

VELS INSTITUTE OF SCIENCE, TECHNOLOGY & ADVANCED STUDIES (VISTAS)

(Deemed to be University u/s 3 of the UGC Act, 1956)

PALLAVARAM - CHENNAI - INDIA



VELS
UNIVERSITY



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 FPF, marine boilers, legislation, leadership & ship security.

VELS UNIVERSITY - SCHOOL OF MARITIME STUDIES
B.E MARINE ENGINEERING DEGREE COURSE
CURRICULUM

Total Number of Credits:190						
Category	Code	Title of the Course	Hour / Week			Credits
			Lecture	Tutorial	Practical	
SEMESTER - I						
CORE	15EMR001	Mathematics - I	3	0	0	3
CORE	15EMR002	Electrical Engineering Basics	2	0	0	2
CORE	15EMR003	Engineering Drawing	3	0	0	3
AECC	15EMR201	Technical English	3	0	0	3
AECC	15EMR202	Workshop Technology	3	0	0	3
AECC	15EMR203	Engineering Mechanics	4	0	0	4
AECC	15EMR204	Applied Mechanics Lab	0	0	2	1
DSE	15EMR__	Discipline Specific Elective - 1	0	0	3	1
SEC	15EMR__	Skill Enhancement Elective - 1	1	0	0	1
SEC	15EMR__	Skill Enhancement Elective - 2	0	0	6	3
TOTAL			19	0	11	24
SEMESTER - II						
CORE	15EMR004	Mechanics Of Materials	4	0	0	3
CORE	15EMR005	Mathematics II	3	0	0	3
CORE	15EMR006	Materials Science I	2	0	0	2
CORE	15EMR007	Marine Machinery Drawing I	3	0	0	3
AECC	15EMR205	Pumps and Pumping Systems I	3	0	0	3
AECC	15EMR206	Thermodynamics I	4	0	0	4
AECC	15EMR207	Hydraulics Lab	0	0	2	1
DSE	15EMR__	Discipline Specific Elective - 2	0	0	2	1
SEC	15EMR__	Skill Enhancement Elective - 3	0	0	1	1
SEC	15EMR__	Skill Enhancement Elective - 4	0	0	6	3
TOTAL			19	0	11	24

SEMESTER – III						
CORE	15EMR008	Electric Motors and Starters I	4	0	0	3
CORE	15EMR009	Electronics I	5	0	0	4
CORE	15EMR010	Material Science II	3	0	0	2
CORE	15EMR011	Marine Machine Drawing II	3	0	0	3
AECC	15EMR208	Deck Machinery	3	0	0	3
AECC	15EMR209	Thermodynamics II	4	0	0	3
AECC	15EMR210	Electrical Machines Lab I	0	0	2	2
AECC	15EMR211	Electronics I Lab	0	0	2	2
DSE	15EMR___	Discipline Specific Elective - 3	0	0	4	2
TOTAL			22	0	8	24
SEMESTER - IV						
CORE	15EMR012	Electric Motors and Starters II	4	0	0	3
CORE	15EMR013	Electronics II	5	0	0	4
CORE	15EMR014	Thermal Engineering	3	0	0	2
AECC	15EMR212	Safe Maintenance on Ships	3	0	0	2
AECC	15EMR213	Marine Auxiliary Machinery	4	0	0	3
AECC	15EMR214	Electrical Workshop-Motors/Starters	4	0	0	4
AECC	15EMR229	Electronics II Lab	0	0	3	2
DSE	15EMR___	Discipline Specific Elective - 4	0	0	2	2
SEC	15EMR___	Skill Enhancement Elective - 5	2	0	0	2
TOTAL			25	0	5	24

SEMESTER – V						
CORE	15EMR015	Marine Internal Combustion Engineering I	5	0	0	4
CORE	15EMR016	Control Systems for Marine Machinery	5	0	0	4
AECC	15EMR215	Marine Engineering Practice I	2	0	0	2
AECC	15EMR216	Marine Electrical Technology I	2	0	0	2
DSE	15EMR__	Discipline Specific Elective - 5	3	0	0	2
DSE	15EMR__	Discipline Specific Elective - 6	0	0	2	1
DSE	15EMR__	Discipline Specific Elective - 7	0	0	5	4
GE	15EMR__	Generic Elective - 1	2	0	0	1
GE	15EMR__	Generic Elective - 2	0	0	2	1
SEC	15EMR__	Skill Enhancement Elective - 6	0	0	2	2
TOTAL			19	0	11	23
SEMESTER – VI						
CORE	15EMR017	Marine Internal Combustion Engineering II	5	0	0	4
CORE	15EMR018	Ship Construction	3	0	0	3
AECC	15EMR217	Refrigeration, Air-Conditioning & Ventilation Systems	3	0	0	3
AECC	15EMR218	Marine Electrical Technology II	2	0	0	2
AECC	15EMR219	Naval Architecture I	3	0	0	3
AECC	15EMR220	Mechanics of Machines	2	0	0	2
DSE	15EMR__	Discipline Specific Elective - 8	0	0	1	1
DSE	15EMR__	Discipline Specific Elective - 9	0	0	5	2
SEC	15EMR__	Skill Enhancement Elective - 7	0	0	4	2
SEC	15EMR__	Skill Enhancement Elective - 8	0	0	2	1
TOTAL			18	0	12	23

SEMESTER - VII						
CORE	15EMR019	Marine Power Plant Operation	4	0	0	4
CORE	15EMR020	Monitoring And Protection Of Electrical Systems	3	0	0	2
CORE	15EMR021	Electrical Testing and Measuring Equipment	2	0	0	1
AECC	15EMR221	Pumps And Pumping Systems II	3	0	0	3
AECC	15EMR222	Marine Engineering Practice II	2	0	0	2
AECC	15EMR223	Naval Architecture II	3	0	0	3
AECC	15EMR224	Advanced Marine Workshop (MEP II)	0	0	3	3
DSE	15EMR___	Discipline Specific Elective - 10	0	0	2	1
GE	15EMR___	Generic Elective - 3	0	0	3	2
SEC	15EMR___	Skill Enhancement Elective - 9	0	0	3	2
SEC	15EMR___	Skill Enhancement Elective - 10	0	0	2	2
TOTAL			17	0	13	25
SEMESTER - VIII						
CORE	15EMR022	Fire Prevention, Fire-Fighting and Life-Saving Appliances	3	0	0	3
CORE	15EMR023	Marine Boilers And Steam Engineering	3	0	0	2
CORE	15EMR024	Elementary Design Of Marine Machinery	2	0	0	2
AECC	15EMR225	Marine Engineering Practice III	2	0	0	2
AECC	15EMR226	Leadership, Team-Building And Ship Security	2	0	0	1
AECC	15EMR227	Engine Room Resources Management	2	0	0	2
AECC	15EMR228	Maritime Legislation	3	0	0	2
DSE	15EMR___	Discipline Specific Elective - 11	0	0	3	2
DSE	15EMR___	Discipline Specific Elective - 12	0	0	2	1
GE	15EMR___	Generic Elective - 4	0	0	2	1
SEC	15EMR___	Skill Enhancement Elective - 11	0	0	4	3
SEC	15EMR___	Skill Enhancement Elective - 12	0	0	2	2
TOTAL			17	0	13	23

List of Core Courses

15EMR001	Mathematics - I
15EMR002	Electrical Engineering Basics
15EMR003	Engineering Drawing
15EMR004	Mechanics Of Materials
15EMR005	Mathematics II
15EMR006	Materials Science I
15EMR007	Marine Machinery Drawing I
15EMR008	Electric Motors and Starters I
15EMR009	Electronics I
15EMR010	Material Science II
15EMR011	Marine Machine Drawing II
15EMR012	Electric Motors and Starters II
15EMR013	Electronics II
15EMR014	Thermal Engineering
15EMR015	Marine Internal Combustion Engineering I
15EMR016	Control Systems for Marine Machinery
15EMR017	Marine Internal Combustion Engineering II
15EMR018	Ship Construction
15EMR019	Marine Power Plant Operation
15EMR020	Monitoring And Protection Of Electrical Systems
15EMR021	Electrical Testing and Measuring Equipment
15EMR022	Fire Prevention, Fire-Fighting and Life-Saving Appliances
15EMR023	Marine Boilers And Steam Engineering
15EMR024	Elementary Design Of Marine Machinery

