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MEMORANDUM

To: Donna E. Shalala, President

From: Richard L. Williamson
Chair, Faculty Senate

A handwritten signature in blue ink, appearing to read 'RLW', is written over the name 'Richard L. Williamson'.

Date: August 29, 2013

Subject: Faculty Senate Legislation #2013-02(B) – Reactivate the Master of Science Degree in Ocean Engineering [administered jointly with the College of Engineering and Rosenstiel School of Marine and Atmospheric Science]

The Faculty Senate, at its August 28, 2013 meeting, voted unanimously to approve the reactivation of the Master of Science Degree offered jointly by the College of Engineering and the Rosenstiel School of Marine and Atmospheric Science. The program was popular in the 1970s and 1980s but fell into decline during the 1990s as national circumstances and priorities changed. The program remained dormant since the 1990s, but still remains in the Bulletin. In the past decade, several major incidents, including the Deep Water oil spill in the Gulf of Mexico and a series of devastating hurricanes in 2003-2005, have raised awareness to the vulnerability of the nation's coastal infrastructure. This has led to a revived interest in the field of Ocean Engineering, albeit with a new focus, that this degree will fulfill.

To be included as part of the legislative history regarding the budget disciplines, the Senate understands that it has been the Provost's practice and plan that all professional degrees will retain 70% of the tuition earnings; the other 30% will be provided to the Provost to cover otherwise unattributable University-wide expenses, and will be applied to this program, as well.

The proposal is enclosed for your reference.

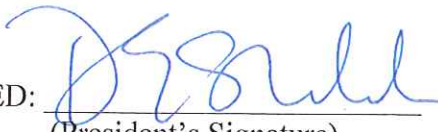
This legislation is now forwarded to you for your action.

RLW/rh

Enclosure

cc: Thomas LeBlanc, Executive Vice President and Provost
Roni Avissar, Dean, Rosenstiel School of Marine and Atmospheric Science
James Tien, Dean, College of Engineering
Shihab Asfour, Associate Dean, Academic Programs, College of Engineering
Brian Haus, Chair, Division of Applied Marine Physics, Rosenstiel School of Marine and Atmospheric Science

CAPSULE: Faculty Senate Legislation #2013-02(B) – Reactivate the Master of Science Degree in Ocean Engineering [administered jointly with the College of Engineering and Rosenstiel School of Marine and Atmospheric Science]

APPROVED:  DATE: Oct 4 2013
(President's Signature)

OFFICE OR INDIVIDUAL TO IMPLEMENT: DEAN TIEN & DEAN AVISSAR

EFFECTIVE DATE OF LEGISLATION: IMMEDIATELY
(if other than June 1 next following)

NOT APPROVED AND REFERRED TO: _____

REMARKS (IF NOT APPROVED): _____

Proposal for the revival of the MS in Ocean Engineering at the University of Miami
College of Engineering, jointly with
Rosenstiel School of Marine and Atmospheric Science
December 30, 2011

I. Executive Summary

In decades past, the University of Miami's College of Engineering together with the Rosenstiel School of Marine and Atmospheric Science offered a Master of Science degree in Ocean Engineering. The program and others of its kind in the nation, were popular in the 1970s and 1980s, but fell into decline during the 1990s as national circumstances and priorities changed. In particular, opportunities in ship building and underwater acoustics, two key sectors in the field, diminished significantly. The program at UM has been dormant since the late 1990s, while others were shut down. Although dormant, the program remains in the Bulletin.

In the past decade, several major incidents – last year's Deep Water oil spill in the Gulf of Mexico, and a series of devastating hurricanes in 2003-2005 – have turned our collective attention to the vulnerability of the nation's coastal infrastructure. This in turn has led to a revival in the field of Ocean Engineering, albeit with a new focus. This proposal is for the revival of the MS in Ocean Engineering. A second proposal, to be submitted by the Rosenstiel School of Marine and Atmospheric Science (with support of the College of Engineering) is for the creation of an undergraduate minor in Ocean and Atmosphere Engineering.

