MARE - MARINE ENGR TECHNOLOGY (MARE)

MARE 100 Marine Engineering Fundamentals  
Credits 3. 2 Lecture Hours. 3 Lab Hours.  
A study of basic marine engineering systems, with emphasis on propulsion plants. Introduction to propulsion plant machinery and shipboard safety practices and equipment; offshore oil production; subsea technologies; petroleum product transport and refinery.

MARE 180 Basic Machine Shop Techniques  
Credit 1. 3 Lab Hours.  
Safety, care of machines and hand-tools, cutting speeds and feeds, measuring instruments, gauging, standard machine tool work in metals, layouts, drilling, tapping, threading, vertical and horizontal milling and shaving.

MARE 200 Basic Operations  
Credits 4. 4 Lecture Hours.  
Prerequisite: NAUT 104.  
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Practical application of student’s classroom studies while at sea on training ship during sea-training period. Student required to complete several projects relating to engineering plant of ship.

MARE 202 Marine Thermodynamics  
Credits 3. 3 Lecture Hours.  
Energy Concepts; First and second law of thermodynamics; Carnot and Rankine principles and reversible heat cycles; Properties of processes of vapors; vapor-power cycles and vapor refrigeration cycles.  
Prerequisite: MARE 100, MATH 152 or MATH 161 or concurrent enrollment.

MARE 205 Engineering Mechanics I  
Credits 3. 3 Lecture Hours.  
Statics, basic vector operations, mechanics of particles and rigid bodies. Center of gravity, analysis of structures, friction, moments of inertia.  
Prerequisite: MATH 151, PHYS 218.

MARE 206 Engineering Mechanics II  
Credits 3. 3 Lecture Hours.  
Dynamics; scalar and vector solutions of relative linear velocities and acceleration; kinetics; dynamics of translation and rotation; work; energy; impact; momentum.  
Prerequisite: MARE 205.

MARE 207 Electrical Power I  
Credits 3. 2 Lecture Hours. 3 Lab Hours.  
Application of circuit analysis principles to DC and AC circuits having sources and passive inductors, resistors and capacitors; electrical instrumentation; power and voltage/current phase relationships in AC circuits; balanced three-phase AC power circuits; cable sizing.  
Prerequisites: MATH 151 and PHYS 208.

MARE 209 Mechanics of Materials  
Credits 3. 2 Lecture Hours. 3 Lab Hours.  
Introduction to the study of stresses, strains, and deformation of a solid body which results when static forces are applied. Transformation of stresses and strains, torsion, beam deflection, and combined loadings are discussed.  
Prerequisite: MARE 205.

MARE 211 Steam Propulsion Plants  
Credits 3. 2 Lecture Hours. 3 Lab Hours.  
Fossil fuel steam generators, shipboard propulsion turbines and condensers, reduction gears, line shafting, internal fittings and fluid flow paths, automatic controls, regulatory requirements for safety device settings, system tests and inspections, boiler water/feed water test and treatment, turbine/reduction gear lubrication, computer aided heat balances, parametric analysis of plant performance.

MARE 242 Manufacturing Methods I  
Credits 2. 1 Lecture Hour. 3 Lab Hours.  
Introduction to manufacturing methods used in marine industries emphasizing fabrication techniques including oxy-acetylene cutting and welding, brazing, arc welding, pipe welding and sheet metal fabrication. Laboratory exercises will develop the knowledge and skills needed to perform fabrication operations, routine maintenance and emergency repairs of marine engineering structures and systems.

MARE 243 Manufacturing Methods II  
Credit 1. 0 Lecture Hours. 3 Lab Hours.  
Continued introduction to manufacturing methods used in marine industries including machine, foundry and forge work and other manufacturing technologies. Laboratory emphasizes machine shop practices including safety, use and care of machine and hand tools; measuring instruments, layout, gauging, cutting speeds and feeds, drilling, tapping, threading, turning and milling.  
Prerequisite: Approval of Instructor.

MARE 261 Engineering Analysis  
Credits 3. 3 Lecture Hours.  
Review of mathematical concepts previously studied (e.g., complex quantities, vectors and calculus), coupled with study of advanced concepts (e.g., differential equations, Laplace Transforms, statistics and numerical methods) with a view to emphasize applications in nuclear engineering, electrical engineering, thermodynamics, heat transfer and turbine theory.  
Prerequisite: MATH 152 or 161.

MARE 285 Directed Studies  
Credits 1 to 4. 1 to 4 Other Hours.  
Special problems in marine engineering technology not covered by any other course in the curriculum; work may be in either theory or laboratory.  
Prerequisite: Approval of department head.

MARE 289 Special Topics  
Credits 1 to 5. 0 to 5 Lecture Hours. 3 to 5 Lab Hours.  
Selected topics in an identified area of marine engineering technology. May be repeated for credit.  
Prerequisite: Approval of instructor.

