PROSPECTUS:
BSc. MARINE SCIENCES **UNIVERSITY OF CADIZ**

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TRANSLATOR:	Samantha Louise Blakeman		

CONTENT

1. Description of the Degree.

1.1. Basic information.

General Information	
Name of the Degree	Bsc. Marine Sciences
Specialties:	
University:	UNIVERSIDAD DE CÁDIZ (UNIVERSITY OF CADIZ)

HEAD OF DEGREE					
1st Surname:	Quiroga	**2nd Surname:**	Alonso		
Name:	José María	**ID:**	31201687W		
Address:	Avda República Saharaui s/n				
Town:	Puerto Real			**Post Code:**	11510
E-mail:	decanato.ccmar@uca.es				
Degree Centre:	MARINE AND ENVIRONMENTAL SCIENCES FACULTY				

1.2. Distribution of the Degree Credits.

GENERAL DISTRIBUTION OF DEGREE CREDITS	
Total Credits	240
Number of Basic Learning Credits	60
Number of External Practice Credits	0
Number of Optional Credits	60
Number of Mandatory Credits	108
Number of Final Project Credits	12

1.3. Centre Information.

Centres
FACULTAD DE CIENCIAS DEL MAR Y AMBIENTALES (MARINE AND ENVIRONMENTAL SCIENCES FACULTY)

2. Objectives and Competences.

2.1. Objectives

General objectives.

According to the White Book (Libro Blanco) of the Marine Sciences Degree, the objective of Marine Science studies can be written as:

"Graduates must be able to study, characterise, model and manage marine and coastal environments, from their natural state to a state affected by human activity."

The BSc Marine Sciences must provide qualifications for professional practice in any activity related to Marine Sciences and scientific-technical and educational development, satisfying the definition of Marine Sciences Higher Education taken from the UNESCO proposal (1971):

"The basic objectives of university education in Marine Sciences are the scientific and technical capacities to":

- *Conduct investigations in different fields of Marine Sciences.*
- *Advise on subjects with which they are competent, for instance marine resources, environmental topics, impacts, etc. at the request of public administrations and/or companies.*
- *Educate other scientists and technicians.*

Partial objectives.

"Knowledge" objectives:

1. Fundamental knowledge of Marine Sciences, principles, theories, hypothesis and models, as well as terminology.
2. The study of physical, chemical, biological and geological processes that occur in salt water systems.
3. Systematic approach to the comprehension of interactions between physical, chemical, biological and geological processes that occur in the sea (atmosphere-ocean interphase, oceans, sediment-ocean interphase and coastal areas), and fundamental anthropogenic influences that perturb the system.
4. Know the relations between oceans and seas and social processes.
5. Provide the future graduate with a multi and interdisciplinary vision.

The attainment of these objectives, aside from developing general qualities and abilities, will allow the acquisition of others that are intrinsic in this discipline. Including the following:

"Know how" objectives.

1. Spatial-temporal vision of marine processes.
2. Aptly manage the main marine environment scientific techniques and methods.
3. Ability to integrate field and laboratory data with theory following the scientific method.
4. Awareness of marine environmental processes.
5. Full understanding of the necessity of sustainable marine resource management.

2.2. Basic Competences.

CODE	BASIC COMPETENCES
CB1	Students have demonstrated knowledge and understanding of a subject matter taught to a higher level, this subject having been taught previously at secondary school level and improved upon with the help of advanced textbooks.
CB2	Students know how to apply their knowledge to their work or vocation in a professional manner and possess the competences that is usually shown by elaborating and putting forward arguments and resolving problems found within the study field.
CB3	Students are capable of collecting and interpreting relevant data (within their field of study) that includes reflecting upon relevant social, scientific and ethical themes.
CB4	Students possess the ability to portray information, ideas, problems and solutions to a specialized and non-specialised public.
CB5	Students have developed learning abilities that are necessary for studying in the future with a high level of independence.

2.3. General Competences.

CODE	GENERAL COMPETENCES
CG1	Develop sensitivity towards oceanic environmental and social problems that vary from ethical commitment to sustainability.

2.4. Specific Competences.

CODE	SPECIFIC COMPETENCES
CE1	General level of knowledge in the fundamental principles of science: mathematics, physics, chemistry, biology and geology.
CE2	Know and understand essential concepts, biodiversity, principles and theories related to marine sciences.
CE3	Know water column, sediment and floor sampling techniques as well as how to measure dynamic and structural variables.
CE4	Know rules and principles that regulate uses of the marine environment, its resources and diversity, as well as the necessary tools and techniques for its evaluation and management.
CE5	Know the tools and techniques for marine environment impact evaluation and management.
CE6	Know the socio-economic activities of entities that influence the marine environment, from a sustainable perspective.
CE7	Apply techniques for planning marine environmental uses and sustainable management of resources.
CE8	Manage marine environment data collecting equipment, processing techniques, analysis and interpretation, whilst promoting good experimental scientific practice responsibly

	and safely.
CE9	Use planning, design and execution tools in investigations applied from the acknowledgement phase until the evaluation phase of the results and conclusions.
CE10	Elaborate marine environmental training, education and dissemination programmes.
CE11	Create, execute and evaluate projects and technical-scientific reports related to the marine environment.
CE12	Use computer resources to resolve problems and search for information on marine sciences
CE13	Possess practical skills with models used in the marine environment.
	SPECIFIC COMPETENCES IN THE GENERAL SCIENTIFIC BASIS MODULE
CE14	Know and understand essential events, concepts, principles and theories related to biology.
CE15.	Know how to link cell function and structure, differentiate types of cells, tissue and different groups of organisms as well as where they are found within the living organism groups.
CE16	Know fundamental concepts of infinitesimal calculations and lineal algebra.
CE17	Know basic applications of simple models and practical problems.
CE18	Use infinitesimal calculations and lineal algebra techniques in basic applications of models and practical problems.
CE19	Know concepts and solution techniques to the equations and systems of differential equations.
CE20	Acquire skills in using differential equations in simple models in various fields of study.
CE21	Evaluate the speed at which geological processes happen and their spatial scope.
CE22	Acquire the ability to recognize effects and consequences of internal and external geological processes.
CE23	Evaluate environmental implications of exploiting geological resources.
CE24	Know fundamental concepts of physics and have the ability to link fundamental aspects to different environmental phenomena.
CE25	Acquire the ability to create simple experiments in the laboratory and link the results to the laws of physics.
CE26	Understand concepts and formulas of fluid mechanics applied to specific cases to do with the ocean and atmosphere.
CE27	Know and understand fundamental aspects of chemistry as well as their physical properties.
CE28	Know and understand fundamental concepts of organic and inorganic compounds found in the environment and their chemical analysis.
CE29	Acquire the ability to link fundamental aspects of chemistry to environmental

	phenomena.
CE30	Identify sea water as a complex dissolution of electrolytes and be familiar with the use of activity coefficients.
CE31	Know how to use equations of chemical equilibriums to calculate the distribution of the substances involved.
CE32	Understand the gravimetric, seismic and geomagnetic principles and their prospection methods.
CE33	Know the basics of tectonic plates, their structure and the evolution of the continental margins and oceanic basins.
CE34	Apply basic sampling, analysis, synthesis and data interpretation techniques.
CE35	Use computer resources to resolve problems and search for information on marine sciences.
	SPECIFIC COMPETENCES OF THE TRANSVERSAL KNOWLEDGE MODULE
CE36	Understand the legal concepts of public maritime domain.
CE37	Know the legal protection tools of the marine environment and its resources.
CE38	Identify legal problems surrounding marine environment protection.
CE39	Analyse legal ordination of marine resource exploitation activities due to its implication and impact on marine protection.
CE40	Know the general fundamentals of economic agents and the differences between market and extramarket aspects.
CE41	Know the basics of bioeconomic models.
CE42	Know the structure and economic mechanisms of fishing and the regulatory systems of marine resources.
CE43	Know the concepts and fundamental principles of environmental protection.
CE44	Know the peculiarities of marine contamination: sources, main accesses, processes that affect the distribution of contaminants and effects on marine ecosystems.
CE45	Work with analytical techniques for the main contaminants found in the marine environment.
CE46	Know the fundamentals of marine ecotoxicology: basic concepts and toxicity tests.
CE47	Know the principal anthropogenic activities that affect marine environment quality and existent technology that reduces contamination caused by these activities.
CE48	Apply environmental management tools to prevent, control and minimise impacts caused by activities in the marine environment.
CE49	Differentiate natural change and human induced change.

CE50	Know the Environmental Impact Assessment and Strategic Environmental Assessment procedures for projects in the marine environment.
CE51	Know the principle methods of identification and evaluation of impacts.
CE52	Apply basic tools to the elaboration of environmental impact studies in the marine environment.
CE53	Know how to write environmental reports.
CE54	Know and apply specific terminology related to environmental impact assessments, management systems and audits.
CE55	Know the implementation and auditing procedures of Normalised Management Systems.
	SPECIFIC COMPETENCES OF THE INSTRUMENTAL SUBJECTS MODULE
CE56	Equip the student with the basics on sampling theory and the ability to innovate new methods.
CE57	Know the tools/specific methods of every general speciality that intervenes in marine studies (physics, chemistry, biology and geology).
CE58	Design, plan and execute sampling and oceanographic campaigns.
CE59	Process the collected samples and data.
CE60	Evaluate critically methodology, performance and data quality.
CE61	Know how to work with different programmes of geographical information systems.
CE62	Analyse and compare different applications of GIS in marine sciences.
CE63	Know the different types of remote sensors, their characteristics, their resolutions and their applications in the marine environment.
CE64	Link information from remote detectors to physical, chemical, geological and biological processes that occur in the marine environment.
CE65	Ability to create simple programmes to solve problems numerically.
CE66	Know how to work with quantities affected by errors so that the error does not spread and affect significantly estimates made with these quantities.
CE67.	Know how to apply numerical methods when the exact solution of the problem is impossible or presents disadvantages compared to the estimated solution.
CE68	Know how to formulate a problem by using differential equations and extracting conclusions from the equation of the properties of the system in question.
CE69	Know and apply regression models to adjust and predict data.
CE70	Know how to work with statistical techniques that allow reduction and classification of information that the marine environmental data provides.
CE71	Apply results and temporal analysis tools to information linked with marine sciences.
CE72	Create, execute and evaluate projects and scientific reports.