II. Existing MS in Ocean Engineering

The following, excerpted from the 2011-2012 University of Miami bulletin, describes the MS in Ocean Engineering as currently on the books.

OCEAN ENGINEERING/APPLIED MARINE PHYSICS

- I. Ocean Engineering concentrates on problems associated with the interaction of the ocean and the works of man.
 - A. The ocean engineer combines competence as an engineer with both a practical experience in and theoretical understanding of the ocean.
 - B. The Ocean Engineering program, offered jointly with the Rosenstiel School of Marine and Atmospheric Science, is intended to lay the foundation of this competence, experience and understanding.
 - C. The areas of faculty specialization in this program include coastal engineering, off-shore engineering, underwater acoustics, ocean measurements, marine geotechnics, and naval hydrodynamics.

- II. The Master of Science degree in ocean engineering is offered jointly with the Rosenstiel School of Marine and Atmospheric Science.
 - A. In addition, Master of Science and Doctor of Philosophy degrees in applied marine physics are offered by the Rosenstiel School of Marine and Atmospheric Science.
 - B. See APPLIED MARINE PHYSICS/OCEAN ENGINEERING under RSMAS elsewhere in this Bulletin for information on the applied marine physics.

- III. An approved interdisciplinary program is required for the M.S. degree in ocean engineering which consists of a minimum of 30 credits at the graduate level with an average grade of B or better and no grade below C.
 - A. The 30 credits are divided among 24 credits in courses and six credits for thesis research.

B. At least nine of the required credits must be 600 level courses.

As currently defined the 30 credit MS involved 24 credits of courses and six credits of thesis (III A). The course curriculum for each student was established based on the interests of the student, and approved by a faculty committee. The revived MS program will be course only (no thesis), and the 30 credits of courses will be based on several tracks as described below. While many traditional ocean engineering programs (see Market Analysis) focus on the design of marine vehicles, as well as harbors and ships, our two initial tracks will focus on sustainable construction in the coastal zone and coastal security. The tracks reflect both current demand in the field, and the expertise of existing faculty at both CoE and RSMAS.

III. Revived MS in Ocean Engineering

The proposed new curriculum is divided into three groups of courses. The first group of four core courses (12 cr) provides an introduction to the field, as well as analytical tools and theoretical background in the fundamental areas of fluid dynamics and wave propagation.

1) Core courses (12 credits):

AMP 5XX: Intro to Ocean Systems Engineering (new) *Prerequisites – Calculus III, Ordinary Differential Equations, Physics II.*

AMP 601: Advanced analytical methods (existing) *Prerequisites – Calculus III, Ordinary Differential Equations, Physics II.*

MAE 512 Intermediate Fluid Mechanics (existing)- *Prerequisites CAE 330 or MAE 309, or AMP 575 Applied Ocean Hydrodynamics (existing) Prerequisites – Calculus III, Ordinary Differential Equations, Physics II.*

AMP 576: Wave propagation in the ocean environment (existing) *Prerequisites – Calculus III, Ordinary Differential Equations, Physics II.*

With the exception of the new AMP course "Intro to Ocean Systems Engineering" all courses from this list are taught on a regular basis as part of the AMP or MAE graduate programs. The new course is being designed to "introduce students to the breadth of activities and key issues in the field of ocean engineering, through a team taught survey course. This will serve to inform their course selection, career planning and professional development." The course will be taught primarily by AMP faculty but will include lectures from MPO and MGG faculty and cover diverse aspects of ocean systems engineering, including; marine structures, coastal engineering, autonomous vehicles, remote sensing, acoustics, mooring design, fluid-structure interactions, marine renewable energy, computational fluid dynamics, ocean measurements, deep ocean exploration and extreme conditions (rogue waves and hurricanes).

The student then elects one course (3 cr) from a group focusing on computational (numerical) methods and one course (3cr) from a group focusing on experimental methods. These courses give the student

the additional tools needed in the profession. Each course is already existing and regularly taught and are listed below.

Deficiencies for those students entering this program without an engineering background are three terms of Calculus, Ordinary Differential Equations, Physics II, Statics and Dynamics.

