COLLEGE OF ENGINEERING

DEPARTMENT OF AEROSPACE AND OCEAN ENGINEERING

BACHELOR OF SCIENCE IN AEROSPACE AND OCEAN ENGINEERING, MAJOR: AEROSPACE ENGINEERING

FOR STUDENTS GRADUATING IN CALENDAR YEAR 2020

128 CREDITS REQUIRED FOR GRADUATION

FRESHMAN FALL SEMESTER 2016	Credits
CHEM 1035 General Chemistry *Co: MATH 1025 or 1225*	3
CHEM 1045 General Chemistry Lab *Co: CHEM 1035*	1
ENGL 1105 First-Year Writing	3
MATH 1225 Calculus of a Single Variable **(C–)** *Pre: Math Ready*	4
ENGE 1215 Foundations of Engineering **(C–)**	2
CLE (Area 2, 3, or 7)	3
TOTAL	**16**

FRESHMAN SPRING SEMESTER 2017	Credits
ENGL 1106 First-Year Writing *Pre: ENGL 1105*	3
MATH 1226 Calculus of a Single Variable *Pre: MATH 1225 (C-)*	4
PHYS 2305 Foundations of Physics *Pre: MATH 1205 or MATH 1205H or MATH 1225 or MATH 1206 or MATH 1206H or MATH 1226; Co: PHYS 2325 or MATH 1206 or MATH 1206H or MATH 1226*	4
ENGE 1216 Foundations of Engineering **(C–)** *Pre: ENGE 1215 (C-)*	2
CLE (Area 2, 3, or 7)	3
TOTAL	**16**

SOPHOMORE FALL SEMESTER 2017	Credits
ESM 2114(1) Statics and Structures *Co: MATH 2204 or MATH 2204H or MATH 2406H*	3
MATH 2114(1) Introduction to Linear Algebra *Pre: MATH 1225 (min grade of B) or MATH 1226*	3
MATH 2204(1) Introduction to Multivariable Calculus *Pre: MATH 1226*	3
AOE 2054(1) Electronics for Aerospace and Ocean Engineers	3 [F]
AOE 2074(1) (ESM 2074) Computational Methods *Pre: ENGE 1114 or ENGE 1216 or ENGE 1434*	2 [F,S,SII]
AOE 2104(2) Introduction to Aerospace Engineering and Aircraft Performance *Pre: ENGE 1216, PHYS 2305, Co: ESM 2104 or ESM 2114*	3 [F,SII]
TOTAL	**17**

SOPHOMORE SPRING SEMESTER 2018	Credits
ESM 2304(1) Dynamics *Pre: 2104 or 2114, (MATH 2224 or MATH 2224H or MATH 2204 or MATH 2204H) Co: MATH 2214*	3
MATH 2214(1) Introduction to Differential Equations *Pre: 1114 or 1114H or 2114 or 2114H), (1206 or 1226)*	3
AOE 2024(1) Thin-Walled Structures *Pre: ESM 2114, MATH 2224(H) or MATH 2204(H); Co: MATH 2214*	3 [F, S]
PHYS 2306 Foundations of Physics *Pre: MATH 1206 or MATH 1206H or MATH 1226), PHYS 2305*	4
CLE (Area 3) ECON 2005 Principles of Economics	3
CLE (Area 6)	1
TOTAL	**17**

JUNIOR FALL SEMESTER 2018	Credits
MATH 4564(1) Operational Methods for Engineers *Pre: (2214 or 2214H) or 2406H or CMDA 2006*	3
AOE 3014(1) Fluid Dynamics for Aerospace and Ocean Engineers *Pre: (2104 or 2204), ESM 2304, MATH 2214*	3 [F]
AOE 3034(1) System Dynamics and Control *Pre: ESM 2304, (MATH 2214 or MATH 2214H)*	3 [F]
AOE 3124(2) Aerospace Structures *Pre: 2024 or 3024*	3 [F,S]
AOE 3154(2) Astromechanics *Pre: ESM 2304*	3 [F]
TOTAL	**15**

JUNIOR SPRING SEMESTER 2019	Credits
AOE 3114(2) Aerodynamics and Compressibility *Pre: 3014, Co:3164*	3 [S]
AOE 3134(2) Air Vehicle Dynamics *Pre: 3034*, ***or*** AOE 3144(2) Space Vehicle Dynamics, *Pre: 3034*	3 [S]
AOE 3164(2) Aerothermodynamics and Propulsion Systems *Pre: 3014, Co: 3114*	3 [S]
AOE 3054(1) Experimental Methods *Pre: 2054, 3014, 3034*	3 [S]
Track Technical Elective	3
TOTAL	**15**

