TRAINING THE NEXT GENERATION OF OCEAN SCIENTISTS:
THE MASTER OF GEOSCIENCE CERTIFICATE IN OCEAN OBSERVING SYSTEMS AT TEXAS A&M UNIVERSITY

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Master of Geoscience-Certificate in OOS

- Rationale for a certificate program in Ocean Observing Systems
- TAMU Degree requirements
  - Skill sets
  - Coursework
  - Timeline
- Features of the program
- Other programs
- Challenges
- Examples
  - degree plan
  - courses
  - field work
Ocean Observing Systems

• An important direction in oceanographic research for the assessment of environmental health and climate change.

• Will require a well-trained workforce
  – Knowledgeable in ocean related issues
    • Science, engineering, management, administration
  – Many expertise levels
    • Technicians to PhD
Why a Certificate in Ocean Observing Systems

- Will meet the growing demand for technically trained persons
  - Industry
  - Government
- Combination of scientific and technical training
- Targets non-thesis non-traditional graduate students
- Addition of Ocean Observing credential to professional portfolio
Certification

• Professional Organization accreditation
  – Currently does not exist
  – Need sponsorship
• Standard skill set and knowledge base
• Iterative Process (evolving/responding)
  – Industry
  – Government
  – Academics
TAMOO Objective

• To train the next generation of ocean professionals
  – Ocean data collection
  – Data Management
  – Production and distribution of products and services

• Initially, 5 new students per year
Certificate Requirements

- 24 credit-hours
  - Ocean Science
  - Climate Science
  - Data Methods
    - GIS
    - Remote Sensing
    - Computational Methods
    - Statistics
    - Time-series analysis
    - Data Products
Coursework Requirements

**Foundations of Ocean Observing (credit hours) (Required)**
- OCNG 604 - Ocean Observing Systems (3)
- OCNG 657 - Data Methods and Graphical Representation in Oceanography (3)
- GEOG 651 - Remote Sensing for Geographical Analysis (3)
- OCNG 611 – Global Scale Oceanography (3)
- FRSC 651 - Geographic Information Systems (3)

**Fundamentals of Ocean Science (1 - 3 of the following):**
- OCNG 608 - Physical Oceanography (3)
- OCNG 620 - Biological Oceanography (3)
- OCNG 640 - Chemical Oceanography (3)
Advanced Specialized Skills (additional electives, up to 3 of the following are required):

- OCNG 610 - Mathematical Modeling of Marine Ecosystems (3)
- OCNG 649 - Estuarine Biogeochemistry (3)
- OCNG 659* - Ocean Observing Applications
- ATMO 656 - Tropical Meteorology (3)
- FRSC 661 - Photo Interpretation (3)
- FRSC 652 - Advanced Topics in GIS (3)
- GEOG 660 - GIS-Based Spatial Analysis and Modeling (3)
- GEOG 661 - Digital Image Processing and Analysis (3)
- MATH 601 - Methods of Applied Mathematics (3)
- STAT 601 - Statistical Analysis (4)
- STAT 626 - Methods in Time Series Analysis (3)
Areas of Concentration

- Ocean instrumentation systems
- Data Processing
- Numerical modeling
- GIS (Certificate)
- Meteorology

- Design is flexible to meet student interests and future course offerings
Distance Learning Options

- Target non-tradition students
  - Non-degree seeking
  - Remotely located
  - Current Ocean Professionals

- Web-based courses
  - Online resources
  - Problem/reading sets
  - 1-100% web-based

- All certificate course instructors have been asked to make their courses “distance friendly”
  - University motivation
Research/Operational Opportunities

• Texas
  – Texas Automated Buoy System (TABS)
  – CICEET - Texas Imaging FlowCytobot
  – TCOON
• Regional
  – NOAA-NGOMEX Hypoxia Research
  – GCOOS
• National
  – IOOS
  – NDBC
  – NODC
Internships

• Positive feedback from industry and state and federal government agencies

• Provide valuable hands-on/real world experience

• Insures students are exposed to timely and practical topics of interest to OOS stakeholders

• TAMOO students internships
  – WHG, Houston
  – GERG, College Station
  – Wilkins Weather, Houston
Summary

• TAMOO Certificate Requirements
  – 24 credit hours (8 courses)
  – Non-thesis
• Currently 7 students
  – Anticipated 5 students per year
• First recipient Dec 2007
Additional Programs

- Rutgers University- Coastal Ocean Observation Laboratory (COOL)
- Princeton University-Bermuda Institute of Ocean Sciences Graduate Program (PU-BIOS)
- NSF-- Center for Ocean Science Excellence in Education (COSEE) utilizing OOI science and technology.
Challenges:

• Recruitment
  – target student audience
• Student support
  – stipends
• Internships
  – links with industry
  – employment
• Certification
Sample Degree 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)
• OCNG 611 - Global Scale Oceanography (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)
OCNG 604
Ocean Observing Systems

• **Objective**: to train students in the motivation, technical design and operation, and policy issues associated with Ocean Observing Systems


• Graduate Level

• Offered in Fall
OCNG 657 Data Methods and Graphical Representation in Oceanography

**Objective**: provides the basic tools and techniques to process, analyze, and represent oceanographic data with EMPHASIS ON APPLICATIONS


- Includes MATLAB and Computational Lab
- Graduate Level
- Offered in Spring
TABS

- Network of current- and wind-measuring buoys
- Communications infrastructure to collect real-time data
- Website
- Prediction and early warning
- Forecast models: offshore and inshore
- Regional component of the Integrated Ocean Observing System (IOOS) through the Gulf of Mexico Coastal Ocean Observing System (GCOOS)
HABs are phytoplankton bloom phenomena that have negative impacts— an unusually high concentration of toxic or nuisance algae.

- The Campbell Lab is testing a novel imaging flow cytometry system, the Imaging FlowCytobot, at the pier at UT-MSI to provide frequent real-time images of plankton in Texas coastal waters.
NOAA-HYPOXIA Program

Investigations of processes responsible for maintaining seasonal hypoxia on the Louisiana Shelf

- Moored Observations
- Hydrographic Surveys
- Student Training
- Outreach
More information

• TAMOO Webpage
  http://ocean.tamu.edu/

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