2) Choose one of (3 credits):

MAE 614 Computational Fluid Dynamics (existing)

MPO 662: Computer models in fluid dynamics (existing)

And one of (3 credits)

AMP 531: Ocean Measurements (existing), *Prerequisites: Core courses or per. instructor*

EEN 507: Active Filter Design (existing)

MAE 606 Experimental Methods in Fluid Mechanics (existing)

Finally, students choose four courses (12 credits) from one of two tracks.

Track A "Fluid-Structure Interactions" focuses on the performance of structures that are subject to loadings from waves, currents and wind. An important aspect of this track is the specification of design loads from wind, waves and currents and will have components relevant to both offshore and coastal problems. Fundamental aspects of flow around rigid bodies, flow induced vibrations and structural response and sediment transport and erosion will also be addressed. The course content will then highlight the synthesis of the design loadings and structural response for relevant ocean engineering problems. There will be a focus on engineering of coastal structures including residential, civil and industrial infrastructure.

Track B "Remote sensing and Maritime Security" focuses on remote sensing techniques in particular as they apply to maritime safety and security. Courses will cover the physics and principles of electromagnetic waves in the microwave, visible and infrared frequencies, acoustic and seismic waves. Students will learn about current technologies applicable to threat detection and mitigation including threats from criminal activities, illegal immigration, piracy, and terrorism. The technologies of interest will include: satellite, aircraft and land-based radar and optical remote sensing, underwater acoustic surveillance, and infrared techniques applied to ship detection; X-Ray scanning, Gamma Ray scanning, radiation detection and Radio Frequency Identification Tags (RFID) applied to cargo. The final cap-stone course will give the students hands-on experience at UM's state-of-the-art CSTARs (Center for Southeastern Tropical Remote Sensing) facility.

Track A) Fluid-Structure interactions

AMP XXX: Capstone Lab based course on structure/fluid interaction (new- SUSTAIN/ASIST)

AMP 509: Coastal Physics and Engineering (existing)

And 2* of the following

- AMP/MPO 650 Coastal Ocean Circulation (existing)
- CAE 510 Structural Mechanics (existing)
- CAE 511 Advanced Structural Analysis (existing)
- AMP577 Marine soil mechanics (on the books, but long dormant)
- MAE 615 Turbulence (on books but dormant)
- AMP 676 Advanced Wave Hydrodynamics (on books)
- MPO 664 Atmospheric and Oceanic Turbulence (existing)

Track B) Remote sensing and Maritime Security

- AMP XXX: Capstone applied problems in remote sensing course (new-CSTARS)
- AMP XXX: Maritime Systems Technologies (new)

And 2* of the following:

- AMP 535: Intro to underwater acoustics (existing)
- EEN 525: Antennas and Propagation (existing)
- MPO 542: Physics of Remote Sensing (existing)
- AMP 690: Air-Sea Interaction (existing)

**Students in a 4+1 program in U-M CoE will only be required to take 1 of these courses and in addition another course will be waived based on the interest and background of the student.*

IV. Market analysis

In the post-Katrina era, there is considerable interest in the nation's coastal infrastructure, as well as the nation's coastal security. These fields naturally lie at the intersection of strengths at RSMAS and CoE. ABET, the Accreditation Board for Engineering and Technology recently changed the academic requirements for accreditation as a Professional Engineer to include a 30 credit MS degree in addition to the BS. When this change takes place starting in 2014, demand for MS programs in Engineering will be significantly increased. ABET lists nine Ocean Engineering programs on their web site of accredited programs, seven of which offer graduate (MS) programs.

Florida Atlantic University (<http://www.ome.fau.edu/category/college/ocean-engineering>). Well known for program on marine vehicles, also acoustics, hydrodynamics, marine materials, offshore structures, and coastal engineering. Thesis and non-thesis options are available.

Florida Institute of Technology (<http://coe.fit.edu/dmes/ocean.php>). Specialization in: aquaculture engineering, coastal engineering, hydrographic engineering, materials and structures, naval architecture, ocean energy, ocean instrumentation, ocean system/underwater technology. Thesis and non-thesis tracks available.