SENIOR FALL SEMESTER 2019	Credits
AOE 4105(2) Experiments for Aerospace Design *Pre: 3054; Co: 4065 or 4165*	1 [F]
AOE 4065(2) Air Vehicle Design, *Pre: 2104, 3054, 3114, 3124, 3134, 3164;* Co: 4105 ***or*** AOE 4165(2) Space Vehicle Design, *Pre: 2104, 3054, 3114, 3124, 3144, 3154, 3164; Co:4105*	3 [F]
MATH Elective *Choice of: MATH 4574(2), MATH 4404(2), or STAT 4705(2)*	3
Track Technical Elective	3
Technical Elective	3
CLE (Area 2, 3, or 7)	3
TOTAL	**16**

SENIOR SPRING SEMESTER 2020	Credits
AOE 4106(2) Experiments for Aerospace Design *Pre: 4105, Co: 4066 or 4166*	1 [S]
AOE 4066(2) Air Vehicle Design *Pre: 4065;* Co: 4106 ***or*** AOE 4166(2) Space Vehicle Design *Pre: 4165;* Co: 4106	3 [S]
Track Technical Elective	3
Technical Elective	3
Technical Elective	3
CLE (Area 2, 3, or 7)	3
TOTAL	**16**

CoE UGCC approved on 12/05/2017

General Information about Checksheet: Superscripted annotation [F,S,SI,SII] in Credits column indicates terms when a course is expected to be offered. Course offerings are subject to change and the availability of sufficient resources. Students should confirm course offerings in advance with their department. Curriculum for Liberal Education (CLE) courses are shaded in Green. AOE common degree core courses common to AE and OE majors are shaded in Blue and contain a superscripted annotation (1) after the course number. AOE courses specific to AE Major are shaded in Yellow and contain a superscripted annotation (2) after the course number. AE primary majors with an OE secondary major may substitute (4065-4066 or 4165-4166) for 4265-4266 and 4105-4106 for 4205-4206 in their secondary OE major.

Curriculum for Liberal Education (CLE)

Consult the CLE Alphabetical Listing at: http://www.cle.prov.vt.edu/guides/alpha.html, CLE courses need to be completed prior to graduation

CLE Area 1: Writing and Discourse (6 hrs)	**ENGL 1105**	**(3)**	**ENGL 1106**	**(3)**
CLE Area 2: Ideas, Cultural Traditions, Values Electives (6 hrs)		**(3)**		**(3)**
CLE Area 3: Society & Human Behavior electives (6 hrs)	**ECON 2005**	**(3)**		**(3)**
CLE Area 4: Scientific Reasoning and Discovery (8 hrs)	**PHYS 2305**	**(4)**	**PHYS 2306**	**(4)**
CLE Area 5: Quantitative and Symbolic Reasoning (8 hrs)	**MATH 1225**	**(4)**	**MATH 1226**	**(4)**
CLE Area 6: Creativity & Aesthetic Experience elective (1 hr)				**(1)**
CLE Area 7: Global Issues Elective (3 hrs)				**(3)**

If a CLE course is double-counted to satisfy two different CLE areas, then a free elective(s) must be taken to maintain a minimum of 128 credits.

Technical Electives: The AOE department requires 18 credits of technical electives. ***Students are required to take a minimum of 9 credits from one of the approved Tracks.*** The remaining credits must be AOE courses not otherwise required for AE major. Up to 3 of the 18 credits may be non-AOE technical courses selected either from Tracks or from the attached list of approved non-AOE technical courses.

Change of Major Requirements: Please see http://www.enge.vt.edu/undergraduate-changing-majors.html

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.

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 AE majors are as follows:

- Each student must meet the minimum University-wide criteria as described in Policy 91 and summarized in the Undergraduate Catalog (http://www.undergradcatalog.registrar.vt.edu/1617/academic-policies.html#22http://www.undergradcatalog.registrar.vt.edu/1617/academic-policies.html#22)
- 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).

Statement of Hidden Prerequisites: Pre-requisites for each course are listed after the course title. 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 pre-requisites in this program of study.

Graduation Requirements: Students must pass all required courses and both the in-major and overall GPA must be at least 2.0 for graduation. No courses on this checksheet may be taken on a Pass/Fail basis.

