

OCEAN ENGINEERING MAJOR

Program Curriculum

Code	Title	Credits
Degree Core Requirements		
ESM 2114	Statics & Structures	3
MATH 2114	Introduction to Linear Algebra	3
MATH 2204	Introduction to Multivariable Calculus	3
AOE 2054	Electronics for Aerospace and Ocean Engineers	3
AOE 2074	Computational Methods	2
ESM 2304	Dynamics	3
AOE 2024	Thin-Walled Structures	3
PHYS 2306	Foundations of Physics	4
MATH 4564	Operational Methods for Engineers	3
AOE 3014	Fluid Dynamics for Aerospace and Ocean Engineers	3
AOE 3034	System Dynamics and Control	3
Subtotal		33
Major Requirements		
AOE 2204	Introduction to Ocean Engineering	3
AOE 3214	Ocean Wave Mechanics	3
AOE 3224	Ocean Structures	3
AOE 3234	Ocean Vehicle Dynamics	3
AOE 3264	Thermodynamics and Marine Propulsion	3
AOE 4205	Experiments for Ocean Vehicle Design	1
AOE 4206	Experiments for Ocean Vehicle Design	1
AOE 4265	Ocean Vehicle Design	3
AOE 4266	Ocean Vehicle Design	3
GEOS 3034	Oceanography	3
STAT 4705	Probability and Statistics for Engineers	3
Subtotal		29
Technical Electives		
Select nine credit hours of technical electives.		9
Select nine credit hours of track technical electives.		9
Subtotal		18
Pathways to General Education		
<i>Pathways Concept 1 - Discourse</i>		
ENGL 1105	First-Year Writing (1F)	3
ENGL 1106	First-Year Writing (1F)	3
Select one of the following:		3
AOE 3054	Experimental Methods (1A)	
AOE 4205 & AOE 4265	Experiments for Ocean Vehicle Design and Ocean Vehicle Design (1A)	
AOE 4206 & AOE 4266	Experiments for Ocean Vehicle Design and Ocean Vehicle Design (1A)	
<i>Pathways Concept 2 - Critical Thinking in the Humanities</i>		
Select six hours in Pathway 2 (https://catalog.vt.edu/course-search/?attrs_pathways=attrs_pathways_G02)		6
<i>Pathways Concept 3 - Reasoning in the Social Sciences</i>		
Select three hours in Pathway 3 (https://catalog.vt.edu/course-search/?attrs_pathways=attrs_pathways_G03)		3
ECON 2005	Principles of Economics	3

Pathways Concept 4 - Reasoning in the Natural Sciences

CHEM 1035 & CHEM 1045	General Chemistry and General Chemistry Laboratory	4
PHYS 2305	Foundations of Physics	4

Pathways Concept 5 - Quantitative and Computational Thinking

MATH 1225	Calculus of a Single Variable (5F ; C-)	4
MATH 1226	Calculus of a Single Variable (5F)	4
MATH 2214	Introduction to Differential Equations (5A)	3

Pathways Concept 6 - Critique and Practice in Design and the Arts

Select three hours in Pathway 6a (https://catalog.vt.edu/course-search/?attrs_pathways=attrs_pathways_G06A)		3
ENGE 1215 & ENGE 1216	Foundations of Engineering and Foundations of Engineering (6D ; C-)	4

Pathways Concept 7 - Critical Analysis of Identity and Equity in the United States

Pathways 7 should be double counted with either Pathways 2, 3, or 6a to avoid taking any additional credit hours.

Subtotal		47
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Total Credits **127**

MATH Elective

All AE students must take MATH 4574 Vector and Complex Analysis for Engineers, MATH 4404 Applied Numerical Methods/AOE 4404 Applied Numerical Methods or STAT 4705 Probability and Statistics for Engineers on an A/F basis. STAT 4705 Probability and Statistics for Engineers is required for OE majors. AOE 5404 Numerical Methods for Aerospace and Ocean Engineering may be substituted in place of AOE 4404 Applied Numerical Methods.

