

B. Tech. in MARINE ENGINEERING

Syllabus for Paper - 1

MARINE STEAM ENGINES

Unit I Steam and Vapour Power Cycles

Carnot cycle - Rankine cycle - Modified Rankine, Reheat and Regenerative cycles. Binary vapour power cycles. Feed pump working. Isentropic efficiency, cycle efficiency, work ratio. Reheating and Regenerative feed heating and their effect on thermal efficiency.

Unit II Marine Steam Engine

Modified Rankine cycle for steam engines - Hypothetical indicator diagram - Mean effective pressure and work transfer - diagram factor - indicated power - specific steam consumption - indicated thermal efficiency - efficiency ratio. energy balance - compound steam engines.

Unit III Steam Nozzles

General flow analysis. velocity at exit. - critical pressure ratio and maximum mass flow - convergent and convergent-divergent nozzles - isentropic flow - effect of friction. nozzle area at the throat and exit - problems of steam flow through nozzles.

Unit IV Marine Steam Turbine Plants

General principle of Impulse and Reaction Turbines - Compounding of steam turbines - Pressure and Velocity compounding, stage efficiency overall efficiency and re-heat factor. Multi-Stage Turbine with regenerative and reheat cycles. Maximum work output condition - Typical steam plant with turbines, condensers and boilers. Thermal efficiency of steam turbine plant.

Unit V Basic Principle of Heat Transfer

Conduction - Fourier law of Conduction - One dimensional Heat Diffusion equation – Convection - Forced and Free Convection – Radiation - Stefan-Boltzmann's equation - Law of Radiation – simple Problems.

MARINE ENGINEERING MATERIALS AND MANUFACTURING

Unit I Marine Materials and Metallurgy

Classification of Materials – Various Alloy materials. Basic metallurgy - Phase diagram- Eutectic, Eutectoid, Peritectic systems- Metallurgy of steel and cast Iron, Iron- Carbon Equilibrium diagram, Time transformation curves - Application of marine materials on board ships & off shore structures - Engineering process used in construction and repair of ships - design characteristics and selection of materials.

Heat treatment of steel – Annealing and its types – Normalizing – hardening - tempering and its types - Hardenability, Jominy end quench test – case hardening - types — precipitation hardening.

Unit II Mechanical Properties and Testing

Properties of the Materials - Mechanism of plastic deformation - Types of fracture — Failure modes - Testing of materials under tension, compression and shear loads - Hardness tests (Brinell, Vickers and Rockwell), Impact test - Fatigue and creep tests, fracture toughness tests - Vibration tests. Destructive and NDT of materials - different methods.

Unit – III Metal Casting and Metal Forming Processes

Sand casting, pattern and core making, moulding process – sand properties, melting furnaces – pit furnace and electric furnaces. Special casting processes, Defects in casting, Types of moulding Process, Testing

and Inspection in moulding. Hot and Cold Working, Sheet Metal Working Process. Types of Dies. High – energy rate forming processes.

Unit – IV Metal Joining Processes

Classification of Metal Joining Process. Study of power sources, electrodes, processes and applications, brazing and soldering. Under water welding. Defects and Inspection of welded joints. Testing of Joints.

Unit – V Machining and Finishing Processes

Lathe: working principle, classification, specification, lathe and tool holders, different operations on a lathe, Drilling and Boring Operation - classification, specification, cutters speed feed and description of parts. Milling Operation – classification, principle, parts- specification milling cutters indexing -- CNC machines.

Surface finishing processes – Grinding processes, various types of grinders, Grinding Wheel and Specification work holding devices, selection of grinding wheels for specific applications – selection of cutting speed and work speed. Fine Finishing Process.

MARINE ELECTRONICS

Unit I Operation Amplifier Theory

Concept of Differential Amplifiers — its use in DP AMPS, Linear OP amp circuits

Unit II Digital Circuits

Logic Systems and Gates - Binary and BCD codes- Boolean algebra - Simplifications – Flip-flops - Counters - Registers and multiplexers.

