



UNIVERSITÀ DEGLI STUDI DI PALERMO

DEPARTMENT	Ingegneria
ACADEMIC YEAR	2023/2024
BACHELOR'S DEGREE (BSC)	MARINE TECHNOLOGIES ENGINEERING
INTEGRATED COURSE	COAST PROTECTION, COASTAL GEOMORPHOLOGY AND MARINE GEOLOGY - INTEGRATED COURSE
CODE	21652
MODULES	Yes
NUMBER OF MODULES	3
SCIENTIFIC SECTOR(S)	GEO/04, GEO/02, ICAR/02
HEAD PROFESSOR(S)	CIRAOLLO GIUSEPPE Professore Ordinario Univ. di PALERMO
OTHER PROFESSOR(S)	CIRAOLLO GIUSEPPE Professore Ordinario Univ. di PALERMO SULLI ATTILIO Professore Ordinario Univ. di PALERMO CAPPADONIA CHIARA Professore Associato Univ. di PALERMO
CREDITS	15
PROPAEDEUTICAL SUBJECTS	
MUTUALIZATION	
YEAR	3
TERM (SEMESTER)	1° semester
ATTENDANCE	Not mandatory
EVALUATION	Out of 30
TEACHER OFFICE HOURS	CAPPADONIA CHIARA Wednesday 15:00 - 17:00 CIRAOLLO GIUSEPPE Tuesday 11:00 - 13:00 Ufficio del Professore (II piano Ed. 8 - blocco "Idraulica") Thursday 11:00 - 13:00 Ufficio del Professore (II piano Ed. 8 - blocco "Idraulica") Friday 9:00 - 14:00 Per gli studenti del CdS in Biotecnologie e Innovazione Tecnologica, presso le strutture del polo didattico di Trapani. I ricevimenti, su richiesta, possono essere svolti anche su piattaforma teams. Ulteriori o differenti incontri possono essere concordati con il docente SULLI ATTILIO Wednesday 15:00 - 17:00 Via Archirafi 20 - III piano, stanza 5 - Studio Prof. Sulli

DOCENTE: Prof. GIUSEPPE CIRAIOLO

PREREQUISITES	Basic hydraulic
LEARNING OUTCOMES	Knowledge and understanding skills. The student will deepen the skills achieved in the basic hydraulic courses, improving the knowledge of coastal processes, hydrodynamic problems and geology and geomorphology aspects. Skills to apply knowledge and understanding Main objective of the course is to provide the students with advanced skills in the analysis of hydrodynamic as morphological processes relevant in coastal areas. Making judgments The variety and complexity of the problems discussed during the course requires that the student achieves the ability to combine the solution of specific methodologies independently of each addressed problem. Communication skills During the exercises in the classroom and in the lab, the student will be invited to discuss the used procedures and methodologies, thus acquiring the ability to explain the meaning of their work. Such capacity will be directly evaluated in the final exam. Learning skills The provided knowledge will allow the students to analyze and study complex coastal engineering problems (other than those covered in the course), thus acquiring the ability to further deepen their expertise throughout their subsequent professional or university experience.
ASSESSMENT METHODS	Oral test. The oral examination consists of the discussion of the reports of the practice exercises and of the basic principles of coastal engineering, marine geology and geomorphology. The final assessment takes into account equally the quality of the reports and of the oral tests and is based on the following requisites: a) knowledge and presentation skills of the fundamental principles; b) ability to apply the principles to practical problems ; c) skills in solving new problems. The examination is passed if the student meets the requirement a) and, at least for simple problems, the requirement b). The requirement c) is a necessary condition to obtain an excellent rating (28 and up). The score is given in thirtieths.
TEACHING METHODS	Frontal lecturing, practical, field visits

MODULE MARINE GEOLOGY

Prof. ATTILIO SULLI

SUGGESTED BIBLIOGRAPHY

Kennett – Marine Geology. Prentice Hall
Seibold & Berger – The Sea Floor. An introduction to Marine Geology, Springer Verlag
Arnulfo & Sulli – Appunti di Geologia Marina

AMBIT	10657-Attività formative affini o integrative
INDIVIDUAL STUDY (Hrs)	48
COURSE ACTIVITY (Hrs)	27

EDUCATIONAL OBJECTIVES OF THE MODULE

The main objective is to provide the theoretical knowledge and investigation tools that students will use both in future scientific research activities and in the professional paths typical of marine geology, with particular reference to applications in coastal and continental shelf environments. Physiographic, geological and geophysical features of the marine areas will be analysed. We will study the mechanisms of formation of continental margins and oceans. We will address the notions related to the relationship between subsidence, eustatism and sediment supply. Will show the physical and chemical characters of the sea water, ocean circulation, and the mechanisms that regulate waves, tides and currents. We will frame the main marine environments and sedimentation. The main investigation methods in marine areas will be explained. In addition, basic knowledge of the coastal areas will be provided and the issues related to marine hazards, coastal vulnerability (natural or induced) and its defense are addressed as a starting point for its correct management.

