

PROGRAM MODIFICATION PROPOSAL FORM

Name of Institution: College of Charleston

Briefly state the nature of the proposed modification (e.g., adding a new concentration, extending the program to a new site, curriculum change, etc.):

Modification/update to the Marine Biology BS program that has been unchanged for 30+ years.

Current Name of Program (include degree designation and all concentrations, options, and tracks): BS Marine Biology

Proposed Name of Program (include degree designation and all concentrations, options, and tracks): BS Marine Biology

Program Designation:

- Associate's Degree Master's Degree
 Bachelor's Degree: 4 Year Specialist
 Bachelor's Degree: 5 Year Doctoral Degree: Research/Scholarship (e.g., Ph.D. and DMA)
 Doctoral Degree: Professional Practice (e.g., Ed.D., D.N.P., J.D., Pharm.D., and M.D.)

Does the program currently qualify for supplemental Palmetto Fellows and LIFE Scholarship awards?

- Yes
 No

If No, should the program be considered for supplemental Palmetto Fellows and LIFE Scholarship awards?

- Yes
 No

Proposed Date of Implementation: August 2020

CIP Code: 26.1302

Current delivery site(s) and modes: lectures, labs, and field sites in and around the College of Charleston

Proposed delivery site(s) and modes: lectures, labs, and field sites in and around the College of Charleston

Program Contact Information (name, title, telephone number, and email address):

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Institutional Approvals and Dates of Approval:

Franklin Czwarzka (System Administrator) approved 11/05/2019
Seth Pritchard (Chair, Department of Biology) approved 11/06/2019
Sebastian van Delden (Dean, School of Science and Math) approved 11/07/2019
Mark Del Mastro (Associate Provost) approved 11/19/2019
Mary Bergstrom (Registrar) approved 11/22/2019
Andrew Przeworski (Chair, Faculty Curriculum Committee) approved 12/18/2019
Faculty Senate approved 1/15/2020

Background Information

Provide a detailed description of the proposed modification, including target audience, centrality to institutional mission, and relation to strategic plan.

Proposed modifications (See updated Catalog curriculum at end of this document: p. 12):

The current BS in Marine Biology curriculum was created back in the 1970s and has changed little in the intervening years even as our faculty expertise has changed and the field has advanced. The College of Charleston's Department of Biology therefore underwent a curricular revision process in 2018/2019 that culminated in departmental and school-wide approval of a largely redesigned BS in Marine Biology curriculum.

The present marine biology curriculum lacks flexibility at the 300 level, relevant courses are omitted from current requirements, and some of our marine biology faculty are boxed out from teaching in the major. This limits student curricular options in addition to the number of marine biology faculty students who are able to take classes from (and the number of marine biology faculty that have an opportunity to teach courses in the major). A related issue is that we currently lack the diversity of upper-division marine biology courses that most similar institutions routinely offer (because students at CofC are locked into taking the same four-course core) and discourages the creation and offering of new and presently relevant marine courses. Solution:

- a. Remove the requirement to take BIOL 335/335L Biology of Fishes, 337/337L Biology of Invertebrates, and 341/341L General Ecology, while retaining BIOL 342/342L Oceanography as a requirement.
- b. Create a Marine Biology Survey course requirement. Students will now be required to take one of the following 4 credit courses: BIOL 335/335L or 337/337L or 303/303L Phycology. We envision adding other courses to this list as new faculty begin to develop additional specialized upper level courses.
- c. Create a variable credit special topics course to allow faculty to try new courses in the area of marine biology that could eventually be converted into permanent offerings. This new course will be called BIOL 454 "Special Topics in Marine Biology" (1-3 credits) and will have an accompanying optional lab called BIOL 454L "Special Topics in Marine Biology Lab" (1 credit).