ITL & CMOS Gates: Digital integrated circuits- Semi conductor memories- ROM - RAM and PROM.

Unit III Converters

Analog to Digital and Digital to Analog Converters and their use in Data - Loggers.

Electronic Instruments : Cathode Ray Oscilloscope - digital voltmeters and frequency meters Multimeters - Vacuum Tube voltmeter and signal Generators - Q- Meters., Transducers for vibration, pressure, volume, velocity measurement-V-I, I -V,P- I, I -P Converters.

Unit IV Industrial Electronics

Power rectification - silicon control rectifier power control-Filters ,RPS - Photoelectric devices invertors. Satellite communication as applicable to GMDSS,GPS, Inmarsat.

Unit V Microprocessors

8085 Architecture - Programming - interfacing and Control of motors - Temperature/Speed control - Basics and Control mechanism of PLC.

MARINE CONTROL ENGINEERING AND AUTOMATION

Unit I Control System

Introduction to control terms, Block diagrams for control systems, open loop and closed feedback control, comparison of closed and open loop, feed forward control. Feed forward modification. ON- OFF control, sequential control, Proportional plus integral plus derivative controls. Use of various control modes, Mathematical Model: Developing Mathematical

Models for Mechanical, Hydraulic, Pneumatic, Thermal, Electrical and Electro mechanical Systems.

Unit II Graphical Representation of Signals

Inputs of step, Ramp, Sinusoid, Pulse and Impulse, Exponential Function etc Error Detector, Controller output elements. Dynamics of a simple servomechanism for Angular position Control: Torque Proportional to error, Different responses of servomechanism.

Unit III Process Control Systems

Automatic closed loop process. Control system Dynamic characteristics of processes. Dynamic characteristics of controllers. Electronic Instrumentation for measurement and control analog computing and simulation: Introduction. Basic concepts. Analog computers. Simulation. The use of Digital computer in the simulation of control system. Hybrid computers.

Unit IV Transmission

Pneumatic and electric transmission - suitability for marine use. Pneumatic and types of controllers hydraulic, electric and electronic controllers for generation of control action Time function controllers. Correcting Units- Diaphragm actuators. Valve positioners, piston actuators, and Electro pneumatic transducers. Electro- hydraulic actuators and Electric actuator control valves.

Unit V Application of Controls on Ships

Marine Boiler - Automatic Combustion control, Air - Fuel ratio control, feed water control single, two and three-element type. Steam pressure control, fuel oil temperature control, Control in Main Machinery units for temperature of lubricating oil, jacket cooling water, fuel valve cooling water, piston cooling water and scavenge air, fuel oil viscosity control. Bridge control of main machinery, Instruments for UMS classification.

STABILITY OF SHIPS

Unit I Hydrostatics

Density, relative density, centre of pressure, load on immersed plane, Archimedes principle, Laws of floatation, displacement, tonne per cm immersion. Coefficients of form, wetted surface area — problems.

Unit II Small Angle Stability

Simpson's first rule and second rule, trapezoidal rule, application of Simpson rule to first and second moments of area - Centre of gravity, VCG, LCG, effect of bilging a midship compartment- problems, small angle stability, Angle of List and Inclining Experiment

Unit III Longitudinal, Transverse Stability and Heel

Calculation of BM and Meta centric height, angle of loll, Stability at large angle of heel, stability of a wall sided ship. IMO recommendations concerning ship stability. Longitudinal BM - MCT1 cm - Change of trim, change of LCB with change of trim, alteration of trim by adding or removing weights, mean draft, change in mean and end draft due to density, flooding

Unit IV Resistance and Propulsion

Types of resistance, frictional residuary and total resistance, wave making, eddy and form resistance, model testing, Admiralty Coefficients, Fuel Co-efficient, theory of waves, wave patterns, forces caused by rolling, pitching, heaving and yawing, Types of propeller, apparent slip, real slip, power calculations, interaction between ship and propeller, hull efficiency over all propulsive efficiency - Problems

