

2019-2020 EDUCATIONAL SKILL REQUIREMENTS
Facilities Engineering
1101 Subspecialty
470x Curriculum

1. Curriculum Number: 470A (Construction Engineering Option).

2. Curriculum taught at Civilian Institutions:

Massachusetts Institute of Technology
Carnegie Mellon University
Stanford University
University of Maryland
Old Dominion University
Virginia Polytechnic Institute
North Carolina State University
Georgia Institute of Technology
University of Florida
Pennsylvania State University
Purdue University
University of Illinois at Urbana-Champaign
University of Pittsburgh
Texas A & M University
University of Texas at Austin
Arizona State University
University of Colorado
University of Wisconsin, Madison
University of Washington
University of California at Berkeley
University of California at Los Angeles
San Diego State University
University of Hawaii (must be stationed in HI)

3. Students are Fully Funded.

4. Curriculum Length in Months: 9-12 Months.

5. APC Required: N/A.

6. CEC Officer 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
LCDR Henry Suter

Approval Date
1 August 2018

7. The officer must understand the fundamental concepts and be familiar with the basic functional areas of Facilities Engineering (Construction) within the Department of the Navy (DON) and the Department of Defense (DoD) including:

a. Understand the principles of and be able to organize, plan, direct, coordinate, and control activities where people, money, and materials are efficiently and economically combined to provide effective engineering, facilities, and infrastructure support services. Implicit is an understanding of the technical and managerial instruments available for proposing and implementing objectives, policies, and programs; policy analysis, program planning, and budgeting; accounting, evaluation, and control; and manpower planning. General knowledge of systems analysis problems solving models, network analysis, benefit cost analysis, and the role of systems analysis in public works/infrastructure decision making. **(Public Works/Infrastructure Management)**

b. Knowledge of problems meeting the growing energy demand. Selection of energy sources and their corresponding advantages and disadvantages. **(Energy Demand and Sources)**

c. Understanding of cyber security 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. **(Cybersecurity of Critical Infrastructure Control Systems)**

d. 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. **(Communication – Oral and Written)**

e. Working knowledge of engineering terms common to construction operations, equipment and material procurement, maintenance, estimating and bidding techniques, work scheduling, quality control techniques, resource allocation, common construction practices, construction organizations, and financing. **(General Engineering)**

f. Familiarity with basic elements of a contract, types of specifications, general provisions, resolution of legal disputes, and negotiating strategies. **(Construction Contracting)**

g. Working knowledge of construction equipment to include selection and performance, estimating productivity, and equipment economics. **(Construction Estimating and Quality Control)**

h. Working knowledge of the physical, chemical, and mechanical properties of construction materials and their non-destructive testing including metals, concrete, timber, asphalt, and soil. **(Materials)**

i. At least one course which extends knowledge in any of the classical engineering disciplines. Can be in any technical area, such as structural engineering, pavement design, environmental engineering, soils analysis or design, hydraulics, hydrology, mechanical or electrical engineering. **(Classic Engineering)**

j. Familiarity with solid waste management and water/wastewater distribution, treatment, and disposal systems. **(Wastewater Management)**

k. If a thesis or major report is required for the degree, the topic selected must be applicable to construction engineering and management problems found in the Navy facilities business or extends knowledge in a particular technical engineering area. **(Thesis/Project)**

Note: Construction Engineering option must be satisfied by courses that address the technical and administrative aspects of the construction process.

2019-2020 EDUCATIONAL SKILL REQUIREMENTS
Facilities Engineering
1101 Subspecialty
470x Curriculum

1. Curriculum Number: 470B (Environmental Engineering Option).

2. Curriculum taught at Civilian Institutions:

Massachusetts Institute of Technology
Carnegie Mellon University
Stanford University
University of Maryland
Old Dominion University
Virginia Polytechnic Institute
North Carolina State University
Georgia Institute of Technology
University of Florida
Pennsylvania State University
Purdue University
University of Illinois at Urbana-Champaign
University of Pittsburgh
Texas A & M University
University of Texas at Austin
Arizona State University
University of Colorado
University of Wisconsin, Madison
University of Washington
University of California at Berkeley
University of California at Los Angeles
San Diego State University
University of Hawaii (must be stationed in HI)

3. Students are Fully Funded.

4. Curriculum Length in Months: 9-12 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	Officer Community Manager	Approval Date
5100	LCDR Henry Suter	1 August 2018

