A Graduate Certificate in Ocean Observing Systems
a New Professional Degree at Texas A&M University

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M.S. Geoscience-Ocean Observing Systems

The **Master of Geoscience (MS-Gsc)** degree is a multidisciplinary non-thesis advanced degree program targeting public- and private-sector professionals working in the environmental field. To meet the MS-Gsc degree requirements each student completes 36 credit hours of course work--including at least 18 credit hours in two areas of specialization within Geosciences (Atmospheric Sciences, Geography, Geology and Geophysics and Oceanography) and 6 credit hours in a supporting discipline other than the two specialization fields– and a satisfactory final comprehensive oral examination. The **Certificate in Ocean Observing Systems** program provides a more structured and focused curriculum within the traditional MS-Gsc and will be awarded to those students who complete 24 credit-hours of the prescribed curriculum (Table 1). The student's official transcript will include a permanent record indicating he or she has completed the Ocean Observing Systems certificate program (MS-Gsc-OOS). Students enrolled in this Certificate Program are administered by the Department of Oceanography at Texas A&M University and must meet the department's admission requirements.

TABLE 1. MS-Gsc-Ocean Observing Systems Curriculum

Course	Title	Credit Hours
Foundations of Ocean Observing (required)		
OCNG 604	Ocean Observing Systems	3
OCNG 657	Data Methods and Graphical Representation in Oceanography	3
ATMO 629	Climate Change	3
GEOG 651	Remote Sensing for Geographical Analysis	3
FRSC 651	Geographical Information Systems	3
Fundamentals of Ocean Science : select 1 to 3		
OCNG 608	Physical Oceanography	3
OCNG 620	Biological Oceanography	3
OCNG 640	Chemical Oceanography	3
Advanced Specialized Topics : select 0 to 2		
OCNG 600	Ocean Observing Applications	3
OCNG 610	Mathematical Models of Marine Ecosystems	3
OCNG 649	Estuarine Biogeochemistry	3
ATMO459/656	Tropical Meteorology	3
STAT 601	Statistical Analysis	3
STAT 626	Methods in Time Series Analysis	3
FRSC 661	Photo Interpretation	3
FRSC 652	Advanced Topics in GIS	3
MATH 601	Methods in Applied Mathematics	3
GEOG 660	GIS-based Spatial Analysis and Modeling	3
GEOG 661	Digital Image Processing and Analysis	3

OCNG = Oceanography, STAT = Statistics, ATMO = Atmospheric Science, FRSC = Forest Sciences, GEOG = Geography, MATH = Mathematics

GERG — GEOCHEMICAL & ENVIRONMENTAL RESEARCH GROUP, College of Geosciences, Texas A&M University

ABSTRACT

A new graduate program in the College of Geosciences at Texas A&M University focuses on Ocean Observing Systems. The objective of this certificate-granting M.S. program is to train a new generation of ocean professionals knowledgeable in the development, design, and implementation of real-time operational oceanographic systems. The TAMU graduate program in Ocean Observing is a truly interdisciplinary program of study that includes: in situ ocean observations, remote sensing technologies, data analysis and display, geographical information science (GIS), as well as analytical techniques and numerical modeling. It is envisioned that the nascent U.S. Integrated Ocean Observing System (IOOS) will be akin to the National Weather Service and will be designed to provide real-time oceanographic data, services, and products (*http://www.ocean.us*). This new program targets non-thesis graduate students in the Geosciences Masters Program who would like to add a certificate in Ocean Observing to their portfolio as a means of enhancing their professional prospects. The anticipated demand for specifically trained oceanographers will be met by students with this professional degree.

CURRICULUM

Central to the curriculum are five required courses designed to provide students with a strong foundation in ocean observing systems and analytical skills (Table 1). The program will provide training in a range of subjects: in situ ocean observations, remote sensing technologies, data analysis and display, geographical information science (GIS), as well as analytical techniques and numerical modeling.

A sample course plan that satisfies the requirements for both the MS-Gsc degree and the Ocean Observing Systems Certificate is shown in Table 2 for Fall and Spring semesters of two academic years.

TABLE 2. Sample Course Plan

Semester 1
OCNG 604 - Ocean Observing Systems (3)
OCNG 608 - Physical Oceanography (3)
FRSC 651 - Geographic Information Systems (3)
Semester 2
OCNG 657 - Data Methods and Graphical Representation in Oceanography (3)
OCNG 620 - Biological Oceanography (3)
ATMO 629 - Climate Change (3)
Semester 3
OCNG 640 - Chemical Oceanography (3)
GEOG 661 - Digital Image Processing and Analysis (3)
GEOG 651 - Remote Sensing for Geographical Analysis (3)
Semester 4
OCNG 600 - Ocean Observing Applications (3)
ATMO 656 - Tropical Meteorology (3)
FRSC 661 - Photo Interpretation (3)

Texas Automated Buoy System
(*http://tabs.gerg.tamu.edu/Tglo/*)

INTERNSHIPS

Field opportunities and internships will be an important component of the Ocean Observing Systems Certificate Program. Texas A&M University has several major oceanographic programs utilizing ocean observing systems. Foremost of these is the Texas Automated Buoy System (TABS), in operation since 1995. This system, funded mostly by the Texas General Land Office and industry sponsorships, is principally involved in oil spill response and recovery efforts off of coastal Texas. Other programs such as the NOAA-sponsored Mechanisms Controlling Hypoxia Project and the NOAA-MERHAB Texas FlowCAM-equipped 3 m discus buoy are contributing to Ocean Observing objectives.

MECHANISMS OF HYPOXIA

Multidisciplinary surveys and real-time moored instrumentation on the Louisiana Shelf are designed to monitor the mechanisms responsible for initiating and sustaining the region of low dissolved oxygen concentrations that recurs each summer.

HARMFUL ALGAL BLOOMS

A new submersible *in situ* optical detection system is in operation with TABS to detect *Karenia brevis* in real-time. Early detection is the most effective way to mitigate the effects of harmful algal blooms.

FOR MORE INFORMATION

The new Certificate in Ocean Observing Systems will provide training for the next generation of ocean professionals. Academic, government and industrial representatives are invited to contact us for information on admissions, distance learning, and internship opportunities.

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