MARINE SCIENCE, B.S.

The#Bachelor of Science#in marine science provides students with a comprehensive understanding of the oceans and how the chemical and physical dynamics interact with the geology and biology of marine environments. The degree provides for upper-level specialization depending on the student's interests and emphasizes real-world applications incorporating a diverse skill set such as statistics, communications and policy. A required field and laboratory experience course provides students with the unique opportunity to conduct research at the Baruch Marine Field Lab in Georgetown, SC.

The diverse approach to marine science provides the background and skills for students to enter a variety of related career opportunities. Graduates can continue to pursue marine science through graduate or professional school or find careers in government, industry and non-profit entities.

Learning Outcomes

1. Students will demonstrate that they understand the scientific process by testing hypotheses related to Marine Science in an inquiry based, hands on setting.
2. Students will demonstrate critical thinking skills using the scientific method.
3. Students will demonstrate the ability to conduct independent research.
4. Students will demonstrate effective oral communication of Marine Science topics by giving an oral presentation.
5. Students will communicate and summarize their research findings effectively in writing (such as on a poster or in an abstract) on Marine Science topics.

Progression Requirement

Marine Science majors may enroll in the following courses a maximum of twice to earn the required grade of C or higher: MATH through MATH 142, CHEM 111, CHEM 111L, CHEM 112, CHEM 112L, PHYS 201/PHYS 201L or PHYS 211/PHYS 211L, PHYS 202/PHYS 202L or PHYS 212/PHYS 212L. For the purposes of this standard of progression, withdrawal with a W does not constitute enrollment. These courses must be completed before the beginning of the student's third academic year (fifth major semester) as a marine science major.

Transfer Requirement

Any student applying for transfer to the marine science major from other programs within the University, or from other accredited colleges and universities, is required to have a minimum overall grade point average of 2.50 on a 4.00 scale.

Admissions

Entrance Requirements

New freshmen who meet University admissions standards are eligible for admission to degree programs offered by the college. A student who wishes to enter the College of Arts and Sciences from another college on the Columbia campus must be in good standing and have a cumulative GPA of 2.00 or higher. A student who wishes to enter the College of Arts and Sciences from another USC campus must fulfill one of the following requirements:

1. Be in good standing, meet the admission requirements for a baccalaureate degree on the Columbia campus, and have a cumulative GPA of 2.00 or higher.
2. Be in good standing and have completed 30 semester hours with a GPA of 2.00 or higher on a USC campus.

Some programs in the College of Arts and Sciences have special admission requirements established by the department or committee that supervises the specific degree program, for example, Cardiovascular Technology, Biological Sciences, Chemistry, Biochemistry and Molecular Biology, Economics, Environmental Science, the Bachelor of Arts in Interdisciplinary Studies, and the Bachelor of Science in Interdisciplinary Studies. These requirements are listed in the sections of this bulletin that describe department and special degree programs.

Degree Requirements (128 hours)

Program of Study

Requirements	Credit Hours
1. Carolina Core	34-46
2. College Requirements	15-18
3. Program Requirements	28-43
4. Major Requirements	36

Founding Documents Requirement

All undergraduate students must take a 3-credit course or its equivalent with a passing grade in the subject areas of History, Political Science, or African American Studies that covers the founding documents including the United State Constitution, the Declaration of Independence, the Emancipation Proclamation and one or more documents that are foundational to the African American Freedom struggle, and a minimum of five essays from the Federalist papers. This course may count as a requirement in any part of the program of study including the Carolina Core, the major, minor or cognate, or as a general elective. Courses that meet this requirement are listed here (https://academicbulletins.sc.edu/undergraduate/founding-document-courses/).

1. Carolina Core Requirements (34-46 hours)

CMW – Effective, Engaged, and Persuasive Communication: Written (6 hours)

must be passed with a grade of C or higher

- any CC-CMW courses (https://academicbulletins.sc.edu/undergraduate/carolina-core-courses/)

ARP – Analytical Reasoning and Problem Solving (8 hours)

- MATH 141* *Must be passed with a C or higher*
- MATH 142* *Must be passed with a D or higher*

SCI – Scientific Literacy (8 hours)

must be passed with a grade of C or higher

- MSCI 101*
- MSCI 102*

GFL – Global Citizenship and Multicultural Understanding: Foreign Language (0-6 hours)

Demonstration of proficiency in one foreign language equivalent to the minimal passing grade on the exit examination in the 122 course is required. Students can demonstrate this proficiency by successfully completing Phase II of the Proficiency Test or by successfully completing the 122 course, including the exit exam administered as part of that course.

