B.E

Marine Engineering

Curriculum and Syllabus

(Based on Choice Based Credit System)

Effective from the Academic year

2015 – 2016

Department of Marine Engineering

School of Maritime Studies
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**Program Source Outcome**

**Department of Marine Engineering**

To enable the student to emerge as:

**PSO-1** To get well versed in engineering concepts (mechanics, graphics & tools).

**PSO-2** To understand structures, mechanic of materials, hydraulics & TD concepts.

**PSO-3** To understand various deck machinery & electrical machinery onboard the ship.

**PSO-4** To understand MAM, safe maintenance of ships & electronics onboard of the ship.

**PSO-5** To understand the marine control system, marine IC engines & safe working practices.

**PSO-6** To understand marine refrigeration & air conditioning, advance MICE & basic naval architecture

**PSO-7** To understand the marine power plant operation, pumping system, advance naval architecture, testing & protection of electrical system onboard the ship.

**PSO-8** Importance of FPFF, marine boilers, legislation, leadership & ship security.
VELS UNIVERSITY - SCHOOL OF MARITIME STUDIES
B.E MARINE ENGINEERING DEGREE COURSE
CURRICULUM

Total Number of Credits: 190

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15EMR203 Engineering Mechanics
15EMR204 Applied Mechanics Lab
15EMR205 Pumps and Pumping Systems I
15EMR206 Thermodynamics I
15EMR207 Hydraulics Lab
15EMR208 Deck Machinery
15EMR209 Thermodynamics II
15EMR210 Electrical Machines Lab I
15EMR211 Electronics I Lab
15EMR212 Safe Maintenance on Ships
15EMR213 Marine Auxiliary Machinery
15EMR214 Electrical Workshop-Motors/Starters
15EMR215 Electronics II Lab
15EMR216 Marine Engineering Practice I
15EMR217 Marine Electrical Technology I
15EMR218 Refrigeration, Air-Conditioning & Ventilation Systems
15EMR219 Marine Electrical Technology II
15EMR220 Naval Architecture I
15EMR221 Mechanics of Machines
15EMR222 Pumps And Pumping Systems II
15EMR223 Marine Engineering Practice II
15EMR224 Naval Architecture II
15EMR225 Advanced Marine Workshop (MEP II)
15EMR226 Marine Engineering Practice III
15EMR227 Leadership, Team-Building And Ship Security
15EMR228 Engine Room Resources Management
15EMR229 Maritime Legislation
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<td>15EMR116</td>
<td>Marine Engineering Practice III-Simulator Lab</td>
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<td>15EMR117</td>
<td>Marine Machinery Start-Up (S-I-C)</td>
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# List of Generic Elective Courses

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<td>Boiler Shop</td>
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<tr>
<td>15EMR163</td>
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List of Skill Enhancement Elective Courses

15EMR251  Computer Science
15EMR252  Basic Workshop 1
15EMR253  NSS - Paper 1
15EMR254  Strength of Materials Lab
15EMR255  Basic Workshop II
15EMR256  NSS - Paper II
15EMR257  NSS - Paper III
15EMR258  Lube Oil. Fuel Oil and Cooling Systems
15EMR259  NSS - Paper IV
15EMR260  Control Engineering Lab
15EMR261  Marine Automation
15EMR262  NSS - Paper V
15EMR263  Ship-in-Campus- Diesel Engine Lab
15EMR264  Ship-in-Campus- Ship Construction
15EMR265  NSS - Paper VI
15EMR266  Ship-in-Campus(Pumps and Auxiliaries)
15EMR267  ship-in-Campus (Watch-Keeping)
15EMR268  Fire-Fighting / Life-Saving Appliances Lab
15EMR269  Communication Lab
15EMR270  Watch Keeping Principles and Practices
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CORE COURSES
**15EMR001 MATHEMATICS I  3 0 0 3**

**Course Objective:**

- To understand the arithmetic, geometry
- To impart knowledge on trigonometry and differential calculus

**Course Outcome:**

**CO-1** To know the basic number systems.

**CO-2** To do practical problems by using A.P & G.P

**CO-3** To remember the formulas of binomial theorem.

**CO-4** To know about cone & the diagrams

**CO-5** To know about the basic geometrical concepts.

**CO-6** To learn about the angle, their relation & all the trigonometric formula.

**CO-7** To learn all the differentiation formula.

**CO-8** To do problems in $n^{th}$ differentiation.

**CO-9** To solve a real life problems on maxima & minima.

**CO-10** To know the difference between the O.D & P.D

**UNIT I ARITHMETIC 08**

Indices, surds, logarithms, quadratic equations, Partial fractions, arithmetical progression, geometric progression, Binomial theorem and its applications.

**UNIT II GEOMETRY 06**

Plane and coordinate geometry coordinates of a point, changing of axes, the circle and the parabola.

**UNIT III TRIGONOMETRY 08**

Simple relations between trigonometric ratios. Compound angles, inverse trigonometrical functions, trigonometrical equations, relations between angles and sides of triangle. Solution of triangle, sum of a cosine curve and sine curve.
UNIT IV DIFFERENTIAL CALCULUS


UNIT V DIFFERENTIAL CALCULUS

Functions of Several variables, limits and continuity. Partial derivatives – definitions, geometrical interpretation and rules of partial differentiation, Higher order partial derivatives, Homogeneous functions and Euler’s Theorem, Total derivatives and Chain Rules, Implicit functions and Composite functions, Errors and Approximations, Maxima and Minima, LaGrange’s multiple.

TOTAL 54 HOURS

TEXT BOOKS:

REFERENCE BOOKS:
15EMR002 ELECTRICAL ENGINEERING BASICS 2002

Course objective:

• To impart knowledge on electrical, electronic and control system.
• To manage operations of electrical and electronic equipment Electrical equipment, Generator and distribution systems.
• To learn about preparing, starting, paralleling and changing over generators.

Course outcome:

CO-1 To understand about basic fundamentals of electric current.
CO-2 To know about circuits (series & parallel), kirchoff’s law & faraday’s law.
CO-3 To understand basic fundamentals of AC circuit.
CO-4 To know the behaviour of AC in pure resistance, capacitance and inductive circuits.
CO-5 To understand about polyphase circuit.
CO-6 To know about power calculation & phase sequence.
CO-7 To know about basic of electrical machines.
CO-8 To know about the different type of transformers connection.
CO-9 To gain knowledge on instrumentation.
CO-10 To know about MI, MC meters & Megger.

UNIT I INTRODUCTION – ELECTRIC CURRENT

UNIT II AC CIRCUITS – FUNDAMENTALS

UNIT III PLOYPHASE CIRCUITS
Ployphase circuits – Phase voltage, line voltage, power factor, power calculation, phase sequence – numerical problems
UNIT IV BASICS OF ELECTRICAL MACHINES
Basics of electrical machines-Different types of transformer connections - basic DC Machines – AC machines

UNIT V INSTRUMENTATION
Measurements and Instrumentation – MI, MC meters, Megger.

TOTAL 36 hours

TEXT BOOKS:

REFERENCE BOOKS:
15EMR003 ENGINEERING DRAWING 3 0 0 3

Course objective:
• To do Maintenance and repair of shipboard machinery and equipments.
• To improve knowledge on machinery drawings and handbooks.

Course outcome:
CO-1 To understand essential feature of printing lettering on technical drawing.
CO-2 To understand the orthographic & basic dimension system.
CO-3 Able to know the draughtsmanship skill & to draw free hand sketch on geometrical object.
CO-4 To understand & able to draw curves like ellipse, parabola & hyperbola.
CO-5 To understand & able to draw on cycloids, epicycloids & hypocycloids.
CO-6 To understand & able to visualize & draw on projection of solid with respect to axis parallel to both planes.
CO-7 To understand & able to project on solid inclined to both vertical plane & horizontal plane.
CO-8 To understand & able to develop a surface area of prism, cone & pyramid.
CO-9 To able to construct helical spring of round & square.
CO-10 To able to construct V thread & square thread.

UNIT I INTRODUCTION TO TECHNICAL DRAWING 12
Draughtsman ship, lettering, dimensioning, types of lines and correct use of drawing instruments. Construction of geometrical figures specially showing joining of straight lines and curves. Free hand sketching

UNIT II CURVES USED IN ENGINEERING PRACTICE 12
Conic sections construction of ellipse, parabola and hyperbola by various methods. Drawing of spirals involutes, cycloids, epicycloids and hypocycloids, helixes.

UNIT III PROJECTIONS 10
Projection of points and lines. Projection of solids - Axis perpendicular to a plane and axis parallel to planes, axis parallel to one plane and inclined to the other, and axis inclined to both planes.
UNIT IV DEVELOPMENT OF SURFACES AND CURVES OF INTERSECTIONS 10
Developing the surface of prisms. Pyramids and cones and drawing the curves of intersection of cylinders to cylinders, cylinders to cones, and other solids.

UNIT V DEVELOPMENT OF SPRINGS AND THREADS 10
Detailed drawings of helical springs of round and rectangular sections square thread formation in proper helical form.

TOTAL 54 hours

TEXT BOOKS:

REFERENCE BOOKS:
Course objective:

- To know about maintenance and repair of shipboard machinery and equipment.
- To impart knowledge on design characteristics and selection of materials in construction of equipment.

Course outcome:

CO-1 To understand about stress.

CO-2 To understand about strain.

CO-3 To understand about Circumferential and longitudinal stress in thin cylindrical shells.

CO-4 To understand about stress on Springs with axial load.

CO-5 To understand Strain energy due to normal, shear stresses & impact loads.

CO-6 To understand about Principal planes and principal stresses.

CO-7 To understand bending of beams.

CO-8 To understand the application of impact loads.

CO-9 To understand Deflection of built-in beams and continuous beams by Integration and Macaulay’s method.

CO-10 To understand Castigliano’s theorem, and its application to curved bars, strain energy due to twisting.

UNIT I STRESS AND STRAIN

UNIT II THIN SHELLS
Circumferential and longitudinal stress in thin cylindrical shells Course to internal pressure. Thick cylinders. Lame’s Theory, Compound cylinders. Springs – Springs with axial load. Calculations for mean diameter of springs, wire diameter and number of coils. Close-coiled helical spring.

UNIT III CONCEPT OF STRAIN ENERGY

UNIT IV BENDING OF BEAMS

UNIT V DEFLECTION

TOTAL 72 hours

TEXT BOOKS:

REFERENCE BOOKS:
Course objective:

- To able to understand integral calculus.
- To impart knowledge on ordinary differential calculus

Course outcome:

CO-1 To understand knowledge about integral calculus.
CO-2 To know application of integration to area under a curve, volume by revolution.
CO-3 To understand about moment of inertia.
CO-4 To know the applications to area and volume, mass of wire, lamina and a solid.
CO-5 To understand formation of differential equation.
CO-6 To know linear differential equations of the first order and first degree, reducible to linear.
CO-7 To know the application to electrical circuits & orthogonal trajectories.
CO-8 To know the application of calculus on deflection of beams, struts and columns.
CO-9 To understand about calculus of finite differences.
CO-10 To know about difference equations – definition formation and solution, Linear difference equation with constant coefficients.

UNIT I INTEGRAL CALCULUS

Integration of standard forms by substitution and by parts. The definite integral as the limit of a sum. Application of integration to area under a curve, volume by revolution. First moment of the area and the position of a centroid of an area. Work done by variable forces. Mean values. Root Mean square values of Sin nX and CosnX. The Rules of Guldinus.

UNIT II MOMENT OF INERTIA

Cylindrical co-ordinates. Applications to area and volume, mass of wire, lamina and a solid. Centre of gravity of a wire lamina and solid. Moment of Inertia using multiple integrals.

**UNIT III  ORDINARY DIFFERENTIAL EQUATIONS**

Definition, order and degree. Formation of differential equation. Solution of first order, first degree equations in variables separable form, homogeneous equations, other substitutions. Equations reducible to homogeneous and exact differential equations. Linear differential equations of the first order and first degree, reducible to linear.

**UNIT IV  APPLICATIONS TO ELECTRICAL CIRCUITS AND ORTHOGONAL TRAJECTORIES**


**UNIT V  CALCULUS OF FINITE DIFFERENCES**

Difference operators and relations between them, Algebra of finite difference operators, Newton’s forward and backward interpolation formulae, Stirling’s interpolation formula, Lagrange’s Interpolation formula, Numerical differentiation, Numerical integration, Difference equations – definition formation and solution, Linear difference equation with constant coefficients.

**TOTAL 72 hours.**

**TEXT BOOKS:**

**REFERENCE BOOKS:**
Course objective:

• To impart knowledge on maintenance and repair of shipboard machinery and equipment.
• To know the Design characteristics and selection of materials in construction of equipment.

Course outcome:

CO-1 To know the basic metallurgy.
CO-2 To know about the metals & the process involved.
CO-3 To gain knowledge about metals used in ship building.
CO-4 To know the properties of metals & non metals.
CO-5 To know the characteristics and limitations of process used for fabrication and repair.
CO-6 To understand the process of heat treatment of carbon steel.
CO-7 To know the properties considered in the fabrication and repair of systems and components
CO-8 To know the parameters considered in the fabrication and repair of systems and components
CO-9 To understand iron carbon equilibrium diagram.
CO-10 To understand about Non-ferrous alloys. Welding, gas-cutting.

UNIT I BASIC METALLURGY. 06
Metals and Processes

UNIT II METALS USED IN SHIP-BUILDING 06
Properties and uses. Non-metallic materials.

UNIT III HEAT TREATMENT 06
Characteristics and limitations of process used for fabrication and repair. Process heat treatment of carbon steel

UNIT IV FABRICATION AND REPAIR 08
Properties and parameters considered in the fabrication and repair of systems and components
– Materials under load, vibration, self-secured joints, permanent joints, bonding plastics, adhesives and bonding, pipe work.

UNIT V IRON-CARBON EQUILIBRIUM DIAGRAM. 10
Non-ferrous alloys. Welding, gas-cutting
TOTAL 36 hours.

TEXT BOOKS:

REFERENCE BOOKS:
Course objective:
• To do Maintenance and repair of shipboard machinery and equipments.
• To improve knowledge on machinery drawings and handbooks.

Course outcome:

CO-1 To understand orthographic projection.
CO-2 To understand about the details of sectioning.
CO-3 To know about screw, threads & fasteners.
CO-4 To know about various types of locking arrangements of nuts.
CO-5 To understand design characteristics of bearings & seals.
CO-6 To understand design characteristics lubrication arrangement, ball and roller bearings.
CO-7 To know about thread formation, Nuts, Bolts & Studs.
CO-8 To understand general conventions for drawing of threads in engineering drawings.
CO-9 To understand Interpretation of machinery drawings.
CO-10 To understand Interpretation of hydraulic and pneumatic diagrams.

UNIT I ORTHOGRAPHIC PROJECTIONS: 16
Orthographic Projections in 1\textsuperscript{st} & 3\textsuperscript{rd} angle projections of simple machine components from given isometric drawings; Drawing of third view from the given two views in Orthographic Projections. Learn to put dimensions in different views Details of Sectioning: Sectioning of components at the central axis; Part Sectioning’ Off-centre Sectioning and Off-set Sectioning; simple assembly drawings with sectional views.

UNIT II SCREW THREADS AND FASTENERS. 12
Locking and retaining devices. Riveted type fastenings.Welded connections. Standard Bolts, studs, nuts & tapped holes - Special bolts & screws e.g. tapped bolts, collar bolts and studs, pinching screws, cheese headed and round headed screws; Various types of locking arrangements of nuts.

UNIT III DESIGN CHARACTERISTICS 08
Design characteristics of bearings, seals, lubrication arrangement, ball and roller bearings.

UNIT IV CONVENTIONS FOR DRAWING 08
Thread formation, Nuts, Bolts & Studs – V - threads and square thread details; Metric & BSP threads; General conventions for drawing of threads in engineering drawings;
UNIT V MACHINERY DRAWING

Interpretation of machinery drawings. Interpretation of hydraulic and pneumatic diagrams.

TOTAL 54 hours.

TEXT BOOKS:

REFERENCE BOOKS:
15EMR008 ELECTRIC MOTORS AND STARTERS I  4 0 0 3

Course objective:
- To operate electrical, electronic, control systems, Electrical motors
- To know the starting methodologies of electrical motors.

Course outcome:

CO-1 To know the principles, constructional details and protection of DC Series, shunt and compound-wound motors and generators.
CO-2 To know about self Excitation, generation of back-EMF and load/voltage characteristics.
CO-3 To know about methods of voltage control, paralleling procedures & load sharing for DC Generators.
CO-4 To understand types of starters, characteristics between speed & torque, speed control of DC motors.
CO-5 To know about theory of rotating magnetic fields in AC machines.
CO-6 To know the relation between slip, rotor emf and frequency, torque-speed characteristics.
CO-7 To understand the theory of synchronous motors.
CO-8 To understand the theory of induction motors.
CO-9 To understand the constructional details of synchronous motors.
CO-10 To understand the constructional details of induction motors.

UNIT I PRINCIPLES, CONSTRUCTIONAL DETAILS


UNIT II METHODS OF VOLTAGE CONTROL

Methods of voltage control, paralleling procedures and load sharing for DC Generators. Numerical problems. Types of starters, characteristics between speed and torque, speed control of DC motors.

UNIT III AC MACHINES

CC-15

UNIT IV THEORY OF SYNCHRONOUS AND INDUCTION MOTORS

Theory of synchronous and induction motors.

UNIT V CONSTRUCTIONAL DETAILS

Constructional details of synchronous machines and induction motors. Coupling, load sharing and changing-over generators.)

TOTAL 54 hours

TEXT BOOKS:
1. BL Theraja ,”Electrical Technology” S. Chand, 2012

REFERENCE BOOKS:
Course objective:
• To operate electrical, electronic and control systems.
• To know the characteristics of basic electronic circuit elements.

Course outcome:
CO-1 To understand about electron emission.
CO-2 To understand the application of electron emission.
CO-3 To understand the types of semi conductors.
CO-4 To understand the characteristics of semi conductors.
CO-5 To understand about transistors & its characteristics.
CO-6 To understand about the basic of digital electronics.
CO-7 To understand about regulators & oscillators.
CO-8 To understand about the amplifiers.
CO-9 To understand the flow chart for manual control systems.
CO-10 To understand the flow chart for automatic control systems.

UNIT I ELECTRON EMISSION
Electron Emission- Thermionic Emission, Photoelectric emission, Electric field emission and their application.

UNIT II SEMI CONDUCTORS
Semi Conductors - Types of Semi Conductors, Electrical characteristics, Diffusion and Drift, Mobility. Diodes Characteristics of diodes, Diodes as a rectifier, Zener diodes, Thyristors, Varistors, Thermistors and Non Linear Resistors their function and operation. Symbols used.

UNIT III TRANSISTORS
Transistors - The junction transistor and its basic characteristics, The transistor as an amplifier, Full wave, half wave, Bridge Rectifiers, DIAC, TRIAC. SCR, UJT, LED. Integrated Circuits and Large Scale Integrated Circuits (LSI). IC555 based timers, audio-visual alarms. Basics of digital electronics
UNIT IV REGULATORS


UNIT V FLOW CHARTS

Flow charts for manual and automatic control systems

TOTAL 90 hours

TEXT BOOKS:

REFERENCE BOOKS:
1. B L Theraja , ”Electrical Technology” S.Chand and company pvt.ltd, 2013
Course objective:

- To do maintenance and repair of shipboard machinery and equipment.
- To know the design characteristics and selection of materials in construction of equipment.

Course outcome:

CO-1 To understand about vibrations.

CO-2 To understand about failure modes caused by vibrations.

CO-3 To understand about the metallurgy of steel and cast Iron.

CO-4 To understand about properties and applications of materials used in machinery on board ships.

CO-5 To understand about the engineering process.

CO-6 To understand the knowledge about materials & welding.

CO-7 To understand mechanical testing of materials.

CO-8 To understand Destructive testing of materials.

CO-9 To understand the testing of materials.

CO-10 To understand the non destructive examination of the materials.

UNIT I VIBRATIONS

Vibrations. Failure modes – viz plastic deformation, fracture, fatigue, creep.

UNIT II TECHNOLOGY OF MATERIALS

Technology of materials – Metallurgy of steel and cast Iron, properties and applications of materials used in machinery on board ships.

UNIT III ENGINEERING PROCESSES

Engineering processes used in construction and repair.

UNIT IV MATERIALS AND WELDING

Materials and welding. Mechanical testing of materials. Destructive testing of materials.
UNIT V TESTING OF MATERIALS

Non-destructive examination and testing of materials.

TOTAL 54 hours

TEXT BOOKS:

REFERENCE BOOKS:
15EMR011  MARINE MACHINE DRAWING II  3 0 0 3

Course objective:
• To do maintenance and repair of shipboard machinery and equipment.
• To able to Interpret machinery drawings and handbooks.
• To know the interpretation of piping, hydraulic and pneumatic diagrams.