7. The officer must understand the fundamental concepts and be familiar with the basic functional areas of Facilities Engineering (Environmental) within the Department of the Navy (DON) and the Department of Defense (DoD) including:

a. Understand the principles of and be able to organize, plan, direct, coordinate, and control activities where people, money, and materials are efficiently and economically combined to provide effective engineering, facilities, and infrastructure support services. Implicit is an understanding of the technical and managerial instruments available for proposing and implementing objectives, policies, and programs; policy analysis, program planning, and budgeting; accounting, evaluation, and control; and manpower planning. General knowledge of systems analysis problems solving models, network analysis, benefit cost analysis, and the role of systems analysis in public works/infrastructure decision making. **(Public Works/Infrastructure Management)**

b. Knowledge of problems meeting the growing energy demand. Selection of energy sources and their corresponding advantages and disadvantages. **(Energy Demand and Sources)**

c. Understanding of cyber security 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. **(Cybersecurity of Critical Infrastructure Control Systems)**

d. 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. **(Communication – Oral and Written)**

e. Knowledge of environmental management and planning processes including political and economic considerations. Introduction to practical procedures and decisions that public servants, lawyers, engineers and citizens confront with regard to the environmental option. **(Ethics)**

f. Understanding of physical and chemical unit processes used for treatment of potable water and wastewater. Ability to interpret water quality/quantity data and knowledge of Federal, State, and local requirements to design appropriate treatment and supply systems to meet Navy needs. **(Water Quality)**

g. Understanding of the effect of pollutants on the ecology and quality of waterways, including an introduction to computer transport modeling techniques. **(Water Ecology)**

h. Knowledge of fundamental aspects of microbiology and biochemistry as related to effects on water and soil environments, including an introduction to the concept of natural treatment systems and bioengineering for pollution control. **(Biochemistry in Pollution Control)**

i. Ability to understand and apply chemical principles to aqueous and gas phase kinetics that permit pollutant capture, transformation, or destruction in pollution control systems. **(Chemistry in Pollution Control)**

j. Working knowledge of solid and hazardous waste disposal concepts and methods to minimize/recover/recycle these wastes. **(Hazardous Waste Disposal)**

k. Introduction to legal and regulatory processes that apply to environmental protection, including basic statutes and the role of the Federal, State, and local government in environmental protection. **(Environmental Law)**

l. If a thesis or major report is required for the degree, the topic selected must be applicable to environmental problems found in the Navy or extends knowledge in a particular technical engineering area. **(Thesis/Report)**

2019-2020 EDUCATIONAL SKILL REQUIREMENTS
Facilities Engineering
1101 Subspecialty
470x Curriculum

1. Curriculum Number: 470C (Geotechnical/Soils Engineering Option).

2. Curriculum taught at Civilian Institutions:

Massachusetts Institute of Technology
Carnegie Mellon University
Stanford University
University of Maryland
Old Dominion University
Virginia Polytechnic Institute
North Carolina State University
Georgia Institute of Technology
University of Florida
Pennsylvania State University
Purdue University
University of Illinois at Urbana-Champaign
University of Pittsburgh
Texas A & M University
University of Texas at Austin
Arizona State University
University of Colorado
University of Wisconsin, Madison
University of Washington
University of California at Berkeley
University of California at Los Angeles
San Diego State University
University of Hawaii (must be stationed in HI)

3. Students are Fully Funded.

4. Curriculum Length in Months: 9-12 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 LCDR Henry Suter	Approval Date 1 August 2018
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7. The officer must understand the fundamental concepts and be familiar with the basic functional areas of Facilities Engineering (Geotechnical/Soils) within the Department of the Navy (DON) and the Department of Defense (DoD) including:

a. Understand the principles of and be able to organize, plan, direct, coordinate, and control activities where people, money, and materials are efficiently and economically combined to provide effective engineering, facilities, and infrastructure support services. Implicit is an understanding of the technical and managerial instruments available for proposing and implementing objectives, policies, and programs; policy analysis, program planning, and budgeting; accounting, evaluation, and control; and manpower planning. General knowledge of systems analysis problems solving models, network analysis, benefit cost analysis, and the role of systems analysis in public works/infrastructure decision making. **(Public Works/Infrastructure Management)**

b. Knowledge of problems meeting the growing energy demand. Selection of energy sources and their corresponding advantages and disadvantages. **(Energy Demand and Sources)**

c. Understanding of cyber security 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. **(Cybersecurity of Critical Infrastructure Control Systems)**

d. 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. **(Communication – Oral and Written)**

e. Working knowledge of soil and rock as a construction material for building foundations, embankments, dams, roads, earth retaining structures, channels and waterfront structures, including bulkheads, dry-docks and piers. **(General Geotech)**

f. Ability to apply theoretical principles of soil mechanics to geotechnical engineering problems related to deep and shallow foundations, retaining walls, slopes, braced cuts, embankments, tunnels, compaction of soil, and solid waste disposal. Understanding of geotechnical engineering solutions and designs that relate to settlement and heave problems; possible engineering solutions or field testing that may result. **(Soil Mechanics/Settlement)**

g. Understanding of the properties of pavement components, design of flexible and rigid pavements, pavement evaluation, and design tests. **(Pavement Design)**

