, the formation of oceans and large mountain ranges...

Recommended prior knowledge:

Notions of Geology acquired at the Lycée.

Content of the subject:

Course program (22h30):

Chapter 1: The Earth in the Universe (1h30)

1.1 Structure of the universe and birth of the solar system
1.2 The different objects of the solar system

Chapter 2: Shape, dimensions and physical characteristics of the Earth (1h30)

2.1 Definition of geodesy
2.2 Shape and dimensions of the Earth
2.3 Geographical coordinates
2.4 Notion of geoid and ellipsoid

Chapter 3: The Earth's surface envelopes (1h30)

3.1 The magnetosphere
3.2 The atmosphere
3.3 The Hydrosphere
3.4 The Biosphere

Chapter 4: The Earth's Internal Structure (4h)

4.1 The different internal envelopes of the terrestrial globe and their chemical characteristics
- 4.1.1 The Crust
- 4.1.2 The Mantle
- 4.1.3 The Core

4.2 Contribution of seismology to the knowledge of the internal structure of the terrestrial globe
- 4.2.1 Definition of volume seismic waves
- 4.2.1 Use of seismic wave properties for knowledge of the Earth's internal structure, physical state and density of matter

4.3 Presentation of the detailed internal structure of the globe

Chapter 5: Continental Drift (1h)

Chapter 6: Plate tectonics (6h)

6.1 Definition of tectonic plates
6.2 The different types of movement at the boundaries of tectonic plates
6.3 Mantle convection
6.4 Depth expansion and paleomagnetism
6.5 Geodynamic sites related to plate tectonics
6.5.1 Divergent plate boundaries
- Continental rifts
- Mid-ocean ridges (oceanic ridges)

6.5.2 Converging plate boundaries
- Continental arc-type subduction zones
- Island arc-type subduction zones
- Continental collision zones

6.5.3 Transformative plate limits
6.6 Hot spots
6.7 The different stages of the evolution of an ocean (The Wilson cycle)

Chapter 7: Tectonic deformation (2h)

7.1 Definitions
7.1.1 Tectonics
7.1.2 The different types of deformation (continuous and discontinuous)
7.1.3 The different deformation regimes
7.2 Markers of deformation
7.2.1 Faults (brittle deformation, discontinuous)
7.2.2 Folds (ductile deformation, continuous deformation)

Chapter 8: Earthquakes (1h30)

8.1 Definition and origin of earthquakes
8.2 Classification and distribution of the different types of earthquakes
8.3 Recording and locating an earthquake
8.4 Magnitude and intensity of an earthquake

Chapter 9: Landforms (2h)

9.1 Definition and origin of landform
9.2 Underwater Reliefs
9.2.1 The continental margin
- The continental shelf
- Le talus continental
- Le glacis continental

9.2.2 Ocean basins (abyssal plains)
9.2.3 Ocean ridges
9.2.4 Ocean Trenches
9.2.5 Passive and Active Margins
7.3Continental reliefs
9.3.1 Mountain Range Areas
9.3.2 Stable continental areas

Chapter 10: Notion of Isostasy and Subsidence (1h30)

Practical work program (15 hours):

- **Internal structure of the globe (2h):**

The use of volume seismic waves for the knowledge of the internal structure of the Earth.

- **Plate tectonics (4h):**

Exercise to calculate the speed of expansion of the oceans.

Understand mantle convection and localization of hot spot magmatism through the analysis of tomographic and heat flux maps.

Isostatic balance and Reliefs (3h)

Calculating the root of a mountain range at isostatic equilibrium

Analysis of the erosion rate of a mountain range and isostatic rebalancing (graph interpretation)

Analysis of the uplift of the continent after the melting of the ice of an ice sheet.

Field trip (6 hours)

On-the-ground location and orientation work

Recognition of the different coastal morphologies; sandy and rocky landscapes (beaches, cliffs, capes, bays,...) and observation of the characteristics of the relief (mountain, slope, slope, etc.) of a portion of the Algerian coastline. Recognition of markers of deformation in the field such as faults.

Directed work program (22h30):

Directed work will focus on mapping:

Study of topographic maps (7h30)

- Presentation of a topographic map and the elements represented on this type of map
- Geographic and cartographic coordinate networks
- Notion of numerical and graphic scale
- Orientation in relation to geographic north and the notion of magnetic north
- Definition and characteristics of contour lines.
- Calculations of slope slopes.
- Use of Google Earth software.
- Creation of topographic profiles.

Study of nautical charts (3h)

- Presentation of a nautical chart and the notion of bathymetry
- Items depicted on nautical charts and used in marine activities.

Method of evaluation:

End of semester exam (50%)

Continuous assessments (50%): (tests in class sessions, practical work, oral tests, homework)

Title of the training: Preparatory Training in Marine Sciences		
Semester : 1		
Teaching Unit: FTU2		
Subject Title: Chemistry-Structure of the matter		
Hourly volume: 60 hours	**Credits: 6**	**Coefficients: 3**

Teaching objectives:

The teaching of this subject allows the student to acquire the elementary basics of chemistry, especially within matter, and to know the atomic structure that deals with the electron and the periodic classification describing the atom and the chemical bond.

The atomic structure, including the number of protons, neutrons, and electrons, including the arrangement of its electrons and the types of atoms with which it bonds, determines physical and chemical properties.

Recommended prior knowledge:

Basic notions of mathematics (integrals, derivatives, differential equations, etc.) and general chemistry.

Content of the subject :

Course program (22h30)

Structure of atoms:

Chapter 1: General

- Matter, atoms and elements, molecules and compounds, mixtures and pure bodies and methods of separation,
- The constitutions of the atom, elementary particles, the notion of chemical element, and isotopies

Chapter 2: Evolution of Atomic Models

- Classic model
- Hydrogen spectrum
- Quantum numbers

Chapter 3: Electronic Structure and Periodic Classification

- Electronic structure of atoms (energy levels, Klechkowski diagram, Pauli's rule, Hund's rule).

Chapter 4: Periodic Classification of Elements.

- Mendeleev's table, periodic classification, construction principle (notion of period, group, subgroup) main family of the periodic table.
- Properties of atoms and ions, atomic radius, electron affinity, electronegativity, ionization energy, ...

II. Structure of the molecules:

Chapter 5: Chemical Bonding

- Lewis chemical bonding, octet rule, bond types (covalent, dative, and multiple), bond polarization, ionic character.
- Geometry of molecules: VSEPR theory, Gillespie rules.
- Polarized bond, dipole moment, bond angle.

Chapter 6: Chemical Buildings

- Different types of bonds (covalent bond, ionic bond, metal bond
- Weak bonds (Van der Waals, Hydrogen), consequences on the physical properties of chemical compounds.
- Crystal structure (mineral chemistry elements): pattern, lattice, lattice Definition, different types of crystal lattices.

Structure of metal buildings, conduction in metals, semiconductor;
Structure of atomic and molecular edifices;
Structure of ionic edifices, defects and semiconductor oxides.

Practical work program (15 hours):

- PW1: laboratory safety and error calculation.
- PW2: mixtures and physical separation methods (filtration, decantation, centrifugation, distillation,..).
- PW3: determination of the density and density of pure bodies.
- PW4: Determination of the Avogadro number.

Directed work program (22h30):

Series 1: Fundamental concepts
Series 2: Electronic Structure of the Atom
Series 3: Periodic table and property
Series 4: Chemical Bonds
Series 5: Geometry of molecules
Series 6: Chemical Buildings

Method of evaluation:

End-of-semester exam (50%).
Continuous assessments (50%): (tests in class sessions, practical work, oral tests, homework)

Title of the training: Preparatory Training in Marine Sciences		
Semester : Semester 1		
Teaching Unit: MTU1		
Subject Title: Physics - Geometric Optics		
Hourly volume: 52 hours 30 minutes	**Credits: 4**	**Coefficients: 2**

Teaching objectives:

- To know the general laws and fundamental principles that govern geometric optics in homogeneous media.
- Apply the laws of geometric optics.
- Understand the notion of an image of an object given by an optical system.
- Explain how elementary optical instruments work.

Recommended Prerequisites: This course requires basic knowledge of mathematics.

Content of the subject:

Course programme (22h30):

Chapter 1: Fundamental Laws of Geometric Optics (3 h)

1. Definition of geometric optics
2. Prince of Fermat
   2.1 Optical path
   2.2 Statement of Fermat's principle
3. Consequences of Fermat's principle
   3.1 Definition
   3.2 Straight propagation of light
   3.3 Reverse light return
4. Snell-Descartes law
   4.1 Law of reflection
   4.2 Law of refraction
   4.3 Limit Reflection Angle
   4.4 Total reflection

Chapter 2: Formation of images-stigmatism and flattening (3h)

1. Definition
   1.1 Object
   1.2 Optical system
   1.3 Image of a point
   1.4 Real and virtual character
2. Rigorous stigma
   2.1 Definition
   2.2 Condition of rigorous stigmatism
3. Approximate stigmatism
   3.1 Definition
   3.2 Approximate stigma condition

Chapter 3: Mirror and plane diopter (4h)

1. Flat mirror
   1.1 Definition
   1.2 Conjugation formulas
2. Dioptre plan
   2.1 Definition
   2.2 Conjugation formulas
3. Parallel Face Blade
   3.1 Definition
   3.2 Walking and lateral movement of a
   3.3 Conjugation relationship
4. Prism
   4.1 Definition
   4.2 Walking a Ray
   4.3 Prism formulas
   4.4 Conditions of emergence

Chapter 4: Spherical dioptre and mirror (4h30)

1. Spherical diopter
   1.1 Definitions
   1.2 Fundamental invariant of the spherical diopter
   1.3 Conjugation relationship
   1.4 Fireplaces and vergence
   1.5 Newton's formulas and transverse magnification
2. Spherical mirror
   2.1 Definitions
   2.2 Spherical mirror stigma
   2.3 Descartes' formulas of the spherical mirror
   2.4 Homes and Newton's formula
   2.5 Convergence of the spherical mirror
   2.6 Some image constructions

Chapter 5: Thin Lenses (4h)

1. Lens classification
   1.1 Converging Lenses
   1.2 Divergent lenses
2. Lens Thinness Conditions and Conventional Representation of Thin Lenses
   2.1 Lens Slimming Conditions
   2.2 Conventional representation of thin lenses
3. Object and Image Plotting
   3.2 Remarkable rays
   3.3 Constructing an Object's Image
   3.4 Drawing any ray

4. Slim Lens Formulas
   4.2 Newton's formula
   4.3 Descartes' formula

Chapter 6: Eye and Optical Instruments (4h)

1. The eye
2. The magnifying glass
3. The microscope
4. The telescope

Practical work program (7h30):

PW1: Light Propagation, Reflection and Refraction

PW2: The prism

PW3: Spherical Mirrors

PW4: Thin lenses

Directed work program (22h5):

DW1: Fundamental Laws of Geometric Optics (3h30)

DW2: Formation of images-stigmatism and flattening (3h)

DW3: Mirror and plane diopter (4h)

DW4: Spherical diopter and mirror (4h)

DW5: Thin Lenses (4h)

DW6: Optical Instruments (4h)

Evaluation method: Continuous assessments and semester exams

End of Semester Exam

Continuous assessments: (tests in class sessions, practical work, oral tests, homework)

Title of the training: Preparatory Training in Marine Sciences		
Semester : 1		
Teaching Unit : MTU1		
Subject Title: Mathematics – Mathematical Analysis 1		
Hourly volume: 52h30	**Credits: 3**	**Coefficients: 2**

Teaching objectives:

Mathematics helps to train students' minds insofar as it allows them to develop their capacities for reasoning, analysis and abstraction.

