COASTAL AND MARINE SYSTEM SCIENCE, MS

Program Description
Coastal and Marine System Science studies the interactions within the coastal and marine environment, which includes most of the critical physical and biological systems that support life on Earth. The mission of the Coastal and Marine System Science (CMSS) program is to support interdisciplinary research and scholarship on the biotic and abiotic components of this zone, including quantitative investigation of socio-economic and political processes. The program addresses this mission by integrating the tools of Earth System Science: biogeochemistry, geographic information science, ecosystem dynamics, and quantitative modeling.

With the increasing efficiency of real-time data collection, transfer, and processing, aided by autonomous observation systems such as satellite sensors, oceanic buoys, and remotely controlled or autonomous subsimmers, Coastal and Marine System Science is at the forefront of extracting meaningful scientific results from large data sets in near real time. Graduates of the CMSS program will demonstrate proficiency in understanding and applying the concepts and principles of all of the natural sciences as well as a working competence in mathematical modeling and geospatial analysis.

All students share a core of five interdisciplinary courses that cover the foundations of mathematical modeling, environmental policy, and case studies in system science. Topical specialized coursework (determined by the graduate advisory committee of each individual student) provides grounding in the specific scientific disciplines needed to effectively manage the coastal and marine system. The required thesis involves an independent, detailed research project of importance to the international scientific community. The graduate advisory committee of each student will guide them through the conception, design, construction, and execution of a systems-based inquiry. Students who earn graduate degrees in the sciences are typically employed in teaching or research positions in universities, or in pure research applications at specialized institutions or governmental agencies.

Student Learning Outcomes
As part of their progression through the Coastal and Marine System Science program, the students will:

- acquire the skills required for system science studies applied to coastal and marine topics such that they are prepared to conduct CMSS original research,
- perform original and hypothesis-driven quantitative analyses that will lead to comprehensive verifiable models of natural systems,
- emphasize mathematical and/or analytical skills to generate new data and critically evaluate models that will aid in our understanding of dynamic natural systems, become a resource capable of answering environmental “what if” questions by providing comprehensive interpretation,
- develop the skills necessary to present and publish their work at national and international venues, and
- develop a skill set and research record such that they can secure employment at universities, federal agencies, private companies, or non-governmental organizations where they can apply the skills and knowledge acquired during their time in the program.

For Additional Information
Website:
http://cmss.tamucc.edu/

Campus Address:
Natural Resource Center, Room 3500
Phone: (361) 825-2814 (Alessandra Garcia)

Mailing Address:
Coastal and Marine System Science Program, Unit 5850
College of Science and Engineering
Texas A&M University-Corpus Christi
6300 Ocean Drive
Corpus Christi, Texas 78412-5850

Admission Requirements
Persons seeking admission to the CMSS Program must apply through the University’s College of Graduate Studies (CGS). In addition to the documents required by CGS, applicants must submit GRE general test scores, an essay of no more than 1,000 words describing their educational background, career interests, goals and challenges, a curriculum vitae, and three letters of evaluation from persons knowledgeable about their potential for success in graduate studies. Persons seeking admission to the MS Program in CMSS should first contact the program faculty and identify a faculty member willing to serve as the graduate advisor. Applicants will not be admitted to the program without a graduate advisor. Applicants may optionally submit other relevant materials, e.g., copies of published works or reports of past scientific research. All materials submitted will be considered. A campus visit with personal interviews involving prospective faculty mentors is highly recommended. Completed applications must be received by the College of Graduate Studies by the deadlines posted on the CGS website.

Incomplete applications are not considered. The applicant will be notified of acceptance or rejection by letter.

Students accepted into the degree program must demonstrate proficiency in the natural sciences, mathematical modeling, and geospatial technology. This proficiency can be demonstrated by the successful completion of undergraduate classes in these topics, or by presentation of satisfactory evidence to the CMSS Program Coordinator. Students who are unable to demonstrate proficiency in the natural sciences, mathematics, or geospatial technology may be required to take undergraduate or graduate courses in these areas. These courses will not count toward the coursework required for the MS degree.