The number of required credit hours in cognate areas (MATH/CHEM/PHYS/GEOL) is relatively high and the ratio of BIOL:Cognate credits is lower at CofC than at 14 out of 15 other marine biology programs examined. Lack of flexibility in choice of supporting science cognates limits flexibility to choose the courses that would provide the greatest benefit to students on any number of highly variable career pathways in marine biology. **Solution:** Decrease the number of required hours in cognate areas from 28-34 to 23-28 and increase the flexibility for students to choose the courses that best fit their individual career goals:

- a. Remove the 3 semester hour GEOL requirement (most programs in marine biology do not have a GEOL requirement).
- b. Remove the requirement for students to take both the second semester of organic chemistry (CHEM 232/232L) and the second semester of physics (either PHYS 102/102L or PHYS 112/112L).
- c. Require students to choose one additional science or data science cognate from the following list: GEOL 107, DATA 101, CHEM 232/232L, PHYS 102/102L, PHYS

112/112L, HONS 158/158L, CHEM 231/231L, CHEM 232/232L, HONS 293/293L. So, while we propose to remove the requirement for all students to take CHEM 232/232L, GEOL, and PHYS 102/102L (PHYS 112/112L), they will now have the option of choosing which of these courses will best prepare them for their desired career. Most graduate degrees in Marine Biology and Biological Oceanography are flexible regarding their admissions requirements of cognate science courses.

A survey of 15 BS in Marine Biology degrees at similar institutions around the country indicated an average number of required BIOL credits of 50.7 compared to only 34 BIOL credits currently required at CofC for the same degree (our requirement is the lowest of all schools examined). **Solution:** Increase the total number of required BIOL credits for the degree from 34 to 41 (still far below the mean of 50.7 at other similar programs) and the number of required credits in marine biology courses from 12 to 21 by implementing the following requirements (these requirements are in addition to the BIOL 305, BIOL 342 and marine biology survey requirement mentioned earlier):

- a. Students must take a minimum of least nine credits from an approved list of marine biology courses (BIOL 303, 335, 337, 357, 359, 421, 449, 451, 454/454L)
- b. At least nine additional credits from a long list of approved biology courses at the 300-level or above (two of the 18 credits taken beyond BIOL 342/342L, the marine biology survey requirement, and BIOL 305, must include a laboratory component).

Marine biology students often do not take a biology course with a marine focus until very late in their program, sometimes as late as their senior year. This is because we currently require a long general biology foundational sequence that includes BIOL 111/111L, 112/112L, 211/211D, and 305 before they can take a marine biology course.

- a. Create a new 4 credit course called BIOL 213 “Marine Biodiversity, Ecology, and Conservation Biology” and accompanying discussion BIOL 213D “Marine Biodiversity, Ecology, and Conservation Biology” that marine biology majors can take in the place of BIOL 211/211D at the beginning of their sophomore year. Creation of a course that draws from marine biology examples but that covers similar biological content compared to BIOL 211/211D, will allow MBIO majors earlier exposure to marine biology content and will aid in cohort building, recruitment, and retention.
- b. Allow BS, BA, and Biology Minors to substitute BIOL 213/213D for BIOL 211/211D in those cases where marine biology majors complete BIOL 213 but later decide to change from the marine biology BS program into one of our other programs. Although BIOL 211/211D and 213/213D will be distinct courses, they are intended to fill a similar function in our degree programs in terms of biological concepts and skill development. We will therefore not allow students to apply credit for both BIOL 211/211D and 213/213D toward their major.

Target audience

All incoming and future declared BS Marine Biology majors

Centrality to institutional mission and relation to strategic plan

This improvement to the BS in Marine Biology advances GOAL 2 of the College Strategic Plan “DEVELOP OR ENHANCE NATIONALLY RECOGNIZED UNDERGRADU-ATE, GRADUATE AND PROFESSIONAL PROGRAMS IN AREAS THAT TAKE ADVANTAGE OF OUR HISTORY, CULTURE AND LOCATION IN CHARLESTON AND CONTRIBUTE TO THE WELL-BEING OF THE REGION.” Our coastal setting makes the College of Charleston the ideal environment for undergraduate studies in marine biology and ensures that this program will continue to be

especially successful. Furthermore, marine biology majors at CofC have tremendous opportunities for internships and employment with local partners including SC Department of Natural Resources, the Medical University of South Carolina, The Citadel, NOAA, and NIST. Availability of state-of-the-art research centers that these partners help to maintain are a key strength of the BS program in Marine Biology at the College of Charleston and will ensure healthy local fisheries and marine biodiversity for future generations which contribute significantly to the local economy and tourism of the Lowcountry.

Assessment of Need

Provide an assessment of the need for the program modification for the institution, the state, the region, and beyond, if applicable.

