

2021 - 2022 EDUCATIONAL SKILL REQUIREMENTS

Ocean Engineering

1103 Subspecialty

472 Curriculum

1. Curriculum Number: 472 (Ocean Engineering).

2. Curriculum taught at Civilian Institutions:

Florida Atlantic University  
University of Hawaii  
Oregon State University  
University of Rhode Island  
University of Delaware  
University of North Florida  
Texas A&M University  
University of New Hampshire

3. Students are Fully Funded.

4. Curriculum Length in Months: 15-18 Months.

5. APC Required: N/A.

6. CEC Community Manager has agreed to allow billets to be coded for Facilities Engineering/1101 and officers to be educated for this curriculum.

Designator  
5100

Officer Community Manager

Approval Date  
1 December 2020

7. The officer must understand the fundamental concepts and be familiar with the basic functional areas of Ocean Engineering within the DON and the DoD including:

a. Environmental Loading. Ability to measure and apply the environmental loading effects of wind, currents, waves, and, if available, seismic activity to the design of flexible and rigid structures.

b. Geotechnical course preferably including marine applications. Working knowledge of seafloor sediment and rock, including types and properties, sampling and testing, and ability to use this knowledge to determine facility foundation and anchoring requirements.

c. Marine Materials Design. Understanding of the types of marine materials, their engineering properties, principles of corrosion, and the techniques of cathodic protection for ocean facilities.

d. Physical Oceanography Course. Working knowledge of physical oceanography, including a thorough understanding of seawater properties, currents, tides, and meteorological conditions, and ability to predict operational and extreme environmental conditions through the application of advanced probability analysis of wave spectra and classical wave theories.

e. Coastal Processes and/or Coastal Engineering Course. Understanding of coastal processes, storm surge, tides, and other physical factors that affect the static and dynamic coastal geomorphology and sediment transport. Ability to determine the effects on structures, shorelines, and harbors.

f. Hydrodynamics or Advanced Fluid Mechanics Course. Understanding of hydrodynamics including fluid flow behavior, resistance determination, and modeling of facility behavior under scaled conditions.

g. Numerical Modeling. Working knowledge of design methodologies for ocean structures, including finite element and difference models, modal analysis, and general quasi-static analysis. Application of the principles of fatigue and fracture mechanics to the design of ocean facilities.

h. Design Course - with ocean project as chosen design. Basic knowledge of ocean construction practices including methods and limitations of working in the offshore environment on fixed and floating facilities, pipelines, cables, and mooring systems.

i. Knowledge of the principles and application of one (1) of the following topics:

(1) Underwater acoustics.

(2) Naval architecture.

(3) Marine engineering.

(4) Project/Program management and systems engineering.

(5) Hyperbaric design.

(6) Instrumentation.

j. Energy Demand and Sources. Knowledge of problems meeting the growing energy demand. Selection of energy sources and their corresponding advantages and disadvantages.

k. Cybersecurity of Critical Infrastructure Control Systems. Understanding of cybersecurity fundamentals as they apply to the nation's critical infrastructure (focused on power/utility distribution grid control systems) to include knowledge and skills in computer network architecture and operations, an understanding of cyber-attack and exploitation methods, cyber system defense mechanisms, as well vulnerability and risk assessment abilities.

Enclosure (5)

l. Utility Systems Management. Understanding of utilities management fundamentals as it applies to electricity, domestic and non-potable water, storm and sanitary sewer, steam, chilled water, natural gas, and other common civil infrastructure distribution systems. General knowledge of utility distribution systems, system components (i.e., substations, switch gear, cabling, duct banks, piping, valves, and control systems), system network analysis and interdependency, operations and maintenance, and recovery of services.

m. Communications. Proficiency in oral and written communications and ability to identify, research, and recommend alternatives to various engineering problems for presentation to both technical and non-technical managers.

n. Thesis/Project. A thesis or major report is required for the degree. The topic selected must be applicable to the type of ocean engineering problems typically found in the Navy, or extends knowledge in a particular technical engineering area. POC for coordination of thesis topic is Deputy OFP Director.

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APPROVED: \_\_\_\_\_ 6/15/2021  
Chief of Civil Engineers (Date)

APPROVED: \_\_\_\_\_ 10/27/21  
Director, Warfighter elopment (OPNAV N71) (Date)