h. Basic understanding of the techniques and limitations of laboratory and field testing including tests for soil and rock properties, capacity of foundations, and an understanding of field testing data for changes in site conditions that may change design. **(Field Testing)**

i. Understanding of techniques for the dynamic analysis of soils and foundations related to vibratory and seismic forces. **(Dynamic Analysis)**

j. Understanding of principles and techniques involved in terrain evaluation by observable geologic surface features, vegetation or drainage patterns, aerial photography, or relief mapping media. **(Geology)**

k. Understanding of principles and properties of groundwater seepage and porous media as related to engineering properties of soil and rock that affect engineering and environmental considerations. **(Groundwater)**

l. If a thesis or major report is required for the degree, the topic selected must be applicable to soils/geotechnical problems found in the Navy or extends knowledge in a particular technical engineering area. **(Thesis/Project)**

2019-2020 EDUCATIONAL SKILL REQUIREMENTS
Facilities Engineering
1101 Subspecialty
470x Curriculum

1. Curriculum Number: 470D (Public Works Option).

2. Curriculum taught at Civilian Institutions:

Massachusetts Institute of Technology
Carnegie Mellon University
Stanford University
University of Maryland
Old Dominion University
Virginia Polytechnic Institute
North Carolina State University
Georgia Institute of Technology
University of Florida
Pennsylvania State University
Purdue University
University of Illinois at Urbana-Champaign
University of Pittsburgh
Texas A & M University
University of Texas at Austin
Arizona State University
University of Colorado
University of Wisconsin, Madison
University of Washington
University of California at Berkeley
University of California at Los Angeles
San Diego State University
University of Hawaii (must be stationed in HI)

3. Students are Fully Funded.

4. Curriculum Length in Months: 9-12 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	Officer Community Manager	Approval Date
5100	LCDR Henry Suter	1 August 2018

7. The officer must understand the fundamental concepts and be familiar with the basic functional areas of Facilities Engineering (Public Works) within the Department of the Navy (DON) and the Department of Defense (DoD) including:

a. Understand the principles of and be able to organize, plan, direct, coordinate, and control activities where people, money, and materials are efficiently and economically combined to provide effective engineering, facilities, and infrastructure support services. Implicit is an understanding of the technical and managerial instruments available for proposing and implementing objectives, policies, and programs; policy analysis, program planning, and budgeting; accounting, evaluation, and control; and manpower planning. General knowledge of systems analysis problems solving models, network analysis, benefit cost analysis, and the role of systems analysis in public works/infrastructure decision making. **(Public Works/Infrastructure Management)**

b. Knowledge of problems meeting the growing energy demand. Selection of energy sources and their corresponding advantages and disadvantages. **(Energy Demand and Sources)**

c. Understanding of cyber security 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. **(Cybersecurity of Critical Infrastructure Control Systems)**

d. 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. **(Communication – Oral and Written)**

e. Familiarity with solid waste management and water/wastewater distribution, treatment, and disposal systems. **(Wastewater Treatment)**

f. Working knowledge of utilities, including generation, distribution, and conservation techniques. **(Utilities)**

g. Understanding of labor relations and collective bargaining. **(Labor Relations)**

h. Understanding of basic fundamentals of urban planning, effective land use development, and general real estate concepts. **(Urban Planning)**

i. Basic understanding of facility energy conservation techniques and environmental regulatory concepts. **(Facilities Energy Conservation)**

j. At least one course which extends knowledge in any of the classical engineering disciplines. Course(s) can be in any technical area such as structural engineering, pavement design, environmental engineering, transportation design and analysis, soils analysis or design, hydraulics, hydrology, mechanical engineering or electrical engineering. **(Technical Engineering)**

k. If a thesis or major report is required for the degree, the topic selected must be applicable to public works engineering problems found in the Navy facilities business or extends knowledge in a particular technical engineering area. **(Thesis/Project)**

l. The requirements for the public works engineering option should be satisfied by courses which emphasize the technical and administrative aspects of public works. Courses in the school of engineering should generally be taken in lieu of the more theoretical courses typically found in business administration curricula.

2019-2020 EDUCATIONAL SKILL REQUIREMENTS
Facilities Engineering
1101 Subspecialty
470x Curriculum

1. Curriculum Number: 470E (Structural Engineering Option).
2. Curriculum taught at Civilian Institutions:

Massachusetts Institute of Technology
Carnegie Mellon University
Stanford University
University of Maryland
Old Dominion University
Virginia Polytechnic Institute
North Carolina State University
Georgia Institute of Technology
University of Florida
Pennsylvania State University
Purdue University
University of Illinois at Urbana-Champaign
University of Pittsburgh
Texas A & M University
University of Texas at Austin
Arizona State University
University of Colorado
University of Wisconsin, Madison
University of Washington
University of California at Berkeley
University of California at Los Angeles
San Diego State University
University of Hawaii (must be stationed in HI)