Technical Electives

The AOE department requires 18 credits of technical electives, all of which must be taken on an A/F basis.. **Students are required to take a minimum of 9 credits from one of the approved Tracks.** If a track includes a foundational course, the foundational course is required in that track, but it does not necessarily need to be taken first unless it is a prerequisite. The remaining credits must be AOE courses not otherwise required for the major. Up to 6 of the 18 credits may be non-AOE technical courses selected either from the Tracks or from the list below. Students pursuing both AE and OE majors may fill all technical elective requirements with required courses from their second major. Otherwise, required courses may not double count as (track) tech electives. Courses other than those below may be acceptable as technical electives; however, substitutions must be approved by the AOE Academic Advisor **before the course is taken**. Students are responsible for the satisfaction of prerequisites required for their chosen technical electives.

Code	Title	Credits
CEE 4384	Coastal Engineering	3
CEE 4674	Airport Planning and Design	3
CHEM 4615	Physical Chemistry for the Life Sciences	3
CS 1044	Introduction to Programming in C	3
CS 1054	Introduction to Programming in Java	3
CS 1064	Introduction to Programming in Python	3
CS 1114	Introduction to Software Design	3
CS 2064	Intermediate Programming in Python	3
CS 2114	Software Design and Data Structures	3

ECE 1574	Object-Oriented Engineering Problem Solving with C++	3	NSEG 3145	Fundamentals of Nuclear Engr	3
ECE 3054	Electrical Theory	3	NSEG 3146	Fundamental of Nuclear Engr	3
ECE 3714	Introduction to Control Systems	3	PHIL/MGT 4324	Business and Professional Ethics	3
ECE 4164	Introduction to Global Positioning System (GPS) Theory and Design	4	PHYS 3324	Modern Physics	4
ECE 4364	Alternate Energy Systems	3	PHYS 3405	Intermediate Electricity and Magnetism	3
ECE 4624	Digital Signal Processing And Filter Design	3	PHYS 3406	Intermediate Electricity and Magnetism	3
ECE 4634	Digital Communications	3	PHYS 3655	Introduction to Astrophysics	3
ECE 4644	Satellite Communications	3	PHYS 3656	Introduction to Astrophysics	3
ENGR 3124	Introduction to Green Engineering	3	PHYS 4455	Introduction to Quantum Mechanics	3
ESM/MSE 3054	Mechanical Behavior of Materials	3	PHYS 4456	Introduction to Quantum Mechanics	3
ESM 4024	Advanced Mechanical Behavior of Materials	3	PHYS 4504	Introduction to Nuclear and Particle Physics	3
ESM 4044	Mechanics of Composite Materials	3	PHYS 4554	Introduction to Solid State Physics	3
ESM 4114	Nonlinear Dynamics and Chaos	3	PHYS 4614	Optics	3
ESM 4154	Nondestructive Evaluation of Materials	3	STAT 4105	Theoretical Statistics	3
ESM/ME 4194	Sustainable Energy Solutions for a Global Society	3	STAT 4106	Theoretical Statistics	3
ESM 4614	Probability-Based Modeling, Analysis, and Assessment	3	STAT 4705	Probability and Statistics for Engineers (for AE majors only, if not used as the math elective)	3
GEOG 4354	Introduction to Remote Sensing	3	STAT 4706	Probability and Statistics for Engineers	3
GEOS 3024	Computational Methods in the Geosciences	3			
GEOS 3034	Oceanography (for AE majors only)	3			
GEOS/GEOG 4354	Introduction to Remote Sensing	3			
ISE 4404	Statistical Quality Control	3			
MSE 2034	Elements of Materials Engineering	3			
MSE/ESM 3054	Mechanical Behavior of Materials	3			
MSE 4055	Materials Selection and Design I and II	3			
MATH 3214	Calculus of Several Variables	3			
MATH 4144	Linear Algebra II	3			
MATH 4225	Elementary Real Analysis	3			
MATH 4226	Elementary Real Analysis	3			
MATH 4234	Elementary Complex Analysis	3			
MATH 4245	Intermediate Differential Equations	3			
MATH 4246	Intermediate Differential Equations	3			
MATH 4425	Fourier Series and Partial Differential Equations	3			
MATH 4426	Fourier Series and Partial Differential Equations	3			
MATH 4445	Introduction to Numerical Analysis	3			
MATH 4446	Introduction to Numerical Analysis	3			
MATH 4574	Vector and Complex Analysis for Engineers (if not used as math elective)	3			
ME 2134	Thermodynamics	4			
ME/ESM 4194	Sustainable Energy Solutions for a Global Society	3			
ME 4204	Internal Combustion Engines	3			
ME 4224	Aircraft Engines and Gas Turbines	3			
ME 4524	Introduction to Robotics and Automation	3			
ME 4534	Land Vehicle Dynamics	3			
ME 4624	Finite Element Practice in Mechanical Design	3			
ME 4634	Introduction to Computer-aided Design and Manufacturing	3			
ME 4644	Introduction to Rapid Prototyping	3			
ME 4724	Engineering Acoustics	3			
MGT 3304	Management Theory and Leadership Practice	3			

