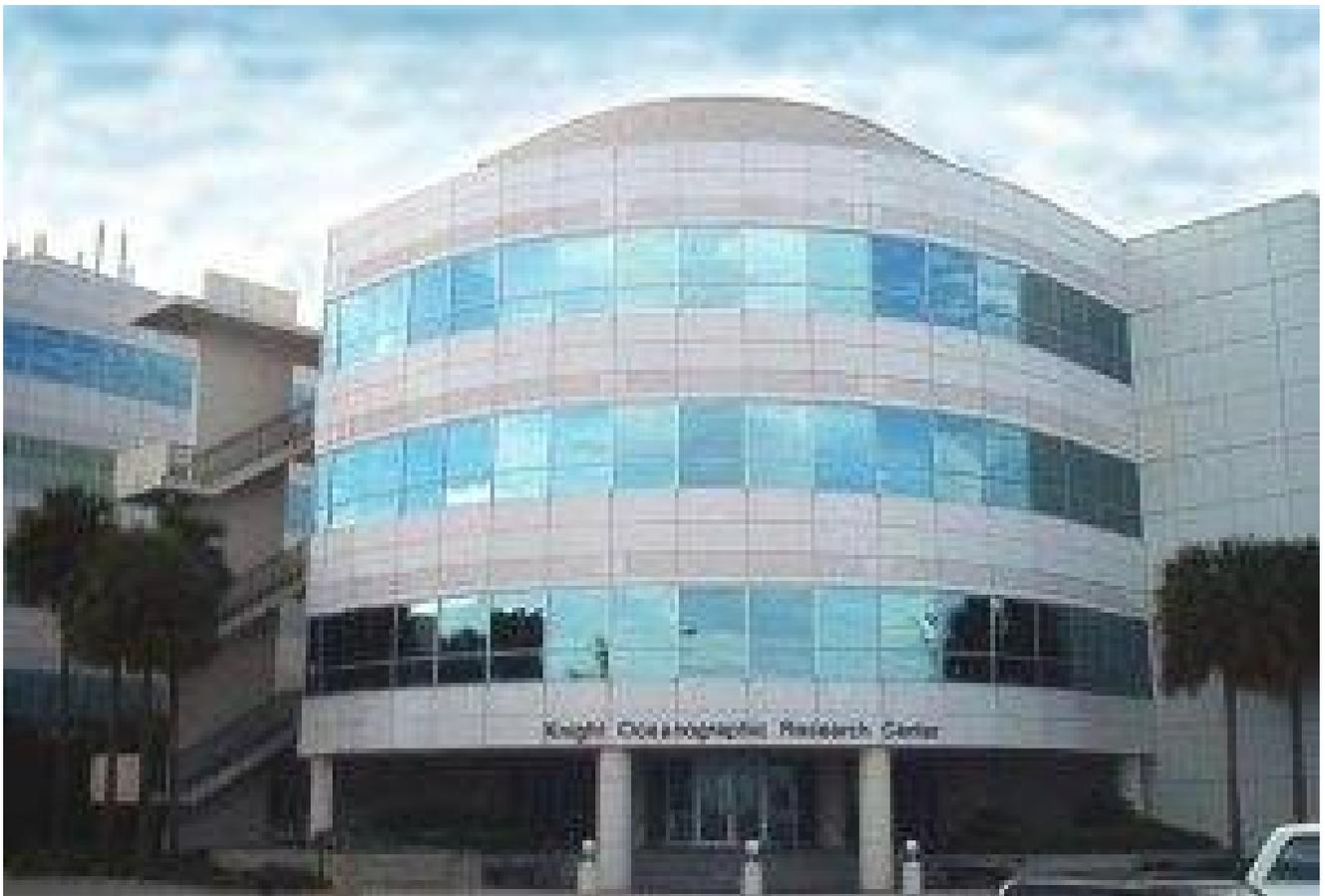


SECTION 19

COLLEGE OF MARINE SCIENCE



Changes to Note

The College of Marine Science did not have any curriculum changes for the 2016-2017 Catalog.

University of South Florida
College of Marine Science
140 7th Avenue S, MSL119
St. Petersburg, FL 33701

Web address: <http://www.marine.usf.edu/>
Email: marinescience@usf.edu
Phone: 727-553-1130
Fax: 727-553-1189

College Dean: Jacqueline E. Dixon, Ph.D.
Associate Dean: Gary Mitchum, Ph.D.
Director of Academic Affairs: David F. Naar, Ph.D.