3. Students are Fully Funded.
4. Curriculum Length in Months: 9-12 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
LCDR Henry Suter

Approval Date
1 August 2018

7. The officer must understand the fundamental concepts and be familiar with the basic functional areas of Facilities Engineering (Structural) within the Department of the Navy (DON) and the Department of Defense (DoD) including:

a. Understand the principles of and be able to organize, plan, direct, coordinate, and control activities where people, money, and materials are efficiently and economically combined to provide effective engineering, facilities, and infrastructure support services. Implicit is an understanding of the technical and managerial instruments available for proposing and implementing objectives, policies, and programs; policy analysis, program planning, and budgeting; accounting, evaluation, and control; and manpower planning. General knowledge of systems analysis problems solving models, network analysis, benefit cost analysis, and the role of systems analysis in public works/infrastructure decision making. **(Public Works/Infrastructure Management)**

b. Knowledge of problems meeting the growing energy demand. Selection of energy sources and their corresponding advantages and disadvantages. **(Energy Demand and Sources)**

c. 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. **(Communication – Oral and Written)**

d. In depth knowledge of construction materials, particularly reinforced concrete and steel, and their performance characteristics including tensile strength, yield strength, modulus of elasticity, ductility, and toughness. **(General Structures)**

e. Working knowledge of matrix analysis techniques and the Finite Element Method (FEM) of structural analysis; including capability to develop and provide design criteria for computer input and interpret the output in terms of magnitude and distribution of internal forces including moments and shears. **(Finite Element Analysis)**

f. Capability to establish the limit of structural elastic response and its relation to the failure load and extend the analysis into the inelastic range through an understanding of plastic analysis or ultimate loading principles. **(Steel/Concrete/Timber Design)**

g. Basic understanding of the probabilistic responses of various structures to seismic accelerations. Understanding of single and multi-degrees of freedom in seismic modeling. **(Seismic Response)**

h. Sound foundation in the principles, techniques and methods of engineering and the related mathematical and physical sciences, including the physical and chemical properties of engineering materials and the uses, limits, and benefits of these materials. **(Foundation Design)**

i. If a thesis or major report is required for the degree, the topic selected must be applicable to structural problems found in the Navy or extends knowledge in a particular technical engineering area often relied upon by the Navy. **(Thesis/Project)**

2019-2020 EDUCATIONAL SKILL REQUIREMENTS
Facilities Engineering
1101 Subspecialty
470x Curriculum

1. Curriculum Number: 470F (Urban, Regional or City Planning Option).
2. Curriculum taught at Civilian Institutions:

Georgia Institute of Technology
University of Florida
Clemson University
Purdue University
University of Illinois at Urbana-Champaign
Texas A & M University
University of Washington
University of California at Berkeley
University of Hawaii (must be stationed in HI)
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	Officer Community Manager	Approval Date
5100	LCDR Henry Suter	1 August 2018

7. The officer must understand the fundamental concepts and be familiar with the basic functional areas of Facilities Engineering (Urban, Regional or City Planning) within the Department of the Navy (DON) and the Department of Defense (DoD) including:

a. Understand the principles of and be able to organize, plan, direct, coordinate, and control activities where people, money, and materials are efficiently and economically combined to provide effective engineering, facilities, and infrastructure support services. Implicit is an understanding of the technical and managerial instruments available for proposing and implementing objectives, policies, and programs; policy analysis, program planning, and budgeting; accounting, evaluation, and control; and manpower planning. General knowledge of systems analysis problems solving models, network analysis, benefit cost analysis, and the role of systems analysis in public works/infrastructure decision making. **(Public Works/Infrastructure Management)**

b. Knowledge of problems meeting the growing energy demand. Selection of energy sources and their corresponding advantages and disadvantages. **(Energy Demand and Sources)**

c. Understanding of cyber security 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. **(Cybersecurity of Critical Infrastructure Control Systems)**

d. 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. **(Communication – Oral and Written)**

e. Understanding of the demographic and socio economic systems which make up a location including population characteristics and monitoring techniques, employment characteristics, revenue resources, and cultural factors and how they affect architecture, the landscape, and the urban environment. **(Architecture and Urban Design)**

f. Basic understanding of political systems, including municipal organizations and services; multi-jurisdictional coordination; federal, state and regional policy, programs and support; and capital improvement programs. **(Public Policy)**

g. Working knowledge of land use planning including considerations of zoning regulations and laws; environmental concerns such as aesthetics, development density, open space, protection and preservation of scarce resources and cultural artifacts; and factors impacting housing, transportation, utilities, and waste treatment/disposal systems. **(Zoning Regulations)**

h. Understanding and ability to incorporate economic dynamics in planning and design. **(Economic Analysis)**

i. Working and practical knowledge of the development, financing, and execution of capital improvement programs. **(Capital Finance)**

j. Introductory knowledge of physical science including geology, topology, meteorology, climatology, and hydrology. Understanding of bio-systems including terrestrial and marine ecosystems and habitat associations. **(Terrestrial Systems)**

k. If a thesis or major report is required for the degree, the topic selected must be applicable to planning issues found in the Navy. **(Thesis/Project)**