The BS in Marine Biology at the College of Charleston is one of the oldest programs of its type on the East Coast. The BS in Marine Biology curriculum was created, as far as we can tell, as long ago as the 1970s and has remained unchanged during the intervening years even as our faculty expertise has changed, the field has advanced, and job opportunities shifted. The Department of Biology therefore underwent a curricular review process in 2018/2019 that culminated in departmental and school-wide approval of this largely redesigned BS in Marine Biology curriculum proposed here. This new curriculum was designed in ways that correct a number of deficiencies identified in our current program including 1) lack of flexibility; 2) high and inflexible cognate (chemistry, math, physics, geology) requirements and low biology course requirements relative to peer institutions; and 3) excessively long introductory core resulting in a long delay before students are exposed to marine biology content. Furthermore, assessment data indicates that students have been scoring below the 50th percentile on the Major Fields Test in the subject area of biology in recent years as a consequence of these curricular deficiencies.

Transfer and Articulation

Identify any special articulation agreements for the modified proposed program. Provide the articulation agreement or Memorandum of Agreement/Understanding.

Description of the Program

Projected Enrollment						
Year	Fall Headcount		Spring Headcount		Summer Headcount	
	New	Total	New	Total	New	Total
2020	35	200			0	165
2021	35	200	10	200	0	165
2022	35	200	10	200	0	165
2023	35	200	10	200	0	165

Explain how the enrollment projections were calculated.

Our enrollments have been fairly steady for a number of years. We do not anticipate enrollments changing significantly as a result of this curricular modification.

Curriculum

Attach a curriculum sheet identifying the courses required for the program.

Curriculum Changes

Courses Eliminated from Program	Courses Added to Program	Core Courses Modified
BIOL 341 Ecology (now an elective)	BIOL 454/454L Special Topics in Marine Biology (a marine biology elective)	BIOL 213/213D Marine Biodiversity, Ecology, and Conservation Biology (new core course that can be taken in the place of our existing BIOL 211/211D Biodiversity, Ecology, and Conservation Biology).
BIOL 337 Invertebrate Biology (now an elective)	DATA 101 Data Science (now included as cognate elective)	
BIOL 335 Fish Biology (now an elective)	BIOL 213/213D Marine Biodiversity, Ecology, and Conservation Biology (core course)	
GEOL 107 Coastal and Marine Geology (now included as cognate elective)		
PHYS 102/102L (now included as cognate elective)		
CHEM 232/232L (now included as cognate elective)		

New Courses

List and provide course descriptions for new courses.

BIOL 213 Marine Biodiversity, Ecology and Conservation Biology (4)

An intermediate-level foundation course intended primarily for marine biology majors. Students will explore synthetic biological concepts, including population genetics, population dynamics, community and ecosystem ecology, phylogenetics, biodiversity, and conservation as they apply to marine environments. In a weekly, three-hour discussion section, students will be introduced to local marine ecosystems, analyze scientific literature, formulate research questions, work with biological data from the marine environment, and write for a scientific audience.

Prerequisite(s) BIOL 111/BIOL 111L, BIOL 112/BIOL 112L. Students must be a declared Marine Biology major or have permission of the instructor. Students may not receive credit for both 211/211D and 213/213D.

Co-requisite: BIOL 213D

Course Frequency: Fall and Spring

BIOL 213D Marine Biodiversity, Ecology and Conservation Biology Discussion (0)

Discussion section to accompany BIOL 211

Prerequisite(s) BIOL 111/BIOL 111L, BIOL 112/BIOL 112L. Students must be a declared Marine Biology major or have permission of the instructor.

Co-requisite(s): BIOL 213. Students may not receive credit for both 211/211D and 213/213D.

Course Frequency: Fall and Spring

BIOL 454 Special Topics in Marine Biology (1-3)

Special studies designed to supplement an offering made in the department or to investigate an additional, specific area of marine biological research.

Prerequisite(s): BIOL 111/BIOL 111L, BIOL 112/BIOL 112L, and BIOL 211/BIOL 211D or BIOL 213/213D or permission of the instructor.

Co-requisite(s) or Prerequisite(s): MATH 250 or equivalent course in statistics.