Accreditation:

The Commission on Colleges of the Southern Association of College and Schools

College Structure and Location:

The College of Marine Science (CMS) was formed during 2000 from the previous Department of Marine Science, initiated in 1967 with three founding faculty members. The Florida Board of Regents declared it a University Center of Excellence in 1978 and approved the Marine Science Ph.D. program in 1982. The CMS at the University of South Florida is constituted as a graduate-level research program that forms the basis for educational opportunities at the Ph.D. and M.S. degree levels and for public service to the State of Florida.

Located on the beautiful waterfront of Tampa Bay adjacent to the USF St. Petersburg campus, CMS is administratively part of the USF Tampa campus and reports to the Provost of USF. The College is focused on interdisciplinary research in marine science. Our ranked faculty, support personnel, and graduate students work together toward a vision of understanding the unified global ocean system. The College seeks to build new interdisciplinary research teams in collaboration with our local marine science research partners, including the Florida Fish and Wildlife Research Institute, the U.S. Geological Survey, NOAA, SRI St. Petersburg, and Mote Marine Lab.

Mission Statement:

The primary mission of the College is to conduct basic and applied research in ocean science. Here, ocean science is defined by application of the traditional fields of science to the biology, chemistry, geology, and physics of the marine environment and the interactions between the marine environment and the adjoining atmosphere and land systems – presently and throughout earth’s history. Included in the primary ocean science mission is the development of new technologies and tools for exploring the coupled ocean-atmosphere-land systems. The College expects its faculty to develop research programs of outstanding caliber and to fully engage the national and international scientific communities, through the reporting of research results in the most respected oral and written venues, and by professional service. Integral to the ocean science research mission is the education of graduate students.

The College recruits, trains, and graduates productive, creative scientists at the Ph.D. and M.S. levels that are prepared to make independent contributions to ocean science. The faculty are expected to develop outstanding graduate education programs that will afford students the opportunity to participate in all aspects of research. The College recognizes that graduate education requires strong mentoring along with traditional

classroom instruction. An ancillary but important mission of the College is education outreach for students at all levels and for the public at large. Our outreach programs have significantly expanded our educational responsibilities, and they are intended to motivate all generations to become scientifically literate citizens and to understand the environment in which they live. The College pursues innovative avenues for educational outreach. Efforts are made to attract more junior and senior level undergraduates into both the ocean science core courses and into advanced courses for which they have pre-requisites. Historically, this is a way in which students have made career decisions to engage in ocean science. In this manner the College maintains close ties with the student body in other University of South Florida colleges and campuses.

Research Facilities:

The College facilities include specialized laboratories equipped for studies in: Scanning and transmission electron microscopy; Trace metal analysis; Water quality; Organic and isotope geochemistry, Physical chemistry, Optical oceanography, Satellite imagery; Sedimentology; Geophysics; Physical Oceanography; Micropaleontology; Physiology; Benthic Ecology; Microbiology; Planktology; and Ichthyology. Additionally, the complex includes the Center for Ocean Technology, which provides instrumental manufacturing and prototyping support to the faculty and students.

The College's students and faculty have conducted research in the Antarctic, Arctic, Atlantic, Indian, and Pacific Oceans, as well as the Bering, Mediterranean, and Caribbean Seas. The College has access to 5 research vessels in conjunction with the Florida Institute of Oceanography (FIO) and the U.S. Geological Survey: The RV Weatherbird II (115 ft), the RV Bellows (71 ft), the RV Gilbert (42 ft), the RV Fish Hawk (38 ft), and the RV Price (24 ft). Ship time on other vessels in the U.S. fleet of oceanographic vessels, as well as foreign research vessels, is generally obtained through federal funding.

Major Research Areas:

Faculty major research areas as listed at: <http://www.marine.usf.edu/faculty/index.shtml>

Degrees, Programs, Concentrations:**Master of Science M.S.**

Marine Science (MSC)
Biological Oceanography (BOC)
Chemical Oceanography (COG)
Geological Oceanography (GOG)
Interdisciplinary (IDY)
Marine Resource Assessment (MRA)
Physical Oceanography (POG)

Doctor of Philosophy Ph.D.