Course outcome:

CO-1 To understand & able to draw the assembly & dismantling of air inlet valve.
CO-2 To understand & able to draw assembly & dismantling of automatic valve.
CO-3 To understand & able to draw assembly & dismantling of starting air pilot valve.
CO-4 To understand & able to draw assembly & dismantling of boiler mounting full bore safety valve.
CO-5 To understand & able to draw assembly & dismantling of high lift safety valve.
CO-6 To understand & able to draw assembly & dismantling of plate type gauge glass.
CO-7 To understand & able to draw assembly & dismantling of four stroke piston.
CO-8 To understand & able to draw assembly & dismantling of bilge suction strainer & fuel oil strainer.
CO-9 To understand & able to draw assembly & dismantling of telemotor receiver.
CO-10 To understand & able to draw assembly & dismantling of reducing valve.

UNIT I  MAIN ENGINE SYSTEM  12
Main Engine System Air-inlet valve, Automatic valve, Starting Air Pilot valve

UNIT II  BOILER MOUNTINGS  16
Boiler Mountings Boiler Blow-Down valves, Full Bore Safety valve, Plate type gauge glass, High lift Safety valve

UNIT III  ENGINE COMPONENTS  16
Engine Components, Connecting rod with bearings, Rocker Arms, Starting Air valve, 4-stroke piston

UNIT IV  MARINE COMPONENTS  12
Marine Components Ballast Chest, Bilge suction strainer, Tele-motor receiver
UNIT V  AUXILIARY COMPONENTS

Auxiliary components, Fuel Oil Strainer, Reducing valve, Return and Non-return globe valves

TOTAL 72 HOURS

TEXT BOOKS:


REFERENCE BOOKS:

15EMR012 ELECTRIC MOTORS AND STARTERS II  4 0 0 3

COURSE OBJECTIVE:
• To operate electrical, electronic and control systems.
• To impart knowledge on Electrical motors starting methodologies.

Course outcome:
CO-1 To understand about three phase ac induction motor.
CO-2 To understand about three phase synchronous motor.
CO-3 To understand motor control & protection.
CO-4 To understand about speed control of motors.
CO-5 To understand about three phase generators.
CO-6 To understand about three phase transformers.
CO-7 To understand the various starting methods for ac machines.
CO-8 To understand Coupling and breaking connection between switchboard and distribution panels.
CO-9 To understand basic electric propulsion system.
CO-10 To understand power distribution system.

UNIT I  10
Three phase AC induction motors, three phase synchronous motors, and effect of varying frequency and voltage of AC motors, Numerical Problems

UNIT II  10
Motor control and protection, IGBT(Insulated Gate Bipolar Transistor) motor speed control, motor speed control by Thyristors,

UNIT III  14
UNIT IV

Various means of starting AC machines, motor speed control, HV and LV switch gear, distribution and equipment- Coupling and breaking connection between switchboard and distribution panels.

UNIT V

Basics of electric propulsion systems, power distribution systems – distribution, insulation, transformer, types.

TOTAL 54 hours

TEXT BOOKS:

REFERENCE BOOKS:
Course objective:

- To gain knowledge on Operate electrical, electronic and control systems.
- To know the Sequential control circuits and associated system devices.

Course outcome:

CO-1 To understand the concept of differential amplifier.
CO-2 To understand about the operation amplifier theory.
CO-3 To gain knowledge about the converters.
CO-4 To understand about various sensors onboard ship.
CO-5 To understand about digital integrated circuits.
CO-6 To understand about the electronic control equipment.
CO-7 To understand communication systems, Modulation and Demodulation, their necessity and circuit explanation.
CO-8 To understand the various application of communication devices.
CO-9 To understand about the electronic equipments.
CO-10 To understand about Depiction and understanding of flow-charts, symbols utilization, and processes involved.

UNIT I


UNIT II

Converters: Analog to Digital (AD) and Digital to Analog (DA) converters and their use in Data-Loggers. Various Sensors used on board ship- Pressure Sensors - Temperature Sensors – Level Sensors - RPM Sensors – Photo Sensors - Water Salinometer
UNIT III


UNIT IV

Communication devices: Communication systems, Modulation and Demodulation, their necessity and circuit explanation. AM, FM, Wireless communication, Radio Transmitters and Receivers, T-V broadcasting, Radar Communication, Pulse Communication. Practical use of VHF.

UNIT V


TOTAL 90 HOURS

TEXT BOOKS:

REFERENCE BOOKS:
1. B L Theraja ,”Electrical Technology” S Chand and company pvt.ltd, 2013
Course objective:
- To manage the operation of propulsion plant machinery. Plan and schedule operations, surveillance, performance assessment.
- Able to maintain safety of propulsion plant and auxiliary machinery.

Course outcome:

CO-1 To understand the working of air compressors.
CO-2 To understand the calculation of work done.
CO-3 To understand about the properties of steam.
CO-4 To solve numericals based on the properties of steam.
CO-5 To understand Operation principle and basic construction of and materials of steam turbine.
CO-6 To understand Elementary principles of steam turbines including simple velocity diagrams for impulse and reaction turbines.
CO-7 To understand combustion & Chemical equations for complete combustion.
CO-8 To understand theory minimum air required & effect of excess air.
CO-9 To understand Gas turbine – open cycle gas turbine-operation, principle and basic construction.
CO-10 To understand Gas dynamics, Gas nozzles and Steam nozzles.

UNIT I  

UNIT II  
UNIT III


UNIT IV


UNIT V

Gas dynamics. Gas nozzles and Steam nozzles. One dimensional flow of gases through varying cross-section, critical pressure ratio, convergent nozzle, convergent-divergent nozzle. Gas turbine – open cycle gas turbine-operation, principle and basic construction. Effect on thermal efficiency due to change in pressure ratio, inclusion of intercooler, reheaters and heat exchangers. construction)

TOTAL 54 hours

TEXT BOOKS:
15EMR015 MARINE INTERNAL COMBUSTION ENGINEERING I 5 0 0 4

Course objective:
• To operate main and auxiliary machinery and associated control systems

Course outcome:

CO-1 To understand the various thermodynamic cycles that are used in IC Engines.
CO-2 To be able to relate the thermodynamic cycles to the actual working of the engines and solve problems based on the cycles.
CO-3 To be able to classify IC Engines based on various parameters.
CO-4 To be able to draw the Valve timing Diagram of the 4-Stroke and 2-Stroke IC Engines.
CO-5 To understand the various components that make up the IC Engines.
CO-6 To understand the function of each component along with their material of construction.
CO-7 To understand the concept of scavenging in IC Engines and the various scavenging methods currently in use.
CO-8 To understand the concept of Supercharging in IC Engines and the various Supercharging methods currently in use.
CO-9 To understand the various thermodynamic cycles that is used in the functioning of Gas Turbine.
CO-10 To understand the various components associated with the Gas turbines and the derivation for various efficiencies.

UNIT I

UNIT II

UNIT III  18

Scavenging systems: Scavenging arrangements in 2 – stroke engines; air charging and exhausting in 4 – stroke engines; various types of scavenging in 2 – stroke engines; Uni – flow, loop, cross scavenging, their merits and demerits Scavenge pumps for normally aspirated engines; under piston scavenging, Scavenge manifolds.

UNIT IV  18

Supercharging arrangements: Pulse and Constant Pressure type; their relative merits and demerits in highly rated marine propulsion engines. Air movements inside the cylinders. Turbocharger and its details. Two stage, un-cooled, radial turbochargers.

UNIT V  18


TOTAL 90 hours

TEXT BOOKS:

REFERENCE BOOKS:
Course objective:

- Able to operate electrical, electronic, and control systems, manage operation of electrical and electronic control equipment, operation, surveillance, performance assessment.
- To maintain safety of propulsion plant and auxiliary machinery.

Course outcome:

**CO-1** To understand about basic control engineering.

**CO-2** To understand Fundamentals of automatic control.

**CO-3** To understand Static and dynamic characteristics of measuring instruments.

**CO-4** To understand Construction and operation of electrical testing and measuring equipment.

**CO-5** To understand about transmission of signals.

**CO-6** To understand principles, operation, application of pneumatic, electrical, and hydraulic servomotors.

**CO-7** To understand Theory and characteristics of P-I-D control, and its tuning.

**CO-8** To understand Generator distribution system, steam boiler, oil purifier, refrigeration, pumping systems, steering gear, cargo handling equipment, and deck machinery.

**CO-9** To understand Design features and system configuration of automatic control equipment and safety devices.

**CO-10** To understand Features of Pneumatic and Hydraulic control equipment.

**UNIT I**

Basic Control Engineering. Fundamentals of automatic control. Various types – ON/OFF control, Continuous Control, Sequential Control.

**UNIT II**

Static and dynamic characteristics of measuring instruments. Construction and operation of electrical testing and measuring equipment. Filters, regulated power supply. Transducers and Transmitters suitable for measurement of temperature, pressure, flow, level, speed, torque, vibration, and water content.
UNIT III

UNIT IV

UNIT V
Design features and system configuration of automatic control equipment and safety devices for the following – Main Engine, Generator and distribution system, and Steam Boiler. Features of Pneumatic and Hydraulic control equipment.

TOTAL 72hours

TEXT BOOKS:

REFERENCE BOOKS:
Course objective:
- Able to operate main and auxiliary machinery and associated control systems.

Course outcome:

CO-1 To understand Propulsive characteristics of Diesel engines.
CO-2 To understand Fuel atomization, Ignition quality, Fuel injectors and its detail. Ignition delay, after burning.
CO-3 To understand Marine Diesel Engine – trunk and Crosshead types.
CO-4 To understand Compression pressure ratio and its effect on engines.
CO-5 To understand Assessment of engine power, and running adjustments to maintain performance.
CO-6 To understand lubrication, linear wear and preventive measures, combinations of lubricating oil its effect and preventive measures.
CO-7 To understand Control and Alarm systems associated with automatic operation of a Diesel Power Plant.
CO-8 To understand Turbochargers, supercharging and scavenge system.
CO-9 To understand the Causes and prevention of crank case explosions.

UNIT I COMBUSTION OF FUELS


UNIT II MARINE DIESEL ENGINE

UNIT III LUBRICATION

UNIT IV CONTROL AND ALARM SYSTEMS
Control and Alarm systems associated with automatic operation of a Diesel Power Plant. UMS operation of Power Plant. Governors (Hydraulic and Electronic). Turbochargers, supercharging and scavenge system. Cooling systems: Various Cooling media used; their merits and demerits, cooling of Pistons, cylinder jackets & cylinder heads, bore cooling, Coolant conveying mechanism and systems, maintenance of coolant and cooling system.

UNIT V SAFETY AND PREVENTION
Detection, Safety and prevention: Causes and prevention of crank case explosions, and scavenge fires, safety fittings, Uptake fire, starting air-line explosion.

TOTAL 72 HOURS

TEXT BOOKS:

REFERENCE BOOKS:
**15EMR018  SHIP CONSTRUCTION   3 0 0 3**

**Course objective:**
- To maintain seaworthiness of the ship, Control trim, stability and stress.

**Course outcome:**

**CO-1** To understand Common terms used in the measurement of steel ships.

**CO-2** To understand Descriptions and sketches of structural members in ordinary types of steel ships.

**CO-3** To understand Water-tight doors, Hatches, Rudders, Bow-thrusters, Propellors, Watertight bulkheads.

**CO-4** To understand Ventilation arrangements for pump rooms in tankers and for cargo holds and oil fuel tanks.

**CO-5** To understand Double-bottom and deep tank filling and pumping arrangements.

**CO-6** To understand about Compartmental drainage.

**CO-7** To understand about Ship stresses- hogging and sagging, racking, panting, pounding & slamming.

**CO-8** To understand Structural arrangements forward and aft to withstand panting and pounding.

**CO-9** To understand Functioning of Ship Classification Societies.

**CO-10** To understand Periodical surveys for retention of Class, and Statutory Surveys.

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**UNIT I**

Common terms used in the measurement of steel ships – Length overall, Length between perpendiculars, breadth overall, moulded depth, draught and freeboard. Definitions of ship-building terms in general use. Descriptions and sketches of structural members in ordinary types of steel ships. Load lines, Deck Line, Freeboard, Plimsoll line.
UNIT II  

UNIT III  
Forepeak and after-peak tanks. Double-bottom and deep tank filling and pumping arrangements. Compartmental drainage. Leveling arrangements for damaged side compartments. Ship dimensions and form- general arrangement of general cargo ships, tankers, bulk carriers, combination carriers, container ships, RO-RO and passenger ships. Definitions of camber, rise of floor, flare, sheer, rake, etc.

UNIT IV  
Ship stresses- hogging and sagging, racking, panting, pounding, slamming, etc. Hull structure- Proper names for the various parts, standard steel sections used, Bow and Stern construction, Stern frame. Structural arrangements forward and aft to withstand panting and pounding, etc.

UNIT V  

TOTAL 54 hours.

TEXT BOOKS:
1. E A Stokoe,”Reed’s Ship Construction for Marine Engineers” , Volume 5,2010

REFERENCE BOOKS:
COURSE OBJECTIVE:

- To operate main and auxiliary machinery and associated control systems

Course outcome:

CO-1 To understand watch keeping procedures.
CO-2 To understand watch keeping routines & operations.
CO-3 To understand the safe working practices.
CO-4 To understand importance of PPE & emergency procedures.
CO-5 To understand about safe system of working.
CO-6 To understand about various hazards.
CO-7 To understand action to be taken in case of emergency.
CO-8 To understand action to be taken in case of stoppage of machinery.
CO-9 To understand action in the event of failure of main engine & boiler.
CO-10 To understand emergency procedure for restarting the machinery.

UNIT I WATCH-KEEPING-PROCEDURES

Safe Engineering Watch-Keeping-Procedures to be adopted in safe Watch-keeping. Procedures for Handing Over/Taking over a Watch. Routine work doing Watch-keeping, such as soot-blowing, cleaning of filters, pumping out of bilges through Oily Bilge Separator, routine pumping operations of fuel oil, ballast water, fire pump and cargo pumping system. Remote operation of pumping system and associated controls, purification and clarification of fuel oil, purification and clarification of lube oil.

UNIT II SAFE WORKING PRACTICES

UNIT III PERMIT TO WORK SYSTEMS

UNIT IV EMERGENCY PROCEDURES
Emergency procedures, such as: action to be taken in the event of fire, including fire drills, flooding of Engine room, rescue operations for injured persons, action in case of stoppage of the main engine, auxiliary engines and associated systems.

UNIT V MAINTENANCE OF MACHINERY

TEXT BOOKS:

REFERENCE BOOKS:
15EMR020 MONITORING AND PROTECTION OF ELECTRICAL SYSTEMS 3 0 0 2

Course objective:
• Able to Maintain and repair of electrical and electronic equipment.
• To manage trouble-shooting, restoration of electrical and electronic control equipment to operating condition.

Course outcome:
CO-1 To understand flow diagrams & circuits.
CO-2 To understand Electric and electronic symbols and interpretations of flow diagrams and circuits.
CO-3 To understand Trouble shooting of electrical and electronic control equipment.
CO-4 To understand Interpretation of circuit symbols.
CO-5 To understand about the protection of generators.
CO-6 To understand about precautions against electric shock and related hazards.
CO-7 To understand Electrical distribution system.
CO-8 To understand Function test of electrical, electronic control equipment and safety devices.
CO-9 To understand Fault-finding in Control Systems.
CO-10 To understand Testing and calibration of sensors and transducers of monitoring systems.

UNIT I FLOW DIAGRAMS AND CIRCUITS 12

UNIT II TROUBLE SHOOTING 09

UNIT III PROTECTION MAINTENANCE 12
Power Generation, Prime mover electrical control. Main Air Circuit breaker. Protection of generators. Safe Electrical practice: Safe watch – keeping, points to check on electrical
machineries, switch gears & equipments, microprocessor control and maintenance electrical fire fighting, precautions against electric shock and related hazards.

UNIT IV SURVEY REQUIREMENTS 09


UNIT V TEST AND CALIBRATION 12

Calibrate and adjust transmitters and controllers. Fault-finding in Control Systems. Trouble shooting of monitoring systems- Test and calibration of sensors and transducers of monitoring systems.

TOTAL 54 hours.

TEXT BOOKS:

REFERENCE BOOKS:
15EMR021 ELECTRICAL TESTING AND MEASURING EQUIPMENT

Course objective:
• able to do Maintenance and repair of electrical and electronic equipment

Course outcome:

CO-1 Able to identify the test equipment needed for testing IR value of electrical equipment and the important of IR value.

CO-2 Attains knowledge of taking IR value of electrical equipment by knowing the points for testing.

CO-3 Able to tell the name of equipment required for various working voltages of electrical equipment.

CO-4 Knows the operating principle of equipment including its parts.

CO-5 Knows the type of test equipment to be used on electrical equipment to check various parameters like V ac & dc, current ac & dc, resistance & capacitance.

CO-6 Have the clear picture of analog & digital testing measuring equipments.

CO-7 Have the knowledge of various indicating electrical equipments & meters for volts, amps, frequency, power factor & speed.

CO-8 Have vast knowledge of various measurement that is required in electrical field like meters for indication recorded as & integrating meters like KWH meters to show the consumption of electrical energy over a period of time.

CO-9 Have current knowledge of connecting volt & amp meters in the circuit for indication. Also have an idea for measuring excess parameters beyond the capacity of meters by using additional attachments.

CO-10 Can able to identify types of electrical different meters for AC & DC measurement.

UNIT I INSULATION TESTER, CONTINUITY TESTER

Construction of electrical testing and measuring equipment: Insulation Tester, Continuity tester,

UNIT II MULTI-TESTER, CLAMP METER

Construction of electrical testing and measuring equipment: Multi-Tester, Clamp Meter
UNIT III INSULATION TESTER, CONTINUITY TESTER
Operation of electrical testing and measuring equipment: Insulation Tester, Continuity tester

UNIT IV MULTI-TESTER, CLAMP METER
Operation of electrical testing and measuring equipment: Multi-Tester, Clamp Meter

UNIT V MEASURING EQUIPMENT
Construction and operation of electrical testing and measuring equipment: Digital meters for voltage, current, speed, frequency, power factor, phase sequence, salinometer.

TOTAL 36 hours.

TEXT BOOKS:

REFERENCE BOOKS:
Course objective:
- Able to Prevent, control and fight fires on board
- To able to operate life-saving appliances.

Course outcome:
CO-1 To understand fire hazard onboard ship & fire basics.
CO-2 To understand control of fire onboard ship.
CO-3 To understand fire protection built in ship.
CO-4 To understand fire detection & safety system.
CO-5 To understand different fire fighting equipments.
CO-6 To understand maintenance & testing of fire fighting appliances.
CO-7 To understand techniques adopted for extinguishing fire at different location onboard ship.
CO-8 To understand ship board organization for fire & emergency for different types of ships.
CO-9 To understand construction & operation of life saving appliances.
CO-10 To understand construction, operation & maintenance of EEBD & neil Robertson stretcher.

UNIT I FIRE HAZARD
Fire hazard aboard ships: Fire triangle, fire tetrahedron, fire chemistry, spontaneous combustion, and limits of inflammability. Advantages of various fire extinguishing agents including vaporizing fluids and their suitability for ship’s use. Controls of Class A, B, C & class D fires, combustion products & their effects on life safety.

UNIT II FIRE PROTECTION
Fire protection built in the ships: SOLAS convention, requirements in respect of materials of construction and design of ships, (class A,B, type BHDS.) Detection and Safety Systems: Types of detectors, selection of fire detectors and alarm systems and their operational limits. Commissioning and periodic testing of sensors and detection system. Description of various systems fitted on ships.
UNIT III  FIREFIGHTING EQUIPMENT

Firefighting 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. Bulk carbon-dioxide. Fireman’s outfit, its use and care. Maintenance, testing and recharging of appliances, preparation, fire appliance survey. Breathing apparatus types, uses, and principle.

UNIT IV  OPERATIONS, PRECAUTIONS FOR PREVENTION

Action required and practical techniques adopted 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, rescue operations from affected compartments. Ship board organization for fire and emergencies, fire control plan, human behavior. Special precautions for prevention, inert gas systems, fighting fire in tankers, chemical carriers and gas carriers.

UNIT V  OPERATION AND MAINTENANCE


TOTAL 54 hours

TEXT BOOKS:

H.D.Mcgeorge, ”Marine Auxiliary Machinery”, Reed Elseiver India, 2011
Course objective:

• able to Operate main and auxiliary machinery and associated control systems.