Course Frequency: Occasional

Repeatable: May be repeated for credit when course content varies.

BIOL 454L Special Topics in Marine Biology Laboratory (1)

Laboratories on selected topics of marine biological interest.

Prerequisite(s): BIOL 111/BIOL 111L, BIOL 112/BIOL 112L, and BIOL 211/BIOL 211D or BIOL 213/213D, or permission of the instructor

Co-requisite(s) or Prerequisite(s): MATH 250 or equivalent course in statistics

Course Frequency: Occasional

Repeatable: May be repeated for credit when course content varies.

**Similar Programs in South Carolina offered by Public and Independent Institutions
Identify the similar programs offered and describe the similarities and differences for each program.**

Program Name and Designation	Total Credit Hours	Institution	Similarities	Differences
BS in Marine Sciences	36	University of South Carolina	Students can choose upper-level major courses to tailor their Marine Science degree, including the option of specializing in biological oceanography.	The BS in Marine Sciences (as opposed to Marine Biology) is a general degree, focused on the oceans but covering subject matters in many different fields such as Geology, Biology, Chemistry, Mathematics, Environmental, Physics, Engineering, Environmental Health and Social Sciences
BS in Marine Science	36	Coastal Carolina University	Students can take upper-level elective courses in an area of emphasis, including marine biology	Marine Science at Coastal Carolina University is an interdisciplinary field where students receive diversified training by taking courses in marine biology, marine chemistry, marine geology and physical oceanography

USC –

- Major Requirements: 36 credits
- Program Requirements: 24 credits (Intro and cognates not including math)
- Math Requirement: 14 credits
- Total Graduation requirements: 128 credits

CCU

- Major Requirements: 36 credits
- Foundations Courses: 34-46 credits (Intro and cognates)
- Total Graduation requirements: 120 credits

Faculty

State whether new faculty, staff or administrative personnel are needed to implement the program modification; if so, discuss the plan and timeline for hiring the personnel. Provide a brief explanation of any personnel reassignment as a result of the proposed program modification.

No new faculty are required. Course loads of existing faculty members will be shifted slightly in order to accommodate the changes which are better aligned to current faculty areas of expertise.

Resources

Identify new library, instructional equipment and facilities needed to support the modified program.

Library Resources: none requested, current holdings are already adequate to support these modifications

Equipment: none requested, current equipment and instruments are already adequate to support these modifications

Facilities: none requested, current facilities are already adequate to support these modifications

Impact on Existing Programs

Will the proposed program impact existing degree programs or services at the institution (e.g., course offerings or enrollment)? If yes, explain

Yes

No

This change will decrease the enrollment in CHEM 232, PHYS 102/112, and some GEOL courses. We anticipate a small increase in enrollment pressure for DATA 101. All affected programs have been notified of potential enrollment changes.

Financial Support

Estimated Sources of Financing for the New Costs						
Category	1st	2nd	3rd	4th	5th	Total
Tuition Funding	0	0	0	0	0	0
						0
Program-Specific Fees						0
Special State Appropriation						0
Reallocation of Existing Funds						0
Federal, Grant, or Other Funding						0
Total						0
Estimated New Costs by Year						
Category	1st	2nd	3rd	4th	5th	Total
Program Administration and Faculty and Staff Salaries	0	0	0	0	0	0
Facilities, Equipment, Supplies, and Materials						0
Library Resources						0
Other (specify)						0
Total						0
Net Total (i.e., Sources of Financing Minus Estimated New Costs)						0

Budget Justification

Provide a brief explanation for all new costs and sources of financing identified in the Financial Support table.

No new costs are incurred due to these changes. Existing faculty resources will be shifted slightly to accommodate the new course offering pattern, and space/equipment/library resources are not impacted by these changes.

Although we are increasing the MBIO course requirements by 7 credits, we are also decreasing the number of credits required in cognate areas by 5 credits so the net increase is only 2 credits (the current curriculum requires 66+ credits while the proposed curriculum requires 64+ credits). Furthermore, we have hired several marine biologist assistant professors in the past few years who can teach the additional required MBIO courses. Finally, the enrollment in the MBIO BS program has fallen more than 25% in recent years (from 200 in 2012 to 142 in 2018) which is now allowing us the opportunity to add additional course requirements in marine biology with the faculty already on staff (the additional student BIOL credit hours we will need to generate as a result of this curricular change is a smaller number than the additional credit hours we used to teach in 2012 because of our higher enrollment).