This module aims to equip students with essential math skills, preparing them to approach advanced concepts and apply them in a variety of contexts. By the end of the course, students will be able to:

- Understand the main logical operators, such as NO, AND, OR, as well as universal quantifiers, and their role in modeling and evaluating mathematical statements.
- Deepen understanding of functions: Explore the limits, continuity, and differentiability of real functions to a variable, as well as their use in practical contexts.
- Acquire advanced limited development skills: Understand and apply the Taylor-Young and Mac-Laurin formulas to approximate functions and calculate limits efficiently.

Recommended prior knowledge:

- Basic math: including operations on fractions, powers, square roots, as well as the manipulation of simple algebraic expressions.
- Understanding polynomials, exponential and logarithmic functions, the formal definition of the limit and continuity of a function, and the rules of differentiation.

Content of the subject:

Course program (22h30):

Chapter I: Logic and reasoning (9h)

1. Introduction to Mathematical Logic:
   - Logical operators.
   - Implication, equivalence and quantifiers.
2. Sets, Applications, and Complex Numbers:
   - The sets.
   - Applications.
   - Injection, surjection, and bijection.
   - Complex numbers: definition, properties and applications.
3. Methods of Proofs:
   - Direct Methods.
   - Proof by cases.
   - Proof by induction.
   - Proof by contradiction.
   - Proof by Contra-positive.
   - Proof by counterexample.

Chapter II: Real function to one variable (10h30)

1. Notion of Function:

- Definition and graph.
- Composition of functions.
- Inverse function.

2. Limits of functions:
   - Definition and operations on boundaries.
   - Indeterminate forms.
   - Finding Limits: Properties of Limits

3. Continuity of real functions to a variable:
   - Continuity at a point x_0.
   - Left and right continuity at a point x_0
   - Continuous extension to a point
   - Operations on continuous functions at x_0
   - The sequential continuity theorem
   - Continuity over an interval
   - Theorems about continuous functions

4. The Derivative of a Function :
   - Geometrical interpretation.
   - Operations on differentiable function .
   - The extremes, Rolle's theorem, the finite increment theorem, L'Hôpital's rules and Taylor's formula.

5. Common functions:
   - Logarithm functions, exponential functions, trigonometric functions, hyperbolic functions.

<u>Chapter III</u>: Series expansion (3h)

1. Taylor-Young series
2. Mac-Laurin's series.
3. Operations on series expansion.
4. Series expansion of usual functions.
5. Calculating limits using boundaries.

<u>Practical work program (....h)</u> : /

<u>Directed work program</u>: (30h)

Work on the chapters mentioned in the course program:

- Logic and reasoning. (12h.)
- A real function with one variable. (12h)
- Limited development. (6h)

Method of evaluation:

End-of-semester exam (50%).
Continuous assessments (50%): tests in class and/or tutorial sessions, homework

Title of the training: Preparatory Training in Marine Sciences		
Semester : Semester 1		
Teaching Unit: MTU1		
Subject Title: Descriptive Statistics		
Hourly volume: 45hours	**Credits: 3**	**Coefficients: 2**
Teaching objectives: is to become familiar with statistical methods, with a view to describing, summarizing and analyzing a series of data.		
Recommended prior knowledge: none		

Content of the subject:

Course program (22h30):

Part I: One-dimensional statistics

Chapter 1: Description of a statistical series (5h)

- Statistics and Statistics
- Basic definitions
- Statistical tables
- Graphical representations

Chapter 2: The characteristics of central tendency (4h)

- Fashion Mode
- Averages
- Median and quantiles

Chapter 3: Dispersion characteristics (2h30)

- Scope Range
- Average absolute deviations
- Interquantile Deviations
- Variance and Standard Deviation
- Coefficient of variation
- The box plot

Chapter 4: Shape characteristics (1h30)

- Asymmetry and coefficients of asymmetry
- Kurtosis and Kurtosis coefficients

Part II: Bivariate Statistics

Chapter 1: Analysis of a contingency table (h 6)

- Contingency Table
- Marginal distributions and numerical characteristics
- Conditional distributions and numerical characteristics
- Covariance
- Types of relationship between two quantitative variables

Chapter 2: Linear Regression and Correlation (3h30)

- Least-squares regression lines
- Correlation

<u>Practical work program (....h)</u> : /

<u>Directed work program (12h30):</u>
Series 1: Description of a one-dimensional statistical series **(6h)**
Series 2: Central Tendency Characteristics **(6h)**
Series 3 : Dispersion and shape characteristics **(4h30)**
Series 4: Two-Dimensional Statistics, Contingency Table **(3h)**
Series 5: Regression and Correlation **(3h)**

Method of evaluation:
End of semester exam (50%)
Continuous assessments (50%): (tests in class sessions, practical work, oral tests, homework)

Title of the training: Preparatory Training in Marine Sciences		
Semester : Semester 1		
Teaching Unit: TTU1		
Subject Title: Office Automation		
Hourly volume: 15h	**Credits: 1**	**Coefficients: 1**
Teaching objectives: This subject offers the first basic notions of computer tools with the use of common office software.		
Recommended prior knowledge:		

Content of the subject:

Note: This teaching is carried out in the form of practical work in a computer laboratory.

Course program (... h): /

Practical work program (15h):

1. Word software on Windows: (5h)

1.1 General Presentation:
- Presentation of the screen (title bar; status bar; ribbons, etc.)
- File management (Document Creation, Text Input, Save File, work on multiple files; Print)

1.2 Document Entry and Formatting
- Writing a text (default input)
- Correct the text (spelling, etc.)
- Format the document (choice of font, margin, paragraph spacing, alignment, border, insert headers and footer, bullets and numbers, columns,...)

1.3 Tables, Images, and Shapes
- How do I insert and set the formatting of a table in a text?
- How do I insert an image and format it into a text?
- How do I create a schematic from the available shapes?

1.3 Managing Document References (Embedding References: Footnotes or bibliographic)

2. Excel software on Windows (10h)

2.1 General presentation:
- Screen layout (title bar; status bar; ribbons; spreadsheet; bar of formula ...)
- Workbook management (Save a workbook, work on several workbooks...)
- Move, copy, paste, and quick sort
- Layout and printing

2.2 Functions and Graphics
- Common and useful functions (Sum- Mean- Variance - functions mathematics)

- Use charts
- Creating and Editing a Chart (Histogram; Scatter Plot; Camembert ...)
- Graphic object (Shape and Image)
- Formatting charts

2.3 Table and Databases
- Creating a data table
- Sort a database
- Activate a filter (custom filter)
- Creating a plan
- Subtotals and use of summary functions.

Directed work program ... (h): /

Method of evaluation:

Continuous assessments (100%): (practical work tests, oral tests, homework)

Title of the training: Preparatory Training in Marine Sciences		
Semester : Semester 1		
Teaching Unit: TTU1		
Subject Title: General English		
Hourly volume: 30 hours	**Credits: 1**	**Coefficients: 1**

Teaching objectives:
Master the fundamentals of the English language, both written and oral. Read and write independently.

Recommended prior knowledge :
Level A1 in English.

Content of the subject:

Note: This teaching is carried out in the form of group directed work **(**Directed work).

Course program (... h): /

Practical work program (....h) : /

Directed work program (30 hours):

First term (S1) : General English

Unit1 : Sentences :

- Simple sentences and verbs.
- Subjects and verbs.
- Verbs and objects.
- Verbs with indirect objects and clauses.
- Linking verbs.
- Compound and complex sentences.

Unit 2 : Tenses :

- Recognizing tenses.
- Choosing the correct form.
- Present and present perfect.
- Past and past perfect.
- Present perfect or past simple.
- Past perfect or past simple.
- Future.

Unit 3 : Negatives and questions :

- Word order in negatives and questions.
- Negative questions and question tags.
- Negative words.
- Question words.
- Other question types.

Unit 4 : The Passive :

- Active and passive.
- Passive with modals, infinitives and gerunds.

- The use of the passive.

Unit 5 : Noun phrase

- Nouns : countable and uncountable.
- Nouns : generic, pair, group, plural and singular.
- Possesive and compound nouns.

Unit 6 : Determiners and quantifiers :

- Determiners.
- Quantify.
- Some and any, no and none.
- All and both, half and whole.
- Each and every, either and neither
- Many , much and a lot of
- Multipliers, fractions and percentages.

Unit 7 : Adjectives and Adverbs :

- Adjectives : emphasizing , describing , classifying.
- Position of adverbs , adverbs of place , time , frequency , degree , manner …

Unit 8 : Clauses

- Noun clauses.
- Relative clauses.
- Adverbial clauses.

Method of evaluation:

End of semester exam (50%)

Continuous assessments (50%): (tests in practical sessions, oral tests, homework)

SEMESTER 2

Title of the training: Preparatory Training in Marine Sciences		
Semester : 2		
Teaching Unit: FTU1		
Subject Title: Animal Biology (Embryology-Histology)		
Hourly volume: 45 hours	**Credits: 4**	**Coefficients: 2**

Teaching objectives:

In biology, an organized being is called an organism because it is provided with structures (organelles, tissues, organs) that function in a coordinated manner. The animal biology course focuses on embryonic development and animal histology. Thus, a first part will be devoted to the development plans, embryology and the main mechanisms of the genesis of the embryo, with the description of the different phases (gametogenesis, fertilization, segmentation and gastrulation). The different tissues put in place, from the embryonic leaflets, will be the subject of a second part of the course "Histology. It studies the structure and function of the 5 fundamental tissues of the animal organism, namely the epithelia, connective tissues, muscle and nerve tissues.

It is intended for students in the first year FP1-ENSSMAL.

At the end of this course, the student should be able to:

- To know and understand the fundamental notions of the genesis of the embryo.
- Recognize the different tissues and cells of the animal organism, understand their organization and specific functions
- To address, through different approaches, the particularities of the developmental biology of certain animal species.

Recommended prior knowledge:

The student must have a basic knowledge of general biology and cytology.

Content of the subject:

Course program (22h30):

Part One: GAMETOGENESIS & EMBRYOLOGY

Chapter I: Introduction to Animal Biology (1h)

- Metazoan development cycle.
- Modes of reproduction (sexual and asexual).

Chapter II: Gametogenesis (2h30)

- Oogenesis and the follicular cycle.
- Spermatogenesis.

(Illustration in PW1)

Chapter III: Embryology (4h)

- Fertilization (Type, role and stage).
- Segmentation, Gastrulation et Neurulation.
- Becoming of slips
- Peculiarities of embryology: the few marine species (fish and sea urchin)

(Illustration in PW2)

Part Two: HISTOLOGY

Chapter IV: Epithelial tissues (2h)

- Introduction to Histology - General Elements
- Coating Epithelia
- Glandular Epithelia

(Illustration in PW3)

Chapter V. Connective tissues (2h)

- General elements
- Non-specialized connective tissues (loose, cross-linked, dense, adipose, etc.)

(Illustration in PW3)

Chapter VII: Cartilaginous tissues (2h)

- The structure of cartilage tissue
- The functions of cartilage tissue

(Illustration in PW3)

Chapter VIII. Bone Tissue (2h)

- The structure of bone tissue
- The functions of bone tissue

(Illustration in PW3)

Chapter VI: Blood tissues (1h)

- Blood Structure and Functions
- Lymphoid tissue

(Illustration in PW4)

Chapter VIII. Muscle Tissue (3h)

- Striated muscle tissue.
- Smooth muscle tissue.
- Cardiac muscle tissue.