Marine Science
Biological Oceanography (BOC)
Chemical Oceanography (COG)
Geological Oceanography (GOG)
Interdisciplinary (IDY)
Marine Resource Assessment (MRA)
Physical Oceanography (POG)

Graduate Certificates Offered:

Teaching and Communicating Ocean Sciences Broader Impacts

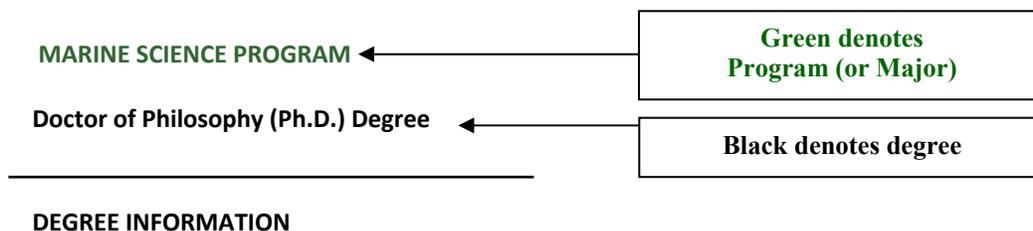
COLLEGE REQUIREMENTS

Refer to the Marine Science Program pages for information.

About the Catalog

The University of South Florida Graduate Catalog is organized with the degree programs offered listed in the section of the College that offers them. For example, the Master of Science degree with a “program” (also known as major) in Biology is listed in the College of Arts and Sciences section. Some colleges offer areas of specialization, or “concentrations” within a degree program.

PROGRAMS



CONCENTRATIONS

Concentration requirements are listed separately under each program.

The Program and Concentration are listed on the official transcript. Other areas, such as application tracks, are not listed on the transcript. Declaring a Concentration on the transcript is not required.

Example:

**Doctor of Philosophy in Marine Science
with a Concentration in Biological Oceanography**

MARINE SCIENCE PROGRAM

Master of Science (M.S.) Degree

DEGREE INFORMATION

Program Admission Deadlines:

U.S. Citizens

Fall: January 10

Spring: October 1

International Students

(not currently residing in U.S.):

Fall: January 2

Spring: June 1

International Students

(currently residing in U.S.):

Refer to U.S. Citizens deadlines

Minimum Total Hours: 32

Program Level: Masters

CIP Code: 40.0607

Dept Code: MSC

Program (Major/College): MSC MS

Approved: 1976

Concentrations:

Biological Oceanography (BOC)

Chemical Oceanography (COG)

Geological Oceanography (GOG)

Interdisciplinary (IDY)

Marine Resource Assessment (MRA)

Physical Oceanography (POG)

CONTACT INFORMATION

College: Marine Science

Contact Information: www.grad.usf.edu

Website: <http://www.marine.usf.edu/>

Email: Marinescience@usf.edu

PROGRAM INFORMATION

The College of Marine Science (CMS) offers M.S. and Ph.D. degrees in Marine Science. This research-based program has a low student-to-faculty ratio, with an average of 100 graduate students under the direction of ~ 30 full-time faculty. Students in the Master's program may elect a concentration in biological, chemical, geological, or physical oceanography, or Marine Resource Assessment through course work and thesis research. CMS graduates are well prepared for positions in academia, industry, government agencies, and non-governmental organizations at local to international levels.

Biological Oceanography

Biological Oceanographers seek to understand the life histories and population dynamics of marine organisms and how they interact with their environment over space and time. Scientists in the College of Marine Science study the full breadth of biological oceanography including microbiology, phytoplankton, zooplankton, benthos, coral reefs, fishes, and marine mammals. Our biological oceanographers utilize a variety of techniques including SCUBA, shipboard samplers, acoustics, molecular biology, and mathematical modeling to understand the oceans and their inhabitants. Scientists in our college also use the latest in remote sensing technology to study vast regions of the Earth's oceans, and have developed new technology, capable of identifying and quantifying harmful algal blooms and related processes.