Unit V Rudder and Vibrations

Types of rudders, turning trials, bow rudders vs stern rudder, forces on rudder, angle of heel due to force on rudder, ship hull vibration, effect of added (virtual) mass of ship on natural frequency – problems, engine vibration, vibration of shafting system, engine noise reduction

MARINE REFRIGERATION AND AIR CONDITIONING

Unit I Reciprocating Compressor

Ideal cycle for compressors work transfer in a single stage compressors - mass flow - volume flow - free air delivery - effect of clearance and volumetric efficiency in single stage compressors, multi stage compression

Unit II Basic Refrigeration and Air Conditioning

Reversed Carnot cycle - vapour compression cycle - refrigerating effect - co-efficient of performance - cooling capacity - refrigerants used in marine - - methods for improving C.O.P.

Unit III Marine Refrigerating Plants

Typical marine refrigerating plants with multiple compression and evaporator system- heat pump cycles, fault finding

Unit IV Marine Air Conditioning

Principles of air conditioning - Psychrometric properties of air - comfort conditions - control of humidity - airflow and air conditioning capacity

Unit V Heat Exchangers

double-pipe, shell and tube type, condenser and evaporator – faults finding

MARINE BOILERS AND STEAM ENGINEERING

Unit I Marine Boilers & Boiler Mountings

Aux. boiler, ,exhaust gas boiler, Composite boilers, Water tube boilers —, Double evaporation boilers. Safety Valves, Gauge glass, Automatic feed regulator water level alarms, Soot blower

Unit II Operation & Maintenance of Boilers

Steam raising and Operating procedures, boiler water tests on board. Blowing down of boiler, maintenance, inspection and survey of boilers. Refractory, Oil burning, Various types of atomizer, Furnace arrangement for oil burning, fuel control, air control and viscosity control

Unit III Marine Steam Plants

General layout of modern geared steam turbine, Condensers, contraction and expansion allowances, leak test.

Unit IV Lubrication

Suitable oils and their properties, lubrication of main bearings, thrust bearings and gears. Gravity and pressure lubrication-oil system and emergency lubrication arrangement.

Unit V Operation and Maintenance of Turbines

Turbine drain system, gland system, warming, control of speed, throttle valve control and nozzle control, emergency controls, emergency operation of turbines, vibration in marine steam turbine.

SHIP'S FIRE PREVENTION AND CONTROL

Unit I Fire Protection Built In Ships

Fire detection and extinction systems. Escape means, ventilation system. fire doors & fire zones.

Unit II Detection and Safety Systems

Fire safety precautions on ships, Types of detectors. periodic testing of sensors and detection system. Description of various systems fitted on ships.

Unit III Fire Fighting Equipment

Fire pumps, hydrants and hoses, couplings, nozzles and international shore connection, construction, operation and merits of different types of portable, non-portable and fixed fire extinguishers installations for ships, properties of chemicals used, water-mist fire suppression system..class A. C & class D fires.

Unit IV Fire Control

Action for extinguishing fires in accommodation, machinery spaces, boiler rooms, cargo holds, galley, etc. Fire fighting in port and dry dock. Procedure for re-entry after putting off fire. First aid, fire organization on ships, shipboard organization for fire and emergencies. Fire drill, Fire control plan,.

Unit V Safety Measures

safety measures for preventing, fighting fire on ship - Safe working practice with respect to fire.

Syllabus for Paper - 2

MARINE FLUID AND SOLID MECHANICS

Unit I Fluid Statics, Kinematics /Dynamics and Losses In Pipes

Properties of fluid , Buoyancy and floatation, Meta-centric height, stability of floating bodies, Continuity equation, Bernoulli's equation, applications –venturimeter, orifice meter, pitot tube-Hagen Poiseuille's equation, Darcy Weisbach equation ,Major and minor energy losses , pipes in Series and parallel.