Aerospace and Ocean Engineering Technical Tracks

Foundational Track

The courses in the Foundational Track span the core areas in both Aerospace and Ocean Engineering. Achieving greater depth in analysis and understanding of these materials is very useful in building a strong general background in Aerospace and Ocean Engineering, and the Foundational Track allows students to acquire greater depth across the range of core areas in both aerospace and ocean engineering. This Track is available to all Aerospace and Ocean Engineering majors. Acceptable Substitution: AOE 5144 Boundary Layer Theory and Heat Transfer may be substituted in place of the required course AOE 3044 Boundary Layer and Heat Transfer.

Code	Title	Credits
Required		
Select a minimum of nine credit hours of the following:		9
AOE 3044	Boundary Layer and Heat Transfer	
AOE 4004	State-Space Control	
AOE/ESM 4084	Engineering Design Optimization	
AOE 4324	Energy Methods for Structures	
Total Credits		9

Aero/Hydrodynamics Track

Aero/Hydrodynamics is a core topic area in both Aerospace and Ocean Engineering. Analysis and understanding of Fluid Flows about vehicles is critical to the design of those vehicles. The Aero/Hydrodynamics Track will allow students with a particular interest in those topics to focus their technical electives in that area. This Track is available to all Aerospace and Ocean Engineering majors. Acceptable Substitution: AOE 5144 Boundary Layer Theory and Heat Transfer may be substituted in place of the required course AOE 3044 Boundary Layer and Heat Transfer.

Code	Title	Credits
Required		
AOE 3044	Boundary Layer and Heat Transfer	3

Select a minimum of six credit hours of the following:	6
AOE 4064 Fluid Flows in Nature	
AOE 4114 Applied Computational Aerodynamics	
AOE 4124 Configuration Aerodynamics	
AOE 4434 Introduction to Computational Fluid Dynamics	
AOE 4474 Propellers and Turbines	
AOE 4624 Foundations of Aero and Hydroacoustics	
AOE 5104 Advanced Aero and Hydrodynamics ¹	
AOE 5114 High Speed Aerodynamics ¹	
AOE 5144 Boundary Layer Theory and Heat Transfer ¹	
Total Credits	9

¹ Graduate School policy: seniors with ≥ 3.0 GPA may take graduate course with instructor's permission.

Dynamics, Control and Estimation Track

Dynamics, Control and Estimation is a core topic area in both Aerospace and Ocean Engineering. The ability to model and predict the motion of a vehicle, and to modulate that motion through proper control design, is critical to the design of those vehicle systems. The Dynamics, Control and Estimation Track will allow students with a particular interest in those topics to focus their technical electives in that area. This Track is available to all Aerospace and Ocean Engineering majors.