List of Ability Enhancement Compulsory Courses

15EMR201	Technical English
15EMR202	Workshop Technology
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

List of Discipline Specific Elective Courses

15EMR101	Electrical Engineering Lab - Basic
15EMR102	Introduction to Shipping
15EMR103	Safe Working Practices
15EMR104	Advanced Marine Workshop(Deck/M/C)
15EMR105	Advanced Marine Workshop (MAM I)
15EMR106	Marine Environmental Pollution Control
15EMR107	Seamanship Practical
15EMR108	Advanced Marine Workshop (MEP I)
15EMR109	Marine Hydraulic Systems
15EMR110	Advanced Marine Workshop-Refrigeration And Airconditioning Trainer
15EMR111	Electrical Lab II + Electrical Workshop
15EMR112	Marine Refrigeration
15EMR113	Advanced Marine Workshop (Electrical)
15EMR114	Energy Efficiency on Ships
15EMR115	Ship Repair and Surveys Practices
15EMR116	Marine Engineering Practice III-Simulator Lab
15EMR117	Marine Machinery Start-Up (S-I-C)

List of Generic Elective Courses

15EMR151	Different Types of Ships
15EMR152	Safe Working Practices On Board
15EMR153	Welding Practices
15EMR154	Marine Machine Design and Drawing
15EMR155	Machine Shop Practices
15EMR156	AutoCAD Principles and Practices
15EMR157	Marine Functions of Systems
15EMR158	Seamanship and Commercial Geography
15EMR159	Anti-Pollution Lab (In Advanced Mar W/S)
15EMR160	E/R Simulator Practices
15EMR161	Control Engineering Lab
15EMR162	Boiler Shop
15EMR163	Management of Ships

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**16**

Differential calculus: Differentiation of algebraic, circular, exponential, logarithmic functions of products, quotients functions, simple implicit function. Successive differentiation – intro and notation, nth order derivatives of std functions, nth order derivatives using (a) trig identities and standard functions. Leibnitz's Theorem. Macluarin's Theorem and Standard Expansions Taylor's Theorem. Indeterminate forms and L'Hospital's Rule. Curve tracing of Cartesian and Polar Curves.

UNIT V DIFFERENTIAL CALCULUS**16**

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:**

1. B.S. Grewal ,”Higher Engineering Mathematics”, Khanna Publishers ,39th edition

REFERENCE BOOKS:

1. P.N. Wartikar and J.N. Wartikar,”A text book of Applied Mathematics”, Volume 1 and 2,2001

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

06

Introduction – Electric current, power, circuit elements – Ohm's law – series circuits – parallel circuits – Kirchhoff's Law – Faraday's law

UNIT II AC CIRCUITS – FUNDAMENTALS

06

AC Circuits – Fundamentals of AC- RMS value – Average value – R, RL, RLC RC circuits with numerical problems – Behaviour of AC in pure resistance, capacitance and inductive circuits.

UNIT III PLOYPHASE CIRCUITS

06

Ployphase circuits – Phase voltage, line voltage, power factor, power calculation, phase sequence – numerical problems

UNIT IV BASICS OF ELECTRICAL MACHINES**06**

Basics of electrical machines-Different types of transformer connections - basic DC Machines – AC machines

UNIT V INSTRUMENTATION**06**

Measurements and Instrumentation – MI, MC meters, Megger.

TOTAL 36 hours**TEXT BOOKS:**

1. B L Theraja, "Electrical Technology" S Chand and company pvt.ltd, 2015

REFERENCE BOOKS:

1. P S Bhimbhara "Electrical Machinery", khanna publishers, 7th edition, 2005

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 draughtmanship 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:**

1. K.V Natarajan, "Engineering Graphics", Dhanalakshmi publications, 16th edition, 2015

REFERENCE BOOKS:

1. Engineering Drawing, by N. H. Dubey, 2008

15EMR004 MECHANICS OF MATERIALS 4 0 0 3

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

12

Direct stress and strain. Modulus of Elasticity. Shear Stress and strain. Modulus of rigidity. Factor of Safety. Stress due to restricted expansion or contraction of single members. Hydrostatic stresses and the corresponding strains. Relationship between the three elastic constants. Thermal stress. Axial stresses in composite materials. Strength of welded joints.

UNIT II THIN SHELLS**12**

Circumferential and longitudinal stress in thin cylindrical shells Course to internal pressure. Thick cylinders. Lamé'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**16**

Strain energy due to normal and shear stresses. Strain energy due to impact loads. Resilience. Compound stress and strain. Stresses on an oblique section. General two-dimensional stress system. Principal planes and principal stresses. Strain on an oblique section. Determination of principal strains. Principal strain in three dimensions. Principal stresses derived from principal strains. Mohr's diagram for stress and strain. Combined bending and twisting. Equivalent bending and twisting moment. Shear, bending and torsion. Theories of failure.

UNIT IV BENDING OF BEAMS**16**

Torsion. Combined stress. Simply supported beams. Cantilevers. Shearing Force and Bending Moment diagrams for cantilevers, simply supported beams with concentrated and uniformly distributed loads. Stress due to bending. Application of impact loads.

UNIT V DEFLECTION**16**

Deflection of built-in beams and continuous beams by Integration and Macaulay's method. Moment area method of deflection coefficient. Deflection due to shear. Deflection by graphical method. Clapeyron's Three moment theorem. Applied problems. Thin curved bar. Strain energy due to bending. Castigliano's theorem, and its application to curved bars, strain energy due to twisting. Applied problems.

TOTAL 72 hours**TEXT BOOKS:**

1. Ramamrutham, "Strength of Materials", Dhanpat Rai, 17th edition, 2011

REFERENCE BOOKS:

1. Rajput, "Strength of materials", 2000

15EMR005 MATHEMATICS II 3 0 0 3

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

12

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 $\cos nX$. The Rules of Guldinus.

UNIT II MOMENT OF INERTIA

16

Integral Calculus - Theories of Parallel axes and Perpendicular Axes. Second moments of area and moments of inertia of rectangular and circular laminas. Multiple integrals. Double and Triple Integrals. Regions of integration and change of order of integration. Spherical, Polar and

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 **16**

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 **16**

Nth order Linear Differential equations – definition and complementary function solution. Methods of obtaining the particular integral. Method of variation of parameters. Method of undetermined coefficients. Cauchy's homogeneous LDE and Legendre's equation. System of ordinary differential equations. Simultaneous equations in symmetrical form. Applications to deflection of beams, struts and columns.

UNIT V CALCULUS OF FINITE DIFFERENCES **12**

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:

1. B.S GrewalKhanna, "Higher Engineering Mathematics", 39th edition, Publishers, New Delhi.,2004

REFERENCE BOOKS:

1. P.N. Wartikar, J.N. Wartikar, "A text book of Applied Mathematics" Volume 1 and 2,2000

15EMR006 MATERIALS SCIENCE I 2002

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:

1. O P Khanna," Material Science and Metallurgy ", Dhanpat Rai Publishers., 2002

REFERENCE BOOKS:

1. R S Khurmi,"Material Science", 2000

15EMR007 MARINE MACHINERY DRAWING I 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 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 1st& 3rd 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**10**

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

TOTAL 54 hours.

TEXT BOOKS:

1. P.S. Gill., "Machine Drawing," 2005

REFERENCE BOOKS:

1. K.V Natarajan, "Engineering Graphics", Dhanalakshmi publications, 16th edition, 2013

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 10

The principles, constructional details and protection of DC Series, shunt and compound-wound motors and generators. Self Excitation, generation of back-EMF and load/voltage characteristics. Numerical problems.

UNIT II METHODS OF VOLTAGE CONTROL 10

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 10

AC Machines: Theory of rotating magnetic fields. Relation between frequency and no of poles and speed of a machine. Relation between slip, rotor emf and frequency, torque-speed characteristics. Numerical problems.

UNIT IV THEORY OF SYNCHRONOUS AND INDUCTION MOTORS **14**

Theory of synchronous and induction motors.

