

# **Department of Ocean Science and Engineering**

## **Program of Oceanography for International Students (2024)**

### **I. Introduction**

Marine science is based on the basic theories and knowledge of mathematics, physics, chemistry, biology, geology, geophysics and Marine science, learning professional knowledge in specific fields of Marine science, and receiving basic training in Marine investigation, ocean observation, data analysis and research of Marine science problems. Students will master the working methods of a specific professional field of Marine science and have the basic ability to carry out experimental design, data collection, research scientific problems and solve applied problems in a specific professional field of Marine science. At present, with the establishment of national Marine strategy, Marine science has become an important subject direction in our economy and national defense construction.

Academic subject areas: Marine science; Program code:070701

### **II. Objectives and Learning Outcomes**

#### 1. Objectives

This major cultivates high quality science and technology professionals with good ideological and moral quality, high humanistic quality, and international vision. Students will learn the basic energy theory, basic knowledge and basic skills of Marine science in a comprehensive way. Systematically master professional knowledge and special skills in specific fields of Marine science; After graduation, they are qualified for scientific research, teaching, management and technical research and development in Marine science and related fields, and have an international vision of high-quality technical professionals.

#### 2. Learning Outcomes

Graduates should acquire knowledge and abilities in the following aspects:

1. Have scientific spirit, professional spirit and ocean consciousness, have a sense of social responsibility, have the spirit of unity and cooperation and humanities literacy;
2. Master basic theories and basic knowledge in mathematics, physics, chemistry, biology,

geology, geophysics and Marine science (earth system science), master specialized system knowledge in specific fields of Marine science;

3. To master the basic methods of Marine survey, observation and analytical research, as well as the general methods and expertise for carrying out work in specific fields of Marine science;

4. Basic ability to undertake routine Marine surveys and specialized work in specific fields of Marine science;

5. Understand the basic knowledge of relevant disciplines, major academic issues, frontier academic achievements and international academic research trends in specific fields of Marine science;

6. Have the ability to design experimental programs, create experimental conditions, and conduct Marine scientific research by means of observation, simulation, experiment and analysis, and be able to write academic papers scientifically and standardized and participate in academic exchange activities;

7. Familiar with national Marine science and technology policies and international cooperative research management of Marine science, able to participate in Marine investigation and research work of different teams at home and abroad in different sea areas within the framework of relevant policies, laws and regulations such as intellectual property rights, information security and international cooperation agreements;

8. Good quality and ability to receive further education.

### III. Study Length, Degree, and Graduation Requirements

1. Study length: 4 years.
2. Degree conferred: Students who complete and meet the degree requirements of the undergraduate program will be awarded a bachelor's degree in Science.
3. The minimum credit requirement for graduation: 150 credits. The specific requirements are as follows.

Module		Category	Minimum Credit Requirement
General Education Courses	Chinese Language and Culture Module	Chinese Language and Culture	16
	Arts and Physical Education Module	Physical Education	4
		Arts	2
	Competence Development Module	Computer Programming	3
		Writing	2
		Foreign Languages	14
	Humanities and Social Sciences Module	Humanities	6
		Social Sciences	
		Chinese Studies	2
	Mathematics and Natural Sciences Module	Mathematics	12
		Physics	10
		Chemistry	3
Geoscience + Life Science		3	
GE to Majors Bridging Module	Introduction to Majors	2	
Major Courses	Major Required Courses	Major Foundational Courses	3
		Major Core Courses	30
		Practice-based Learning (Undergraduate Thesis, Internships, Research projects, etc.)	18
	Major Elective Courses	Major Elective Courses	20
Total			150
Note: please see the General Education Requirement for more details on Chinese Language and Culture Module, Arts and Physical Education Module, Competence Development Module (Foreign Languages & Writing) , Humanities and Social Sciences Module, and GE to Majors Bridging Module.			