CE73	Use computer resources to solve problems and search for information on marine sciences.
	SPECIFIC COMPETENCES OF THE ORGANISMS AND SYSTEMS MODULE
CE74	Know the basic principles of microbiology and be able to apply them to their knowledge of the environment.
CE75	Know and understand microorganism growth, their control and applications at a technological and industrial level.
CE76	Know the microorganisms representativeness.
CE77	Know the biological classification and taxonomy basis
CE78	Know the morphological characteristics and internal anatomy of the different groups of marine animals and plants.
CE79	Observe first-hand the knowledge acquired in theory classes about morphology and internal anatomy of the important marine animals and plants.
CE80	Understand the adaptive processes of the different groups of marine animals and plants.
CE81	Learn to recognize the different groups of marine animals and plants.
CE82	Understand basic plant physiology.
CE83	Know the organisation levels used whilst studying nature.
CE84	Know the structure and dynamics of marine ecosystems.
CE85	Know the difference between evolutionary ecological analysis and thermodynamic ecological analysis.
CE86	Understand the relative concepts of niche, succession, population dynamics, diversity, limiting factors and trophic network.
	SPECIFIC COMPETENCES OF THE OCEANOGRAPHY MODULE
CE87	Know the main mechanisms that formed the oceans and the main balances and property cycles that define their state.
CE88	Possess an integrated vision, from a multidisciplinary perspective, of the marine environmental processes.
CE89	Understand the mechanisms that force the movement of the oceans and seas masses of water.
CE90	Know the main physical processes that occur on the coast and their implications.
CE91	Know the direct and indirect ways to measure and interpret data that are used in studying and understanding coastal dynamics.

CE92	Know and understand geological processes that occur in marine physiographic provinces.
CE93	Know the causes of historical sea level variation.
CE94	Know the factors of the physical forces that determine adaptations, distribution and abundance of marine organisms.
CE95	Know the structure of marine trophic networks and biogeochemical and energy analysis of marine ecosystems.
CE96	Determine the equilibriums of ionic species and dissolved gases in oceanic waters, including kinetic and thermodynamic considerations.
CE97	Know the global cycles of the elements found in seawater.
	SPECIFIC COMPETENCES OF THE LIVE MARINE RESOURCES MODULE
CE98	Know the characteristics of extractive fishing, fishing techniques and the effects of fishing, as well as biological characteristics of the resources of interest for fisheries and the complex relationships between fisheries in the marine environment.
CE99	Learn to evaluate the state of a fishing resource, draw conclusions from the results and propose fishing strategies.
CE100	Apply theoretical knowledge to the most used biological fishing techniques.
CE101	Know the biological cycles of the aquatic species susceptible to being cultivated and/or domesticated in controlled captive conditions and their position in aquatic ecosystems.
CE102	Know and differentiate physiological characteristics, in every stage of their life cycle (development, growth, reproduction and nutrition), and the factors that control them, leading to the optimisation of the culture of the aquatic species of interest.
CE103	Know how to link different marine organism mass production technologies and their applications.
CE104	Understand the basics of culture technologies used with different aquatic species regarding their biological peculiarities.
CE105	Know the basic concepts in cultivated species pathology and diagnostic techniques.
CE106	Learn to differentiate infectious and non-infectious pathological processes in the different stages of their life cycle.
CE107	Know the genetic control of certain characters of interest in aquaculture and techniques that allow to genetically enhance them.
CE108	Understand the importance and results of systematic and dispersive (mutation, migration, selection, genetic drift, etc…) processes in wild and cultured populations.
	SPECIFIC COMPETENCES IN THE MARINE AND COAST MANAGEMENT MODULE
CE109	Know the contribution of science to coast and marine environment territorial planning and management processes and the interest and current integrating and global

	perspective it provides.
CE110	Possess the knowledge, experience, tools and sources of information that introduces the student to the fundamentals of coastal management.
CE111	Analyse the different variables involved in coastal management processes, understand that these answer to complex phenomena involving various factors and agents, each one with its own objective and criteria.
CE112	Understand the constant interaction processes that occur on the coast between physical subsystems.
CE113	Know the main models and normalised management systems that exist in coastal management, especially the new focus orientated towards integrated management and sustainable development.
CE114	Know the main engineering interventions done in coastal areas and their implications on coastal dynamics.
CE115	Know maximum sea level calculation methods and their application in coastal management.
CE116	Know the environmental problems that develop from coastal erosion and sedimentation.
CE117	Know the different adaptive strategies of coastal processes.
	SPECIFIC COMPETENCES OF THE PROJECT MODULE
CE118	Know the general aspects of a project developed in the marine environment.
CE119	Know the general aspects of a report.
CE120	Learn to use the necessary tools for designing and working on a project.
CE121	Present correctly a document, in written or oral format.
CE122	Design economic reports and company plans.
CE123	Know the procedures for obtaining administrative authorizations.
	SPECIFIC COMPETENCES OF THE LIVE RESOURCES ORIENTATION MODULE
CE124	Know the genetic improvement programmes used in aquaculture and how to apply their techniques in fish and molluscs.
CE125	Learn to evaluate genetically aquaculture broodstock.
CE126	Know the illnesses associated with marine cultures and the first stages of development in marine fishes.
CE127	Learn about the main neoplasms and general aspects of therapy and prophylaxis in aquaculture.
CE128	Learn how to report pathologies of cultivated species.

CE129	Know the necessities of marine installations for aquaculture and basic equipment found in culture plants.
CE130	Know the physiological processes and how to optimise aquaculture production by manipulating them.
CE131	Learn how to control biological rhythms by varying environmental conditions.
CE132	Know exogenous and endogenous factors that control development and growth.
CE133	Know endocrine manipulation processes that are used in aquaculture.
CE134	Know the origin and principle types of natural products found in the marine environment.
CE135	Know and apply techniques used in the extraction, isolation and purification of natural products obtained from marine organisms.
CE136	Know and apply spectroscopic techniques used in the structural characterization of natural products.
CE137	Understand the role of natural products in the marine environment
CE138	Know the main biological activities of natural products isolated in algae and marine invertebrates.
CE139	Know the main applications of natural products obtained from marine sources.
CE140	Understand the role of marine reserves in the conservation of marine resources.
CE141	Understand the concept of conservation on all levels and its importance in sustainable development.
CE142	Understand the main processes that erode and threaten marine biodiversity.
CE143	Design conservation strategies and/or restore ecosystems, especially those under exploitation.
CE144	Understand the biological interaction network found in the marine environment and its consequences on the functioning of ecosystems.
	SPECIFIC COMPETENCES OF THE ADVANCED OCEANOGRAPHY ORIENTATION MODULE
CE145	Learn to assemble and integrate fundamental physical and biological processes at the ecosystem level.
CE146	Know the organization and functioning of marine ecosystems, differentiating units and variability.
CE147	Know how to apply mathematic models to simulate the main physical processes that occur in the oceans and seas.
CE148	Know how to apply the main techniques of spatial and temporal analysis with the

	different variables that are characteristic of the oceans and seas.
CE149	Know the current situation and exploration, exploitation and characterization techniques of the submarine geological resources.
CE150	Know the effects and environmental problems of the exploitation of submarine geological resources.
CE151	Know the main processes that determine the reactivity of the oceans elements, as well as their influence in the formation of vertical profiles.
CE152	Understand the approximations used to establish biogeochemical cycles at a global scale and their applications in the C, N, P and Si cycles.
CE153	Know the different aspects of the coastal systems cycles, emphasising the intensification of transfers through interphases and the importance of coastal inputs.
	SPECIFIC COMPETENCES OF THE COASTAL AREA MANAGEMENT MODULE
CE154	Understand the peculiarities of the physical environment and biological communities of semi-closed bodies of water.
CE155	Know the forming processes of different coastal systems and the factors that control their evolution.
CE156	Work with analytical tools that allow characterisation of hydrodynamic and physical properties.
CE157	Understand the interactions between the processes, of diverse nature, that define and control the ecosystem in coastal areas.
CE158	Know the contribution of science to coast and marine environment territorial planning and management processes and the interest and current integrating and global perspective it provides.
CE159	Possess the knowledge, experience, tools and sources of information that introduces the student to the fundamentals of coastal management.
CE160	Analyse the different variables involved in coastal management processes, understand that these answer to complex phenomena involving various factors and agents, each one with its own objective and criteria.
CE161	Understand the constant interaction processes that occur on the coast between the physical subsystems.
CE162	Know the main models and normalised management systems that exist in coastal management, especially the new focus orientated towards integrated management and sustainable development and the different adaptive strategies of coastal processes.

2.5. Transversal Competences.

CODE	TRANSVERSAL COMPETENCES
CT1	Maximise, oral and written, public communication of information, ideas, problems and solutions in English and Spanish.

CT2	Work in groups and promote entrepreneurial and innovative spirit.
CT3	Ability to use computers confidently at a user level and within the degrees context.

3. Teaching Plan.

3.1. General Study Plan Structure.

General Explanation of the Study Plan.

The BSc Marine Sciences study plan is structured into 4 years of 240 ECTS credits which are split into 60 ECTS credits per year or 30 ECTS credits per term.

The fundamental aspects of the Degree are structured into modules and materials, which contain the different subjects. The structure may be revised if necessary following the regulations and procedures of the University of Cadiz.

The study plan is organised into 11 modules separated by the thematic affinity of the subject matter. 5 modules are mandatory, 3 are mixed, these include mandatory and optional subjects of the same thematic background, and 3 optional modules of specialized orientation

Study plan module types.

MODULE	MODULE TYPE	MODULE	MODULE TYPE
M1	Mandatory	M7	Mandatory
M2	Mixed	M8	Mandatory
M3	Mandatory	M9 (Or1)	Optative
M4	Mixed	M10 (Or2)	Optative
M5	Mandatory	M11 (Or3)	Optative
M6	Mixed		

The module-subject structure and study plan timeline is found in the following table:

Table 3.1. Brief Description of the Study Plan.