(Illustration in PW5)

Chapter VIII. Nerve tissues (3h)

- The nervous system
- Nerve tissue 1 (neurons; glial cell)
- The spread of nerve impulses

(Illustration in PW5)

Practical work program (22h30):

PW1: Gametogenesis (Spermatogenesis & Oogenesis) (4h30)

- Dissection and observation of gonads of a gonochoric and hermaphrodite species (echinoderms/fishes).
- Observation of the stages of Gametogenesis (3h)
- Observation of histological slides showing the stages of spermatogenesis and oogenesis

PW2: Embryology (4h30)

- Fertilization & segmentation (echinoderms/fishes)
- Gastrulation & Neurulation (echinoderms/fishes)

PW3: Epithelial & Connective Tissues (4h30)

- Observation of histological sections and identification of epithelia
- Observation of histological sections and identification of non-specialized connective tissues

PW4: Blood smear & oral mucosa (4h30)

- Preparation and observation of a blood smear.
- Preparation and observation of the tissues of the oral mucosa.

PW5: Muscle & Nerve Tissue (4h30)

- Observation of histological sections and identification of muscle tissue.
- Observation of histological sections of nerve tissue.

Directed work program (... (h): /

Method of evaluation:

End-of-semester exam (50%).

Continuous assessments (50%): (Evaluations by chapter and by part; Practical work reports; research and presentations).

Title of the training: Preparatory Training in Marine Sciences		
Semester : 2		
Title of the EU: FTU1		
Subject Title: Plant Biology		
Hourly volume: 45 hours	**Credits: 4**	**Coefficients: 2**

Teaching objectives:

- To know and understand the place of plants in the living world and the main differences with animals and microorganisms.
- To know the main tissues constituting a higher plant as well as their origin, location and respective roles.
- To know the specificities of reproduction in plants.

Recommended prior knowledge:

- Natural Sciences (Botany)
- Cytology Knowledge

Content of the subject:

Course program (22h30):

Chapter 1: Introduction to Plant Biology (4h30)

- General information on plant biology
- What is a plant?
- The origin of plates
- Plant classification
- Importance of plants

Chapter 2: Plant tissues (9h)

- Meristematic tissues (primary and secondary meristems)
- Dermal tissues
- Ground tissues (Parenchyma)
- Supporting tissues
- Vascular tissues
-
- Upholstery fabrics
- Parenchymas
- Supporting fabrics
- Conductive tissues

Chapter 3: Reproduction in plants (9h)

- Types of reproduction in plants
- Reproductive cycles in plants
- Structures involved in reproduction
- Fertilization methods
- Examples of sexual reproduction cycles in the main systematic groups (Thallophytes, Bryophytes, Pteridophytes, Spermaphytes (Gymnosperms and Angiosperms).

Practical work program (22h30):

Morphology of higher plants (6h30)

- TP1 (3h). **The vegetative system**: The stems, roots and leaves (phyllotaxis).
- TP2 (3h). **The reproductive system**: Flowers and inflorescences, fruits and seeds.

Plant tissues (16h)

- TP3 (1h30). The plant cell and vacuoles.
- TP4 (1h30). Covering tissues: epidermis and secretory tissues.
- TP5 (3h). Parenchymas: chlorophyll, water and starch storage parenchyma.
- TP6 (3h). The supporting tissues: collenchyma and sclerenchyma.
- TP7 (3h). Conductive tissues: Part I: Primary conductive tissues.
- TP8 (3h). Conductive tissues: Part II: secondary conductive tissues.

Directed work program (... h): /

Method of evaluation:

End of semester exam (50%)

Continuous assessments (50%): (tests in class sessions, reports of practical work, homework).

Title of the training: Preparatory Training in Marine Sciences		
Semester : 2		
Teaching Unit: FTU2		
Title of the subject: Geology-Petrography		
Hourly volume: 60 hours	**Credits: 6**	**Coefficients: 3**

Teaching objectives:

The objective of this course is to recognize rocks based on description by analyzing their structural, mineralogical and chemical characteristics to arrive at their classification. Petrography is an important branch of engineering geology that allows you to obtain a high level of diagnosis on the rocks that make up a physical environment. It allows the identification of useful mineral raw materials, sometimes of high value. This course relates the different types of rocks to their geological environment of formation, which makes it possible to link them to the geological history of a place.

Recommended prior knowledge:

Notions of Geology acquired at the Lycée. Courses given in the subject Geology-Structure and Internal Geodynamics of the Earth of the 1st year Preparatory Training.

Content of the subject:

Course program (22h30):

Chapter 1: Notions of crystallography (1h30)

1.1 Definition of Crystallography
1.2 Crystal lattice and elementary lattice
1.3 Crystal systems and symmetry classes
1.4 The elements of symmetry

Chapter 2: Minerals (3h)

2.1 Definition of a mineral and mineralogy
2.2 The main minerals that make up the Earth's crust
2.2.1 Silicate minerals
2.2.2 The different groups of non-silicate minerals.
2.3 Mineral Identification Criteria

Chapter 3: Magmatic rocks (3h)

3.1 Definition of magmatic rocks
3.2 Definition of a magma
3.3 The different types of magmas
3.4 The formation processes of magmatic rocks
3.4.1 Partial merger
3.4.2 Fractional crystallization
3.5 Classification and nomenclature of magmatic rocks
3.6 Magmatic bodies produced by magmatic activity

4 Sedimentary rocks (5h)

4.1 Definition
4.2 The different sources of sediments

4.3 The formation processes of sedimentary rocks
4.3.1 Alteration
4.3.2 Transportation
4.3.3 Sedimentation
- Sedimentation media
- Characteristics of mature and immature sediments
4.3.4 Digenesis
4.4 Classification and nomenclature of sedimentary rocks
4.4.1 Sedimentary rocks of detrital origin
4.4.2 Sedimentary rocks of chemical origin
4.4.3 Sedimentary rocks of biochemical origin
4.4.4 Sedimentary rocks of organic origin

Chapter 5: Sedimentary cycles (1h)

5.1 Definition of sedimentary cycle, eustatism, marine transgression and marine regression
5.2 The characteristics of sedimentary deposits of marine transgression
5.3 Characteristics of marine regression sedimentary deposits

Chapter 6: Metamorphic Rocks (2h)

6.1 Definition of metamorphism
6.2 The different types of metamorphism
6.3 Deformation structures in metamorphic rocks (schistosity and foliation)
6.4 Classification and nomenclature of metamorphic rocks
6.4.1 Notion of metamorphic facies
6.4.2 The main metamorphic rocks

Chapter 7: The Cycle of Rocks (1h30)

Chapter 8: Notions of stratigraphy (3h)

8.1 Definition of stratigraphy
8.2 Stratigraphic principles
8.3 Stratigraphic fossils
8.4 Relative geochronology and absolute geochronology
8.5 Unconformities and sedimentary gaps
8.6 The stratigraphic scale

Chapter 9: The major geological ensembles of Algeria (1h)

Practical work program (37h30):

Crystallography practical work (3h): the identification of the seven crystal systems and their symmetry elements.

Mineral Identification practical work (6h): application of the physical, optical and chemical criteria for the identification of minerals belonging to the major groups of silicates and non-silicates.

Practical work for the recognition of magmatic rocks (3h): description of the texture, determination of the mineralogical composition, classification and nomenclature of the different

plutonic (granite, diorite, gabbro...) and volcanic (rhyolites, andesites, basalts...) magmatic rocks

Practical work on the recognition of sedimentary rocks (7h30): description, classification and nomenclature of the different sedimentary rocks.

- Sedimentary rocks of loose detrital origin (sand, gravel, silts,..) and coherent (conglomerates, sandstones, clays, marls, etc.). Recognition of mature and immature sediments by macroscopic observation for rudites and with a binocular magnifying glass for sands.
- Sedimentary rocks of chemical origin (evaporites, flint.....)
- Sedimentary rocks of siliceous (diatomites and radiolarites) and carbonate (chalk, built limestones, lumachelic limestones, etc.) biochemical rocks

Practical work for the recognition of metamorphic rocks (3h): description, observation of deformation structures (schistosity and foliation), observation of metamorphic minerals and nomenclature of rocks.

Practical work for reading geological maps (6h): Presentation of the elements represented on geological maps. Observation of the representation of different types of rocks and faults on geological maps. Representation of the geometric characteristics of the sedimentary layers (outcrop, boundaries of the layers, direction and dip). Realization of geological sections from geological maps.

Stratigraphy practical work (3h): Interpretation of geological sections by applying stratigraphic principles and establishing the chronological order of geological events.

Field trip (6 hours)

Observation of outcrops and recognition of the different types of rocks (magmatic, sedimentary and metamorphic) on a portion of the Algerian coast. Mapping of rocks and faults observed in the field (production of minute maps). Realization of geological sections.

Directed work program .. (h):

Method of evaluation:

End of semester exam (50%)

Continuous assessments (50%): (tests in class sessions, practical work, oral tests, homework)

Title of the training: Preparatory Training in Marine Sciences		
Semester : 2		
Title of the EU: FTU2		
Subject Title: Chemistry - Chemistry of Solutions		
Hourly volume: 60 hours	**Credits: 6**	**Coefficients: 3**

Teaching objectives:

To know how to describe the evolution and energy exchanges of a system in chemical reaction (internal energy, enthalpy, entropy and free energy of reaction). To know the influence of temperature on these quantities and to know how to predict the evolution of a chemical equilibrium.

To provide the necessary basis for understanding reactions in aqueous solutions (acid-base, solubility and oxidation-reduction) and to determine the speed and order of the chemical reaction.

Recommended prior knowledge:

Basic notions of mathematics (integrals, derivatives, differential equations, etc.) and general chemistry.

Content of the subject:

Course program (22h30)

Chapter 1: Thermodynamic concepts

- System, state function and state variables,
- Notion of ideal gases,

Chapter 2: First Law of Thermodynamics and Thermochemistry

- Notion of work, heat, internal energy ΔU, enthalpy ΔH
- Thermochemistry, enthalpy of heat of formation, enthalpy of heat of reaction (Hess's law, Kirchoff's law.....
- Bonding energy (Hess cycle).

Chapter 3: Second Law of Thermodynamics

- Notion of entropy ΔS and absolute S°.
- Notion of ΔG (free enthalpy), Gibbs El Motz's law.
- Influence of physical and chemical parameters on the evolution of a system, study of chemical equilibria.

Chapter 4: Chemical Balance.

- Laws of chemical equilibria: equilibrium constant and relationship with G, influence parameters, equilibrium balances.
- Multiple equilibria: reaction between the majority species, preponderant reaction
- Equilibria in solution.

Chapter 5: Acid Base

- Acid-base concept and Hydrogen potential pH.
- Acid-base reactions.
- Titrations in solutions (simple cases).

Chapter 6: Solubility.

- Notion of solubility, solubility product and precipitation.

- Influence of parameters on solubility (temperature, pH and common ion).

Chapter 7: Oxidation-reduction

- Notion of oxidation, redox reactions.
- Oxidation-reduction potential (Nerst relation, etc.).
- Daniell battery and how it works.

Chapter 8: Chemical Kinetics

- Reaction or balance equation. Elementary reaction. Molecule.
- Reaction mechanism. Reaction speed. Order of reaction.
- Constant of speeds. Experimental methods.