UNIT V CONSTRUCTIONAL DETAILS **10**

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:

1. P S Bhimbhara “Electrical Machinery”, khanna publishers,7th edition,2005

15EMR009 ELECTRONICS I 5 0 0 4

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

12

Electron Emission- Thermionic Emission, Photoelectric emission, Electric field emission and their application.

UNIT II SEMI CONDUCTORS

24

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

18

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**24**

Regulated power supplies Series Regulators, Shunt regulators. Oscillators – circuit diagram and explanation – requirements for Oscillations phase shift Oscillator Wien Bridge oscillators, Crystal Oscillators. Power Amplifiers circuit diagram and explanation. Class A, B & C amplifier, efficiency, distribution. Design theory, Symmetry, Practical complementary push-pull amplifier. Wave Shaping and Switching -Clipping, Clamping. Operational amplifier – inverting and non inverting.

UNIT V FLOW CHARTS**12**

Flow charts for manual and automatic control systems

TOTAL 90 hours**TEXT BOOKS:**

1. V.K. Metha & Rohit, "Principle of Electronics," S.chand,10th edition,2008

REFERENCE BOOKS:

1. B L Theraja , "Electrical Technology" S.Chand and company pvt.ltd, 2013

15EMR010 MATERIAL SCIENCE II 3 0 0 2

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 12

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

UNIT II TECHNOLOGY OF MATERIALS 12

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

UNIT III ENGINEERING PROCESSES 10

Engineering processes used in construction and repair

UNIT IV MATERIALS AND WELDING 12

Materials and welding. Mechanical testing of materials. Destructive testing of materials

UNIT V TESTING OF MATERIALS

08

Non-destructive examination and testing of materials.

TOTAL 54 hours

TEXT BOOKS:

1. O.P. Khanna "Material Science and Metallurgy ,", DhanpatRai Publishers,2012

REFERENCE BOOKS:

1. R.S. Khurmi, "Material Science",2009

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**16**

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

TOTAL 72 HOURS**TEXT BOOKS:**

1. H.G Beck, "Reeds Engg. Drawing for marine engineers", Thomas Reed publication, 2nd edition, 1978.

REFERENCE BOOKS:

1. K.V Natarajan, "Engineering Graphics", Dhanalakshmi publications, 16th edition, 2015

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

Three phase Generators, Three phase transformers. Transformers – theory of transformers and their onboard usage. Specifications of coolant. Distribution Systems. Numerical problems.

UNIT IV**10**

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**10**

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

TOTAL 54 hours**TEXT BOOKS:**

1. B L Theraja, "Electrical Technology", S Chand, 2015

REFERENCE BOOKS :

1. P S Bhimbhara "Electrical Machinery", khanna publishers, 7th edition, 2005

15EMR013 ELECTRONICS II 5 0 0 4

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

24

Operation Amplifier Theory: Concept of Differential Amplifiers. Linear OP-amp circuits. Digital Circuits: Logic System and Gates. Binary and BCD codes, Boolean algebra, Simplifications, Flips-flops; Counters; Registers and Multiplexers.

UNIT II

18

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**16**

TTL & CMOS GATES: Digital integrated Circuits, Semi – conductor Memories-ROM, RAM and PROM. Industrial Electronics: Power rectification, Silicon Control rectifier power control, Photo-Electric Devices. Electronic Control equipment – PLC – Integrated Automation Control and Monitoring System (IACMS), Computer programmable controller, Relay circuit Unit, Digital Sequential Control devices

UNIT IV**16**

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**16**

Electronic Instruments: Cathode Ray Oscilloscope, Digital Voltmeters and frequency – meters, Multimeters; Voltmeter and signal Generators, Q-Meters. Flow Chart for Automatic and other Control Systems – Depiction and understanding of flow-charts, symbols utilization, and processes involved.

TOTAL 90 HOURS**TEXT BOOKS:**

1. V. K. Mehta "Electronics engineering ", S.Chand, 2012

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**10**

Air Compressors – Elementary principles and cycles of operation. Calculation of work done. Indicator diagrams. Numerical examples.

UNIT II**10**

Properties of steam – Saturated steam, dry, wet. Dryness fraction. Super heated steam. Internal energy. Enthalpy. Specific volume. Steam tables. Throttling. Advantages of using steam expansively. Numerical examples.

UNIT III**10**

Rankine cycle. Operation principle and basic construction of and materials of steam turbine. Impulse turbine. Reaction turbine. Elementary principles of steam turbines including simple velocity diagrams for impulse and reaction turbines. Force and work on blades. Numerical examples.

UNIT IV**10**

Combustion – Solid and liquid fuels. Calorific value. Chemical equations for complete combustion. Theoretical minimum air required. Excess air. Numerical examples.

UNIT V**14**

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 54hours**TEXT BOOKS:**

1. Thermal Engineering by A P. Ballaney.2012

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**18**

Characteristics of I.C. Engine: 4 – stroke and 2 – stroke cycles; Deviation from Ideal Condition in actual engines; Limitation in parameters, Timing Diagrams of 2-stroke and 4 – stroke engines. Comparative study of slow speed, medium speed and high speed diesel engines – suitability and requirements for various purposes mean piston speed, M.C.R. & C.S.R. ratings. Practical heat balance diagrams and thermal efficiency.

UNIT II**18**

General Description of I.C. Engines: Marine Diesel Engine of M.A.N., Sulzer, B& W make constructional details of I.C. Engines: Principal components: Jackets and Liners, Cylinder heads.

Pistons, Cross heads, Connecting rods, Bed plates, A-frames, welded construction for bed plates & frames. Tie rods.

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 aspired 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**

Marine Gas Turbines: Brief history of development. Principle of simple open-cycle gas turbine, gas turbine with regenerator, intercooler. Definition of Air Rate, Work ratio, compressor and turbine efficiencies. Basic gas turbine components. Materials of construction of the various components.

TOTAL 90 hours

TEXT BOOKS:

1. Devan Aranha, "Marine Diesel Engines", Shroff Pub., 5th edition, 2010

REFERENCE BOOKS:

1. Doug wood yard ,"Pounder's Marine Diesel Engines" 8th Edition,Elsevier Ltd, 2004

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**12**

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

UNIT II**18**

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**12**

Measurement of process value. Temperature (Mechanical, Electrical), Pressure, Level (Direct and inferential methods), Flow. Transmission of signals- Transmitters, controlling elements (Pneumatic, electrical). Manipulator elements – principles, operation, application of pneumatic, electrical and hydraulic servomotors.

UNIT IV**18**

Theory and characteristics of P-I-D control, and its tuning. V-I, I-V, P-I and I-P Converters. Basics of Programmable Logic Controllers. Functions and mechanism of automatic control for Main Engines and Auxiliary Machinery. Generator distribution system, steam boiler, oil purifier, refrigeration, pumping systems, steering gear, cargo handling equipment and deck machinery..

UNIT V**12**

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:**

1. Marine Control Practice by D A Taylor, 2nd Edition, Butterworth and Co (Publishers) Ltd., London 1987.

REFERENCE BOOKS:

1. J.Majumder,Elasthan A Fernandez,“Marine Control Technology”, Shroff Pub. , 7th edition, 2014

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**16**

Propulsive characteristics of Diesel engines including speed, output and fuel consumption. Engine lay-out and load diagrams. Fuel oil preparation systems. Combustion of Fuels in I.C. Engines: Grades of suitable fuels. Preparation of fuels for efficient combustion. Fuel atomization, Ignition quality, Fuel injectors and its detail. Ignition delay, after burning.

UNIT II MARINE DIESEL ENGINE**12**

Marine Diesel Engine – trunk and Crosshead types. Compression pressure ratio and its effect on engines. Reasons for variation in compression pressure and peak pressure. Design aspects of combustion chamber. Control of NOX, SOX in Exhaust emission.

UNIT III LUBRICATION

16

Assessment of engine power, and running adjustments to maintain performance. Operational limits of Power Plants. Lubrication systems: need for lubrication – types of Lubrication systems
Lubrication systems: lubrication arrangement in diesel engines including coolers & filters, cylinder – lubrication, linear wear and preventive measures, combinations of lubricating oil its effect and preventive measures. Improvements in lubricating oils through use of additives types of additives. Monitoring engines through lubricating oil analysis reports.