FIRST SEMESTER				SECOND SEMESTER		
FIRST YEAR						
M1	BIOLOGY	**6**		M1	PHYSICS	**6**
M1	GEOLOGY	**6**		M1	DIFFERENTIAL EQUATIONS	**6**
M1	MATHEMATICS	**6**		M2	ECONOMY AND LEGISLATION	**6**
M1	CHEMISTRY	**6**		M6	INTRODUCTION TO OCEANOGRAPHY	**6**
M1	STATISTICS	**6**		M3	MICROBIOLOGY	**6**
SECOND YEAR						
M1	GEOPHYSICAL FLUID MECHANICS	**6**		M3	MARINE ZOOLOGY AND BOTANY	**9**
M1	AQUEOUS SOLUTION CHEMISTRY	**6**		M3	MARINE ECOLOGY	**6**
M1	GEOPHYSICS AND TECTONICS	**6**		M4	RESEARCH METHODS IN OCEANOGRAPHY	**9**
M4	NUMERICAL CALCULATION AND COMPUTATION	**6**		M6	PHYSICAL OCEANOGRAPHY	**6**
M4	GIS AND REMOTE SENSING	**6**				
THIRD YEAR						
M4	APPLIED STATISTICS	**6**		M2	MARINE POLLUTION	**6**

M6	BIOLOGICAL OCEANOGRAPHY	6		M7	INTRODUCTION TO INTEGRATED COASTAL ZONE MANAGEMENT	6
M6	CHEMICAL OCEANOGRAPHY	6		M7	COASTAL ENGINEERING	6
M6	GEOLOGICAL OCEANOGRAPHY	6		M5	AQUACULTURE	12
M6	COASTAL DYNAMICS	6				
FOURTH YEAR						
M5	FISHERIES	6		M2	ENVIRONMENTAL IMPACT ASSESMENT AND NORMALISED MANAGEMENT SYSTEMS	6
				M8	PROJECT DRAFTING AND IMPLEMENTATION	6
				M8	FINAL PROJECT	12
	ORIENTATION	**24**			RECOGNITION OF EXTRACURRICULAR CREDITS	6
Orientation 1 LIVE RESOURCES						
	ADVANCED AQUACULTURE	12		**MODULES**		
	NATURAL PRODUCTS	6		**M1**	**GENERAL SCIENTIFIC BASIS**	
	CONSERVATION OF LIVE MARINE RESOURCES	6		**M2**	**TRANSVERSAL KNOWLEDGE**	
				M3	**INSTRUMENTAL MATERIAL**	
Orientation 2 APPLIED OCEANOGRAPHY				**M4**	**ORGANISMS AND SYSTEMS**	
	MARINE ECOSYSTEMS	6		**M5**	**OCEANOGRAPHY**	
	APPLIED GEOLOGICAL OCEANOGRAPHY	6		**M6**	**LIVE MARINE RESOURCES**	
	APPLIED PHYSICAL OCEANOGRAPHY	6		**M7**	**MARINE AND COASTAL MANAGEMENT**	
	APPLIED CHEMICAL OCEANOGRAPHY	6		**M8**	**PROJECT**	
				M9	**LIVE RESOURCES ORIENTATION**	
Orientation 3 COASTAL ZONE MANAGEMENT				**M10**	**APPLIED OCEANOGRAPHY ORIENTATION**	
	INTEGRATED COASTAL ZONE MANAGEMENT MODELS	6		**M11**	**COASTAL ZONE MANAGEMENT ORIENTATION**	
	INTEGRATED DYNAMICS OF NATURAL COAST SYSTEMS	12				
	PUBLIC MARINE LAW	6				

3.1.1. Activities

STUDY PLAN ACTIVITIES	
NUMBER	**DESCRIPTION OF THE ACTIVITY**
1	THEORY CLASSES: They take place in a classroom and are explanations of subjects given by a professor: competency analysis, explanation and demonstration of abilities and knowledge in the classroom, using participating methods.
2	LABORATORY CLASSES: group work sessions supervised by a professor. Activities in specialised areas with specific equipment that improves learning through interaction. These classes take place in a laboratory where the professor sets objectives, directs the work and follows progress.
3	COMPUTER CLASSES: group work sessions supervised by a professor. These classes take place in a computer room for case studies and data treatment.

4	PROBLEM/CASE PRACTICAL CLASSES: Like other practical sessions they are group work sessions supervised by a professor. Their objective is to resolve set problems or cases. The professor sets the objectives, directs the work and corrects mistakes.
5	FIELD/BOAT PRACTICALS: group work sessions supervised by a professor. This includes field excursions and visits to installations, improving learning by using interaction and actively applying their knowledge.
6	SEMINARS: Monothematic sessions on current issues to do with a subject, either given by the professor of the subject or other professors.
7	PRODUCTION OF WORK PRESENTATIONS OR DEBATES. Development of a topic, with or without public speaking, individually or in groups, supervised by a professor who sets the objectives and directs the work. The participation is shared by the students and the topic is presented and/or debated.
8	SEARCHES: group or individual work sessions directed by a professor which consists of searching data or information in libraries, data bases, internet, etc. The professor indicates the necessity of increasing knowledge and directs the search.
9	TUTORIALS: Allow significant building of knowledge through student interaction and activity, the sessions may be individual or in reduced groups, where the professor guides and resolves questions.
10	EVALUATION: Set of oral and/or written tests used to evaluate the student.
11	GROUP WORK: group preparation of lectures, exercises, problem solving, projects, reports, etc. that are presented or submitted in mandatory classes or virtual spaces.
12	AUTONOMOUS WORK: Student study. Individual preparation of lectures, exercises, problem solving, etc. That are presented or submitted in mandatory classes or virtual spaces.

The relative distribution of the different activities will be done taking into account that 25 hours of work done by the student is the equivalent of one ECTS credit. Generally theory classes and practicals will cover 8 hours per credit. However, due to the nature of Experimental Sciences degrees and the necessity of practical teaching, laboratory practicals and excursions may reach 10 hours.

3.2. Planning and Management of Local and Foreign Student Movement.

The Marine and Environmental Sciences Faculty of the University of Cadiz is involved in an intense exchange of students with other universities, Spanish and foreign. It must be said that the Marine and Environmental Sciences Faculty is the centre of the Puerto Real Campus that takes part in the most number of foreign student exchanges. The success of leaving students is high and the experiences and knowledge received by students are positive and complete their learning. There is a high annual intake of students, both Spanish and foreign.

In recent years the amount of agreements between European and Spanish universities has increased and the Faculty's objective is to maximise movement within Erasmus and SICUE (between Spanish universities) offers.

All of the information to do with the agreements and movement grants is available on the International Relations Vice-principalship webpage, as well as on the Student Vice-principalship page and the Marine and Environmental Sciences Faculty page. Information will be facilitated to students who speak with members of the UCA or their university of origin. The International Relations Vice-principalship organises informative days in various UCA campus' in which the Faculty participates.

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3.3. Module Description. Subject Files.

Module 1	
NAME OF MODULE 1:	**General scientific basis**

MATERIAL 1 of Module 1			
MATERIAL 1:	**Biology**		
CHARACTER	**BASIC FORMATION**	**LANGUAGE**	**SPANISH**
ECTS:	**6**	**TIME FRAME:**	**1ST TERM**

SUBJECTS OF MATERIAL 1			
Subject 1:	**Biology**		
CHARACTER	**BASIC FORMATION**	**LANGUAGE**	**SPANISH**
ECTS:	**6**	**TIME FRAME:**	**1ST TERM**

MATERIAL 2 OF MODULE 1			
MATERIAL 2:	**Mathematics**		
CHARACTER:	**BASIC FORMATION**	**LANGUAGE:**	**SPANISH**
ECTS:	**18**	**TIME FRAME:**	**1ST AND 2ND TERM**

SUBJECTS OF MATERIAL 2			
Subject 1:	**Mathematics**		
CHARACTER:	**BASIC FORMATION**	**LANGUAGE:**	**SPANISH**

ECTS:	**6**	**TIME FRAME:**	**1ST TERM**
Subject 2:	**Differential Equations**		
CHARACTER:	**BASIC FORMATION**	**LANGUAGE:**	**SPANISH**
ECTS:	**6**	**TIME FRAME:**	**2ND TERM**
Subject 3:	**Statistics**		
CHARACTER:	**BASIC FORMATION**	**LANGUAGE:**	**SPANISH**
ECTS:	**6**	**TIME FRAME:**	**1ST TERM**

MATERIAL 3 OF MODULE 1			
MATERIA 3:	**Geology**		
CHARACTER:	**BASIC FORMATION**	**LANGUAGE:**	**SPANISH**
ECTS:	**6**	**TIME FRAME:**	**1ST TERM**

SUBJECTS OF MATERIAL 3			
Subject 1:	**Geology**		
CHARACTER:	**BASIC FORMATION**	**LANGUAGE:**	**SPANISH**
ECTS:	**6**	**TIME FRAME:**	**1ST TERM**

MATERIAL 4 OF MODULE 1			
MATERIA 4:	**Physics**		
CHARACTER:	**BASIC FORMATION**	**LANGUAGE:**	**SPANISH**
ECTS:	**12**	**TIME FRAME:**	**1ST AND 3RD TERM**

SUBJECTS OF MATERIAL 4			
Subject 1:	**Physics**		
CHARACTER:	**BASIC FORMATION**	**LANGUAGE:**	**SPANISH**
ECTS:	**6**	**TIME FRAME:**	**1ST TERM**
Subject 2:	**Geophysical Fluid Mechanics**		
CHARACTER:	**BASIC FORMATION**	**LANGUAGE:**	**SPANISH**
ECTS:	**6**	**TIME FRAME:**	**3RD TERM**

MATERIAL 5 OF MODULE 1			
MATERIA 5:	**Chemistry**		
CHARACTER:	**BASIC FORMATION**	**LANGUAGE:**	**SPANISH**
ECTS:	**12**	**TIME FRAME:**	**1ST AND 3RD TERM**

SUBJECTS OF MATERIAL 5			
Subject 1:	**Chemistry**		
CHARACTER:	**BASIC FORMATION**	**LANGUAGE:**	**SPANISH**
ECTS:	**6**	**TIME FRAME:**	**1ST TERM**
Subject 2:	**Aqueous Solution Chemistry**		
CHARACTER:	**BASIC FORMATION**	**LANGUAGE:**	**SPANISH**
ECTS:	**6**	**TIME FRAME:**	**3RD TERM**

MATERIAL 6 OF MODULE 1			
MATERIAL 6:	Physics and Geology		
CHARACTER:	BASIC FORMATION	LANGUAGE:	SPANISH
ECTS:	6	TIME FRAME:	3RD TERM