SYLLABUS

Hrs	Frontal teaching
2	Hypsographic curve. Marine physiography and environments. Continental shelf and late Quaternary
2	Continental slope. Submarine canyon. Turbidity currents. Submarine landslides. Contourites. Abyssal plains. Oceanic trenches
2	Marine water chemistry. Salinity and density. Sea water temperature. Minimum oxygen. CCD
2	Marine circulation. Coriolis effect. Upwelling and downwelling
2	Wind-generated waves. Tides: static and dynamic model
3	Littoral system and coastal processes. Classification of the coasts. Cliffs. Beaches. Beach profiles. Coastal sedimentary balance
3	Coast vulnerability and coastal risk. Defense systems: walls, cliffs, groins, breakwaters and their effects. Artificial nourishments
2	Anomalous waves and tsunamis. Calculation of anomalous wave parameters. Marine geological hazard
2	Marine cartography. Positioning systems, bottom sampling, wells
2	Seismic reflection
2	Acoustic methods – Multibeam and Side Scan Sonar

MODULE COASTS PROTECTION

Prof. GIUSEPPE CIRAOLLO

SUGGESTED BIBLIOGRAPHY

- Dispense, appunti e slides del corso
- PETTI MARCO - FONDAMENTI DI IDRAULICA MARITTIMA E COSTIERA - Casa Editrice FORUM
- TOMASICCHIO UGO - MANUALE DI INGEGNERIA PORTUALE E COSTIERA - Casa editrice HOEPLI
- Benassai G., 2006. Introduction to coastal dynamics and shoreline protection. WIT press, Southampton.
- CEM Coastal Engineering Manual

AMBIT	10657-Attività formative affini o integrative
INDIVIDUAL STUDY (Hrs)	144
COURSE ACTIVITY (Hrs)	81

EDUCATIONAL OBJECTIVES OF THE MODULE

The general aim of the course is to provide to the students the theoretical knowledges and the advanced and operational methodologies of coastal hydrodynamics analysis and the most appropriate interventions and works for coastal protection. The full understanding of interactions waves-infrastructure is one is also an important objective of the course.

SYLLABUS

Hrs	Frontal teaching
8	Coastal characteristics. Coastal areas classification, GIS and cartography
3	Coastal climate
2	Wave processes: waves generation
4	Marine wave measurements systems and the remote sensing
2	Marine wave propagation
4	Linear theory of waves propagation
2	Waves propagation on a variable bottom
2	Wave breaking
2	Wave propagation in presence of discontinuities
2	Wave propagation on submerged structures
2	Wave breaking on natural beaches
2	Artificial protection structures
2	Fundamentals of hard and soft coastal structures
4	Coastal Sediment transport
Hrs	Practice
22	Exercises on coastal wave processes
18	Design of Coastal Structures and Sea Defenses

MODULE COASTAL GEOMORPHOLOGY

Prof.ssa CHIARA CAPPADONIA

SUGGESTED BIBLIOGRAPHY

Enzo Pranzini. La forma delle coste. Zanichelli

MATTM-Regioni, 2018. Linee Guida per la Difesa della Costa dai fenomeni di Erosione e dagli effetti dei Cambiamenti climatici. Versione 2018 - Documento elaborato dal Tavolo Nazionale sull'Erosione Costiera MATTM-Regioni con il coordinamento tecnico di ISPRA, 305 pp - disponibile on line

AMBIT	10657-Attività formative affini o integrative
INDIVIDUAL STUDY (Hrs)	48
COURSE ACTIVITY (Hrs)	27

EDUCATIONAL OBJECTIVES OF THE MODULE

The main issues of the course are the ones related to Coastal Geomorphology, including the acquisition of the skill in classifying the different types of coastal environments and recognising the associated landforms pattern. At the same time, interaction of coastal morphodynamic with fluvial geomorphology and slope processes will be highlighted, with reference to the analyse the sediment budget. Besides, the role of climate change and anthropogenic stress on the coastal system response will be analysed.

SYLLABUS

Hrs	Frontal teaching
1	Introduction
3	Coastal morphodynamic and landforms.
3	Coast classification: cliffs, beaches and submerged coasts.
2	Elements of Fluvial Geomorphology. The sediment delivery and budget.
3	Cliff stability.
4	Coastal erosion and morphodynamic response to prevention and protection works.
Hrs	Workshops
12	Coastal areas recognition and mapping aiming at risk assessment and mitigation