- CC-GFL courses (https://academicbulletins.sc.edu/undergraduate/carolina-core-courses/)

It is strongly recommended that students continuing the study of a foreign language begin college-level study of that language in their first semester and continue in that language until their particular foreign language requirement is completed.

GHS – Global Citizenship and Multicultural Understanding: Historical Thinking (3 hours)

- any CC-GHS course (https://academicbulletins.sc.edu/undergraduate/carolina-core-courses/)

GSS – Global Citizenship and Multicultural Understanding: Social Sciences (3 hours)

- any CC-GSS course (https://academicbulletins.sc.edu/undergraduate/carolina-core-courses/)

AIU – Aesthetic and Interpretive Understanding (3 hours)

- any CC-AIU course (https://academicbulletins.sc.edu/undergraduate/carolina-core-courses/)

CMS – Effective, Engaged, and Persuasive Communication: Spoken Component [1] (0-3 hours)

- any overlay or stand-alone CC-CMS (https://academicbulletins.sc.edu/undergraduate/carolina-core-courses/)course

INF – Information Literacy [1] (0-3 hours)

- any overlay or stand-alone CC-INF course (https://academicbulletins.sc.edu/undergraduate/carolina-core-courses/)

VSR – Values, Ethics, and Social Responsibility [1] (0-3 hours)

- any overlay or stand-alone CC-VSR course (https://academicbulletins.sc.edu/undergraduate/carolina-core-courses/)

[1] **Carolina Core Stand Alone or Overlay Eligible Requirements** — Overlay-approved courses offer students the option of meeting two Carolina Core components in a single course. A maximum of two overlays is allowed. The total Carolina Core credit hours must add up to a minimum of 31 hours. Some programs may have a higher number of minimum Carolina Core hours due to specified requirements.

2. College Requirements (15-18 hours)

Foreign Language (0-3 hours)

- only if needed to meet 122-level proficiency

Analytical Reasoning (6 hours)

must be passed with a grade of C or higher

Course	Title	Credits
STAT 515	Statistical Methods I (*)	3
Select one of the following:		3
CSCE 102	General Applications Programming (*)	
or a higher level CSCE course		
MSCI 305	Ocean Data Analysis	
MSCI 509	MATLAB-Based Data Analysis in Ocean Sciences	
Total Credit Hours		**6**

Note: Courses used to fulfill the College requirements may not also be used to fulfill other degree requirements.

History (3 hours)

The College of Arts and Sciences requires one additional GHS course beyond the Carolina Core GHS requirement.

- If the Carolina Core GHS requirement is fulfilled by a ***U.S. history*** course, the College of Arts and Sciences history requirement must be fulfilled by a ***non-U.S. history*** course.
- If the Carolina Core GHS requirement is fulfilled by a ***non-U.S. history*** course, the College of Arts and Sciences history requirement must be fulfilled by a ***U.S. history*** course.

Please select the College of Arts and Sciences history requirement from the approved list of U.S. and non-U.S. history courses (https://academicbulletins.sc.edu/undergraduate/arts-sciences/history-requirement/).

Social Science and Fine Arts or Humanities (6 hours)

- **Social Science (3 hours)**
  - The College of Arts and Science requires one 3- hour Social Science Course (https://academicbulletins.sc.edu/undergraduate/arts-sciences/courses-acceptable-social-science/)
- **Fine Arts/Humanities (3 Hours)**
  - A Bachelor of Science from the College of Arts and Sciences requires one 3-hour Fine Arts/Humanities Course (https://academicbulletins.sc.edu/undergraduate/arts-sciences/courses-acceptable-fine-arts-humanities/)