UNIT IV CONTROL AND ALARM SYSTEMS

16

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

12

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:

1. DevanAranha, "Marine Diesel Engines", Shroff Pub., 5th edition, 2010

REFERENCE BOOKS:

1. Doug wood yard ,"Pounder's Marine Diesel Engines" 8th Edition, Elsevier Ltd, 2004

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, Propellers, 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.

UNIT I

09

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**12**

Water-tight doors, Hatches, Rudders, Bow-thrusters, Propellers, Watertight bulkheads. Double bottoms. Anchors and cables. Descriptive treatment of the effect of liquids on stability Arrangements for the carriage of dangerous goods in bulk. Ventilation arrangements (natural and mechanical) for pump rooms in tankers and for cargo holds and oil fuel tanks.

UNIT III**12**

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**09**

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**12**

Fittings- water-tightness of the hatches, openings in oil tankers, chain lockers and attachment of cables. Bilge piping system. Ballast System. Sounding pipes and air pipes. Propellers and rudders- construction of rudders and propellers, controllable pitch propellers, stern-tube arrangement. Ship Survey Rules. Functioning of Ship Classification Societies. Surveys during construction. Periodical surveys for retention of Class, and Statutory Surveys.

TOTAL 54 hours.**TEXT BOOKS:**

1. E A Stokoe, "Reed's Ship Construction for Marine Engineers" , Volume 5, 2010

REFERENCE BOOKS:

1. D. J. Eyres, "Ship Construction", Elsevier Ltd, Sixth edition, 2007

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

18

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

18

Practical Knowledge – Ensure Safe Working Practices – Risk Assessment – Safety Officials – Personal Protective equipment – Work equipment- Safety Induction – Fire Precautions – Emergency procedures.

UNIT III PERMIT TO WORK SYSTEMS**18**

Safe movement on board ship. Safe system of working – Entering enclosed or confined spaces – Permit to work systems – Manual handling of equipment – Use of work equipment – Lifting devices – Maintenance of machinery – Hot Work-Painting hazards – Hazardous substances – Noise and vibrations.

UNIT IV EMERGENCY PROCEDURES**18**

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**18**

Actions in the event of Main Engine auto slow-down and shut down. Main Boiler auto shut-down. Power Failure. Emergency procedure for other equipment/Installations. Emergency Steering. Black-out operations and power restoration, and propulsion Plant restart. Interpretation of functional tests on communication and control systems. Maintenance of machinery space Log Book and the significance of the readings taken.

TEXT BOOKS:

- 1 .Marine Control Practice by D A Taylor, 2nd Edition, Butterworth and Co (Publishers) Ltd., London 1987

REFERENCE BOOKS:

1. Nanda and Ghokale, "Basic Marine Engineering Knowledge" N.G Series, 4th edition, 2011.

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

Electrical and simple electronic diagrams. Electric and electronic symbols and interpretations of flow diagrams and circuits. Software Version Control – Programmable Logic controllers, Microcontrollers, Digital techniques.

UNIT II TROUBLE SHOOTING 09

Trouble shooting of electrical and electronic control equipment. Electrical Safety. Test equipment. Interpretation of circuit symbols. Logical six-step trouble-shooting procedure.

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

Electrical distribution system. Motors. Electrical Survey requirements. Function test of electrical, electronic control equipment and safety devices.

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:

1. Eltsan Fernandez, "Marine Electrical Technology", shroff pub., 7th edition, 2014

REFERENCE BOOKS:

1. Marine Control Practice by D A Taylor, 2nd Edition, Butterworth and Co (Publishers) Ltd., London 1987.

15EMR021 ELECTRICAL TESTING AND MEASURING EQUIPMENT 2 0 0 2

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

08

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

UNIT II MULTI-TESTER, CLAMP METER

08

Construction of electrical testing and measuring equipment: Multi-Tester, Clamp Meter

UNIT III INSULATION TESTER, CONTINUITY TESTER 08

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

UNIT IV MULTI-TESTER, CLAMP METER 06

Operation of electrical testing and measuring equipment: Multi-Tester, Clamp Meter

UNIT V MEASURING EQUIPMENT 06

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:

1. B.L Theraja & A K Theraja, "Electrical Technology," S.Chand, 2012

REFERENCE BOOKS:

1. P S Bhimbhara "Electrical Machinery", khanna publishers, 7th edition, 2005

15EMR022 FIRE PREVENTION, FIRE-FIGHTING AND LIFE-SAVING APPLIANCES 3 0 0 3

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

12

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

09

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**12**

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**09**

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**12**

Ship's lifeboats- their construction, operation and maintenance. Equipment renewal intervals. Life-boat surveys. Life boat launching using Davits. Construction operation and maintenance of davits and LB Winches and associated gear. Life Rafts - construction, operation and maintenance. Maintenance routines required on gravity davits. Function, location, construction and maintenance of EEBDs in Engine Rooms and Pump Rooms Neil Robertson stretcher - its use, and maintenance.

TOTAL 54 hours**TEXT BOOKS:**

H.D.McGeorge, "Marine Auxiliary Machinery", Reed Elsevier India, 2011

15EMR023 MARINE BOILERS AND STEAM ENGINEERING 3 0 0 2

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

12

Cochran Boiler, Spanner Boiler, Clarkson thimble tube, waste-heat recovery calculation, Lamont exhaust gas boiler, Composite boilers, and water tube boilers – Babcock Wilcox; Foster Wheeler – D-type, Double evaporation boilers. Boiler Mountings: Safety valves – Improved High Lift, Full lift and full Bore type - procedure for setting. Gauge glass – Ordinary plate type and remote indicator- blowing of gauge glass. Automatic feed regulator, three element High & Low water level alarms, Main Steam stop valve, Retractable type Soot blower.

UNIT II OPERATION CARE AND MAINTENANCE OF BOILERS

12

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**09**

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**12**

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**09**

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 54hours**TEXT BOOKS:**

1. , J.H. Milton & R.M. Leach, "Marine Steam Boilers", 4TH Edition, Butter worth, London 1980

15EMR024 ELEMENTARY DESIGN OF MARINE MACHINERY 2 0 0 2

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:

1. R. S. Khurmi & J.K.Gupta, "A Textbook of Machine Design",2012

**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

Simple, Compound and Complex sentences – impersonal passive voice – Use of Articles – Use of Prepositions – Commonly mispronounced and wrongly spelt words – Reading text: skimming for general information.

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

10

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

TOTAL 54 HOURS

TEXTBOOKS:

1. Mark Ibbotson, “ English for engineering ”,Cambridge press, 2008 edition, 2014

REFERENCE BOOKS:

1. Rizvi M. Ashraf ,”Effective Technical Communication, “,Rizvi M. Ashraf, Tata McGraw-Hill publishing company ltd., New Delhi.2005

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

Permanent joints. Riveting. Soldering. Self-secured joints.

UNIT IV WELDING**12**

Safety and Health when welding. Principles of electric Arc welding. Principles of gas welding. Welded joints and low carbon steels. Common faults in welded joints. Inspection and Non-destructive testing.

UNIT V MACHINE PROCESSES IN MANUFACTURE**16**

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:**

1. S.K Hajra Choudhry "Workshop Technology" MPP, 14th edition, 2015

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

16

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. Plain 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**16**

Linear Motion. Graphs and equations for displacement, speed, velocity and uniform acceleration. Velocity as a vector. Relative velocities in one plane only. Angular motion. Equations for displacement, velocity and uniform acceleration. Kinematics of particles and rigid bodies. Impulse and momentum principle. Work and energy principle. Rectilinear motion. Curvilinear motion. Motion of projectiles. Use of D'Alembert's formula. Instantaneous centre. Problems on constant force or force with linear variation. Potential Energy. Kinetic energy. Newton's Laws of motion. Conservation of momentum. Centrifugal force and its application to conical pendulum, unloaded governor, curved tracks and machine parts. Stress in thin rim due to centrifugal action.