Course outcome:

CO-1 To understand various types of marine boilers.
CO-2 To understand about the mountings in boiler.
CO-3 To understand about the various operation of boilers.
CO-4 To understand about the care & maintenance of boilers.
CO-5 To understand Furnace arrangement for oil burning.
CO-6 To understand Procedure of liquid fuel burning in open furnace.
CO-7 To understand the operation of steam turbines.
CO-8 To understand the maintenance of the steam turbine.
CO-9 To understand Types of condensers, constructional details, location & working principles.
CO-10 To understand Effect of Change of temperature, circulating water quantity, change of main engine power, condenser surface.

UNIT I VARIOUS TYPES OF MARINE BOILERS AND BOILER MOUNTINGS


UNIT II OPERATION CARE AND MAINTENANCE OF BOILERS

Pre-commissioning procedures - preparing for Survey - Hydraulic tests, steam raising and Operating procedures, Action in the event of shortage of water. Blowing down of boiler, laying up a boiler; general maintenance External and internal tube cleaning. Tube renewals, etc, Maintenance inspection and survey of boilers. Refractory: Purposes of Refractory types of Refractory and reasons for failure.
UNIT III OIL BURNING

Procedure of liquid fuel burning in open furnace, various types of atomizer - overhauling of FO Burner. Furnace arrangement for oil burning, Boiler control system i.e. master control, fuel control, air control & viscosity control, Introduction to Automation.

UNIT IV  OPERATION AND MAINTENANCE

Turbine drain system, turbine gland system, warming through a turbine plant, control of speed and power of propulsion, throttle valve control and nozzle control, emergency controls, emergency operations of turbines, vibration in marine steam turbine, steam turbine losses. Lubrication of Turbines: Suitable oils and their properties, lubrication of main bearings, thrust bearings and gears. Gravity and pressure lubrication - Oil system and emergency lubrication arrangement. Breakdown and faultfinding.

UNIT V  CONDENSERS

Types of condensers, constructional details, location & working principles, contraction and expansion allowances, leak test. Effect of Change of temperature, circulating water quantity, change of main engine power, condenser surface.

TOTAL 54 hours

TEXT BOOKS:
Course objective:
• Able to manage the operation of propulsion plant machinery, Plan and schedule operations Operation, surveillance, performance assessment.
• To maintain safety of propulsion plant and auxiliary machinery.

Course outcome:
CO-1 To understand the procedure in machine design.
CO-2 To understand the Concepts of design, procedure and processes.
CO-3 To understand the elementary design of Main propulsion Engine (Diesel Engine).
CO-4 To understand the elementary design of Auxiliary Diesel Generator & gas turbine.
CO-5 To understand the elementary design of Main propulsion Engine (Steam Turbine).
CO-6 To understand the elementary design of Turbo-electric propulsion. Turbo-generator.
CO-7 To understand about start up procedures.
CO-8 To understand about the shut down procedures.
CO-9 To understand safety of operation of Main Propulsion and Auxiliary equipment.
CO-10 To understand to take performance assessment.

UNIT I PROCEDURE IN MACHINE DESIGN 06
Concepts of design, procedure and processes, Design synthesis, Economic consideration in design, Feasibility, Preliminary Design alternative, Preliminary & final plans & drawings.

UNIT II ELEMENTARY DESIGN 06
Elementary design considerations of following: Main propulsion Engine (Diesel Engine), Auxiliary Diesel Generator, gas turbine.

UNIT III ELEMENTARY DESIGN 06
Elementary design considerations of following: Main propulsion Engine (Steam Turbine), Turbo-electric propulsion. Turbo-generator
UNIT IV  START-UP AND SHUT DOWN PROCEDURES  09

Start-up and shut down procedures for the following ships’ Power plant: (i) Diesel Engine (ii) Steam turbine (iii) Main WT Boiler. Include all auxiliary machinery in each case.

UNIT V  PERFORMANCE ASSESSMENT  09

For all propulsive Plants above determine operating limits, maintain operational surveillance, carry out performance assessment, and ensure safety of operation of Main Propulsion and Auxiliary equipment.

TOTAL 36 hours.

TEXT BOOKS:

ABILITY ENHANCEMENT COMPULSORY COURSES
15EMR201  TECHNICAL ENGLISH  3 0 0 3

Course objective:
• Able to get adequate knowledge of the English Use in written and oral form.

Course outcome:

CO-1 To understand Simple, Compound and Complex sentences.
CO-2 To understand Reading text: skimming for general information.
CO-3 To understand the characteristics of technical style.
CO-4 To understand Listening and transferring of information from text to graphic forms.
CO-5 To understand reading comprehension.
CO-6 To understand Listening and guided note-taking.
CO-7 To understand grammar & vocabulary.
CO-8 To understand Marine Vocabulary.
CO-9 To understand Extensive listening.
CO-10 To understand intensive listening.

UNIT I ORAL COMMUNICATION  08

UNIT II WRITTEN COMMUNICATION  12
Introduction to the characteristics of technical style – writing definitions and descriptions – note making – Listening and transferring of information from text to graphic forms - bar charts, flow-charts.

UNIT III READING  12
Reading Comprehension - scanning for information – inferring meaning from context - Listening and guided note-taking - using notes – giving suitable headings / subheadings for paragraphs

UNIT IV GRAMMAR AND VOCABULARY  12
Word formation with prefixes and suffixes – Parts of Speech – Verb patterns - adjectives,
adverbs - matching words with meanings - British and American Vocabulary – Marine Vocabulary

UNIT V LISTENING

Extensive listening – listening for general content – listening to fill up missed text – intensive listening – listening for specific information.

TOTAL 54 HOURS

TEXTBOOKS:

REFERENCE BOOKS:
15EMR202 WORKSHOP TECHNOLOGY 3 0 0 3

Course objective:

• Able to Maintain and repair shipboard machinery and equipments.
• To gain appropriate basic mechanical knowledge and skills.

Course outcome:

CO-1 To understand common workshop tools.
CO-2 To understand Pattern maker’s tools, Smithy tools and Mouldings tools.
CO-3 To understand measuring tools.
CO-4 To understand the inspection of measuring tools.
CO-5 To understand about permanent joints.
CO-6 To understand the self secured joints.
CO-7 To understand Principles of electric Arc welding.
CO-8 To understand Common faults in welded joints.
CO-9 To understand machine process in manufacture.
CO-10 To understand Manufacturing of components, gauges, deck machinery, gearing, clutches.

UNIT I COMMON WORKSHOP TOOLS 10
Description and used of different types of calipers, Straight edges, Try squares. Vices, Hammers, Chisels, Scrapers, Files, Drills, Reamers, Taps, V-Block, Face plate, Marking Blocks Carpentry Tools, Pattern maker’s tools, Smithy tools and Mouldings tools

UNIT II MEASURING INSTRUMENTS & INSPECTION 10
Description and use of steel rule, Vernier’s Scale, Micro-meter, Dial gauge, Depth gauge, thread gauge, Feeler gauge, Wire gauge, Pattern Maker’s Scale, Taper gauge, snap gauge, Plug gauge, Optical method of measurement, principles of interchangeability, limit system, uses of limit gauge.

UNIT III METAL WORK - JOINTS 06
UNIT IV WELDING


UNIT V MACHINE PROCESSES IN MANUFACTURE

Plate work – marking out, thermal cutting, Mechanical cutting, Cutting forces, Stresses and power; Friction of chip on tool. Plate Forming, Bending plates. Pipe work. Manufacturing of components, gauges, deck machinery, gearing, clutches.

TOTAL 54 hours

TEXT BOOKS:

REFERENCE BOOKS:
1. Workshop Technology by Chapman,2009
15EMR203 ENGINEERING MECHANICS 4 0 0 4

Course objective:
• Able to do Maintenance and repair of shipboard machinery and equipment Design characteristics.
• To know the selection of materials in construction of equipment.

Course outcome:
CO-1 To understand scalar & vector quantities.
CO-2 To understand Graphic representation of forces.
CO-3 To understand Graphs and equations for displacement, speed, velocity and uniform acceleration.
CO-4 To understand Problems on constant force or force with linear variation.
CO-5 To understand Simple lifting machines.
CO-6 To understand Moment of inertia of material bodies.
CO-7 To understand Centrifugal force and its application to conical pendulum, unloaded governor, curved tracks and machine parts.
CO-8 To understand Dynamic balancing of masses rotating in one plane.
CO-9 To understand the term friction.
CO-10 To understand Energy and power lost due to friction in simple bearings.

UNIT I  STATICS
Scalar & Vector quantities - addition/subtraction. Graphic representation of forces - parallelogram of forces - resultant of two forces - conditions for a number of forces to be in equilibrium. Force as a vector, triangle and polygon of forces, resultant and equilibrium of a system of concurrent, coplanar forces. Lami’s theorem. Parallel forces in a plane. General cases of forces in a plane. Couples. Method of moments. Palin trusses. Method of joints, method of sections. Method of members. Centroids, areas and volumes of composite bodies (Pappu’s Theorem). Centre of Gravity - definition centre of gravity - centre of gravity of (a) suspended mass (b) mass supported at a single point - C.G. of regular shaped masses.
UNIT II DYNAMICS


UNIT III SIMPLE MACHINES (STATIC ANALYSIS)


UNIT IV SIMPLE MACHINES (DYNAMIC ANALYSIS)


UNIT V FRICTION

Coefficient of friction. Friction angle. Energy and power lost due to friction in simple bearings. Friction in belt drive, Efficiency of screw-jack (Square and Vee Thread)

TOTAL 72 hours

TEXT BOOKS:
Course objective:
• Able to do Maintenance and repair of shipboard machinery and equipment Design characteristics.
• To select materials in construction of equipment.

Course outcome:
CO-1 To understand Principles of Moment.
CO-2 To understand the magnitude and nature of forces acting on the different members.
CO-3 To understand about Young’s Modulus of a Loaded Beam.
CO-4 To understand about co-efficient of friction.
CO-5 To understand about uniplanar forces.
CO-6 To understand the Mechanical Advantage, Velocity Ratio, Theoretical Effort, Efficiency, Friction, the equation giving the relation between Load and Actual Efforts.
CO-7 To understand about acceleration due to gravity.
CO-8 To understand Moment of Inertia and Radius of Gyration of a Fly Wheel.

LIST OF EXPERIMENTS
1. To verify the Principles of Moment with the help of (a) Bell Crank Lever & (b) Moments of Stand
2. To determine the magnitude and nature of forces acting on the different members of—
   (a)Wall Crank,(b)Shear Leg Apparatus,&(c)Derrick Crane.
3. To determine the Young’s Modulus of a Loaded Beam.
4. To determine the co-efficient of friction between leather and metal in an inclined plane.
5. To prove that if a system of uniplanar forces is in equilibrium, the links respectively given in magnitude and direction taken in order form a closed polygon. If any number of forces acting at a point be such that they can be represented in magnitude, direction and sense by the sides of a closed polygon taken in order, then they shall be in equilibrium.
6. To find out the Mechanical Advantage, Velocity Ratio, Theoretical Effort, Efficiency, Friction, the equation giving the relation between Load and Actual Efforts, and draw graphs with load as base for(i)Efficiency (ii)Actual Effort (iii)Mechanical Advantage and (iv)Friction for the following machines
   (a) Screw Jack;
   (b) Worm and Worm Wheel
   (c) Compound Wheel and Axle
   (d) Single Purchase Crab and
   (e) Double Purchase Crab.
7. To determine the value of ‘g” (acceleration due to gravity) by means of
(a) Atwood’s Machine, and,
(b) Fletcher’s Trolley.
8. To determine the Moment of Inertia and Radius of Gyration of a Fly Wheel.

**TOTAL 36 hours**

**TEXT BOOKS:**
In-house developed Lab Manual.
Course objective:

- To able to Operate fuel, lubrication, ballast and other pumping systems and associated control systems.
- To know the Operational characteristics of pumps and piping systems, including control systems.

Course outcome:

- CO-1 To understand Properties of fluid.
- CO-2 To understand Equilibrium of floating bodies.
- CO-3 To understand Bernoulli’s equation and applications.
- CO-4 To understand Flow rate measurement.
- CO-5 To understand the concepts of flow through pipes.
- CO-6 To understand Coefficients of velocity, contraction of area and discharge.
- CO-7 To understand about impact of jets.
- CO-8 To understand Blade diagrams for a centrifugal pump.
- CO-9 To understand Fluid flow and characteristics of major ship’s pumping systems.
- CO-10 To understand Operation and material construction of devices/equipment in the system.

UNIT I PROPERTIES OF FLUID


UNIT II BERNOULLI’S EQUATION AND APPLICATIONS

UNIT III  FLOW THROUGH PIPES

Full- bore flow of liquids under a constant head. Flow through an orifice. Flow through pipes. Flow through concentric pipes. Flow through parallel plates. Coefficients of velocity, contraction of area and discharge.

UNIT IV IMPACT OF JETS

Impact of jets – force exerted by a jet on flat and curved plates and at pipe bends. Surge pressure and control. Blade diagrams for a centrifugal pump.

UNIT V  FLUID FLOW AND CHARACTERISTICS

Fluid flow and characteristics of major ship’s pumping systems. Description of all fluid systems on board. Operation and material construction of devices/equipment in the system.

TOTAL 54 hours

TEXT BOOKS:

REFERENCE BOOKS:
Course objective:
- Able to Manage the operation of propulsion plant machinery Plan and schedule operations.
- Operation, surveillance, performance assessment and maintaining safety of propulsion plant and auxiliary machinery.

Course outcome:

CO-1 To understand about the basic thermodynamic definitions.
CO-2 To understand Problems involving changes of phase and not more than three substances.
CO-3 To understand First law of thermodynamics and its application to various processes.
CO-4 To understand Relationship between pressure, temperature and volume.
CO-5 To understand Statements of the Second Law of Thermodynamics.
CO-6 To understand about Thermodynamic temperature scale.
CO-7 To understand properties of mixture of gases & gas vapors.
CO-8 To understand Equivalent Molecular weight, Density, specific volume, specific Heat and molar heat capacity of a gas mixture.
CO-9 To understand about compressors & IC engines.
CO-10 To understand Calculation of work done, indicator diagrams.

UNIT I THERMODYNAMIC DEFINITIONS
Heat, Work, Energy, System, Boundary, Control, Volume. Working substance, phase properties, Phase diagrams. Point function, Path function, Reversible and irreversible process; P-V Diagram of work transfer in reversible processes; Closed system and Open System; Steady flow process and Non-flow process - Specific heat capacity – specific enthalpy of evaporation and fusion. Problems involving changes of phase and not more than three substances. Linear, superficial and volumetric expansion due to temperature changes. Co-efficient and the relationships between them.

UNIT II FIRST LAW OF THERMODYNAMICS
adiabatic and polytropic process. Relationship between pressure, temperature and volume. Work done, change in internal energy.

UNIT III SECOND LAW OF THERMODYNAMICS


UNIT IV PROPERTIES OF MIXTURE OF GASES AND GAS VAPORS


UNIT V COMPRESSORS AND IC ENGINES

Reciprocating Air compressors: Elementary principles and cycles of operation. Calculation of work done, indicator diagrams. IC engines: Elementary principles and cycle of operation, actual indicator diagrams, mean effective pressure, work done, power developed, indicated and brake thermal efficiency, mechanical efficiency, overall efficiency, fuel consumption and heat balance.

TOTAL 60 hours

TEXT BOOKS:
1. P.L. Ballaney, ”Thermal engineering”, khanna publication,2005

REFERENCE BOOKS:
1. Nag,”Engineering Thermodynamics “,2012
Course objective:

- To able to understand Operational fuel, lubrication, ballast and other pumping systems and associated control systems.
- To understand the Operational characteristics of pumps and piping systems, including control systems.

Course outcome:

CO-1 To understand about venturimeter.
CO-2 To understand about pelton wheel.
CO-3 To understand about co-efficient of velocity of contraction.
CO-4 To understand about co-efficient of discharge of water through orifice/s.
CO-5 To understand about the friction co-efficient for the flow of water through a pipe.

FLUID MECHANICS EXPERIMENTS

1. To determine the meter constant of the venturimeter
2. To determine the efficiency of a Pelton wheel
3. To determine the co-efficient of velocity of contraction and co-efficient of discharge of water through orifice/s.
4. To determine the friction co-efficient for the flow of water through a pipe.

TEXT BOOK:

In-house developed Work Manual
Course objective:

• To able to Operate main and auxiliary machinery and associated control systems, Deck machinery.

Course outcome:

CO-1 To understand construction & working of windlass & mooring winches.
CO-2 To understand bow thruster system & controls.
CO-3 To understand types of cargo cranes (electro hydraulic & total hydraulic).
CO-4 To understand various crane movement & safety.
CO-5 To understand various hydraulic systems.
CO-6 To understand hydraulic circuits.
CO-7 To understand construction of LSA.
CO-8 To understand operation & maintenance of LSA.
CO-9 To understand various types of steering gear.
CO-10 To understand operation & testing of steering gear.

PRINCIPLES AND OPERATION OF THE FOLLOWING TYPES OF DECK MACHINERY:

UNIT I WINDLASS AND MOORING WINCHES

Windlass and Mooring Winches – construction, operation and precautions while operating. Routine maintenance of these machines. Circuit diagrams of hydraulic systems. Bow-Thruster Systems and their Remote Control.

UNIT II CARGO CRANES

Cargo Cranes – Electro-hydraulic and totally hydraulic systems. Various movements of the cranes and the safety features installed on such Cranes.
UNIT III HYDRAULIC CIRCUIT

UNIT IV LIFE BOAT
Life Boat Winch and accommodation Ladder Winch. Constructional features, operation and maintenance required.

UNIT V STEERING GEAR

TOTAL 54 hours

TEXT BOOKS:

REFERENCE BOOKS:
1. Leslie Jackson and W Embleton, “Reed’s General Engineering Knowledge” Volume VIII, 2010
Course objective:

- To able to Manage the operation of propulsion plant machinery Plan and schedule operations, surveillance, performance assessment.
- To maintain safety of propulsion plant and auxiliary machinery.

Course outcome:

CO-1 To understand Steam and Two Phase System.

CO-2 To understand Non flow processes with Steam.

CO-3 To understand Steam Cycle: Carnot’s cycle for steam and ideal efficiency.

CO-4 To understand Reheating and Regenerative Feed Heating and their effect on Thermal Efficiency.

CO-5 To understand Boilers and Evaporators.

CO-6 To understand Boilers and Calculations.

CO-7 To understand Steam Turbines: General Principles of impulse and Reaction Turbines.

CO-8 To understand Effect of Friction on blades, Applied Problems.

CO-9 To understand Steam Engines.


UNIT I INTRODUCTION

Steam and Two Phase System: Phase; Equation of Steam; Temperature- Pressure Diagrams; Triple Point; Specific Enthalpy and Entropy Diagrams; Use of Steam table and Steam Charts; Pressure volume and Enthalpy and Entropy Diagrams Internal energy vapours Super critical vapours, Non flow processes with Steam; Applied Problems.

UNIT II STEAM CYCLE

UNIT III  BOILERS AND EVAPORATORS  
Boilers and Evaporators: Boilers and Calculations; Boiler Thermal Efficiency and Equivalent Evaporation of a Boiler; Basic calculations on the effect of Condenser Leakage and Impure feed, dissolved solids and scale in Boilers; Density of water and its control in Boilers & Evaporators. Applied Problems.

UNIT IV  STEAM TURBINES  

UNIT V  STEAM ENGINES  

TOTAL 54 HOURS

TEXT BOOKS:
Course objective:
- Able to operate electrical, electronic and control systems, Electrical motors including starting methodologies.

Course outcome:
CO-1 To understand about the continuity test.
CO-2 To understand about speed controls of motor.
CO-3 To understand about starters.
CO-4 To understand about constant current & voltage.
CO-5 To understand about wattmeter.
CO-6 To understand about three phase four wire system.
CO-7 To understand about usage of energy meter.
CO-8 To understand about load test on dc shunt generator.
CO-9 To understand about transformers.
CO-10 To understand about open circuit characteristics.

LIST OF EXPERIMENTS
1. Testing of continuity, insulation and grouping of coils of AC and DC Motors. 04
2. Speed control of DC motors by armature and field control. 04
3. Connecting a three phase Induction Motor with DOL starter and measurement of power and speed. 04
4. Study of constant current and voltage source and current source. 04
5. Measurement single phase power using wattmeter. 04
6. Wiring of TPN switch, fuse units for circuits of three phase four wire system load. 04
7. Energy measurement by single phase Energy meter. 04
8. Load test on DC shunt generator. 04
9. Study of single phase and three phase transformers. 02
10. Open circuit characteristics of DC generator. 02

TOTAL 36 HRS

TEXT BOOKS:
In-House developed Lab Manual
Course objective:
- Able to Operate electrical, electronic and control systems, Flowchart for automatic and control systems.