Code	Title	Credits
Required		
AOE 4004	State-Space Control	3
Select a minimum of six credit hours of the following:		6
AOE 3134	Air Vehicle Dynamics (If not taking as required major course)	
AOE 3144	Space Vehicle Dynamics (If not taking as required major course)	
AOE 3234	Ocean Vehicle Dynamics (If not taking as required major course)	
AOE 4344	Dynamics of High-Speed Marine Craft	
AOE 4454	Spacecraft Position/Navigation/Timing and Orbit Determination	
AOE 4514	Nonlinear Dynamics and Chaos	
AOE 4804	Special Topics in Dynamics, Control, and Estimation	
ECE 3714	Introduction to Control Systems	
ECE 4624	Digital Signal Processing And Filter Design	
ESM 4114	Nonlinear Dynamics and Chaos	
ME 4534	Land Vehicle Dynamics	
AOE 5204	Vehicle Dynamics and Control ¹	
AOE 5234	Orbital Mechanics ¹	
AOE 5334	Advanced Ship Dynamics ¹	
AOE 5744/ ME 5544/ ECE 5744	Linear Systems Theory ¹	
AOE/ECE 5754/ME 5554	Applied Linear Systems ¹	
AOE 5764/ ME 5564/ ECE 5764	Applied Linear Control ¹	

AOE/ECE Nonlinear Systems Theory¹
5774/ME 5574

Total Credits 9

¹ Graduate School policy: seniors with ≥ 3.0 GPA may take graduate course with instructor's permission.

Energy and the Environment Track

Energy and the Environment, a major application area in both Aerospace and Ocean Engineering, focuses on imparting specific skills required to understand the nature, scope, and challenges of environmental impact and the science behind energy and propulsion systems that minimize that impact. The Energy and the Environment Track will allow students with a particular interest in environment impact, energy systems and renewable energy to focus their technical electives in that area. This Track is available to all Aerospace and Ocean Engineering majors.

Code	Title	Credits
Select a minimum of nine credit hours of the following:		9
AOE 4064	Fluid Flows in Nature	
AOE 4474	Propellers and Turbines	
AOE 4624	Foundations of Aero and Hydroacoustics	
AOE 4634	Wind Turbine Technology and Aerodynamics	
AOE 4824	Special Topics in Energy and the Environment	
ECE 4364	Alternate Energy Systems	
ENGR 3124	Introduction to Green Engineering	
ESM/ME 4194	Sustainable Energy Solutions for a Global Society	
Total Credits		9

Naval Engineering Track

Naval Engineering is an application track in both Aerospace and Ocean Engineering. Understanding naval missions, capability requirements and the broad scope of engineering applications to naval missions, and developing particular technical application knowledge in elective courses, will provide students with a unique and valuable skill set. These skills will enable the student to perform research and work in this field. This Track is available to all Aerospace and Ocean Engineering majors.

Code	Title	Credits
Required		
AOE 4264	Principles of Naval Engineering	3
Select a minimum of six credit hours of the following:		6
AOE 4244	Naval and Marine Engineering Systems Design	
AOE 4274	Intermediate Ship Structural Analysis	
AOE 4344	Dynamics of High-Speed Marine Craft	
AOE 4474	Propellers and Turbines	
AOE 5074	Advanced Ship Structural Analysis ¹	
AOE 5334	Advanced Ship Dynamics ¹	
ECE 4164	Introduction to Global Positioning System (GPS) Theory and Design	
ECE 4364	Alternate Energy Systems	
Total Credits		9

¹ Graduate School policy: seniors with ≥ 3.0 GPA may take graduate course with instructor's permission.