Practical work program (15h):

PW1: Glassware and apparatus and error calculation.

PW2: Preparation and dilution of solutions and determination of densities.

PW3: Determination of the temperatures of changes in the state of pure bodies.

PW4: Volumetric and potentiometric acid-base dosing.

PW: Solubility-Oxidation-reduction.

Directed work program (22h30):

- Series 1: introduction to thermodynamics.
- Series 2: heat, work, ΔU, ΔH, ΔS, 1st and 2nd law of thermodynamics.
- Series 3: calorimetry and thermometry.
- Series 4: thermochemistry.
- Series 5: chemical balances.
- Series 6: Acids and Bases.
- Series 7: Salts in solution.
- Series 8: Oxidation reduction.

Method of evaluation:

End of semester exam (50%)

Continuous assessments (50%): (tests in class sessions, practical work, oral tests, homework)

Title of the training: Preparatory Training in Marine Sciences		
Semester : 2		
Teaching Unit: MTU1		
Subject title: Physics - Electricity and Magnetism		
Hourly volume: 45 hours	**Credits: 3**	**Coefficients: 2**
Teaching objectives: To introduce students to the basics of Electricity and Electromagnetism.		
Recommended prior knowledge: Mathematical Notions (Analysis & Algebra)		

Content of the subject:

Course program (22h30):

Chapter 1: **Electrostatics (3h)**

1.1 Electric charge
1.2 Conductors and insulators
1.3 Inductive charging
1.4 Coulomb's Law

Chapter 2: **Circuits powered by direct current (3h)**

2.1 Ohm's Law
2.2 Elements of an electrical circuit
2.3 Resistivity
2.4 Joule effect
2.5 Kirchhoff's laws
2.6 Series and parallel resistors
2.7 Electromotive force

Chapter 3: **The Electric Field (3h)**

3.1 Electric field
3.2 Field lines
3.3 Moving Charges in a Uniform Electric Field

Chapter 4: **Gauss's theorem (3h)**

4.1 Electric field and conductors
4.2 Electrical flow
4.3 Gauss's theorem
4.4 Distributions de charges continues

Chapter 5: The Electric Potential (3h)

5.1 Electrical potential
5.2 Energy conservation

5.3 Determination of the electric field from the potential

Chapter 6: Capacitors (3h)

6.1 Capacitors
6.2 Dielectric
6.3 Series and parallel capacitors
6.4 Circuits RC

Chapter 7: Electromagnetism (4h30)

7.1 Definition of a magnetic field
7.2 Lorentz Force
7.3 Laplace Force
7.4 Faraday's Law
7.5 Biot and Savart's Law

Practical work program (…h):

Directed work program (22h30):

DW1: Electrostatics (3h)

DW2: DC Circuits (3 h)

DW3: The Electric Field (3 h)

DW4: Gauss's theorem (3 h)

DW5: The Electric Potential (3 h)

DW6: Capacitors (3 h)

DW7: Electromagnetism (4h30)

Method of evaluation:
End of semester exam (50%)
Continuous assessments (50%): (tests in class sessions, practical work, oral tests, homework)

Title of the training: Preparatory Training in Marine Sciences		
Semester : S2		
Teaching Unit: MTU1		
Subject Title: Mathematics - Mathematical Analysis 2		
Hourly volume: 45 hours	**Credits: 3**	**Coefficients: 2**

Teaching objectives:

The Mathematics 2 module aims to prepare students by providing them with an in-depth understanding of calculus and introducing advanced concepts such as differential equations, series, and numerical methods. Its main goal is to equip students with the skills to succeed in more advanced math courses and in fields of study that require proficiency in complex mathematical concepts, while also enabling them to:

- Master integral calculus techniques.
- Efficiently solve a variety of differential equations, both first and second order.
- Understand and analyze the properties of numerical sequences, as well as their convergence.
- Apply numerical analysis methods to solve mathematical problems and find approximations of solutions.

Recommended Prior Knowledge

Mathematics 1 (limits, continuity, differentiability, complex numbers...) and a familiarity with numerical sequences.

Content of the subject:

Course program (22h30):

Chapter I: Calculus of Integrals (9h)

1. Definition and properties of the integral in the Riemann sense.
2. Calculus of primitives and definite integral.
3. General integration techniques :
   - Direct integration.
   - Integration by parts.
   - Integration by substitution.
   - Integration of rational fractions.

Chapter II: Ordinary Differential Equations (6h)

1. General.
2. Differentiated equations of the first order.
   - Differential equations with separate variables.
   - Homogeneous differential equations in x and y.
   - First-order linear differential equations.
   - Bernoulli's differential equation.
3. Second-order linear differential equations with constant coefficients.
   - Solving the associated homogeneous linear equation.
   - Solving the non-homogeneous linear equation.

Chapter III: Numerical sequences (4.5h)

1. General (definition, graphic representation, etc.).
2. Sequence limit.
3. Convergent sequence.

4. Divergent sequences
5. Adjacent sequences
6. Arithmetic, geometric , and Cauchy sequence.

Chapter IV: Introduction to Numerical Analysis: (3h)

1. Dichotomy method (or bisection method).
2. Newton-Raphson method.

Practical work program (....h):

Directed work program (22h30):

Work on the chapters mentioned in the course program:

1. Calculation of integrals. (9h.)
2. Ordinary differential equations. (6h)
3. Numerical sequences. (4h30h)
4. Introduction to numerical analysis. (3h)

Method of evaluation:
End-of-semester exam (50%).
Continuous assessments (50%): tests in class sessions and/or Directed work , homework.

Title of the training: Preparatory Training in Marine Sciences		
Semester : 2		
Teaching Unit: MTU1		
Subject Title: General Oceanography		
Hourly volume: 45 hours	**Credits: 3**	**Coefficients: 2**

Teaching objectives:
To introduce the notion of oceanography by presenting the seas and oceans and their interaction with the air and the seabed and also the habitats and their biodiversity.

Recommended prior knowledge:
Biology and Geology courses of the 1st semester Preparatory classes

Content of the subject:

Course program (22h30):

INTRODUCTION (1h30):
History of Oceanography

PART ONE: KNOWLEDGE OF THE OCEAN

1. ORIGIN, EVOLUTION AND GEOGRAPHY OF THE OCEANS (3h)
   1.1. Origin and structure of the ocean floor
   1.2. Marine sediments (origin and structure)
   1.3. The major ocean basins (Pacific, Atlantic, Indian, Arctic, Antarctic)

2. MARINE WATERS (3h)
   2.1. Distribution of water on the planet
   2.2. Composition and characteristics of seawater
   2.3. Climate and general oceanic circulation (surface and thermohaline)

3. OCEAN PRODUCTIVITY (3h)
   3.1. Energy transfer, photosynthesis
   3.2. Critical factors for ocean productivity
   3.3. Concept of trophic chain and fertility

4. MARINE HABITATS AND THEIR BIODIVERSITY (3h)
   4.1 . Pelagic Domain
   4.2. Benthic domain

PART TWO: THE MEDITERRANEAN SEA (9 a.m.)

5. GEOGRAPHICAL, GEOLOGICAL AND CLIMATIC ELEMENTS (3 h)
   5.1.Dimensions, Configuration of the Main Basins, Island Aspect
   5.2. Volcanism and seismicity,
   5.3. Mediterranean climate (water balance, wind regime)
   5.4. General water circulation in the Mediterranean (surface and thermohaline)

6. REMARKABLE CHARACTERS OF THE MEDITERRANEAN (3h)

6.1. Productivity of the Mediterranean: Notion of Oligotrophy
6.2. Biodiversity of the Mediterranean and remarkable habitats
6.2.1. Biodiversity
6.2.2. Posidonia and Coralligenous meadows Film-debate: Discovery of the remarkable habitats of the Mediterranean

PART THREE: MARINE DOMAIN ISSUES
7. MARINE RESOURCES & HUMAN ACTIVITIES (1h30)
7.1. Living and Non-Living Marine Resources
7.1.1. Living Resources and their exploitation
7.1.2. Non-living resources and their exploitation
7.2. Anthropogenic pressures on the marine environment
7.2.1. Population growth and distribution: demography
7.2.2. Economic activity (industry, agriculture, tourism, maritime traffic, etc.)
7.2.3. Environmental and Resource Impacts

8. SUSTAINABLE MANAGEMENT OF THE MARINE DOMAIN (1h30)
8.1. Conflicts of use and the concept of integrated coastal zone management
8.2. Concept of sustainability in economic development
8.3. Major current issues on the sea (climate change, protection of biodiversity, various types of pollution, acidification)

Practical work program (....h) : /

Directed work program (22h30):

1- Common equipment used in oceanography (CTD/Rosette; Large volume bottles; Skips and Core Barrels; Pollsters; ….)
2- Autonomous marine instrumentation (moorings, profilers, gliders, sediment traps; deployment and lifting, drifting buoy, ...)
3- Videos: oceanographic and hydrological campaign; Coring campaign, autonomous marine instrumentation
4- Instrumentation used for marine biota (Net, direct observation by diving, ROV,.....)
5- Ocean Circulation and Seawater Properties (Work)
6- The Mediterranean Seas and the Mediterranean Circulation
7- Videos: Discovery of marine habitats (life on the surface of the oceans, space observation)
8- Videos: Marine reserves, sustainable fisheries, ocean acidification, Ocean of plastic

Method of evaluation:
End of semester exam (50%)
Continuous assessments (50%): (tests in class sessions, practical work, oral tests, homework)

Title of the training: Preparatory Training in Marine Sciences		
Semester : S2		
Teaching Unit: TTU1		
Subject title: Academic English		
Hourly volume: 30 hours	**Credits: 1**	**Coefficients: 1**

Teaching objectives:
Communicate in English in a professional setting (writing, analysis of scientific articles, discussion with collaborators).

Content of the subject:

(Note: This teaching is carried out in the form of directed work at the rate of 2 hours per week)

Course program (....h) : /

Practical work program (....h) : /

Directed program (30h):

Unit 1 : Analysis of texts and articles related to the marine environment :

- What is oceanography.
- Oceans and seas.
- Marine environmental zones.
- Marine ecology.
- Marine pollution.
- The hydrosphere.
- The nutrient cycle.
- The interraction of organisms in the marine environment . (symbiosis)
- Coral reefs.
- Algae.
- The uses of the sea.
- Heavy metals.
- Marine organisms (vertebarets /invertebrates).
- Sharks.
- Fisheries.
- Remote sensing.

Unit 2 : Oral presentations to be given by students :

- Marine environment.
- Fisheries.
- Aquaculture.
- Human impact on the marine environment.
- Climate change.
- Euthrophication.
- Invasive species.

Method of evaluation:
End of Semester Exam
Continuous assessments: (tests in class sessions, practical work, oral tests, homework)

SEMESTER 3

Title of the training: Preparatory Training in Marine Sciences		
Semester : 3		
Teaching Unit : FTU1		
Subject Title: ZOOLOGY		
Hourly volume: 60 hours	**Credits: 6**	**Coefficients: 3**

Teaching objectives:

The objective of the Zoology UE is to give students, whether they are destined for research or biodiversity management, the necessary basics of phylogeny, biology and morphological identification of the main animal groups. Practical work is preponderant, in order to develop skills (use of identification keys, handling of animals in collections) and knowledge (morpho-anatomy, characters of the main groups) in zoology. The teachings of this course thus offer many illustrations of the importance of phylogeny in understanding both evolution and animal biodiversity

Recommended prior knowledge:

The student should have an idea of the different classes of the animal kingdom as well as knowledge of animal physiology, embryology, and biology.

