UNIVERSITÀ DEGLI STUDI DI PALERMO

DEPARTMENT	Scienze della Terra e del Mare		
ACADEMIC YEAR	2018/2019		
MASTER'S DEGREE (MSC)	MARINE BIOLOGY		
INTEGRATED COURSE	MICROBIOLOGY AND MARINE CHEMISTRY - INTEGRATED COURSE		
CODE	19800		
MODULES	Yes		
NUMBER OF MODULES	2		
SCIENTIFIC SECTOR(S)	CHIM/12, BIO/19		
HEAD PROFESSOR(S)	ORECCHIO SANTINO	Professore Associato	Univ. di PALERMO
OTHER PROFESSOR(S)	ORECCHIO SANTINO QUATRINI PAOLA	Professore Associato Professore Associato	Univ. di PALERMO Univ. di PALERMO
CREDITS	9		
PROPAEDEUTICAL SUBJECTS			
MUTUALIZATION			
YEAR	2		
TERM (SEMESTER)	1° semester		
ATTENDANCE	Not mandatory		
EVALUATION	Out of 30		
TEACHER OFFICE HOURS	**ORECCHIO SANTINO** Tuesday 08:00 10:00 Studio Prof. Orecchio, Ed. 17, Viale delle Scienze, Palermo **QUATRINI PAOLA** Thursday 10:00 12:00 Studio Docente Viale delle scienze ed 16. tel 09123897320. Chiamare per conferma.		

DOCENTE: Prof. SANTINO ORECCHIO

PREREQUISITES	General chemistry, stechiometry, biology
LEARNING OUTCOMES	EXPECTED LEARNING RESULTS The knowledge and understanding of the students of the above course will be oriented to the acquisition of theoretical and experimental skills in sea water chemistry, marine microbiology and microbial ecology, the acquisition of analytical methods related to environmental matrices and interpretation and evaluation of data coming from monitoring. In addition, the student must possess integrated knowledge on the chemical processes that occur in the environmental fields, on the biochemical processes by marine microorganisms, on the interactions between the biotic and abiotic sectors and on the influence that the anthropic activities exert on the different environmental matrices and on the communities marine microbes. Ability to apply knowledge and understanding. At the end of the course the student must possess multidisciplinary application skills for the monitoring of the various environmental matrices both with field and laboratory instruments; In particular, the student, on the basis of specific acquired knowledge, supplemented by classroom experiments and simulation of laboratory activities, must be able to design, from a chemical and microbiological point of view, environmental monitoring plans. In particular, the student must be able to define the main chemical and microbiological characteristics of an environmental matrix, in particular of marine waters, in terms of composition, reactivity and uses. Knowledge of the metabolic potential of microorganisms can also be applied in bioremediation interventions. Autonomy of judgment. The student will have to develop skills regarding: the scientific approach to sampling and monitoring, the evaluation and interpretation of experimental data; safety in the laboratory and in the field; In particular, on the basis of the acquired knowledge, supplemented by laboratory and field exercises (or simulations), it must be able to perform an interdisciplinary assessment of the state of the environment and of the resources, considering also the microbial component among the main quality variables. The autonomy of judgment is achieved through the experience gained through the exercises, the production of papers and reports, etc. Communication skills The student must be able to explain the basic concepts of the chemistry and microbiology of the marine environment, integrating them with the concept of natural (or biogeochemical) cycle and pollution of the various environmental sectors. Learning skills The students of the course will have to develop adequate skills for the independent deepening of further skills, with reference to: consultation of bibliographic material, consultation of banks data, bioinformatics tools on the net and other information on the net. The course of Marine Microbiology and that of Marine Chemistry will offer tools for communication in English by directly analyzing scientific research articles in English. Learning skills are developed throughout the training process with particular reference to individual and / or group study and to the elaboration of a research. the The exercises will complete and consolidate the theoretical knowledge. Informazioni su Google TraduttoreCommunityPer cellulariTutto su GooglePrivacy e TerminiGuidaInvia commenti
ASSESSMENT METHODS	LEARNING EVALUATION An entry test is scheduled to evaluate the initial preparation. The assessment will be based on a non-compulsory written exam in progress and a final exam for each of the two modules. For both tests the vote will be expressed in thirtieths. As for the Marine Chemistry module, the final exam will consist of a written task containing at least 15 questions, some of which with multiple answers, in some it is required to discuss a topic covered during the course, some provide numerical resolution of a problem. Each question is assigned a value (shown next to the question). In addition, the final grade of the exam will be assigned based on the score obtained in the task and the evaluation of the discussion in the classroom of a topic agreed with the teacher during the course. To pass the exam it is necessary to pass the written task with at least 18/30. As for the microbiology module, the exam will be oral. The final mark of each module is given taking into account the average of the marks (out of thirty) obtained in the final test and in the final exam. The positive evaluation of the in itinere test allows the student to take the final exam (in the first useful session) only on the topics of the second part of the course, not the subject of the ongoing exam. If the student intends to refuse the outcome of the