Course outcome:

CO-1 To understand about half & full wave rectifiers.
CO-2 To understand characteristics of semiconductor diode.
CO-3 To understand characteristics of zener diode.
CO-4 To understand Characteristics of Thermistor.
CO-5 To understand Characteristics of LED.
CO-6 To understand Characteristics of Field Effect Transistor.
CO-7 To understand Characteristics of SCR.
CO-8 To understand Characteristics of TRIAC.
CO-9 To understand Speed Control of DC motor using SCR.

LIST OF EXPERIMENTS

1. Study of half wave and full wave rectification circuit without and with filter 04
2. Characteristics of Semiconductor diode 04
3. Volt – ampere characteristics of Zener diode. 04
4. Characteristics of Thermistor. 04
5. Characteristics of LED. 04
6. Characteristics of Field Effect Transistor. 04
7. Characteristics of SCR. 04
8. Characteristics of TRIAC. 04
9. Speed Control of DC motor using SCR. 04

TOTAL 36 hours

TEXT BOOKS:
In-house developed Lab Manual
15EMR212 SAFE MAINTENANCE ON SHIPS 3 0 0 2

Course objective:
• able to Maintenance and repair of shipboard machinery and equipment Safety measures to be taken for repair and maintenance.
• To do the safe isolation of shipboard machinery and equipment required before personnel are permitted to work on such machinery or equipment.

Course outcome:
CO-1 To understand about risk assessment.
CO-2 To understand General safety and cleanliness on board.
CO-3 To understand about the usage of Personal protective equipment.
CO-4 To understand the standard communication system onboard.
CO-5 To understand the risks of working aloft & outboard.
CO-6 To understand about unmanned machinery spaces.
CO-7 To understand about machinery maintenance.
CO-8 To understand about high voltage systems.
CO-9 To understand signs & notices.
CO-10 To understand portable fire extinguishers.

UNIT I 12

UNIT II 16
UNIT III


UNIT IV


UNIT V


TOTAL 72 hours

TEXT BOOKS:
15EMR213 MARINE AUXILIARY MACHINERY 4003

Course Objective:
• able to operate main and auxiliary machinery and associated control systems Shafting installations, including propeller.
• able to operate other auxiliaries, including various pumps, air compressor, purifier, fresh water generator, heat exchanger, refrigeration, air-conditioning and ventilation systems etc.

Course outcome:
CO-1 To understand Propulsion transmission systems.
CO-2 To understand Types of propellers and features.
CO-3 To understand Heat Exchangers.
CO-4 To understand Fouling of tubes.
CO-5 To understand principles, operation, types of Steering Gear.
CO-6 To understand principles, operation, types of Stabilizers & Bow Thrusters.
CO-7 To understand air compressors.
CO-8 To understand Air Bottles – Construction and mountings.
CO-9 To understand Evaporators and distillers.
CO-10 To understand Construction, characteristics and operation of Fresh Water Generators.

UNIT I  16

UNIT II  16
UNIT III 16
Steering Gear, Stabilizers, Bow Thrusters – principles, operation, types, materials of construction, hydraulic power pumps and control systems for above.

UNIT IV 12
Air Compressors – System principles, materials of construction, operation, the compression process, inter and after coolers. Air Bottles – Construction and mountings.

UNIT V 12

TOTAL 72 hours.

TEXT BOOKS:

REFERENCE BOOKS:
1. Leslie Jackson and W Embleton, “Reed’s General Engineering Knowledge” Volume VIII, 2010
Course objective:
• Able to operate electrical, electronic and control systems Electrical motors including starting methodologies.

Course outcome:
CO-1 To study about squirrel cage induction motor.
CO-2 To study about wound rotor induction motor.
CO-3 To study about capacitor start induction motor.
CO-4 To study about capacitor start / capacitor run induction motor.
CO-5 To understand Stator armature winding of 3ph squirrel cage type induction motor.
CO-6 To understand three phase ac motor starters.
CO-7 To understand single phase transformer winding.
CO-8 To understand three phase transformer winding.
CO-9 To understand about soft starting.
CO-10 To understand auto transformer starter.

Exercises
1. Dismantling and study of AC motor – 3 ph induction type – squirrel cage type.
2. Dismantling and study of AC motor – 3 ph induction type – wound rotor type.
3. Dismantling and study of AC motor – 1 ph induction type – capacitor start type
4. Dismantling and study of AC motor – 1 ph induction type – capacitor start/capacitor run
5. Type
6. Stator armature winding of 3ph squirrel cage type induction motor
7. Single-phase AC motor starter – wiring connections
8. Direct-on-line starter for 3ph AC motor – wiring connections
9. Star-Delta Starter for 3ph AC motor
10. Auto-transformer starter for 3ph induction motor
11. Transformer winding – 1 phase
12. Transformer winding – 3 phase
13. Soft starting – 3 ph induction motor

TEXT BOOKS:
In-house developed Lab Manual
Course objective:
• Able to Operate electrical, electronic and control systems Sequential control circuits and associated system devices.

Course outcome:
CO-1 To understand about push pull amplifier.
CO-2 To understand Integrator and Differentiator.
CO-3 To understand Inverting and Non inverting amplifier.
CO-4 To understand Logic Gates truth tables.
CO-5 To understand multiplexers & de multiplexers.
CO-6 To understand Analog to Digital converter.
CO-7 To understand Digital to Analog Converter.
CO-8 To understand 555 Timer.

LIST OF EXPERIMENTS:
1. Push Pull Amplifier.
2. Study of Integrator and Differentiator
3. Study of Inverting and Non inverting amplifier
4. Verification of Logic Gates truth tables
5. Study of multiplexers & de multiplexers
7. Study of Digital to Analog Converter.
8. Study of 555 Timer

TOTAL 36 hours
TEXT BOOKS:
In-house developed Lab Manual
Course objective:

- Able to use hand tools, machine tools and measuring instruments for fabrication and repair on board.

Course outcome:

CO-1 To be aware of different types of material.
CO-2 To understand the properties of material.
CO-3 To understand the choice of material for main engine.
CO-4 To understand the choice & application of materials for steam turbines & gas turbines.
CO-5 To understand the safe working practice of power tools & hand tools.
CO-6 To understand the working & usage of specialized overhauling tools of machinery.
CO-7 To understand the work process of construction using different welding process.
CO-8 To understand the tests carried out on a typical periodical survey.
CO-9 To be aware of various mediums & application onboard for safety
CO-10 To be aware of different chemicals used on board.

UNIT I

Characteristics and limitations of materials used in construction and repair of ships and equipment. – Steel – mild steel, carbon steel, cast iron, wrought iron, aluminium and aluminium alloys, copper, tin, plastics, composites.

UNIT II

Design characteristics and selection of materials in the construction of equipment – Main engine cylinder liners, pistons, crankshafts, bearings. Material for boilers, super-heaters, steam turbines casing, blades, rotor etc. Gas turbine casings, rotors, blades, combustion chambers etc.
UNIT III
Safety measures to be taken to ensure a safe working environment, and for use of hand tools, powered hand tools, machine tools (Centre Lathe, Soldering, Thermal cutting, Inspection, safety and health when carrying out above operations – using appropriate specialized tools(for overhaul of particular machinery items) and precision measuring instruments (micrometers, liner gauges, tachometers, feeler gauges, UTG).

UNIT IV
The process of welded repair and construction. Advantages and disadvantages. Types of welds. Defects in welds. Destructive and Non-destructive testing of welds. (tests carried out on a typical welded seam of a water tube boiler drum).

UNIT V
Use of various types of sealants and packings for various applications on board- Superheated Steam, Sea water, Fresh water, Lub oil, Refrigerant lines, chemicals.

TOTAL 72 hours.

TEXT BOOKS:
1. H.D Mc George, ”Marine Auxiliary Machinery”, Reed Elsevier India, 2011

REFERENCE BOOKS:
Course objective:
• able to Manage operation of electrical and electronic control equipment Operation, surveillance, performance assessment and maintaining safety of propulsion plant and auxiliary machinery, Maintenance and repair of electrical and electronic equipment.

Course outcome:
CO-1 To understand Starting, parallel operation and changing of alternators.
CO-2 To understand Maintenance required on Alternators and motors and paralleling equipment.
CO-3 To understand Emergency Generator & Different Starting methods including auto-start.
CO-4 To understand Emergency batteries construction and its different types.
CO-5 To understand Safety devices on emergency switch board.
CO-6 To understand maintenance routine of all the equipment, including circuit breakers.
CO-7 To understand Switchboard construction.
CO-8 To understand Cables & temperature classification.
CO-9 To understand Motor & Control Equipments.
CO-10 To understand enclosures & protective devices on motors.

UNIT I                    06

UNIT II                    09
Purpose of emergency power supply. Emergency Generator & Different Starting methods including auto-start. Emergency batteries construction and its different types (Lead acid and alkaline battery) &duties. Location of emergency power. Maintenance required on all the above equipment.
UNIT III

Alternative Source of Power: Safety devices on emergency switch board – Interconnection between the MSB and emergency switch board. Shore Supply – Specifications as per Voltage / Frequency, precautions while taking shore supply. List the essential services supplied with electrical power. Describe the maintenance routine of all the above equipment, including circuit breakers.

UNIT IV

Switchboard construction – Main and Emergency – different switchgear & protective devices, Grounded and insulated neutral systems, precautions adopted in High Voltage Distribution system. Transformers. Cables & temperature classification. Describe the maintenance routine of all the above equipment, including circuit breakers.

UNIT V

Motor & Control Equipments: Types of marine motors, types of enclosures, protective devices on motors explain how excitation of a motor is produced and supplied. Describe how a generator is cooled and why heaters are fitted. Describe the maintenance required on these items.

TOTAL 36 hours.

TEXT BOOKS:

REFERENCE BOOKS:
15EMR218  REFRIGERATION, AIR-CONDITIONING & VENTILATION SYSTEMS 3 0 0 3

Course objective:

• Able to operate main and auxiliary machinery and associated control systems.

Course outcome:

CO-1 To understand basic refrigeration concepts.
CO-2 To understand refrigeration system components.
CO-3 To understand operation, maintenance & troubleshooting of refrigeration plant.
CO-4 To understand temperature monitoring system & automatic operation.
CO-5 To understand basic air conditioning principles & concepts.
CO-6 To understand air conditioning system components & its types.
CO-7 To understand air conditioning duct layouts, operation & HVAC control.
CO-8 To understand trouble & operation & maintenance.
CO-9 To understand ventilation requirements for different ship areas.
CO-10 To understand types of blower for ventilation.

UNIT I INTRODUCTION 12


UNIT II OPERATION OF REFRIGERATION SYSTEMS 09

Operation and maintenance of refrigeration plants, control of temperature in different chambers, changing of refrigerant/Oil, purging of air, defrosting methods,

UNIT III  AIR CONDITIONING

Introduction to Air Conditioning. Psychrometric principles. Why imperative on tankers. Circuit diagrams and components of Air Conditioning System. Construction and materials used for the various components. Air conditioning: necessity on board ships, different systems, control of rooms, air change requirements, design considerations, maintenance.

UNIT IV  OPERATION OF AIR CONDITIONING SYSTEMS


UNIT V  VENTILATION

Ventilation of cargo holds (natural and forced), Accommodation and Engine Rooms. Types of blowers used. Emergency shut-off in case of fire. Ventilation: Ventilation of engine room, pump room, CO2 and battery rooms, air change requirements, design considerations, maintenance.

TOTAL  54hours.

TEXT BOOKS:

1. Leslie Jackson and W Embleton, “Reed’s General Engineering Knowledge” Volume VIII, 2010

REFERENCE BOOKS:

15EMR219   MARINE ELECTRICAL TECHNOLOGY II  2 0 0 2

Course objective:
• Able to do Maintenance and repair of electrical and electronic equipment.

Course outcome:
CO-1 To understand Marine electrical equipment.
CO-2 To understand Alarm system (types, supply) on board.
CO-3 To understand Maintenance of electrical systems, fault finding & repair.
CO-4 To understand Detection of faults on electrical circuits
CO-5 To understand Special electrical practice.
CO-6 To understand Rules and regulations & operation electric propulsion system.
CO-7 To understand Electrical systems for operation in flammable areas.
CO-8 To understand Special electrical practice for oil, gas and chemical tankers.
CO-9 To understand electrical fire fighting.
CO-10 To understand precautions against electric shock and related hazards.

UNIT I INTRODUCTION 06
Miscellaneous Marine electrical equipment Alarm System: Alarm system (types, supply) on board- watertight doors, bow-doors, oxygen analyzer, High & low level alarms, navigational lights, emergency radio operation, main engine telegraph, steering gears, Electrical Deck Cranes.

UNIT II MAINTENANCE 09
Maintenance of electrical systems, fault finding & repair: Type of faults & indications on Generator, motor & distribution systems, different testing equipments& meters (multimeter / megger, clampmeter, etc) Salvaging a motor. Detection of faults on electrical circuits – Indications & corrective arrangements, necessary precautions & care while fault finding and repair, preventive maintenance, periodic surveys, spares requirement.

UNIT III SAFE WORKING PRACTICES 09
Special electrical practice: Rules and regulations & operation of electro-hydraulic & electrical steering gear, Diesel-electric and turbo electric propulsion system.

UNIT IV ELECTRICAL SYSTEMS

Electrical systems for operation in flammable areas. Special electrical practice for oil, gas and chemical tankers (Tanker classification, Dangerous spaces, Hazardous zones, Temperature class), flame proof Ex ‘d’ and intrinsic safety Ex ‘i’ Ex ‘e’, and Ex ‘n’ equipments and their applications in zones, maintenance of Ex-protected apparatus.

UNIT V MAINTENANCE

Safe Electrical practice: Safe watch – keeping, points to check on electrical machineries, switch gears & equipments, microprocessor control and maintenance – electrical fire fighting, precautions against electric shock and related hazards.

TOTAL 36 hours

TEXT BOOKS:

REFERENCE BOOKS:
1. B L Theraja ,”Electrical Technology” S Chand and company pvt.ltd, 2013
Course objective:

- Able to Maintain seaworthiness of the ship Working knowledge and application of stability, trim and stress tables, diagrams and stress-calculating.

Course outcome:

CO-1 To understand Principal terms used in Naval Architecture.
CO-2 To understand Hydrostatic calculations.
CO-3 To understand specific terms in naval architecture.
CO-4 To understand effect of addition and removal of masses.
CO-5 To understand Simpson’s rules, application to area and volume.
CO-6 To understand Tchebycheff’s rule and their applications.
CO-7 To understand Transverse stability of ships.
CO-8 To understand inclining experiment & free surface effect.
CO-9 To understand Transverse stability at large angles of heel.
CO-10 To understand curves of statical stability & dynamical stability.

UNIT I 12
Principal terms used in Naval Architecture – Geometry of ships. Hydrostatic calculations: Ship lines, displacement calculation, first and second moment of area.

UNIT II 12
Tons per Cm. Immersion, Co-efficient of forms, wetted surface area, similar figures, centre of gravity, effect addition and removal of masses.

UNIT III 09
Simpson’s rules, application to area and volume, Trapezoidal rule, mean and mid-ordinate rule, Tchebycheff’s rule and their applications.
UNIT IV

Transverse stability of ships- statical stability at small angles of heel, calculation of BM, metacentric height- inclining experiment- free surface effect –

UNIT V

Transverse stability at large angles of heel – curves of statical stability- dynamical stability.

TOTAL 54 hours

TEXT BOOKS:

REFERENCE BOOKS:
Course objective:
- Able to do Maintenance and repair of shipboard machinery and equipment.

Course outcome:
- CO-1 To understand Relative motion between bodies moving in different planes.
- CO-2 To understand Analytical determination of velocity and acceleration.
- CO-3 To understand Function of a flywheel.
- CO-4 To understand Effect of centrifugal tension on flywheel.
- CO-5 To understand Flat belts and effect of centrifugal tension.
- CO-6 To understand Roller & inverted tooth chains.
- CO-7 To understand Balancing of masses rotating in one or different planes.
- CO-8 To understand vector representation of torque and angular momentum.
- CO-9 To understand Free Harmonic vibrations, linear motion of an elastic system, and Angular motion of an elastic system.
- CO-10 To understand Differential equation of motion.

UNIT I KINEMATICS AND LINK MECHANICS: 06
Relative motion between bodies moving in different planes. Instantaneous center method; Rubbing velocities at pin joints. Graphical construction for relative and acceleration in different link and sliding mechanisms. Analytical determination of velocity and acceleration. Forces in Crank and connecting rods. Inertia force on link connecting rods etc. effect of friction.

UNIT II TURNING MOMENT & FLYWHEEL: 06

UNIT III BELTS AND CHAINS: 09
Flat belts and effect of centrifugal tension. Initial Belt tension & conditions for maximum power transmission. Roller & inverted tooth chains. Gears: Spur Gears – Various definitions – P.C.D.,

UNIT IV BALANCING: 06

Balancing of masses rotating in one or different planes, dynamic forces at bearings; Primary and secondary balance of multi-cylinder in-line engines and configurations. Balancing Machines. Gyroscope: Gyroscopic couple, vector representation of torque and angular momentum, steady rectangular precession; vector treatment; steady conical precession; Motion involving steady procession; Application to ship’s stabilization.

UNIT V VIBRATION: 09


TOTAL 36hours

TEXT BOOKS:
Course objective:
- Able to operate fuel, lubrication, ballast and other pumping systems and associated control systems, Manage fuel, lubrication and ballast operations.

Course outcome:
CO-1 To be able to draw the typical bilge pumping arrangement in the Engine room showing the various components.
CO-2 To be able to draw the typical sludge pumping arrangement in the Engine room showing the various components.
CO-3 To be able to draw the Ballasting and De-ballasting pipeline arrangement in a typical tanker ship.
CO-4 To be able to explain the IG system on an Oil tanker with emphasis on how it protects the cargo space.
CO-5 To be able to draw the typical cargo pumping arrangement in a tanker ship.
CO-6 To sketch in detail an Oily water separator used on board.
CO-7 To sketch in detail the Oil Discharge Monitoring control system (ODMCS) used on board.
CO-8 To be able to apply Dimensional Analysis to solve complex hydraulic equations.
CO-9 To be able to explain the testing of Fuel oil on board the ship and ashore.
CO-10 To be able to explain the testing of Lube oil on board the ship and ashore.

UNIT I OPERATING PUMPING SYSTEMS
Operation of pumping systems-Routine pumping operations – Operation of bilge, ballast and cargo operating systems

UNIT II MARPOL
Oily Water separator – prevention of pollution – principles, construction and operation – requirements of MARPOL
UNIT III DIMENSIONAL ANALYSIS

Dimensional Analysis & dynamically similarity: Use of dimension for finding conversion factors: Dimensions equation: Methods of finding dimensional groups; Geometrical and dynamical similarity, General principle; dynamically similarity problems

UNIT IV CHEMICAL PROPERTIES

Physical and chemical properties of fuels and lubricants – Production of oils from crude oil- properties and characteristics of fuels and lubricants

UNIT V TESTING OF FUEL OIL

Shore side and shipboard sampling and testing of fuel oil – interpretation of test results – contaminants including microbial infection – treatment of fuels and lubricants including storage, centrifuging, blending, pretreatment and handling

TOTAL 36 hours

TEXT BOOKS:


REFERENCE BOOKS:

15EMR223 MARINE ENGINEERING PRACTICE II 2002

Course objective:

• able to Maintain and repair of shipboard machinery and equipment.

Course outcome:

CO-1 To be aware of principles of clarifier & purifier.

CO-2 To be aware of purifier parts, assembly / disassembly procedures.

CO-3 To get working knowledge of purification piping layout, gravity disc selection & desludging procedure.

CO-4 To understand the sequence of operation of purifier.

CO-5 To be aware of rules & regulation of automation on slips.

CO-6 To understand the procedures & hazards of hot work onboard ships.

CO-7 To understand the main engine cylinder head removal inspection.

CO-8 To understand the use & application of hydraulic tightening tools.

CO-9 To be well versed with overhaul of the compressor valves.

CO-10 To understand the working of different types of centrifugal pumps.

UNIT I PURIFIERS AND CLARIFIERS. 06

Construction and characteristics of Separators – Purifiers and Clarifiers.

UNIT II FUEL OIL PREPARATION AND TREATMENT 06

Fuel Oil preparation and treatment – Operation and principles and materials of construction of purifiers and clarifiers.

UNIT III SAFE WORKING PRACTICES 06


UNIT IV OVERHAULING PROCEDURES 09

Procedures to be followed when handling heavy machinery parts, and overhauling of engines. Man-entry and hot work in enclosed compartments. Safe and efficient operation and maintenance of Marine Diesel Engines. Crankcase inspection, Depth gauge and crankshaft deflections.

AECC-41
UNIT V MAINTENANCE AND REPAIR

Maintenance and repair such as dismantling, adjustment and reassembling of machinery and equipment. Preparation for work on machinery. General maintenance procedures for centrifugal pumps, screw and gear pumps, valves, air compressors and heat exchangers.