Teaching assistantships, graduate research assistantships, and fellowship positions are available to admitted degree-seeking students who maintain full-time graduate student status (9 credit hours per semester). For additional information, please contact the

CMSS Program Coordinator
College of Science and Engineering
Texas A&M University-Corpus Christi
6300 Ocean Dr.
Corpus Christi, Texas 78412-5850
## Program Requirements

Each student admitted to the MS in Coastal and Marine System Science degree program must complete a minimum of 36 hours beyond the bachelor’s degree (at the 5000- or 6000-level). A student’s advisory committee must approve the degree plan. All students must successfully complete at least nine semester credit hours per long semester to remain in the program. All students must pass a final thesis defense, to be administered by their advisory committee, during their last semester before graduation.

The program normally requires a minimum of 18 credit hours of regular graded coursework. Justification for exceptions to this rule should be prepared by the student and advisor(s), endorsed by the advisory committee, and attached to the degree plan when submitted for the department head’s signature.

Students can also enroll in a Directed Independent Study, supervised by their advisor or other faculty members, at any stage of the program progression: CMSS 5596 Directed Independent Study (1-5 sch).

Students may also enroll in CMSS 5940 Thesis Project Research (1-9 sch) to conduct research related to the CMSS M.S. thesis project. Up to six hours may count as credit toward regular graded (non-research, non-variable credit) elective coursework for the M.S. degree requirement in Coastal and Marine System Science.

The remainder of classes or research projects designated as part of the elective coursework requirement must receive the approval of a student’s graduate advisory committee. Students must demonstrate to the committee that the selection of classes or research projects produces a coherent course of study focused on the student’s particular area of emphasis. Depending on the emphasis area, selections may include coastal and marine system science, marine biology, the natural sciences, computer science, geographic information science, mathematics, political science, public administration, business law, or other areas as stipulated by the graduate advisory committee.

### Thesis Information

#### Thesis Course Series

Three courses are taken for the main research component of the degree, CMSS 5392 Thesis I: Thesis Proposal (3 sch), CMSS 5393 Thesis II: Thesis Research (3 sch), and CMSS 5394 Thesis III: Thesis Submission (3 sch). These must be taken by all students.

#### Thesis Format, Style, and Submission

The thesis must be prepared in a standard format and style prescribed by the advisory committee. Guidance can be found in the CMSS Student Handbook. For more information, contact the College of Graduate Studies.

Upon approval by the student’s graduate advisory committee, a copy of the thesis will be submitted to the College of Graduate Studies. For more information, see the Masters Student Handbook, available from the College of Graduate Studies.

#### Final Thesis Defense

Each student must pass a final thesis defense examination during the last semester before graduation, to be administered by the student’s graduate advisory committee. The exam will cover topics related to:

1. all graduate coursework undertaken for the CMSS program,
2. the student’s thesis research area, and
3. broad concepts of system science, requiring familiarity with the literature and appropriate professional societies.

The student is responsible for scheduling the defense in consultation with the graduate advisory committee. A student who fails the defense may repeat it once, but only after an interval of four months or more. If a student fails the second defense, the student will be terminated from the program. Students must enroll in the course CMSS 5394 Thesis Project Research (3 sch) during the semester in which they are planning to defend the thesis and/or graduate.

### Elective, Specialized and Topical Courses

Elective coursework (12 sem. hrs.) supporting the student’s individual research goals is chosen from biology, chemistry, coastal and marine system science, computer science, environmental science, geographic information science, geology, math, marine biology, or other course offerings, in consultation with student’s advisory committee.

Topical coursework should be approved by the graduate advisory committee, and is offered under the heading of: CMSS 6590 Advanced Topics (1-5 sch) Advanced Topics.