UNIT III SIMPLE MACHINES (STATIC ANALYSIS)**16**

Simple lifting machines. Graphics of load and effort and efficiency. Linear Law. Velocity Ratio, Mechanical Advantage and Efficiency of Wheel and axle, Differential Wheel and Axle, Rope pulley blocks, differential pulley blocks, Warwick Screw, worm driven chain blocks, and single and double purchase crab winches. Virtual Work, Moment of Inertia of plane figures. Moment of inertia of material bodies.

UNIT IV SIMPLE MACHINES (DYNAMIC ANALYSIS)**16**

Law of Conservation of momentum. Centrifugal force and its application to conical pendulum, unloaded governor, curved tracks and machine parts. Stress in thin rim due to centrifugal action. Periodic motion (SHM). Acceleration of connected bodies. Effect of simple air friction on motion under effect of gravity. Kinetic energy of translation and rotation. Flywheels. Impulse forces. Governors including sleeve friction. Simple pendulum. Simple vibrations. Dynamic balancing of masses rotating in one plane. Basic dynamics of the engine mechanism. Balancing – Simple harmonic Motion).

UNIT V FRICTION**08**

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:**

1. K.V Natarajan, "Engineering mechanics" dhanalalshmi publishers, 10th edition, 2015

15EMR204 APPLIED MECHANICS LAB 0021

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.

15EMR205 PUMPS AND PUMPING SYSTEMS I 3 0 0 3

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

14

Properties of fluid density. Compressibility. Vapor pressure. Capillarity. Cavitation phenomena. Viscosity and its measurement. Rotating viscometer. Equilibrium of floating bodies. Variation of fluid pressure with depth. Total force due to liquid pressure on immersed plane surfaces, horizontal or vertical. Centre of pressure on a rectangular vertical plane surface or triangular plane surface, both with one edge parallel to the liquid surface.

UNIT II BERNOULLI'S EQUATION AND APPLICATIONS

16

Bernoulli's equation and applications. Venturi-meter. Euler's formula. Bernoulli's formula. Energy equations and applications. Flow rate measurement – Venturimeter, Orifice meter, Pitot tube. Coefficients of velocity, contraction of area, and discharge.

UNIT III FLOW THROUGH PIPES**08**

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**08**

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**08**

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:**

1.R. K Bansal,"Fluid Mechanics", Lakshmi publicaions, 9th edition, 2009

REFERENCE BOOKS:

1.JagdishLal," Hydraulic Machines ",2010

15EMR206 THERMODYNAMICS I 4 0 0 4

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

10

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

10

First law of thermodynamics and its application to various processes; Steady- Flow Energy Equation; Non-Flow Energy Equation; Applied Problems. Boyles and Charles law for perfect gases. Characteristics equation. Constant R and its use in simple problems. Isothermal,

adiabatic and polytropic process. Relationship between pressure, temperature and volume. Work done, change in internal energy.

UNIT III SECOND LAW OF THERMODYNAMICS 12

Statements of the Second Law of Thermodynamics. Carnot's cycle, Thermodynamic Reversibility. Carnot's principle, Carnot's cycle for a gas, deductions from Carnot's cycle. Thermodynamic temperature scale. Steam and Gas processes on T-S and H-S charts, Entropy and irreversibility. Applied problems.

UNIT IV PROPERTIES OF MIXTURE OF GASES AND GAS VAPORS 14

Dalton's Law of partial pressure, Amagat's Law of partial volume, volumetric and Gravimetric Analysis of Gas mixtures, Gibb's Law – Dalton's Law, Mean value of a Gas constant. Equivalent Molecular weight, Density, specific volume, specific Heat and molar heat capacity of a gas mixture.

UNIT V COMPRESSORS AND IC ENGINES 14

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

15EMR207 HYDRAULICS LAB 0 0 2 1

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

15EMR208 DECK MACHINERY 3 0 0 3

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

08

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

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 CIRCUIT**12**

Hydraulic and Mechanical hatch-cover operation. Operation of hydraulic ramps, bow-doors on ferries. Operation of large bore Ballast System valves using hydraulics. Hydraulic Circuit diagrams.

UNIT IV LIFE BOAT**06**

Life Boat Winch and accommodation Ladder Winch. Constructional features, operation and maintenance required.

UNIT V STEERING GEAR**16**

Steering Gear 4ram and 2 ram type – Hydraulic Transmitter and receiver. Electrical Telemotor. Line diagrams of Steering Gear systems. Rotary vane type Steering. Emergency steering Gear. Testing of Steering departure and arrival port.

TOTAL 54 hours**TEXT BOOKS:**

1. H.D McGeorge, "Marine Auxillary Machinery", Reed Elsevier India, 2011

REFERENCE BOOKS:

1. Leslie Jackson and W Embleton, "Reed's General Engineering Knowledge" Volume VIII, 2010

15EMR209 THERMODYNAMICS II 4 0 0 3

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.

CO-10 To understand Efficiency ratio, Engine Efficiency, Energy Balance, Applied Problems.

UNIT I INTRODUCTION

12

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

08

Steam Cycle: Carnot's cycle for steam and ideal efficiency. Rankine cycle with dry saturated steam and superheated steam. Feed Pump work. Rankine Efficiency, cycle efficiency, Isentropic Efficiency, work ratio, Reheating and Regenerative Feed Heating and their effect on Thermal Efficiency. Applied problems.

UNIT III BOILERS AND EVAPORATORS**10**

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**12**

Steam Turbines: General Principles of impulse and Reaction Turbines – Velocity Diagrams for simple impulse and impulse – Reaction Turbine. Compounding of impulse Turbine-Pressure and velocity compounding. Force on blades, work done by Blades, Axial Thrust, Blade or Diagram Efficiency. Effect of Friction on blades, Applied Problems.

UNIT V STEAM ENGINES**12**

Steam Engines: Modified Rankine cycle for steam engines, Hypothetical Indicator Diagram. Mean Effective pressure and work transfer, Diagram factor. Indicated power, specific steam consumption. Indicated Thermal Efficiency. Efficiency ratio, Engine Efficiency, Energy Balance, Applied Problems.

TOTAL 54 HOURS**TEXT BOOKS:**

1. P.L. Ballaney, "Thermal engineering", khanna publication, 2005

15EMR210 ELECTRICAL MACHINES LAB I 0 0 2 2

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

15EMR211 ELECTRONICS I LAB

0 0 2 2

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 Semi conductor 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

General safety and cleanliness on board. Risk Assessment – Introduction – Key terms – Principles – What and when to assess and by whom-Elements of risk assessment – Guidance on main elements of risk assessment.

UNIT II 16

Personal protective equipment. Its use and care – Introduction – employer duties – worker duties-types of equipment – head protection-hearing protection-face and eye protection-respiratory protective equipment-head and foot protection-protection from falls-body protection. Carriage of tools. Use of helmets and goggles in specific work areas. Reporting and standard communication systems between individuals and between work stations.

UNIT III**16**

Work Activities – Safe Systems of Work – Introduction – Working aloft and outboard – portable ladders – cradles and stages – Bosun’s chair-Working from punts – work in machinery spaces- Boilers – Unmanned Machinery spaces – Refrigeration Machinery – Scaffolding-

UNIT IV**16**

Maintenance – Introduction – General – Floor plates and hand rails – Machinery maintenance- Boilers – Auxiliary machinery and equipment-Main engines-Refrigeration machinery and refrigerated compartments-steering gear – hydraulic and pneumatic equipment-electrical equipment-Main switch boards-distribution switchboards-electrical machinery- High Voltage systems-storage batteries –general – lead acid-alkaline batteries- radio and associated equipment – valves and semi-conductor devices

UNIT V**12**

Use of Safety Signs –Introduction – Signs and notices – Occasional signs – Electrical wiring-Gas cylinders – pipe lines – portable fire extinguishers – International color coding of signs – Permit to work systems – Introduction – Sanction-to-test systems – Permit to work in UMS, enclosed space, machinery equipment, Hot Work – Working aloft – General electrical – HV electricity – Sanction to test above 1000V.

TOTAL 72hours**TEXT BOOKS:**

Code of Safe Practices for Merchant Seamen – Consolidated Edition 2010

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

Propulsion transmission systems including thrust and shaft bearings and stern-tubes.(oil-filled and water-lubricated lignum-vitae, and Thordon types. Types of propellers and features – fixed pitch, CPP. Materials of construction. Cavitation.