2019-2020 EDUCATIONAL SKILL REQUIREMENTS
Facilities Engineering
1101 Subspecialty or 3000 if member already holds 1101
470x Curriculum

1. Curriculum Number: 470G (Facilities Financial Program Management Option).
2. Curriculum taught at NPS and Civilian Institutions:

University of Florida
Pennsylvania State University
University of Illinois at Urbana-Champaign
University of Pittsburgh
Texas A & M University
University of Wisconsin, Madison
University of Washington
University of Hawaii (must be stationed in HI)
3. Students are Fully Funded.
4. Curriculum Length in Months: 9-12 Months.
5. APC Required: N/A.
6. CEC Community Manager has agreed to allow billets to be coded for Facilities Engineering/1101 or 3000 and officers to be educated for this curriculum.

Designator	Officer Community Manager	Approval Date
5100	LCDR Henry Suter	1 August 2018

7. The officer must understand the fundamental concepts and be familiar with the basic functional areas of Facilities Engineering (Facilities Financial Program Management) within the Department of the Navy (DON) and the Department of Defense (DoD) including:

a. Understand the principles of and be able to organize, plan, direct, coordinate, and control activities where people, money, and materials are efficiently and economically combined to provide effective engineering, facilities, and infrastructure support services. Implicit is an understanding of the technical and managerial instruments available for proposing and implementing objectives, policies, and programs; policy analysis, program planning, and budgeting; accounting, evaluation, and control; and manpower planning. General knowledge of systems analysis problems solving models, network analysis, benefit cost analysis, and the role of systems analysis in public works/infrastructure decision making. **(Public Works/Infrastructure Management)**

b. Knowledge of problems meeting the growing energy demand. Selection of energy sources and their corresponding advantages and disadvantages. **(Energy Demand and Sources)**

c. Understanding of cyber security 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. **(Cybersecurity of Critical Infrastructure Control Systems)**

d. 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. **(Communication – Oral and Written)**

e. Working knowledge of engineering terms common to construction operations, equipment and material procurement, maintenance, estimating and bidding techniques, work scheduling, quality control techniques, resource allocation, common construction practices, construction organizations, and financing. **(General Engineering)**

f. Understand the operating processes and concepts of the private sector and apply these processes and concepts to acquisition of facilities and services through joint ventures and other innovative business practices. **(Facility Finance)**

g. Understand private and public organizational financing, including corporate financial structures; cost and financial accounting; capital budgeting techniques; financial engineering, and financial analysis. Knowledge of the principles of economics, including monetary and fiscal theories. **(Accounting – Financial and Management Concepts)**

h. Understand methods to develop and implement a financial planning structure in conformity with fiscal restraints and government policy. Implicit is an ability to employ various techniques for financial analysis, allocation of funds, and developing alternate sources and forms of financing for capital projects. **(Economics)**

i. Knowledge of the theories, principles, and techniques of interdisciplinary management of a complex business venture, including the disciplines of systems design, resource allocation, managerial theory, optimization techniques, and cost-benefit analysis. **(Interdisciplinary Management of Complex Business – Systems, Optimization, Cost-benefit)**

j. Knowledge of statistics relative to decision-making, probability theory, sampling techniques, contingency table analysis, hypothesis testing, simple and multiple regression analysis, and analysis of variance. **(Probability and Statistics)**

k. If a thesis or major report is required for the degree, the topic selected must be applicable to facilities acquisition or business practices relative to the Navy facilities business or extends knowledge in a particular technical engineering area. **(Thesis/Project)**

Note: The requirements for the facilities acquisition option should be satisfied by courses which emphasize the business practices and innovative acquisition strategies to improve capitalization and re-capitalization of Navy shore facilities. Courses in the school of business should be taken in lieu of the more specialized technical courses typically found in an engineering curriculum.

2019-2020 EDUCATIONAL SKILL REQUIREMENTS

Facilities Engineering

1101 Subspecialty

470x Curriculum

1. Curriculum Number: 470H (Engineering Management Option).

2. Curriculum taught at NPS and Civilian Institutions:

University of Maryland
Old Dominion University
University of Colorado

3. Students are Fully Funded.

4. Curriculum Length in Months: 9-12 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	Officer Community Manager	Approval Date
5100	LCDR Henry Suter	1 August 2018