3. Program Requirements (28-43 hours)

Supporting Courses (16 hours)

must be passed with a C or higher

Course	Title	Credits
Select one of the following: [1]		4
PHYS 201 & 201L	General Physics I and General Physics Laboratory I (*)	
PHYS 211 & 211L	Essentials of Physics I and Essentials of Physics I Lab (*)	
Select one of the following: [2]		4
PHYS 202 & 202L	General Physics II and General Physics Laboratory II (*)	
PHYS 212 & 212L	Essentials of Physics II and Essentials of Physics II Lab (*)	

CHEM 111 & 111L	General Chemistry I and General Chemistry I Lab (*)	4
CHEM 112 & 112L	General Chemistry II and General Chemistry II Lab (*)	4
Total Credit Hours		**16**

[1] Students in the Physical Oceanography concentration must take PHYS 211 & PHYS 211L.
[2] Students in the Physical Oceanography concentration must take PHYS 212 & PHYS 212L.

Cognate or Minor (0-18 hours)

This major does not require a cognate or minor.

An optional minor may be added to a student's program of study. A minor is intended to develop a coherent basic preparation in a second area of study. Courses applied toward general education requirements cannot be counted toward the minor. No course may satisfy both major and minor requirements. All minor courses must be passed with a grade of C or higher. At least half of the courses in the minor must be completed in residence at the University. A list of minor programs of study can be found at Programs A-Z. An optional additional major may also be added to a student's program of study. **Additional majors must include all major courses as well as any prescribed courses noted (*) in the bulletin.** Prescribed courses noted in the bulletin may be shared with Carolina Core, College requirements, and Program requirements in the primary program.

A list of minor programs of study can be found at Programs A-Z (https://academicbulletins.sc.edu/undergraduate/programs-az/).

Electives (12-27 hours)

120 (or 128) degree applicable credits are required to complete any degree at USC. After the cognate, minor or second major is complete, any additional credits needed to reach 120 (or 128) total credits can be fulfilled by electives. No courses of a remedial, developmental, skill-acquiring, or vocational nature may apply as credit toward degrees in the College of Arts and Sciences. The College of Arts and Sciences allows the use of the Pass-Fail option on elective courses. Further clarification on inapplicable courses can be obtained from the College of Arts and Sciences.

4. Major Requirements (36 hours)

a minimum grade of C is required in all major courses

Major Courses (13 hours)

Course	Title	Credits
MSCI 311	Biology of Marine Organisms	4
MSCI 313	The Chemistry of the Sea	4
MSCI 314	Physical Oceanography	4
MSCI 505	Senior Seminar	1
Required Field Experience [1]		
Total Credit Hours		**13**

[1] All MSCI majors are required to complete a minimum of 60 hours of marine science field effort. Possibilities include taking the MSCI 460 class, semester or summer internship, REU, semester at sea, faculty-sponsored field research or cruise or field data collection/analysis experience. Students who opt for an experience other than the MSCI 460 class must submit a petition for an alternative field experience to the Undergraduate Director. If the alternative is approved, the student must submit a short (2-3 page minimum) report at the completion of the experience to the Undergraduate Director for approval. Upon approval, the Undergraduate Director will notify the Dean's office of the substitution, and the student's record will be updated to reflect zero credit hours in MSCI 460 for meeting the field effort requirement. If a student takes the MSCI 460 class (2-credit hours), those credits will be counted towards their 23 major elective credit hours.

Major Electives (23 hours)

Students, in consultation with a faculty advisor, must select 23 hours of major electives. Preferred courses available for major credit are listed below; however, any course which is eligible for cognate credit in the College of Arts and Sciences can potentially be a major course with consent of faculty advisor. Hours used to fulfill an optional concentration count toward the fulfillment of the 23 hours of major electives, e.g., students selecting Biological Oceanography would fulfill 13 hours of the 23 hours of required major electives.