#### IV. Course Requirements for the Mathematics and Natural Sciences Module and Computer Programming

Course Category	Course Code	Course Name	Credits	Terms	Prerequisite	Dept.
Mathematics	MA101a	Mathematical Analysis I	5	1 Fall		MATH
	MA102a	Mathematical Analysis II		1 Spring	MA101a	
	MA117	Calculus I	4	1 Fall		
	MA127	Calculus II		1 Spring	MA117	
	MA118	Advanced calculus II	4	1 Fall		
	MA128	Advanced calculus II		1 Spring	MA118	
	MA107	Advanced Linear Algebra I	4	1 Fall		
	MA113	Linear Algebra	4	1 Spring & Fall		
Physics	PHY101	General Physics I	5	1 Fall		PHY
	PHY102	General Physics II		1 Spring	PHY101	
	PHY105	College Physics I	4	1 Fall		
	PHY106	College Physics II		1 Spring	PHY105	
	PHY104 B	Experiments of Fundamental Physics	2	1-2 Spring & Fall		
Chemistry	CH103	General Chemistry	4	1-2 Spring & Fall		CH
	CH105	College Chemistry	3	1-2 Spring & Fall		
Geoscience + Life Science	EOE100	Introduction to Earth Sciences	3	1-2 Spring & Fall		ESS, OCE, ESE
Computer Programming	CS109	Introduction to Computer Programming	3	1-2 Spring & Fall		CSE
	CS110	Introduction to Java Programming	3	1-2 Spring & Fall		
	CS111	Introduction to C programming	3	1-2 Spring & Fall		
	CS112	Introduction to Python Programming	3	1-2 Spring & Fall		
	CS113	Introduction to MATLAB Programming	3	1-2 Spring & Fall		

Note:

1. For Mathematics, students must select one of the A, B, or C course categories (at least 8 credits) and complete the course Advanced Linear Algebra I or Linear Algebra for 4 credits.
2. For Physics, students must select either course category A or B (at least 8 credits) and complete the course Experiments of Fundamental Physics for 2 credits.
3. For Chemistry, students must choose one of the listed courses to receive at least 3 credits.
4. For Geoscience + Life science, students must choose one of the listed courses to receive 3 credits.
5. For Computer Programming, students must choose one of the listed courses to receive at least 3 credits.

## V. Prerequisites for Major Declaration

Major Declaration Time	Course Code	Course Name	Prerequisite
Declare major at the end of the first academic year	EOE100	Introduction to Earth Sciences	
Declare major at the end of the second academic year	EOE100	Introduction to Earth Sciences	

Note:

1. If the number of students entering a major at the end of the first academic year in the department is greater than or equal to the total number of the teaching-research faculty (PI)\*2\*60%, all majors in the department may implement the prerequisites for major declaration at the end of the second academic year.
2. If the number of students entering a major at the end of the first academic year in the department is less than the total number of the teaching-research faculty (PI)\*2\*60%, all majors in the department do not implement the prerequisites for major declaration at the end of the second academic year.
3. Suppose the number of students applying for a major at the end of the first academic year exceeds four times the total number of the teaching-research faculty (PI), then the department may select students according to predetermined rules. In principle, the rules set by the department shall examine the students' suitability for the major and not based on weighted GPA (Specific rules shall be set by the department and announced in advance).
4. For departments that do not implement prerequisites for major declaration at end of the second academic year, if the cumulative number of students applying for a major at the end of the second academic year and the number of students who have entered a major at the end of the first academic year exceeds four times the total number of the teaching-research faculty (PI), the department may select students according to predetermined rules. In principle, the rules set by the department shall examine the students' suitability for the major and not based on weighted GPA (Specific rules shall be set by the department and announced in advance).

## VI: Major Course Arrangement

**Table 1: Major Required Courses**

### Program of Marine science

Course Category	Course Code	Course Name	Credits	Practice-based Learning Credits	Terms	Prerequisite	Dept.
Major Foundational Courses	OCE100	Introduction to Marine Science	3	0	1 Fall/Spring		OCE
	<b>Total</b>		3	0			
Major Core Courses	OCE203	Marine Biology	3	0	2/Spring		OCE
	OCE305	Physical Oceanography	3	0	2/Spring		OCE
	OCE301	Introduction to Atmospheric Science	3	0	3/Fall		OCE
	OCE306	Marine Geology	3	0	3/Fall		OCE
	OCE307	Chemical Oceanography	3	0	3/Fall		OCE
	OCE401	Marine Geophysics	3	0	3/Fall	OCE100	OCE
	OCE304	Introduction to Computational Oceanography	3	0	3/Spring		OCE
	OCE308	Microbial Oceanography	3	0	3/Spring		OCE
	OCE340	Multidimensional Data Analysis in Geosciences	3	0	3/Fall	MA113	OCE
	OCE423	Biological Isotopes	3	0	4/Fall		OCE
<b>Total</b>		30	0				
Practice-based Courses	OCE470	Geology Field Trip	2	2	2/Summer		OCE
	OCE471	Marine Cruises	2	2	3/Summer	OCE100	OCE
	OCE480	Projects of Science and Technology Innovation	2	2	4/Fall		OCE
	OCE490	Thesis (Graduation Project)	12	12	4/Spring		OCE
<b>Total</b>		18	18				
<b>Total</b>			51	18			