Unit II Pumps and Turbines

Impact of jets – force exerted by a jet on flat, curved plates and pipe bends. Centrifugal pumps – definitions, output, input, efficiencies. Multistage pumps, Axial flow pumps-characteristics, construction details. Classification of hydraulic turbines-Pelton turbine, Francis turbine, Kaplan turbine working principle, efficiency, characteristics and draft tubes.

Unit III Stresses in Various Sections

Stress-Types- Hooke 's law- elastic constants and their relationship- thermal stresses of simple members- strength of welded joints- suddenly applied loads- Stresses in beams- theory of simple bending- bending stresses various sections- principal stresses and principal Planes- Mohr's diagram.

Unit IV Bending Moment, Slope, Deflection of Beams

BMD and SFD for statically determinate beams- Slope and deflection of various beams- Double integration method — Macalay's Method - Moment area method- Deflection due to shear, Deflection by graphical method.- Torsion of solid and hollow circular shafts- torsion applied to closely coiled and open coiled springs.

Unit V Columns, Struts, Cylinders and Pressure Vessels

Columns and struts - long and short columns- Euler's formula for long column — equivalent length —slenderness ratio - Eccentric loaded long and short columns. thin cylinders and thin spherical shells under internal pressure- simple treatment of thick cylindrical walled pressure vessels- Castigliano's theorem & its application to curved bar, strain energy due to twisting, applied problems.

MECHANICS OF MARINE MACHINES

Unit I Mechanisms

Introduction –definitions kinematic inversion – slider crank chain inversions – four bar chain inversions – Grashoffs law– Determination of velocities and acceleration in mechanisms– Static, Inertia and combined force analysis– slider crank mechanism and four bar mechanism, turning moment diagram and flywheel.

Unit II Theory of Gearing & Bearings

Classification of gears, law of gearing, nomenclature – involutes as a gear tooth profile –lay out of an involute gear- Related parameters. Basic design principles of spur gears, helical gears, Journal bearings, thrust bearings. Rolling bearing - Load ratings, types of radial ball bearings, selection of bearings.

Unit III Control Mechanisms

Governors – gravity controlled and spring controlled – governor characteristics – governor effort and power - Gyroscopes – gyroscopic forces and couple – forces on bearing due to gyroscopic action.

Unit IV Balancing of Masses

Static and dynamic balancing – balancing of rotating masses – balancing of several masses in different planes

Unit V Vibration

Periodic motion & non harmonic periodic motion – undamped free vibration– natural frequency of single degree freedom system — Free vibrations with viscous damping of single degree freedom system and solution. Forced vibration of single degree freedom system with damping- System with two degrees of freedom – shaft with two rotors, system with many degrees of freedom- torsional vibration of major components in Ships - problems.

MARINE ELECTRICAL TECHNOLOGY

Unit-1

Principles of D.C. Machines, Generators and Motors

Principles of DC machines – construction – winding and e.m.f equations – armature reaction – commutation – brush shift – compensating winding – D.C. generator – their characteristics-methods of excitation – parallel operation – performance equations.

D.C. Motors

D.C. Motor –their characteristics – starting and reversing – speed – torque equations – starters– speed control including electronic method of control – testing of D.C. machines for finding out the losses and efficiency – braking of D.C. motor, Ward-Leonard control.

Unit-II

Induction Machines

Three phase induction motor –Principle of operation and theory of action – slip speed–rotor to stator relationship – rotor frequency – rotor e.m.f. and current – equivalent circuit relationship between rotor IR loss and rotor slip – torque/Slip characteristics – starting torque and maximum running torque- Effect of change in supply voltage on Torque-Induction generator.