MARE 300 Intermediate Operations  
Credits 4. 4 Lecture Hours.  
Intermediate Operations. Training program for second sea-training period. Sea project required of each student under supervision of officer-instructors. Lifeboat and safety training.  
Prerequisite: Junior or senior classification or approval of instructor.

MARE 303 Marine Thermodynamics  
Credits 3. 3 Lecture Hours.  
Prerequisites: MATH 161. Junior or senior classification or approval of instructor.
MARE 305 Fluid Mechanics Theory  
Credits 4. 3 Lecture Hours. 2 Lab Hours.  
Theory of incompressible and compressible fluid flow, introduction to fluid power systems and controls, and dynamics of turbomachinery. Mathematical analysis of piping systems to determine pump head, system resistance, and pipe sizing optimization. Topics include physical properties of fluids, continuity equation, Bernoulli’s Equation, Darcy’s Equation, series and parallel flow, relative roughness, friction factors, dimensional analysis, and laws of similitude.  
Prerequisite: Junior or senior classification or approval of instructor.

MARE 306 Electrical Power II  
Credits 3. 2 Lecture Hours. 3 Lab Hours.  
Electrical power generation and piping machinery; transformers; controllers and safety devices; operation, maintenance and repair procedures and practices; static converters AC/DC and DC/AC that are used in modern electric propulsion systems.  
Prerequisite: MARE 207.

MARE 307 Marine Electronics  
Credits 3. 2 Lecture Hours. 3 Lab Hours.  
Introduction to the theory of electronic circuits. Fundamentals and basic concepts of semiconductors; solid-state components; power supplies; amplifiers; inverters; rectifiers; oscillators; digital and analog integrated circuits. Application in automation, motor controllers, battery-charging systems, communications; and propulsion plant monitoring systems.  
Prerequisite: MARE 207.

MARE 309 Marine Construction Materials  
Credits 3. 2 Lecture Hours. 3 Lab Hours.  
Introduction to materials science and engineering, structural, property relationships; advanced manufacturing techniques from the point of view of marine applications such as subsea pipelines, ship hulls, etc.; corrosion and biofouling. Laboratory includes experimental testing of materials properties, materials syntheses and heat treatment techniques.  
Prerequisite: MARE 209.

MARE 310 Marine Auxiliary Systems  
Credits 3. 2 Lecture Hours. 2 Lab Hours.  
Study of the principal shipboard auxiliary systems, including: auxiliary fired-boilers, sea water service, ballast, freshwater service, lubricating oil, fuel oil storage and transfer, distilling, and steering systems. Major components, operation and maintenance, and interrelationship with other auxiliary systems are covered. Additional topics include steam turbine, gas turbine, and diesel-driven electric power generators and support systems, as well as propulsion train power take-off type electric power generation systems.  
Prerequisites: MARE 305, 313. Junior or senior classification or approval of instructor.

MARE 312 Diesel Propulsion Plants  
Credits 3. 2 Lecture Hours. 3 Lab Hours.  
Marine Diesel Engines. Comprehensive study of diesel engines, thermodynamics of air standard cycles, actual compression ignition engine cycles, emissions and emission controls, fuel injection systems and turbo charging systems, engine material properties, operational parameters including forces and temperatures resulting from combustion and inertial dynamics. Laboratory includes computer-aided parametric analysis of engine performance and use of low-speed diesel propulsion plant simulator.  
Prerequisites: MARE 305, MARE313. Junior or senior classification or approval of instructor.

MARE 313 Heat Transfer  
Credits 3. 2 Lecture Hours. 3 Lab Hours.  
Introduction to heat transfer; basic heat transfer modes and different solution techniques; introduction to 1-D and 2-D heat conduction in transient and steady state conditions; fundamentals of convection heat transfer under different flow conditions; forced convection in internal and external flows; analysis and selection of heat exchangers; introduction to thermal radiation heat transfer.  
Prerequisites: MARE 261 and MARE 305 or concurrent enrollment.

MARE 314 Gas Turbine Power Generation  
Credits 3. 2 Lecture Hours. 3 Lab Hours.  
Application of the Brayton cycle to gas turbine power cycles, including ideal gas cycle analysis, compressor design and construction, gas turbine construction, operation and maintenance for marine and industrial installations.  
Prerequisites: MARE 202, MARE 205, MARE 309 or concurrent enrollment and permission of instructor.

MARE 350 Commercial Cruise Internship  
Credits 4. 4 Other Hours.  
Training program for second sea-training period; sea project required of each student under supervision of officer-instructors; lifeboat and safety training.  
Prerequisites: MARE 100, MARE 200, MART 103. Junior or senior classification or permission of MARR and MART department heads.