TOTAL 36 hours.

TEXT BOOKS:
1. The Running and maintenance of Marine Machinery (Institute of Marine Engineers, London.), 2009

REFERENCE BOOKS:
Course objective:

- able to Maintain seaworthiness of the ship, Control trim, stability and stress.

Course outcome:

CO-1 To understand Curves of buoyancy and weight, curves of load, shearing force and bending moments.
CO-2 To understand Longitudinal strength, moment of inertia of section & section modulus.
CO-3 To understand Trim because of filling / flooding several tanks with different densities.
CO-4 To understand method for determination of floodable lengths.
CO-5 To understand relation between powers & relation between pressure and speed.
CO-6 To understand various efficiencies & calculation of effective power
CO-7 To understand Action of the rudder in turning a ship.
CO-8 To understand Types of rudder, model experiments and turning trials.
CO-9 To understand Blade element theory, law of similitude and model tests with propellers.
CO-10 To understand Motion of ship on waves.

UNIT I LONGITUDINAL STABILITY AND TRIM: STRENGTH OF SHIPS

Curves of buoyancy and weight, curves of load, shearing force and bending moments, alternate methods, standard conditions, balancing ship on wave, approximation for max. Shearing force and bending moment, method of estimating B.M. & Deflection. Longitudinal strength, moment of inertia of section, section modulus. MCT1, change of L.C.B. with change of trim, change of trim due to adding and deducting weights, change in draft – associated numerical

UNIT II TRIM

Trim because of filling / flooding several tanks with different densities, alteration of draft due to change in density, flooding calculations, floodable length curves, Trim: M.O.T. method for determination of floodable lengths, factors of sub division, loss of stability due to grounding, docking stability, pressure on chocks.
UNIT III PROPULSION
Definitions, apparent and real ships wake, thrust, relation between powers, relation between pressure and speed, Resistance and powering - Froude’s law- frictional resistance-residuary resistance- calculation of naked power-various efficiencies-calculation of effective power- admiralty coefficient--applied problems

UNIT IV RUDDER THEORY
Action of the rudder in turning a ship, force on rudder, torque on stock, calculation of force torque on non-rectangular rudder, angle of heel due to force torque on rudder, angle of heel when turning. Types of rudder, model experiments and turning trials; area and shape of rudder, stern rudders bow rudders.

UNIT V PROPELLER

TOTAL 54 hours

TEXT BOOKS:

REFERENCE BOOKS:
Course objective:
• To Maintenance and repair of shipboard machinery and equipment (Table A – III/1).

Course outcome:

CO-1 To understand fuel oil separator- purifier.
CO-2 To understand fuel oil separator- clarifier.
CO-3 To understand purification system for Fuel Oil using a Purifier-Clarifier.
CO-4 To understand procedures to be followed when doing hot work, gas cutting, arc welding.
CO-5 To understand procedures to be followed for moving heavy machinery in engine room & working aloft.
CO-6 To understand for procedures to be followed for Main Engine overhaul.
CO-7 To understand crankshaft deflection.
CO-8 To understand precaution to be taken for main bearing clearances.
CO-9 To understand checks of running auxiliary machinery.

LIST OF JOBS/EXPERIMENTS
1. Construction and characteristics of A Fuel Oil Separator – Purifier - Opening up, identification of parts, inspection for damage and reassembly. Start up after re-assembly.
2. Construction and characteristics of A Fuel Oil Separator – Clarifier - Opening up, identification of parts, inspection for damage and reassembly. Start up after re-assembly.
3. Setting up purification system for Fuel Oil using a Purifier-Clarifier combination in series.
4. Draw up check lists for procedures to be followed when doing hot work, gas cutting, arc welding.
5. Draw up check lists for procedures to be followed when (i) moving heavy machinery items within the Engine Room (ii) working aloft in Machinery Spaces..
6. Draw up check lists for procedures to be followed when the Main Engine is to be opened up for overhaul.
7. Draw up check lists for procedures to be followed when Crankshaft deflections of the Main Engine are to be taken. List the precautions and tabulate the results.
8. Draw up check lists for procedures to be followed when Main Bearing clearances of the Main Engine are to be taken. List the precautions and tabulate the results.

9. Draw up check lists for procedures to be followed when the running gear of an Auxiliary Engine is to be checked. Set the valve tappets of a 4-stroke Auxiliary Engine. List the precautions and tabulate the results.

**TOTAL 144 hours.**

**TEXT BOOKS:**

In-house developed Lab Manual
Course objective:

- Able to manage safe and effective maintenance and repair procedures.
- To Detect and identify the cause of machinery malfunctions and correct faults Ensure safe working practices.

Course outcome:

**CO-1** To understand Detection and identification of the cause of machinery malfunctions and correct faults.

**CO-2** To understand destructive and non-destructive testing.

**CO-3** To understand Unplanned or break-down maintenance.

**CO-4** To understand inspection and adjustment of all relevant equipment.

**CO-5** To understand Theoretical knowledge of Marine Engineering Practice

**CO-6** To understand Manageable breakdowns and Emergency Repairs.

**CO-7** To understand Management and conduct of ship maintenance by Planned Maintenance.

**CO-8** To understand Surveys for maintenance and renewal of Class, and Statutory Certificates.

**CO-9** To understand Planning and execution of safe maintenance activity and repair procedures.

**CO-10** To understand Trials and restoration of the Plant after repairs.

**UNIT I   DETECTION OF MACHINERY MALFUNCTIONS**

Detect and identify the cause of machinery malfunctions and correct faults – practical knowledge- Detection of machinery malfunctions, localization of faults – actions to prevent damage – destructive and non-destructive testing

**UNIT II   MAINTENANCE – INSPECTION**

Unplanned or break-down maintenance – inspection and adjustment of all relevant equipment.- Risk assessment and evaluation before commencement of maintenance activity.

**UNIT III   MARINE ENGINEERING PRACTICE**

Theoretical knowledge of Marine Engineering Practice and Maintenance of Machinery. Methods of dealing with wear and tear of machinery, both electrical and mechanical. Alignment
of machinery components. Correction of defects. Temporary and permanent repairs in the event of breakdown. Manageable breakdowns and Emergency Repairs.

**UNIT IV SURVEYS**


**UNIT V SAFE WORKING PRACTICES**

Safe Working Practices. Planning for Dry-docking and major repairs. Planning and execution of safe maintenance activity and repair procedures taking into account technical, legislative, safety procedural specifications, appropriate plan, specification of materials and equipment available for maintenance and repairs. Trials and restoration of the Plant after repairs.

**TOTAL 54 hours.**

**TEXT BOOKS:**

15EMR227 LEADERSHIP, TEAM-BUILDING AND SHIP SECURITY 2001

Course objective:

• Able to gain Application of leadership and team working skills, Maintain the conditions set forth in a ship security plan.
• To recognize the security risks and threats.
• To undertake regular security inspections of the ship and proper usage of security equipment.

Course outcome:

CO-1 To understand Knowledge of shipboard Personnel management.
CO-2 To understand training of shipboard personnel.
CO-3 To understand Human resource management.
CO-4 To understand Training, development & Negotiation skills.
CO-5 To understand Ability to apply task and workload management.
CO-6 To understand Personal assignments, Time, resource constraints & Prioritization.
CO-7 To understand Knowledge and ability to apply decision-making techniques.
CO-8 To understand Situation and Risk Assessment.
CO-9 To understand Drills and exercises under IMO Codes and Circulars.
CO-10 To understand General knowledge of various types of security equipment and systems.

UNIT I PERSONNEL MANAGEMENT 06
Knowledge of shipboard Personnel management and training – Engineer and Manager.

UNIT II RESOURCE MANAGEMENT 06
Human resource management - Training and development - Negotiation skills

UNIT III WORKLOAD MANAGEMENT 06
Ability to apply task and workload management. Communication, Team-building, Planning and co-ordination, Personal assignments, Time and resource constraints, Prioritization.
UNIT IV MANAGEMENT PROCESSES
Knowledge and ability to apply decision-making techniques – Management processes and functions. Situation and Risk Assessment. Identify and generate options. Select course of action. Evaluate effectiveness

UNIT V WORKING KNOWLEDGE
Security-Working knowledge of maritime security terms and definitions, maritime security levels. Drills and exercises under IMO Codes and Circulars. Techniques for monitoring restricted areas on board. General knowledge of various types of security equipment and systems, including their limitations; need for testing, calibrating and maintaining security systems and equipment.

TOTAL 36 hours

TEXT BOOKS:
Course objective:
• Able to maintain a safe Engineering watch, Use internal communication systems.

Course outcome:
CO-1 To be well versed in utilizing available resources in engine room.
CO-2 To know about the quality and safety conventions.
CO-3 To be well versed in allocating the resources.
CO-4 To know about multi cultural environment.
CO-5 To understand the concept of prioritization.
CO-6 To understand the concept of workload management.
CO-7 To understand the effectiveness of communication onboard and ashore.
CO-8 To be well versed in taking decisions.
CO-9 To be well versed in implementing the project plans.
CO-10 To understand the standard operating procedure for typical engine room and maintenance.

UNIT I INTRODUCTION 06
Introduction to Resources Management, Related Conventions(ISM Code), Quality, safety and environmental Management systems.

UNIT II RESOURCE MANAGEMENT 09

UNIT III PRIORITIZATION OF RESOURCES 06
Knowledge and ability to apply effective Resource Management. Allocation, assignment and prioritization of resources.
UNIT IV COMMUNICATION

Effective communication on board and ashore. Application to task, workload management and decision making. Decisions taken should reflect consideration of team experience.

UNIT V MAINTENANCE

Development and implementation of Project plans. Overview of standard operating procedures for typical Engine Room running and maintenance operations. Project planning and control with emphasis on Maintenance Management.

TOTAL 36 hours

TEXT BOOKS:
Course objective:
• Able to monitor compliance with legislative requirements.

Course outcome:
CO-1 To understand Knowledge of relevant International Maritime Law embodied in international agreements.
CO-3 To understand International Health Regulations.
CO-4 To understand the practical applications of medical guides
CO-5 To understand International Labor Organization
CO-6 To understand Regulations and responsibilities under International Instruments affecting the Safety of Ships.
CO-7 To understand Surveys and Audits, certification and their validity.
CO-8 To understand Certificates and documents required on board ships.
CO-9 To understand ISM Code and its requirements.
CO-10 To understand Safety Management System, Documentation and Certification.

UNIT I MARITIME LAW

UNIT II HEALTH REGULATIONS
International Health Regulations. Understand the practical applications of medical guides; understand process of Radio medical advice; demonstrate knowledge of actions to be taken in case of accidents or illnesses that are likely to occur on board ships. WHO’s International Health Regulations 2005(IHR). International Medical Guide for ships (IMGS). IMO’s Medical First-Aid
Guide. WHO’s guidelines for drinking water quality.

UNIT III REGULATIONS


UNIT IV SURVEYS CERTIFICATION

Surveys and Audits, certification and their validity. Classification Societies-Role of Classification Societies. International Association of Classification Societies. Certificates and other documents that are required to be on board ships by International Conventions, how they may be obtained, and period of their legal validity – 1.List of Certificates and documents as per SOLAS Annex I 2. Additional Certificates and documents required on board ships.

UNIT V MARITIME ADMINISTRATION


TOTAL 54 hours.

TEXT BOOKS:
DISCIPLINE
SPECIFIC
ELECTIVE
COURSES
Course objective:


Course outcome:

CO-1 To understand Measurement of resistance using battery, voltmeter and ammeter.
CO-2 To understand Measurement of voltage using voltmeter – description of voltmeter.
CO-3 To understand Measurement of current using ammeter – description of ammeter.
CO-4 To understand Measurement of power in a DC circuit.
CO-5 To understand Measurement of power in an AC circuit, and calculation of power factor.
CO-6 To understand parallel operation of DC Generators.
CO-7 To understand parallel operation of AC Generators.
CO-8 To understand Applications of HV equipment and advantages of HV.
CO-9 To understand Battery charging circuit.

LIST OF EXPERIMENTS TO BE CARRIED OUT

1. Measurement of resistance using battery, voltmeter and ammeter 08
2. Measurement of voltage using voltmeter – description of voltmeter 08
3. Measurement of current using ammeter – description of ammeter 08
4. Measurement of power in a DC circuit 08
5. Measurement of power in an AC circuit, and calculation of power factor 08
6. Study of parallel operation of DC Generators 04
7. Study of parallel operation of AC Generators 04
8. Applications of HV equipment and advantages of HV 04
9. Battery charging circuit. 02

TOTAL 54 hours

TEXT BOOKS:
In-house Laboratory Manual

REFERENCE BOOKS:
Course objective:

• Able to understand the basics of shipping, the mechanism of trade- exports from and imports into a country, cargoes moved from port to port.

• To understand the types of cargoes, the ships employed and in general the routes used for the ships.

Course outcome:

CO-1 To understand basics of international trade.

CO-2 To understand domestic & foreign trade.

CO-3 To understand major shipping routes.

CO-4 To understand major ports of the world.

CO-5 To understand types of ships.

CO-6 To understand types of ships & its uses.

CO-7 To understand role of world bodies such as IMF & world bank.

CO-8 To understand role of world bodies such as WTO & Un.

CO-9 To understand role of shipboard organization.

CO-10 To understand duties to be carried out onboard.

UNIT I  INTRODUCTION 04
Introduction – Shipping – Trade – Domestic and Foreign – Basics of International Trade

UNIT II  SHIPPING ROUTES 05
Major Shipping Routes – Ports – Types- Major Ports of the World

UNIT III  TYPES OF SHIPS 05
Types of Ships- Cargo Ships- Bulk Carriers- Tankers- Container Ships – Cruise Vessels

UNIT IV  WORLD BODIES 05
Role of World Bodies- IMF – World Bank – WTO- UN – Others

UNIT V  SHIPBOARD ORGANIZATION 05
Role of Shipboard Organization - Tasks associated in movement of ships from port to port and others- Nautical and Engine Departments- Duties to be carried out – Progression of career

TOTAL 24 hours

TEXT BOOKS:
Course objective:

• able to do Maintenance and repair of shipboard machinery and equipment Safety measures to be taken for repair and maintenance.

Course outcome:

CO-1 To understand General shipboard safety procedures.

CO-2 To understand Procedures for isolating, and safety checks prior to overhaul of
machineries.

LIST OF EXPERIMENTS
(ADVANCED MARINE WORKSHOP)

Safety measures to be taken for repair and maintenance of the following marine machinery:

1. General shipboard safety procedures - Working aloft, working in restricted areas, enclosed spaces, hazardous spaces, handling heavy equipment, use of safety harness, tool-kit belts, communications (10)

2. Procedures for isolating, and safety checks prior to overhaul of: (i) an Air Compressor (ii) an Air-Conditioning Compressor (iii) a Fridge Compressor (iv) a Centrifugal Pump (v) A Reciprocating pump (vi) a Screw displacement pump (vii) a Gear Pump (viii) a Vane type pump (ix) an air cooler (x) Main Engine Scavenge spaces inspection (xi) Main Engine Crankcase inspection (xii) Dismantling any Main Engine Part (xiii) Aux Engine Crankcase inspection (xiv) Dismantling any Aux Engine part (xv) Inspection of Boiler furnace (xvi) Inspection of a Fuel Oil tank (xvii) Overhaul of hydraulic equipment (xviii) Inspection of Main Air Receiver (xix) Overhaul of FO Separator (xx) Main Switch Board (20 items@4h each = 80h).

TOTAL 90 Hours

TEXT BOOKS:

In-house developed Work Manual

REFERENCE BOOKS:

Course objective:

- Able to operate main and auxiliary machinery, associated control systems and Deck machinery.

Course outcome:

CO-1 To understand Windlass and Mooring Winches.
CO-2 To understand Circuit diagrams of hydraulic systems.
CO-3 To understand Cranes – Electro-hydraulic and totally hydraulic systems.
CO-4 To understand the safety features installed on Cranes.
CO-5 To understand Hydraulic and Mechanical hatch-cover operation.
CO-6 To understand Operation of hydraulic ramps, bow-doors on ferries.
CO-7 To understand Constructional features, operation and maintenance required for Life Boat Winch.
CO-8 To understand Constructional features, operation and maintenance required for accommodation Ladder Winch.
CO-9 To understand Steering Gear - 4 ram and 2 ram type.
CO-10 To understand Testing of steering departure and arrival port.

OPERATE/OVERHAUL THE FOLLOWING DECK M/C:

UNIT I WINDLASS AND MOORING WINCHES 12
Windlass and Mooring Winches – construction, operation and precautions while operating. Routine maintenance of these machines. Circuit diagrams of hydraulic systems.

UNIT II CARGO CRANES 12
Cargo Cranes – Electro-hydraulic and totally hydraulic systems. Various movements of the cranes and the safety features installed on such Cranes.

UNIT III HYDRAULIC AND MECHANICAL HATCH-COVER 12
UNIT IV LIFE BOAT
Life Boat Winch and accommodation Ladder Winch. Constructional features, operation and maintenance required.

UNIT V STEERING GEAR

UNIT VI BOW-THRUSHER
Bow-Thruster Systems and their Remote Control.

TOTAL 72 hours

TEXT BOOKS:
In-house developed Lab Manual
15EMR105  ADVANCED MARINE WORKSHOP (MAM I)  0 0 2 2

Course objective:
• able to operate main and auxiliary machinery and associated control systems Shafting installations, including propeller and other auxiliaries.

Course outcome:

CO-1 To understand Inspection of propulsion transmission systems.
CO-2 To understand Types of propellers and features.
CO-3 To understand Heat Exchangers.
CO-4 To understand filters.
CO-5 To understand Steering Gear, Stabilizers & Bow Thrusters.
CO-6 To understand overhaul of air compressors.
CO-7 To understand safe starting & operation of air compressors.
CO-8 To understand inspection of air bottles.
CO-9 To understand Construction, characteristics and operation of Fresh Water Generators.

LIST OF EXPERIMENTS

1. Inspection of propulsion transmission systems including thrust and shaft bearings and stern-tubes.(Oil-filled and water-lubricated lignum-vitae, and Thordon types).
5. Steering Gear, Stabilizers, Bow Thrusters – principles, operation, types, materials of construction, hydraulic power pumps and control systems for above.
6. Air Compressors – Opening up and overhaul of cylinder heads, valves, inter and after coolers.
7. Air Compressors – Safe start-up, operation, shut-down, and charging of Air Bottles
8. Air Bottles – inspection and overhaul of mountings and inspection Air of Bottles.
9. Construction, characteristics and operation of Fresh Water Generators(Vacuum distillation).

TOTAL 54 hours

TEXT BOOKS:
In-house developed Workshop Manual
15EMR106 MARINE ENVIRONMENTAL POLLUTION CONTROL  3 0 0 2

Course objective:
• Able to ensure compliance with pollution prevention requirements.

Course outcome:

CO-1 To understand marine environmental pollution & its impact.
CO-2 To understand precaution for oil transfer.
CO-3 To understand operation of pollution prevention equipments.
CO-4 To understand MARPOL requirements & documentation.
CO-5 To understand various convention (ballast water management).
CO-6 To understand various annexes in MARPOL.
CO-7 To understand OPA 90 & antifouling convention.
CO-8 To understand environmental impact of accidental & operational discharges.
CO-9 To understand emergency actions to protect & safeguard the environment.

UNIT I 09
Marine environment – Marine environmental awareness. Marine ecology, seas and coastal areas. Ship’s discharges to the sea and their environmental impact.

UNIT II 12
Precautions during bunkering, loading discharging oil cargo, tank cleaning, pumping out bilges, and knowledge of construction and operation of oil pollution prevention equipment in Engine room, and on various types of ships.

UNIT III 12

UNIT IV 12

**UNIT V**

Environmental impact of accidental and operational discharges. Emissions to air from ships. Other pollutants. Proactive measures to control pollution and maintain the environment. Emergency situations-action to be taken to protect and safeguard the environment.

**TOTAL: 54 hours.**

**TEXT BOOKS:**

**REFERENCE BOOKS:**
Course objective:

- Able to understand semen duties, ship departments, signals, lights etc.

Course outcome:

**CO-1** To understand seamen & their duties.

**CO-2** To understand general ship knowledge.

**CO-3** To understand nautical terms.

**CO-4** To understand navigational lights.

**CO-5** To understand signals.

**CO-6** To understand mooring.

**CO-7** To understand types of knots.

**CO-8** To understand cable stopper.

**CO-9** To understand general knowledge of principles of navigation.

**CO-10** To understand about echosounder.

LAB EXPERIMENTS

- Seamen & their duties
- Ship’s departments
- General ship knowledge
- Nautical terms like poop-deck, Forecastle, bridge etc.
- Navigational lights
- Signals
- Port & starboard, forward and aft mast lights, Colors and location
- Ropes and wires
- Mooring
- Types of knots.
- Anchors, their use, dropping and weighing anchor
- Cable stopper
• General knowledge of principles of navigation
• Compasses
• Echo sounder.
15EMR108 ADVANCED MARINE WORKSHOP (MEP I) 0 0 5 4

Course objective:
• Able to use hand tools, machine tools and measuring instruments for fabrication and repair on board.