AOE DEPARTMENT ELECTIVE REQUIREMENTS
For students graduating in calendar year 2020

AOE students have several types of electives required in their program of study.
Listed below are departmental, College and University requirements governing those electives.

CURRICULUM FOR LIBERAL EDUCATION (CLE): Satisfaction of CLE requirements is required of all students in the university. Engineering students satisfy this requirement in Areas 1, 4, and 5 through curricular math, science and English courses. Areas 2, 3, 6, and 7 are satisfied through elective courses; 6 credits are required in Areas 2 and 3, 1 credit in Area 6 and 3 credits in Area 7. The one course required for Area 7 may, if carefully selected, simultaneously satisfy an Area 2 or 3 requirements. Several courses appear on both the Area 2 and Area 6 lists but can be used to satisfy only one of these requirements. Area 7 is the only area in which a course may "double count." **All CLE requirements must be met with courses taken on an A/F basis unless a course is only offered on the P/F basis.** A link to the *University Curriculum for Liberal Education Guide* is maintained at http://www.provost.vt.edu/. Each year, courses may be added to or removed from each Area. A course may be used to satisfy an Area, if it appears on the list of approved courses for that Area during the year it was taken.

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

MATH ELECTIVE: All AE students must take MATH 4574 (Vector and Complex Analysis for Engineers), MATH/AOE 4404 (Applied Numerical Methods) or STAT 4705 (Probability and Statistics for Engineers) on an A/F basis. (STAT 4705 is required for OE majors.)

TECHNICAL ELECTIVES: The AOE Department requires 18 credits of technical electives, all of which must be taken on an A/F basis. This includes at least 9 credits from one of the approved Tracks. The remaining credits must be AOE courses not otherwise required for AE major. Up to 3 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. 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.

CEE:	4384, 4674
CHEM:	4615
CS:	1044, 1054, 1064, 1114, 1124
ECE:	1574, 3054, 4164, 4364, 4405, 4406, 4624, 4634, 4644
ENGE:	2514
ENGR:	3124
ESM:	3054 (MSE 3054), 4024, 4044, 4114, 4154, 4194 (ME 4194), 4614
GEOG:	4354 (GEOS 4354)
GEOS:	3024, 3034, 4354 (GEOG 4354)
ISE:	4404
MSE:	2034, 3054 (ESM 3054), 4055, 4056
MATH:	3214, 4144, 4225, 4226, 4234, 4245, 4246, 4425, 4426, 4445, 4446, 4574 (if not used as math elective)
ME:	3134, 4194 (ESM 4194), 4204, 4224, 4504, 4524, 4534, 4624, 4634, 4644, 4724
MGT:	3304
NSEG:	3145, 3146
PHIL:	4324 (MGT 4324)
PHYS:	3405, 3406, 3655, 3656, 4455, 4456, 4504, 4554, 4614
STAT:	4105, 4106, 4705 (AE only, if not used as the math elective), 4706

AEROSPACE AND OCEAN ENGINEERING TECHNICAL TRACKS
For students graduating in calendar year 2020

The AOE department requires 18 credits of technical electives. Students are required to take a minimum of 9 credits from one of the approved Tracks. Up to 3 of the 18 credits may be non-AOE technical courses selected either from Tracks or from the list of approved non-AOE technical courses.

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 will be available to all Aerospace and Ocean Engineering majors.

Required: Choose a minimum of 9 credit hours from the following courses.

Course	Title	CH
AOE 3044	Boundary Layer and Heat Transfer	3
AOE 4004	State-Space Control	3
AOE 4084 (ESM 4084)	Engineering Design Optimization	3
AOE 4324	Energy Methods for Structures	3

Prerequisites may apply – see your advisor

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.

Required:

Course	Title	CH
AOE 4324	Energy Methods for Structures	3

Choose a minimum of 6 credit hours from the following courses

Course	Title	CH
AOE 4054 (ESM 4444)	Stability of Structures	3
AOE 4024 (ESM 4734)	An Introduction to the Finite Element Method	3
AOE 4274	Intermediate Ship Structural Analysis	3
ESM 3054 (MSE 3054)	Mechanical Behavior of Materials	3
ESM 4024	Advanced Mechanical Behavior of Materials	3
ESM 4044	Mechanics of Composite Materials	3
ME 4624	Finite Element Practice in Mechanical Design	3
MSE 2034	Elements of Materials Engineering	3

Prerequisites may apply – see your advisor

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 will be available to all Aerospace and Ocean Engineering majors.