Chemical Oceanography

Chemical oceanographers seek to understand the ways in which various chemical forms are cycled within the oceans, and the reactions that influence biogeochemical cycles. Ocean chemists improve our understanding of the basic conditions under which ocean life thrives in seawater, and help predict the effects of anthropogenic and natural climate change on ocean composition. Research programs in the College of Marine Science include wide ranging topics such as the role and

variability of nutrients in seawater, the distribution and cycling of both biologically-essential and toxic trace metals, the oceans' CO₂ system, dissolved organic matter, molecular organic compounds, radionuclides and stable isotopes, and the distribution of chemical pollutants and their interactions with marine organisms and ecosystems. Faculty and students utilize a wide variety of state-of-the-art instrumentation and technology for conducting this research.

Geological Oceanography

Geological oceanographers in the College of Marine Science conduct research from the continental margins to the deep-ocean seafloor. Their work extends from modern environments to millions of years before present to understand and predict Earth surface and interior processes. Primary research themes include: (1) paleoceanography and paleoclimatology; (2) coastline and continental shelf development and processes including effects of storms and sea-level fluctuations; (3) the health of modern coral reefs; (4) carbonate depositional processes; (5) anthropogenic influences on estuaries; (6) mathematical descriptions of geologic phenomena; and (7) plate tectonics. Our geological oceanography group has a variety of modern well-equipped laboratories and field equipment, including one of the best seafloor mapping capabilities in the US. Fully integrated with these field instruments is the computational capability to generate state-of-the-art data depictions and imagery. Our group also works closely with scientists from the US Geological Survey's Center for Coastal and Marine Science Center, a major federal laboratory located nearby.

Physical Oceanography

Physical oceanography involves the study of water movement in the ocean. Energy is introduced to the ocean through wind and solar heating, and these combine with the rotation of the Earth and gravitational effects to drive ocean circulation, tides, and waves. Our physical oceanographers also investigate how the Earth's oceans are directly coupled with the atmosphere, from local weather patterns to the global climate system. Physical oceanographers in the CMS carry out research on a variety of topics using the latest technology. Computer models, real time data, satellite remote sensing, and in situ data from moored arrays, coastal tide gauges, and research cruises are used to study a wide range of research problems. Topics include tide and current prediction in Tampa Bay, circulation on the West Florida Shelf and in the Gulf of Mexico, El Niño phenomena, and the potential for global climate change.

Marine Resource Assessment

The College of Marine Science offers an interdisciplinary concentration in Marine Resource Assessment (MRA) as part of its M.S. and Ph.D. programs. This concentration provides training in the emerging field of ecosystem-based management. Its mission is to train a new generation of scientists that can effectively address issues concerning the sustainability of the world's living natural resources. The MRA concentration addresses the national shortage of graduates possessing the skills required for managing living marine resources by teaching a quantitative approach to ecosystem analysis and living resource assessment. The MRA concentration is designed to produce resource assessment scientists who can introduce relevant ecosystem-level variables into the traditional, single-species assessment process, complementing and enhancing the development of science-based management policies that protect living marine resources.

Accreditation:

Accredited by the Commission on Colleges of the Southern Association of College and Schools.

ADMISSION INFORMATION

Must meet University requirements (see Graduate Admissions) as well as requirements listed below.

Program Admission Requirements

Meeting these criteria shall not be the only basis for admission. Complete and up-to-date application instructions can be found at <http://www.marine.usf.edu/students/how-to-apply>

- Bachelor's degree or equivalent from a regionally accredited university (Preferable majors include biology, chemistry, geology, physics, and math).
- Have earned a 3.00 or higher average GPA (on a 4.00 scale) in upper division undergraduate coursework.
- Have completed all of the coursework listed on our website (<http://www.marine.usf.edu>) under "Undergraduate Preparation".

- Have taken the Graduate Record Examination (GRE) within 5 years preceding the application. Preferred minimum scores are as follows: Verbal = 153(59th percentile), Quantitative = 148 (32nd percentile). Preferred minimum scores for Marine Resource Assessment concentration are: Verbal = 156(71st percentile), Quantitative = 155 (60th percentile).
- Have the commitment of a Marine Science faculty member to serve as advisor during the student's graduate studies.

Required Application Materials

- research interest essay (use template from Marine Science website) -
- a resume or curriculum vitae
- three letters of recommendation
- official transcripts of grades
- GRE exam scores

Additional Requirements for International Applicants

- Minimum TOEFL exam score of 79
- Financial Support Requirements Form (available on the Office of Graduate Studies website)
- Official transcripts of grades: all international transcripts must be in English; it is the applicant's responsibility to have foreign transcripts translated and evaluated before submitting them as part of their graduate application packet. Please visit the Foreign Transcript Evaluations Services Listing of acceptable evaluators. Further details can be found at:

<http://www.usf.edu/admissions/graduate/application-requirements/transcripts-foreign.aspx>

DEGREE PROGRAM REQUIREMENTS

A committee, consisting of a major advisor and at least 2 other members of the graduate faculty, will be appointed to supervise and guide the program of each student.