UNIT II

16

Heat Exchangers: Tubular and plate type, reasons of corrosion, leakages – erosion tube removal, plugging, pressure testing. Materials used. Fouling of tubes – plates. Renewal of sacrificial anodes Filters: Strainers and filters, types of marine filters, auto cleaner and duplex filters, Static filters. Priming and core maintenance of filters.

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**

Evaporators and distillers- Principles, Operation, materials of construction. Flash evaporators, Multiple-effect evaporation. Construction, characteristics and operation of Fresh Water Generators.

TOTAL 72 hours.**TEXT BOOKS:**

1.H.D McGeorge,"Marine Auxiliary Machinery", Reed Elsevier India, 2011

REFERENCE BOOKS:

1. Leslie Jackson and W Embleton, "Reed's General Engineering Knowledge" Volume VIII,2010

15EMR214 ELECTRICAL WORKSHOP – MOTORS/STARTERS 4 0 0 4

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

15EMR215 ELECTRONICS II LAB 0 0 3 2

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
6. Study of Analog to Digital converter.
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

12

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

16

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**16**

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**16**

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**12**

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:

1. Devan Aranha, "Marine Diesel Engines", Shroff Pub., 5th edition, 2010

15EMR217 MARINE ELECTRICAL TECHNOLOGY I 2 0 0 2

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

Starting, parallel operation and changing of alternators. Synchronizing methods – scope and lamp. Load sharing. Parallel operation of Diesel Generator and Shaft Generator. Maintenance required on Alternators and motors and paralleling equipment.

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**09**

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**06**

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**06**

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 36hours.**TEXT BOOKS:**

1. Eltsan Fernandez, "Marine Electrical Technology", shroff pub., 7th edition, 2014

REFERENCE BOOKS:

1. Marine Control Practice by D A Taylor, 2nd Edition, Butterworth and Co (Publishers) Ltd., London,2012

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

Marine refrigeration Cycle. Principles of refrigeration. Circuit diagrams and components of Vapor Compression Refrigeration System. Construction and materials used for the various components. Cargo refrigeration system and Domestic Refrigeration System (Brine and Direct Cooling). Construction of cold rooms. Refrigeration: Design and construction of various components of refrigeration plants i.e. compressor, condenser, evaporator, expansion valves, and control and safety equipments.

UNIT II OPERATION OF REFRIGERATION SYSTEMS

09

Operation of refrigeration Systems (Cargo and Domestic). Automatic Operation. Normal operating parameters. Abnormal operation, fault detection and remedial measures. Reefer Container plant operation. Data loggers and temp monitoring systems. Defrosting systems.

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

12

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

12

Operation of Air Conditioning Systems. Cabin cooling, Cabin heating and humidity control. Automatic Operation. Normal operating parameters. Recirculation options and duct layouts. Abnormal operation, fault detection and remedial measures.

UNIT V VENTILATION

09

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:

1. Nanda and Ghokale, "Basic Marine Engineering Knowledge" N.G Series, 4th edition, 2011.

15EMR219 MARINE ELECTRICAL TECHNOLOGY II 2002

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

Mandatory requirements for electrical installations. Ship's lighting. Safe working practices. Electrical protective devices. Specification and installation of cables for various shipboard uses.

Special electrical practice: Rules and regulations & operation of electro-hydraulic & electrical steering gear, Diesel-electric and turbo electric propulsion system.

UNIT IV ELECTRICAL SYSTEMS

06

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

06

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:

1. ElsanFernandez, "Marine Electrical Technology," Shroff Pub., 7th edition, 2014

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**12**

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

UNIT V**09**

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

TOTAL 54 hours**TEXT BOOKS:**

1. E.A. Stokoe, "Reeds Naval Architecture for Marine Engineers", Volume V, 2013

REFERENCE BOOKS:

1. D. J. Eyres, "Ship Construction", Elsevier Ltd, Sixth edition, 2007

module, Interference, Gear ratio and center distance of simple and compound gear trains. Fundamental Law. Tooth profiles – proportions. Bevel and Worm Gears. Plain and epicyclic gear trains.

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 precession; Application to ship's stabilization.

UNIT V VIBRATION:

09

Free Harmonic vibrations, linear motion of an elastic system, and Angular motion of an elastic system. Differential equation of motion. Single and two degrees of freedom. Torsional vibrations: Single rotor system, rotor at end and rotor in the middle. Effect of inertia of shaft, two rotor system, rotors at both ends and rotors at one end. Three rotor and multi rotor system. Torsionally equivalent shafts, geared system – whirling. Forced vibrations: Forced linear and angular vibrations, periodic force transmitted to support, periodic movement of the support. Damping

TOTAL 36hours

TEXT BOOKS:

1. Ballaney, "Theory of Machines" ,2010

15EMR222 PUMPS AND PUMPING SYSTEMS – II 3 0 0 3

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 OPERATION OF PUMPING SYSTEMS 09

Operation of pumping systems-Routine pumping operations – Operation of bilge, ballast and cargo operating systems

UNIT II MARPOL 06

Oily Water separator – prevention of pollution – principles, construction and operation – requirements of MARPOL

UNIT III DIMENSIONAL ANALYSIS**06**

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**06**

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**09**

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:**

1. H.D McGeorge, "Marine Auxiliary Machinery", Elsevier India, 2011

REFERENCE BOOKS:

1. DevanAranha, "Marine Diesel Engines", Shroff Pub., 5th edition, 2010

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

Change-over of Remote/Automatic to Local Control for ALL Main and auxiliary Systems. Safe Working Practices in carrying out hot work and welding.

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.

UNIT V MAINTENANCE AND REPAIR**09**

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:

1. Nanda and Ghokale, "Basic Marine Engineering Knowledge" N.G Series, 4th edition, 2011.

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**12**

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**09**

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**12**

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**09**

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**12**

Blade element theory, law of similitude and model tests with propellers, measurement of pitch, cavitations. Propeller types, fixed pitch and variable pitch. Propeller types- Ring propeller, Kort nozzles, Voith Schneider propeller - propulsion tests, Geometry and geometrical properties of screw propellers, ship model correlation ship trials. Motion of ship on waves-theory of waves, Trochoidal waves, relationship between line of orbit centers and the undistributed surface, Sinusoidal waves. Rolling in unresisting media, rolling in resisting media, practical aspects of rolling, anti-rolling devices.

TOTAL 54 hours**TEXT BOOKS:**

1. E.A. Stokoe ,“Reeds Naval Architecture for Marine Engineers Volume V,”2013

REFERENCE BOOKS:

1. D. J. Eyres, “Ship Construction”, Elsevier Ltd, Sixth edition, 2007

15EMR225 ADVANCED MARINE WORKSHOP (MEP II) 0 0 3 3

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

15EMR226 MARINE ENGINEERING PRACTICE III 2 0 0 2

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

09

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

09

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

12

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

12

Management and conduct of ship maintenance by Planned Maintenance and Preventive Maintenance. Theory of condition monitoring and its application on board ships. Principles of Tribology and its practice. Statutory Certification of ships and Class verification. Surveys for maintenance and renewal of Class, and Statutory Certificates.

UNIT V SAFE WORKING PRACTICES

12

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:

The Running and Maintenance of Marine Machinery – Institute of Marine Engineers, London.
2009

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**09**

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**09**

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:**

- 1.Capt. Dhanraj Gupta, "Commercial Geography Ship Operation and Management", Mastermind Ventires, 2nd edition, 2008

15EMR228 ENGINE ROOM RESOURCES MANAGEMENT 2 0 0 2

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

Engine Room Resource management. Effective corrections, allocation of resources. Time and resource constraints. Personnel relationships on board. Working in a multi-cultural environment.

UNIT III PRIORITIZATION OF RESOURCES

06

Knowledge and ability to apply effective Resource Management. Allocation, assignment and prioritization of resources.

UNIT IV COMMUNICATION**06**

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**09**

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:**

1. Nanda and Ghokale, "Basic Marine Engineering Knowledge" N.G Series, 4th edition, 2011.

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-2 To understand Requirements and responsibilities under the SOLAS 1974, Load Lines Convention 1966, and STCW Convention 1978.