**Table 2: Major Elective Courses**

**Program of Marine science**

Course Code	Course Name	Credits	Practice-based Learning Credits	Terms	Prerequisite	Dept.
Marine science course						
OCE210	Intelligent Ocean Exploration	3	0	2/Spring		OCE
OCE313	Frontiers in Marine Geodynamics	1	0	3/Fall		OCE
OCE412	History of Ocean Sciences	2	0	4/Fall		OCE
Marine geophysics courses						
ESS201	Introduction to Earth and Space Sciences	3	0	2/Fall		ESS
PHY203-15	Mathematical Methods in Physics	4	0	2/Fall	MA102B MA107A PHY105B	PHY
ESS205	Computational Methods	3	0	2/Spring		ESS
EE205	Signals and Systems	3	1	3/Fall		EE
EE323	Digital Signal Processing	3	1	3/Fall	EE205	EE
ESS308	Fundamentals of Geophysics I (Seismology)	3	0	3/Fall	MA101B/MA107A	ESS
ESS309	Fundamentals of Geophysics II (Geomagnetism, Geoelectricity, Geothermics and Gravity)	4	0	3/Fall	MA101B	ESS
ESS310	Geophysical Experiments	3	1	3/Spring	ESS308/ESS309	ESS
ESS421	Gravity and Earth tide	3	0	3/Spring	MA101B/MA107A	ESS
OCE402	Fundamental of Marine Seismology Observations	3	0	4/Fall	OCE304	OCE
ESS209	Principles of Geophysics	3	0	2/Spring		ESS
ESS211	Fundamentals of Planetary Science	3	0	2/Spring		ESS
ESS213	Continuum Mechanics	3	0	2/Spring		ESS
ESS214	Principles of Applied Geophysics	3	0	2/Spring		ESS
PHY204	Thermodynamics and Statistical Physics I	3	0	2/Spring	PHY106	PHY
ESS313	Introduction to Space Physics	3	0	3/Fall	PHY203-15	ESS
ESS317	Fundamentals of Inverse Theory in Geophysics	3	0	3/Fall		ESS
Marine geology courses						

OCE202	Earth System History	3	0	1/Spring		OCE
OCE105	Principle of coastal landform	3	0	2/Fall		OCE
ESS102	Principle of Geological	3	0	2/Fall		ESS
ESE329	Principles of Remote Sensing	3	0	2/Spring	MA102B PHY105B	ESE
OCE309	Paleomagnetism and Environmental Magnetism	3	0	3/Fall		OCE
ESE317	Application of GIS & RS	3	0.5	3/Fall		ESE
ESS406	Geochemistry	2	0	4/Fall		ESS
OCE407	Mineralogy and Petrology	2	0	3/Spring		OCE
OCE303	Physical Geology	3	0	2/Fall		OCE
Marine microbiology courses						
BIO104	General Biology Laboratory	2	2	1/Spring	BIO102B or BIO103	BIO
OCE205	Biology of the Marine Environment Lab	2	2	2/Spring		OCE
OCE472	Field Trip of Life in Extreme Environments	2	2	2/Summer	OCE308 or OCE411	OCE
OCE475	Field Trip of Microbial Oceanography	2	2	2/Summer		OCE
BIO309	Computational Biology	3	1	3/Fall		BIO
OCE318	Marine Molecular Biology Lab	2	2	3/Fall		OCE
OCE411	Life in Extreme Environments	2	0	3/Fall		OCE
OCE316	Marine Microbiology Laboratory	2	2	3/Spring	OCE308	OCE
OCE330	Evolution	3	0	3/Spring		OCE
BIO306	Bioinformatics	4	2	3/Spring	BIO309	BIO
OCE409	Marine Organic Biogeochemistry	3	0	4/Fall		OCE
OCE410	Geomicrobiology	3	0	4/Fall		OCE
BIO203	Microbiology	3	0	2/Fall		BIO
Marine chemistry courses						
CH102-17	General Chemistry Laboratory A	1.5	1.5	1/Spring	CH101A	CH
CH203	Organic Chemistry I	4	0	2/Fall	CH101A	CH
CH208	Organic Chemistry Laboratory	2	2	2/Spring	CH102-17/CH203	CH
ESE206	Environmental Chemistry	3	0	2/Spring	CH101B	ESE
ESE212	Environment Monitoring	2	0	2/Spring	CH101B PHY105B	ESE
ESE214	Environment Monitoring Laboratory	1	1	2/Spring	CH102-17	ESE
OCE311	Seawater Analysis*	3	0	3/Spring		OCE
OCE312	Seawater Analysis Laboratory**	2	2	3/Spring	OCE307	OCE
CH218	Analytical Chemistry II	3	0	4/Spring	CH216/CH217	CH
ESE336	Environmental analytical chemistry	3	0	2/Fall		ESE



