

Developing Additionally Improved Rubrics Following a Very Successful ABET Accreditation of the Ocean and Resources Engineering Department

Department of Ocean and Resources Engineering (ORE)

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ORE & ABET Accreditation

The Ocean and Resources Engineering Department is a small highly specialized graduate department within the School of Ocean and Earth Sciences and Technology.

ORE is accredited by ABET: Accreditation Board for Engineering and Technology.

Accreditation means more than that students learn material favored by a selection of departmental faculty... failure by designers to master key ocean engineering concepts can result in catastrophic loss for society.



Deep Water Horizon Catastrophe



Students Need to Understand the Principles of Marine Structural Integrity

Department Facts

Small: 7 faculty

Graduate: MS & PhD only

Highly design-oriented

Very strong international relations and component

Rigorously accredited by ABET: 6 year-cycle

Successful ABET Assessment in 2015

- All 12 Program Outcomes assessed for 2015 ABET review
- ORE received a highly unusual perfect score (no deficiencies, weaknesses, concerns)
- Following success, ORE committed to strengthen 12 winning rubrics to better quantify assessment results & present itself as a nationally leading program



UH Designed Submersible Lift Platform

Example of New Rubric to Evaluate Theses

Category	Needs work	Meets expectations	Exemplary
Hypothesis	<ul style="list-style-type: none"> Hypothesis stated but is vague and lacks clarity regarding the research questions to be answered. Describes an activity, tool, method, technique, rather than a hypothesis. 	<ul style="list-style-type: none"> Hypothesis is clearly stated, concise and testable. Provides a clear understanding of the research questions to be answered. Is significant. 	<ul style="list-style-type: none"> Hypothesis is very clearly stated, concise and highly testable. Makes the research questions transparent. Is highly significant and original.
Research Design/ Methods	<ul style="list-style-type: none"> Clear enough for readers to understand what is to be accomplished. Is shoddy. The method selection and the sequence needs to be further justified. Leaves part of the research questions unanswered 	<ul style="list-style-type: none"> Method selection is well justified: compares the chosen method against the existing methods; and discusses its advantages and disadvantages. Is relevant and appropriate to test the hypothesis or answer the research questions Serves as a map of the study Represents rigor 	<ul style="list-style-type: none"> Well grounded in theory; exhausts all possibilities; Design is elegant and compelling. Serves as a blueprint of the study and is highly replicable. Represents high analytical power and rigor
Data Analysis	<ul style="list-style-type: none"> Data analysis techniques provide basic answer to the hypothesis/research question(s). There lacks investigation of the quality of the data. Analysis sequence lacks coherence. The accuracy of the results is unclear. Can support the results with basic visual aids. 	<ul style="list-style-type: none"> Employs appropriate data analysis technique of the specialization Investigates quality of data and identifies sources of error or bias. Analysis sequence and results are accurate/appropriate Supports the communication of the results with appropriate visual aids. 	<ul style="list-style-type: none"> Uses strong and innovative analysis techniques Thoroughly establishes the quality of data Analysis sequence is highly logical, thorough, and compelling and the results are accurate. Effectively uses visual presentation of the data of superior quality.
Data Interpretation/ Conclusion	<ul style="list-style-type: none"> Major topics or concepts are inaccurately described. Considerable relevant discussion is missing. Conclusions/summary is not entirely supported by findings/outcomes. 	<ul style="list-style-type: none"> Discussion is sufficient and with few errors. Conclusion draw upon past work in the area but greater foundation is needed. Conclusions/summary is based on outcomes and is appropriate, includes some recommendations. 	<ul style="list-style-type: none"> Discussion is superior, accurate, and engaging. Shows strong foundation of the past work and contributes significantly to the field. Conclusions/summaries and recommendations are appropriate and clearly based on outcomes.
Writing Quality	<ul style="list-style-type: none"> There are language errors that interfere understanding of major concepts in the writing. There is organization in the writing but it is loose and occasionally lacks logic. Transitions between ideas are weak or lacking. Documents sources but there are some major omissions and some misuses of sources. 	<ul style="list-style-type: none"> Writing is of high quality with few language errors. Organization is logical and text flows smoothly with transitions between ideas. Documents sources ethically with few omissions and problems. 	<ul style="list-style-type: none"> Writing is highly polished and of publication quality, with few if any grammatical, spelling, stylistic, or other language errors. Organization is highly fluid, compelling, and engaging. Documentation of sources meets professional standards.

Program Outcomes

- A broad education necessary to understand the impact of engineering solutions in a global and societal context
- An ability to apply knowledge of mathematics, science, and basic engineering topics that include statics, dynamics fluid mechanics and probability and statistics.
- Proficiency in the core program that comprises hydrostatics, oceanography, water waves, fluid-structure interaction, underwater acoustics, laboratory and at-sea experience
- Working knowledge of at least one of the three option areas that include coastal, offshore, and ocean resources engineering
- An ability to use the techniques, skills, and latest engineering tools necessary for ocean and resources engineering practice
- An ability to identify, formulate, and solve ocean and resources engineering problems
- An ability to design and optimize engineering systems to meet the needs of the marine community
- An ability to work independently and function on multi-disciplinary teams
- An appreciation of professional and ethical responsibilities
- An ability to communicate effectively to technical and non-technical audiences
- An awareness of the latest research and contemporary issues in and beyond the marine community
- A recognition of the need for, and an ability to engage in life-long learning and continuing professional development.

Assessment Methods

Direct Measures

- Master's qualifying exam
- Committee verification of undergrad. ABET requirements and assignment of remedial action
- Capstone Design Class
- Master's thesis defense & evaluation of thesis for outcome elements
- Circulation & review of thesis proposals by all the faculty
- Student employment placing, particularly repeat hires by employers

Indirect Measures

- Local and International Advisory Panels
- Employer Surveys
- Student Exit Interviews
- ABET course reviews done at the end of each course by both students and faculty
- Alumni Surveys
- Student advising meeting to determine fulfillment of undergrad requirements and progress (new form and process implemented in 2015)

Conclusions from ABET Success

Extremely positive review was supported by/is a testimony to:

- the strong research and teaching performance of ORE.
- the significant interaction between the department and its advisory committees.
- the support provided by the local engineering community in terms of the capstone design class and internships.
- the fact that local engineering companies (e.g., Sea Engineering) repeatedly hire large numbers of ORE's graduates.
- ORE's graduates' outstanding success in a wide range of ocean engineering positions across the US and around the world.
- the close links between the department and professional engineering societies (e.g., SNAME and MTS).

Moving forward...

- Expand three option areas to include oceanographic engineering and interdisciplinary engineering.
- Include more courses in each option areas for specialization beyond core classes.
- Strengthen advising through a new form and procedure.