Total Minimum Hours:

32 hours

Students must complete a minimum of 32 credit hours within the following areas:

1. CORE REQUIREMENTS (12 hours)

Core courses completed with a grade of "B" or better:

OCB 6050	Biological Oceanography	3
OCC 6050	Chemical Oceanography	3
OCG 6051	Geological Oceanography	3
OCP 6050	Physical Oceanography	3

2. CONCENTRATION REQUIREMENTS (14 hours)

Students select one of the following concentrations and complete 14 hours of electives within the concentration subject area (or other courses as approved by the Graduate Program Director). Note: At least 8 of these credit hours must be in formal courses to satisfy the USF requirement of 20 hours of formal coursework.

Biological Oceanography (BOC)
 Chemical Oceanography (COG)
 Geological Oceanography (GOG)
 Interdisciplinary (IDY)
 Marine Resource Assessment (MRA)*
 Physical Oceanography (POG)

*Students in Marine Resource Assessment Concentration area are required to take 3 courses from the following list (totaling 9 credit hours) as part of their concentration requirements:

Population Dynamics	3
Fish Biology	3
Dynamics of Marine Ecosystems	3
Applied Multivariate Statistics	3

3. ELECTIVE REQUIREMENTS

Electives are taken within each concentration area (see above)

4. COMPREHENSIVE EXAM REQUIREMENTS

In lieu of a standard Comprehensive Exam, M.S. students must only pass their thesis defense. M.S. students planning to remain in CMS and enter the Ph.D. program after completion of their M.S. are invited and encouraged to take the Integrated Marine Science Exam (IMSE) after their first or second year in the M.S. Program. Or they can wait until they are in the Ph.D. program.

5. THESIS REQUIREMENTS (6 hours)

- A minimum of 6 credits of OCE 6971 (Thesis credit hours)
- A written thesis
- A successful thesis defense examination

6. OTHER REQUIREMENTS

Other coursework as required by thesis advisory committee

COURSES

See <http://www.ugs.usf.edu/course-inventory/>

See <http://www.marine.usf.edu/students/courses-offered>

MARINE SCIENCE PROGRAM

Doctor of Philosophy (Ph.D.) Degree

DEGREE INFORMATION

U.S. Citizens:	
Fall:	January 10
Spring:	October 1

Internatational Students
(not currently residing in U.S.):

Fall:	January 2
Spring:	June 1

International Students
(currently residing in U.S.):
Refer to U.S. Citizens deadlines

Minimum Total Hours:	90
Program Level:	Doctoral
CIP Code:	40.0607
Dept Code:	MSC
Program (Major/College):	MSC MS
Approved:	2000

Concentrations:

- Biological Oceanography (BOC)
- Chemical Oceanography (COG)
- Geological Oceanography (GOG)
- Interdisciplinary (IDY)
- Marine Resource Assessment (MRA)
- Physical Oceanography (POG)

CONTACT INFORMATION

College: Marine Science

Contact Information: www.grad.usf.edu

Website: <http://www.marine.usf.edu/>

Email: Marinescience@usf.edu

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Biological oceanography seeks to understand the life histories and population dynamics of marine organisms and how they interact with their environment over space and time. Scientists in the College of Marine Science study the full breadth of biological oceanography including microbiology, phytoplankton, zooplankton, benthos, coral reefs, fishes, and marine mammals. Our biological oceanographers utilize a variety of techniques including SCUBA, shipboard samplers, acoustics, molecular biology, and mathematical modeling to understand the oceans and their inhabitants. Scientists in our college also use the latest in remote sensing technology to study vast regions of the Earth's oceans, and have also developed new technology, such as genosensor capable for identifying and quantifying harmful algal blooms and related processes on unprecedented scales.