Courses Acceptable for Major Credit

Course	Title	Credits
MSCI courses numbered 300 and above		
MSCI 399	Independent Study [1]	
MSCI 495	Internship in Marine Science [1]	
MSCI 496	Undergraduate Research [1]	
MSCI 497	Undergraduate Research [1]	
MSCI 498	Undergraduate Research [1]	
MSCI 499	Undergraduate Research [1]	
MSCI 505	Senior Seminar [1]	
MSCI/GEOG 590	Beach-Dune Interactions	3
BIOL 301 & 301L	Ecology and Evolution and Ecology and Evolution Laboratory	4
BIOL 302 & 302L	Cell and Molecular Biology and Cell and Molecular Biology Laboratory	4
BIOL 303	Fundamental Genetics	3
BIOL 450	Principles of Biological Oceanography	3
BIOL 460 & 460L	Advanced Human Physiology and Advanced Human Physiology Laboratory	4
BIOL 462 & 462L	Advanced Microbiology and Advanced Microbiology Laboratory	4
BIOL 497	Undergraduate Seminar in Biological Sciences	1
BIOL 505 & 505L	Developmental Biology and Developmental Biology Laboratory I	4
BIOL 534 & 534L	Animal Behavior and Animal Behavior Laboratory	4
BIOL/MSCI 537	Aquaculture	3
BIOL 541 & 541L	Biochemistry and Biochemistry Laboratory	4
BIOL 543 & 543L	Comparative Physiology and Comparative Physiology Laboratory	4
BIOL 545	Biochemistry/Molecular Biology I	3
BIOL 549	Plant Physiology	4
BIOL 550 & 550L	Bacteriology and Bacteriology Laboratory	4
BIOL/MSCI 552	Population Genetics	3

BIOL 570 & 570L	Principles of Ecology and Principles of Ecology Laboratory	4
BIOL 599	Topics in Biology [1]	1-3
BIOL 630	Biology of Birds	3
BIOL 640	Microbial Ecology	3
BIOL 652	Evolutionary Biology	3
BIOL 654	Speciation	3
BIOL 670	Plant Ecology	3
BIOL 690	Ultramicroscopy	3
CHEM 321 & 321L	Quantitative Analysis and Quantitative Analysis Laboratory	4
CHEM 331L	Essentials of Organic Chemistry Laboratory I	1
CHEM 332L	Essentials of Organic Chemistry Laboratory II	1
CHEM 333 & 333L	Organic Chemistry I and Comprehensive Organic Chemistry Laboratory I	5
CHEM 334 & 334L	Organic Chemistry II and Comprehensive Organic Chemistry Laboratory II	5
CHEM 511	Inorganic Chemistry	3
CHEM 541 & 541L	Physical Chemistry and Physical Chemistry Laboratory [1]	5
CHEM 542 & 542L	Physical Chemistry and Physical Chemistry Laboratory	5
CHEM 621	Instrumental Analysis	3
CSCE 561	Numerical Analysis	3
ECIV 360	Fluid Mechanics	3
ECON 548	Environmental Economics	3
ENHS 665	Biofilms in Environmental Health and Disease	3
ENVR 231	Introduction to Sustainability Management and Leadership	3-4
ENVR 548	Environmental Economics	3
ENVR 571	Conservation Biology	3
ENVR 572	Freshwater Ecology	3
ENVR 480	Capstone Seminar in Environmental Science and Environmental Studies	3
GEOG 263	Geographic Information Systems	3
GEOG 341	Cartography	3
GEOG 345	Introduction to Remote Sensing	3
GEOG 365	Hurricanes and Tropical Climatology	3
GEOG 510	Special Topics in Geographic Research	3
GEOG 516	Coastal Zone Management	3
GEOG 541	Advanced Cartography	3
GEOG 545	Weather Analysis and Forecasting	4
GEOG 546	Applied Climatology	4
GEOG 551	Remote Sensing of the Environment	3
GEOG 554	Spatial Programming	3
GEOG 563	Advanced Geographic Information Systems	3
GEOG 564	GIS-Based Modeling	3
GEOL 305	Earth Systems through Time	4
GEOL 315	Surface and Near Surface Processes	4
GEOL 325	Stratigraphy and Sedimentary Basins	4
GEOL 335	Processes of Global Environmental Change	4
GEOL 345	Igneous and Metamorphic Processes	4
GEOL 355	Structural Geology and Tectonics	4
GEOL 371	A View of the River	3
GEOL 500	Field Geology	4-6
GEOL 503	Regional Stratigraphy and Biostratigraphy of North America	3
GEOL 516	Sedimentology	4
GEOL 541	Earth Science for Teachers II	3
GEOL 545	Geological Oceanography	3
GEOL 546	Marine Geophysics	3
GEOL 555	Elementary Seismology	3
GEOL 570	Environmental Hydrogeology	3
JOUR 507	Health Communication: The Science and Practice	3
MATH 241	Vector Calculus	3
MATH 242	Elementary Differential Equations	3
MATH 344	Applied Linear Algebra	3
MATH 344L	Applied Linear Algebra Lab	1
MATH 520	Ordinary Differential Equations	3
MATH 521	Boundary Value Problems and Partial Differential Equations	3
MATH 526	Numerical Linear Algebra	4
MATH 527	Numerical Analysis	3
MATH 544	Linear Algebra	3
NAVY 301 & 301L	Navigation/Naval Operations I and Navigation/Naval Operations Lab I	4
NAVY 302 & 302L	Navigation/Naval Operations II and Navigation/Naval Operations II Lab	4
PHYS 311	Introduction to Applied Numerical Methods	3
PHYS 515	Mathematical Physics I	3
PHYS 516	Mathematical Physics II	3
POLI 370	Introduction to Public Administration	3
POLI 399A	Independent Study in Political Science	1-6
POLI 399B	Independent Study in International Studies	1-6
POLI 420	International Law	3
POLI 431	Science, Technology, and Public Policy	3
POLI 477	Green Politics	3
SCHC 390-SCHC 398 [1]		
SCHC 499	HNRS: Senior Thesis/Project [1]	1-15
SOCY 310	Social Demography	3
SOCY 315	Global Population Issues	3
STAT 506	Introduction to Experimental Design	3
STAT 511	Probability	3
STAT 512	Mathematical Statistics	3
STAT 513	Theory of Statistical Inference	3
STAT 516	Statistical Methods II	3
STAT 518	Nonparametric Statistical Methods	3

