

OCEAN ENGINEERING MAJOR (B.S.)

<https://ceps.unh.edu/ocean-engineering/program/bs/ocean-engineering-major>

Description

Ocean engineering is a field of study that seeks to solve engineering problems associated with the ocean, including those problems associated with the sustainable utilization of ocean resources and the scientific exploration and study of the ocean environment. Ocean engineering is an interdisciplinary field with roots in mechanical, electrical, civil, and environmental engineering, with strong ties to physical, chemical, biological, and geological oceanography. Students of ocean engineering are best served when they are formally trained inside a framework that fuses the expertise of these often-disparate fields.

The BSOE curriculum provides students with a solid engineering core and prepares students for professional engineering careers or for graduate study. The BSOE starts with foundational classes in math, physics, chemistry, and engineering computing, along with introductions to ocean engineering through seminars and oceanography coursework. Students develop their engineering acumen through coursework and laboratory studies that are focused on analysis, experimentation, and design. Students proceed to increasingly advanced coursework in ocean instrumentation, waves and tides, the design of ocean structures, coastal engineering, ocean measurements, and ocean acoustics. Opportunities exist for at least four technical electives, which help students gain further competence in an area of their choice. Students finish their curriculum with a two-semester senior capstone design project. Elective courses in the arts, humanities, and the social sciences are included to provide a well-rounded education.

Students work with an advisor to plan a program that is based on the required coursework for the degree. Some ocean engineering elective courses may not be offered every year.

The Ocean Engineering (B Sci in Ocean Engineering) program is accredited by the Engineering Accreditation Commission of ABET, <http://www.abet.org>, under the General Criteria and the Program Criteria for Naval Architecture, Marine Engineering, Ocean Engineering and Similarly Named Engineering Programs.

Requirements

Degree Requirements

Minimum Credit Requirement: 128 credits

Minimum Residency Requirement: 32 credits must be taken at UNH

Minimum GPA: 2.0 required for conferral*

Core Curriculum Required: Discovery & Writing Program Requirements

Foreign Language Requirement: No

All Major, Option and Elective Requirements as indicated.

*Major GPA requirements as indicated.

Major Requirements

Technical Electives

The ocean engineering program curriculum requires four technical electives that are CEPS 600-level or higher courses that have been approved by the OE undergraduate curriculum committee. Sequences have been identified that will provide students more in-depth opportunities in one of the ocean engineering sub-areas. One of the technical electives needs to be a program-approved statistics course (OE 764 Spectral Analysis of Geophysical Time Series Data, MATH 644 Statistics for Engineers and Scientists, or ESCI 701 Quantitative Methods in Earth Sciences).

Discovery Program

Students must satisfy the University's Discovery Program requirements. The following features are unique to students in the Ocean Engineering program: students are required to take an Inquiry course or an Inquiry Attribute course during their first two years. This is satisfied with ESCI 501 Introduction to Oceanography. The Discovery Environment, Technology, and Society category requirement is met upon receiving a B.S. degree in ocean engineering. The Discovery Social Science category must be satisfied with either ECON 402 Principles of Economics (Micro) or EREC 411 Environmental and Resource Economics Perspectives. The Discovery senior capstone experience is satisfied with TECH 797 Undergraduate Ocean Research Project.

Grade-Point Average

In order to graduate with an ocean engineering B.S. degree, students must have at least a 2.0 grade-point average in all engineering and science courses, including required technical electives, normally taken as department requirements after the start of the junior year as defined in the degree plan below.

Predictor courses: To enter the sophomore year, students must achieve a greater than (but not equal to) 2.00 GPA in PHYS 407 General Physics I and MATH 426 Calculus II with no grade below a C.

To enter the junior year, students must achieve a minimum GPA of 2.00 in ME 525 Statics, ME 526 Mechanics of Materials, and ME 503 Thermodynamics with only one C- grade allowed and no grades below C-.