SUBJECTS OF MATERIAL 6			
Subject 1:	Geophysics and Tectonics		
CHARACTER:	BASIC FORMATION	LANGUAGE:	SPANISH
ECTS:	6	TIME FRAME:	3RD TERM

MODULE 2	
NAME OF MODULE 2:	TRANSVERSAL KNOWLEDGE

MATERIAL 1 OF MODULE 2			
MATERIAL 1:	Economy and Legislation		
CHARACTER:	MANDATORY	LANGUAGE:	SPANISH
ECTS:	6	TIME FRAME:	2ND TERM

SUBJECTS OF MATERIAL 1			
Subject 1:	Economy and Legislation		
CHARACTER:	MANDATORY	LANGUAGE:	SPANISH
ECTS:	6	TIME FRAME:	2ND TERM

MATERIAL 2 OF MODULE 2			
MATERIAL 2:	Contamination		
CHARACTER:	MANDATORY	LANGUAGE:	SPANISH
ECTS:	6	TIME FRAME:	6TH TERM

SUBJECTS OF MATERIAL 2			
Subject 1:	Marine Pollution		
CHARACTER:	MANDATORY	LANGUAGE:	SPANISH
ECTS:	6	TIME FRAME:	6TH TERM

MATERIAL 3 OF MODULE 2			
MATERIAL 3:	Environmental Management Tools		
CHARACTER:	OPTATIVE	LANGUAGE:	SPANISH
ECTS:	6	TIME FRAME:	8TH TERM

SUBJECTS OF MATERIAL 3			
Subject 1:	Environmental Impact Assessment and Normalised Management Systems.		
CHARACTER:	OPTATIVE	LANGUAGE:	SPANISH
ECTS:	6	TIME FRAME:	8TH TERM

MODULE 3	
NAME OF MODULE 3:	INSTRUMENTAL MATERIAL

MATERIAL 1 OF MODULE 3			
MATERIAL 1:	Biology, Physics, Geology, Chemistry		
CHARACTER:	MANDATORY	LANGUAGE:	SPANISH
ECTS:	9	TIME FRAME:	4TH TERM

SUBJECTS OF MATERIAL 1			
Subject 1:	Research Methods in Oceanography		
CHARACTER:	MANDATORY	LANGUAGE:	SPANISH
ECTS:	9	TIME FRAME:	4TH TERM

MATERIAL 2 OF MODULE 3			
MATERIAL 2:	Physics, Geography, Geology		
CHARACTER:	MANDATORY	LANGUAGE:	SPANISH
ECTS:	6	TIME FRAME:	3RD TERM

SUBJECTS OF MATERIAL 2			
Subject 1:	GIS and Remote Sensing		
CHARACTER:	MANDATORY	LANGUAGE:	SPANISH
ECTS:	6	TIME FRAME:	3RD TERM

MATERIAL 3 OF MODULE 3			
MATERIAL 3:	Mathematics		
CHARACTER:	MANDATORY/OPTATIVE	LANGUAGE:	SPANISH
ECTS:	12	TIME FRAME:	3RD AND 5TH TERM

SUBJECTS OF MATERIAL 3			
Subject 1:	Numerical Calculation and Computation		
CHARACTER:	MANDATORY	LANGUAGE:	SPANISH
ECTS:	6	TIME FRAME:	3RD TERM
Subject 2:	Applied Statistics		
CHARACTER:	OPTATIVE	LANGUAGE:	SPANISH
ECTS:	6	TIME FRAME:	5TH TERM

MODULE 4	
NAME OF MODULE 4:	ORGANISMS AND SYSTEMS

MATERIAL 1 OF MODULE 4			
MATERIAL 1:	Biology		
CHARACTER:	MANDATORY/OPTATIVE	LANGUAGE:	SPANISH
ECTS:	21	TIME FRAME:	1ST AND 4TH TERM

SUBJECTS OF MATERIAL 1			
Subject 1:	Microbiology		
CHARACTER:	OPTATIVE	LANGUAGE:	ESPAÑOL

ECTS:	**6**	**TIME FRAME:**	**1ST TERM**
Subject 2:	**Marine Zoology and Botany**		
CHARACTER:	**MANDATORY**	**LANGUAGE:**	**SPANISH**
ECTS:	**9**	**TIME FRAME:**	**4TH TERM**
Subject 3:	**Marine Ecology**		
CARÁCTER:	**MANDATORY**	**LANGUAGE:**	**SPANISH**
ECTS:	**6**	**TIME FRAME:**	**4TH TERM**

MODULE 5	
NAME OF MODULE 5:	**OCEANOGRAPHY**

MATERIAL 1 OF MODULE 5			
MATERIAL 1:	**Biology, Physics, Geology, Chemistry**		
CHARACTER:	**OPTATIVE**	**LANGUAGE:**	**SPANISH**
ECTS:	**6**	**TIME FRAME:**	**2ND TERM**

SUBJECTS OF MATERIAL 1			
Subject 1:	**Introduction to Oceanography**		
CHARACTER:	**OPTATIVE**	**LANGUAGE:**	**SPANISH**
ECTS:	**6**	**TIME FRAME:**	**2ND TERM**

MATERIAL 2 OF MODULE 5			
MATERIAL 2:	**Biology**		
CHARACTER:	**MANDATORY**	**LANGUAGE:**	**SPANISH**
ECTS:	**6**	**TIME FRAME:**	**5TH TERM**

SUBJECTS OF MATERIAL 2			
Subject 1:	**Biological Oceanography**		
CHARACTER:	**MANDATORY**	**LANGUAGE:**	**SPANISH**
ECTS:	**6**	**TIME FRAME:**	**5TH TERM**

MATERIAL 3 OF MODULE 5			
MATERIAL 3:	**Physics**		
CHARACTER	**MANDATORY**	**LANGUAGE:**	**SPANISH**
ECTS:	**6**	**TIME FRAME:**	**4TH TERM**

SUBJECTS OF MATERIAL 3			
Subject 1:	**Physical Oceanography**		
CHARACTER:	**MANDATORY**	**LANGUAGE:**	**SPANISH**
ECTS:	**6**	**TIME FRAME:**	**4TH TERM**

MATERIAL 4 OF MODULE 5			
MATERIAL 4:	**Physics and Geology**		
CHARACTER:	**MANDATORY**	**LANGUAGE:**	**SPANISH**
ECTS:	**6**	**TIME FRAME:**	**5TH TERM**

SUBJECTS OF MATERIAL 4			
Subject 1:	**Coastal Dynamics**		
CHARACTER:	**MANDATORY**	**LANGUAGE:**	**SPANISH**

ECTS:	**6**	**TIME FRAME:**	**5TH TERM**

MATERIAL 5 OF MODULE 5			
MATERIAL 5:	**Geology**		
CHARACTER:	**MANDATORY**	**LANGUAGE:**	**SPANISH**
ECTS:	**6**	**TIME FRAME:**	**5TH TERM**

SUBJECTS OF MATERIAL 5			
Subject 1:	**Geological Oceanography**		
CHARACTER:	**MANDATORY**	**LANGUAGE:**	**SPANISH**
ECTS:	**6**	**TIME FRAME:**	**5TH TERM**

MATERIAL 6 OF MODULE 5			
MATERIAL 6:	**Chemistry**		
CARÁCTER:	**MANDATORY**	**LANGUAGE:**	**SPANISH**
ECTS:	**6**	**TIME FRAME:**	**5TH TERM**

SUBJECTS OF MATERIAL 5			
Subject 1:	**Chemical Oceanography**		
CHARACTER:	**MANDATORY**	**LANGUAGE:**	**SPANISH**
ECTS:	**6**	**TIME FRAME:**	**6TH TERM**

MODULE 6	
NAME OF MODULE 6:	**LIVE MARINE RESOURCES**

MATERIAL 1 OF MODULE 6			
MATERIAL 1:	**Biology**		
CHARACTER:	**MANDATORY**	**LANGUAGE:**	**SPANISH**
ECTS:	**18**	**TIME FRAME:**	**6TH AND 7TH TERM**

SUBJECTS OF MATERIAL 1			
Subject 1:	**Aquaculture**		
CHARACTER:	**MANDATORY**	**LANGUAGE:**	**SPANISH**
ECTS:	**12**	**TIME FRAME:**	**6TH TERM**
Subject 2:	**Fisheries**		
CHARACTER:	**MANDATORY**	**LANGUAGE:**	**SPANISH**
ECTS:	**6**	**TIME FRAME:**	**7TH TERM**

MODULE 7	
NAME OF MODULE 7:	**MARINE AND COASTAL MANAGEMENT**

MATERIAL 1 OF MODULE 7			
MATERIAL 1:	**Geography**		
CHARACTER:	**MANDATORY**	**LANGUAGE:**	**SPANISH**
ECTS:	**6**	**TIME FRAME:**	**5TH TERM**

SUBJECTS OF MATERIAL 1

Subject 1:	**Introduction to Integrated Coastal Zone Management**		
CHARACTER:	**MANDATORY**	**LANGUAGE:**	**SPANISH**
ECTS:	**6**	**TIME FRAME:**	**5TH TERM**

MATERIAL 2 OF MODULE 7			
MATERIAL 2:	**Engineering**		
CHARACTER:	**MANDATORY**	**LANGUAGE:**	**SPANISH**
ECTS:	**6**	**TIME FRAME:**	**6TH TERM**

SUBJECTS OF MATERIAL 2			
Subject 1:	**Coastal Engineering**		
CHARACTER:	**MANDATORY**	**LANGUAGE:**	**SPANISH**
ECTS:	**6**	**TIME FRAME:**	**6TH TERM**

MODULE 8	
NAME OF MODULE 8:	**PROJECT**

MATERIAL 1 OF MODULE 8			
MATERIAL 1:	**Project drafting and execution**		
CHARACTER:	**OPTATIVE**	**LANGUAGE:**	**SPANISH**
ECTS:	**6**	**TIME FRAME:**	**8TH TERM**

SUBJECTS OF MATERIAL 1			
Subject 1:	**Project drafting and execution**		
CHARACTER:	**OPTATIVE**	**LANGUAGE:**	**SPANISH**
ECTS:	**6**	**TIME FRAME:**	**8TH TERM**