MARE 400 Advanced Operations  
Credits 4. 4 Lecture Hours.  
Training program for third sea-training period. At the end of this period each student will have achieved the knowledge and will have demonstrated the ability to take complete charge of a modern marine power plant while underway at sea.  
Prerequisite: Junior or senior classification or approval of instructor.

MARE 401 Marine Auxiliary Systems  
Credits 3. 2 Lecture Hours. 2 Lab Hours.  
Study of automation in marine power plants; including electronic and pneumatic proportional, integral and derivative control elements; applications in boiler combustion and water level control; engine speed control; remote sensing and performance monitoring systems.  
Prerequisites: MARE 307, 311, 312. Junior or senior classification or approval of instructor.

MARE 402 Shipboard Automation and Control  
Credits 3. 3 Lecture Hours.  
Study of automation in marine power plants; including electronic and pneumatic proportional, integral and derivative control elements; applications in boiler combustion and water level control; engine speed control; remote sensing and performance monitoring systems.  
Prerequisites: MARE 307, 311, 312. Junior or senior classification or approval of instructor.

MARE 405 Fundamentals of Naval Architecture  
Credits 3. 2 Lecture Hours. 3 Lab Hours.  
Ship geometry and arrangement; ship-form calculations; intact and damaged stability; ships’ structure; fundamentals of resistance and propulsion; ship motion, maneuverability, and control; introduction to ship design, construction, and overhaul.  
Prerequisites: Junior or senior classification or approval of instructor.

MARE 431 Subsea Technology  
Credits 3. 3 Lecture Hours.  
Theory, concepts, and practices of subsea projects and operations in the offshore oil and gas industry: field development, drilling, architecture, installation, intervention, mooring systems, operations, flow assurance, chemistry, materials, classification, economics and risk management.  
Prerequisite: Junior or senior classification or approval of instructor.
MARE 434 Offshore Energy, Oil, and Gas Production
Credits 3. 3 Lecture Hours.
Orientation to the offshore and gas industry; petroleum exploration, production, and marketing; platform and floating production facilities; operations; classification of production systems; economics and risk management.
Prerequisite: Junior or senior classification or approval of instructor.

MARE 441 Engineering Economics and Project Management
Credits 3. 3 Lecture Hours.
Analysis of engineering economics and management, using costs and benefits of various engineering options. Topics include time value of money, cash flows, analysis techniques, interests rates, inflation, depreciation, optimization, statistics, network analysis and critical path programming.
Prerequisite: Junior or senior classification or advisor approval.

MARE 451 Senior Design Project I
Credits 2. 1 Lecture Hour. 3 Lab Hours.
Introduction to design, modeling, testing and validation processes.
Design of equipment, components or systems for marine and related power generation applications. Complete design process including: definition of the problem, research for existing designs and related technologies, conceptualization and evaluation of alternatives, development of preliminary design, refining and generation of final design and documents.
Prerequisites: MARE 206, MARE 242, MARE 306, MARE 309, MARE 311, MARE 312, MARE 313, PHYS 208 (or concurrent enrollment) and senior classification.

MARE 452 Senior Design Project II
Credits 2. 1 Lecture Hour. 3 Lab Hours.
This course is a continuation of MARE 451. Development of theoretical, computational or experimental models using the design developed in MARE 451. Formulation, construction and/or fabrication work. Refining, experimenting and testing of models considering alternatives. Analyzing results and preparing and submitting design documents including a project report.
Prerequisite: MARE 451.

MARE 484 Undergraduate Internship
Credits 0 to 6. 0 to 6 Other Hours.
Supervised study with an approved power generator, either electrical, mechanical, or thermal power. Alternatively, studies can be with a research, manufacturing or repair facility whose primary mission is to support power generation.
Prerequisites: 2.5 GPR and completion of 300 level courses.

MARE 485 Directed Studies
Credits 1 to 8. 1 to 8 Other Hours.
Special problems in marine engineering technology not covered by any other course in the curriculum. Work may be in either theory or laboratory.
Prerequisites: Approval of department head. Junior or senior classification or approval of instructor.

MARE 489 Special Topics
Credits 1 to 4. 1 to 4 Lecture Hours.
Selected topics in an identified area of marine engineering technology.
May be repeated for credit.
Prerequisites: Junior or senior classification or approval of instructor.

MARE 491 Research in Marine Engineering Technology
Credits 1 to 4. 1 to 4 Other Hours.
Research in Engineering Technology. Research conducted under the direction of faculty member in Marine Engineering Technology. May be repeated 2 times for credit. Please see academic advisor in department. Registration in multiple sections of this course is possible within a given semester provided that the per semester credit hour limit is not exceeded.
Prerequisites: Junior or senior classification and approval of instructor.