7. The officer must understand the fundamental concepts and be familiar with the basic functional areas of Facilities Engineering (Engineering Management) within the Department of the Navy (DON) and the Department of Defense (DoD) including:

a. Understand the principles of and be able to organize, plan, direct, coordinate, and control activities where people, money, and materials are efficiently and economically combined to provide effective engineering, facilities, and infrastructure support services. Implicit is an understanding of the technical and managerial instruments available for proposing and implementing objectives, policies, and programs; policy analysis, program planning, and budgeting; accounting, evaluation, and control; and manpower planning. General knowledge of systems analysis problems solving models, network analysis, benefit cost analysis, and the role of systems analysis in public works/infrastructure decision making. **(Public Works/Infrastructure Management)**

b. Knowledge of problems meeting the growing energy demand. Selection of energy sources and their corresponding advantages and disadvantages. **(Energy Demand and Sources)**

c. Understanding of cyber security 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. **(Cybersecurity of Critical Infrastructure Control Systems)**

d. 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. **(Communication – Oral and Written)**

e. Working knowledge of engineering terms common to equipment and material procurement, maintenance, estimating and bidding techniques, work scheduling, quality control techniques, resource allocation, common construction practices, construction organizations, and financing. **(General Engineering)**

f. Familiarity with basic elements of a contract, types of specifications, general provisions, resolution of legal disputes, and negotiating strategies. **(Construction Contracts)**

g. At least one course which extends knowledge in any of the classical engineering disciplines. Can be in any technical area, such as structural engineering, pavement design, environmental engineering, soils analysis or design, hydraulics, hydrology, mechanical or electrical engineering. **(Technical Engineering)**

h. Technical analysis of process, organizational, and production issues encountered in the industry. **(Production Analysis)**

i. Organizational analysis of language, concepts and principles related to integrating technical, structural, and human aspects of organizations. Identifying and resolving organizational issues within technical enterprises. **(Organizational Management)**

j. If a thesis or major report is required for the degree, the topic selected must be applicable to engineering and management problems found in the Navy facilities business or extends knowledge in a particular technical engineering area. **(Thesis/Project)**

2019-2020 EDUCATIONAL SKILL REQUIREMENTS
Facilities Engineering
1101 Subspecialty
470x Curriculum

1. Curriculum Number: 470I (Architecture and Urban Design Option).

2. Curriculum taught at Civilian Institutions:

Virginia Polytechnic Institute (Architects only)
Georgia Institute of Technology
University of California at Los Angeles

3. Students are Fully Funded.

4. Curriculum Length in Months: 9-12 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	Officer Community Manager	Approval Date
5100	LCDR Henry Suter	1 August 2018

7. The officer must understand the fundamental concepts and be familiar with the basic functional areas of Facilities Engineering (Architecture and Urban Design) within the Department of the Navy (DON) and the Department of Defense (DoD) including:

a. Understand the principles of and be able to organize, plan, direct, coordinate, and control activities where people, money, and materials are efficiently and economically combined to provide effective engineering, facilities, and infrastructure support services. Implicit is an understanding of the technical and managerial instruments available for proposing and implementing objectives, policies, and programs; policy analysis, program planning, and budgeting; accounting, evaluation, and control; and manpower planning. General knowledge of systems analysis problems solving models, network analysis, benefit cost analysis, and the role of systems analysis in public works/infrastructure decision making. **(Public Works/Infrastructure Management)**

b. Knowledge of problems meeting the growing energy demand. Selection of energy sources and their corresponding advantages and disadvantages. **(Energy Demand and Sources)**

c. Understanding of cyber security 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. **(Cybersecurity of Critical Infrastructure Control Systems)**

d. 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. **(Communication – Oral and Written)**

e. Understanding of the demographic and socio-economic systems which make up a location, including population characteristics and monitoring techniques, employment characteristics, revenue resources, and cultural factors. **(Urban Demographics)**

f. Basic understanding of political systems, including municipal organizations and services; multi-jurisdictional coordination; federal, state and regional policy, programs and support; and capital improvement programs. **(Urban Policy and Programs)**

g. Working knowledge of land use planning including considerations of zoning regulations and laws; environmental concerns such as aesthetics, development density, open space, protection and preservation of scarce resources and cultural artifacts; and factors impacting housing, transportation, utilities, and waste treatment/disposal systems. **(Urban Planning)**

h. Understanding and ability to incorporate economic dynamics in planning and design. **(Economic Planning and design)**

j. Working and practical knowledge of the development, financing, and execution of capital improvement programs. **(Capital Finance)**

k. Basic knowledge of architectural, landscape, and urban design. **(General Urban Design)**

l. Introductory knowledge of physical science including geology, topology, meteorology, climatology, and hydrology. Understanding of bio-systems, including terrestrial and marine ecosystems, and habitat associations. **(Terrestrial Systems)**

m. If a thesis or major report is required for the degree, the topic selected must be applicable to facilities planning issues found in the Navy. **(Thesis/Project)**

2019-2020 EDUCATIONAL SKILL REQUIREMENTS
Facilities Engineering
1101 Subspecialty
471 Curriculum

