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 courses shown in the ocean engineering degree plan below that totals not less than 128 credits. 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. Some ocean engineering elective courses may not be offered every year.

Requirements

Technical Elective Requirements:

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 Requirements:

Students must satisfy the University's Discovery Program requirements. The following features are unique to students in the Ocean Engineering program:

As is the case across the University, all 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 Requirements:

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 into the Department of Mechanical Engineering:

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 Department of Mechanical Engineering from another college at UNH, students have to satisfy the CEPS college transfer policy as well as the Department of Mechanical Engineering transfer policies listed above according to status.

List of Required Courses:

Code	Title	Credits
CHEM 405	Chemical Principles for Engineers	4
or CHEM 403 & CHEM 404	General Chemistry I and General Chemistry II	
ECON 402	Principles of Economics (Micro)	4
or EREC 411	Environmental and Resource Economics Perspectives	
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	8-12
ME 503	Thermodynamics	3
ME 525	Statics	4
ME 526	Mechanics 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

Course	Title	Credits
First Year		
Fall		
MATH 425	Calculus I [1]	4
OE 400	Ocean Engineering Seminar	1
PHYS 407	General Physics I [2]	4
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 (satsifies 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	Mechanics 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 Outcomes consist of the ABET 1-7 general requirements for all engineering programs with four additional outcomes specific to the Ocean Engineering program which are subsets of (1).

- (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.