Required:

Course	Title	CH
AOE 3044	Boundary Layer and Heat Transfer	3

Choose a minimum of 6 credit hours from the following courses.

Course	Title	CH
AOE 4064	Fluid Flows in Nature	3
AOE 4114	Applied Computational Aerodynamics	3
AOE 4124	Configuration Aerodynamics	3
AOE 4174 (ME 4174)	Spacecraft Propulsion	3
AOE 4434	Introduction to Computational Fluid Dynamics	3
AOE 4474	Propellers and Turbines	3
ME 3134	Fundamentals of Thermodynamics	3

Prerequisites may apply – see your advisor

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 will be available to all Aerospace and Ocean Engineering majors.

Required:

Course		Title	CH
AOE	4004	State-Space Control	3

Choose a minimum of 6 credit hours from the following courses.

Course		Title	CH
AOE	3134	Air Vehicle Dynamics	3
AOE	3144	Space Vehicle Dynamics	3
AOE	3234	Ocean Vehicle Dynamics	3
AOE	4344	Dynamics of High-Speed Marine Craft	3
AOE	4454	Spacecraft Position/Navigation/Timing and Orbit Determination	3
AOE	4804	Special Topics in Dynamics, Control, and Estimation	3
ECE	4405	Control Systems	3
ECE	4406	Control Systems	3
ECE	4624	Digital Signal Processing and Filter Design	3
ESM	4114	Nonlinear Dynamics and Chaos	3
ME	4534	Land Vehicle Dynamics	3

Prerequisites may apply – see your advisor.

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 will be available to all Aerospace and Ocean Engineering majors.

Required:

Course	Title	CH
AOE 4084 (ESM 4084)	Engineering Design Optimization	3

Choose a minimum of 6 credit hours from the following courses.

Course	Title	CH
	AE Major	
AOE 4114	Applied Computational Aerodynamics	3
AOE 4124	Configuration Aerodynamics	3
AOE 4174 (ME 4174)	Spacecraft Propulsion	3
AOE 4234 (ME 4234)	Aerospace Propulsion Systems	3
AOE 4414	Computer-Aided Space Mission Planning	1
ME 4644	Introduction to Rapid Prototyping	3
MGT 3304	Management Theory and Leadership	3
PHIL 4324 (MGT 4324)	Business and Professional Ethics	3
	OE Major	
AOE 4244	Naval and Marine Engineering Systems Design	3
AOE 4264	Principles of Naval Engineering	3
ME 4644	Intro to Rapid Prototyping	3
MGT 3304	Management Theory and Leadership	3
PHIL 4324 (MGT 4324)	Business and Professional Ethics	3

Prerequisites may apply – see your advisor

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 skillset. These skills will enable the student to perform research and work in this field. This Track will be available to all Aerospace and Ocean Engineering majors.

Required:

Course	Title	CH
AOE 4264	Principles of Naval Engineering	3

Choose a minimum of 6 credit hours from the following courses.

Course	Title	CH
AOE 4244	Naval and Marine Engineering Systems Design	3
AOE 4274	Intermediate Ship Structural Analysis	3
AOE 4344	Dynamics of High-Speed Marine Craft	3
AOE 4474	Propellers and Turbines	3
ECE 4164	Global Navigation Satellite Systems	3
ECE 4364	Alternate Energy Systems	3
ME 3134	Fundamentals of Thermodynamics	3

Prerequisites may apply – see your advisor.

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 will be available to all Aerospace and Ocean Engineering majors.

Choose a minimum of 9 credit hours from the following courses.

Course	Title	CH
AOE 2664 (ECE 2164)	Exploration of the Space Environment	3
AOE 4174 (ME 4174)	Spacecraft Propulsion	3
AOE 4454	Spacecraft Position/Navigation/Timing and Orbit Determination	3
ECE 4164	Introduction to Global Positioning System (GPS) Theory and Design	4
PHYS 3655	Introduction to Astrophysics	3
PHYS 3656	Introduction to Astrophysics	3

Prerequisites may apply – see your advisor

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 will be available to all Aerospace and Ocean Engineering majors.

Tech Elective Courses

Choose a minimum of 9 credit hours from the following courses.