CH219	Analytical Chemistry Laboratory II	2	2	4/Spring	CH218	CH
Physical Oceanography courses						
ME112	Introduction to Matlab	2	1	1/Spring		ME
MAE207	Engineering Fluid Mechanics	3	0	2/Fall	MA102B	MAE
ESE204	Principles of Environmental Engineering	2	0	2/Fall	CH101A PHY105B	ESE
ESE319	Global Climate Change	3	0	2/Spring		ESE
MSE202	Physical Chemistry	3	0	2/Spring	MA102B/CH101A	MSE
ESE205	Fundamentals of Physical Chemistry	3	0	2/Spring	CH103 MA127	ESE
MA201b	Ordinary Differential Equations B	4	0	2/Spring	MA102B	MATH
OCE314	Satellite Oceanography	3	0	3/Spring		OCE
MAE302-16	Fluid Mechanics Lab	3	3	3/Spring	MAE207 or MAE303	MAE
ESE304	Atmospheric Pollution Prevention and Control	3	0	3/Spring	ESE206/MSE202	ESE
ESS405	Signal Processing and Data Processing	3	0	3/Spring	MA101B/MA107A	ESS
OCE406	Natural Hazards and Monitoring	2	0	4/Fall		OCE
Marine Engineering courses						
MA109	Advanced Linear Algebra	4	0	1/Spring	MA107B	MATH
MAE203B	Engineering Mechanics I – Statics and Dynamics	3	0	2/Fall	MA107A	MAE
OCE310	Fundamentals of Ocean Technology	3	0	2/Spring		OCE
Big data courses						
MA215 / STA203	Probability Theory / Foundation of Probability Theory	3	0	2 Fall	MA102a / MA127 & MA113	MATH/STA
MA204	Mathematical Statistics	3	0	2 Spring/3 Fall	MA215/MA212	STA
STA201	Operational Research and Optimization	3	0	2 Spring	MA107 / MA113	STA
CS203B	Data Structures and Algorithm Analysis B	3	1	2 Fall	CS102A	CSE
CS201/ MA205	Discrete mathematics	3		2 Spring	MA127/MA113	CS/MATH
MA203a /MA213-16	Mathematical Analysis III / Mathematical Analysis	5		2 Fall	MA102a/MA127	MATH
STA321	Distributed storage and parallel computing	3	1	3 Fall	CS102/CS203	STA
CS303	Artificial intelligence	3	1	3 Fall	CS102A/ CS203B/MA212	CSE
MA329	Statistical Linear Models	3	0	3 Fall	MA204 / MA212	STA
MA304	Multivariate Statistical Analysis	3	0	3 Spring	MA204 / MA212	STA
STA302	Big data analysis software and	3	1	3 Spring	CS102/CS203	STA

