

MEMORANDUM

TO: UUPC
FROM: Dr. P. Edgar An, Department of Ocean and Mechanical Engineering
SUBJECT: Proposed Ocean Engineering Curricular Changes
DATE: February 13, 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, and two existing courses 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)

Existing Courses to be Added

1. EGM 4045 (Electro-Mechanical Devices, 3 credit hours)
2. EEL 2161C (C for Engineers, 3 credit hours)

Rationale for the Changes

1. Computer Applications II (EML 4534) is an additional Math course beyond the number required by ABET. This reduces OE credit hour requirements by 3 hours.

2. We consolidate Circuits I (EEL 3111) and Introduction to Electronics & Programming (EOC 4612C) into the existing course 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 replaced courses. Since Circuits I is a pre-req for Acoustics for Ocean Engineers (EOC 3306), it will instead be EGM 4045. With this change, the OE Program credit hours requirement is reduced by 3 hours.
3. We consolidate Intro to C Programming (COP 2220) and Computer Applications in Engineering I (EGN 2213) into an existing EE course called C for Engineers (EEL 2161C). 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 I as the only pre-req for this course.
5. OE Lab (EOC 3130L) currently has Engineering Math I (MAP 3305) as a co-requisite. The UG Committee has determined that OE Lab no longer covers contents that require in-depth knowledge of ordinary differential equations. We will therefore remove MAP 3305 as a co-requisite to OE Lab. In addition, we will replace the pre-requisite Intro to C Programming (COP 2220) to OE Lab with an existing EE course called C for Engineers (EEL 2161C). General Chemistry I and Lab (CHM 2045 & 2045L), General Physics for Engineers and Lab (PHY 2044 and 2049L), will continue to be pre-requisite to OE Lab.

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), C for Engineers (EEL 2161C).

| Ocean Engineering Core | | |
|---|----------------------|--------------|
| Circuits 1 | EEL 3111 | 3 |
| Introduction to Electronics and Programming | EOC 4612C | 3 |
| Electro-Mechanical Devices | EGM 4045 | 3 |
| C for Engineers | EEL 2161C | 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 |
| Choose one of the following two junior elective courses: | | |
| Innovative Sensing and Actuation Technology | EGN 4670C | 3 |
| Finite Element Analysis for Engineering Design | EGM 4350 | 3 |
| Choose two of the following four courses: | | |

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

| | | |
|--|-----------|------|
| Non-Engineering Core (grade of "C" or higher required) | | |
| Introduction to Programming in C | COP 2220 | 3 |
| Engineering Math 1 | MAP 3305 | 3 |
| Engineering Math 2 or | MAP 4306 | 3 or |
| Computer Applications in ME 2 | EML 4534 | 3 |
| Computer Applications in Engineering 1 | EGN 2213 | 3 |
| 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).

| | | |
|--------------------------------------|-----------|---|
| First Year, Fall (14 credits) | | |
| 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 |

| | | |
|--|-----------|---|
| First Year, Spring (14 credits) | | |
| 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 |

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

| Second Year, Fall (13 credits) | | |
|---------------------------------------|-----------|---|
| 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 |

| Second Year, Spring (12 credits) | | |
|---|---------------------|--------------|
| Computer Applications in Engineering 1 | EGN 2213 | 3 |
| C for Engineers | EEL 2161C | 3 |
| Dynamics | EGN 3321 | 3 |
| Engineering Thermodynamics | EGN 3343 | 3 |
| Ocean Engineering Lab | EOC 3130L | 3 |

| Second Year, Summer (9 credits) | | |
|--|---------------------|--------------|
| Second Year, Summer (6 credits) | | |
| Strength of Materials | EGN 3331 | 3 |
| Circuits 1 | EEL 3111 | 3 |
| Foundations of Humanities course* | | 3 |

| Third Year, Fall (15 credits) | | |
|---|---------------------|-----------------|
| Third Year, Fall (12 credits) | | |
| Dynamic Systems | EGN 4432 | 3 |
| Electro-Mechanical Devices | EGM 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 |

| Third Year, Spring (14 credits) | | |
|--|-----------|---|
| 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 |

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| Third Year, Summer (9 credits) | | |
|---|-------------|---|
| 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 |

| Fourth Year, Fall (13 credits) | | |
|--|-----------|---|
| 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 |

| Fourth Year, Spring (13 credits) | | |
|---|-----------|------------|
| 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 |
| Total | | 136 |
| Total | | 127 |

* 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~~

(See [Mechanical Engineering courses, this section](#))

2. Add the following courses

C for Engineers (EEL 2161C) 3 credits

Introduces the fundamental capabilities of C++ and MATLAB. Illustrates the numerical problem-solving process, testing and interpretation of results through a variety of engineering examples and applications.

(See [Electrical Engineering courses, this section](#))

Electro-Mechanical Devices (EGM 4045) 3 credits

Introduction to basic DC and AC circuits; passive and active filtering; DC and AC motors; and Arduino micro-controller for hardware and software interfaces.

(See [Mechanical Engineering courses, this section](#))

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 EEL 2161C ~~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 2005~~ 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.