University of Hawaii (http://www.ore.hawaii.edu/OE/ore_academics.htm), program in Ocean and Resource Engineering with specializations in coastal, ocean resources, or offshore engineering. Thesis and project tracks available

Massachusetts Institute of Technology (<http://meche.mit.edu/academic/graduate/>), MS degree in Ocean Engineering or Naval Architecture/Marine Engineering offered by Mechanical Engineering, as well as MS in Oceanographic Engineering offered jointly by the Mechanical Engineering and Woods Hole Oceanographic Institution. MS requires a thesis.

University of Rhode Island (<http://www.oce.uri.edu/graduate.shtml>). Concentrations in six areas: Ocean Instrumentation & Seafloor mapping, Underwater Acoustics & Data Analysis, Marine Hydrodynamics & Water-wave Mechanics, Coastal and Near-shore modeling, Marine Geomechanics, and Coastal & Offshore Structures.

Texas A&M University (<http://oceaneng.civil.tamu.edu/Academics/GRProgram.htm>). Principal areas are offshore structures, estuary and coastal engineering, dredging and/or mining processes, and marine hydrodynamics. Thesis (MS) and project (MEng) options.

Virginia Polytechnic Institute and State University (<http://www.aoe.vt.edu/graduate/master-of-science-degree.html>). Areas of specialization include: hydrodynamics, ship dynamics, ship structures, and numerical methods. Thesis and non-thesis options.

Stevens Institute of Technology (<http://www.stevens.edu/ses/graduate/ocean-engineering-grad.html>). MEng in Ocean Engineering (non-thesis) and MS in Maritime Systems (thesis or non-thesis), with specializations in: maritime environment, maritime management, maritime security, maritime structures, maritime system engineering, and maritime transportation.

University of Delaware (<http://www.engr.udel.edu/home/index.html>), a non-thesis based MS program offered jointly by the Physical Ocean Science and Engineering (POSE) program in the Graduate College of Earth, Ocean, and Environment (CMES) and the Ocean Engineering program of the Department of Civil and Environmental Engineering.

The last two programs on the list are known to us but not on the ABET list, as neither Stevens nor Delaware offer BS programs in Ocean Engineering and only BS programs are accredited. In addition, MS or MEng Coastal Engineering programs are offered at University of Florida and Louisiana State University, while Oregon State University offers a Master of Science in Civil Engineering with a concentration area in Coastal and Ocean Engineering. This list is not exhaustive, but includes all known major programs.

Of the programs on the list, our proposed core MS program appears closest to those at University of Rhode Island and TAMU, two other institutions with large and active Engineering and Marine Science programs. The fluid-structure interaction track, with its emphasis on sustainable construction in the coastal zone has some overlap with the URI program. However, the UM cap-stone course for the track, which will utilize the Air-Sea Interaction Saltwater Tank (ASIST) until 2013, and then the new SUSTAIN

(SURge-STructure-Atmosphere Interaction) facility, will offer unique opportunities for the OEN students to design and test structures in simulated hurricane conditions. The Maritime Security component has much overlap with a similar track at Stevens. This is not coincidental, as both originated with discussions and a subsequent grant by co-PIs by Graber at RSMAS/UM and colleagues at Stevens. The remote sensing component of the track, utilizing a RSMAS strength (including CSTARS, the Center for Southeastern Tropical Remote Sensing) will also be unique.

V. Program management

The Ocean Engineering Masters Program will be run by a director appointed by agreement of CoE and RSMAS Deans. The Director will be advised by a steering committee of 4 (2 appointed by CoE and 2 by RSMAS). Course approvals for new courses associated with this program will be the responsibility of the faculty of the school/college in which the course is listed. Course scheduling and teaching assignments will be coordinated by the Director in consultation with the Divisions/Departments in which the courses are listed.