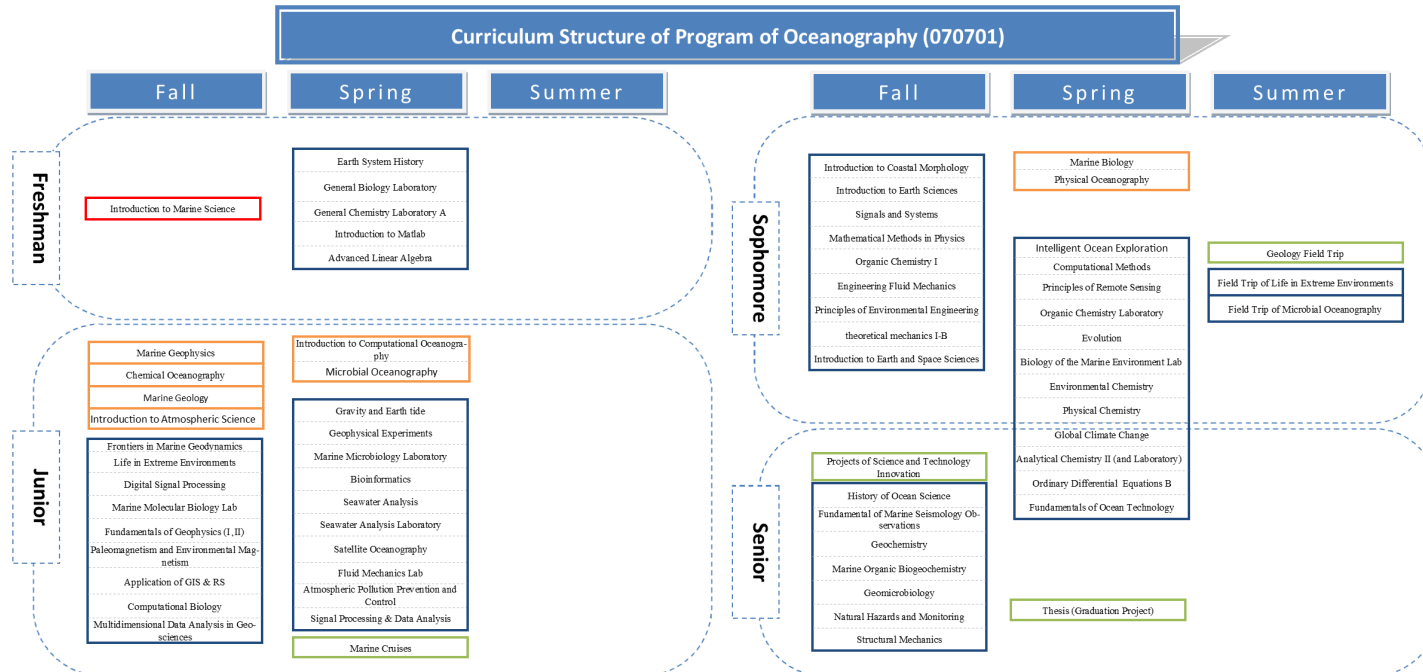
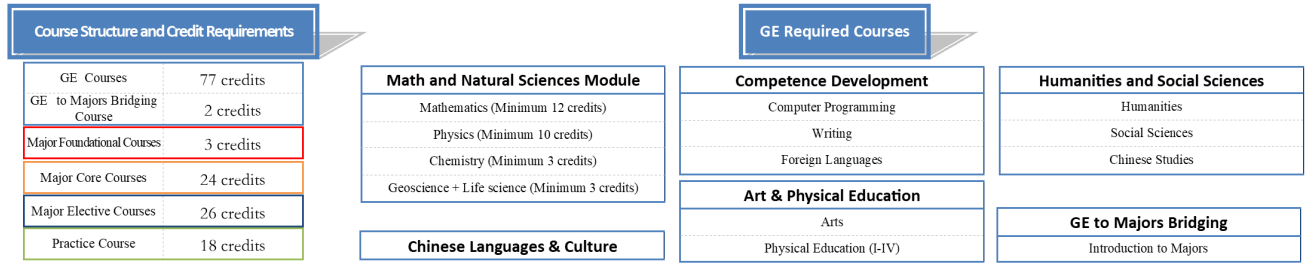
	applications					
Computer courses						
CS203	Data Structures and Algorithm Analysis	3	1	2/Fall	CS109	CSE
CS207	Digital Logic	3	1	2/Fall		CSE
MA212	Probability and Statistics	3		2/Fall	MA102a or MA127 or MA102B	MATH
CS307	Principles of Database Systems	3	1	2/Fall	CS109	CSE
CS201	Discrete Mathematics	3		2/Spring	MA127/MA113	CSE
CS202	Computer Organization	3	1	2/Spring	CS207	CSE
CS208	Algorithm Design and Analysis	3	1	2/Spring	CS109, CS203	CSE
CS305	Computer Networks	3	1	3 / Fall	CS109	CSE
CS302	Operating Systems	3	1	3 / Spring	CS109/CS203	CSE
CS304	Software Engineering	3	1	3 / Spring	CS109/CS203	CSE
CS321	Group Projects I	2	2	3 / Full		CSE
CS326	Group Projects II	2	2	3 / Spring		CSE
CS413	Group Projects III	2	2	4 / Fall		CSE
Biomedical courses						
MED105	Medical Organic Chemistry	4		2/Fall		MED
MED221	Molecular Microbiology	3		2/Fall		MED
MED219	Advanced Molecular Biology	3		2/Fall		MED
MED205	Medical Cell Biology	3		2/Spring		MED
MED203	Medical Biochemistry	3		2/Spring		MED
MED405	Medical Immunology	3		3/Fall		MED
MED307	Pathology	3	1	3/Spring	MED306	MED
MED404	Medical Genetics	3		3/Spring		MED
MED206	Basic Biomedical Laboratory	2	2	2/Spring		MED
MED216	Medical Microbiology Laboratory	1	1	2/Spring		MED
Total		286.5	53			
NOTE: Minimum requirement 26 credits. *Note: The credits CH216 Analytical Chemistry I can replace the credits of OCE311 Seawater Analysis. **Note: The credits CH217 Analytical Chemistry Laboratory I can replace the credits of OCE312 Seawater Analysis Laboratory.						

