

COURSE DESCRIPTION - MARINE

51-101 Fluid Mechanics

Credits: 2

Hours: 3

Pre-requisite: 56-113

Properties of fluids. Fluid statics: pressure, pressure measurement. Forces on immersed plane surfaces application to ship tanks and bulkheads. Fluid flow continuity equation Bernoulli's equation velocity and flow measurement. Momentum and forces in fluid flow fluid impact jet propulsion. Dimensional analysis similarity laws ship model experiments Froude and Reynolds numbers.

51-103 Engineering Mechanics

Credits: 2

Hours: 3

Pre-requisite: 76-105

Concurrent and non-concurrent force systems position and force vectors. Equilibrium of force systems for particles and rigid bodies. Application to ship cranes and steering gears. Friction. Work energy and power. Impulse and momentum. Newton's Second law. Kinetics of particles and rigid bodies. Gears. Centroid and moment of inertia of area. Application to midship section. Simple beams.

51-104 Naval Architecture & Ship Construction (1)

Credits: 2

Hours: 3

Pre-requisite: None

Terminology of naval architecture. General arrangement of modern ship types. Buoyancy. Hull geometry. Simpson's Rule. Hydrostatic curves. Metacentric height. Fresh water allowance. Initial stability. The inclining experiment. Free surface effect. Removal or addition of weights. Hogging and sagging. Racking stresses. Slamming. Framing systems. Classification Societies. Midship section of different ship types.

51-105 Manufacturing Processes

Credits: 1

Hours: 3

Pre-requisite: None

Fundamentals of metal cutting. Measuring systems. Process accuracy and produced surface finish. Hand tools and machine tools with emphasis on basic lathe operations. Thread generation. Electric arc welding. Inspection of welds. Oxy-acetylene welding and flame cutting. Setting up of milling machines (horizontal and vertical) drill presses hydraulic press and vertical band saw. Knurls shoulders cuts off in lathe using proper procedures. Pipe threading and welding. Cutting methods using oxy fuel torch and associated equipment. The plasma arc cutting process. Gas tungsten arc welding.

51-106 Material Technology***Credits: 2******Hours: 3******Pre-requisite: None***

Basic metallurgy metals and processes, properties of materials (Physical Chemical Electrical and Mechanical). Mechanical properties and Strength of materials. Properties of metals and alloys Selection and Heat Treatment of the Marine Materials (Metallic metals and alloys) Classification properties and heat treatment of Non-metallic metals and alloys. Rubber Plastics Fiberglass and Other important materials used in marine.

51-107 Thermodynamics***Credits: 3******Hours: 4******Pre-requisite: 56-113***

The state of working substance. Perfect gasses. Gas Laws. Heat and work relationship. Gas processes. The First Law for non-flow processes. The steady flow equation. Conservation of energy. Flow processes. Gasses and vapors. Reversible and non-reversible processes. The Second Law. Entropy. Heat engine cycles: Otto cycle Diesel cycle dual combustion cycle gas turbine cycle. Performance of engine.

51-114 High Performance Boats***Credits: 3******Hours: 3******Pre-requisite: None***

General on leisure boats jet ski propulsion engines: propulsion and jet pumping systems. Boat geometry and hull materials. mechanical and Electrical systems: Tools Engines disassembly procedure. Engines maintenance check points. Lubrication oil system. Water cooling system. Fuel oil system. Air intake and exhaust systems. Electrical system (DC electric theory and batteries). Auxiliary equipment. Trouble shootings. Deck hardware. Power estimation and sizing outboard engine boats hull and propellers.

51-116 Introduction to Engineering Technology***Credits: 2******Hours: 2******Pre-requisite: None***

What is Engineering? Describe some of the subfields of engineering what are the differences between engineering and engineering technology Role of engineering technology in society being successful in engineering colleges and industry what is Design? Project management and Teamwork Skills

Engineering tools overview Using spreadsheets and computer software Engineering ethics and professional responsibility The Human-Machine Interface. Engineers and the real world. Knowledge of fundamental physics and mathematics. Employ engineering measurements units and conversions Engineering methods and problem solving Job opportunities for engineering technology Learning to Speak Write and Make Presentations. Field visit and report writing.