Evaluation and Assessment

Program Objectives	Student Learning Outcomes Aligned to Program Objectives	Methods of Assessment
<p>1. Evolution: the diversity of life evolved over time by processes of mutation, selection and genetics change. Darwin’s theory of evolution by natural selection remains the fundamental organizing principle over the entire range of biological phenomena. A strong preparation in the theory of evolution remains essential to understanding biological systems at all levels. Themes of adaptation and genetic variation also provide rich opportunities for students to work with data and practice quantitative analysis and modeling.</p> <p>2. Structure and Function: basic units of structure define the function of all living things. Structural complexity, together with the information it provides, is built upon combinations of subunits that drive increasingly diverse and dynamic physiological responses. Fundamental structural units and molecular and cellular processes are filtered through evolution and yield the diversity of biological systems seen today. Knowledge of relationships between biological structure and function is informed by design approaches from</p>	<p>SLO 1: At the end of the foundation sequence (BIOL 111, BIOL 112, BIOL 211 or 213) students demonstrate improvement in their understanding of the core concepts and competencies in biology to classify, explain, and interpret biological phenomena.</p>	<p>Success is demonstrated by improved performance on the Biology Major Field Test (MFT) by students who have completed the foundation sequence when compared with students at the beginning of the foundation sequence.</p>

engineering and from models based on quantitative analysis of data.		
Ability to Apply the Process of Science: biology is evidence-based and grounded in formal practices of observation, experimentation, and hypothesis testing. All students need to understand the process of science. Studying biology means practicing the skills of posing problems, generating hypotheses, designing experiments, observing nature, testing hypotheses, interpreting and evaluating data, and communicating the results.	SLO 2: At the end of the program (BS, BA, BS Marine) students demonstrate additional improvement in their ability to apply knowledge of the core concepts and competencies in biology to classify, explain, and interpret biological phenomena.	Success is demonstrated by improved performance overall on the Biology MFT by graduating seniors in biology majors compared to performance by students at the end of the foundation sequence.
Ability to Communicate and Collaborate with Other Disciplines: biology is a collaborative discipline. Effective communication is a basic skill required for participating in inclusive and diverse scientific communities. Practicing the communication of science through a variety of formal and informal written, visual, and oral methods should be a standard part of undergraduate education.	SLO 3: At the end of the program (BS, BA, BS Marine) students demonstrate the ability to communicate biological explanations and interpretations using a variety of methods.	Success is demonstrated by acceptable oral and written reports evaluated by common departmental rubrics.

Will any the proposed modification impact the way the program is evaluated and assessed? If yes, explain.

- Yes
 No

Will the proposed modification affect or result in program-specific accreditation? If yes, explain; and, if the modification will result in the program seeking program-specific accreditation, provide the institution's plans to seek accreditation, including the expected timeline.

- Yes
 No

Will the proposed modification affect or lead to licensure or certification? If yes, identify the licensure or certification.

- Yes
 No

Explain how the program will prepare students for this licensure or certification.

If the program is an Educator Preparation Program, does the proposed certification area require national recognition from a Specialized Professional Association (SPA)? If yes, describe the institution's plans to seek national recognition, including the expected timeline.

- Yes
 No

Marine Biology, B.S. - BS-MBIO

Biology Core Courses

BIOL 111 Introduction to Cell and Molecular Biology	(3)
BIOL 111L Introduction to Cell and Molecular Biology Lab	(1)
[After] OR	
HONS 151 Honors Biology I	(3)
HONS 151L Honors Biology I Lab	(1)
[After]	
BIOL 112 Evolution, Form, and Function of Organisms	(3)
BIOL 112L Evolution, Form, and Function of Organisms Lab	(1)
[After] OR	
HONS 152 Honors Biology II	(3)
HONS 152L Honors Biology II Lab	(1)
[After]	
BIOL 211 Biodiversity, Ecology, and Conservation Biology	(4)
BIOL 211D Biodiversity, Ecology, and Conservation Biology Discussion	(0)
BIOL 305 Genetics	(3)