Course outcome:

CO-1 To understand about dismantling of main engine cylinder liner.
CO-2 To understand about material for boilers.
CO-3 To understand about material for gas turbines.
CO-4 To understand safety measures taken while using power tools & machine tools.
CO-5 To understand the process of welded repair and construction.
CO-6 To understand Destructive and Non-destructive testing of welds.
CO-7 To understand Use of various types of sealants and packings.
CO-8 To understand about precision measuring instruments.

JOB I

Dismantle Main engine cylinder liners, pistons, crankshafts, bearings.

JOB 2

Material for boilers, super-heaters, steam turbines casing, blades, rotor etc. Gas turbine casings, rotors, blades, combustion chambers etc.

JOB 3

Safety measures to be taken to ensure a safe working environment, and for use of hand tools, powered hand tools, machine tools (Centre Lathe, Soldering, Thermal cutting,

JOB 4

The process of welded repair and construction. Advantages and disadvantages. Types of welds. Defects in welds. Destructive and Non-destructive testing of welds. (Tests carried out on a sample of a typical welded seam of a water tube boiler drum.)
JOB 5

Use of various types of sealants and packings for various applications on board- Superheated Steam, Sea water, Fresh water, Lub oil, Refrigerant lines, chemicals.

Job 6

Inspection, safety and health when carrying out above operations – using appropriate specialized tools(for overhaul of particular machinery items) and precision measuring instruments (micrometers, liner gauges, tachometers, feeler gauges, UTG).

TOTAL 144 hours.
Course objective:

- Able to understand the importance of various aspects of Marine Hydraulic Systems prevalent on board ships, with specific reference to main, auxiliary hydraulic systems, rotary and liners drives, control, operational, safety and emergency operation of all hydraulic systems.

Course outcome:

CO-1 To understand Introduction to Marine Hydraulic systems.
CO-2 To understand the usage of marine hydraulic systems.
CO-3 To understand Marine hydraulics for application of rotary and linear motion drives on winches.
CO-4 To understand Marine hydraulics for application of rotary and linear motion drives on windlass.
CO-5 To understand Marine hydraulics for application for deck cranes & hatch covers of cargo ships.
CO-6 To understand Marine hydraulics for application grabs for cargo ships.
CO-7 To understand hydraulic system of steering gear.
CO-8 To understand safety feature of steering system.
CO-9 To understand Operational, safety and emergency operation of all hydraulic systems.

UNIT I INTRODUCTION TO MARINE HYDRAULIC SYSTEMS 04
Introduction to Marine Hydraulic systems- and their usage for steering gear, deck machinery etc

UNIT II MAIN HYDRAULICS SYSTEMS 05
Marine hydraulics for application of rotary and linear motion drives on winches and windlass.

UNIT III DECK MACHINERIES 05
Marine hydraulics for application for deck cranes, hatch covers and grabs for cargo ships

UNIT IV STEERING GEARS 05
Marine hydraulics for application for use on ship’s steering gears with all safety features.

UNIT V SAFETY AND EMERGENCY OPERATION 05
Operational, safety and emergency operation of all hydraulic systems.

TOTAL 24 hours
15EMR110 ADVANCED MARINE WORKSHOP – REFRIGERATION AND AIRCONDITIONING TRAINER

Course objective:
• Able to operate main and auxiliary machinery and associated control systems.

Course outcome:

CO-1 To understand the circuit of refrigeration system.

CO-2 To understand the circuit of air conditioning system.

LIST OF EXPERIMENTS

1. Familiarization of the circuit and components of a Refrigeration system, including its automatic temperature control

2. Familiarization of the circuit and components of an Air Conditioning System, including its automatic temperature control

TOTAL 18 hours

TEXT BOOKS:

In-house developed Lab Manual
Course objective:
• able to Maintenance and repair of electrical and electronic equipment.

Course outcome:
CO-1 To understand the alarm system onboard.
CO-2 To understand the fault & repair on generators & motors.
CO-3 To understand about distribution systems.
CO-4 To understand about testing equipments.
CO-5 To understand about electrical protective devices.
CO-6 To understand the electrical systems for operation in flammable region.
CO-7 To understand the maintenance of Ex-protected apparatus.
CO-8 To understand about safe electrical practice.
CO-9 To understand about electric fire fighting.
CO-10 To understand about electric shock & electric hazards.

LIST OF EXPERIMENTS
Alarm system (types, supply) on board for-
1. Watertight doors,
2. Bow-doors,
3. Oxygen analyzer,
4. High & low level alarms,
5. Navigational lights,
6. Main engine telegraph
7. Steering gears
8. Electrical Deck Cranes.

FAULT FINDING & REPAIR:
Type of faults & indications on:
9. Generator
10. Motor
11. Distribution systems, different testing equipments & meters (multimeter / megger, clamp meter, etc)
12. Detection of faults on electrical circuits – Indications & corrective arrangements, necessary precautions & care while fault finding and repair, preventive maintenance, periodic surveys, spares requirement.
13. Salvaging a motor.

**ELECTRICAL SYSTEMS FOR OPERATION IN FLAMMABLE AREAS.**

15. Special electrical practice for oil, gas and chemical tankers (Tanker classification, Dangerous spaces, Hazardous zones, Temperature class), flame proof Ex ‘d’ and intrinsic safety Ex ‘i’ Ex ‘e’, and Ex ‘n’ equipments

16. Their applications in zones; maintenance of Ex-protected apparatus.

**SAFE ELECTRICAL PRACTICE:**

Safe watch – keeping, points to check on:

17. Electrical machinery – Switch gears & equipment

18. Electrical fire fighting, precautions against electric shock and related hazards.

**TOTAL 108hours**

**TEXT BOOKS:**

15EMR112  MARINE REFRIGERATION  2001

Course objective:

• Able to understand the importance of various aspects of Marine Refrigeration Systems prevalent on board ships, with specific reference to main, auxiliary Refrigeration systems, cargo and other reefer systems.

• To understand Control, operational, safety and emergency operation of all Marine Refrigeration systems.

Course outcome:

CO-1 To understand Marine Refrigeration systems used for Reefer cargoes carried on ships.

CO-2 To understand Reefer ship’s systems used for cargoes and gas carriage on gas carriers and others.

CO-3 To understand about Reefer containers.

CO-4 To understand Assessment of heat leakage and insulation of reefer plant.

CO-5 To understand procedures for Reefer cargo survey.

CO-6 To understand Reefer cargo mock tests.

CO-7 To understand Surveys and inspections of reefer plant.

CO-8 To understand about adequacy of cooling in reefer plant.

UNIT I INTRODUCTION TO MARINE REFRIGERATION  04
Introduction to Marine Refrigeration systems used for Reefer cargoes carried on ships.

UNIT II REEFER SHIP’S SYSTEMS  05
Reefer ship’s systems used for cargoes and gas carriage on gas carriers and others.

UNIT III REEFER CONTAINERS  05
Reefer containers - 20 and 40 TEUs self contained reefer systems for different types of cargoes

UNIT IV REEFER PLANT  05
Assessment of heat leakage and insulation of reefer plant and procedures for Reefer cargo survey

UNIT V REEFER PLANT  05
Reefer cargo mock tests. Surveys and inspections and Adequacy of cooling

TOTAL 24 hours
Course objective:
• Able to Maintenance and repair of electrical and electronic equipment.

Course outcome:
CO-1 To understand about insulation tester.
CO-2 To understand about continuity tester.
CO-3 To understand use of multi tester.
CO-4 To understand use of clamp meter.
CO-5 To understand about analog & digital voltmeters.
CO-6 To understand about analog & digital ammeters.
CO-7 To understand about analog & digital tachometers.
CO-8 To understand about analog & digital frequency meters.
CO-9 To understand about analog & digital factor meters.

LIST OF JOBS/EXPERIMENTS
1. Opening up, study and use of: Insulation tester. Safety precautions to be observed.
2. Opening up, study and use of: Continuity tester. Safety precautions to be observed.
3. Opening up, study and use of: Multi-tester. Safety precautions to be observed.
4. Opening up, study and use of: Clamp meter. Safety precautions to be observed.
5. Opening up, study and use of: Analog and digital voltmeters. Safety precautions to be observed.
6. Opening up, study and use of: Analog and digital ammeters. Safety precautions to be observed.
7. Opening up, study and use of: Analog and digital tachometers. Safety precautions to be observed.
8. Opening up, study and use of: Analog and digital frequency meters. Safety precautions to be observed.
9. Opening up, study and use of: Analog and digital Power factor meters. Safety precautions to be observed.
TOTAL 54 hours

TEXT BOOKS:

In-house developed Lab Manual
Course objective:

- Able to understand the importance of Energy Efficiency and ships and Ship Energy Efficiency Management plan aspects of Ships.
- To know about EPT, EEDI and IHSF Statistics code system for coding of cargo vessel etc.

Course outcome:

CO-1 To understand Energy Efficiency on Ships.
CO-2 To understand Ship Energy Efficiency Management Plan.
CO-3 To understand Energy Efficiency Design Index.
CO-4 To understand Energy Efficiency Operational Index.
CO-5 To understand Assessment of IHSF Statistics code system for coding of cargo vessel.
CO-6 To understand Validation of EPT.
CO-7 To understand Electric Power Table in relevance to EEDI.
CO-8 To understand Energy Efficiency Design Index on tankers and other vessels.

UNIT I INTRODUCTION TO ENERGY EFFICIENCY ON SHIPS
Introduction to Energy Efficiency on Ships and its development and overview

UNIT II CONCEPTS – EEDI AND SEEMP

UNIT III CONCEPTS – EEOI - - ENERGY EFFICIENCY OPERATIONAL INDEX
Concepts - EEOI- Energy Efficiency Operational Index for both new and old cargo ships.

UNIT IV IHSF STATISTICS CODE SYSTEM
Assessment of IHSF Statistics code system for coding of cargo vessel and other types of vessels.

UNIT V EPT- ELECTRIC POWER TABLE
Validation of EPT- Electric Power Table in relevance to EEDI- Energy Efficiency Design Index on tankers and other vessels.

TOTAL 24 hours
Course objective:

- Able to understand the importance of Ship Repair and Surveys Practices and Management plan aspects of Ships and others. The costs and expenses of routine repairs and breakdown expenses and consequences etc.

Course outcome:

CO-1 To understand ship surveys.
CO-2 To understand checklists & documentation for the survey.
CO-3 To understand types of ship survey.
CO-4 To understand annual surveys.
CO-5 To understand about hull, load line surveys.
CO-6 To understand the classification of surveys.
CO-7 To understand compliance of surveys.
CO-8 To understand the recommendation & conditions of class.
CO-9 To understand Concepts on Classification of Surveys.
CO-10 To understand Conditions of class and Inspections on Repairs.

UNIT I INTRODUCTION TO SHIP SURVEYS, INSPECTIONS
Introduction to Ship Surveys, Inspections, Survey procedures and Certifications and Compliance. Keeping in readiness the items for Surveys, check lists used and other needed documentation.

UNIT II TYPES OF SHIP SURVEYS
Concepts on types of Ship Surveys carried out in the course of ship surveys – Periodical Ship Surveys commencing from 1st Special and others to follow done every 4 yearly

UNIT III TYPES OF ANNUAL SURVEYS
Concepts on Annual Surveys - Hull, Load Line, SEQ-Safety Equipment, Life Saving Appliance Items, Radio, Dry Dock, Cargo-Gear, Machineries,

UNIT IV CLASSIFICATION OF SURVEYS
Concepts on International Conventions, Classification of Surveys, Compliance of Surveys, Recommendation and Conditions of Class,

UNIT V CONDITIONS OF CLASS AND SURVEYS
Concepts on Classification of Surveys, Conditions of class and Inspections on Repairs and measurements of data records, check lists of surveys etc..

TOTAL 24 hours
Course objective:
• Able to manage safe and effective maintenance and repair procedures, Detect and identify the cause of machinery malfunctions and correct faults, Ensure safe working practices.

Course outcome:

CO-1 To understand Plant arrangements on Simulator Panels.
CO-2 To understand Instrumentation and Control System for Main and Auxiliary Machineries.
CO-3 To understand Procedures for Pumps and Pumping Systems.
CO-4 To understand Procedures for Air Compressors, Purifiers, Hydrophore System.
CO-5 To understand Procedures for Diesel operated aux. engines.
CO-6 To understand Procedures for Steam driven Turbine Generator.
CO-7 To understand Procedures for Aux. Boiler& Exhaust Boiler.
CO-8 To understand Procedures for Main Propulsion Diesel Engine.
CO-9 To understand Procedures for Inert Gas and COPT system.
CO-10 To understand Procedures for Incinerator plant OWS.

ENGINE SIMULATOR LAB EXPERIMENTS
1. Familiarization with Plant arrangements on Simulator Panels.
2. Familiarization with Instrumentation and Control System for Main and Auxiliary Machineries.
4. Familiarization with Operational Procedures for Air Compressors, Purifiers, Hydrophore System.
5. Familiarization with Operational Procedures for Diesel operated aux. engines.
6. Familiarization with Operational Procedures for Steam driven Turbine Generator.
8. Familiarization with Operational Procedures for Main Propulsion Diesel Engine.
9. Familiarization with Operational Procedures for Inert Gas and COPT system.
10. Familiarization with Operational Procedures for Incinerator plant OWS.

TOTAL 54 hours

TEXT BOOKS:
In-house developed Lab Manual.
Course objective:
- able to manage the operation of propulsion plant machinery Plan and schedule operations
  Operation, surveillance, performance assessment and maintaining safety of propulsion
  plant and auxiliary machinery.

Course outcome:

CO-1 To understand bilge pumping system.
CO-2 To understand ballast pumping system.
CO-3 To understand steam and condensate line.
CO-4 To understand Feed water line.
CO-5 To understand cooling water line.
CO-6 To understand cargo oil pumping system in oil tankers.
CO-7 To understand fuel oil line.

LIST OF JOBS/EXPERIMENTS

1. Sketch the layout of bilge pumping system
2. Sketch the layout of ballast pumping system
3. Sketch the layout of steam and condensate line
4. Sketch the layout of Feed water line
5. Sketch the layout of cooling water line
6. Sketch the layout of cargo oil pumping system in oil tankers
7. Sketch the layout of fuel oil line.

TOTAL 36 hours.

TEXT BOOKS:
1. In-house developed Lab Manual.
GENERIC ELECTIVE COURSES
Course objective:

- Able to understand the different types of ships, with clear distinction on cargoes as states of matter—solids, liquids, and gases as found in raw, semi-processed and processed form in the categories of cargoes and passenger carriage on ships.

Course outcome:

CO-1 To understand about shipping trade.
CO-2 To understand basics of international trade.
CO-3 To understand different types of ships.
CO-4 To understand different type of cargo ships.
CO-5 To understand different type of tanker ships.
CO-6 To understand liquid cargo ships.
CO-7 To understand off shore vessels.
CO-8 To understand gas vessels.
CO-9 To understand survey vessels.

UNIT I  INTRODUCTION
Introduction – Shipping – Trade – Domestic and Foreign – Basics of International Trade

UNIT II  CARGO AND PASSENGER SHIPS
Different types of Ships – Cargo Ships - Bulk Carriers- Tankers- Container Ships – Cruise Vessels

UNIT III  CARGO SHIPS
Cargo Ships – RO-RO Ships, Car Carriers - different types of tankers,

UNIT IV  LIQUID CARGO SHIPS
Tankers- Petroleum- Crude, Product, Chemical, Other liquids- vegetable oils, acids, alkakis,

UNIT V  OFFSHORE OIL AND GAS VESSELS
Different types of Oil and Gas Field - Off Shore Vessels, Survey Vessels.

TOTAL 24 hours

TEXT BOOKS:

15EMR152  SAFE WORKING PRACTICES ON BOARD  2 0 0 1

Course objective:

• Able to understand the importance of safe work practices on board ships. Also the safety measures taken prior, during and after the repair and other works are carried out.

Course outcome:

CO-1 To understand Safe Working Practices on Board.
CO-2 To understand working in restricted areas & enclosed spaces.
CO-3 To understand Safety principles and practices.
CO-4 To understand Working in aloft areas, hazardous spaces and confined areas.
CO-5 To understand Safety procedures for isolation.
CO-6 To understand carrying out safety checks for maintenance work in Engine Room.
CO-7 To understand Documentation of work permits.
CO-8 To understand check lists for various works on machinery maintenance.
CO-9 To understand Procedures of taking work data and permits for undertaking work.
CO-10 To understand check lists for carrying out various works for carrying out machinery maintenance.

UNIT I  INTRODUCTION  04
Introduction – Safe Working Practices on Board- working in restricted areas, enclosed spaces,

UNIT II  SAFE WORK PRACTICES  05
Safety principles and practices- Working in aloft areas, hazardous spaces and confined areas

UNIT III  ISOLATION OF MACHINES  05
Safety procedures for isolation, carrying out safety checks for maintenance work in Engine Room

UNIT IV  DOCUMENTATION PROCEDURES  05
Documentation of work permits, check lists for various works on machinery maintenance, others
UNIT V REPORTING PROCEDURES

Procedures of taking work data and permits for undertaking work, check lists for carrying out various works for carrying out machinery maintenance, dimensions and drawings and others

TOTAL 24 hours
Course objective:

- Able to understand the importance of welding practices on board ships. Also the safety measures taken prior, during and after the repair and welding and other works are carried out.

Course outcome:

CO-1 To understand Safe Welding on Board.
CO-2 To understand welding principles and practices.
CO-3 To understand Different types of welding.
CO-4 To understand about forge welding.
CO-5 To understand about electric welding.
CO-6 To understand Common defects in Welding practices.
CO-7 To understand brazing and soldering practices.
CO-8 To understand Gas welding practices on cutting.

UNIT I INTRODUCTION 04
Introduction – Safe Welding on Board- Electric Arc and Gas welding principles and practices

UNIT II DIFFERENT TYPES OF WELDING 05
Different types of welding- Pressure welding and non-pressure welding practices, forge welding

UNIT III WELDING- WORK PROCEDURES 05
Electric Welding- Work procedures- Common defects in Welding practices – on surface, internal

UNIT IV GAS WELDING PRACTICES 05
Differentiation of welding, brazing and soldering practices, Gas welding practices on cutting, Etc.

UNIT V TESTING PROCEDURES ON WORK COMPLETION 05
Differentiation of welding, brazing and soldering practices, Gas welding practices on cutting, Etc.

TOTAL 24 hours

TEXT BOOKS:

Course objective:

• Able to understand the importance of marine machine design and drawing practices on board ships. Also the techniques of interpretation of machinery drawings and their importance for the upkeep of machinery etc.

Course outcome:

CO-1 To understand Basics of Marine Machine Design and Drawing.
CO-2 To understand Function purpose of machine & parts.
CO-3 To understand Procedure in Machine Design.
CO-4 To understand Elements of design, procedure and processes.
CO-5 To understand elements of design synthesis.
CO-6 To understand practices with safety factors.
CO-7 To understand Practices on forming preliminary & final plans.
CO-8 To understand safety consideration and material specification.
CO-9 To understand Practices on Machine design.
CO-10 To understand theory principles with calculations on machine design.

UNIT I INTRODUCTION TO MARINE DRAWING ASPECTS. 04
Introduction – Basics of Marine Machine Design and Drawing, and Function purpose of machine, parts

UNIT II MACHINE DESIGN CONCEPTS 05
Procedure in Machine Design – Elements of design, procedure and processes, devices in a system

UNIT III ELEMENTS OF DESIGN SYNTHESIS 05
Design synthesis, applying preliminary design principles, and practices with safety factors Preliminary & final plans & drawings.

UNIT IV MATERIAL SPECIFICATION 05
Practices on forming preliminary & final plans, drawings made with machine, strength, safety consideration and material specification etc.

UNIT V FORMULATION OF FINAL PLANS 05
Practices on Machine design, theory principles with calculations of working stres / strain and the strength of the members etc. forming preliminary & final plans,

TOTAL 24 hours

TEXT BOOKS:
Course objective:

- Able to understand the importance of Machine Shop Practices with all types of practices on board ships. Also the techniques of polishing and finishing job to specific standards.

Course outcome:

CO-1 To understand Basics of Machine Shop Practices.

CO-2 To understand Procedure in other machining practices.

CO-3 To understand Special machines applied for on board work.

CO-4 To understand Advanced Machining practices applied for hull, and docking surveys.

CO-5 To understand Procedure in machining practices for on board repairs of components.

CO-6 To understand Class Standards and specification.