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<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
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<tbody>
<tr>
<td>CMSS 5392</td>
<td>Thesis I: Thesis Proposal</td>
<td>3</td>
</tr>
<tr>
<td>CMSS 5393</td>
<td>Thesis II: Thesis Research</td>
<td>3</td>
</tr>
<tr>
<td>CMSS 5394</td>
<td>Thesis III: Thesis Submission</td>
<td>3</td>
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<tr>
<td>CMSS 6312</td>
<td>Communicating Science Seminar</td>
<td>3</td>
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### Core: Multidisciplinary Course Choices

Select two of the following:

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
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<tbody>
<tr>
<td>CMSS 6307</td>
<td>Coastal and Marine Systems</td>
</tr>
<tr>
<td>GSEN 6330</td>
<td>Spatial Systems Science</td>
</tr>
<tr>
<td>CMSS 6370</td>
<td>Coastal Management and Ocean Law</td>
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<tr>
<td>CMSS 6359</td>
<td>Marine Ecosystem Dynamics</td>
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### Core: Math and Statistics Course Choices

Select two of the following:

<table>
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<tr>
<th>Code</th>
<th>Title</th>
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<tbody>
<tr>
<td>MATH 6315</td>
<td>Statistical Methods in Research I</td>
</tr>
<tr>
<td>MATH 6316</td>
<td>Statistical Methods Research II</td>
</tr>
<tr>
<td>CMSS 6323</td>
<td>Experimental Design</td>
</tr>
<tr>
<td>CMSS 6352</td>
<td>Environmental Forecasting</td>
</tr>
<tr>
<td>CMSS 6360</td>
<td>Computer Programming in Earth System Sciences</td>
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### Elective, Specialized and Topical Courses

Select 12 hours of elective coursework with approval of the graduate advisory committee. Coursework may include:

<table>
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<tr>
<td>CMSS 6590</td>
<td>Advanced Topics</td>
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<tr>
<td>CMSS 5596</td>
<td>Directed Independent Study</td>
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<tr>
<td>CMSS 5940</td>
<td>Thesis Project Research</td>
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The remainder of classes or research projects designated as part of the elective coursework requirement must receive the approval of a student’s graduate advisory committee.

<table>
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<tr>
<th>Total Hours</th>
<th>36</th>
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Courses

CMSS 5392 Thesis I: Thesis Proposal
3 Semester Credit Hours (3 Lecture Hours)
Thesis students must submit a completed proposal for their thesis project. A course section will be created for the student to enroll. Upon successful completion and submission of the proposal signed by the graduate committee of the student, students may then register for CMSS 5393 Thesis Research. Open only to M.S. Thesis Degree Candidates in CMSS.

CMSS 5393 Thesis II: Thesis Research
3 Semester Credit Hours (3 Lecture Hours)
Implementation of the Thesis Proposal, and the production of a rough draft of the thesis submitted to the graduate committee of the student for initial editing and comment. A course section will be created for the student to enroll. 
Prerequisite: CMSS 5392.

CMSS 5394 Thesis III: Thesis Submission
3 Semester Credit Hours (3 Lecture Hours)
Completion of the final draft of the thesis, signed by the graduate committee of the student and ready for binding and distribution. A course section will be created for the student to enroll.
Prerequisite: CMSS 5393.

CMSS 5596 Directed Independent Study
1-5 Semester Credit Hours
Study in areas of current interest. A total of six semester hours of Directed Independent Study may be counted towards the CMSS M.S. degree.

CMSS 5940 Thesis Project Research
1-9 Semester Credit Hours
Research related to the CMSS M.S. thesis project. Open only to M.S. students in CMSS with consent of the graduate advisor. Up to six hours may count as credit toward regular graded (non-research, non-variable credit) elective coursework for M.S. degree requirement in Coastal and Marine System Science.

CMSS 6303 Natural Systems Analysis
3 Semester Credit Hours (3 Lecture Hours)
Statistical analysis for data collected in several variables. Topics include sampling from multivariate normal distribution, multivariate analysis of variance, discriminant analysis, principle components, and factor analysis.
Prerequisite: MATH 6315.

CMSS 6305 Natural Systems Modeling
3 Semester Credit Hours (3 Lecture Hours)
Modeling and analysis of deterministic and stochastic dynamical systems, including investigation of model behavior and stability. Theory will be applied to research natural environmental and biological systems such as multi-species systems, carbon circulation in the biosphere, Nutrients-Phytoplankton-Zooplankton models, etc.
Prerequisite: MATH 6315 and 6316.