Content of the subject:

Course program (22h30):

Chapter 1: Presentation of the animal kingdom

1.1. Bases de la classification
1.2. Zoological nomenclature
1.3. Evolution and phylogeny
1.4. Numerical importance of the animal kingdom

Chapter 2: Subkingdom Protozoa

2.1. General information on protozoa.
2.2. Classification
2.2.1. Embranchement Sarcomastigophora
2.2.2. Embranchement Ciliophora
2.2.3. Embranchement Apicomplexa
2.2.4. Phylum Cnidosproridies

Chapter 3: Subkingdom Metazoa

3.1. Phylum Spongiaria
3.2. Cnidarian phylum
3.3. Ctenary Phylum
3.4. Phylum Platyhelminthes
3.5. Phylum Nemathelminthes
3.6. Phylum Annelids
3.7. Phylum Molluscs
3.8. Phylum Arthropods
3.9. Phylum Echinoderms
3.10. Phylum Chordates

3.10.1 External morphology
3.10.2 The integuments
3.10.3 Internal morphology: a study of the apparatus
- the digestive system
- The respiratory system: general organization, links with circulation
- The circulatory system: heart, venous system, arterial system
- The urinary tract: morphology and role
- the skeleton (cephalic, visceral, ..)
- the central and peripheral nervous system
- The Sense Organs
- The reproductive system
- Fertilization and development

Practical work program (15 hours):

PW1. Sponges: Study of Sponge Histology

PW2. Cnidarians: Observation and recognition of scyphozoans and anthozoans

PW3. Molluscs: Study of a bivalve mollusc. External and internal morphology

PW 4. Crustaceans: Study of a crustacean: the squille. External morphology, comparative study of the appendages

PW 5. Echinoderms: Study of the sea urchin

PW 6. Fish: Physiological study of bony fish or cartilaginous fish (comparison)

Directed work program (22h30):

DW 1. The basics of zoological nomenclature

DW 2. Sponges: calcareous sponges, homocoele calcareous sponges, heterocoele calcareous sponges,Hexactinellids or Demosponges

DW 3. Cnidarians: Hydrozoa, Scyphozoa and Anthozoans

DW 4. Molluscs: Solenogastra, Caudofovéates, Polyplacophores, Monoplacophores, Scaphopods, Gastropods, Lamellibranchs, Cephalopods (gastropods- lamellibranchs-cephalopods will be discussed in more detail).

DW 5. Arthropods: Chelicerates, Hexapods or insects, Myriapods, Trilobitomorphs, Crustaceans.

DW 6. Echinoderms: Echinoids, Asterids, Ophiurids and Holothurids

DW 7. The chordates: the Prochordates and the Vertebrates, the Prochordates, the Cephalochordates or Acannians, the Urochordates, the Perenicordae, the Caducichordates, the Ascidiaceae, the Thaliaceae.

Vertebrates: Agnathans, Cyclostomes, Petromyzontids, Myxinidae.

DW 8. Fish and tetrapods

Method of evaluation:
End of Semester Exam
Continuous assessments: (tests in class sessions, practical work, homework)

Title of the training: Preparatory Training in Marine Sciences		
Semester : 3		
Teaching Unit: FTU1		
Subject Title: Biochemistry		
Hourly volume: 45 hours	**Credits: 4**	**Coefficients: 2**

Teaching objectives:

At the end of the course, the student will have the basic skills concerning the structure of biological molecules (carbohydrates, lipids and proteins) as well as their metabolism and also know the usual analytical principles in biochemistry. The 2nd year student must: 1) Master the structure and metabolism of carbohydrates, lipids, amino acids and proteins. 2) The kinetics of single-substrate enzymes (Michaelis – Menten) as well as the mode of action of the different inhibitors.3) Beintroduced to biochemical analysis techniques.

Recommended prior knowledge:

Notions of General Chemistry and notions of Cytology.

Content of the subject:

Course program (22h30)

Part 1: Structural Biochemistry

Chapter 1: Carbohydrates

1. General
2. Carbohydrate Classification
3. Nomenclature of the oses
4. Cyclic structure of the oses
5. Physicochemical properties of oses
6. Biological Species and their derivatives
7. Polyosides

Chapter 2: Lipids

1. General
2. Fatty acids (Saturated fatty acids, Unsaturated fatty acids: nomenclature, type and properties)
3. Classification of lipids:
   - Simple Fat
   - Complex Lipids
4. Physicochemical properties

Chapter 3: Proteins

1. General
2. Amino acids:
   - Structure and classification
   - Physicochemical properties of amino acids
   - Amino acid separation and dosing
3. Peptides :
   - General
   - Structure and nomenclature
   - Physicochemical properties
   - Study of peptide sequences

4. Proteins:
    - General
    - Structure
    - Physicochemical properties

Chapter IV: Enzymes

1. Classification and nomenclature
2. Specificity of enzymes
3. Enzymatic kinetics: Michaelis-Menten equation
4. Inhibitors

Part 2: Metabolic Biochemistry

Chapter V: Metabolism of the Bone

1. Introduction
2. Glycolysis
    - Anaerobic Glycolysis
    - Aerobic Glycolysis
    - Energy balance of glycolysis
3. Krebs cycle or citric acid cycle

Chapter VI: Lipid Metabolism: Fatty Acid Oxidation

1. Introduction
2. Fatty acid activation
3. β- oxidation
4. Energy balance of β-oxidation

Chapter VII: Metabolism of proteins.

1. Deamination
    - Oxidative deamination
    - Non-Oxidative Deamination
2. Deamidation
3. Ornithine - Urea Cycle

Directed work program (19h30):

DW1: Application on carbohydrates (oses, diholosides, polyosides)

DW2: Application on lipids (structure, esterification, saponification, molecular weight)

DW3: Application on proteins (isoelectric point, amphoteric character, separation technique, sequence)

DW4: Application on enzymes (graphical determination of kinetic parameters, mode of action of inhibitors)

Practical work program (3h):

PW1: Application on carbohydrates: rotational power of sugars: polarimetry

PW2: Application on lipids: determination of the peroxide value of a lipid or saponification reaction

PW3: Application on amino acids: molecular absorption spectrophotometry (qualitative and quantitative analysis)

Method of evaluation:

End of Semester Exam
Continuous assessments: (tests in class sessions, practical work, homework)

Title of the training: Preparatory Training in Marine Sciences		
Semester : 3		
Teaching Unit: FTU2		
Subject Title: Mineral Chemistry		
Hourly volume: 60 hours	**Credits: 6**	**Coefficients: 3**

Teaching objectives:

To know the characterization parameters of water and to know how to analyze natural water (dissolved salts and gases, suspended solids, natural organic matter). Solving chemical equilibria in solution, interpreting and criticizing results

The focus will be on calco-carbonic equilibria and their role in natural water chemistry, metal chemistry and oxidation-reduction reactions. This is an opportunity to use the main water analysis methods (pH, alkalinity, hardness, dissolved oxygen, complexation, solubility-precipitation and redox potential)

Recommended prior knowledge:

It is recommended to master the subjects "Structure of Matter and Chemistry of Solutions" and the "Practical Work " taught in S1 and S2 of the Preparatory Training.

Content of the subject:

Course program (22h30):

Chapter 1: Properties of Water

- Chemical structure of water (polarity, polarizability, H-bonding, solvent, stability, etc.),
- Chemical property of water
- Thermodynamic properties (latent and specific heats, phase equilibria, transparencies, surface tension, dielectric constant, saturation vapor pressure),
- Energy properties (thermal, steam engine, etc.)

Chapter 2: Dissolved Gases - Acidic Bases

- Equation of state of atmospheric gases, partial pressure of atmospheric gases, fugacity of non-ideal gases in pure state and in a mixture
- Dissolution of gases in surface water
- Solubility gas coefficient and atmospheric gas solubility
- CO2 and O2 dissolved in water.
- Acid-base reactions in natural waters: (Reminders of acid-base balances, pH, activity and activity coefficient, Buffering capacity of waters)
- Monoacids and polyacids
- Chemistry of carbonic acid in water
- Dissolutions of limestone by rain.
- Diagrams of the predominance and distribution of acid-base species: Log-log diagrams (D.L.M)

Chapter 3: Complexation reaction in water

- Notion of Complex or Coordination Compound
- Complex ion characteristic constants and predominance diagram (case of simple and successive complex)
- Diagrams of the predominance and distribution of the species of the complexes.

Chapter 4: Precipitation Response in Water

- Concept of solubility and solubility product (precipitate existence diagram and competitive precipitation)
- Prediction of precipitation reactions (effect of temperature, common pH and complexation ion)
- Precipitation or non-precipitation diagrams of salts in solution as a function of pI or PH

Chapter 5: Oxidation-reduction reactions in natural waters

- Concept of oxidation-reduction (oxidation-reduction potential, free enthalpy and potential, Nernst relation)
- Stability of chemical species in water
- Domain of predominance and existence of species
- Parameters influencing the E potential (PH, precipitation and complexation)
- Oxidation-reduction and micro-organisms (aerobic decomposition and aneorobia of organic matter).
- Corrosive actions of water: Pourbaix diagrams of water, iron, copper and aluminum.

Practical work program (15h):

PW1: Study of the calco-carbonic balance of drinking water. Determination of the Alkali Strength, the Full Alkali Strength, the calcium concentration and the study of the calcocarbonic equilibrium

PW2: Nitrite ion assay. Determination of the nitrite concentration of drinking water, and evaluation of its possible drinkability with regard to this variable.

PW3: Potentiometric determination of chloride ions. Determination of chlorides and determination of the solubility product of silver chloride

PW4: Oxidation-reduction reactions.

Directed work program (22h30):

- Series 1: Chemical properties of water.
- Series 2: Thermodynamic properties of water.
- Series 3: Gases dissolved in water
- Series 4: acid-base reactions and the carbonate system
- Series 5: Precipitation and complexation reactions in natural waters
- Series 6: Redox reactions and Pourbaix diagrams

Method of evaluation:

End of Semester Exam

Continuous assessments: (tests in class sessions, practical work, oral tests, homework)

Title of the training: Preparatory Training in Marine Sciences		
Semester : S3		
Teaching Unit: FTU2		
Subject Title: Marine Geology		
Hourly volume: 45 hours	**Credits: 4**	**Coefficients: 2**

Teaching objectives:

To perfect the students' knowledge acquired in the 1st year in the fundamental disciplines and to give the specific notions of the marine and coastal environment. The purpose of marine geology is to describe the marine and coastal environment (complex) and to understand the mechanisms (factors) that govern it.

Recommended prior knowledge:

To be able to continue the teaching of this unit, the student must have followed the courses taught in the 1st year of the preparatory classes, namely: general geology and general oceanography.

Content of the subject:

Course program (22h30):

1. Introduction to marine geology. (3h)
2. Introduction to Underwater and Littoral Geomorphology. (3h)
3. The mechanisms of coastal erosion. (3h)
5. The products of coastal erosion. (1h30)
6. The elements of study of the marine Quaternary. (3h)
7. Description of the Algerian continental margin. (3h)
8. The sedimentary distribution on the Algerian continental margin. (1h30)
9. Elements of geodynamics of the Algerian basin (compression and distortion of plates). (3h)

Practical work program (22h30)

1. Sediment particle size (classification, distribution, median, hydrodynamic factors). (6h)
2. Sediment morphoscopy. (3h)
3. Interpretation of nautical charts of the Algerian coast. (The main morphological features of the Algerian coast, case of low coast with wide plateau, case of high coast with reduced plateau etc...). (3h)
4. Nature, distribution and origin of sediments on the Algerian continental shelf, based on the mechanism of sediment genesis, in relation to continental inputs. (3h)

Field trip (7h30).