[1] A maximum of 10 hours of independent study, seminar, and undergraduate research courses may count in the 23 hours of major electives required for the Marine Science major.

Note: Credit for a degree will not be given for both CHEM 340 and CHEM 541.

Concentrations (12-15 hours)

Students may elect to have a Concentration specified directly on their academic transcript upon graduation from the Marine Science Program. In order to earn a Concentration certification, students must take the following courses, with an additional course(s) to be decided upon by the student and his or her Faculty Advisor. These courses may also be included in the 36 major credit hours required for graduation.

Biological Oceanography (13 hours minimum)

Course	Title	Credits
BIOL 301 & 301L	Ecology and Evolution and Ecology and Evolution Laboratory (Lab not required)	4
BIOL 302	Cell and Molecular Biology (Lab not required) [1]	3
or BIOL 302L	Cell and Molecular Biology Laboratory	
or BIOL 303	Fundamental Genetics	
Select two additional courses (six hours minimum) from the following list of marine biology, ecology, biology courses or similar courses as approved by advisor:		6
MSCI 375	The Deep Sea	
MSCI/BIOL 450	Principles of Biological Oceanography	
MSCI 503/ BIOL 502	Environmental Microbiology	
MSCI/BIOL 510	Invertebrate Zoology	
MSCI/BIOL 525	Marine Plants	
MSCI/BIOL 535	Fishery Management	
MSCI/BIOL 536	Ichthyology	
MSCI/BIOL 537	Aquaculture	
MSCI/BIOL 538	Behavior of Marine Organisms	
MSCI/BIOL 552	Population Genetics	
MSCI/BIOL 574	Marine Conservation Biology	
MSCI/BIOL 575	Marine Ecology	
MSCI/BIOL 576	Marine Fisheries Ecology	
MSCI/BIOL 577	Ecology of Coral Reefs	
MSCI/BIOL 627	Marine Phytoplankton	
MSCI 496	Undergraduate Research (if biology oriented)	
MSCI 497	Undergraduate Research (if biology oriented)	
MSCI 498	Undergraduate Research (if biology oriented)	
MSCI 499	Undergraduate Research (if biology oriented)	
MSCI 599	Topics in Marine Science (if biology oriented)	
MSCI 566	Ecosystem Analysis	
MSCI 578	Physiological and Pollution Ecology of Marine Organisms	
BIOL 302	Cell and Molecular Biology [2]	
or BIOL 303	Fundamental Genetics	
BIOL 460	Advanced Human Physiology (Lab not required)	
or BIOL 460L	Advanced Human Physiology Laboratory	
BIOL 505	Developmental Biology (Lab not required)	
or BIOL 505L	Developmental Biology Laboratory I	
BIOL 534	Animal Behavior (Lab not required)	
or BIOL 534L	Animal Behavior Laboratory	
BIOL 541	Biochemistry	
BIOL 543	Comparative Physiology (Lab not required)	
or BIOL 543L	Comparative Physiology Laboratory	
BIOL 549	Plant Physiology	
BIOL 550	Bacteriology (Lab not required)	
or BIOL 550L	Bacteriology Laboratory	
BIOL 570	Principles of Ecology (Lab not required)	
or BIOL 570L	Principles of Ecology Laboratory	
BIOL 640	Microbial Ecology	
BIOL 462	Advanced Microbiology	
BIOL 652	Evolutionary Biology	
BIOL 670	Plant Ecology	
BIOL 690	Ultramicroscopy	
Total Credit Hours		**13**