1. Curriculum Number: 471 Electrical Engineering (Shore Facilities).

2. Curriculum taught at NPS and Civilian Institutions:

University of Maryland
North Carolina State University
Georgia Institute of Technology
University of Florida
Pennsylvania State University
Purdue University
University of Illinois at Urbana-Champaign
University of Pittsburgh
Texas A & M University
University of Texas at Austin
University of Colorado
University of Washington
University of California at Berkeley

3. Students are Fully Funded.

4. Curriculum Length in Months: 9-12 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	Officer Community Manager	Approval Date
5100	LCDR Henry Suter	1 August 2018

7. The officer must understand the fundamental concepts and be familiar with the basic functional areas of Electrical Engineering (Shore Facilities) within the Department of the Navy (DON) and the Department of Defense (DoD) including:

a. Understand the principles of and be able to organize, plan, direct, coordinate, and control activities where people, money, and materials are efficiently and economically combined to provide effective engineering, facilities, and infrastructure support services. Implicit is an understanding of the technical and managerial instruments available for proposing and implementing objectives, policies, and programs; policy analysis, program planning, and budgeting; accounting, evaluation, and control; and manpower planning. General knowledge of systems analysis problems solving

models, network analysis, benefit cost analysis, and the role of systems analysis in public works/infrastructure decision making. **(Public Works/Infrastructure Management)**

b. Knowledge of problems meeting the growing energy demand. Selection of energy sources and their corresponding advantages and disadvantages. **(Energy Demand and Sources)**

c. Understanding of cyber security 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. **(Cybersecurity of Critical Infrastructure Control Systems)**

d. 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. **(Communication – Oral and Written)**

e. Theoretical and working knowledge of power systems engineering, including various power sources power supply protection, reliability and fault analysis, and systems grounding. **(Power Systems)**

f. Ability to plan and design electrical systems to include a working knowledge of load characteristics, voltage considerations, circuit arrangements and overhead, and underground systems. **(Electrical System Design)**

g. Working knowledge of protective devices and relays. **(Electrical Systems – Circuits)**

h. Basic understanding of the functions of transformers, regulators, rectifiers, converters, and inverters. **(Electrical Systems – Transformers)**

i. Basic understanding of/ability to apply principles of control systems. **(Electrical Systems – Control Systems)**

j. Basic understanding of electromagnetic communications systems. **(Electrical Systems - Communications)**

k. If a thesis or major report is required for the degree, the topic selected must be applicable to electrical engineering problems found in the Navy facilities business or extends knowledge in a particular technical engineering area. **(Thesis/Project)**

2019-2020 EDUCATIONAL SKILL REQUIREMENTS
Facilities Engineering
1101 Subspecialty
473x Curriculum

1. Curriculum Number: 473A Mechanical Engineering (Shore Facilities Option).
2. Curriculum taught at Civilian Institutions:
 - University of Maryland
 - North Carolina State University
 - Georgia Institute of Technology
 - University of Florida
 - Pennsylvania State University
 - Purdue University
 - University of Illinois at Urbana-Champaign
 - Texas A & M University
 - University of Texas at Austin
 - University of Colorado
 - University of Washington
 - University of California at Berkeley
 - University of Hawaii (must be stationed in HI)
3. Students are Fully Funded.
4. Curriculum Length in Months: 9-12 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	Officer Community Manager	Approval Date
5100	LCDR Henry Suter	1 August 2018

7. The officer must understand the fundamental concepts and be familiar with the basic functional areas of Mechanical Engineering (Shore Facilities) within the Department of the Navy (DON) and the Department of Defense (DoD) including:

a. Understand the principles of and be able to organize, plan, direct, coordinate, and control activities where people, money, and materials are efficiently and economically combined to provide effective engineering, facilities, and infrastructure support services. Implicit is an understanding of the technical and managerial instruments available for proposing and implementing objectives, policies, and programs; policy analysis, program planning, and budgeting; accounting, evaluation, and control; and manpower planning. General knowledge of systems analysis problems solving

models, network analysis, benefit cost analysis, and the role of systems analysis in public works/infrastructure decision making. **(Public Works/Infrastructure Management)**

b. Knowledge of problems meeting the growing energy demand. Selection of energy sources and their corresponding advantages and disadvantages. **(Energy Demand and Sources)**

c. Understanding of cyber security 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. **(Cybersecurity of Critical Infrastructure Control Systems)**

d. 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. **(Communication – Oral and Written)**

e. Application of basic principles of thermodynamics, heat transfer, and fluid mechanics to the analysis and design of industrial system components and equipment. **(Thermodynamics)**

f. Working knowledge of mechanical engineering problems associated with electrical power production in steam power plants, gas turbine engines, fossil fuel power plants, and nuclear power plants. **(Electrical Power Production)**

g. Understanding of basic heating, ventilating and air-conditioning system design, including central plant components and equipment; understanding designs to control air pollutants; absorption and adsorption of gaseous pollutants; and air quality modeling/monitoring. **(Heating and Ventilation)**