UNIT I INTRODUCTION TO MACHINE SHOP PRACTICES 04
Basics of Machine Shop Practices- Turning, Shaping, cutting, slotting and planning machines,

UNIT II MACHINING PRACTICES 05
Procedure in other machining practices - Milling, broaching, taper turning done on machines

UNIT III MACHINING PRACTICES- ENGINE ASSEMBLIES 05
Procedure in machining practices for on board repairs of components- large component- Exh. V/v.

UNIT IV SPECIAL MACHINING PRACTICES 05
Special machines applied for on board work using principles of jigs and fixtures, honing, lapping

UNIT V ADVANCED MACHINING PRACTICES 05
Advanced Machining practices applied for hull, and docking surveys and conforming to Class Standards and specification.

TOTAL 24 hours
15EMR156 AUTOCAD PRINCIPLES AND PRACTICES 2001

Course objective:

- Able to understand the importance of AutoCAD principles and practices as used primarily for designing, adapting designs, and with drawing skills.

Course outcome:

CO-1 To understand Introduction to AutoCAD.

CO-2 To understand Introduction to AutoCAD interface.

CO-3 To understand the basics of drawing commands.

CO-4 To understand erase command & mirror command.

CO-5 To understand the various commands of autocad.

CO-6 To understand Offset commands, Extent command, Array Command etc.

CO-7 To understand about command orders.

CO-8 To understand assessments of drawing.

CO-9 To understand recapitulation.

UNIT I INTRODUCTION TO AUTOCAD 04
Introduction to AutoCAD, AutoCAD interface, Draw Commands, Line Commands, Polygon Commands, Rectangle Commands

UNIT II DRAWING COMMANDS 05
Circle commands, Ellipse Commands, Toolbar Modifications, Erase Command, Copy Command, Mirror Command

UNIT III VARIED COMMANDS 05
Offset commands, Extent command, Array Command, Scale command, Move Command

UNIT IV COMMAND ORDERS 05
Rotate command, Trim command, Chamfer command, Fillet command, Coordinate Entry, Osnap, QNew, Open, Save, Exit commands, Layers, Dimensioning, and Zoom.

UNIT V ASSESSMENT AND RECAPITULATION 05
Command orders, assessments of drawing and adaptable designing as per changes effected.

TOTAL 24 hours
Course objective:

- Able to understand the importance of various Marine functions available on board ships, with specific reference to operational, safety and emergency requirements.

Course outcome:

CO-1 To understand Sea water cooling & bilge system.
CO-2 To understand ballast, fuel process & steam system.
CO-3 To understand Details of service systems
CO-4 To understand Sea water cooling/ low-temperature water pumps and pipelines.
CO-5 To understand ballast & bilge pumping system.
CO-6 To understand fuel oil bunkering system.
CO-7 To understand fuel oil service system.
CO-8 To understand simulation of various marine functions.
CO-9 To understand contingency & emergency situations onboard.

UNIT I INTRODUCTION TO MARINE FUNCTIONS 04
Different types of service systems – Sea water cooling, bilge, ballast, fuel process, steam, others

UNIT II SEAWATER COOLING SYSTEMS 05
Details of service systems - Sea water cooling/ low-temperature water pumps and pipelines.

UNIT III BILGE, BALLAST SYSTEMS 05
Details of service systems - Ballast water, bilge pumps, pumping systems and pipelines.

UNIT IV FUEL OIL SYSTEMS 05
Details of service systems - Fuel oil- bunkering, clean-up process, for use systems and pipelines.

UNIT V MARINE FUNCTIONS CONCEPTS 05
Consolidation and simulation of various marine functions for on board application, with contingency and emergency situations.

TOTAL 24 hours
SEAMANSHIP AND COMMERCIAL GEOGRAPHY  2 0 0 1

Course objective:
• Able to understand semen duties, mooring practice, anchors etc.

Course outcome:

CO-1 To understand about the duties of seaman.
CO-2 To understand about nautical terms.
CO-3 To understand about ropes & knots.
CO-4 To understand about mooring.
CO-5 To understand about anchors.
CO-6 To understand General knowledge of principles of navigation compasses & echo sounder.
CO-7 To understand major ports in the world.
CO-8 To understand economics of sea transport.
CO-9 To understand the major shipping routes.
CO-10 To understand the fishing zones.

UNIT I 06
Seamen & their duties: Ship’s department, general ship knowledge and nautical terms like poop-deck, forecastle, bridge etc. navigational lights and signals: Port & starboard, forward and aft mast lights, colors and location.

UNIT II 09
Rope Knots and Mooring: Types of knots. Practice of knot formation.

UNIT III 06
Anchors: Their use, dropping and weighing anchor, cable stopper. Navigation: General knowledge of principles of navigation compasses, echo sounder.

UNIT IV 09

UNIT V 06

TOTAL 36 hours.
TEXT BOOKS:
Course objective:
- able to ensure compliance with pollution prevention requirements.

Course outcome:
CO-1 To understand about the operation carried during bunkering, loading & tank cleaning.
CO-2 To understand sopep equipments.
CO-3 To understand the environmental impact of accidental oil discharge.
CO-4 To understand preventive measure to avoid oil spills.

JOB 1
Precautions to be taken during bunkering, loading discharging oil cargo, tank cleaning, pumping out bilges, and knowledge of construction and operation of oil pollution prevention equipment in Engine room, and on various types of ships. Demonstrate use of Check Lists. Equipment to be made ready and proficiency in its use to be demonstrated.(200 ltr Drum, Sawdust, Scoop, Buckets, Mops, Wilden Pump with suction and discharge hoses. All Reports to be recorded.

JOB 2
Make a dummy assessment of the environmental impact of accidental oil discharges. Carry out mock drill on various actions to be taken in such an event, assuming the vessel is on the US Coast. Follow-up with preventive measures to avoid recurrence of the event. Show complete documentation of the drill.

TOTAL 24 hours.

REFERENCE BOOKS:
MARPOL with latest Amendments
15EMR160 E/R SIMULATOR PRACTICES 2001

Course objective:

- Able to understand the importance of various aspects of E/R Simulator System and other prevalent systems on board ships, with specific reference to main, auxiliary, cargo machinery safety and operation of all systems.

Course outcome:

CO-1 To understand Introduction to E/R simulator system.
CO-2 To understand operation control of main engine, aux. engine and others.
CO-3 To understand objectives of engine room.
CO-4 To understand manning procedures of engine room.
CO-5 To understand functions of monitoring panels.
CO-6 To understand about watch keeping.
CO-7 To understand the functions of troubleshooting.
CO-8 To understand about safe operation in engine room.
CO-9 To understand about the emergency operation.

UNIT I INTRODUCTION TO E/R SIMULATOR SYSTEM
Introduction to E/R simulator system, operation control of main engine, aux. engine and others.

UNIT II OBJECTIVES AND MANNING OF ENGINE ROOM
Objectives E/R simulator system- with modern engine plant fully automated on reduced manning

UNIT III MONITORING PANELS
E/R simulator system associated with demonstrations of functions on control, monitoring panels

UNIT IV E/R SIMULATOR SYSTEM
E/R simulator system training for operational, watch keeping and troubleshooting functions,

UNIT V STANDBY, SAFETY AND EMERGENCY OPERATION
Operational, conditions of standby systems, operation of all simulator systems.

UNIT V SAFETY AND EMERGENCY OPERATION
Operational, safety and emergency operation of all simulator systems.

TOTAL 24 hours.
Course objective:
• Able to Maintenance and repair of electrical and electronic equipment, Manage trouble- shooting, restoration of electrical and electronic control equipment to operating condition.

Course outcome:

CO-1 able to operate & explain the control process of the fluids viscosity.
CO-2 To Understand the configuration of various parameters to achieve required viscosity- air pressure, PI control, steam or electrical heater.
CO-3 To Learn the configuration required for measuring flow control of fluids – temperature, pressure, differential pressure.
CO-4 To operate oil mist detector understands the importance.
CO-5 Able to set the set point to reach the output using PID controller.
CO-6 Able to make motor winding using CNC machine.
CO-7 Have the knowledge of operating VMC machine & the types of cutter used with it.
CO-8 Able to control the dc motor speed using electronic server control system.
CO-9 Able to operate 3 phase induction motor on single phase supply using electronic microprocessor control method.
CO-10 Have the knowledge of software version of SCADA. Its configuration of operation using PLC & sensors.

CONTROL LAB EXPERIMENTS
1. Operation of an Automatic Viscosity Controller, and maintaining a specific viscosity of a given fuel.
2. Operation of an Automatic Flow Controller and measuring the flow in a given pipe.
3. Operation and utility of a 3-term (P + I + D) Controller.
4. To study the functioning of an Oil mist detector, and check the alarm when the pre-set value is exceeded.
5. Study the operation of a Fire Detection Unit(Ionization chamber type detector).
6. CNC and VMC Machines.
7. Microprocessor controlled DC machines.
8. Microprocessor controlled AC machines.
9. SCADA – Supervisory Control and Data Acquisition.

**TOTAL 54 hours**

**TEXT BOOKS:**

In-house developed Lab Manual.
Course objective:
- Able to operate main and auxiliary machinery and associated control systems.

Course outcome:
CO-1 To understand inspection of boiler mountings.
CO-2 To understand safety valve overhauling.
CO-3 To understand plate type gauge glass overhauling.
CO-4 To understand main steam stop valve overhauling.
CO-5 To understand the overhauling of soot blower.
CO-6 To understand the condition of furnace & checks to be carried on furnace.
CO-7 To understand the procedure of boiler blowing down.
CO-8 To understand boiler annual survey.

LIST OF JOBS/EXPERIMENTS.
1. External inspection and description of Boiler and all its mountings.
2. Safety valve to open up, overhaul and box up, relevant clearances being measured and recorded.
3. Plate type Gauge Glass to be opened up, overhauled, all valves and cocks overhauled and all parts fitted back with new joints and packing.
4. Main Steam stop valve to be opened up, all parts checked for soundness. Valve to be ground on its seat. All parts to be cleaned and reassembled with new joints and packing, and relevant clearances measured and recorded.
5. Soot Blower to be opened up, overhauled, working checked, and boxed up with new joints and packing.
6. Furnace to be opened up cleaned. Condition of burner, air-register to check and report on. Condition of refractory to be determined. A sample area of refractory to be repaired.
7. Blowing down the boiler, draining, opening the manhole doors - and cleaning of the boiler. Boxing up with new jointing.
8. Preparing to present the Boiler for Annual Survey.
9. After survey closing up the boiler, raising steam, floating and securing of the safety valves.
TOTAL 36 hours

TEXT BOOKS:
15EMR163 MANAGEMENT OF SHIPS 2001

Course objective:
• Able to understand the management policies onboard & about owners & managers.

Course outcome:

CO-1 To understand Concepts on Managing of ships.

CO-2 To understand about the sea passage routes.

CO-3 To understand Elements on Ship Management Principles and Practices.

CO-4 To understand principles on manning of ships.

CO-5 To understand Concepts on Ship Owners, Ship Manager, ships on time and voyage charter.

CO-6 To understand Time delays & Demurrage charges on Charter.

CO-7 To understand about marine safety risks.

CO-8 To understand life cycle cost.

CO-9 To understand practices on Operational and Management functions.

UNIT I INTRODUCTION TO MANAGEMENT OF SHIPS 04
Concepts on Managing of ships, daily, regular running expenses- DRE, Average Annual Cost AAC. Different types of ships- cargoes, sea- passage-routes, cost of bunkers, crewing costs, bunkers etc.

UNIT II SHIP MANAGEMENT PRINCIPLES 05
Elements on Ship Management Principles and Practices with concepts and principles on manning of ships, and engagement and discharge of ship’s crew, and safe manning certificate etc.

UNIT III OWNERS AND MANAGERS 05
Concepts on Ship Owners, Ship Manager and ships on time and voyage charter. On Hire and off Hire surveys. Notice of Readiness - NOR. Time delays, Demurrage charges on Charter, others.

UNIT IV RETURN OF INCOME, LIFE CYCLE COST 05
Concepts on elements - Return of income, Life Cycle cost, wastage of resources, increase pollution effects, risk to marine safety, periodical survey with up keep afforded for maintaining ship.

UNIT V OPERATIONAL AND MANAGEMENT FUNCTIONS 05
Concepts on principles and practices on Operational and Management functions.

TOTAL 24 hours

TEXT BOOKS:
SKILL ENHANCEMENT ELECTIVE COURSES
Course objective:
• Able to Use Computer Applications (PMS, E Learning, LAN network) etc, Internet and Shipboard Applications.

Course outcome:
CO-1 To understand the evolution of information processing.
CO-2 To understand about motherboard structure.
CO-3 To understand about machine language.
CO-4 To understand fourth generation languages.
CO-5 To understand concept & functions of operating system.
CO-6 To understand about DOS & its functions.
CO-7 To understand about internet topology.
CO-8 To understand about world wide web.
CO-9 To understand the application of computers onboard.
CO-10 To understand about artificial intelligence.

UNIT I INTRODUCTION

UNIT II PROGRAMMING LANGUAGES
Machine language – assembly languages, high level languages – fourth generation languages
UNIT III OPERATING SYSTEMS 04

Concept and functions of operating systems – batch processing – multi programming – real
time – time sharing distributed systems- familiarity with common operating systems.DOS:
Functions of DOS, structure booting – internal and external commands.

UNIT IV INTERNET 04

Internet topology – how internet works – email - www (World Wide Web) - web sites – LAN -
search engines.

UNIT V SHIPBOARD APPLICATIONS 04

Alarms – data storage – inventory control - use of spread sheets for voyage planning –
maintenance schedules – PMS - simulation – artificial Intelligence

TOTAL 18 hours

TEXT BOOKS:
1. Alexis Leon & Mathews Leon ,”Fundamentals of Information Technology “,Vijay Nicole
   Imprints Pvt. Ltd, second edition, 2014

REFERENCE BOOKS:
1. Principles Of Information systems by George Reyholds,2013
Course objective:
- Able to gain appropriate use of hand tools, machine tools and measuring instruments for fabrication and repair.
- To ensure a safe working environment and for using hand tools, machine tools and measuring instruments.

Course outcome:

CO-1 To make a hexagon block from a round bar by chipping and filing
CO-2 To make a Male-Female V- fitting.
CO-3 To make a T-Fitting.
CO-4 To make a dove tail fitting
CO-5 To make a Square fitting
CO-6 To make a H fitting.
CO-7 To make outside calipers of given dimensions.

LIST OF EXPERIMENTS

FITTING

1. To make a hexagon block from a round bar by chipping and filing  20
2. To make a Male-Female V- fitting.  20
3. To make a T-Fitting.  20
4. To make a dove tail fitting  20
5. To make a Square fitting  20
6. To make a H fitting.  20
7. To make outside calipers of given dimensions.  24

TOTAL 144 hours

TEXT BOOKS:

1. In house Manual as per TAR Book
Course Objective:

- The overall objective of the N.S.S. is "Service to the Community" offered while undergoing instruction in an Educational institution.
- It is sought to arouse the social conscience of students and provide them with the opportunity to work with people around the educational campus creatively and constructively and to put the Education they receive to concrete social use.
- Its motto is "NOT ME, BUT YOU"

Course Outcome:

CO – 1: To understand the History, Philosophy and Objectives of NSS
CO – 2: To understand the concept of regulation activities
CO – 3: To understand the Definition, profile of youth, categories of youth
CO – 4: To be well versed with Issues, challenges and opportunities for youth
CO – 5: To understand the Mapping of community stakeholders
CO – 6: To understand the Identifying methods of mobilization
CO – 7: To understand the Indian Tradition of volunteerism
CO – 8: To understand the Motivation and Constraints of volunteerism

UNIT – 01: INTRODUCTION AND BASIC CONCEPTS OF NSS 04
History, philosophy, aims & objectives of NSS 01
Emblem, flag, motto, song, badge etc. 01
Organizational structure, roles and responsibilities of various NSS functionaries 02

UNIT – 02: NSS PROGRAMMES AND ACTIVITIES 10
Concept of regular activities, special camping, Day camps 03
Basis of adoption of villages/slums, Methodology of conducting Survey 02
Financial pattern of the scheme 01
Other youth prog./schemes of GOI 02
Coordination with different agencies 02
Maintenance of the Diary 01

UNIT – 03: UNDERSTANDING YOUTH 05
Definition, profile of youth, categories of youth 02
Issues, challenges and opportunities for youth 02
Youth as an agent of social change 01

UNIT – 04: COMMUNITY MOBILISATION 09
Mapping of community stakeholders 03
Designing the message in the context of the problem and the culture of the community 01
Identifying methods of mobilisation 03
Youth-adult partnership 02

UNIT – 05: VOLUNTEERISM AND SHRAMDAN 07
Indian Tradition of volunteerism 01
Needs & importance of volunteerism 02
Motivation and Constraints of volunteerism 02
Shramdan as a part of volunteerism 02

TOTAL 35 hours
Course OBJECTIVE:
• Able to do Maintenance and repair of shipboard machinery and equipment Design characteristics.
• To know about the Selection of materials in construction of equipment.

Course outcome:
CO-1 To understand Rockwell hardness test.
CO-2 To understand Brinell hardness test.
CO-3 To understand Universal testing machine – stress – strain curve.
CO-4 To understand Torsion test on mild steel rod.
CO-5 To understand Impact test – Izod and Charpy test.
CO-6 To understand Compression test on a coil spring.

LIST OF EXPERIMENTS
1. Rockwell hard 06
2. Brinell hardness test 06
3. Universal testing machine – stress – strain curve 06
4. Torsion test on mild steel rod 06
5. Impact test – Izod and Charpy test 06
6. Compression test on a coil spring 06

TOTAL 36 hours

TEXT BOOKS:
In-house developed Lab Manual.
15EMR255 BASIC WORKSHOP II 0 0 6 3

Course objective:
• Able to appropriate use of hand tools, machine tools and measuring instruments for fabrication and repair on board.
• To know about the Safety measures to be taken to ensure a safe working environment and for using hand tools, machine tools measuring instruments.

Course outcome:

CO-1 To understand about grinding tools.

CO-2 To understand the procedure for Grinding of cutting tools & welded joints.

CO-3 To understand technique involved in lathe work.

CO-4 To understand about shaping.

CO-5 To understand about drilling.

CO-6 To understand about arc welding.

CO-7 To understand about various joints in arc welding.

CO-8 To understand about gas welding & gas cutting.

UNIT I GRINDING 24
Grinding tools familiarization - Checking of angles with tool angle gauge - Grinding of cutting tools - Grinding of welded joints

UNIT II LATHE WORK 32
Straight Turning - Step Turning - Taper Turning - Thread cutting on Lathe

UNIT III SHAPING AND DRILLING 32
Familiarization of shaping machine - Tools employed in shaping - Shaping a specimen - Machine Drilling - Hand Tapping of threads

UNIT IV WELDING (ARC WELDING) 32
Bead building - Closed Butt joint - Square Butt Joint - Single Vee Butt Joint - Single Bevel Butt Joint - T Joint - Lap Joint - Outside corner joint - Fillet joint (Flat) - Horizontal Butt Joint - Horizontal Filet joint - Vertical Butt Joint - Vertical Fillet joint

UNIT V WELDING 24
Gas Welding
Butt joint - Fillet joint - Vertical up Fillet
Gas Cutting
Round cutting
Beveling
TOTAL 144 hours

TEXT BOOKS:
   1. S.K Hajra Choudhry” Workshop Technology ”MPP, 14th edition, 2013
Course Objective:

- The overall objective of the N.S.S. is "Service to the Community" offered while undergoing instruction in an Educational institution.
- It is sought to arouse the social conscience of students and provide them with the opportunity to work with people around the educational campus creatively and constructively and to put the Education they receive to concrete social use.
- Its motto is "NOT ME, BUT YOU"

Course Outcome:

CO – 1: To understand the meaning and types of leadership
CO – 2: To understand the importance and role of youth leadership
CO – 3: To understand the definition and importance of life competencies
CO – 4: To be well versed with Problem-solving and decision-making
CO – 5: To understand the Indian history and culture
CO – 6: To understand the Role of youth in Nation building
CO – 7: To understand National Youth Policy
CO – 8: To be well versed with Indian history and culture

UNIT – 01: IMPORTANCE AND ROLE OF YOUTH LEADERSHIP

Meaning and types of leadership  02
Qualities of good leaders; traits of leadership  02
Importance and role of youth leadership  02

UNIT – 02: LIFE COMPETENCIES

Definition and importance of life competencies  02
Communication  03
Inter Personal  03
Problem-solving and decision-making  03

UNIT – 03: SOCIAL HARMONY AND NATIONAL INTEGRATION

Indian history and culture  02
Role of youth in peace-building and conflict resolution  05
Role of youth in Nation building  02
UNIT – 04: YOUTH DEVELOPMENT PROGRAMMES IN INDIA

National Youth Policy 03
Youth development programmes at the National Level, State Level and voluntary sector 04
Youth-focused and Youth-led organizations 02

PROJECT WORK/PRACTICAL:
Conducting surveys on special theme and preparing a report there of 40 Marks

TOTAL 35 hours
Course Objective:

- The overall objective of the N.S.S. is "Service to the Community" offered while undergoing instruction in an Educational institution.
- It is sought to arouse the social conscience of students and provide them with the opportunity to work with people around the educational campus creatively and constructively and to put the Education they receive to concrete social use.
- Its motto is "NOT ME, BUT YOU"

Course Outcome:

CO – 1: To understand the basic features of Constitution of India
CO – 2: To understand the fundamental rights and duties
CO – 3: To understand the Family and Society
CO – 4: To understand the Human Values
CO – 5: To be well versed with definition, needs and scope of health education
CO – 6: To understand the National Health Programme
CO – 7: To understand the Healthy Lifestyles
CO – 8: To understand the HIV AIDS, Drugs and Substance abuse
CO – 9: History, philosophy and concept of Yoga
CO – 10: Myths and misconceptions about yoga

UNIT – 01: CITIZENSHIP

Basic Features of Constitution of India
Fundamental Rights and Duties
Human Rights
Consumer awareness and legal rights of the consumer
RTI

UNIT – 02: FAMILY AND SOCIETY

Concept of family, community, (PRIs and other community-based organizations) and society
Growing up in the family – dynamics and impact
Human values
UNIT – 03: HEALTH, HYGIENE & SANITATION
- Definition, needs and scope of health education
- Food and Nutrition
- Safe drinking water, water borne diseases and sanitation (Swachh Bharat Abhiyan)
- National Health Programme
- Reproductive health

UNIT – 04: YOUTH HEALTH
- Healthy Lifestyles
- HIV AIDS, Drugs and Substance abuse
- Home Nursing
- First Aid

UNIT – 05: YOUTH AND YOGA
- History, philosophy and concept of Yoga
- Myths and misconceptions about yoga
- Different Yoga traditions and their impacts
- Yoga and Preventive, promotive, and curative method
- Yoga as a tool for healthy lifestyle

PROJECT WORK/PRACTICAL
- Preparation of research project report 40 Marks

TOTAL 35 hours
Course objective:
- Able to operate main and auxiliary machinery and associated control systems Fluid flow
- To know the characteristics of lubricating oil, fuel oil and cooling systems.