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**12**

Knowledge of relevant International Maritime Law embodied in international agreements and applicable conventions. Requirements and responsibilities under the Safety of Life at Sea Convention 1974, Load Lines Convention 1966, and Standards of Training, Certification and Watch-Keeping Convention 1978. Brief description of SOLAS 1974. Obligation to carry out surveys and maintain validity of certificates, maintain records. Obligations and rights of the master.

UNIT II HEALTH REGULATIONS**09**

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

12

Treaties, conventions, Protocols, Rules and regulations: International Maritime Organization, List of IMO Conventions. Introduction to International Labor Organization (ILO), World Health Organization. Authorities, Regulations and responsibilities under International Instruments affecting the Safety of Ships, Passengers, Crew or Cargo: United Nations Law of the Sea (UNCLOS). ILO's International Maritime Labor Convention 2006 (MLC2006). Convention on the International Regulations for Preventing Collisions at Sea (COLREG) 1972 International Convention on Salvage 1989; Lloyd's Standard Form of Salvage Agreement (LOF2000) Convention on the Limitation of Liability of Maritime Claims 1976. International Convention for the Unification of certain Rules of Law relating to Bills of Lading (Hague-Visby Rules).

UNIT IV SURVEYS CERTIFICATION

09

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

12

ISM Code and its requirements – Safety Management System, Documentation and Certification. National Legislation – Merchant Shipping Act 1958: Role of Maritime Administration (Directorate General of Shipping) and its functions; DGS Rules and MS Notices; Flag State Requirements; Statutory Surveys and Certification; Port State Control. Charter Parties. Marine Insurance, General Average, and P&I Clubs.

TOTAL 54 hours.

TEXT BOOKS:

- 1.Capt. Dhanraj Gupta, "Commercial Geography Ship Operation and Management", Mastermind Ventires, 2nd edition, 2008

**DISCIPLINE
SPECIFIC
ELECTIVE
COURSES**

15EMR101 ELECTRICAL ENGINEERING LAB - BASIC 0 0 3 1

Course objective:

- Able to operate electrical, electronic and control system Manage operations of electrical and electronic equipment Operation, surveillance.

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:

P S Bhimbhara “Electrical Machinery”,khanna publishers,7th edition,2005

15EMR102 INTRODUCTION TO SHIPPING**3 0 0 2****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:**

1. Learning Guide by Board of Examinations for Seafarers Trust 1st Edition, 2008

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:

1. Code of Safe Working Practices for Merchant Seamen,2010

15EMR104 ADVANCED MARINE WORKSHOP (DECK M/C) 0 0 4 2

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

Hydraulic and Mechanical hatch-cover operation. Operation of hydraulic ramps, bow-doors on ferries. Operation of large bore Ballast System valves using hydraulics. Hydraulic Circuit diagrams.

UNIT IV LIFE BOAT**12**

Life Boat Winch and accommodation Ladder Winch. Constructional features, operation and maintenance required.

UNIT V STEERING GEAR**12**

Steering Gear - 4 ram and 2 ram type – Hydraulic Transmitter and receiver. Electrical Telemotor. Line diagrams of Steering Gear systems. Rotary vane type Steering. Emergency steering Gear. Testing of steering departure and arrival port.

UNIT VI BOW-THRUSTER**12**

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).
2. Types of propellers and features – fixed pitch, CPP. Materials of construction. Cavitation.
3. Heat Exchangers: Tubular and plate type, reasons of corrosion, leakages – erosion tube removal, plugging, pressure testing. Materials used. Fouling of tubes – plates. Renewal of sacrificial anodes
4. Filters: Strainers and filters, types of marine filters, auto cleaner and duplex filters, Static filters. Priming and core maintenance of filters.
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

MARPOL 73/78-AIII Annexes, equipment requirements and their documentation, including necessary Record Books. Ballast Water Management Convention 2004. Anti-Fouling Convention 2001. Oil Pollution Act 1990.

UNIT IV 12

Responsibilities under the relevant requirements of the international Convention for the prevention of Pollution from Ships – Annex I, Annex II, Annex III, Annex IV, Annex V, Annex VI.

Ballast Water Management Convention 2004. Anti-Fouling Convention 2001. Oil Pollution Act 1990.

UNIT V

09

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:

1. VikramGokhale, N.Nanda, "Ship's Safety And Environmental Protection", N.G Series, 4th edition, 2011.

REFERENCE BOOKS:

1. Nanda and Ghokale, "Basic Marine Engineering Knowledge" N.G Series, 4th edition, 2011

15EMR107 SEAMANSHIP PRACTICAL 0 0 2 1

Course objective:

- Able to understand seamen 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) 0054

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 1 24

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

JOB 2 24

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

JOB 3 24

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 24

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**24**

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**24**

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.

15EMR109 MARINE HYDRAULIC SYSTEMS**5 0 0 4****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 0 0 1 1

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 | 09 |
| 2. Familiarization of the circuit and components of an Air Conditioning System, including its automatic temperature control | 09 |

TOTAL 18 hours

TEXT BOOKS:

In-house developed Lab Manual

15EMR111 ELECTRICAL LAB II + ELECTRICAL WORKSHOP 0 0 5 2

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.

14. Mandatory requirements for electrical installations. Electrical protective devices.

Specification and installation of cables for various shipboard uses.

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:

1. J.Majumder,Elasthan A Fernandez, "Marine Control Technology", Shroff Pub. , 7th edition, 2014

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

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

15EMR113 ADVANCED MARINE WORKSHOP (ELECTRICAL) 0 0 2 1

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

15EMR114 ENERGY EFFICIENCY ON SHIPS

0 0 2 1

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

04

Introduction to Energy Efficiency on Ships and its development and overview

UNIT II CONCEPTS – EEDI AND SEEMP

05

Concepts - EEDI- Energy Efficiency Design Index, SEEMP- Ship Energy Efficiency Management Plan

UNIT III CONCEPTS – EEOI - - ENERGY EFFICIENCY OPERATIONAL INDEX

05

Concepts - EEOI- Energy Efficiency Operational Index for both new and old cargo ships.

UNIT IV IHSF STATISTICS CODE SYSTEM

05

Assessment of IHSF Statistics code system for coding of cargo vessel and other types of vessels.

UNIT V EPT- ELECTRIC POWER TABLE

05

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

TOTAL 24 hours

15EMR115 SHIP REPAIR AND SURVEYS PRACTICES 0 0 2 1

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 04

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 05

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 05

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 05

Concepts on International Conventions, Classification of Surveys, Compliance of Surveys, Recommendation and Conditions of Class,

UNIT V CONDITIONS OF CLASS AND SURVEYS 05

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.
3. Familiarization with Operational Procedures for Pumps and Pumping Systems.
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.
7. Familiarization with Operational Procedures for Aux. Boiler& Exhaust Boiler.
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.

15EMR117 MARINE MACHINERY START-UP(S-I-C) 0 0 2 1

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**

15EMR151 DIFFERENT TYPES OF SHIPS

2 0 0 1

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

04

Introduction – Shipping – Trade – Domestic and Foreign – Basics of International Trade

UNIT II CARGO AND PASSENGER SHIPS

05

Different types of Ships – Cargo Ships - Bulk Carriers- Tankers- Container Ships – Cruise Vessels

UNIT IIICARGO SHIPS

05

Cargo Ships – RO-RO Ships, Car Carriers - different types of tankers,

UNIT IV LIQUID CARGO SHIPS

05

Tankers- Petroleum- Crude, Product, Chemical, Other liquids- vegetable oils, acids, alkalis,

UNIT V OFFSHORE OIL AND GAS VESSELS

05

Different types of Oil and Gas Field - Off Shore Vessels, Survey Vessels.

TOTAL 24 hours

TEXT BOOKS:

Learning Guide by Board of Examinations for Seafarers Trust 1st Edition, 2008

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**05**

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

15EMR153 WELDING PRACTICES 2001

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:

1. S.K Hajra Choudhry, "Workshop Technology "MPP, 14th edition, 2013

15EMR154 MARINE MACHINE DESIGN AND DRAWING 2001

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 stress / strain and the strength of the members etc. forming preliminary & final plans,

TOTAL 24 hours

TEXT BOOKS:

1. K.V Natarajan, "Engineering Graphics", Dhanalakshmi publications, 16th edition, 2013

15EMR155 MACHINE SHOP PRACTICES 2001

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 planing 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

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

15EMR157 MARINE FUNCTIONS OF SYSTEMS 2 0 0 1

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

15EMR158 SEAMANSHIP AND COMMERCIAL GEOGRAPHY 2 0 0 1

Course objective:

- Able to understand seamen 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, forecandle, 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

World Transport – Ports – Types, Characteristics and establishment issues – Major ports of the world – Government Policy.