	test in progress, the oral exam will focus on the entire program of the course. For each test the grade will be attributed on the basis of the level of knowledge and understanding of the topics of the program, the ability to elaborate and link together the contents of the course and the property of scientific language. The final grade will be given taking into account the average between the marks obtained in the two tests and the active participation of the student in frontal lessons and exercises. Excellent (30-30 cum laude). Excellent knowledge of the topics, excellent property of language, good analytical skills. The student is able to apply the knowledge to solve all the proposed problems. Very good (26-29). Good command of the arguments, full ownership of language. The student is able to apply the knowledge to solve the proposed problems. Good (24-25). The student reaches a basic knowledge of the main topics, a discreet language property, limited ability to autonomously apply the knowledge to the solution of the proposed problems. Satisfactory (21-23). The student does not have full command of the topics main but has the knowledge, satisfactory language properties, poor ability to independently apply the acquired knowledge. Sufficient (18-20). The student has a basic knowledge of the main topics and the technical language, very little or no ability to independently apply the acquired knowledge. Insufficient. The student does not possess an acceptable knowledge of the contents of the topics covered in the teaching. The final vote of C.I. it will be constituted by the average of the final votes of the two modules.
TEACHING METHODS	Lesson and laboratory activities

MODULE
MARINE CHEMISTRY

Prof. SANTINO ORECCHIO

SUGGESTED BIBLIOGRAPHY	
Appunti di lezione S.E.Manahan – Chimica dell'Ambiente- Piccin Diapositive fornite dal docente	
AMBIT	20879-Attività formative affini o integrative
INDIVIDUAL STUDY (Hrs)	43
COURSE ACTIVITY (Hrs)	32
EDUCATIONAL OBJECTIVES OF THE MODULE	
The course is aimed to provide the basic and experimental concepts for the definition of the chemical composition and characteristics of natural ecosystems (water, air, soil, sediment, organisms). The concepts will be developed in view of biogeochemical cycles, in order to define the environmental pollution processes. The course will provide the analytical basis for the monitoring of the different ecosystems.	

SYLLABUS

Hrs	Frontal teaching
2	Laboratory tequiniques
2	Sampling (water, sediments, etc.) In natural environments:
2	Preparation of samples for analysis
2	Analytical methods (volumetric, gravimetric and instrumental) for water, sediemnts, soils, air, etc

Hrs	Practice
8	Water analysis
4	Heavy metals analysis
4	micro organic pollutants (PAHs, pesticides, etc.)
2	Marine sediments nanalysis
2	Organisms analysis
4	Critical evaluation ot the analytical results of waters, sediments and organisms

MODULE
MARINE MICROBIOLOGY

Prof.ssa PAOLA QUATRINI

SUGGESTED BIBLIOGRAPHY

Articoli scientifici segnalati durante il corso.
Scientific articles and reviews suggested during the course.
PDF slides of the course.
Barbieri P, Bestetti G, Galli E, Zannoni. Microbiologia Ambientale ed Elementi di Ecologia Microbica Casa Editrice Ambrosiana
Madigan T et al., Brock Biologia dei Microrganismi. XIV edizione. Casa Editrice Ambrosiana.
(in alternativa) Madigan T et al., Brock Biologia dei Microrganismi. Volume 2A Microbiologia Ambientale ed Industriale Casa Editrice Ambrosiana.

AMBIT	50507-Discipline del settore biomolecolare
INDIVIDUAL STUDY (Hrs)	98
COURSE ACTIVITY (Hrs)	52

EDUCATIONAL OBJECTIVES OF THE MODULE

To Consolidate the cultural background in basic microbiology and acquire a specific preparation in marine microbiology and microbial ecology; reach a good understanding of the mechanisms and trials of marine micro-organisms and adaptations to different environments. Knowledge of the microbial diversity of aquatic ecosystems and acquire skills of conventional microbiological methods and molecular approaches for the analysis of marine microbial communities.

SYLLABUS

Hrs	Frontal teaching
8	Introduction to Marine Microbiology Issues of marine microbiology, history and goals. Chemical and physical characteristics of the marine environment. References to classification of microorganisms. The species concept in prokaryotes; phylogenesis and molecular chronometers. Nutritional needs and diversity of microbial metabolisms. Diversity of marine micro-organisms: bacteria and archaea, marine Viruses.
6	The marine environment and microorganisms. Main abiotic factors that influence the lives of microorganisms. The role of microorganisms in the biogeochemical cycles. Primary production and energy production in prokaryotes. Colonization of surfaces, microbial biofilms. Marine snows
6	Microbial ecology. Microbial food web. DOM and POM Microbial and viral loops. interactions between microorganisms and multicellular marine organisms
8	The methods of marine microbiology. Cultural methods. Culture media, isolation, cultivation and identification of microorganisms. Viable bacteria that can not be cultivated. "The great plate count anomaly". Methods for quantitative determination of marine microorganisms: MPN and fluorescence. Biomolecular methods and applications to marine microbiology. Cloning vectors, transformation and selection of recombinants. Screening of genomic libraries. Clone libraries of 16S rRNA genes. Concept of metagenomics. Metagenomic libraries from the sea.Identification of bacterial species in situ: FISH. Molecular fingerprint for the study of marine microbial communities: ARISA, DGGE
6	Monitoring of marine microorganisms. Analysis of Water Quality. Microorganisms indicators. Detection of coliforms, faecal streptococci, enterobacteria. Direct search of pathogens
6	Marine microorganisms and man. Biofouling and biodeterioration. Microbiological marine resources: metabolically active molecules from the sea. Bioremediation and degradation of hydrocarbons by Hydrocarbonoclastic bacteria

Hrs	Practice
12	Experiences of Microbiology (in classroom and laboratory) Isolation and cultivation of marine bacteria; identification methods for bacterial isolates