Propulsion Track

The study of Propulsion, a core technology in Aerospace and Ocean Engineering, focuses on learning and applying fundamental knowledge to understand the nature, scope, opportunities and challenges of designing, specifying and integrating propulsion technologies. The Propulsion Track will allow students with a particular interest in the design, and analysis of aircraft, spacecraft or ocean propulsion to focus their technical electives in that area. This Track is available to all Aerospace and Ocean Engineering majors.

Code	Title	Credits
Select a minimum of nine credit hours of the following:		9
AOE/ME 4174	Spacecraft Propulsion	
AOE/ME 4234	Aerospace Propulsion Systems	
AOE 4474	Propellers and Turbines	
AOE 4604	Booster Design, Fabrication, and Operation	
AOE 4814	Special Topics in Propulsion	
AOE/ME 5135	Vehicle Propulsion ¹	
AOE 5144	Boundary Layer Theory and Heat Transfer ¹	
ME 4204	Internal Combustion Engines	
Total Credits		9

¹ Graduate School policy: seniors with ≥ 3.0 GPA may take graduate course with instructor's permission.

Space Engineering Track

Space Engineering is a core topic area in both Aerospace and Ocean Engineering. Analysis and understanding of the space environment, space payloads, and/or space mission design and operations is critical to the design, analysis, and functioning of those space vehicles and payloads. The Space Engineering Track will allow students with a particular interest in those topics to focus their technical electives in that area. This Track is available to all Aerospace and Ocean Engineering majors.

Code	Title	Credits
Select a minimum of nine credit hours of the following:		9
AOE 2664/ ECE 2164	Exploration of the Space Environment	
AOE/ME 4174	Spacecraft Propulsion	
AOE 4454	Spacecraft Position/Navigation/Timing and Orbit Determination	
AOE 4604	Booster Design, Fabrication, and Operation	
AOE 4654/ ECE 4154	Space Weather: The Solar Wind and Magnetosphere	
AOE 4674	Upper Atmosphere/Ionosphere Space Weather	
AOE 4864	Special Topics in Space Engineering	
AOE/ME 5135	Vehicle Propulsion ¹	
AOE/ECE 5174	Introduction to Plasma Science ¹	
AOE 5234	Orbital Mechanics ¹	
ECE 3104	Introduction to Space Systems and Technologies	
ECE 3154	Space Systems - Design and Validation	
ECE 4164	Introduction to Global Positioning System (GPS) Theory and Design	
ECE 4194	Engineering Principles of Remote Sensing	
PHYS 3655	Introduction to Astrophysics	

PHYS 3656 Introduction to Astrophysics

Total Credits 9

¹ Graduate School policy: seniors with ≥ 3.0 GPA may take graduate course with instructor's permission.

Structures and Materials Track

Structures and Materials is a core topic area in both Aerospace and Ocean Engineering. Analysis and understanding of structural analysis and materials selection for aerospace and ocean vehicles is critical to the design of those vehicles. The Structures and Materials Track will allow students with a particular interest in those topics to focus their technical electives in that area. This Track is available to all Aerospace and Ocean Engineering majors.

Code	Title	Credits
Required		
AOE 4324	Energy Methods for Structures	3
Select a minimum of six credit hours of the following:		6
AOE 4024/ ESM 4734	An Introduction to the Finite Element Method	
AOE 4054/ ESM 4444	Stability of Structures	
AOE 4274	Intermediate Ship Structural Analysis	
AOE 5024	Vehicle Structures ¹	
AOE 5034/ ESM 5304	Mechanical and Structural Vibrations ¹	
AOE 5074	Advanced Ship Structural Analysis ¹	
ESM/MSE 3054	Mechanical Behavior of Materials	
ESM 4024	Advanced Mechanical Behavior of Materials	
ESM 4044/ CEE 4610	Mechanics of Composite Materials	
ME 4624	Finite Element Practice in Mechanical Design	
MSE 2034	Elements of Materials Engineering	
MSE/AOE 3094	Materials and Manufacturing for Aero and Ocean Engineers	
Total Credits		9

¹ Graduate School policy: seniors with ≥ 3.0 GPA may take graduate course with instructor's permission.