MATERIAL 2 OF MODULE 8			
MATERIAL 2:	**Final Degree Project**		
CHARACTER:	**FINAL DEGREE PROJECT**	**LANGUAGE:**	**SPANISH**
ECTS:	**12**	**TIME FRAME:**	**8TH TERM**

SUBJECTS OF MATERIAL 2			
Subject 1:	**Final Degree Project**		
CHARACTER:	**FINAL DEGREE PROJECT**	**LANGUAGE:**	**SPANISH**
ECTS:	**12**	**TIME FRAME:**	**8TH TERM**

MODULE 9	
NAME OF MODULE 9:	**LIVE RESOURCES ORIENTATION**

MATERIAL 1 OF MODULE 9			
MATERIAL 1:	**Biology and Engineering**		
CHARACTER:	**OPTATIVE**	**LANGUAGE:**	**SPANISH**
ECTS:	**12**	**TIME FRAME:**	**7TH TERM**

SUBJECTS OF MATERIAL 1			
Subject 1:	**Advanced Aquaculture**		
CHARACTER:	**OPTATIVE**	**LANGUAGE:**	**SPANISH**
ECTS:	**12**	**TIME FRAME:**	**7TH TERM**

MATERIAL 2 OF MODULE 9			
MATERIAL 2:	Biology and Chemistry		
CHARACTER:	OPTATIVE	LANGUAGE:	SPANISH
ECTS:	6	TIME FRAME:	7TH TERM

SUBJECTS OF MATERIAL 2			
Subject 1:	Natural Marine Products		
CHARACTER:	OPTATIVE	LANGUAGE:	SPANISH
ECTS:	6	TIME FRAME:	7TH TERM

MATERIAL 3 OF MODULE 9			
MATERIAL 3:	Biology		
CHARACTER:	OPTATIVE	LANGUAGE:	SPANISH
ECTS:	6	TIME FRAME:	7TH TERM

SUBJECTS OF MATERIAL 3			
Subject 1:	Live Marine Resource Conservation		
CHARACTER:	OPTATIVE	LANGUAGE:	SPANISH
ECTS:	6	TIME FRAME:	7TH TERM

MODULE 10	
NAME OF MODULE 10:	APPLIED OCEANOGRAPHY ORIENTATION

MATERIAL 1 OF MODULE 10			
MATERIAL 1:	Biology		
CHARACTER:	OPTATIVE	LANGUAGE:	SPANISH
ECTS:	6	TIME FRAME:	7TH TERM

SUBJECTS OF MATERIAL 1			
Subject 1:	Marine Ecosystems		
CHARACTER:	OPTATIVE	LANGUAGE:	SPANISH
ECTS:	6	TIME FRAME:	7TH TERM

MATERIAL 2 OF MODULE 10			
MATERIAL 2:	Physics		
CHARACTER:	OPTATIVE	LANGUAGE:	SPANISH
ECTS:	6	TIME FRAME:	7TH TERM

SUBJECTS OF MATERIAL 2			
Subject 1:	Applied Physical Oceanography		
CHARACTER:	OPTATIVE	LANGUAGE:	SPANISH
ECTS:	6	TIME FRAME:	7TH TERM

MATERIAL 3 OF MODULE 10			
MATERIAL 3:	Geology		
CHARACTER:	OPTATIVE	LANGUAGE:	SPANISH
ECTS:	6	TIME FRAME:	7TH TERM

SUBJECTS OF MATERIAL 3			
Subject 1:	Applied Geological Oceanography		
CHARACTER:	OPTATIVE	LANGUAGE:	SPANISH
ECTS:	6	TIME FRAME:	7TH TERM

MATERIAL 4 OF MODULE 10			
MATERIAL 3:	Chemistry		
CHARACTER:	OPTATIVE	LANGUAGE:	SPANISH
ECTS:	6	TIME FRAME:	7TH TERM

SUBJECTS OF MATERIAL 3			
Subject 1:	Applied Chemical Oceanography		
CHARACTER:	OPTATIVE	LANGUAGE:	SPANISH
ECTS:	6	TIME FRAME:	7TH TERM

MODULE 11	
NAME OF MODULE 11:	COASTAL ZONE MANAGEMENT ORIENTATION

MATERIAL 1 OF MODULE 11			
MATERIAL 1:	Law		
CHARACTER:	OPTATIVE	LANGUAGE:	SPANISH
ECTS:	6	TIME FRAME:	7TH TERM

SUBJECTS OF MATERIAL 1			
Subject 1:	Public Marine Law		
CHARACTER:	OPTATIVE	LANGUAGE:	SPANISH
ECTS:	6	TIME FRAME:	7TH TERM

MATERIA 2 OF MODULE 11			
MATERIAL 2:	Geography		
CHARACTER:	OPTATIVE	LANGUAGE:	SPANISH
ECTS:	6	TIME FRAME:	7TH TERM

SUBJECTS OF MATERIAL 2			
Subject 1:	Integrated Coastal Zone Management Models		
CHARACTER:	OPTATIVE	LANGUAGE:	SPANISH
ECTS:	6	TIME FRAME:	7TH TERM

MATERIAL 3 OF MODULE 11			
MATERIAL 3:	Biology, Physics, Geology and Chemistry		
CHARACTER:	OPTATIVE	LANGUAGE:	SPANISH
ECTS:	6	TIME FRAME:	7TH TERM

SUBJECTS OF MATERIAL 3			
Subject 1:	Integrated Dynamics of Natural Coastal Systems		
CHARACTER:	OPTATIVE	LANGUAGE:	SPANISH
ECTS:	12	TIME FRAME:	7TH TERM

BIOLOGICAL MATERIAL (MODULE GENERAL SCIENTIFIC BASIS)			
ACQUIRED COMPETENCES:			
BASIC	**GENERAL**	**SPECIFIC**	**TRANSVERSAL**
CB1, CB3	**CG1**	**CE1, CE2, CE14, CE15**	

BREIF DESCRIPTION:

Subject: Biology

1.- Molecular basis of organisms: biomolecules, their structure and their function.

2.- Structure and function of animal and plant cells: metabolism and reproduction.

3.- Structure, organisation and development of organisms: tissues, organs and systems of animals and plants.

4.- Animal and plant biodiversity.

5.-Origin and evolution of organisms.

OBSERVATIONS:

MATHEMATICS MATERIAL (GENERAL SCIENTIFIC BASIS MODULE)			
ACQUIRED COMPETENCES:			
BASIC	**GENERAL**	**SPECIFIC**	**TRANSVERSAL**
CB1, CB2, CB3		**CE1, CE8, CE12, CE16, CE17, CE18, CE19, CE20, CE34, CE35**	

BREIF DESCRIPTION:

Subject: Mathematics

1. Systems of linear equations. Matrices. Vectors. Linear applications. Autovectors. Diagonalisation.

2. Real functions of a variable. Derivatives and their applications. Integrals and their applications.

3. Functions of various variables. Partial derivatives, gradient vector. Vectorial fields: divergence and curl.

4. Double and triple integrals for simple areas. Integration in polar, cylindrical and spherical coordinates.

Subject: Differential equations

1.- First order differential equations.

2.- Linear differential equations of higher order.

3.- Differential equations with variable coefficients.

4.- Systems of linear differential equations.

5.- Introduction to equations with partial derivatives.

Subject: Statistics

1. Introduction to data analysis. Organisation, graphical representation and synthesis of information.
2. Basic concepts of calculating probabilities and statistical inference. Contrasting hypothesis.
3. Treating experimental data by computer.
4. Analysis of variance regression models. Validate models.
5. Apply statistical techniques, using computers, to the analysis of real or simulated data.

OBSERVATIONS:

GEOLOGICAL MATERIAL (GENERAL SCIENTIFIC BASIS MODULE)			
ACQUIRED COMPETENCES:			
BASIC	**GENERAL**	**SPECIFIC**	**TRANSVERSAL**
CB1, CB2, CB3	**CG1**	**CE1, CE2, CE12, CE21, CE22, CE23, CE33, CE35**	**CT1**

BRIEF DESCRIPTION:

Subject: Geology

1. Geological time scale.
2. Global structure and tectonics.
3. General mineralogy and petrology.
4. Superficial and subterranean water and floors.
5. Geological resources.
6. Internal and external geological processes.

OBSERVATIONS:

PHYSICAL MATERIAL (GENERAL SCIENTIFIC BASIS)			
ACQUIRED COMPETENCES:			
BASIC	**GENERAL**	**SPECIFIC**	**TRANSVERSAL**
CB1, CB2,CB3,		**CE1, CE2, CE12, CE17, CE18, CE24, CE25, CE26, CE35,**	**CT1**

BRIEF DESCRIPTION:

Subject: Physics

1. Dynamics and kinematics.
2. Gravitation.
3. Oscillatory movement.
4. Undulatory movement.
5. Fluids. Hydrostatic and fluid dynamics.
6. Thermodynamic principles.
7. Electricity and Magnetism.
8. Radioactive disintegration. Alfa, beta and gamma radiation.

Subject: Geophysical Fluid Mechanics

1.- Fluid kinetics. Vorticity and circulation. Conservation principles.

2.- Fluid dynamics. Navier-Stokes equations.

3.- Dimensional analysis and scaling.

4.- Laminar y turbulent flow. Boundary layers.

5.- Turbulence.

OBSERVATIONS:

CHEMICAL MATERIAL (GENERAL SCIENTIFIC BASIS MODULE)			
ACQUIRED COMPETENCES			
BASIC	**GENERAL**	**SPECIFIC**	**TRANSVERSAL**
CB1, CB3		**CE1, CE8, CE27, CE28, CE29, CE30, CE31**	

BRIEF DESCRIPTION:

Subject: Chemistry

1. Matter structure. Periodic system.
2. Chemical bond: ionic bond, covalent bond and metallic bond.
3. Stoichiometry and chemical calculations.
4. Thermodynamic and kinetic aspects of chemical reactions.
5. Chemical equilibriums in aqueous solutions (acid-base, complex formation, oxidation-reduction and precipitation) and their analytical applications.
6. Fundamental aspects of organic chemistry.

Subject: Aqueous Solution Chemistry

1.- The chemical potential: spontaneity and equilibrium conditions.

2.- Aqueous solutions: real solutions of electrolytes and activity coefficients.