VI. Budget

Most of the courses required for the minor are already in the books and offered on a regular basis. Four additional courses will be created: The core course "Introduction to Ocean Systems Engineering", the capstone course for each track, and two additional courses in the Remote Sensing & Maritime Security track. The addition of new curriculum is part of a broader expansion of teaching activity at RSMAS. Under its new financial model, RSMAS is transitioning to a 9-month salary support for its tenure track faculty. This transition will create opportunities for a variety of new courses to be taught at no additional financial cost to UM. All of the new courses will fall under this. The core Intro course will be team taught, and RSMAS-AMP faculty (Haus, Graber and Romeiser) have agreed to teach the remaining three as part of their regular teaching load.

Recurring costs are associated with the Track A capstone course utilizing the ASIST or SUSTAIN flumes. Estimated expenses include partial support of a lab technician REDACTED laboratory operations REDACTED and model fabrication and equipment replacement REDACTED. The latter figure is weakly dependent on enrollment, and assumes 5 students. This totals to REDACTED and covers power, water and other materials required as well as support a technician to work with the students. Recurring costs are associated with the Track B are for CSTARS satellite image costs REDACTED. In addition, non-recurring costs will be incurred for initial modifications to the ASIST flume REDACTED the acquisition of strain gauges for measurement of loading on structures REDACTED and appropriate model fabrication equipment REDACTED.

Tuition revenue generated to the program is REDACTED. Assuming 5 students initially, the program will generate revenues of REDACTED and incur costs of REDACTED for a net profit of REDACTED. Profits in future years will be REDACTED again based on only 5 students. Any profits made (or losses incurred) by the program will be shared by the CoE and RSMAS as agreed upon by their respective Deans.

VII. Space requirements

For the MS courses, classroom space on RSMAS and CG campuses are sufficient for program needs. Laboratory courses will be held in the ASIST facility until the SUSTAIN building is completed.

VII. Library Support

Library support, at either Richter or RSMAS is adequate for program needs. The following journals are available on-line through UM libraries

Annual review of fluid mechanics
Applied Acoustics
Applied ocean research
ASCE Journal of Environmental Engineering
ASCE Journal of Hydrologic Engineering
ASCE Journal of Irrigation and Drainage Engineering
ASCE Journal of Composites for Construction
ASCE International Journal of Geomechanics
ASCE Journal of Geotechnical & Geoenvironmental Engineering
ASCE Journal of Infrastructure Systems
ASCE Journal of Materials in Civil Engineering
ASCE Journal of Waterway, Port, Coastal, and Ocean Engineering
Coastal Engineering
Coastal Engineering Journal
Dynamics of atmospheres and oceans
Environmental fluid mechanics
Experimental thermal and fluid
Fluid dynamics
IEEE Journal of Ocean Engineering
IEEE Oceans conference proceedings
IEEE Transactions in Geosciences and Remote Sensing
Geophysical Research Letters
International journal of computational fluid dynamics
International journal of heat and fluid flow
Journal of Atmospheric and Oceanic Technology
Journal of Fluid Mechanics
Journal of Geophysical Research
Journal of ocean technology
Journal of offshore mechanics and Arctic engineering
Journal of Physical Oceanography
Journal of the Acoustical Society of America
Journal of the Atmospheric Sciences
Marine georesources & geotechnology
Ocean Engineering
Ocean modelling

Ocean news & technology
Ocean Science
Open ocean engineering journal
Theoretical and computational fluid dynamics

VIII. Graduate School Notice

In response to a query from Robyn (Faculty Senate) on what would be required from the Graduate School, Dean Scandura requested she be sent the "same material you are sending to the Faculty Senate with a cover memorandum" (email to Dr. Drennan, RSMAS, on 12-September-2011, cc'd to Faculty Senate).

UNIVERSITY OF MIAMI
COLLEGE of ENGINEERING




James M. Tien, Ph.D., DEng (h.c.), NAE
Distinguished Professor and Dean

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MEMORANDUM

TO: Professor Richard Williamson, UM Senate Chair
FROM: J.M. Tien 
DATE: August 5, 2013
SUBJECT: Reactivation of the MS Degree in Ocean Engineering

I am writing this memo to inform you that:

- 1) The College Council of the College of Engineering has voted unanimously in support of the reactivation of the MS Degree in Ocean Engineering.
- 2) The College of Engineering Faculty has voted unanimously in support of the reactivation of the MS Degree in Ocean Engineering.
- 3) I have approved the proposed budget.