51-117 Marine Safety

Credits: 2

Hours: 2

Pre-requisite: None

General safety roles Safety systems –. Relevant IMO/SOLAS/Class Regulations and conventions concerning safety of life at sea. Types of hazards. Fire protection and firefighting equipment: Fire detection systems fire-main systems CO2 and foam extinguishing systems hand portable and semi-portable fire extinguishers. Lifesaving appliances: Lifeboats L.S.A. Boats life rafts PFDs exposure suits ring life buoys ship's distress signals and emergency equipment. Safe handling dangerous hazardous and harmful cargoes.

51-225 Marine Engineering Technical Drawing

Credits: 2

Hours: 3

Pre-requisite: 51-104

Fundamentals of technical drawings. Drawing standards descriptive geometry Orthographic and axonometric projection methods Sectioning and Dimensioning. The students will learn freehand sketching as well as sketching with CAD packages applied to marine engineering technology.

51-230 Marine Heat Engines

Credits: 2

Hours: 3

Pre-requisite: 51-107

Steam cycles. Main components of marine steam plants: Boilers turbines marine condensers condensate pumps deaerators feed pumps heaters. Economizers. Boiler types, specifications, construction, operation control. Fuel systems. Draft systems. Superheating and de-superheating. Water treatment. Marine auxiliary boilers. Heat recovery. Marine steam turbines: construction operation and control.

51-233 Marine Diesel Power Plants (1)

Credits: 3

Hours: 6

Pre-requisite: 51-107

General description of Marine diesel engines. Principles of 2- and 4-stroke diesel engines. Scavenge of marine diesel engines. Requirements for marine diesel engines. Engine structure: Cylinders cylinder heads and combustion chambers. Valves. Pistons and piston rings. Crankshafts. Flywheels. Vibration

dampers. Marine fuel types properties. Injection pumps and injectors for marine diesel engines. Timing diagrams. Indicator diagrams. Power calculations. Slow speed marine diesel engines.

51-237 Auxiliary Machinery

Credits: 3

Hours: 5

Pre-requisite: 51-101

Pumps: Types of marine pumps and their applications and characteristics. Rotor dynamic pumps: Centrifugal pumps mixed flow pumps and axial flow pumps. Positive displacement pumps: Reciprocating and rotary pumps (screw and gear pumps). Factors affecting pump performance. Ejectors. Piping – various types of piping system fitted in ships valves types used in Marine Practice. Marine Heat exchangers. Air compressors. Marine distilling plants. waste heat recovery systems. Marine sanitation systems. Marine oily water separators centrifuges purifiers and clarifiers.

51-239 Ship Systems

Credits: 2

Hours: 3

Pre-requisite: 51-237

Steering system: The action of the rudder in steering a ship. Types of rudders. Rudder carrier and pintless. Steering gear. Design requirements. Types of steering gear: Hydraulic Electric and Electrohydraulic. Anchoring systems: Anchor handling arrangements from hawse pipe to spill pipe. Windlass and capstan arrangement on the deck. Mooring of ship: arrangement of mooring lines fairleads and mooring bitts. Cargo handling gear: Masts and Sampson posts. Boom types and deck cranes. Cargo access and automatic hatch covers. Ship piping systems: Bilge Ballast Fresh water etc.

51-250 Marine Propulsion Systems

Credits: 3

Hours: 3

Pre-requisite: 51-101

Ship resistance. Model testing. Propeller as a thrust producing mechanism Powering. Types of marine power plants. Fuel consumption calculations. Engine room layout. Shafting: Arrangement loads bearings stern tubes thrust blocks alignment reduction gears. Torsional vibrations. Combined marine power plants. Marine propellers. Propeller geometry. Propeller theory. Interaction between Hull and propeller. Cavitation. Propeller strength- Materials and their qualities. Different types of marine propellers.