Vehicle and System Design Track

Vehicle and System Design is a core discipline in both Aerospace and Ocean Engineering. Its focus is on imparting specific skills required to understand the nature, scope, and challenges of designing innovative vehicles and systems by synthesizing foundational knowledge from other courses. The Vehicle and System Design Track will allow students with a particular interest in design and operation of aircraft, spacecraft, and ocean vehicles to focus their technical electives. This Track is available to all Aerospace and Ocean Engineering majors.

Code	Title	Credits
Required		
AOE/ESM 4084	Engineering Design Optimization	3
Select a minimum of six credit hours of the following:		6

AOE 3354	Avionics Systems
AOE 3804	Special Topics in Aircraft Systems
AOE 4124	Configuration Aerodynamics
AOE 4244	Naval and Marine Engineering Systems Design
AOE 4264	Principles of Naval Engineering
AOE 4604	Booster Design, Fabrication, and Operation
AOE 4814	Special Topics in Propulsion
CEE 5614	Analysis of Air Transportation Systems
ME 4644	Introduction to Rapid Prototyping
MGT 3304	Management Theory and Leadership Practice

Total Credits 9

Graduation Requirements

Students must pass all required courses and both the in-major and overall GPA must be at least 2.0 for graduation. The in-major GPA consists of all courses taken under the AOE designation. No courses on this checklist may be taken on a Pass/Fail basis.

General Information about Checklist

Course offerings are subject to change and the availability of sufficient resources. Students should confirm course offerings in advance with their department. OE primary majors with an AE secondary major may substitute 4265-4266 for (4065-4066 or 4165-4166) and 4205-4206 for 4105-4106 in their secondary AE major (substitutions are not permitted for dual degrees).

Statement of Hidden Prerequisites

Prerequisites for each course are listed after the course title. The (letter grade) notation, such as (C-) indicates the minimum grade students must earn in the pre-requisite course. Prerequisites may change from what is indicated. Be sure to consult the University Catalog or check with your advisor for the most current requirements. There are no hidden prerequisites in this program of study.

Change of Major Requirements

Please see <https://eng.vt.edu/em> (<https://eng.vt.edu/em/>)

Foreign Language Requirements

Students must have had 2 years of a foreign language in high school or one year at the college level (6 credit hours) of the same language. College-level credits used to meet this requirement do not count towards the degree.

Pathways to General Education (Pathways)

Consult the pathways courses table: <https://www.pathways.prov.vt.edu/about/table.html>. Pathways courses need to be completed prior to graduation.

Satisfaction of Pathways requirements is required of all students in the university. Engineering students satisfy this requirement in Concepts 1f (foundational), 4, 5, and 6d (design) through curricular engineering, math, science and English courses. Concept 1a (advanced/applied discourse) will be satisfied through the senior design and lab courses. Concepts 2, 3, 6a (arts), and 7 are satisfied through elective courses; six credits are required in Concepts 2 and 3, three credits in Concept 6a and 3 credits in Concept 7. The one course required for Concept 7 may, if carefully

selected, simultaneously satisfy a Concept 2 or 3 requirement. Several courses appear on both the Concept 2 and Concept 6a (arts) lists, but they can be used to satisfy only one of these requirements. Concept 7 is the only concept in which a course may “double count.” **All Pathways requirements must be met with courses taken on an A/F basis unless a course is only offered on the P/F basis.** Each year, courses may be added to or removed from each Concept. A course may be used to satisfy a Concept, if it appears on the list of approved courses for that Concept during the year it was taken. A link to the *Pathways to General Education Course Catalog* guide is maintained at <https://www.pathways.prov.vt.edu/about/course-catalog.html>.