**Table 3: Overview of Practice-based Learning**

**Program of Marine science**

Course Code	Course Name	Credits	Practice-based Learning Credits	Terms	Prerequisite	Dept.
BIO104	General Biology Laboratory	2	2	1/Spring	BIO102B/BIO103	BIO
ME112	Introduction to Matlab	2	1	1/Spring		ME
CH102-17	General Chemistry Laboratory A	1.5	1.5	1/Spring	CH101A	CH
OCE205	Biology of the Marine Environment Lab	2	2	2/Spring		OCE
CH208	Organic Chemistry Laboratory	2	2	2/Spring	CH 102-17 CH203	CH
ESE214	Environment Monitoring Laboratory	1	1	2/Spring	CH102-17	ESE
OCE470	Geology Field Trip	2	2	2/Summer	OCE202	OCE
OCE472	Field Trip of Life in Extreme Environments	2	2	2/Summer	OCE308 or OCE411	OCE
OCE475	Field Trip of Microbial Oceanography	2	2	2/Summer		OCE
OCE318	Marine Molecular Biology Lab	2	2	3/Fall		OCE
EE205	Signals and Systems	3	1	3/Fall		EE
EE323	Digital Signal Processing	3	1	3/Fall	EE205	EE
ESE317	Application of GIS & RS	3	0.5	3/Fall	CS102B/ESE201	ESE
BIO309	Computational Biology	3	1	3/Fall		BIO
OCE316	Marine Microbiology Laboratory	2	2	3/Spring	OCE308	OCE
OCE312	Seawater Analysis Laboratory	2	2	3/Spring	OCE311	OCE
CH219	Analytical Chemistry Laboratory II	2	2	3/Spring	CH218	CH
ESS310	Geophysical Experiments	3	1	3/Spring	ESS308 ESS309	ESS
MAE302-16	Fluid Mechanics Lab	3	3	3/Spring	MAE207 or MAE303	MAE
CS321	Group Projects I	2	2	3 / Full		CSE
CS326	Group Projects II	2	2	3 / Spring		CSE
CS413	Group Projects III	2	2	4 / Fall		CSE
MED206	Basic Biomedical Laboratory	2	2	2/Spring		MED
MED216	Medical Microbiology Laboratory	1	1	2/Spring		MED
OCE471	Marine Cruises	2	2	3/Summer	OCE100	OCE
OCE480	Projects of Science and Technology Innovation	2	2	4/Fall		OCE
OCE490	Thesis (Graduation Project)	12	12	4/Spring		OCE
Total		67.5	56			

# Curriculum Structure of Oceanography



**Note:** Except for courses of *Marine science*, *Marine geophysics*, *Marine geology*, *Marine microbiology*, *Marine chemistry*, *Physical Oceanography* and *Marine Engineering*, 2023 undergraduate students can also choose courses of *Big data*, *Computer* and *Biomedical*.