3.- Chemical equilibriums in solutions and their dependence on temperature, ionic force

and pressure. 4.- Reactions in solutions: formal kinetics and catalysis. 5.- Electrochemistry: conductivity and electrochemical equilibriums.
OBSERVATIONS:

PHYSICAL AND GEOLOGICAL MATERIAL (GENERAL SCIENTIFIC BASIS MODULE)			
ACQUIRED COMPETENCES			
BASIC	**GENERAL**	**SPECIFIC**	**TRANSVERSAL**
CB1, CB2, CB3		**CE21, CE22, CE23, CE24, CE27, CE29, CE30, CE31**	**CT1**

BRIEF DESCRIPTION:
Subject: Geophysics and Tectonics 1.- Earth's shape, gravity field and gravimetrical anomalies. Earth tides. 2.- Seismic waves. Focal parameters of earthquakes. 3.- Earth's magnetic field. 4.- Continental drift and tectonic plates. Lithospheric structure. Plate kinetics. 5.- Distensive, compressive and transcurrent regimes. 6.- Geophysical survey of continental margins.
OBSERVATIONS:

ECONOMY AND LAW MATERIAL (TRANSVERSAL KNOWLEDGE MODULE)			
ACQUIRED COMPETENCES			
BASIC	**GENERAL**	**SPECIFIC**	**TRANSVERSAL**
CB2, CB5	**CG1**	**CE4, CE36, CE37, CE38, CE39, CE40, CE42**	**CT3**

BRIEF DESCRIPTION:
Subject: Economy and Legislation 1. Basic notions in Maritime Administrative Law. 2. Legal regime of coastal and marine areas and their natural resources. 3. Legal protection of the marine environment from soil contamination processes derived from marine exploitation activities. 4. Legal protection of the marine environment from marine contamination processes off vessels and other floating artefacts.

5. Consumption and production economics. Competences and markets. 6. The economy and natural resources. 7. Economic study of marine resources. 8. Introduction to bio-economy. 9. Economic and fishery politics.
OBSERVATIONS:

POLLUTION MATERIAL (TRANSVERSAL KNOWLEDGE MODULE)			
ACQUIRED COMPETENCES			
BASIC	**GENERAL**	**SPECIFIC**	**TRANSVERSAL**
CB2, CB3, CB5	**CG1**	**CE4, CE5, CE6, CE10, CE11, CE12, CE43, CE44, CE45, CE46, CE47, CE48**	**CT1, CT2, CT3**

BRIEF DESCRIPTION
Subject: Marine Pollution 1. Introduction to the environment: definitions y principles. 2. Water and sediment quality. 3. Types of marine contaminants: Contaminating activities and installations, access routes, distribution and transformation, effects. 4. Contaminant analysis and evaluation. 5. Marine ecotoxicology. 6. Marine pollution control technology. 7. Protection and vigilance processes.
OBSERVATIONS:

ENVIRONMENTAL MANAGEMENT TOOLS MATERIAL (TRANSVERSAL KNOWLEDGE MODULE)			
ACQUIRED COMPETENCES			
BASIC	**GENERAL**	**SPECIFIC**	**TRANSVERSAL**
CB2, CB3, CB5	**CG1**	**CE4, CE5, CE11, CE43, CE47,CE48, CE49, CE50, CE51, CE52, CE53, CE54, CE55**	**CT1, CT2, CT3**

BRIEF DESCRIPTION
Subject: Environmental Impact Assessment and Normalised Management Systems 1. Concepts and definitions. Specifics in coastal-maritime areas. 2. Environmental Impact Assessment and Strategic Environmental Assessment procedures. Specifics in coastal-maritime areas. 3. Normalised Management Systems implementation and auditing procedures.

Specifics in coastal-maritime areas. 4. Identification and impact assessment methods. 5. Development of environmental inventories. 6. Correctional and protective measures and the environmental vigilance programme. 7. Study cases: submarine cables, marine wind farms, ports, thermal power plants, beach recovery, desalination plants, application of Management Systems in the marine environment: beaches, marinas, etc.
OBSERVATIONS:

BIOLOGICAL, PHYSICAL, GEOLOGICAL AND CHEMICAL MATERIAL (INSTRUMENTAL MATERIAL MODULE)			
ACQUIRED COMPETENCES			
BASIC	**GENERAL**	**SPECIFIC**	**TRANSVERSAL**
CB1, CB2, CB3, CB5	**CG1**	**CE3, CE8, CE9, CE11, CE12, CE56, CE57, CE58, CE59, CE60, CE72, CE73,**	**CT1, CT2, CT3**

BRIEF DESCRIPTION
Subject: Research Methods in Oceanography 1. Hydrography, bathymetry and positioning. 2. Sea sampling theory. 3. Sampling: organisation and execution. 4. Oceanographic campaigns: organisation and execution. 5. General oceanographic instrumentation. 6. Sampling and data collection: sampling and oceanographic campaigns. 7. Processing oceanographic samples and data. 8. Evaluation of oceanographic data. 9. Development of final reports.
OBSERVATIONS:

PHYSICAL, GEOGRAPHICAL AND GEOLOGICAL MATERIAL (INSTRUMENTAL MATERIAL MODULE)			
ACQUIRED COMPETENCES:			
BASIC	**GENERAL**	**SPECIFIC**	**TRANSVERSAL**
CB1, CB2, CB3, CB5	**CG1**	**CE8, CE9, CE12, CE60, CE61, CE62, CE63, CE64, CE73**	**CT1, CT2, CT3**

BRIEF DESCRIPTION

Subject: GIS and Remote Sensing

1. Foundations of GIS: definition, components and basic characteristics.

2. GIS functions (capture, analyse and design cartography) and data models.

3. Applications of GIS in Marine Sciences.

4. Characteristics of remote sensors and main spatial platforms used in marine observation.

5. Oceanographic applications of spatial and airborne remote sensors.

6. Treatment of satellite images of the marine environment.

OBSERVATIONS:

MATHEMATICS MATERIAL (INSTRUMENTAL MATERIAL MODULE)			
ACQUIRED COMPETENCES			
BASIC	**GENERAL**	**SPECIFIC**	**TRANSVERSAL**
CB1, CB3, CB5		**CE59, CE65, CE66, CE67, CE68, CE69, CE70, CE71, CE73**	**CT3**

BRIEF DESCRIPTION

Subject: Numerical Calculation and Computation

1. Introduction to scientific programming. Arithmetic computation and error analysis.
2. Numerical methods of non-linear equations.
3. Interpolation and approximation of functions. Application of determining numerical differentiation formulas.
4. Numerical solution of linear equation systems. Calculation of eigenvalues.
5. Numerical integration methods.
6. Numerical solution of differential equations.

Subject: Applied Statistics

1. Linear Models
    i. Linear regression
    ii. Logistical regression
2. Time series
    i. ARMA

ii. ARIMA
3. Information reduction techniques
i.Main components
ii. Correspondence analysis
iii. Factorial analysis
4. Information classification techniques
i. Cluster analysis
ii. Discriminant analysis

OBSERVATIONS:

BIOLOGICAL MATERIAL (ORGANISMS AND SYSTEMS MODULE)			
ACQUIRED COMPETENCES:			
BASIC	**GENERAL**	**SPECIFIC**	**TRANSVERSAL**
CB1, CB2, CB5	**CG1**	**CE1, CE2, CE3, CE5, CE7, CE8, CE10, CE11, CE74, CE75, CE76, CE77, CE78, CE79, CE80, CE81, CE82, CE83, CE84, CE85, CE86**	**CT1, CT2**

BRIEF DESCRIPTION

Subject: Microbiology

1. General structure of microorganisms and their cell functions.
2. Microorganism study methods.
3. Microbial growth, control and importance at an industrial and technological level.
4. Microbial biodiversity. Microorganisms origin and evolution.
5. Microbial activity and implication in the natural environment.

Subject: Marine Zoology and Botany

1. Foundations and models. Animal design. Shape and function.
2. Classification.
3. Diploblastic metazoan.
4. Triploblastic metazoa: Acoelomata and pseudocoelomata.
5. Triploblastic metazoa: Invertebrates.
6. Triploblastic metazoa: Chordata.
7. Plant biology diversity: phylogeny and life cycles.
8. Prokaryotic algae.
9. Unicellular eukaryotic algae: main marine groups.
10. Pluricellular eukaryote algae: main marine groups.
11. Marine angiosperms.
12. Ocean plant biogeography: notions and basic concepts.

Subject: Marine Ecology
1. Ecophysiology and nutrient acquisition in primary producers. 2. Population ecology. 3. Species interactions. 4. Marine communities' structure and organisation. 5. Ecological succession. 6. Marine ecosystems and energy flow in food webs.
OBSERVATIONS:

BIOLOGICAL, PHYSICAL, GEOLOGICAL AND CHEMICAL MATERIAL (OCEANOGRAPHY MODULE)			
ACQUIRED COMPETENCES			
BASIC	**GENERAL**	**SPECIFIC**	**TRANSVERSAL**
CB1, CB3, CB5		**CE2, CE12, CE87, CE88, CE89**	**CT1**

BRIEF DESCRIPTION:
Subject: Introduction to Oceanography 1.- History of Oceanography. Origin of the Earth, oceans and ocean life. 2.- Sediment types and distribution according to the main marine physiographic provinces. 3.-Physical-chemical properties of seawater. Oceanic composition. Evolution of the concept of salinity. 4.-Spatial-temporal distribution of oceanic physical-chemical properties. Masses of water. Oceanic circulation. Oceanic waves. 5.-Oceanic ecosystems. Marine organisms. Trophic-dynamic aspect of marine ecosystems. 6.-Marine resources and the environment.
OBSERVATIONS:

BIOLOGICAL MATERIAL (OCEANOGRAPHY MODULE)			
ACQUIRED COMPETENCES			
BASIC	**GENERAL**	**SPECIFIC**	**TRANSVERSAL**
CB1, CB2, CB3, CB5		**CE2, CE8, CE12, CE88, CE94, CE95, CE97**	**CT1**

BRIEF DESCRIPTION:
Subject: Biological Oceanography 1.- Pelagic ecosystems. 2.- Plankton and nekton in an aquatic environment: adaptations. 3.- Plankton distribution and dynamics on various levels. 4.- Benthic ecosystems. 5.- Factors that determine organism distribution and dynamics in the benthos and intertidal zone. 6.- Material and energy flow: Primary, secondary and bacterial production. 7.- Nutrient regeneration. Detritus flow and the plankton-benthos connection.
OBSERVATIONS:

PHYSICAL MATERIAL (OCEANOGRAPHY MODULE)			
ACQUIRED COMPETENCES			
BASIC	**GENERAL**	**SPECIFIC**	**TRANSVERSAL**
CB1, CB2, CB5		**CE2, CE12, CE13, CE89**	

BRIEF DESCRIPTION:
Subject: Physical Oceanography 1.-Oceanic currents without friction. Geostrophic and inertial currents, calculation of relative speeds with the geostrophic method. 2.- Ekman layer (wind driven currents). Upwelling. 3.- Oceanic circulation on a big scale. Gyres, Sverdrup transport, Equatorial countercurrent and intensification towards the west. 4.- Long waves, tides and swell.
OBSERVATIONS:

PHYSICAL AND GEOLOGICAL MATERIAL (OCEANOGRAPHY MODULE)			
ACQUIRED COMPETENCES			
BASIC	**GENERAL**	**SPECIFIC**	**TRANSVERSAL**
CB1, CB3, CB5		**CE8, CE12, CE13,**	**CT1**

		CE87, CE88, CE89, CE90, CE91, CE93,	

BRIEF DESCRIPTION:
Subject: Coastal Dynamics 1.- Wave propagation in coastal zones and their associated currents. 2.- Tide hydrodynamics in coastal zones. 3.- Transport, mixing and diffusion processes. 4.- Physical mechanisms of sediment transport in coastal zones. 5.- Genesis and effects of extreme events. 6.- Morphodynamics of coastal systems. 7.- Mid and long term influence of the climate on coastal evolution.
OBSERVATIONS:

GEOLOGICAL MATERIAL (OCEANOGRAPHY MODULE)			
ACQUIRED COMPETENCES:			
BASIC	**GENERAL**	**SPECIFIC**	**TRANSVERSAL**
CB1, CB2, CB3, CB5		**CE2, CE13, CE87, CE88, CE91, CE92, CE93,**	**CT1**

BRIEF DESCRIPTION:
Subject: Geological Oceanography 1.- Sedimentary processes in transitional environments. 2.-Sedimentary processes in continental shelves and slopes. 3.- Sedimentary processes in oceanic basins. 4.- Magmatism and hydrothermal alteration in oceanic environments. 5.- Lithosphere-hydrosphere interaction. 6.- Types and distribution of marine geological resources. 7.- History of the oceans and sea level variations.
OBSERVATIONS:

CHEMICAL MATERIAL (OCEANOGRAPHY MODULE)			
ACQUIRED COMPETENCES:			
BASIC	**GENERAL**	**SPECIFIC**	**TRANSVERSAL**
CB3		**CE8, CE88, CE96, CE97**	

BRIEF DESCRIPTION:

Subject: Chemical Oceanography

1.- Major chemical elements in seawater.

2.- Minor chemical elements in seawater.

3.- Chemical speciation.

4.- Surface physical-chemical phenomena.

5.- Dissolved gases in seawater.

6.- Chemistry of interstitial water.

7.- Biogeochemical cycles.

OBSERVATIONS:

BIOLOGICAL MATERIAL (LIVE MARINE RESOURCES MODULE)			
ACQUIRED COMPETENCES			
BASIC	**GENERAL**	**SPECIFIC**	**TRANSVERSAL**
CB2, CB3	**CG1**	**CE2, CE7, CE9, CE12, CE13, CE98, CE99, CE100, CE101, CE102, CE103, CE104, CE105, CE106, CE107, CE108**	**CT1, CT2, CT3**

BRIEF DESCRIPTION:

Subject: Fisheries

1. Fishing sector. Species of commercial interest.
2. Fishing techniques: types, effects and selectivity.
3. Influence of abiotic factors and biotic interactions on fisheries.
4. Biology of fishing resources. Feeding, growth and reproduction.
5. Abundance, mortality and recluting. Migration and fisheries.
6. Stock evaluation models: excess production, virtual population analysis, pelagic evaluation.
7. Fisheries management.

Subject: Aquaculture

1. Technological foundations of aquaculture.
2. Algae, invertebrate and fish culture: biological, physiological and technological basis.
3. Integrated fish farming and polycultures. Ecological aquaculture.
4. Reproduction in aquaculture: physiological basis.
5. Environmental and hormonal manipulation of the reproductive cycle. Hormonal and environmental control of sex.
6. Nutrition and trophic technology in aquaculture: feeding, metabolism and nutritional needs.
7. Environmental factors influence on aquaculture production.
8. Stress in aquaculture: basic and applied aspects.
9. Introduction to marine pathology.
10. Infectious and non-infectious pathologies in cultured marine organisms.
11. Aquaculture diagnostic methods.
12. Organisation, expression and regulation of genes and genomes of marine organisms.
13. Inheritance of qualitative and quantitative characters in marine organisms and their application in optimising using improvement techniques.
14. Wild and cultured population genetics: equilibrium conditions and processes that alter them.

OBSERVATIONS:

GEOGRAPHICAL MATERIAL (MARINE AND COAST MANAGEMENT MODULE)			
ACQUIRED COMPETENCES:			
BASIC	**GENERAL**	**SPECIFIC**	**TRANSVERSAL**
CB2, CB3, CB5	**CG1**	**CE4, CE5, CE6, CE7, CE109, CE110, CE111, CE112, CE113**	**CT1, CT2, CT3**

BRIEF DESCRIPTION:

Subject: Introduction to Integrated Coastal Zone Management

1. Geographical analysis of coastal areas. Coastal subsystems. Problems and conflicts.

2. Formal aspects of integrated coastal zone management (ICZM).

3. Aspects of ICZM methodology.

4. Aspects of ICZM strategies.

5. Operational and instrumental aspects of ICZM.

6. ICZM techniques.

OBSERVATIONS:

ENGINEERING MATERIAL (MARINE AND COASTAL MANAGEMENT MODULE)			
ACQUIRED COMPETENCES:			
BASIC	**GENERAL**	**SPECIFIC**	**TRANSVERSAL**
CB2, CB3, CB5		**CE12, CE13, CE114, CE115, CE116, CE117**	**CT1**

BRIEF DESCRIPTION:
Subject: Coastal Engineering 1. Surf breakers. 2. Introduction to physical models of coastal engineering. 3. Coastal risks. 4. Coastal buildings and structures. 5. Environmental effects of coastal buildings. 6. Adaptive strategies for coastal processes.
OBSERVATIONS:

PROJECT DRAFTING AND EXECUTION MATERIAL (PROJECT MODULE)			
ACQUIRED COMPETENCES:			
BASIC	**GENERAL**	**SPECIFIC**	**TRANSVERSAL**
CB1, CB2, CB3, CB4, CB5	**CG1**	**CE1, CE2, CE3, CE4, CE5, CE6, CE7, CE8, CE9, CE10, CE11, CE12, CE13, CE118, CE119, CE120, CE121, CE122, CE123**	**CT1, CT2, CT3**

BRIEF DESCRIPTION:
Subject: Project Drafting and Execution 1.- General aspects of developing projects in marine areas. 2.- General aspects of a report. 3.- Necessary tools for project design and completion. 4.- Public presentation techniques. 5.- Design economy reports and company plans.

6.- Procedures for obtaining administrative authorisations.
OBSERVATIONS:

FINAL DEGREE PROJECT MATERIAL (PROJECT MODULE)			
ACQUIRED COMPETENCES:			
BASIC	**GENERAL**	**SPECIFIC**	**TRANSVERSAL**
CB1, CB2, CB3, CB4, CB5	**CG1**	**CE118, CE119, CE120, CE121, CE122, CE123**	**CT1, CT2, CT3**

BRIEF DESCRIPTION:

The Final Degree Project will include activities that integrate knowledge and transversal and specific competences which the student has acquired throughout the degree. It must be original and integrative work in the Marine Science field and may be a part of one of the following: laboratory work, field work, work experience or bibliographical revision.

RESULTS OF LEARNING:

1. Acquire global competences linked to developing and applying knowledge.
2. Acquire competences linked to searching and organising information and relevant documents on the study topic.
3. Convey acquired knowledge and abilities by presenting them in a rigorous and convincing manner, written or oral, to a specialised or non-specialised public.
4. Know how to apply obtained knowledge and demonstrate professional critical comprehension, with the ability to define and synthesise a topic, problem or study area and apply coherent reasoning in order to elaborate a pertinent and contextualised answer.
5. Know how to apply processes and procedures to the collection, analysis and interpretation of data and relevant information in a methodical manner in order to reach a conclusion for a topic, problem or study area, using new technologies as tools and support material.
6. Understand systematically and critically a topic, problem or study area, incorporating theoretical framework and available knowledge, as well as judgements that include social, scientific and ethical reflections.
7. Acquire commitments and exercise professional personal responsibilities, practicing individual work habits which are essential in developing complex intellectual activities.

OBSERVATIONS:

The defence and evaluation will be individual. The student must have passed all basic and mandatory material to be able to defend their Final Degree Project.

BIOLOGICAL AND ENGINEERING MATERIAL (LIVE RESOURCES ORIENTATION MODULE)			
ACQUIRED COMPETENCES:			
BASIC	**GENERAL**	**SPECIFIC**	**TRANSVERSAL**
CB2, CB3, CB5	**CG1**	**CE2, CE4, CE6, CE7, CE9, CE11, CE12, CE124, CE125, CE126, CE127, CE128, CE129, CE130, CE131, CE132, CE133, CE138, CE141**	**CT1, CT2**

BRIEF DESCRIPTION:
Subject: Advanced Aquaculture **1.-** Aquaculture of microalgae (species, nutrition value and culture). 2.- Intensive and extensive culture of macrophytes for industrial use (nutrition, cosmetics, biotechnology). 3.-Functional adaptation of cultivated species. 4.- Physiological development and growth of important species in aquaculture. 5.-Biological cycles and aquaculture. 6.- Endocrinology applied to aquaculture. 7.- Selection genetic improvement programmes. 8.- Cross-breeding genetic improvement technique. 9.- Chromosomic manipulation for genetic improvement. 10.- Genetic evaluation of aquaculture stock. 11.- Pathologies associated to cultures at sea and on land. 12.- Larvae pathologies. 13.- Neoplasias. Etiology. Types. 14.- Prevention and profilaxis in marine pathology. 15.- Pathology reports.