Marine Biology Required Courses

BIOL 335 Biology of Fishes	(4)
BIOL 337 Biology of Invertebrates	(4)
BIOL 341 General Ecology	(4)
BIOL 342 Oceanography	(4)

Elective Requirement

~~Complete 10 additional hours of BIOL coursework at the 300-level or above (excluding BIOL 301) to include at least two laboratory courses (Independent study, tutorial, Bachelor's Essay, or BIOL 450 and BIOL 451 with labs do not fulfill the lab requirement). A minimum of 9 credits must be completed from the Marine Biology Course list.~~

New Core Complete one of the following survey courses with lab (4 credits)

BIOL 303 Phycology	(4)
[Before]OR	
BIOL 335 Biology of Fishes	(4)
[Before]OR	
BIOL 337 Biology of Invertebrates	(4)

~~Biology 300 Level and Above Electives List~~ Elective Requirement

Complete 18 additional credit hours of BIOL coursework at the 300-level or above (excluding BIOL 381) with at least 9 credit hours from the Marine Biology Course list; to include at least two laboratory courses (Independent study, tutorial, Bachelor's Essay, or BIOL 450 and BIOL 451 with labs do not fulfill the lab requirement). ~~A minimum of 9 credits must be completed from the Marine Biology Course list~~

BIOL 300 Botany	(4)
BIOL 301 Plant Taxonomy	(4)
BIOL 302 Plant Anatomy	(4)
BIOL 303 Phycology	(4)
BIOL 304 Plant Physiology	(4)
BIOL 305L Genetics Lab	(1)
BIOL 310 General Microbiology	(4)
BIOL 312 Molecular Biology	(3)
BIOL 312L Molecular Biology Laboratory	(1)
BIOL 313 Cell Biology	(3)
BIOL 313L Cell Biology Laboratory	(1)
BIOL 314 Immunology	(3)
BIOL 320 Histology	(4)
BIOL 321 General and Comparative Physiology	(4)
BIOL 322 Developmental Biology	(4)
BIOL 323 Comparative Anatomy of Vertebrates	(4)
BIOL 332 Vertebrate Zoology	(4)
BIOL 333 Ornithology	(4)
BIOL 334 Herpetology	(4)
BIOL 335 Biology of Fishes	(4)
BIOL 336 Parasitology	(4)
BIOL 337 Biology of Invertebrates	(4)
BIOL 338 Entomology	(4)
BIOL 339 Dinosaur Biology	(3)
BIOL 340 Zoogeography	(3)
BIOL 341 General Ecology	(4)
BIOL 343 Animal Behavior	(3)
BIOL 343L Animal Behavior Lab	(1)
BIOL 350 Evolution	(3)
BIOL 351 Principles of Neurobiology	(3)
BIOL 352 Neurobiology and Behavior	(3)
BIOL 353 Hormones and Behavior	(3)
BIOL 354 Techniques in Neuroscience	(4)
BIOL 356 Comparative Biomechanics	(4)
BIOL 357 Oceanographic Research	(4)
BIOL 359 Study Abroad in Neuroscience	(4)
BIOL 360 Introduction to Biometry	(3)
BIOL 396 Biophysical Modeling of Excitable Cells	(3)
BIOL 399 Tutorial	(1-3)
BIOL 406 Conservation Biology	(3)
BIOL 410 Applied and Environmental Microbiology	(4)
BIOL 411 Microtechnique and Cytochemistry	(4)
BIOL 412 Capstone in Molecular Biology	(3)

BIOL 414 Environmental Immunology	(3)
BIOL 420 General and Comparative Endocrinology	(4)
BIOL 421 Topics in Physiology, Cell, and Molecular Biology of Marine Organisms	(3)
BIOL 423 Genomics	(4)
BIOL 444 Plant Ecology	(4)
BIOL 445 Systematic Biology	(3)
BIOL 446 Special Topics in Neuroscience	(3)
BIOL 447 Seminar in Neuroscience	(3)
BIOL 448 Bachelor's Essay in Neuroscience	(6)
BIOL 449 Biology of Coral Reefs	(3)
BIOL 450 Problems in Biology	(1-4)
BIOL 451 Problems in Marine Biology	(1-4)
BIOL 452 Seminar	(1)
BIOL 453 Special Topics	(1-3)
BIOL 453L Special Topics Laboratory	(1)
BIOL 454 Marine Special Topics	
BIOL 454L Marine Special Topics Laboratory	
BIOL 455 Seminar in Molecular Biology	(2)
BIOL 499 Bachelor's Essay	(6)

