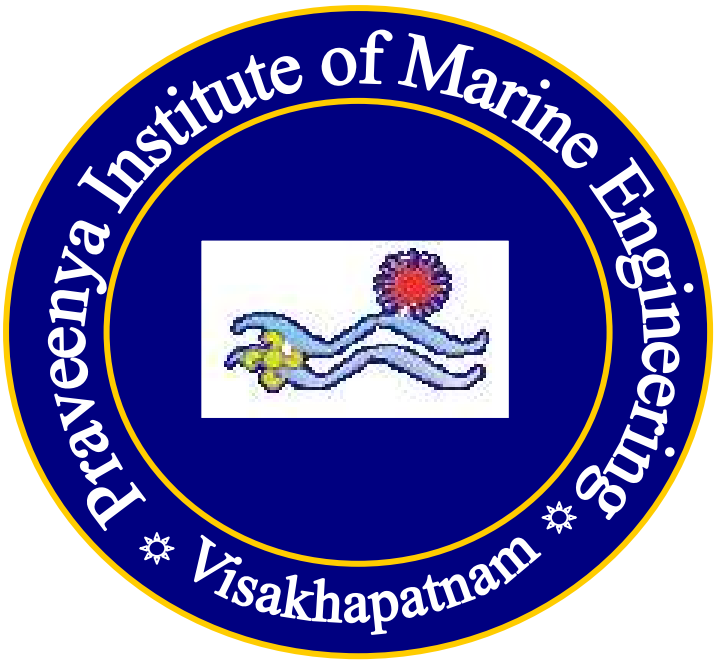

SYLLABUS

FOR

BACHELOR'S DEGREE COURSE IN

MARINE ENGINEERING

OF

PRAVEENYA INSTITUTE OF MARINE ENGINEERING & MARITME STUDIES

MODAVALASA – 531 162 (Vizianagaram Dist.), A.P

SEMESTER – 1

COMMUNICATIVE ENGLISH & REMEDIAL GRAMMAR (54 hrs)

This course is designed to enable the students to enhance their linguistic abilities in listening, reading, writing and speaking communicative English:

Communication and its importance:

Oral communication: use of English in situation with elementary phonetic drill. - 9 hrs.

Written communication: Comprehension, letter writing, précis's, and reporting. - 9 hrs

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Reading and listening: Selected tests to develop skill in comprehension and speech. - 9 hrs.

Remedial Grammar: The Article, Parts of Speech, Linking words, Negative sentences, questions, Verbs Transitive/Intransitive, Regular/Irregular, Tense and their uses, Helping verbs, verbs and adverbs Question Tags, Transformation Nouns Singular &Plural. The Possessive Adjective or the Definite/Articles with Nouns denoting parts of the body, confusion of Adjective & Adverbs, Adverbial use of No, Not & None. -16 hrs.

Difficulties in the comparative & superlative, Confusion of Participles: Active and Passive Voice, the use of Prop word 'one' Prepositions, Negative verbs, the use of correlatives. Understand and use technical/engineering publications.

-8 hrs.

Use of who and whom, much and many, still & yet, so that, so as, may be and do. -3 hrs.

SEMESTER – 1

MATHEMATICS – I (54 hrs)

Differential Calculus:

Differentiation of algebraic, circular, exponential and logarithmic functions, of products, quotients functions of a function and simple implicit functions. - 8

Successive differentiation - intro. and notation, nth order derivatives of std. Functions, nth order derivatives using (a) trig. Identities and std. fns.(b) partial fractions, Leibnitz' Theorem, Maclaurin's Theorem and std. Expansions, Expansions using std. Expansions, Taylor's Theorem, Indeterminate forms and L'Hospital's rule, Curve tracing of cartesian and polar curves. - 12

Functions of several variables, limits and continuity, Partial derivatives - def., geometrical interpretation and rules of partial differentiation, Higher order partial derivatives, Homogeneous fns. and Euler's Theorem, Total derivatives and chain rules, Implicit fns. and composite fns., Errors and approximations, Maxima and minima, Lagrange's multipliers - 10.

Integral Calculus:

Integration of standard forms by substitution and by parts. The definite integral as the limit of a sum. Application of integration to area under curve; volume of revolution; First moment of 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. - 10

Theorems of parallel and perpendicular axes. Second moments of area and moments of inertia of a rectangular and circular laminas. - 4

Multiple Integrals. Double and Triple Integrals. Region of integration and change of order of integration. Spherical Polar and Cylindrical Co-ordinates. Applications –Area, Volume, Mass of wire, lamina and solid. Centre of Gravity of wire, lamina and solid. Moment of Inertia using multiple integrals. - 10

SEMESTER – 1

BASIC THERMODYNAMICS (54 Hrs)

Thermodynamic Definitions: Heat, Work, Energy, System, Boundary, Control, Volume. Working substance, Phase Properties, Phase Diagrams. Point Function, Path Function, Reversible and Irreversible Process; P-V Diagram for Work Transfer in Reversible Processes; Closed System and Open System; Steady Flow Process and Non-flow Process; First Law of Thermodynamics and its application to various Processes; Steady-Flow Energy Equation; Non-Flow Energy Equation; Applied Problems.-10 hrs.