Chemical Oceanography

Chemical oceanographers seek to understand the ways in which various elements are cycled within the oceans, and the reactions that influence biogeochemical cycles. Ocean chemists improve our understanding of the basic conditions under which ocean life thrives in seawater, and help predict the effects of anthropogenic and natural climate change on ocean composition. Research programs in the College of Marine Science include such wide ranging topics as the role and variability of nutrients in seawater, the distribution and cycling of both biologically-essential and toxic metals, the oceans' CO₂ system, dissolved organic matter, molecular organic compounds, radionuclides and stable isotopes and the distribution of chemical pollutants and their interactions with marine organisms and ecosystems. Faculty and students utilize a wide variety of state-of-the art instrumentation and technology for conducting this research. .

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Geological oceanographers in the College of Marine Science conduct research from the continental margins to the deep-ocean seafloor. Their work extends from modern environments to millions of years present to understand and predict Earth surface and interior processes. Primary research themes include: (1) paleoceanography and paleoclimatology; (2) coastline and continental shelf development and processes including effects of storms and sea-level fluctuations; (3) the health of modern coral reefs(4) carbonate depositional processes; (5) anthropogenic influences on estuaries; (6) mathematical descriptions of geologic phenomena; and (7) plate tectonics. Our geological oceanography group has a variety of modern well-equipped laboratories and field equipment, including one of the best seafloor mapping capabilities in the US. Fully integrated with these field instruments is the computational capability to generate state-of-the art data depictions and imagery. Our group also works closely with scientists from the US Geological Survey's Center for Coastal and Marine Science Center, a major federal laboratory located nearby.

Physical Oceanography

Physical oceanography involves the study of water movement in the ocean. Energy is introduced to the ocean through wind and solar heating, and these combine with the rotation of the Earth and gravitational effects to drive ocean circulation, tides, and waves. Our physical oceanographers also investigate how the Earth's oceans are directly coupled with the atmosphere, from local weather patterns to the global climate system. Physical oceanographers in the CMS carry out research on a variety of topics using the latest technology. Computer models, real time data, satellite remote sensing, and in situ data from moored arrays, coastal tide gauges, and research cruises are used to study a wide range of research problems. Topics include tide and current prediction in Tampa Bay, circulation on the West Florida Shelf and in the Gulf of Mexico, El Niño phenomena, and the potential for global climate change.

Marine Resource Assessment

The College of Marine Science offers an interdisciplinary concentration in Marine Resource Assessment (MRA) as part of its M.S. and Ph.D. programs. This concentration provides training in the emerging field of ecosystem-based management. Its mission is to train a new generation of scientists that can effectively address issues concerning the sustainability of the world's living natural resources. The MRA concentration addresses the national shortage of graduates possessing the skills required for managing living marine resources by teaching a quantitative approach to ecosystem analysis and living resource assessment. The MRA concentration is designed to produce resource assessment scientists who can introduce relevant ecosystem-level variables into the traditional, single-species assessment process, complementing and enhancing the development of the science-based management policies that protect living marine resources.

Accreditation:

Accredited by the Commission on Colleges of the Southern Association of College and Schools.

ADMISSION INFORMATION

Must meet University requirements (see Graduate Admissions) as well as requirements listed below.

Program Admission Requirements

Meeting these criteria per se shall not be the only basis for admission. Complete application instructions can be found on the college website: <http://www.marine.usf.edu/students/how-to-apply>

- Bachelor's degree or equivalent from a regionally accredited university (Preferable majors include biology, chemistry, geology, physics or math)
- Have earned a 3.00 (on a 4.00 scale) average GPA or higher on upper division undergraduate coursework • Have completed all of the coursework listed on our website (<http://www.marine.usf.edu>) under "Undergraduate Preparation"
- Have taken the Graduate Record Examination (GRE) within 5 years preceding application. Preferred minimum scores are as follows: Verbal = 135 (59th percentile), Quantitative = 148 (32nd percentile). Preferred minimum scores for Marine Resource Assessment concentration are: Verbal = 156 (71st percentile), Quantitative = 155 (60th percentile).
- Have the commitment of a Marine Science faculty member to serve as advisor during the student's graduate studies.