Directed work program (.. (h): /

Method of evaluation:

End of Semester Exam

Continuous assessments: (tests in class sessions, practical work, oral tests, homework)

Title of the training: Preparatory Training in Marine Sciences		
Semester : 3		
Teaching Unit: MTU1		
Subject Title: Physics -Fluid Mechanics		
Hourly volume: 45 hours	**Credits: 3**	**Coefficient: 2**

Teaching objectives:

Fluid mechanics is a branch of physics that studies the behavior of fluids at rest and in motion, it aims at the analysis of flows, the calculation of forces and pressures, the design and sizing of fluid pipe networks and the study of natural phenomena.

Recommended prior knowledge:

A good command of the basic sciences is essential, in particular general physics (kinematics, dynamics), mathematics (differential and integral calculus, derivatives, geometry, etc.)

Content of the subject:

Course program (22h30):

PART I: Fluid Mechanics

Chapter 1: Introduction to Fluid Mechanics (1h30)

1. Definitions, perfect fluid, real fluid, incompressible fluid and compressible fluid.
2. Physical characteristics: density, relative density, viscosity.
3. Surface tension, capillary action and applications (1h30).

Chapter 2: Hydrostatics (4h30)

1. Notion of pressure, Laws of hydrostatics (1h30).
2. Applications: (1h30)
- 2.1. Communicanting vessels,
- 2.2. Hydraulic press,
- 2.3. Pascal's principle, Archimedes' principle, floating bodies.
- 2.4. Barometers

3. Pressure force: Flat surfaces and left surfaces (1h30).

Chapter 3: Hydrodynamics (12h)

1. Perfect Incompressible Fluid Dynamics (4h30)
- 1.1. Permanent flow
- 1.2. Law of conservation of mass
- 1.3. Current line, net and tube and concept of flow
- 1.4. Bernoulli's equation: Case of a flow without labor exchange (1h30)
- 1.5. Bernoulli equation: Case of a flow with labor exchange
- 1.6. Euler's theorem (1h30).
- 1.7. Applications, Venturi Effect, Pitot Tubes, Tank Drain (1h30)

2. Real Incompressible Fluid Dynamics (7h30)
- 2.1. Flow regimes and the Reynolds number
- 2.2. Definition, adhesion, boundary layer, flow applications (1h30).
- 2.3. Linear and singular pressure losses
- 2.4. Generalized Bernoulli equation (1h30).
- 2.5. Navier Stokes equations (1h30).
- 2.6. Poiseuille's law, application (1h30).

2.7. Resistance to the movement of a fluid: Frictional forces, coefficient of friction Cd, Drag, Lift. (1h30)

PART II: Introduction to mass and energy transfer phenomena: (4h30)

Chapter 4: Mass transfer (1h30)
1. Fick's First and Second Laws and Applications

Chapter 5: Heat transfer (3h).
1. Definitions (luminance, intensity, emittance, irradiance, blackbody)
2. Laws Governing Heat Transfer Modes
2.1. Conduction and J. Fourier's law
2.2. Convection and I. Newton
2.3. Radiation and S. Boltzmann's Law

Directed work program (22h30):

DW 1: Properties of fluids (density, relative density, viscosity, surface tension and capillarity). (1h30)
DW 2: Hydrostatic pressure / Scale and units (1h30).
DW 3: Hydraulic press and Archimedes' thrust, Hydrostatics of floating bodies (3h).
DW 4: Pressing force on the walls: Flat surfaces and left surfaces; (3h)
DW 5: Perfect fluid: Equation for the conservation of mass; Calculation of flows. (3h)
DW 6: Real fluid and pressure drop: Generalized Bernoulli equation; Flow regimes. (3 hours).
DW 7: Navier Stokes equations: Solving in simplified cases (1h30).
DW 8: Poiseuille's Law, Drag Force and Lift Force (3h).
DW 9: Transfer of the mase (Application of Fick's laws) (1h30)
DW 10: Heat transfer (1h30)

Method of evaluation:
End of Semester Exam
Continuous assessments: (tests in class sessions, practical work, oral tests, homework)

Title of the training: Preparatory Training in Marine Sciences		
Semester : 3		
Teaching Unit: MTU1		
Subject Title: Mathematics - Linear Algebra and Calculus		
Hourly volume: 60 hours	**Credits: 4**	**Coefficients: 2**

Teaching objectives:

At the end of this course, the student is expected to:

- Know how to manipulate matrices
- Solve systems of linear equations
- Calculate partial and second partial derivatives of multivariable functions,
- Calculate multiple integrals, using a change of variables

Recommended prior knowledge:

- Study of one-variable functions
- Calculation of simple integrals
- Trigonometric calculation

Content of the subject:

Course program (22h30):

Chapter 1: Vector Spaces - Linear transformations (4h30)

1.1 Basic Algebraic Structures **(1h30)**
1.2 Vector or inner spaces on a field (K=C or K=R) **(1h30)**
1.3 Linear transformations **(1h30)**

Chapter 2: Matrix calculus and systems of linear equations (10:30 am)

2.1 The Matrices **(4h30)**
2.2 Matrices associated with linear maps **(3h)**
2.3 System of linear equations **(3h)**

Chapter 3: Multivariable Functions: (Two-Variable Functions) (4h)

Chapter 4: Multiple Integrals (3h30)

Practical work program (....h) : /

Directed work program (37h30):

- Vector Spaces-Linear transformations: **(9h)**
- Operations on matrices and systems of linear equations: **(10h30)**
- Multivariable Functions: **(9h)**
- Double and triple integrals: **(9h)**

Method of evaluation:

End of semester exam (50%)
Continuous assessments (50%): Quizzes in progress (10%), tests in practical work sessions (75%), attendance grade (15%)

Title of the training: Preparatory Training in Marine Sciences		
Semester : 3		
Teaching Unit: TTU1		
Subject Title: General Ecology		
Hourly volume: 45 hours	**Credits: 2**	**Coefficients: 2**

Teaching objectives:
This subject presents biocenoses and ecological factors, the ecology of populations and stands as well as an introduction to digital ecology.

Recommended prior knowledge:

Content of the subject:

Course program (22h30):

1-General
1.1 Definitions
1.2 Earth and Biosphere
1.3 Biogeography and distribution of species

2- Ecological factors
2.1. Limiting factors
2.1 Abiotic factors
2.2. Biotic factors

3-Population ecology
3.1. Study methods
3.2. Demographic parameters
3.3. Spatial distribution of populations
3.4. Competition
3.5. Predation
3.6. Parasitism
3.7. Symbiosis

4-Ecology of stands and communities
4.1. Organization of Settlements and Communities
4.2. The concept of ecological niche
4.3. Structure and organization of stands and communities
4.4. Development and evolution of stands and communities

5. Energy Flow and Matter Cycle
5.1. Food chains and webs
5.2. Production and productivity
5.3. Diagram of energy flows in stands and Communities

6. Notion of digital ecology
6.1. Workforce Assessment
6.2. Growth Laws

6.3. Laws of succession
6.4. Distributional Laws

Practical work program (.. h):/

Directed work program (22h30):

1. How to enter data on a spreadsheet (1h30)
2. How to do numerical calculations on a spreadsheet (1h30)
3. Analysis of climatic factors (1h30)
4. Analysis of hydrological factors (1h30)
5. Analysis of edaphic factors (1h30)
6. Method of calculating densities and biomasses (1h30)
7. Method of calculating abundance diagrams (1h30)
8. Method of calculating dominances and frequencies (1h30)
9. Method of calculating diversity indices (1h30)

A field trip: 6 hours / Reconnaissance of coastal ecosystems

Method of evaluation:
End of semester exam (50%)
Continuous assessments (50%): (tests in class sessions, practical work, oral tests, homework)

Title of the training: Preparatory Training in Marine Sciences		
Semester : 3		
Teaching Unit: DTU1		
Title of the subject: Marine resources		
Hourly volume: 15h	**Credits: 1**	**Coefficients: 1**

Teaching objectives:
This module aims to introduce students to the richness and diversity of living and non-living marine resources, as well as their importance to society.

Recommended prior knowledge:
Biology, Chemistry and Geology.

Content of the subject

Course programme (15h): (with visual aids)

Chapter 1: Introduction to Marine Resources
- Definition of marine resources
- Importance of marine resources to the global economy

Chapter 2: Marine Living Resources
- Fish: fishing and aquaculture.
- Marine algae and phytoplankton: brown, red, and green algae used in food, cosmetics, aquaculture, and other industries.
- Marine organisms for medical research: sponges, corals, some molluscs, etc.

Chapter 3: Marine non-living resources
- Marine renewable energy: offshore wind energy, wave energy, ocean thermal energy.
- Minerals and metals: mineral sands, manganese, nickel, copper, polymetallic nodules used in industry.
- Oil and natural gas: fossil resources extracted from the seabed for energy.
- Building materials: Sand and gravel used in construction, civil engineering, and concrete manufacturing.
- Fresh and drinking water (desalination).

Chapter 4: Commercial and Tourism Activities
- Maritime transport, tourism, submarine cabling, etc...

Practical work program (....h) : /

Directed work program (.. h): /

Method of evaluation:
End of Semester Exam
Continuous assessments: (tests in class sessions and oral tests)

SEMESTER 4

Title of the training: Preparatory Training in Marine Sciences		
Semester : 4		
Teaching Unit: FTU1		
Subject title: Microbiology		
Hourly volume: 45 hours	**Credits: 4**	**Coefficients: 2**

Teaching objectives:

Students oriented towards Natural and Life Sciences will acquire a good training to carry out their future in the field of scientific research and employment.

The world of Microbiology allows students to learn about different microorganisms. This knowledge is necessary to undertake studies in different biology pathways.

The objective of this subject is to give students the theoretical and experimental bases specific to the study of microorganisms,

- it will provide the knowledge essential to understanding the place of micro-organisms in ecosystems and;
- to show the interest of the microbial model on research applications in biology, cell biology and physiology, biotechnology and microbial genetics.
- knowledge of all the microorganisms that surround us (bacteria, fungi, protozoa, algae, viruses);
- understanding and monitoring their activities when they are harmful (microbiological examination of samples and biological fluids; quality control;

antibiotic therapy; environmental depollution, bioremediation, etc.) ;

- the use and improvement of their properties when they are beneficial (yeast, yoghurt, antibiotics, vaccines, enzyme, etc.). fatty acids, lipids,...).

Recommended prior knowledge:

Microbiology is a sub-discipline of biology that is concerned with the study of microorganisms, and their relationships with their environment (air, water, land,.....). It requires notions of General Biology, notions of Biochemistry and notions of Genetics.