Control of Induction Machines

Reversing – speed control of induction motor-Electronic methods of speed control of Induction Motor(IGBT, Thyristor) – starting of induction motor – method of starting – Direct on-line starters – Star – delta starter – auto-transformer starter – starting of special high torque induction motors – single phase induction motor – principle and operational characteristics – starting control – constructional details – Failure and repairs of electrical machines.

Unit-III

Alternators

Alternators – general arrangement – construction of salient pole and cylindrical rotor types – types of stator windings – e.m.f equation – distribution and pitch factor –waveform of e.m.f. generated – rotating magnetic field – armature reaction – voltage regulation – load characteristics – open circuit and short circuit tests – e.m.f and m.m.f. methods – parallel operation of alternators – KW and KVA sharing – Brushless alternator – static excitation system.

Distribution and Transmission Systems

Two wire and three wire D.C. distribution– A.C. Transmission – single and three phase – comparison of D.C. and A.C. transmission – use of balancer – 2-wire, 3-wire and 4- wire A.C. distribution – copper efficiency under different modes of distribution – one end fed and ring main distributor – fuses and its materials – D.C. air circuit breaker – A.C. air circuit breakers.

Unit-IV Cables and Lighting Systems

Electrical Cables: Cables- conductors – Wire Sizes-Current Rating – testing-codes- Practical tips. Insulation – protection and temperature ratings – insulation classes – A, B, E, F,H Insulation for High temperatures – Insulating Materials – Cable insulation & Sheath– Cable gland – Degrees of Protection – Temperature Ratings – Temperature Rise – Determination of hot temperature. Lighting Systems: Introduction – Incandescent Lamps – Discharge lamps – HCLPMF lamps – High pressure Mercury Fluorescent lamps – High and Low pressure sodium vapour lamps – Lamp caps – Effect of voltage on lamp performance – Navigation & signal lights – Signals for a power driven ship under way (At night) – Emergency lighting – Requirement of lighting of Deck and pump house of oil tankers. Alarm Indication Systems: Fire alarms and Detection – Heat detectors – Smoke detectors – Combustion detectors – Miscellaneous alarm indicator systems – Scanning type system – Sequential starting and cut outs for an automatic fired boiler incorporating safety devices and combustion control equipments – incinerators – Sewage plants – Bilge oil separators.

Unit-V

Systems : Auxiliary propulsion systems – Layout and Optimizing storage space – Electrical Propulsion – Advantages & Disadvantages DC constant current systems – DC motor supplied from alternators – Turbo – electric propulsion – AC single speed and Induction motor drives – Fixed speed alternators – Cyclo converter device-Diesel Electric propulsion – Thruster and Water jet propulsion. Steering Systems & Gyrocompasses: Fundamentals – Auto Navy steering Systems –

Type P – Electro hydraulic Steering – Control systems-Typical system configuration- Components- Auto Steer- Types, Structure – Gyroscopes – Compass Considerations. Deck Machinery & Cargo Equipment: Anchor Windlass – Cargo winches – Hydra lift Marine cranes-Maritime GMC A.S.- Hagglunds Drives & H.W. Carlsen AB-Magnetic disc brakes. Automation of Air Compressors: Selection – Choice of a correct machine-Oil-free and non-oil free air – Instrument air – Air Vs Water cooled - Reciprocating Compressors-Starting & control-Safety protection Equipment – Automatic Operation.

SHIP CONSTRUCTION

Unit I Ship Terms and types of ships

Various terms used in ship construction with reference to ship's parameter e.g. L.B.P.- Moulded Depth - Moulded draught etc. - General classification of ships. Types of cargo ships, dry cargo, Containers, Bulk Carrier, liquid cargo VLCC, ULCC, LNG, LPG, types of passenger ships, liners, tramps constructional details and requirements. Ship Parts, keel, types of keel, layout of a shipyard.