Course outcome:
CO-1 To understand about engine room layout.
CO-2 To understand about the layout of various type of ships.
CO-3 To understand the layout of lube oil pipeline system.
CO-4 To understand Main circulation system and Continuous by-pass purification system.
CO-5 To understand the layout of fuel oil pipeline system.
CO-6 To understand the components of fuel oil system.
CO-7 To understand the layout of fuel oil bunker & transfer system.
CO-8 To understand about bunker procedures & precautions.
CO-9 To understand the layout of main jacket cooling water system.
CO-10 To understand about the components in jacket cooling system.

UNIT I
Engine Room Layout: Lay-out of Main and Auxiliary machinery in engine rooms in different ships – bulk carriers, tankers, RO-RO, Passenger vessels.

UNIT II
Lay-out of piping arrangement for Main Lube Oil system. Main circulation system and Continuous by-pass purification system. Components of the system – Filters, Coolers

UNIT III
Lay-out of piping arrangement for Main Engine Fuel Oil system. Components of the system – Filters, heaters, flow meters, quick closing valves, drain and collection arrangements.

UNIT IV

UNIT V
Lay-out of piping arrangement for Main Jacket Cooling Water System. Components of the system – Filters, Coolers, Valves, Temperature Control valves, Thermostatic valves for temperature control.
TOTAL 54 hours

TEXT BOOKS:

REFERENCE BOOKS:
Course Objective:

- The overall objective of the N.S.S. is "Service to the Community" offered while undergoing instruction in an Educational institution.
- It is sought to arouse the social conscience of students and provide them with the opportunity to work with people around the educational campus creatively and constructively and to put the Education they receive to concrete social use.
- Its motto is "NOT ME, BUT YOU"

Course Outcome:

CO – 1: To be well versed with Environment conservation, enrichment and sustainability
CO – 2: To understand the Climate Change
CO – 3: To understand the Waste Management
CO – 4: To understand the Natural resource management
CO – 5: To understand the Introduction to Disaster Management, classification of disasters
CO – 6: To understand the Role of youth in Disaster Management
CO – 7: To understand the Project planning
CO – 8: To understand the Project Cycle Management

Unit – 01: Environment Issues

Environment conservation, enrichment and Sustainability 02
Climate change 02
Waste management 02
Natural resource management (Rain water harvesting, energy conservation, waste land development, soil conservations and afforestation 05

Unit – 02: Disaster Management

Introduction to Disaster Management, classification of disasters 04
Role of youth in Disaster Management 03
### Unit – 03: Project Cycle Management

- Project planning 02
- Project implementation 03
- Project monitoring 02
- Project evaluation: impact assessment 03

### Unit – 04: Documentation and Reporting

- Collection and analysis of data 03
- Preparation of documentation / reports 02
- Dissemination of documents / reports 02

### PROJECT WORK / PRACTICAL

Workshops/seminars on personality development and improvement of communication skills 40 Marks
Course objective:
• able to operate electrical, electronic and control systems, Manage operation of electrical and electronic control equipment, Operation, surveillance, performance assessment.
• To maintain safety of propulsion plant and auxiliary machinery.

Course outcome:
CO-1 Is able to operate & explain the control process of the fluids viscosity.
CO-2 Understand the configuration of various parameters to achieve required viscosity- air pressure, PI control, steam or electrical heater.
CO-3 Learns the configuration required for measuring flow control of fluids – temperature, pressure, differential pressure.
CO-4 In position to operate oil mist detector understands the importance.
CO-5 Able to set the set point to reach the output using PID controller.
CO-6 Able to make motor winding using CNC machine.
CO-7 Have the knowledge of operating VMC machine & the types of cutter used with it.
CO-8 Able to control the dc motor speed using electronic server control system.
CO-9 Able to operate 3 phase induction motor on single phase supply using electronic microprocessor control method.
CO-10 Have the knowledge of software version of SCADA. Its configuration of operation using PLC & sensors.

CONTROL ENGINEERING LAB EXPERIMENTS
1. Operation of automatic viscosity controller and maintaining a specific viscosity of a given fuel.
2. Operation of an automatic flow controller and measuring the flow from in a given pipe.
3. Operation and utility of a 3 term (P + I + D) Pneumatic controller.
4. To study the functioning of a mist detector and checking the alarm when the pre-set value is exceeded.
5. Study the operation of fire detection unit using ionization chamber type detector.
6. CNC & VMC machines, microprocessor controlled DC & AC machines, SCADA.
TOTAL 36 hours

TEXT BOOKS:

In-house developed Lab Manual.
Course Objective: At the end of the course, the cadet should be

- Able to understand the importance of various aspects of Marine Automation prevalent on board ships, with specific reference to main, auxiliary control, operational, safety and emergency operation.

Course outcome:

CO-1 To understand the marine automation applied for the machineries.
CO-2 To understand marine automation control & process system.
CO-3 To understand the parameters maintained in the automatic function.
CO-4 To know about unmanned machinery spaces.
CO-5 To understand the safety operation onboard.
CO-6 To understand the emergency operation onboard.

UNIT I INTRODUCTION TO MARINE AUTOMATION 04
Introduction to Marine Automation applied for main, auxiliary and other machinery systems

UNIT II MARINE AUTOMATION 05
Marine Automation – control and process systems- pneumatics, electronics, hydraulics,

UNIT III FUNCTIONAL PARAMETERS 05
Parameters maintained in automatic function - pressure, temperature, liquid levels, others

UNIT IV UMS- E-O CLASS OF VESSELS 05
Concepts on UMS- E-O Class of vessels, with bridge control and reduced manning on ships.

UNIT V SAFETY AND EMERGENCY OPERATION 05
Concepts on main, auxiliary control, operational, safety and emergency operation.

TOTAL 24 hours
Course Objective:

- The overall objective of the N.S.S. is "Service to the Community" offered while undergoing instruction in an Educational institution.
- It is sought to arouse the social conscience of students and provide them with the opportunity to work with people around the educational campus creatively and constructively and to put the Education they receive to concrete social use.
- Its motto is "NOT ME, BUT YOU"

Course Outcome:

CO – 1: To understand Vocational Skill Development
CO – 2: To understand the Qualities of good entrepreneur
CO – 3: To be well versed with Steps/ways in opening an enterprise
CO – 4: To understand the Sociological and Psychological Factors influencing Youth Crime
CO – 5: To understand the Peer Mentoring in preventing crimes
CO – 6: To understand the Awareness about Anti-Ragging
CO – 7: To understand the Cyber Crime and its Prevention
CO – 8: To understand Juvenile Justice

UNIT – 01: VOCATIONAL SKILL DEVELOPMENT

This unit will aim to enhance the employment potential of the NSS volunteers or, alternately, to help them to set up small business enterprises. For this purpose, a list of 12 to 15 vocational skills will be drawn up, based on the load conditions and opportunities. Each volunteer will have the option to select two skill-areas out of this list – one such skill in each semester. The education institution (or the university) will make arrangements for developing these skills in collaboration with established agencies that possess the necessary expertise in the relational vocational skills.

UNIT – 02: ENTREPRENEURSHIP DEVELOPMENT

Definition & Meaning
Qualities of good entrepreneur
Steps/ways in opening an enterprise 03
Role of financial and support service institutions 02

UNIT – 03: YOUTH AND CRIME 07
Sociological and Psychological Factors influencing Youth Crime 02
Peer Mentoring in preventing crimes 01
Awareness about Anti-Ragging 01
Cyber Crime and its Prevention 02
Juvenile Justice 01

PROJECT WORK/PRACTICAL 40 Marks

TOTAL 35 hours
Course objective:

- Able to operate main and auxiliary machinery and associated control systems.

Course outcome:

CO-1 To understand about repair & maintenance of main engine.

CO-2 To understand about repair & maintenance of auxiliary engine.

LIST OF EXPERIMENTS

REPAIR AND MAINTENANCE OF MAIN PROPULSION ENGINES

1. Procedure for dismantling and assembling of main engine unit, including all cylinder head mountings.
2. Inspect condition, wear, clearances etc. of Piston, Piston rings, Cylinder head, Cylinder liner, air starting valve, fuel injectors, relief valve, and exhaust valve. Prepare decarbonizing report.
3. Procedure for dismantling and assembling Main Engine bearing (a)Main bearings (b)Crosshead bearings (c)Bottom End bearings.
4. Inspect above bearings, check clearances, drops, and criteria for rejection of a white metalled bearing.
5. Crankshaft deflection, purpose, procedure tabulation and interpretation of results.

REPAIR AND MAINTENANCE OF AUXILIARY ENGINES.

1. Procedure for dismantling and assembling auxiliary engine for (a) complete over haul (b) top overhaul.
2. Inspect cylinder head, piston, piston rings liner bottom end bearings, fuel injector, inlet, exhaust valves, air starting valve distributor take clearances, measure wear down, and prepare a report.
3. Carry out crank case inspection tappet clearance, fuel valve priming.
4. Crank shaft deflections.
5. Generator maintenance routines /schedules.
6. Check fuel pump timing.
7. Starting procedure.
8. Check working of safety cut outs.
9. Safe working procedure for various operations.

TOTAL 72 hours
Course objective:
- Able to maintain seaworthiness of the ship.

Course outcome:

CO-1 To understand about the vertical portion of ship’s hull.

CO-2 To understand about the curved portion of stern of ship’s hull.

CO-3 To understand about the layout of machinery spaces.

CO-4 To understand about the steering gear.

CO-5 To understand about the construction of rudder.

CO-6 To understand about stern tube & propeller.

LIST OF JOBS

TO STUDY AND REPORT ON THE CONSTRUCTION OF THE FOLLOWING:

1. Ship’s hull – vertical portion – plating and welds 06
2. Ship’s hull – curved portion of stern – plating and welds 06
3. Machinery Room lay-out 06
4. Steering Compartment and Main Steering Gear 06
5. Rudder construction 06
6. Stern-tube and Propeller 06

TOTAL 36 hours

TEXT BOOKS:

1. E A Stokoe, “Reed’s Ship Construction for Marine Engineers”, Volume 5,

REFERENCE BOOKS:

Course Objective:

- The overall objective of the N.S.S. is "Service to the Community" offered while undergoing instruction in an Educational institution.
- It is sought to arouse the social conscience of students and provide them with the opportunity to work with people around the educational campus creatively and constructively and to put the Education they receive to concrete social use.
- Its motto is "NOT ME, BUT YOU"

Course Outcome:

CO – 1: To understand the Vocational Skill Development
CO – 2: To understand the Civil defense services
CO – 3: To understand the Needs for self defense training
CO – 4: To be well versed with Writing a Project Proposal for Resource Mobilisation
CO – 5: To understand the establishment of SFUs
CO – 6: To understand the Positive Thinking
CO – 7: Self Confidence and Self Esteem
CO – 8: Setting Life Goals and working to achieve them

UNIT – 01: VOCATIONAL SKILL DEVELOPMENT

This unit will aim to enhance the employment potential of the NSS volunteers or, alternately, to help them to set up small business enterprises. For this purpose, a list of 12 to 15 vocational skills will be drawn up, based on the load conditions and opportunities. Each volunteer will have the option to select two skill-areas out of this list – one such skill in each semester. The education institution (or the university) will make arrangements for developing these skills in collaboration with established agencies that possess the necessary expertise in the relational vocational skills.

UNIT – 02: CIVIL / SELF DEFENSE

Civil defense services, aims and Objectives of civil defense

SEEC-
Needs for Self defense training 03

UNIT – 03: RESOURCE MOBILISATION 03

Writing a Project Proposal 02
Establishment of SFUs 01

UNIT – 04: ADDITIONAL LIFE SKILLS 07

Positive Thinking 01
Self Confidence and Self Esteem 02
Setting Life Goals and working to achieve them 02
Management of Stress including Time Management 02

PROJECT WORK/PRACTICAL 40 Marks

TOTAL 35 hours
COURSE OBJECTIVE:

- Able to operate fuel, lubrication, ballast and other pumping systems and associated control systems. Manage fuel, lubrication and ballast operations.

Course outcome:

CO-1 To understand about starting of a pump.
CO-2 To understand Safety precaution before starting maintenance work on a pump.
CO-3 To understand about centrifugal pump.
CO-4 To understand about reciprocating pump.
CO-5 To understand about screw pump.
CO-6 To understand about gear pump.
CO-7 To understand about the trials after overhauling.
CO-8 To understand about oily water separator & bilge pump.
CO-9 To understand about cargo oil pump & stripping pump.

LIST OF EXPERIMENTS

1. Precautions to be taken before starting a pump.
2. Safety precaution before starting maintenance work on a pump.
7. Trials after overhauling. Data to be checked (all the above types of pumps.)
8. Learn starting and stopping of Engine Room Bilge pump and Oily Water Separator
9. Learn starting and stopping of cargo oil pumps and Stripping pumps on tankers.

TOTAL 90 hours

TEXT BOOKS:

In-house developed Lab Manual
Course objective:
• Able to maintain safe engineering watch Operate main and auxiliary machinery and associated control systems.

Course outcome:
CO-1 To understand Procedures for Handing Over/Taking over a Watch.
CO-2 To understand routine work on watch keeping.
CO-3 To understand Purification and clarification of fuel oil.
CO-4 To understand Safe Working Practices & Risk Assessment.
CO-5 To understand about personal protective equipment.
CO-6 To understand the fire precautions.
CO-7 To understand about the permit to work systems.
CO-8 To understand emergency procedures.
CO-9 To understand rescue operation for injured person.
CO-10 To understand Procedures for Emergency Steering.

LIST OF JOBS/EXPERIMENTS
1. Procedures for Handing Over/Taking over a Watch
2. Routine work doing Watch-keeping, such as soot-blowing, cleaning of filters, pumping out of bilges through Oily Bilge Separator, routine pumping operations of fuel oil, ballast water, fire pump and cargo pumping system.
3. Purification and clarification of fuel oil, purification and clarification of lube oil
5. Personal Protective equipment – Work equipment- Safety Induction
7. Safe movement on board ship. Safe system of working – Entering enclosed or confined spaces – Permit to work systems
8. Manual handling of equipment – Use of work equipment – Lifting devices
10. Emergency procedures, such as action to be taken in the event of fire, including fire drills
11. Emergency procedures, such as action to be taken in the event of flooding of Engine room, including drills
12. Rescue operations for injured persons
13. Emergency action in case of stoppage of the Main Engine, Auxiliary Engines, and/or associated systems.
14. Emergency action in case of auto shutdown of the Main Boiler, and/or associated systems
15. Procedures for Emergency Steering
16. Power Black-out, restoration of power and sequence restarting of various machinery
17. Interpretation of functional tests on communication and Control Systems
18. Maintaining Engine Room Log Book and significance of the readings entered there-in.

TOTAL 120 hours

TEXT BOOKS:
1. The Running and maintenance of Marine Machinery (Institute of Marine Engineers, London)
Course objective:
- Able to Prevent, control and fight fires on board, Operate life-saving appliances.

Course outcome:

**CO-1** To understand fire hazard onboard ship & fire basics.

**CO-2** To understand control of fire onboard ship.

**CO-3** To understand fire protection built in ship.

**CO-4** To understand fire detection & safety system.

**CO-5** To understand different fire fighting equipments.

**CO-6** To understand maintenance & testing of fire fighting appliances.

**CO-7** To understand techniques adopted for extinguishing fire at different location onboard ship.

**CO-8** To understand ship board organization for fire & emergency for different types of ships.

**CO-9** To understand construction & operation of life saving appliances.

**CO-10** To understand construction, operation & maintenance of EEBD & neil Robertson stretcher.

**LIST OF EXPERIMENTS (FIRE-FIGHTING)**

Testing and operation of:

1. Jet type water nozzle/spray type water nozzle
2. Combined spray/jet nozzle
3. Fog nozzle.
4. Fire hoses – operation and maintenance - uncoiling for use, operation, cleaning with FW after use, draining and recoiling and stowing on drum. Instantaneous coupling on fire lines.
5. Soda acid type extinguisher – operation, cleaning and recharging
6. Foam type extinguisher – operation, cleaning and recharging.
7. Dry powder – operation, cleaning and recharging.
8. Operation use and functions of breathing apparatus: (a)Self-contained type  (b) Bellow Type
9. Use of fireman’s outfit.
LIST OF EXPERIMENTS (LIFE-SAVING)

1. Study of working of FRP lifeboat
2. Study of construction of FRP life-boat, and list of equipment on board
4. Features, use and maintenance of life jackets.
5. Construction and operational details of the life raft giving importance to manual and hydrostatic release devices.
6. Construction and operation of gravity davits for life-boat
7. Maintenance routines required on gravity davits
8. Function, location, construction and maintenance of EEBDs in Engine Rooms and Pump Rooms

TOTAL 108 hours.

TEXT BOOKS:
In-House Prepared Lab Manual.
Course objective:
• able to maintain a safe Engineering watch, Use internal communication systems

WILL BE CARRIED OUT IN THE CLASSROOMS ALONG WITH THE THEORY PORTIONS UNDER 15CMRE87
15EMR270 WATCH KEEPING PRINCIPLES AND PRACTICES

COURSE OBJECTIVE:

- To understand the importance of Watch Keeping Principles and Practices aspects of Ships and others. The concepts on watch keeping at different situations and data, record and check lists maintained etc.

Course Outcome:

CO – 1: To understand the elements of watch keeping principles and practices

CO – 2: To understand the concepts on watch keeping at different situations

CO – 3: To understand emergency response plans

UNIT I INTRODUCTION TO WATCH KEEPING

Elements on Watch Keeping Principles and Practices with concepts on purpose on how and why it is carried out, carrying out a watch with taking over and handing over of regular watches.

UNIT II WATCH KEEPING IN PORT, ANCHORAGE

Concepts on watch keeping at different situations- in port, anchorage, during maneuvering, sailing at sea, bunkering, dry dock and repairs and survey procedures etc.

UNIT III WATCH KEEPING AT SEA AND PORTS

Watch keeping at different situations- in port, anchorage, during maneuvering, sailing at sea, bunkering, dry dock and repairs and survey procedures etc.

UNIT IV EMERGENCY RESPONSE PLANS

Watch keeping at different situations of ERP- Emergency Response Plans – Oil Pollution, check lists and use of safety, emergency and standby equipments,

UNIT V WATCHKEEPING FFA AND LSA DRILLS

Watch keeping at Safety ERP- Emergency Response Plans – Fire Fighting, Life Saving, Plans and other emergency drills, equipments,

TOTAL 24 hours.