~~New-Core~~ Marine Biology Courses

BIOL 303 Phycology	(4)
BIOL 335 Biology of Fishes	(4)
BIOL 337 Biology of Invertebrates	(4)
BIOL 357 Oceanographic Research	(4)
BIOL 421 Topics in Physiology, Cell, and Molecular Biology of Marine Organisms	(3)
BIOL 449 Biology of Coral Reefs	(3)
BIOL 451 Problems in Marine Biology	(1-4)
BIOL 454 Marine Special Topics	
BIOL 454L Marine Special Topics Laboratory	

Chemistry Requirement

CHEM 111 Principles of Chemistry	(3)
CHEM 111L Principles of Chemistry Laboratory	(1)
[After] AND	
CHEM 112 Principles of Chemistry	(3)
CHEM 112L Principles of Chemistry Laboratory	(1)
[After] AND OR	
HONS 190 Accelerated General Chemistry	(4)
HONS 190L Accelerated General Chemistry Lab	(1)
[Before]	
CHEM 220 Fundamentals of Analytical Chemistry	(3)
CHEM 220L Fundamentals of Analytical Chemistry Laboratory	(2)
[After] OR	
CHEM 232 Organic Chemistry	(3)

CHEM 222L Organic Synthetic and Analytic	(4)
CHEM 231 Organic Chemistry	(3)
CHEM 231L Introduction to Organic Chemistry Laboratory Techniques	(1)
[After] AND OR	
HONS 192 Honors Organic Chemistry: Applications of Molecular Structure and Properties	(3)
HONS 192L Honors Organic Chemistry Laboratory: Purification, Separation and Characterization of Organic Compounds	(1)

~~Complete at least 3 credit hours from Geology Courses:~~

GEOL 103 Environmental Geology	(3)
GEOL 103L Environmental Geology Laboratory	(4)
GEOL 105 Earth History	(3)
GEOL 105L Earth History Laboratory	(4)
GEOL 107 Introduction to Coastal and Marine Geology	(2)
[Right] ±±	
GEOL 206 Planetary Geology	(2)
GEOL 213 Natural Hazards	(3)
GEOL 225 Geology and Civilization	(2)
GEOL 240 Special Topics in Geology	(1-4)
GEOL 250 Introduction to Geochemistry	(4)
GEOL 256 Mineralogy and Petrology	(4)
GEOL 257 Marine Geology	(4)
GEOL 260 NASA Space Mission Design	(2)
GEOL 260L NASA Space Mission Design Lab	(1)
GEOL 272 Stratigraphy and Sedimentation	(4)
GEOL 275 Geomorphology	(4)
GEOL 288 Global Change: A Geological Perspective	(3)
GEOL 301 Water Resources	(4)
GEOL 303 Independent Study in Geology	(1-3)
GEOL 312 Environmental Field Methods	(2)
GEOL 314 Introduction to Remote Sensing	(4)
GEOL 320 Earth Resources	(3)
GEOL 333 Paleobiology	(4)
GEOL 352 Structural Geology	(4)
GEOL 357 Oceanographic Research: the Transect Program	(4)
GEOL 360 Field Studies	(4)
GEOL 364 Field Studies: Environmental Geology and Water Resources in the Developing World	(4)
GEOL 365 Field Studies: Geology and Environmental Geosciences in Africa	(4)
GEOL 366 Field Studies: Geology and Paleontology	(4)
GEOL 385 Internship	(1-4)
GEOL 395 Special Topics	(1-4)
GEOL 399 Tutorial	(1-3)
GEOL 411 Tectonics	(3)
GEOL 412 Crustal Geophysics	(3)