51-251 Marine Electro-Technology (1)

Credits: 2

Hours: 3

Pre-requisite: 51-103

Basic electrical concepts and relationships. DC electric circuits. Series and parallel circuits. Capacitors and inductors. Electromagnetic induction. Sources of electrical power onboard ships. System configuration. Storage batteries. DC generators. AC generators. Main and emergency generator shaft

generator. Load analysis. Switchboards. Shipboard cabling and installations Lighting systems on ships.

51-253 Marine Diesel Plant Simulator

Credits: 3

Hours: 6

Pre-requisite: 51-233

Engine room arrangement. Identification of systems and components. Engine cold start. Emergency generators. Compressed air starting system. Shore connections. Engine continuous operation. Engine shutdown. Diesel generators. Turbo-generators. Synchronizing generators. Power distribution. Boiler operation. Engine room blackout and emergency procedures. Engine room troubleshooting.

51-257 Marine Automatic Control

Credits: 3

Hours: 3

Pre-requisite: 51-250

Pressure temperature level flow and other measuring devices. Automatic control system analysis and performance. Concepts of on/off proportional integral derivative control schemes. Automatic control valves. Pneumatic and electronic control principles and systems. Typical shipboard control systems e.g. Fuel Cooling systems. Engine room controls.

51-258 Marine Power Plants Maintenance

Credits: 3

Hours: 5

Pre-requisite: 51-233

Maintenance policies. Duties and responsibilities of workers and supervisors. Use of personal safety equipment. Types of maintenance schemes: Corrective preventive and predictive maintenance. Maintenance scheduling. Inspection maintenance and repair of main engine and auxiliaries. Hull inspection and maintenance. Docking arrangements. Computerization of planned maintenance systems.

51-301 Introduction to Offshore Technology

Credits: 2

Hours: 2

Pre-requisite: None

An introduction to offshore drilling systems. Oil and gas production systems. Types of drilling rigs. Mooring and anchor handling. Subsea equipment. Tanker loading terminals and buoy systems. Support systems and logistics. Pipe laying techniques. Salvage and rescue operations. Diving and submersibles. Role of Classification Societies. Supply and Workboats.

51-302 Corrosion Protections & Monitoring

Credits: 2

Hours: 2

Pre-requisite: 51-106

Definition of corrosion Corrosion cost Corrosion monitoring and its performance in corrosion prevention and control. Corrosion fundamentals and characterization techniques. Cathodic and Anodic Protection and comparisons. Electrochemical techniques for corrosion monitoring. Physical and Chemical methods for corrosion monitoring. Corrosion monitoring in particularly environments.

51-303 Marine Pollution & Maritime Law

Credits: 2

Hours: 2

Pre-requisite: None

Sources of marine pollution. Types of marine pollutants. Natural processes acting on spilled oil (weathering). Containment and recovery of oil. Treatment of recovered oil. Shipboard oil pollution contingency plan. Implementation of MARPOL 73/78 Convention. Control of oil from machinery. Discharge criteria. Oil Record Book. Oil and hazardous material transfer operations. Rules for tankers carrying oil in bulk. International Maritime Law Contracts Agency Insurance Accident tort Carriage Towage and Salvage Laws International conventions.

51-304 Naval Architecture & Ship Construction (2)

Credits: 2

Hours: 3

Pre-requisite: 51-104

Hull form definition of ships and ocean structures; Deadweight capacity and tonnage measurement Hydrostatic calculations Bonjean's calculation and curves sectional area curve stability at large angles; Intact and damaged stability computations; Damaged stability and its calculation by lost buoyancy and added weight methods; IMO stability criteria; Subdivision and floodable length calculations; Subdivision indices; Launching calculations; Stability of fully submerged body; Stability of multibody systems; Pressure integration technique of computing hydrostatic and stability. Structural components - bottom construction shell plating decks fore and aft peak construction superstructure and deckhouses bulkheads.

