

## MEMORANDUM

**TO:** UUPC  
**FROM:** Dr. P. Edgar An, Department of Ocean and Mechanical Engineering  
**SUBJECT:** Proposed Ocean Engineering Curricular Changes  
**DATE:** January 15, 2020

This memo is to describe the proposed curricular changes in the Ocean Engineering Program. Overall, six existing courses are no longer required in the program, five existing courses modified, one new course created, and one existing course added.

### **Existing Courses no longer Required**

1. EML 4534 (Computer Applications in ME II, 3 credit hours)
2. MAP 4306 (Engineering Math II, 3 credit hours)
3. EOC 4612C (Introduction to Electronics & Programming, 3 credit hours)
4. EEL 3111 (Circuits 1, 3 credit hours)
5. COP 2220 (Introduction to C Programming, 3 credit hours)
6. EGN 2213 (Computer Applications in Engineering I, 3 credit hours)

### **Existing Courses to be Modified**

1. EOC 3306 (Acoustics for Ocean Engineers, 3 credit hours)
2. EOC 3123 (OE Fluid Mechanics, 4 credit hours)
3. EOC 4193 (Ocean Thermal Systems, 3 credit hours)
4. EOC 3130L (OE Lab, 3 credit hours)
5. OCE 3008 (Introduction to Oceanography, 3 credit hours)

### **New Course to be Created**

1. EOC 4133 (Introduction to Programming for Ocean & Mechanical Engineers, 3 credit hours, elective)

### **Existing Courses to be Added**

1. EGM 4045 (Electro-Mechanical Devices, 3 credit hours, elective)

### **Rationale for the Changes**

1. Computer Applications II (EML 4534) no longer covers the important topic of partial differential equations that are useful for three of the OE core courses: Acoustics for Ocean Engineers (EOC 3306), OE Fluid Mechanics (EOC 3123), and Ocean Thermal Systems (EOC 4193). As such, we will remove this course from the OE Program. We will remove this as a pre-requisite for OE Fluid Mechanics, Acoustics for Ocean Engineers, and Ocean Thermal Systems.
2. To streamline the OE Program in terms of credit hours requirement, we will replace Circuits I (EEL 3111) and Introduction to Electronics & Programming (EOC 4612C) by an existing course called Electro-Mechanical Devices (EGM 4045). This course covers basic circuits, signal filtering, AC/DC motors and micro-controller interfaces, and should adequately cover the two dropped courses. Since Circuits I is a pre-req for Acoustics for Ocean Engineers (EOC 3306), it will now be EGM 4045. With this change, the OE Program credit hours requirement is reduced by 3 hours.
3. To streamline the OE Program in terms of credit hours requirement, we will replace Intro to C Programming (COP 2220) and Computer Applications in Engineering I (EGN 2213) by a new course called Introduction to Programming for Ocean & Mechanical Engineers (EOC 4133). This new course covers C and Matlab programming, with focus on ocean and mechanical applications, and should adequately cover the two dropped courses. With this change, the OE Program credit hours requirement is reduced by another 3 hours.
4. Introduction to Oceanography (OCE 3008) currently requires a pre-req of either General Chemistry 1 (CHM 2045) or Engineering Chemistry (EGN 2095). Since Engineering Chemistry has not been offered for many years, we will now require General Chemistry as the only pre-req for this course.
5. OE Lab (EOC 3130L) currently has the following pre-reqs: Introduction to C Programming (COP 2220), General Chemistry I and Lab (CHM 2045 & 2045L), General Physics for Engineers and Lab (PHY 2044 and 2049L), and a co-requisite: Engineering Math I (MAP 3305). This course no longer covers content that requires in-depth ordinary differential equations. We will remove the co-req from this course. In addition, we will replace Intro to C Programming with the new course Intro to Programming for Ocean and Mechanical Engineers.

With these changes, the OE Program credit hours requirement are reduced from 136 to 127. The corresponding course syllabi and course changes/new course forms for these courses are attached.

## Academic Program – Ocean Engineering Program

The table of courses in the Ocean Engineering Core should be changed to the following. The changes consist of:

**1) Courses That Are No Longer Required (red color):**

Intro to C Programming (COP 2220), Circuits 1 (EEL 3111), Introduction to Electronics & Programming (EOC 4612C), Engineering Math II (MAP 4306), Computer Applications in Engineering I (EGN 2213), and Computer Applications in ME II (EML 4534).

**2) Added Courses (green color):**

Electro-Mechanical Devices (EGM 4045), Introduction to Programming for Ocean and Mechanical Engineers (EOC 4133).