Content of the subject

<u>Course program (22h30):</u>

Chapter 1: Introduction to the microbial world (1h30)

1.1. History (reminder on spontaneous generation)
1.2. The place of microorganisms in the living world
1.3. General characteristics of the prokaryotic cell
1.4. Comparison between eukaryotic and prokaryotic cells

Chapter 2: Morphology and Ultrastructure of Bacteria (6h)

2.1. Morphology of bacteria (shape, size and their modes of association) (1h30)
2.2. Ultra-structure of bacteria: The constituents of the bacterial cell:
Constant and Inconstant Elements of Bacterial Structure (Simplified General Diagram of a Bacterium)

2.2.1 The constant (mandatory) elements of the bacterial cell (2h30)

- The bacterial wall
- The cytoplasm
- The nuclear apparatus
- The cytoplasmic membrane

2.2.2 The (optional) inconstant elements of the bacterial cell (2h)

- The capsule
- Flagella
- The pili or fimbriae
- Les plasmides
- Spores: sporulation and germination

2.3 Biofilm (concepts)

Chapter 3: Basics of bacterial taxonomy (1h30)

3.1 Different types of classification
3.2 Artificial classification
3.3 Natural classification
3.4 Phenotypic and phylogenetic

Chapter 4: Metabolism and trophic types (4h30)

4.1 Energy metabolism

The notions*:* autotrophy, *heterotrophy*, *growth factors*, *anti-metabolite, chemotrophy, lithotrophy, organothrophy, auxothrophy, protothrophy, syntrophy* and *limiting factor*.

4.2. Respiratory Types of Chemotrophs (Respiration and Fermentation)
4.3. Source of carbon
4.4. Nitrogen source
4.5. Mineral ion requirements
4.6. Physicochemical factors: Temperature, pH, Osmotic pressure, Oxygen requirements

Chapter 5: Bacterial Growth (4h30)

5.1 Growth Measurement Method
5.2 Growth Parameters
5.3 Growth Charts
5.4 Diauxie phenomenon **(**Diauxic growth**.)**

Chapter 6: Mycology (3h)

6.1. General characteristics of microscopic fungi **(yeast and moulds)**
6.1.1. Chemical Composition and Structure of Cells
6.1.2. Growth and reproduction
6.2. Taxonomy of fungi,
6.3. Morphology
6.4. Reproduction

Chapter 7: Notion of Virology (1h30)

7.1. Characteristics of viruses
7.2. Morphology (capsid and envelope)
7.3. Different Types of Viruses and Bacteriophages
7.4. Viral cycle (lytic and lysogenic cycle)

<u>Practical work program</u> (22h30)

TP 1. Instructions (rules) to follow during handling in the Microbiology laboratory

TP 2. Culture media: definition, presentation, composition and use

TP 3. 1- The discovery of the microbial world: Contamination of the agar medium (use of non-aseptic conditions)

2- Microscopic examination of microorganisms (bacteria, protozoa, fungi, yeast,.....) in their fresh state

TP 4. Macroscopic examination (Macroscopic description criteria) of bacterial and fungal colonies.

TP 5. Microscopic examination of microorganisms (bacteria and fungi) after staining:

1. Preparation of dry smears fixed;
2. Simple staining;
3. Differential staining (Gram)

TP 6. 1- Methods of sowing and isolation of pure crops.

2- Biochemical identification of isolated bacteria

has. Conventional tests (Simmons citrate, mannitol mobility,.....)

b. Miniaturized gallery seeding (e.g. API 20E)

TP 7. 1- preparation of the bacterial suspension,

2- the stages of sowing, etc....., reading and interpretation)

Directed work program (... h): /

Method of evaluation:

End of Semester Exam

Continuous assessments: (tests in class sessions, practical work, oral tests)

Title of the training: Preparatory Training in Marine Sciences		
Semester : S4		
Teaching Unit: FTU1		
Subject Title: Botany		
Hourly volume: 45 hours	**Credits: 4**	**Coefficients: 2**

Teaching objectives:
Study of the different levels of organization of the plant kingdom: Systematics, evolution and phylogeny.
Study of marine plants (algae and marine phanerogams) as well as their morphological structures, growth and reproduction.

Recommended prior knowledge:
Fundamental notions of plant biology.

Content of the subject

Course program (22h30):

CHAPTER I: GENERAL NOTIONS OF BOTANY

1.1 What is botany
1.2 Historical
1.3 Concepts and criteria for classification
1.4 Complexity of classification
1.5 Evolution and phylogeny
1.6 Systematics of the major groups of the plant kingdom
- 1.6.1 Thallophytes (Algae and fungi)
- 1.6.2 Les Cormophytes
  - a- Les Bryophytes
  - b- Pteridophytes
  - c- Les Spermaphytes
    - Gymnosperms
    - Chlamydosperms.
    - Angiosperms (Monocots and Dicotyledons).

CHAPTER II: ALGAE

2.1 Prokaryotic algae (cyanophytes or cyanobacteria)
- Morphological and cytological characters
- The different types of cyanobacteria
- Reproduction

2.2 Eukaryotic algae
- 2.2.1 Morphological and cytological characters
- 2.2.2 The different types of thalli (in evolutionary order)
- 2.2.3 The different growth methods
- 2.2.4 The plastidial structure (in evolutionary order)
- 2.2.5 Asexual and sexual reproduction
- 2.2.6 Life Cycles
  - Monogenetic cycle
  - Digenetic cycle
  - Trigenetic cycle

2.2.7 The major groups of eukaryotic algae (systematics, particularities and ecological status)
- Rhodophytes
- Chromophytes
- Chlorophytes

CHAPTER III: MARINE PHANEROGAMS

3.1 General and systematic
3.2 Morphological characters and growth
3.3 Anatomy and Acrarium
3.4 Reproduction and development

CHAPTER IV: LICHENS

4.1 Definitions and general
4.2 The main types of thalli
4.3 Reproduction
4.4 Classification principles

Practical work program (22h30):

TP 1. The major groups of the plant kingdom
TP 2. Cyanophytes
TP 3. The different types of thalli in algae
TP 4. The plastidial structure of algae.
TP 5. The different modes of growth in algae.
TP 6. The life cycles of algae: Monogenetic and digenetic cycles.
TP 7. The life cycles of algae: Trigenetic cycle.

Directed work program (.. h): /

Method of evaluation:
End of semester exam (50%)
Continuous assessments (50%): practical work reports, homework, CC in progress.

Title of the training: Preparatory Training in Marine Sciences		
Semester : S4		
Teaching Unit: FTU1		
Subject Title: Genetics		
Hourly volume: 37h30	**Credits: 4**	**Coefficients: 2**

Teaching objectives:

Nature and life science students must distinguish prokaryotic organisms from eukaryotic organisms in genetics;

DNA is an easily manageable working tool in different molecular biology techniques, in this case molecular hybridization, transgenesis and cloning, without neglecting bacterial genetics;

This subject deals with a set of basic notions in genetics, from the structure of DNA and its variations, through formal genetics, to protein synthesis and an introduction to population genetics;

The chapters were treated, without exhaustive details, while trying to include all the essential requirements for a basic genetics course;

We have set ourselves the goal of establishing a structured organization within and between chapters and inserting pedagogically useful figures.

Genetics has become essential in any biology curriculum;

It plays a central role in an individual's life. It affects his physical appearance, his sensitivity to a series of diseases, his personality and his intelligence;

Genetics plays an important role in agriculture, the pharmaceutical industry and medicine. Developments in this discipline have doubled the size of textbooks devoted to it.

Recommended prior knowledge:

Teaching of the subjects, Cell Biology and Animal Biology, first year preparatory classes.

Content of the subject

Course programme (22h30):

Chapter I: GENETIC MATERIAL:(4h)

- Nucleic acid structure;
- DNA replication in prokaryotes and eukaryotes
- Chromosome organization

Chapter II: LIFE CYCLES: (2h)

- The diplobiontic cycles: the drosophila
- Haplobiontic cycles: chlamydonomas and neurospora

Chapter III: FORMAL OR MENDELIAN GENETICS (4h30)

- The Mendelian experiences
- Gene interactions
- The polyallelia
- Epistasia

Chapter IV: BACTERIAL GENETICS (3h)

- Genetic transfers in bacteria

Chapter V: Protein synthesis (3h)

- Transcript
- Genetic code
- Translation
- Gene mutations

Chapter VI: Structure, function and regulation of gene expression in prokaryotes and eukaryotes (3h)

Chapter VII: Notions of population genetics: (3h)

- Population definition
- Hardy and Weinberg's law and its implications
- Genetic drift
- Natural selection

Practical work program (... h): /

Directed work program (15h):

- Work on the structure of nucleic acids
- Work on haploid genetics
- Work on Mendelian genetics
- Work on protein synthesis and gene expression regulation in prokaryotes and eukaryotes.

Method of evaluation:

End of semester exam (50%)

Continuous assessments (50%): (tests in class sessions, oral tests, homework)

Title of the training: Preparatory Training in Marine Sciences		
Semester : 4		
Teaching Unit: UEF2		
Subject Title: Organic Chemistry		
Hourly volume: 52h30	**Credits: 4**	**Coefficients: 2**

Teaching objectives:

Of paramount importance, the teaching of this subject allows the student to acquire the theoretical knowledge and fundamental laws of organic chemistry, to be able to name and represent a molecule. Knowing how to assemble and arrange molecules in different ways (isomerism and stereoisomerism). Determine the category of a reaction by examining the nature of the reactants and products

Recommended prior knowledge:

It is recommended to master the subjects "Structure of matter and Chemistry of solutions" and the "PW" taught in S1 and S2 FP1

Content of subject:

Course program (22h30):

Chapter 1: Nomenclature in Organic Chemistry

- Nomenclature according to IUPAC
- Cyclic and acyclic hydrocarbons (saturated and unsaturated)
- Organic functions (acid, alcohols, ketones, etc.)

Chapter 2: Isomerism and Stereochemistry

- Planar isomerism (function, position and chain)
- Conformational and configuration stereoisomerism
  Optical isomerism (chirality, R and S configuration,
  Geometric isomerism (cis and trans)

Chapter 3: Electronic Effects

- Influence on the properties of organic molecules (inductive and mesomeric effect)

Chapter 4: Reaction mechanisms

- SN1 and SN2 nucleophilic substitution
- E1 and E2 elimination
- Nucleophilic and electrophilic addition
- Electrophilic substitution SE1 and SE2

Practical work program (7h30):

- PW1: Molecular models and nomenclature
- PW2: Stereoisomerism and optical activity
- PW3: Preparation of tertiobutyl chloride
- PW4: Synthesis of an amide (acetanilide) or synthesis of soap (saponification reaction).

Directed work program (22h30):

- Series 1: Nomenclature in organic chemistry.
- Series 2: Stereoisomerism.
- Series 3: Electronic effects (inductive and mesomeric effects)

- Series 4: Addition and elimination reactions - Series 5: Electrophilic and nucleophilic substitution reactions
Method of evaluation: End of semester exam (50%) Continuous assessments (50%): (tests in class sessions, practical work, oral tests, homework)

Title of the training: Preparatory Training in Marine Sciences		
Semester : S4		
Teaching Unit: FTU2		
Subject Title: General Hydrology		
Hourly volume: 45 hours	**Credits: 4**	**Coefficients: 2**

Teaching objectives:

To perfect and deepen the knowledge of students acquired in the 1st year in the preparatory classes. This fundamental subject will allow students to access the knowledge of the hydrology of the watershed, its dynamics and functioning and its impact on coastal morphology, it studies runoff, erosion phenomena, river flows and floods as well as the analysis of spatial data.

Recommended prior knowledge:

To be able to continue the teaching of this unit, the student must have followed the courses given in the preparatory classes, namely: General Geology, General Oceanography, Marine Geology, Marine Physics.