GEOL 416 Paleocology	(4)
GEOL 430 Sedimentary Petrology	(4)
GEOL 424 Geology of the Carolinas	(2)
GEOL 438 Hydrogeology	(4)
GEOL 440 Igneous & Metamorphic Petrology	(4)
GEOL 441 Pollution in the Environment	(4)
GEOL 442 Geological Application of Remote Sensing	(4)
GEOL 444 Quantitative Hydrogeology	(2)
GEOL 449 Geographical Information Systems	(4)
GEOL 460L NASA Space Mission Design Leadership Lab	(4)
GEOL 469 Advanced GIS—Environmental and Hazards Modeling	(4)
GEOL 491 Senior Thesis	(3)
GEOL 492 Senior Seminar	(4)
GEOL 400 Bachelor's Essay	(6)

Note

~~*†This course is recommended for Marine Biology majors.~~

Physics Requirement

PHYS 101 Introductory Physics I	(3)
PHYS 101L Introductory Physics Laboratory	(1)
[After] AND OR	
PHYS 102 Introductory Physics II	(3)
PHYS 102L Introductory Physics Laboratory	(1)
PHYS 111 General Physics I	(3)
PHYS 111L General Physics I Lab	(1)
[After] OR	
[After] AND	
PHYS 112 General Physics II	(2)
PHYS 112L General Physics II Lab	(1)
HONS 157 Honors Physics I	(3)
HONS 157L Honors Physics I Lab	(1)

Mathematics Requirement

MATH 120 Introductory Calculus	(4)
[Before]OR	
HONS 115 Honors Calculus	(4)
[Before]	
MATH 250 Statistical Methods I	(3)
[Before]OR	
HONS 217 Honors Statistics	(3)

~~New Core One additional science cognate course~~ **Additional Science Cognate Course from the following list** ~~Following List~~

GEOL 107 Introduction to Coastal and Marine Geology	(3)
[Before]OR	
DATA 101 Introduction to Data Science	(3)
[Before]OR	
PHYS 102 Introductory Physics II	(3)
PHYS 102L Introductory Physics Laboratory	(1)
[Before]OR	
PHYS 112 General Physics II	(3)
PHYS 112L General Physics II Lab	(1)
[Before]OR	
HONS 158 Honors Physics II	(3)
HONS 158L Honors Physics II Lab	(1)
[Before]OR	
CHEM 231 Organic Chemistry	(3)
CHEM 231L Introduction to Organic Chemistry Laboratory Techniques	(1)
[Before]OR	4
CHEM 232 Organic Chemistry	(3)
CHEM 232L Organic Synthesis and Analysis	(1)
[Before]OR	
HONS 293 Honors Organic Chemistry: Reactions and Applications of Organic Compounds in Materials Science and Biology	(3)
HONS 293L Honors Organic Chemistry Laboratory: Reactions and Applications of Organic Compounds in Materials Science and Biology	(1)

Notes:

~~MATH 250 is a prerequisite for all 300-level BIOL courses. CHEM 220 and CHEM 220L are recommended. Honors students can take the alternative course of HONS 190/ HONS 190L in lieu of CHEM 111/ CHEM 111L, CHEM 112/ CHEM 112L. Honors students can take the alternative sequence of HONS 192/ HONS 192L and HONS 293/ HONS 293L in lieu of CHEM 231/ CHEM 231L, and CHEM 232/ CHEM 232L. Honors students can take the alternative sequence of HONS 157/ HONS 157L and HONS 158/ HONS 158L in lieu of PHYS 111/ PHYS 111L and PHYS 112/ PHYS 112L. * BIOL 291 does not fulfill a 200-level course requirement.~~

- Students are not permitted to double major in Marine Biology and Biology.
- **No more than 4 credit hours from BIOL 211 and BIOL 213 may be applied toward the program.**

Coursework Meeting Major Requirements Excluded from the Major GPA Calculation

The following courses are excluded: ~~CHEM 111, CHEM 111L, CHEM 112, CHEM 112L, CHEM 220, CHEM 220L, CHEM 231, CHEM 231L, CHEM 232, CHEM 232L, GEOL 103, 499,~~ DATA 101, GEOL 107, HONS 115, HONS 157, HONS 157L, HONS 158, HONS 158L, HONS 190, HONS 190L, HONS 192, HONS 192L, HONS 217, HONS 293, HONS 293L, MATH 120, MATH 250, PHYS 101, PHYS 101L, PHYS 102, PHYS 102L, PHYS 111, PHYS 111L, PHYS 112, PHYS 112L, ~~GEOL 107, DATA 101~~