Required Application Materials

- research interest statement (use template from Marine Science website)
- a resume or curriculum vitae
- three letters of recommendation
- official transcripts of grades
- GRE exam scores

Additional Requirements for International Applicants

- Minimum TOEFL exam score of 79
- Financial Support Requirements Form (available on the Office of Graduate Studies website (<http://www.grad.usf.edu/graduate-admissions-international.asp>))
- Official transcripts of grades: all international transcripts must be in English; it is the applicant's responsibility to have foreign transcripts translated and evaluated before submitting them as part of their graduate application packet. Please visit the Foreign Transcript Evaluations Services Listing of acceptable evaluators. Further details can be found at: <http://www.usf.edu/admissions/graduate/application-requirements/transcripts-foreign.aspx>

DEGREE PROGRAM REQUIREMENTS

A committee, consisting of a major advisor and at least four other members of the graduate faculty, is appointed to supervise and guide the program of the candidate. One member shall be from a department outside of the College of Marine Science.

Total Minimum Hours Required:

90 hours beyond the Bachelor's

Students must complete a minimum of 90 credit hours beyond the Bachelor's degree, (12 hours of core requirements, 16 hours of dissertation, and 62 hours split between coursework and research as determined by the committee) and must complete the following:

1. CORE REQUIREMENTS (12 hours)

Core courses completed with a grade of "B" or better

OCB 6050	Biological Oceanography	3
OCC 6050	Chemical Oceanography	3
OCG 6051	Geological Oceanography	3
OCP 6050	Physical Oceanography	3

2. CONCENTRATION REQUIREMENTS

Students select one of the following concentrations. There is no minimum credit requirement except for the Marine Resource Assessment Concentration:

Biological Oceanography (BOC)
 Chemical Oceanography (COG)
 Geological Oceanography (GOG)
 Interdisciplinary (IDY)

Marine Resource Assessment (MRA)*
Physical Oceanography (POG)

*Students in the Marine Resource Assessment Concentration area are required to take three courses from the following list (totaling nine credit hours) as part of their concentration requirements:

Population Dynamics	3
Fish Biology	3
Dynamics of Marine Ecosystems	3
Applied Multivariate Statistics	3

3. ELECTIVE REQUIREMENTS

Electives are taken within each concentration area (see above)

4. COMPREHENSIVE QUALIFYING EXAM REQUIREMENTS

There will be an Integrated Marine Science Exam (IMSE) administered early each Fall semester. The exam aims to judge a student's ability, upon successful completion of the four core classes (B- or better), to integrate the concepts covered in these classes. All students will take the same exam, at the same time, and questions will be determined by a committee to be appointed by the Dean. All Ph.D. students are expected to take this exam no later than the beginning of their third year (to allow for students who take 2 years to finish the core classes because of other course requirements or if they do not start in the fall term). M.S. students who anticipate continuing in the program to obtain their Ph.D. are encouraged to take this exam, which will fulfill this requirement as long as they enter the PhD program within 7 years of successfully completing the exam. The IMSE is a written exam, followed by optional oral exam if the student does not perform satisfactorily on the written exam. If the student fails the exam, he/she has a second chance to pass the exam in the following year. If a student fails the exam twice, he/she may not proceed in the Ph.D. program.

After passing the IMSE, students are expected to form their dissertation committee, have their research proposal approved by the committee, and to take and pass a Ph.D. Candidacy Exam (PCE) administered by the dissertation committee. The qualifying exam is meant to test the students' in-depth knowledge in their area of concentration and/or dissertation research. The PCE must consist of a 2-4 hour oral exam, with an optional written exam (which could be prior to or after the oral exam) at the discretion of the student's major advisor. The student is expected to take and pass the PCE no later than the start of their fourth year. A student has two chances to pass the PCE in order to become a Ph.D. candidate and must do so prior to beginning their fifth year. Students failing the first time must take the exam again within one year of the first try. If a student fails the exam twice, he/she may not proceed in the Ph.D. program.

5. DISSERTATION REQUIREMENTS (16 hours)

- A minimum of 16 credits of OCE 7980 (Dissertation credit hours). Following admission to candidacy, the student must enroll in OCE 7980 when engaged in research, data collection, or writing activities relevant to the dissertation. The student is required to accumulate a minimum of 6 credits during each previous 12 month period (previous 3 terms, e.g., Fall, Spring, Summer) until the degree is granted.
- A written dissertation
- A successful dissertation defense examination

6. OTHER REQUIREMENTS

Other coursework as required by dissertation advisory committee

COURSES

See <http://www.ugs.usf.edu/course-inventory/>

See <http://www.marine.usf.edu/students/courses-offered>