Content of subject:

Course program (22h30):

Chapter 1: Instruments for measuring spatial data (Topography) **(06h)**

1-Definition
2-Areas of use
3-Angle measurements
3-1 Horizontal Angles
3-2 Vertical Angles
4-Angle measuring instruments
4-1 Theodolite
4-2 Drive total
5-Distance measurement
6-Distance measuring instruments
6-1 Tachometer
6-2 Stadimetric rangefinder
7-Leveling

Chapter 2: Descriptive approach to the physical and natural environment **(7h30)**

1. Introduction to Surface Hydrology
   1.1 Definition of hydrology
   1.2 Areas of application
   1.3 Definition of the hydrological cycle
   1.4 Components of the hydrological cycle
   1.5 Hydrological (water) balance

2. The watershed
   2.1 Concept of "watershed"
   has. Topographic watershed
   b. Hydrogeological watershed

3. Morphometric characteristics
    a. The surface
    b. The perimeter
    c. Gravelius Shape Index or Compactness Coefficient "Kk "
    d. The equivalent rectangle
4. Topographical features
    a. Relief Parameters
    b. Characteristics of altitudes (hypsometric curve)
    c. Slope indices
5. Characteristics of the hydrographic network
    a. Network Prioritization
    b. Shape of the hydrographic network
    c. Drainage density
6. Agro-pedo-geological characteristics
    a. Ground cover
    b. the nature of the soil (geological characteristics)

Chapter 3: Evolution and anthropogenic impacts on the hydrological balance **(06 h)**

1. The effects of urbanization and industrial activities
    a. Soil sealing
    b. Acceleration of flows
    c. The construction of flow barriers
    d. The artificialization of urban rivers
2. Effects of agricultural work
3. Development and work on waterways
    a. Dams and hydroelectric structures
    b. Other developments and river works
4. Development in flood zones
5. Impacts of overexploitation of groundwater

Chapter 4: Inputs to the sea from Algerian wadis **(03h)**

1. Liquid intake
2. Solid contributions
3. Relationship between liquid and solid flow rates
4. Specific erosion and solid inputs
5. Relationship between watershed and coastal morphology
6. Example of some Algerian exoreic wadis

Practical work program (22h30):

1- Use of a GPS navigation (Handling and configuration of the GPS, survey of details) (3h)
2- Reading a digital map (Software tools, geo-referencing a map) (7h)
3- Representation on a map of the point surveyed. (3h30)
4- Catchment area of an Algerian wadi: Delimitation of the B.V, compactness index and the equivalent rectangle. (3h)
5- Watershed of an Algerian wadi: elaboration of a hypsometric curve. (3h)
6- Catchment area of an Algerian wadi: classification of the hydrographic network and drainage density. (3h)

Directed work program (.. h): /
Method of evaluation: End of semester exam (50%) Continuous assessments (50%): (tests in class sessions, practical work, oral tests, homework)

Title of the training: Preparatory Training in Marine Sciences		
Semester : 4		
Teaching Unit: MTU1		
Subject Title: Marine Physics		
Hourly volume: 45 hours	**Credits: 04**	**Coefficients: 02**

Teaching objectives:

1. Understanding of the fundamental principles of physics applied to the ocean.
2. Application of physical concepts to the study of oceanographic phenomena such as currents, waves, and tides.
3. Familiarization with the measurement techniques and instruments used in physical oceanography.
4. Analysis of the interaction between the ocean and other components of the Earth system, such as the atmosphere and lithosphere.
5. Exploring the implications of ocean physics on climate, marine biodiversity, and coastal ecosystems.
6. Promoting research and development of solutions to ocean-related environmental challenges, such as climate change and pollution.

Recommended prior knowledge:

1. Mastery of the basic principles of physics, including mechanics and thermodynamics.
2. Understanding of mathematical concepts such as differential and integral calculus.
3. Knowledge of physical geography, including ocean topography, distribution of water bodies, and seabed characteristics.
4. Familiarity with the concepts of general chemistry and geochemistry, particularly as it relates to the chemical composition of seawater.
5. Mastery of the basic principles of marine biology, in particular with regard to marine ecosystem dynamics and biodiversity.
6. Ability to use computer tools and software.

Content of the subject:

Course program (22h30):

INTRODUCTION

Planet Earth in figures.
Land and sea distribution
Ocean basin structure.
Physical characteristics of pure water.
Applications of hydrostatics in the ocean.

CHAPTER 1: GENERAL PROPERTIES OF SEAWATER

The notions of salinity.
Temperature and density.

CHAPTER 2: OCEAN MASS AND SALT BALANCES

Conservation of mass in the ocean.
Salt conservation in the oceans.
Time of Residence: τ
.

CHAPTER 3: OCEAN LIGHT PENETRATION

Introduction.
Light attenuation.
Process of light penetration in the oceans.

CHAPTER 4: TEMPERATURE, SALINITY AND DENSITY DISTRIBUTION

Temperature distributions.
    Overview.
    Temperature evolution at depth.
Salinity distributions.
    Surface salinity.
    Evolution of salinity at depth.
Density distributions.
    Surface density.
    Evolution of density in depth.
Notion of stability.
Notion of of water mass.
T/S diagrams.

CHAPTER 5: FRICTIONAL OR DRIFT CURRENTS "EKMAN'S THEORY"

Forces acting on marine waters.
Ekman's theory.
Ekman's spiral.
Ekman's transport.
Wind blowing parallel to a coast.
Whirlwinds.
Current and period of inertia.

CHAPTER 6: GEOSTROPHIC CURRENT

Introduction.
Pressure gradient in the oceans.
Barotropic and baroclinic conditions.
Geostrophic current.
Convergences and divergences.

CHAPTER 7: SURFACE GRAVITY WAVES

Introduction.
Definitions.
Waves (Wind Sea).
Swell.
Sea state forecasting.
Characteristic properties of the swell.
Swell/Wave study:.
Linear theory of the wave.
Important special cases.

CHAPTER 8: GENERAL CIRCULATION IN THE OCEANS

Introduction.
Ocean circulation.
Surface currents.
Deep currents.
Thermohaline circulation (THC).
Impacts of human activity.
The "El Niño" phenomenon.
The "La Niña" phenomenon.

CHAPTER 9: GENERAL CIRCULATION IN THE MEDITERRANEAN
Introduction.
The 3D circuit of Mediterranean water masses
Main water masses in the western Mediterranean basin.
Circulation of Main water masses in the western Mediterranean basin.

Directed work program (22h5):

- Geodetic system and unitary conversation.
- Hydrostatic applications of the oceans and Archimedes' principle.
- Ocean mass and salt balances.
- Penetration of light into the ocean.
- Notion of water mass and T/S diagrams.
- Ekman's theory.
- Geostrophic current.
- Surface gravity waves.

Method of evaluation:
End-of-semester exam (50%).
Continuous assessments (50%): (tests in Directed work , oral tests, homework, drawing curves).

Title of the training: Preparatory Training in Marine Sciences

Semester : 4

Teaching Unit: MTU1

Subject Title: Probability & Random Variables

Hourly volume: 45hours	**Credits: 4**	**Coefficients: 2**

Teaching objectives:
At the end of this course, the student should be able to understand and model simple experiments, calculate probabilities of events, calculate expectation, variance,...

Recommended prior knowledge:
None.

Content of the subject:

Course programme (22h30):

Part I: Probability Theory

Chapter 1: Combinatorial Analysis (5h30)

- Arrangements with/without repetition
- Swaps with/without repetition
- Combinations without repetition

Chapter 2: The Theory of Probability (5h30)

- Random experiments and events
- Event Operations
- Conditional probability
- Probability formulas
- Independence

Part II: Random Variables

Chapter 3: Random Variable and Discrete Probability Distributions (5h30)

- Discrete Random Variable and Numerical Characteristics
- Probability distributions: Binomial distribution, Poisson distribution

Chapter 4: Random Variable and Continuous Probability Distributions (6h)

- Continuous Random Variable and Numerical Characteristics
- Normal Distribution

Practical work program (....h) : /

Directed work program (22h30):
Series 1: Combinatorial analysis (6h30)
Series 2: Probability Theory (6h)
Series 3: Discrete Random Variable (6h)
Series 4: Continuous random variable (4h)

Method of evaluation:
End of semester exam (50%)
Continuous assessments (50%): (tests in Directed work , oral tests, homework, drawing curves).

Title of the training: Preparatory Training in Marine Sciences		
Semester : 4		
Teaching Unit: MTU1		
Subject Title: Algorithmics and Programming		
Hourly volume: 45 hours	**Credits: 3**	**Coefficients: 2**

Teaching objectives:

The objective of this course is to equip students with the basics of computer science and programming. They will learn a language like Python, while learning about algorithms and how computers work. These technical skills are accompanied by the development of logical thinking and teamwork.

Recommended prior knowledge:

Have an understanding of basic mathematical concepts such as mathematical variables, functions, equations and formulas.

Be familiar with mathematical logic and basic problem-solving concepts.

Content of the material:

Note: This teaching is carried out in the form of practical work in computer laboratories and directed work (Directed work).

Course program (... h): /

Practical work program (22h30):

PW1: Access to Python (3h)

PW2: Exploring the basics of Python (6h)

PW3: Conditional structures (4h30)

PW4: Loops (4h30)

PW5: Application of Python Skills (4h30)

Directed work program (22h30):

Chapter 1: Introduction to Algorithmics and Programming in Python (6h)

1. Introduction to Algorithmics (03h)
2. Programming language (1h30)
3. Python programming language (1h30)

Chapter 2: Variables (3h)

1. Variable reporting
2. Assignment instruction
3. Expressions and operators

Chapter 3: Display and Input (1h30)

1. The print() function
2. The input() function
3. Notes on vocabulary and syntax

Chapter 4: The Lists (3h)

1. Definition and use
2. List Operations

3. Predefined Functions

Chapter 5: Tests (4h30)

1. Structure of a test
2. Conditional execution

Chapter 6: Loops (4h30)

1. Principle
2. "For" loop

Boucle « While »

Method of evaluation:

End of semester exam (50%)

Continuous assessments (50%): (tests in class sessions, practical work, oral tests, homework)

The continuous assessments and the exam will be carried out on paper and on the computer simultaneously.

Title of the training: Preparatory Training in Marine Sciences		
Semester : 4		
Teaching Unit: DTU1		
Title of the subject: Thematic outings		
Hourly volume: 15h	**Credits: 1**	**Coefficients: 1**
Teaching objectives: The objective of this subject is to allow the student, at the end of his preparatory training, to know the different fields of activity in relation to the different specialties existing at ENSSMAL.		
Recommended prior knowledge: Teaching given in the different subjects of the Preparatory Classes.		
Content of the subject: *Note: This teaching is carried out in the form of thematic outings aimed at areas of socio-economic activities related to marine sciences.* **Programme of educational outings (15h):** Visit to aquaculture farms, fishing ports, marine science research centres, desalination plants and others. **Course programme (.....): /**		
Programme of practical work (....h) : /		
Programme of Directed work (.. h):/		
Method of evaluation: Continuous checks: Outing reports		

IV- Opinion of the school authorities

Conseil scientifique du département – formation préparatoires

Date :

Avis du président du Conseil scientifique du département :

رئيسة اللجنة العلمية
لقسم التكوين التحضيري
السيدة: قزاع نسيمة

Conseil scientifique de l'école

Date :

Avis du président du conseil scientifique de l'école :

الأستاذة: بن حاجة لبنى
رئيسة المجلس العلمي