UNIT V 06

Economics of Sea Transport – Major Shipping Routes – Weather Routing – Fishing Zones – Off shore Oil and Power Installations.

TOTAL 36 hours.

TEXT BOOKS:

1. Capt. Dhanraj Gupta, "Commercial Geography Ship Operation and Management", Mastermind Ventures, 2nd edition, 2008.

15EMR159 ANTI-POLLUTION LAB (IN ADVANCED MAR W/S) 0 0 2 1

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

12

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

12

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 2 0 0 1

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

04

Introduction to E/R simulator system, operation control of main engine, aux. engine and others.

UNIT II OBJECTIVES AND MANNING OF ENGINE ROOM

05

Objectives E/R simulator system- with modern engine plant fully automated on reduced manning

UNIT III MONITORING PANELS

05

E/R simulator system associated with demonstrations of functions on control, monitoring panels

UNIT IV E/R SIMULATOR SYSTEM

05

E/R simulator system training for operational, watch keeping and troubleshooting functions,

UNIT V STANDBY, SAFETY AND EMERGENCY OPERATION

05

Operational, conditions of standby systems, operation of all simulator systems.

UNIT V SAFETY AND EMERGENCY OPERATION

05

Operational, safety and emergency operation of all simulator systems.

TOTAL 24 hours.

15EMR161 CONTROL ENGINEERING LAB 0032

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.

15EMR162 BOILER SHOP 0 0 2 1

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:

1. J.H. Milton & R.M. Leach, "Marine Steam Boilers", 4TH Edition , Butter worth, London 1980.,2010

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:

1. Capt. Dhanraj Gupta, "Commercial Geography Ship Operation and Management",
Mastermind Ventires, 2nd edition, 2008

**SKILL
ENHANCEMENT
ELECTIVE
COURSES**

15EMR251 COMPUTER SCIENCE 1 0 0 1

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

04

Information – need for information – evolution of information processing – elements of computer processing systems. Classification of Computers based on size, design and purpose – Hardware: CPU- components RAM ROM – Motherboard structure - Storage devices. Personal Computer Software – systems and applications – word processing packages – Spread sheet packages MS office. MS Word – MS EXCEL – MS Power Point

UNIT IIPROGRAMMING LANGUAGES

02

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

15EMR252 BASIC WORKSHOP 1 0 0 6 3

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

15EMR254 STRENGTH OF MATERIALS LAB 0 0 1 1

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 shapping.

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

15EMR256 NSS – PAPER II 2001

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	06
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	11
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	09
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	09
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

15EMR257 NSS – PAPER III 2001

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

07

Basic Features of Constitution of India

02

Fundamental Rights and Duties

02

Human Rights

01

Consumer awareness and legal rights of the consumer

01

RTI

01

UNIT – 02: FAMILY AND SOCIETY

06

Concept of family, community, (PRIs and other community-based organizations) and society

02

Growing up in the family – dynamics and impact

01

Human values

01

Gender justice	02
UNIT – 03: HEALTH, HYGIENE & SANITATION	07
Definition, needs and scope of health education	01
Food and Nutrition	01
Safe drinking water, water borne diseases and sanitation (Swachh Bharat Abhiyam)	02
National Health Programme	02
Reproductive health	01
UNIT – 04: YOUTH HEALTH	06
Healthy Lifestyles	01
HIV AIDS, Drugs and Substance abuse	02
Home Nursing	01
First Aid	02
UNIT – 05: YOUTH AND YOGA	09
History, philosophy and concept of Yoga	02
Myths and misconceptions about yoga	01
Different Yoga traditions and their impacts	02
Yoga and Preventive, promotive, and curative method	02
Yoga as a tool for healthy lifestyle	02
PROJECT WORK/PRACTICAL	
Preparation of research project report	40 Marks
TOTAL 35 hours	

15EMR258 LUBE OIL, FUEL OIL, AND COOLING SYSTEMS 2 0 0 2

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 **12**
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 **12**
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 **09**
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 **12**
Lay-out of piping arrangement for Fuel Oil Bunkers and Transfer system. Components of the system – Filters, heaters, sampling arrangement. Bunker precautions and Procedure.

UNIT V **09**
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:

1. Paul A Russel, Thomas D Morton, Leslic Jackson, Anthony S Prince, "Reed's Motor Engineering Knowledge", Thomas Reed Publication, 3rd Edition, 2014

REFERENCE BOOKS:

1. H.D McGeorge, "Marine Auxiliary Machinery", Reed Elsevier India, 2011

15EMR259 NSS – PAPER IV 2001

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

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Unit – 01: Environment Issues 11

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 07

Introduction to Disaster Management, classification of disasters 04

Role of youth in Disaster Management 03

Unit – 03: Project Cycle Management	10
Project planning	02
Project implementation	03
Project monitoring	02
Project evaluation: impact assessment	03
Unit – 04: Documentation and Reporting	07
Collection and analysis of data	03
Preparation of documentation / reports	02
Dissemination of documents / reports	02
PROJECT WORK / PRACTICAL	40 Marks
Workshops/seminars on personality development and improvement of communication skills	

15EMR260 CONTROL ENGINEERING LAB 0022

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	

15EMR262 NSS – PAPER V 2001

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 20

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 08

Definition & Meaning 01

Qualities of good entrepreneur 02

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 metallised bearing.
5. Crankshaft deflection, purpose, procedure tabulation and interpretation of results.
6. Causes of crankshaft misalignment.

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

15EMR264 SHIP-IN-CAMPUS – SHIP CONSTRUCTION 0 0 2 1

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:

1. D. J. Eyres, "Ship Construction", Elsevier Ltd, Sixth edition, 2007

15EMR265 NSS – PAPER VI 2001

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 20

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 05

Civil defense services, aims and Objectives of civil defense 02

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	

15EMR266 SHIP-IN-CAMPUS (PUMPS AND AUXILIARIES) 0 0 3 2

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
3. Centrifugal Pump - Casting impeller- wear rings- shaft bearings- gland seal- air pump & float chamber mechanical seal. Various types of impellers. Dismantle & reassemble centrifugal pumps: Identify all parts – Check for wear – wastage of casing, pitting, trueness of shaft, condition of bearings, seals, wear rings alignment of pump and motor.
4. Reciprocating pump: Cylinders, piston/ bucket rings, valves, glands, relief valve. Dismantle & reassemble pump. Measure cylinder liner wear, ring gaps, overhaul valve/ seats. Various links, bushes relief valve gland packing etc.
5. Screw Pump: Dismantle & reassemble screw pump: Rotors / Gears – seals- bearings- relief valve, pump body. Examine for wear and damages, check clearances and back lashes. Repair/ adjust seals.
6. Gear Pump: Dismantle & reassemble screw pump: Rotors / Gears – seals- bearings- relief valve, pump body. Examine for wear and damage, check clearances and back lashes. Repair/ adjust seals.
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

15EMR267 SHIP-IN-CAMPUS (WATCH-KEEPING)**0 0 2 2****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
4. Ensure Safe Working Practices – Risk Assessment – Safety Officials
5. Personal Protective equipment – Work equipment- Safety Induction
6. Fire Precautions – Emergency procedures.
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
9. Hot Work-Painting hazards - Hazardous substances – Noise and vibrations.
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
3. Maintenance of equipment in life-boat and Rules regarding checking them, renewal of provisions.
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
9. Neil Robertson stretcher - its use, and maintenance.

TOTAL 108 hours.

TEXT BOOKS:

In-House Prepared Lab Manual.

15EMR269

COMMUNICATION LAB

0 0 2 2

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 0 0 2 2

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 04

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 05

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 05

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 05

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 AND LSA DRILLS 05

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

TOTAL 24 hours.