<b>Ocean Engineering Core</b>		
<del>Circuits 1</del>	<del>EEL 3111</del>	<del>3</del>
<del>Introduction to Electronics and Programming</del>	<del>EOC 4612C</del>	<del>3</del>
Electro-Mechanical Devices	EGM4045	3
Intro to Programming for Ocean & Mechanical Engineers	EOC 4133	3
Fundamentals of Engineering	EGN 1002	3
Statics	EGN 3311	3
Dynamics	EGN 3321	3
Strength of Materials	EGN 3331	3
Engineering Thermodynamics	EGN 3343	3
Engineering Materials 1	EGN 3365	3
Fabrication of OE Systems	EOC 2801	1
Vibration Synthesis and Analysis	EGN 4323	3
Ocean Engineering Fluid Mechanics	EOC 3123	4
Ocean Engineering Lab	EOC 3130L	3
Materials 1 – Marine Topics	EOC 3213	1
Acoustics for Ocean Engineers	EOC 3306	3
Structural Analysis	EOC 3410C	3
Ocean Engineering Systems Control and Design	EOC 4804	3
Ocean Engineering Systems Control and Design Project	EOC 4804L	4
<b>Choose one of the following two junior elective courses:</b>		
Innovative Sensing and Actuation Technology	EGN 4670C	3
Finite Element Analysis for Engineering Design	EGM 4350	3
<b>Choose two of the following four courses:</b>		

Ocean Structures	EOC 4412	3
Ship Hydrodynamics	EOC 4124	3
Underwater Acoustics	EOC 4307C	3
Marine Materials and Corrosion	EOC 4201C	3

<b>Non-Engineering Core</b> (grade of "C" or higher required)		
<del>Introduction to Programming in C</del>	<del>COP 2220</del>	<del>3</del>
Engineering Math 1	MAP 3305	3
<del>Engineering Math 2 or</del>	<del>MAP 4306</del>	<del>3 or</del>
<del>Computer Applications in ME 2</del>	<del>EML 4534</del>	<del>3</del>
<del>Computer Applications in Engineering 1</del>	<del>EGN 2213</del>	<del>3</del>
Engineering Graphics	EGN 1111C	3
Oceanography	OCE 3008	3

The sample four-year program of study for BSOE should be changed to the following (the changes are highlighted in red).

<b>First Year, Fall (14 credits)</b>		
College Writing 1	ENC 1101*	3
General Chemistry 1	CHM 2045	3
General Chemistry 1 Lab	CHM 2045L	1
Calculus with Analytic Geometry 1	MAC 2311	4
Fundamentals of Engineering	EGN 1002	3

<b>First Year, Spring (14 credits)</b>		
College Writing 2	ENC 1102*	3
Oceanography	OCE 3008	3
General Physics for Engineers 1	PHY 2048	3
General Physics 1 Lab	PHY 2048L	1
Calculus with Analytic Geometry 2	MAC 2312	4

<del>First Year, Summer (10 credits)</del>		
<b>First Year, Summer (7 credits)</b>		
Calculus with Analytic Geometry 3	MAC 2313	4
<del>Introduction to Programming in C</del>	<del>COP 2220</del>	<del>3</del>
Foundations of Humanities course		3

<b>Second Year, Fall (13 credits)</b>		
Engineering Math 1	MAP 3305	3
Physics for Engineers 2	PHY 2044	3
General Physics 2 Lab	PHY 2049L	1
Statics	EGN 3311	3
Engineering Graphics**	EGN 1111C	3

<b>Second Year, Spring (12 credits)</b>		
Computer Applications in Engineering 1	EGN 2213	3
Intro to Programming for Ocean & Mechanical Engineers	EOC 4133	3
Dynamics	EGN 3321	3
Engineering Thermodynamics	EGN 3343	3
Ocean Engineering Lab	EOC 3130L	3

<b>Second Year, Summer (9 credits)</b>		
<b>Second Year, Summer (6 credits)</b>		
Strength of Materials	EGN 3331	3
Circuits 1	EEL 3114	3
Foundations of Humanities course*		3

<b>Third Year, Fall (15 credits)</b>		
<b>Third Year, Fall (12 credits)</b>		
Dynamic Systems	EGN 4432	3
Electro-Mechanical Devices	EEM 4045	3
Introduction to Electronics and Programming	EOC 4612C	3
Engineering Mathematics 2 or	MAP 4306	3 or
Computer Applications in ME 2	EML 4534	3
Engineering Materials 1	EGN 3365	3
Foundations of Global Citizenship course*		3

<b>Third Year, Spring (14 credits)</b>		
Acoustics for Ocean Engineers	EOC 3306	3
Ocean Engineering Fluid Mechanics	EOC 3123	4
Ocean Thermal Systems	EOC 4193	3
Structural Analysis	EOC 3410C	3
Fabrication of Ocean Engineering Systems	EOC 2801	1

<b>Third Year, Summer (9 credits)</b>		
Vibrations	EGN 4323	3
Finite Element Analysis for Engineering Design***	EGM 4350 or	3
Innovative Sensing and Actuation Technology***	EGN 4670C	3
<u>Foundations of Society and Human Behavior course</u>		3