CMSS 6307 Coastal and Marine Systems
3 Semester Credit Hours (3 Lecture Hours)
Description of coastal and oceanic ecosystems to provide an overview of the fundamental concepts of the abiotic and biotic components, physical-chemical processes, and interactions with environmental and human systems.

CMSS 6308 Coastal Geoenvironments and Change
3 Semester Credit Hours (3 Lecture Hours)
Investigations of the origin, character, and processes of coastal geoenvironments with an emphasis on tracking historical and projecting future changes, including examination of the interactions of geological and biological processes and impacts of human activities on coastal depositional systems.

CMSS 6310 Fundamentals of Remote Sensing
3 Semester Credit Hours (3 Lecture Hours)
Fundamental theory of satellite/airborne remote sensing techniques, sensor performance and calibration, and the scientific applications for land, ocean and atmosphere observations. Topics include physical principles of remote sensing, radiometry, sensors and sensor technology from infrared to microwave sensing, and scientific applications for land, ocean and atmosphere observations. Cross listed with ESCI 6310.

CMSS 6312 Communicating Science Seminar
3 Semester Credit Hours (3 Lecture Hours)
Covers communication topics ranging from proposal writing to professional presentations with a minor emphasis on additional non-traditional communication formats. Must be taken to fulfill degree plan requirements by all Marine Biology graduate students and is recommended in the first spring of the degree.

CMSS 6323 Experimental Design
3 Semester Credit Hours (3 Lecture Hours)
Fundamental concepts of mathematical ecology and the design and analysis of environmental experiments. Students Learn SAS programming and procedures to compute ecological metrics, data management techniques, exploratory analysis, power, sample size, checking assumptions, and analysis of variance models to compute a priori and post hoc hypothesis tests.
Prerequisite: MATH 6315.

CMSS 6327 Physical Oceanography
3 Semester Credit Hours (3 Lecture Hours)
Succinct review of basic concepts of physical oceanography followed by general presentations and discussions in three selected areas: global ocean circulation, circulation along the Gulf of Mexico continental shelf, and ocean-atmosphere interaction and impacts on climate. A significant portion of the class is based on student guided reading assignments.

CMSS 6328 Coastal Ocean using RMT SNS
3 Semester Credit Hours (3 Lecture Hours)

CMSS 6333 Paleo Systems
3 Semester Credit Hours (3 Lecture Hours)
Study of the interrelationships of ancient organisms and their environment through interpretation of the fossil record, analog communities, and oceanographic data, such as carbon and oxygen isotopes. Theories and methods of reconstructing terrestrial, marine and freshwater biotic communities and environments. Review of classic paleoecological and paleoceanographic studies as well as current research.
Prerequisite: BIOL 3428 and GEOL 1401 and (ESCI 3351 or GEOL 4316).

CMSS 6334 Geological Oceanography
3 Semester Credit Hours (3 Lecture Hours)
Integrated examination of the geology and geochemistry of the marine environment. Evolution of ocean basins, continental margins and plate boundaries; geology of oceanic crust; controls on the types, origin, and distribution of marine sediments; and introduction to paleoceanography.
Prerequisite: ESCI 3351 or GEOL 4316.
Responsibilities of governments and rights of citizens. Public Trust Doctrine cases to gain an integral part of understanding the students will use case law studies relating to those rights and duties and maritime law will be studied including applicable Texas real property law. Citizen, state, and federal rights and duties as they impact coastal and in depth as the central focus of the course. Statutory law relating to which is administered by the General Land Office, will be dealt with.

Intensive study of the 1972 National Coastal Zone Management Act and subsequent coastal management programs. The Texas program, which is administered by the General Land Office, will be dealt with in depth as the central focus of the course. Statutory law relating to citizen, state, and federal rights and duties as they impact coastal and maritime law will be studied including applicable Texas real property law. Students will use case law studies relating to those rights and duties and Public Trust Doctrine cases to gain an integral part of understanding the responsibilities of governments and rights of citizens.