16.- Basic concepts and elements of project studies developed in aquaculture plants. 17.- General description of on land and at sea aquaculture installations. 18.- Basic equipment of continental plants and pumps.
OBSERVATIONS:

BIOLOGICAL AND CHEMICAL MATERIAL (LIVE RESOURCES ORIENTATION MODULE)			
ACQUIRED COMPETENCES:			
BASIC	**GENERAL**	**SPECIFIC**	**TRANSVERSAL**
CB2, CB3, CB5	**CG1**	**CE134, CE135, CE136, CE137, CE138, CE139**	**CT1, CT2**

BRIEF DESCRIPTION:
Subject: Natural Marine Products 1.- Algae, invertebrates and marine microorganisms as a source of natural organic products. 2.-Detection, isolation and structural characterisation of natural products found in marine organisms. 3.-Chemistry of marine ecology. Chemical compounds from marine organism interactions. 4.-Biomedical properties of natural products from marine invertebrates. 5.-Algae and microalgae. Derivatives and their applications. 6.-Marine microorganisms. Marine toxins.
OBSERVATIONS:

BIOLOGICAL MATERIAL (LIVE RESOURCES ORIENTATION MODULE)			
ACQUIRED COMPETENCES:			
BASIC	**GENERAL**	**SPECIFIC**	**TRANSVERSAL**
CB2, CB3, CB4, CB5	**CG1**	**CE2, CE4, CE6, CE7, CE9, CE10, CE11, CE12, CE140,CE141, CE142, CE143, CE144**	**CT1, CT2**

BRIEF DESCRIPTION:
Subject: Conservation of Live Marine Resources 1. Introduction to the concept of conservation. 2. Genetic variability and population diversity.

3. Factors that threaten biodiversity. 4. Species conservation and recuperation. 5. Ecosystem conservation and restoration. 6. Protection measures. Marine reserves.
OBSERVATIONS:

BIOLOGICAL MATERIAL (APPLIED OCEANOGRAPHY ORIENTATION MODULE)			
ACQUIRED COMPETENCES:			
BASIC	**GENERAL**	**SPECIFIC**	**TRANSVERSAL**
CB2, CB3, CB4, CB5		**CE145, CE146**	**CT1, CT2, CT3**

BRIEF DESCRIPTION:
Subject: Marine Ecosystems 1.- Latitudinal variation patterns in the functioning of pelagic systems. 2.- Study cases of interactions between physical and biological processes in regional seas (Mediterranean, Baltic, Black). 3.- Estuary ecosystems. 4.- Zoning, production and adaptations in marsh lands. 5.- Scientific basis for identifying specific impacts in coastal ecosystems. 6.- Introduction to aquatic ecosystem modelling.
OBSERVATIONS:

PHYSICAL MATERIAL (APPLIED OCEANOGRAPHY ORIENTATION MODULE)			
ACQUIRED COMPETENCES:			
BASIC	**GENERAL**	**SPECIFIC**	**TRANSVERSAL**
CB2, CB3, CB4, CB5		**CE8, CE9, CE10, CE12, CE13, CE147, CE148**	**CT1, CT2, CT3**

BRIEF DESCRIPTION:
Subject: Applied Physical Oceanography 1.- Technical analysis of time series of oceanographic variables. 2.- Spatial analysis techniques. 3.- Analytical models of physical oceanography.

4.- Numerical modelling as a diagnostic and prognostic tool in physical processes.
OBSERVATIONS:

GEOLOGICAL MATERIAL (APPLIED OCEANOGRAPHY ORIENTATION MODULE)			
ACQUIRED COMPETENCES:			
BASIC	**GENERAL**	**SPECIFIC**	**TRANSVERSAL**
CB2, CB3, CB4, CB5		**CE8, CE9, CE10, CE12, CE13, CE149, CE150**	**CT1, CT2, CT3**

BRIEF DESCRIPTION:
Subject: Applied Geological Oceanography 1.- Exploration and exploitation of marine geological resources. 2.- Geophysical methods in evaluating geological resources. 3.- Geological survey. Physical property analysis of surveys and geological resource characterisation techniques. 4.- Evaluation of sedimentary process rates. 5.- Environmental implications of exploiting marine geological resources.
OBSERVATIONS:

CHEMICAL MATERIAL (APPLIED OCEANOGRAPHY ORIENTATION MODULE)			
ACQUIRED COMPETENCES:			
BASIC	**GENERAL**	**SPECIFIC**	**TRANSVERSAL**
CB3, CB4		**CE8, CE10, CE151, CE152, CE153**	

BRIEF DESCRIPTION:
Subject: Applied Chemical Oceanography 1.- Creation of vertical profiles: surface water reactivity and deep ocean segregation. Basic biogeochemical models. 2.- Ocean carbon cycle. Equilibriums in solutions and gas transference. 3.- N, P and Si ocean cycles. Reactivity, sources and sinks. 4.- Chemical traces in oceanography: use of orogenic, cosmogenic and anthropogenic radionuclides in ocean circulation studies. Use of carbon isotopes.

5.- Coastal system element cycles: differential and important aspects of land contributions. 6.- Practical cases of chemical oceanography. The Gulf of Cadiz. 7.- Practical cases of coastal oceanography. The Guadalquivir estuary.
OBSERVATIONS:

LAW MATERIAL (COASTAL ZONE MANAGEMENT MODULE)			
ACQUIRED COMPETENCES:			
BASIC	**GENERAL**	**SPECIFIC**	**TRANSVERSAL**
CB3, CB4, CB5		**CE3, CE10, CE154, CE155, CE156, CE157, CE158, CE159, CE160, CE161, CE162**	**CT2**

BRIEF DESCRIPTION:
Subject: Public Marine Law 1.- European legal framework and international protection of the marine environment. 2.- Territorial organisation and competences in marine and coastal areas. 3.- General and sectorial regulations in coastal and maritime management. 4.- Legal coast and marine ordination and planning instruments. 5.- Legal regime of marine areas. 6.- Exploitation of marine natural resources. 7.- Areas of international interest.
OBSERVATIONS:

GEOGRAPHICAL MATERIAL (COASTAL ZONE MANAGEMENT MODULE)			
ACQUIRED COMPETENCES:			
BASIC	**GENERAL**	**SPECIFIC**	**TRANSVERSAL**
CB2, CB3, CB4, CB5	**CG1**	**CE4, CE5, CE6, CE7, CE10CE158, CE159, CE160, CE161, CE162**	**CT1, CT2**

BRIEF DESCRIPTION:
Subject: Integrated Coastal Zone Management Models. 1.- Andalusian coast: coastal subsystems and problems. 2.- Public politics and regulations that affect the Andalusian coast and its resources. 3.- Distribution of responsibilities and institutes in Andalusian coastal management. 4.- Strategic instruments. Technical-scientific information and knowledge. 5.- Education and awareness as tools for sustainability on the Andalusian coast. 6.- Social participation and institutional cooperation.
OBSERVATIONS:

BIOLOGICAL, PHYSICAL, GEOLOGICAL AND CHEMICAL MATERIAL (COASTAL ZONE MANAGEMENT MODULE)			
ACQUIRED COMPETENCES:			
BASIC	**GENERAL**	**SPECIFIC**	**TRANSVERSAL**
CB2, CB3, CB4	**CG1**	**CE5, CE8, CE9, CE10, CE12, CE13, CE154, CE155, CE156, CE157, CE158, CE159**	

BRIEF DESCRIPTION:
Subject: Integrated Dynamics of Natural Coastal Systems. 1.- Hydrodynamic models as tools for diagnostics and prognostics of physical processes in bays, estuaries and marshes. 2.- Analysis and treatment techniques of coastal oceanographic variables. 3.- Sedimentation and morphodynamics in deltas, estuaries and marshes. 4.- Rocky and sandy coastal dynamics, evolution and vulnerability. 5.- Variability of coastal systems physical-chemical properties. Spatial and temporal variations. Small scale gradients and circadian and tidal rhythms. 6.- Material transference processes between environmental compartments. Organic material diagenesis and benthic flows. Exchange of gases in the water-atmosphere interphase.

7.- Chemical reactivity in estuaries. Types of behaviour and transference between phases. 8. Interactions between the physical environment and the biological processes of a coastal ecosystem. 9. Coastal ecological communities' gradients and dynamics. 10. Introduction to coastal ecosystems functioning models. 11. Integrated study of special cases.
OBSERVATIONS:

4. Investigation Groups of Interest

INVESTIGATION GROUPS OF THE UNIVERSITY OF CADIZ ASSOCIATED WITH THE MARNE AND ENVIRONMENTAL SCIENCES FACULTY		
DEPARTAMENT	**GROUP PAI**	**NAME**
Pathological Anatomy, Cellular Biology, Histology, Science History, Legal and Forensic Medicine and Toxicology.	RNM-345	Environmental and Analytical Toxicology
Biology.	RNM-213	Marine Biology and Fisheries
	RNM-329	Coastal Wetlands Conservation
	RNM-243	Fish Population Dynamics
	RNM-214	Aquatic Ecosystems Structure and Dynamics
	RNM-216	Marine Species Pathology and Histophysiology
Molecular Biochemistry and Biology, Microbiology, Preventative Medicine and Public Health, Physiology and Genetics.	BIO-219	Applied Microbiology and Molecular Genetics.
Earth Sciences.	RNM-328	Coastal and Marine Geology and Geophysics.
Material Sciences and Metallurgic and Inorganic Chemistry Engineering.	TEP-231	Corrosion and Protection.
Applied Physics.	RNM-205	Physical Oceanography: Dynamics.
	RNM-337	Oceanography and Remote Sensing.
Applied Physics and Earth Sciences.	RNM-160	Radioactivity and the Environment.
History, Geography and Philosophy	HUM-117	Coastal Planning and Management.
Chemical Engineering, Food Technology and Environmental Technology.	TEP-181	Environmental Quality and Residue and Liquid and Gas Effluent Technology.
Physical Chemistry.	RNM-144	Oceanography and Coastal Contamination.
Organic Chemistry.	FQM-285	Natural Marine Products.
Condensed Material Physics.	TEP-115	New Sol-gel Material Processing.
Analytical Chemistry.	RMN-236	Marine Geochemistry.
Mathematics.	FQM-315	Theoretical and Numerical Analysis of Experimental Sciences Models.
Public Law.	SEJ-152	Cadiz Chair of Administrative Law