Students are allowed two repeats of these predictor courses to achieve the predictor rule requirements before being removed from the program. This can be a single class repeated twice or two classes repeated once. Students are also removed from the program if they obtain a semester GPA <1.5 three times. Students may petition to be reinstated after one year out of the program.

Transfer Policy for UNH Students

CEPS Students: To transfer into the freshman or sophomore year, students must earn a combined GPA greater than (but not equal to) 2.00 in PHYS 407 General Physics I and MATH 426 Calculus II with no grade below a C in these two courses.

If students are enrolled in ME 525 Statics (or CEE 500 Statics for Civil Engineers), ME 526 Mechanics of Materials (or CEE 501 Strength of Materials), or ME 503 Thermodynamics, they must earn a combined GPA of 2.00 with no grade below a C- in two of these courses with only one C- grade allowed to transfer in and advance to the junior year.

Non-CEPS Students: To transfer into the Ocean Engineering B.S. from another college at UNH, students have to satisfy the CEPS college

transfer policy as well as the Ocean Engineering program transfer policies listed above according to status.

| Code | Title | Credits |
|---|--|---------|
| Required Courses | | |
| CHEM 405 or CHEM 403 & CHEM 404 | Chemical Principles for Engineers General Chemistry I and General Chemistry II | 4 |
| ECON 402 or EREC 411 | Principles of Economics (Micro) Environmental and Resource Economics Perspectives | 4 |
| ECE 537 | Introduction to Electrical Engineering | 4 |
| ESCI 501 | Introduction to Oceanography | 4 |
| ESCI 720 | Ocean Measurements Lab | 4 |
| IAM 550 | Introduction to Engineering Computing | 4 |
| MATH 425 | Calculus I | 4 |
| MATH 426 | Calculus II | 4 |
| MATH 525 & MATH 526 or MATH 527 & MATH 528 | Linearity I and Linearity II Differential Equations with Linear Algebra and Multidimensional Calculus | 12 |
| ME 503 | Thermodynamics | 3 |
| ME 525 | Statics | 4 |
| ME 526 or CEE 501 | Mechanics of Materials Strength of Materials | 3 |
| ME 608 | Fluid Dynamics | 3 |
| ME 627 | Dynamics | 3 |
| OE 400 | Ocean Engineering Seminar | 1 |
| OE 401 | Ocean Engineering Seminar | 1 |
| OE 490 | Introduction to Ocean Engineering | 4 |
| OE 610 | Ocean Instrumentation Lab | 4 |
| OE 754 | Ocean Waves and Tides | 4 |
| OE 757 | Coastal Engineering and Processes | 3 |
| OE 758 | Design of Ocean Structures | 3 |
| OE 765 | Underwater Acoustics | 3 |
| PHYS 407 | General Physics I | 4 |
| PHYS 408 | General Physics II | 4 |
| TECH 797 | Undergraduate Ocean Research Project | 2 |

Technical Electives: 600-level or higher, choose four electives; at least one of the four courses must be 4 credits.

Degree Plan

The degree plan is considered a guideline and may be modified to suit student needs and desires within the constraints of meeting minimum credit hours, course prerequisites, and non-major elective course requirements.

First Year

| Fall | | Credits |
|----------------------------|-----------------------------------|----------------|
| MATH 425 | Calculus I ¹ | 4 |
| PHYS 407 | General Physics I ² | 4 |
| OE 400 | Ocean Engineering Seminar | 1 |
| Discovery Program Elective | | 4 |
| Discovery Program Elective | | 4 |
| Credits | | 17 |
| Spring | | |
| ENGL 401 | First-Year Writing ³ | 4 |
| MATH 426 | Calculus II | 4 |
| OE 490 | Introduction to Ocean Engineering | 4 |
| PHYS 408 | General Physics II | 4 |
| Discovery Program Elective | | 4 |
| Credits | | 20 |