<b>Fourth Year, Fall (13 credits)</b>		
Ocean Systems Control and Design	EOC 4804	3
Ocean and Environmental Data Analysis	EOC 4631C	3
Materials 1 - Marine Topics	EOC 3213	1
Ocean Wave Mechanics	EOC 4422	3
<u>Foundations of Global Citizenship course*</u>		3

<b>Fourth Year, Spring (13 credits)</b>		
Ocean Engineering Systems Control and Design Project	EOC 4804L	4
Ship Hydrodynamics****	EOC 4124	3
Marine Materials and Corrosion****	EOC 4201C	3
Underwater Acoustics****	EOC 4307C	3
Ocean Structures****	EOC 4412	3
<u>Foundations of Society and Human Behavior course</u>		3
<b>Total</b>		<b>136</b>
<b>Total</b>		<b>127</b>

\* WAC (Gordon Rule) course.

\*\* Engineering Graphics should typically be taken at FAU.

\*\*\* Choose one course from these two courses.

\*\*\*\* Choose two courses from these four senior elective courses.

# Course Descriptions – Ocean Engineering Program

## 1. The following courses are no longer required in the OE Program

~~Circuits 1 (EEL 3111) 3 credits~~  
~~Introduction to Programming in C (COP 2220) 3 credits~~  
(See [Electrical Engineering courses, this section](#))

~~Computer Applications 1 (EGN 2213) 3 credits~~  
~~Computer Applications 2 (EML 4534) 3 credits~~  
Electro-Mechanical Devices (EGM 4045) 3 credits  
(See [Mechanical Engineering courses, this section](#))

## 2. Add the following course

### Introduction to Programming for Ocean and Mechanical Engineers (EOC 4133) 3 credits

Prerequisite: Calculus II (MAC 2312)

This course will introduce the fundamentals of programming required for Ocean and Mechanical Engineering applications and data analysis using MATLAB and C/C++. The material will cover basic concepts such as arrays and vectors, strings, 'for' and 'while' loops, conditional 'if-else' statements, Boolean logic, and writing modular user-defined functions. The emphasis will be on Ocean and Mechanical Engineering applications.

## 3. Modify the following courses

### **Ocean Engineering Fluid Mechanics (EOC 3123) 4 credits**

Prerequisites: EGN 3321 or equivalent, EGN 3343 or equivalent, EOC 3130L ~~and (MAP 4306 or EML 4534)~~, all with minimum grades of "C"

The first course of a two-semester study of incompressible-fluid flow and its application to ocean engineering with emphasis on fluid properties, hydrostatic forces, buoyancy and stability of floating bodies including metacentric height concepts, fluid dynamics, dimensional analysis, modeling, real flows in closed conduits and open channels, boundary-layers, lift and drag, turbo-machines, computational and experimental methods, resistance and propulsion of marine vehicles, and design problems. A grade of "C" or better is required for the major.

### **Ocean Engineering Laboratory (EOC 3130L) 3 credits**

Prerequisites: CHM 2045, CHM 2045L, PHY 2044, PHY 2049L and EOC 4133 ~~COP 2220~~, all with minimum grades of "C"  
~~Corequisite: MAP 3305~~

Introduction to engineering laboratory methods and techniques with experiences in measurements, experiment planning, data recording, and laboratory report preparation. Five major lab experiences, including one or more at sea, are included.

### **Acoustics for Ocean Engineers (EOC 3306) 3 credits**

Prerequisites: ~~EEL 3111~~, EGM 4045, EOC 3130L ~~and (MAP 4306 or EML 4534)~~, all with minimum grades of "C"

Fundamentals of acoustics. Sound propagation in fluids; speech, hearing, noise, architectural acoustics, loudspeakers, microphones, transducers, underwater sound transmission.

### **Ocean Thermal Systems (EOC 4193) 3 credits**

Prerequisites: EGN 3343 ~~and (MAP 4306 or EML 4534)~~, all with minimum grades of "C"

Corequisite: EOC 3123

Basic concepts of heat and mass transfer concepts with application to the ocean and ocean systems. Applications will include power cycles and heat exchangers in ocean systems. The interactive environmental processes involving solar radiation, convective ocean circulation, evaporation and mixtures will be considered.

### **Oceanography (OCE 3008) 3 credits**

Prerequisite: CHM 2045 ~~or EGN 2095~~ with minimum grade of "C"

Nature of sea water; trace and major constituents; the ocean carbon, phosphorous, and nitrogen cycles; basins, continental shelf, deep ocean floor; thermal vents, manganese nodules, marine sediments; marine life; plate tectonics; estuaries and

mixing processes; pollution; corrosion and biofouling; winds, waves, tides, currents and ocean circulation processes; energy (heat, light, sound); depth, temperature, salinity, and other physical effects.