Unit II Bottom & Side Framing

Double bottoms, watertight floors solid and bracket floors - Longitudinal framing keels - side framing like tank side brackets - Beam knee - Web frame etc, Shell & Decks: Plating systems for shells -Deck plating & Deck Girders - discontinuities like hatches and other openings - supporting & closing arrangements - mid-ship section of ships. Bulk Heads & Deep Tanks: water tight bulkheads -Arrangement of plating and stiffeners - water tight sliding doors - Water tight openings through bulkheads for electric cables pipes and shafting - Deep tank for oil fuel or oil cargo corrugated bulk heads.

Unit III Fore & Aft End Arrangements

Fore end arrangement, arrangements to resist pounding bulbous bow - Types of sterns stern frame and rudder - Types of rudder - Supporting of rudder - Locking pintle - Bearing pintle Pallister, bearing shaft tunnel - Tunnel bearings.

Unit IV Free Board and Tonnage

Significance and details of markings various international Regulations. Plimsol Line Shipyard Practice - Mould loft - Optical marking - Automatic plate cutting, Fabrication and assembly etc., Ventilation arrangements for pump rooms ,holds and oil fuel tanks, Bulk Carriers, Arrangement for the carriage of dangerous goods in bulk- Container ships - L.N.G., L.P.G., and Chemical carriers - Lash ships - Passenger ships – Dredgers - Tugs etc.,

Unit V Shipyard Practices and Periodical Surveys

Sections and Materials Use: Type of sections like angles - Bulb plates flanged beams used in ship construction - Process of welding. Riveting & Welding testing of welds - Fabricated components. Stresses in Ship's structure: Hogging -Sagging - Racking – Pounding - Panting etc., and Strength members to counteract the same. Fire fighting arrangement –special auxiliary service ships. Ship Surveys: Survey rules – Functions of ship classification – Societies –Surveys during construction – Periodical surveys for retention of class.

MARINE DIESEL ENGINES

Unit I General Description and Characteristics of I.C. Engine

4-Stroke and 2-Stroke cycles; Timing Diagrams. Constructional Details: jackets and liners. cylinder heads and fittings, pistons, cross heads, connecting rods, crank shaft, bearings, bed plates, a frames, welded construction for bedplates & frames and tie rods etc.

Unit II Fuel and Marine Lubricating Oil

Treatment of fuel for contaminants including microbiological infection. reasons for variation in compression pressure and peak pressure. control of NO_x, SO_x in Exhaust emission. Lubrication principles: introduction - types of lubricants - hydrodynamic lubrication etc. cylinder lubrication crank case oil ,lubricating oil analysis .

Unit III Fuel Pumps and Metering Devices

Jerk and common rail systems, , V.I.T. Super vit & Electronic injection systems. Effects of viscosity on liquid fuel combustion. Necessity of variable fuel injection system. Governors.

Unit IV Scavenging System, Manouvering Systems, Indicator Diagrams

Various types of scavenging. Pulse and constant pressure type; merits and demerits, turbocharger and its details. Starting and reversing systems of different Marine diesel engines. indicator diagram, power calculations, fault detection, simple draw cards and out of phase diagrams, power balancing, performance characteristic curves

Unit V Medium Speed Engines

Different types of medium speed marine diesel engines, couplings and reduction gear used in conjunction with medium speed engine, development in exhaust valve design, V type engine details, crankcase inspection., Depth gauge and crankshaft deflections.

MARINE AUXILIARY MACHINERY

Unit I Pumps, Heat Exchangers

Types of centrifugal pumps - gear pumps - screw pumps and reciprocating pumps, construction of shell and tube type - lubricating oil coolers, fuel oil heaters, fresh water coolers, compressed air coolers, Main Engine charge air cooler,

Unit II Evaporators And Distillers

Steam condensers, evaporators and condensers in refrigeration expansion allowance - maintenance. Distillation of water, low pressure vacuum type evaporator, salt water leaks and detection, reverse osmosis desalination plant, membranes, drinking water and treatment.