Second Year

| Fall | | |
|---|--|-----------|
| CHEM 405 or CHEM 403 and CHEM 404 | Chemical Principles for Engineers ² or General Chemistry I and General Chemistry II | 4 |
| ESCI 501 | Introduction to Oceanography (satisfies the Discovery Inquiry requirement) ⁴ | 4 |
| MATH 528 or MATH 525 | Multidimensional Calculus ⁵ or Linearity I | 4 |
| ME 525 | Statics | 4 |
| Credits | | 16 |
| Spring | | |
| IAM 550 | Introduction to Engineering Computing | 4 |
| MATH 527 or MATH 526 | Differential Equations with Linear Algebra ⁵ or Linearity II | 4 |
| ME 503 | Thermodynamics | 3 |
| ME 526 or CEE 501 | Mechanics of Materials or Strength of Materials | 3 |
| OE 401 | Ocean Engineering Seminar | 1 |
| Credits | | 15 |

Third Year

| Fall | | |
|---------------------------------|--|-----------|
| ECE 537 | Introduction to Electrical Engineering | 4 |
| ME 608 | Fluid Dynamics | 3 |
| ME 627 | Dynamics | 3 |
| OE 754 | Ocean Waves and Tides | 4 |
| Credits | | 14 |
| Spring | | |
| OE 610 | Ocean Instrumentation Lab | 4 |
| OE 757 | Coastal Engineering and Processes | 3 |
| OE 758 | Design of Ocean Structures | 3 |
| Technical Elective ⁶ | | 4 |
| Credits | | 14 |

Fourth Year

| Fall | | |
|---------------------------------|--------------------------------------|----------------|
| ESCI 720 | Ocean Measurements Lab | 4 |
| OE 765 | Underwater Acoustics | 3 |
| TECH 797 | Undergraduate Ocean Research Project | 2 |
| Discovery Program Elective | | 4 |
| Technical Elective ⁶ | | 4 |
| Credits | | 17 |
| Spring | | |
| TECH 797 | Undergraduate Ocean Research Project | 2 |
| Technical Elective ⁶ | | 3-4 |
| Technical Elective ⁶ | | 3-4 |
| Discovery Program Elective | | 4 |
| Discovery Program Elective | | 4 |
| Credits | | 16-18 |
| Total Credits | | 129-131 |

¹ MATH 425 Calculus I satisfies the Discovery Foundation Quantitative Reasoning category.

- ² PHYS 407 General Physics I or CHEM 405 Chemical Principles for Engineers or CHEM 403 General Chemistry I and CHEM 404 General Chemistry II satisfies the Discovery Physical Science (with lab) category.
- ³ ENGL 401 First-Year Writing satisfies the Discovery Foundation Writing Skills category.
- ⁴ ESCI 501 Introduction to Oceanography satisfies the Discovery Inquiry requirement.
- ⁵ MATH 525 Linearity I and MATH 526 Linearity II may be substituted for MATH 527 Differential Equations with Linear Algebra and MATH 528 Multidimensional Calculus. The MATH 525 and MATH 526 sequence will also count as one Technical Elective.
- ⁶ Total technical elective credits must be at 14 credits or higher to meet the UNH required total of 128 credits for graduation

Student Learning Outcomes

The Student Learning Outcomes specific to the Ocean Engineering Program are provided below:

- (1) ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science and math. Knowledge of fluid mechanics and hydrostatics with depth in at least one. An ability to apply solid mechanics and dynamics through multivariate calculus and differential equations. Knowledge of oceanography, water waves, and underwater acoustics. Ability to apply probability and applied statistics.
- (2) ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety and welfare, as well as global, cultural, social, environmental and economic factors.
- (3) ability to communicate effectively with a range of audiences.
- (4) ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments which must consider the impact of engineering solutions in global, economic, environmental and societal contexts.
- (5) ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.
- (6) ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.
- (7) ability to acquire and apply new knowledge as needed, using appropriate learning strategies.