51-314 Shipyard Technology

Credits: 2

Hours: 3

Pre-requisite: 51-104

Ship design stages. Shipyard layout. Stockyard. Material preparation stage. Lofting operation (conventional optical computer aided lofting). Main fabrication processes of component ship parts in shipyards. Sub assembly and assembly stages. Erection of ship's hull. Installation of machinery and shafting. Launching methods. Test trials and delivery. Docking and repair technology.

51-315 Ship Operation & transportation

Credits: 2

Hours: 2

Pre-requisite: None

Introduction to the maritime transport industry. International shipping organizations. Supply and demand in maritime transport. Multi modal transport. Containerization. Container terminal operations. Logistics information systems. Maritime law. Commercial arbitration. Marine insurance. Cargo claims. Liabilities. P&I Clubs. Legal aspects in ports.

51-333 Marine Diesel Power Plants (2)

Credits: 2

Hours: 3

Pre-requisite: 51-233

Engine scavenging. Air intake and supercharging. Turbochargers. Exhaust systems. Engine lubrication oils and systems. Marine engines cooling systems. Salt water system. Starting and reversing of marine engines. Mixing tanks. Governors. Engine heat balance. Engine performance and heat balance diagrams. Fuel injection components and systems. Troubleshooting. Emergency marine generators. Engine monitoring. Engine shutdown.

51-335 Steam and Gas Turbines

Credits: 2

Hours: 3

Pre-requisite: 51-230

Thermodynamic process in turbines. Impulse reaction turbines. Blading. Nozzles and diaphragms. Casing and foundation. Sealing. Auxiliary turbines. Lubricating systems oil purifiers. Bearings. Marine reduction gears. Couplings. Throttles and controls. Governors. Over speed devices. Turbine operation monitoring. Gas turbines. Compressors. Combustion chambers. Control of gas turbines.

51-341 Refrigeration & Air Conditioning

Credits: 2

Hours: 3

Pre-requisite: 51-107

Refrigeration cycles and components. Refrigerants and lubricants. Operation maintenance and troubleshooting of refrigerating systems. Air conditioning theory. Properties of air. Air conditioning systems and components. Operation maintenance and troubleshooting of air conditioning systems. The marine environment and special requirements for marine refrigeration systems.

51-352 Marine Electro-Technology (2)

Credits: 2

Hours: 3

Pre-requisite: 51-251

Electrical Power Systems: (AC circuits Power Factor Power Management). Electronic Principles and Systems: (Signal Shaping Power Supplies Amplifiers and Oscillators Digital Devices and Systems Displays Measuring Instruments). Electrical Machines: Synchronous motors and induction machines. Advanced Marine Electrics: (DC & AC Circuits Semiconductor Components and Systems).

51-356 Advanced Pneumatic and Hydraulic Systems

Credits: 2

Hours: 3

Pre-requisite: 51-101

Pascal's law Pressure measurement Fluid flow Temperature measurement Gas laws. Hydraulic pumps and pressure regulation Air compressors air treatment and air pressure regulation. Check valves sequence valves and proportional valves. Linear and rotary actuators. Hydraulic and pneumatic auxiliary equipment. Process control pneumatics. Process control actuators. Sequencing applications. Safety fault finding and preventative maintenance. Types and principle of operation of pneumatic and hydraulic marine industrial power systems Design and assemble and test a fluid power and control system fault findings.

51-367 Projects

Credits: 2

Hours: 3

Pre-requisite: 51-237

Teams of several students conceive and complete a marine design project under the supervision of a faculty member most often in one of the fields they studied namely marine power plants auxiliary machinery ship systems naval architecture propulsion systems or small boat technology. Oral presentation and written report are required.

51-399 Field Training

Credits: 4

Hours: 16

Pre-requisite: 30-162 Passing 50 credits

Students should spend 14 weeks in an industrial field such as: Shipyards Repair yards Marine salvage and firefighting centers Coast Guard centers Shipping companies to get acquainted with real life to participate in real life practices and daily work routines. The student is enrolled in small groups under mutual supervision from college and industrial establishment to carry out some assignments under a mutual supervision from college and industrial establishment.