ECON 2005 Principles of Economics **is required for graduation** and may be taken as one of the two Concept 3 requirements in the Pathways. If a student chooses to satisfy the Concept 3 requirements with courses not including ECON 2005 Principles of Economics, ISE 2014 Engineering Economy may also be used to satisfy this requirement but this requires additional credits.

ESM 2114 Statics & Structures **is required for graduation.** ESM 2104 Statics and ESM 2204 Mechanics of Deformable Bodies may be substituted in place of ESM 2114 Statics & Structures. However, doing so requires that a student take 6 credits instead of the 3 required for ESM 2114 Statics & Structures.

Satisfactory Progress Towards Degree

University Policy 91 outlines university-wide minimum criteria to determine if students are making satisfactory progress towards the completion of their degrees. The AOE Department fully supports this policy. Specific expectations for satisfactory progress for OE majors are as follows:

- Each student must meet the minimum University-wide criteria as described in Policy 91 and summarized in the Undergraduate Catalog: <https://www.undergradcatalog.registrar.vt.edu/>
- A student must have at least 2.0 overall and in-major GPAs. (The in-major GPA consists of all courses taken under the AOE designation).

Roadmap

Course	Title	Credits
First Year		
Fall Semester		
CHEM 1035	General Chemistry	3
CHEM 1045	General Chemistry Laboratory	1
ENGL 1105	First-Year Writing	3
MATH 1225	Calculus of a Single Variable (C-)	4
ENGE 1215	Foundations of Engineering (C-)	2
Pathways 2 and/or 7 ¹		3
Credits		16
Spring Semester		
ENGL 1106	First-Year Writing	3
MATH 1226	Calculus of a Single Variable	4
PHYS 2305	Foundations of Physics	4
ENGE 1216	Foundations of Engineering (C-)	2
Pathways 2 and/or 7 ¹		3
Credits		16
Second Year		
Fall Semester		
ESM 2114	Statics & Structures	3
MATH 2114	Introduction to Linear Algebra	3
MATH 2204	Introduction to Multivariable Calculus	3

AOE 2054	Electronics for Aerospace and Ocean Engineers	3
AOE/ESM 2074	Computational Methods	2
AOE 2204	Introduction to Ocean Engineering	3
Credits		17
Spring Semester		
ESM 2304	Dynamics	3
MATH 2214	Introduction to Differential Equations	3
AOE 2024	Thin-Walled Structures	3
PHYS 2306	Foundations of Physics	4
ECON 2005	Principles of Economics (Pathways 3)	3
Credits		16
Third Year		
Fall Semester		
MATH 4564	Operational Methods for Engineers	3
AOE 3014	Fluid Dynamics for Aerospace and Ocean Engineers	3
AOE 3034	System Dynamics and Control	3
AOE 3214	Ocean Wave Mechanics	3
AOE 3224	Ocean Structures	3
Credits		15
Spring Semester		
GEOS 3034	Oceanography	3
AOE 3234	Ocean Vehicle Dynamics	3
AOE 3264	Thermodynamics and Marine Propulsion	3
AOE 3054	Experimental Methods	3
Track Technical Elective		3
Credits		15
Fourth Year		
Fall Semester		
AOE 4205	Experiments for Ocean Vehicle Design	1
AOE 4265	Ocean Vehicle Design	3
STAT 4705	Probability and Statistics for Engineers	3
Track Technical Elective		3
Technical Elective		3
Pathways 6a and/or 7 ¹		3
Credits		16
Spring Semester		
AOE 4206	Experiments for Ocean Vehicle Design	1
AOE 4266	Ocean Vehicle Design	3
Track Technical Elective		3
Technical Elective		3
Technical Elective		3
Pathways 3 and/or 7 ¹		3
Credits		16
Total Credits		127

¹ Total program credit hours of 127 required is based on a Pathway 7 course double counting with Pathway 2, 3, or 6a. If you elect to complete a Pathway 7 course that does not double count, an additional three Pathway credits will be needed for degree completion (130 credits total).