Unit III Steering System

Hydraulic Telemotor charging system, - hydraulic power unit - hunting gear, construction and operation - 2-ram and 4-ram steering gear - All electric steering gear and emergency steering gear. Electro-hydraulic steering gear, Rotary vane steering gear - steering system regulations rudder and pintle, rudder wear down - rudder carrier.

Unit IV Purifiers /Air Compressor , Operation & Maintenance

fuel oil and lube oil purifiers, self desludge operation Construction, operation, maintenance of main air compress. bow thrusters, Deck machinery cargo winches, windless mooring winches, maintenance of the same.oil, garbage, sewage, air pollution. oil water separator. incinerator and the of sewage plant.

Unit V Shafting and Dry Docking

thrust block. - intermediate shaft. stern tube and stem tube bearing both water cooled and oil cooled together with sealing glands . Maintenance of hull, underwater fittings.

MARINE SYSTEM AND BEARINGS

Unit I Main journal bearings, thrust bearings, connecting rod bearings

Journal bearings, thrust bearings, crank pin bearing and crosshead bearing, methods of failure.

Unit II C Engine Parts

Piston, connecting rod with bearings, crankshaft, flywheel and rocker arms.

Unit III Valves & Lifting Devices

Valves, safety valves and reducing valves - crane hooks, lifting chains, chain blocks, E.O.T. Crane.

Unit IV Water cooling systems, steam plants, Lubricating oil systems, steering gear system

Water cooling systems for diesel engines and steam plants. Lubricating oil systems for propulsion and auxiliary engines. Electro hydraulic steering gear system including rudder, rudderstock, tiller, rams. Marine Diesel Engine air starting system including air receiver, compressors and air starting valves.

Unit V Scavenge and Exhaust systems, fuel pump and its system, shafting, steam turbine plants.

Marine Diesel Engine Scavenge and Exhaust systems. Marine diesel I-Engine fuel injection system including fuel pumps and fuel injectors. Power transmission system including thrust blocks, intermediate shaft and tail end shaft. Steam turbine plants. Gas turbine plants.

SHIPBOARD OPERATIONS AND MANAGEMENT

Unit I Seaman & Their Duties

Ship's Department, General ship knowledge and nautical terms like poop-deck, fore-castle, bridge etc. deck equipment: winches, Windlass, derricks, cranes, gypsy, capstan, hatches and function. Navigation lights and Signals: port and starboard, forward and aft mast lights, colours and location. Look out precautions and bad weather, flags used on ships, flag etiquette, sound Signals

Unit II Rope Knots, Moorings and Navigation

Types of knots. Practice of knot formation, materials of ropes, strength care and maintenance use of mooring line, heaving line, rat guards, canvas and its use. Anchors: their use, drooping and weighing anchor, cable stopper. General knowledge of principal stars. Sextant, G.M.T and Zonal time, wireless Navigational Instruments, radar satellite navigation etc.

Unit III Survival at Sea

Life buoy, EPIRB, SART, TPA, Construction, equipment carried, carrying capacity. Davits and their operation, Launching of life rafts (Inflatable type) Embarkation into lifeboat and life raft. Survival pack, Stowage and securing arrangement, Lowering & hoisting of life boats (model).

Unit IV Shipping Business

Structure of a shipping company and functioning of its various departments, Planning sailing schedules and voyage estimates, liner and tramp shipping services, conference systems, chartering and charter parties, ship's papers for arrival and departure, port procedures, role of agents, theory of freight rates, bills of lading International Labour Organization (ILO) and Maritime Labour Convention, 2006, COLREG 1972.

Unit V International Conventions

IMO Conventions, legislations, MARPOL acts and conventions, annexes I to VI, SOLAS 1974 and amendments, main objectives, overview of all chapters and articles with an emphasis on ISM and ISPS codes. Load Lines Convention 1966, Tonnage Convention 1969. International convention on STCW for seafarers 1978 with 1995 amendments, an overview of all sections, manning of ships, engagement and discharge of ship's crew.