[1] CHEM 333 is a prerequisite for BIOL 302 and is recommended for those intending to complete postgraduate work in this area of emphasis.

[2] BIOL 302L is optional.

Chemical Oceanography (13 hours)

Course	Title	Credits
CHEM 321	Quantitative Analysis	3
CHEM 321L	Quantitative Analysis Laboratory	1
CHEM 333	Organic Chemistry I (Lab not required)	3
or CHEM 333L	Comprehensive Organic Chemistry Laboratory I	
CHEM 334	Organic Chemistry II (Lab not required)	3
or CHEM 334L	Comprehensive Organic Chemistry Laboratory II	
One more Chemical Oceanography course at the 400-level or above		3
Total Credit Hours		**13**

Coastal Resource Management & Marine Policy (12 hours)

Course	Title	Credits
MSCI 390	Policy and Marine Science	3
GEOG 516	Coastal Zone Management	3
ENVR 548	Environmental Economics [1]	3
One more Coastal Resource Management & Marine Policy course at the 400-level or above		3
Total Credit Hours		**12**

[1] ENVR 548 requires a prerequisite of ECON 221 and ECON 222 or ECON 224.

Geological Oceanography (15 hours)

Course	Title	Credits
GEOL 302	Rocks and Minerals	4
GEOL 305	Earth Systems through Time	4

or GEOL 335	Processes of Global Environmental Change	
GEOL 315	Surface and Near Surface Processes	4
or GEOL 325	Stratigraphy and Sedimentary Basins	
One more Geological Oceanography course at the 300-level or above		3
Total Credit Hours		**15**

Physical Oceanography (12 hours)

Course	Title	Credits
MATH 241	Vector Calculus	3
MATH 242	Elementary Differential Equations	3
Select two of the following: [1]		6
MSCI 509	MATLAB-Based Data Analysis in Ocean Sciences	
MSCI 557	Coastal Processes	
MSCI 579	Air-Sea Interaction	
MSCI/GEOL 580	Satellite Oceanography	
MSCI 581	Estuarine Oceanography	
MSCI 582	Marine Hydrodynamics	
Total Credit Hours		**12**

[1] Courses are taught alternate years. Please check teaching schedule.
[2] Students in the Physical Oceanography concentration must take PHYS 211 & PHYS 211L and PHYS 212 & PHYS 212L.

Major Map

A major map is a layout of required courses in a given program of study, including critical courses and suggested course sequences to ensure a clear path to graduation.

Major maps are only a suggested or recommended sequence of courses required in a program of study. Please contact your academic advisor for assistance in the application of specific coursework to a program of study and course selection and planning for upcoming semesters.

Marine Science, B.S. No Concentration

Marine Science, B.S. Biological Oceanography Concentration

Marine Science, B.S. Chemical Oceanography Concentration

Marine Science, B.S. Coastal Resource Mgmt. & Marine Affairs Concentration

Marine Science, B.S. Geological Oceanography Concentration

Marine Science, B.S. Physical Oceanography Concentration