h. Understanding of simulation methods of modeling techniques as methods of solving problems associated with mechanical design; including a basic understanding of data processing and computer techniques for application to engineering problems. **(Mathematical Modeling)**

i. If a thesis or major report is required for the degree, the topic selected must be applicable to mechanical engineering problems found in the Navy facilities business or extends knowledge in a particular technical engineering area. **(Thesis/Report)**

j. Specialize in one of the three mechanical engineering subspecialty areas as detailed below. Curriculum course content shall provide coverage of the majority of subtopics shown under either “Thermal”, “Fluids” or “Materials/Machine Design” as indicated. **(Specialized Mechanical Engineering)**

Fluids	Thermal	Materials/Machine Design
Navier-Stokes equations	Mass transfer and transport properties	Machine design – turbomachinery
Boundary layer theory	Droplet, particle and slurry combustion	Pumps

Fluids	Thermal	Materials/Machine Design
Two-dimensional incompressible and compressible fluids	Flammability, ignition, extinction & flame stability	Compressors
Viscous flow in laminar and turbulent layers	Combustion flow systems	Fans
Applications to turbomachinery	Sprays	Gears
Flow measurement techniques	Laminar and detonation waves	Robotics
Control methods for unsteady flow	Vapor/compression/refrigeration/compression	Control Systems
Analysis of fluid networks/devices		Hydraulics and Pneumatics

2019-2020 EDUCATIONAL SKILL REQUIREMENTS
Facilities Engineering
1101 Subspecialty
473x Curriculum

1. Curriculum Number: 473B Mechanical Engineering (Energy Management Option).
2. Curriculum taught at NPS and Civilian Institutions:

Carnegie Mellon University
University of Maryland
North Carolina State University
Georgia Institute of Technology
University of Florida
University of Illinois at Urbana-Champaign
University of Colorado
University of California at Berkeley
University of Hawaii (must be stationed in HI)
3. Students are Fully Funded.
4. Curriculum Length in Months: 9-12 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	Officer Community Manager	Approval Date
5100	LCDR Henry Suter	1 August 2018

7. The officer must understand the fundamental concepts and be familiar with the basic functional areas of Energy Management within the Department of the Navy (DON) and the Department of Defense (DoD) including:
 - a. Understand the principles of and be able to organize, plan, direct, coordinate, and control activities where people, money, and materials are efficiently and economically combined to provide effective engineering, facilities, and infrastructure support services. Implicit is an understanding of the technical and managerial instruments available for proposing and implementing objectives, policies, and programs; policy analysis, program planning, and budgeting; accounting, evaluation, and control; and manpower planning. General knowledge of systems analysis problems solving models, network analysis, benefit cost analysis, and the role of systems analysis in public works/infrastructure decision making. **(Public Works/Infrastructure Management)**

b. Understanding of cyber security 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. **(Cybersecurity of Critical Infrastructure Control Systems)**

c. 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. **(Communication – Oral and Written)**

d. Understanding of the basic workings of the systems that supply, distribute, and utilize energy. This can include fossil fuels, nuclear energy, and renewable sources. **(Energy Conversion and Supply)**

e. Knowledge of current energy demands across various sectors and understanding of tools and technologies used to measure efficiencies and energy demand response. **(Energy Demand and Utilization)**

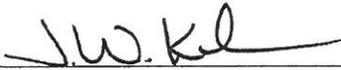
f. Understanding energy and environmental policy and the economic impacts of public policy related to the energy and environment. **(Energy Policy and Economics)**

g. Knowledge of renewable energy sources, availability, implementation and management of renewable resources. **(Renewable Energy)**

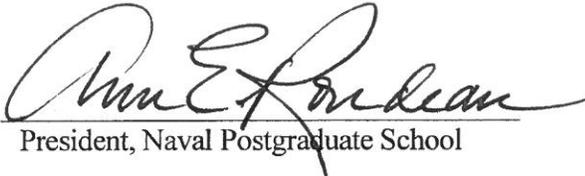
h. Understanding of simulation methods of modeling techniques as methods of solving problems associated with energy system; including a basic understanding of data processing and computer techniques for application to engineering problems. **(Mathematical Modeling)**

i. If a thesis or major report is required for the degree, the topic selected must be applicable to energy problems found in the Navy facilities business or extends knowledge in a particular technical energy area. **(Thesis/Project)**

2019-2020 EDUCATIONAL SKILL REQUIREMENTS
Facilities Engineering
1101 Subspecialty
470/471/473 Curricula

APPROVED 
Chief of Civil Engineers

23 FEB 2019
(Date)

APPROVED 
President, Naval Postgraduate School

21 MAR 2019
(Date)

APPROVED 
Director, TFMTE (OPNAV N12)

10 JUN 2019
(Date)