Course	Title	CH
AOE 4174 (ME 4174)	Spacecraft Propulsion	3
AOE 4234 (ME 4234)	Aerospace Propulsion Systems	3
AOE 4474	Propellers and Turbines	3
AOE 4814	Special Topics in Propulsion	3
ME 3134	Fundamentals of Thermodynamics	3
ME 4204	Internal Combustion Engines	3

Prerequisites may apply – see your advisor

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 will be available to all Aerospace and Ocean Engineering majors.

Tech Elective Courses

Choose a minimum of 9 credit hours from the following courses.

Course	Title	CH
AOE 4064	Fluid Flows in Nature	3
AOE 4474	Propellers and Turbines	3
AOE 4624	Foundations of Aero/hydroacoustics	3
AOE 4634	Wind Turbine Technology and Aerodynamics	3
AOE 4824	Special Topics in Energy and the Environment	3
ECE 4364	Alternate Energy Systems	3
ENGR 3124	Introduction to Green Engineering	3
ESM 4194 (ME 4194)	Sustainable Energy Solutions for a Global Society	3
ME 3134	Fundamentals of Thermodynamics	3

Prerequisites may apply – see your advisor

TABLE OF AOE TRACKS

(See Track Descriptions for Specific Conditions/Requirements)

TRACKS	Structures and Materials	Aero/Hydrodynamics	Dynamics, Control, and Estimation	Vehicle and System Design	Naval Engineering	Space Engineering	Propulsion	Energy and the Environment
Foundational Courses	4324 Energy Methods for Structures	3044 Boundary Layer	4004 State-Space Control	4084 (ESM 4084) Engineering Design Optimization	4264 Principles of Naval Engr			
Foundational Track **Track Courses**	4054 (ESM 4444) Stability of Structures	4064 Fluid Flows in Nature	3134/3144/3234 (Air, Space, Ocean) Vehicle Dynamics	4114 Applied Computational Aerodynamics	4244 Naval and Marine Engineering Systems Design	2664 (ECE 2164) Space Environment	4174 (ME 4174) Spacecraft Propulsion	4064 Fluid Flows in Nature
	4024 (ESM 4734)Intro to Finite Element Method	4114 Applied Computation Aerodynamics	4344 Dynamics of High-Speed Marine Craft	4124 Configuration Aerodynamics	4274 Intermediate Ship Structural Analysis	3744 Aerospace Electronics	4234 (ME 4234) Aerospace Propulsion Systems	4474 Propellers and Turbines
	4274 Intermediate Ship Structural Analysis	4124 Configuration Aerodynamics	4454 Spacecraft PNT/Orbit Det	4174 (ME 4174) Spacecraft Propulsion	4344 Dynamics of High-Speed Marine Craft	4174 (ME 4174) Spacecraft Propulsion	4474 Propellers and Turbines	4624 Foundations of Aero/hydroacoustics
	ESM 3054 (MSE 3054) Mech Behavior of Materials	4174 (ME 4174) Spacecraft Propulsion	4804 Special Topics in DC&E	4234 (ME 4234) Aerospace Propulsion Systems	4474 Propellers and Turbines	4454 Spacecraft PNT/Orbit Det	4814 Special Topics in Propulsion	4634 Wind Turbine Technology and Aerodynamics
	ESM 4024 Adv Mechanical Behavior Materials	4434 Intro CFD	ECE 4405-4406 Control Systems	4244 Naval and Marine Engineering System Design	ECE 4164 Global Navigation Satellite Systems	ECE 4164 Intro to GPS Theory and Design	ME 3134 Thermodynamics	4824 Special Topics in Energy and the Environment
	ESM 4044 Mechanics Composite Materials	4474 Propellers and Turbines	ECE 4624 Digital Signal Processing and Filter Design	4264 Principles of Naval Engineering	ECE 4364 Alternate Energy Systems	PHYS 3655/3656 Introduction to Astrophysics	ME 4204 Internal Combustion Engines	ECE 4364 Alternate Energy Systems
	ME 4624 Finite Element Practice	ME 3134: Thermodynamics	ESM 4114: Nonlinear Dynamics and Chaos	4414 Computer-Aided Space Mission Planning	ME 3134 Thermodynamics			ENGR 3124 Green Engineering
	MSE 2034 Materials		ME 4534: Land Vehicle Dynamics	ME 4644 Intro to Rapid Prototyping				ESM 4194 Sustainable Energy Solution
				MGT 3304 Management Theory and Leadership				ME 3134 Thermodynamics
				PHIL 4324 (MGT 4324) Business and Professional Ethics				