I strongly support the reactivation of the MS Degree in Ocean Engineering.



M. Brian Blake, Ph.D.
Vice Provost for Academic Affairs
& Dean of the Graduate School

Graduate School
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MEMORANDUM

DATE: August 12, 2013
TO: Richard Williamson
Chair, Faculty Senate
FROM: M. Brian Blake, Ph.D. *M. Brian Blake*
Dean, The Graduate School
SUBJECT: Reactivation of the MS Degree in Ocean Engineering

As a follow up to the previous memorandum dated May 2, 2013, below is the clarification submitted by the authors regarding the areas of concern raised by the Graduate Council members:

- *Is the degree a 5-year BA/MA or a BA plus one year MS?*
This is a regular MS degree (in this case, MS in Ocean Engineering).
- *Is the degree more of an engineering degree or a marine science degree?*
It is an Engineering degree. However, it is administered jointly by CoE and RSMAS.
- *Demonstrate that there is no impact to the accreditation coming up next year.*
ABET only accredits undergraduate, not graduate, degrees. It should also have no impact on SACS accreditation this coming year since we will not be admitting students for at least one year.

Based on the above responses, the Graduate School supports the reactivation of the MS degree in Ocean Engineering.

cc: Roni Avissar, Dean, RSMAS
James Tien, Dean, College of Engineering
Martin Grosell, Associate Dean for Graduate Studies, RSMAS
Brian Haus, Chair, RSMAS
Office of Planning, Institutional Research and Assessment



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MEMORANDUM

DATE: August 9, 2013

TO: Dr. Shihab Asfour, Associate Dean for Academics
College of Engineering

FROM: David E. Wiles, Executive Director 
Assessment and Accreditation

SUBJECT: Reactivation of MS in Ocean Engineering

On 05/06/2013, the College of Engineering, jointly with the Rosenstiel School of Marine and Atmospheric Science, submitted a proposal notifying our office of their intent to reactivate the Master of Science in Ocean Engineering degree program. Based on the details of the proposal, the reactivation is not considered substantive and will not require formal approval from the Southern Association of Colleges and Schools (SACS) prior to proceeding with its reactivation. A notification letter was submitted to SACS back on May 16, 2013.

Please feel free to contact our office should you have any further questions (305) 284-9431.

cc: Faculty Senate
Dr. Brian Blake, Vice Provost and Graduate School Dean
Dr. James Tien, Dean, College of Engineering
Dr. Roni Avissar, Dean, School of Marine and Atmospheric Science



MEMORANDUM

TO: Professor Richard Williamson, UMI Senate Chair
FROM: Roni Avissar, Dean *Roni Avissar*
DATE: August 16, 2013
SUBJECT: Reactivation of the MS Degree in Ocean Engineering
Cc: Dean Tien, College of Engineering.

Over the last several years the faculty of the Rosenstiel School of Marine & Atmospheric Science (RSMAS) and the College of Engineering (CoE) have increasingly worked together to develop collaborative research opportunities to address critical national priorities such as resilient building technologies, national security, natural resources, and human health. The various science and engineering issues involved in the Deepwater Horizon oil spill in the Gulf of Mexico is a good example of how the disciplines come together to address crucial issues for society, the marine ecosystem, and more generally the environment. It is clear that these research challenges will increase in the coming decades as the nation and world respond to climate change and shifts in energy resources. Through these research efforts RSMAS and CoE faculty have come to realize that there is a significant need and opportunity to develop educational programs that enable students to address these challenges. The proposed MS program will build upon the strengths of CoE and RSMAS to create an opportunity for students that either unit alone could not achieve. It will enhance STEM education at the University of Miami and help it to move forward in multidisciplinary research collaborations in areas of high national priorities.

Furthermore, I am pleased to let you know that:

1. The RSMAS faculty present at the Faculty Meeting held on August 16, 2013 **voted unanimously** in support of the reactivation of this MS Degree in Ocean Engineering;
2. I unambiguously and enthusiastically support this program.

Roni Avissar, Ph.D.
Professor and Dean

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