New Graduate Certificate Program in Marine Engineering and Naval Architecture
Department of Mechanical and Aerospace Engineering
Old Dominion University
Norfolk, VA 23529-0247

Adjacent to the largest naval base and the shipbuilding industry, ODU is in a unique position to address the need to produce not only on a responsive and advanced workforce and industry leaders but also on scientists in academia for pioneering technologies and approaches in the field. Particularly, the Mechanical and Aerospace Engineering Department began to offer the advanced certificate program in marine engineering and naval architecture in 2007. These graduate certificate programs provide the working professional the opportunity to further their knowledge and to fill a need in this fast moving and high demand technological field. The programs will enable participants to understand the marine engineering systems and their interactions with marine environment and necessary engineering methods for design, analysis, construction, design and maintenance of complex marine vessels. Students must complete 4 3-credit graduate-level courses. The certificate program credits can be transferred to the regular Master's degree. Several scholarships provided by NSF are available in this new program.

The emphases of the program are in design and analysis of high performance crafts and the ship repair and maintenance. Our program provides traditional courses in hydrodynamics, seaworthiness, hull form characteristics, marine structural mechanics, marine power systems, as well as courses in life cycle engineering, lean and six sigma manufacturing and concurrent engineering. Furthermore, a laboratory, the Dynamics Environment Simulation (DES) laboratory, was founded in Fall 2006 to support research and instruction in broad areas pertaining to man-machine integration in a high impact environment endured by high performance crafts. The laboratory houses a linear dynamometer and a six degrees-of-freedom (DOFs) motion simulator.

Linear Dynamometer

High Acceleration Six DOFs Platform

The certificated program offers two tracks; Marine Engineering and Naval Architecture. Students have to take three of the 4 courses in each part of the courses. The course of ME 608 is the required courses for every student who is enrolled in the certificated program.

Mathematical Background Course (3 credit hours) –

ME 608 Computational Methods in Mechanical Engineering
or
MATH 691 Engineering Analysis I

General Background Courses for Naval Architecture – (9 credit hours; select three from four regularly offered courses)

Reguired:
ME 595 Principle of Naval Architecture
Optional:
ME 695 Ship Hydrodynamics
ME 695 Ship Resistance and Propulsion
ME 695 Ship Production and Maintenance
ME 695 Dynamics of Marine Crafts
ME 695 Computational Intelligence for Engineering Optimization with an emphasis on Marine Applications

General Background Courses for Marine Engineering – (9 credit hours; select three from the following regularly offered courses)

Required:
ME 511 Mechanical Engineering Power Systems
Optional:
ME 513 Energy Conversion
ME 517 Propulsion Systems
ME 610 Advanced Fluid Mechanics
ME 614 Theory and Design of Turbomachines

For more information, contact

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Course Descriptions:

ME 411/511. Mechanical Engineering Power Systems Theory and Design. Lecture 3 hours; 3 credits. Prerequisites: ME 312 and 315.
Thermodynamic properties of gases and vapors relating to power generating devices, work-energy relations, combustion, and heat exchangers. Performance analyses and design concepts of gas turbines, internal combustion engines, steam power plants and heat exchanger equipment from theoretical and applied viewpoints.

ME 413/513. Energy Conversion. Lecture 3 hours; 3 credits. Prerequisite: ME 312.
Introduction of relevant kinetic theory, solid state, and thermodynamic principles; operation and analysis of thermoelectric, photovoltaic, thermionic, magnetohydrodynamic devices, fuel cell, isotopic, and solar power generators. Course
seeks to define engineering limits of converter efficiency and other performance criteria.

ME 417/517 Propulsion Systems. Lecture 3 hours; 3 credits. Prerequisites: ME312 or 414/514 Introduction to Gas Dynamics.
Basic principles of operation and performance of propulsion systems – including turbojet, turboprop, turbofan, and ramjet engines; an introduction to chemical rockets, ion and plasma thrusters.

ME 608. Computational Methods in Mechanical Engineering. Lecture 3 hours; 3 credits. Prerequisite: MATH 316 or ME 340.
Numerical methods for linear algebra eigenvalue problems, curve fitting optimization, differentiation, integration, ordinary and partial differential equations. Applications in mechanical engineering.

ME 610. Advanced Fluid Dynamics. Lecture 3 hours; 3 credits. Prerequisite: MATH 691.
Conservation laws of mass, momentum and energy equations; boundary conditions; exact and approximate solutions of Navier-Stokes equations; boundary-layer theory; introduction to internal and rotational flows; application to flows in pipes and blade passages; introduction to turbulent flows. (cross-listed with AE 602)

ME 614. Theory and Design of Turbomachines. Lecture 3 hours; 3 credits.
Prerequisites: ME 414 and 610.
Real cycles; fluid motion in turbomachines; theory of diffusers and nozzles; fluid-rotor energy transfer; radial equilibrium; transonic stages; combustion chambers; axial and centrifugal turbines; axial and centrifugal pumps and compressors; performance and design criteria; cavitation and two-phase flow considerations.

MATH 619 Engineering Analysis I. Lecture 3 hours; 3 credits. Prerequisites: MATH 307 and 312.
Separation of Variable techniques, Sturm-Liouville systems, generalized Fourier series, orthogonal functions of the trigonometric, Legendre and Bessel type boundary value problems associated with the wave equation and the heat conduction equation in various coordinate systems, applications to physics and engineering.