Properties of Gases:: Characteristic Equation of State for a Perfect Gas; Equation of State for Real Gas; Internal Energy of a Gas and Joule's Law; Two Specific Heats of a Gas and relation between them. Different Gas Processes and Heat & Work Transfer in various Gas Process; Temperature- Entropy Diagram; Applied Problems.

Steam and Two Phase System: Phase; Equation of Steam; Temperature-Pressure Diagrams; Triple Point; Specific Enthalpy and Entropy. Use of Steam Tables and Steam Charts; Pressure Volume and Enthalpy-Entropy Diagrams; Internal Energy of Vapours, Super Critical Vapours; Non-flow Processes with Steam; Applied Problems.

Boilers and Evaporators:: Boiler 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. Basic calculations on performance of single-effect, multi-effect and Flash-type Evaporators; Applied Problems.

Ideal Gas Cycles:: Constant Volume Cycle; Constant Pressure Cycle; Diesel Cycle; Dual Combustion Cycle; 4-Stroke & 2-Stroke Cycle; Criteria of Performance; Compression Ratio and Thermal Efficiency; Indicator Diagrams; Indicated Power; Brake Power; Friction Power; Mechanical Efficiency: Specific Fuel consumption; Energy Balance; Applied Problems

SEMESTER – 1

GEOMETRICAL DRAWING (72 hrs)

Introduction to Technical Drawing: 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. -10 hrs.

Curves used in Engineering Practice: Conic sections construction of ellipse, parabola and hyperbola by various methods. Drawing of spirals, involutes, cycloids, epicycloids and hypocycloids, helixes. Detailed drawings of helical springs of round and rectangular sections Square thread formation in proper helical form. Projection of points and lines. -18 hrs.

Development of surface and curves of intersections: Developing the surface of prisms. Pyramids and cones and drawing the curves of intersection of cylinders to cylinders, cylinders to cones, and other solids. -14 hrs

Projection of Solids: Axis perpendicular to a plane and axis parallel to both planes, axis parallel to one plane and inclined to the other, axis inclined to both planes. - 14 hrs.

Isometric Projection / Views, Orthographic Projection, Missing Views - 16 hrs

SEMESTER – 1

WORKSHOP TECHNOLOGY (54 hrs)

Common workshop Tools: Description and uses of different types of Calipers, Straight edges, Try squares, Vices, Hammers, Chisels, Scrapers, Files, Drills, Reamers, Tapes, V-Blocks, Face plate, Marking blocks, Carpentry tools, pattern maker's tools, Smithy tools and Moulding tools. - 6 hrs.

Machine Process & Machine Tools: The geometry of cutting processes Machines of cutting, Chip formation, Cutting forces, Stresses and power; Friction of chip on tool. Generation and dissipation of heat in cutting. Standard nomenclature for cutting tools. Cutting speeds and feed estimation of machining time. The fundamental Cutting process, Application in hand tools as chisel, file and saw; geometrical control of the cutting edge. Kinematic analysis, specification, operation and inspection of the more important types of metal cutting machine tool including Centre lathes, Capstan and turret lathes, Automatic lathes, drilling and boring machines. Shaping slotting and planning machines, Milling and broaching machines. Turning, Screw cutting and taper turning processes on Centre lathe, Abrasive process; Grinding, honing and lapping by hand and machines. Shears and punches. Wood working machines. Principles of jigs and fixtures, Standardization. -20 hrs.

Measuring Instruments & Inspection : Description and use of steel rule, Vernier scale, Micro-meter, Dial gauge, Depth gauge, thread gauge, Feeler gauge, Wire gauge, pattern maker's scale, Taper gauge, snap gauge, Plug gauge, Optical methods of measurement, Principles of interchangeability, limit system, Use of limit gauge. -6 hrs.

Fitting and Overhauling: Types of packing and jointing materials and their uses, Design considerations and construction of various types of valves and cocks, Reducing valves for steam and air. Bedding of bearings, marking of engine parts for fitting, machining operations fitting of keys, cotters, etc. -8 hrs.

Safety Measures: Sources of danger and methods of protection. Types of guards and safety devices, Factory Act regulations. -4 hrs.

Welding: Welding Equipment & Applications, Electric welding (A.C. & D.C.) spot welding. Gas welding. Soldering & Brazing. Different welding & Electrodes, Solders & Brazing Fluxes. -10 hrs.

SEMESTER – 1

BASIC ELECTRICAL ENGINEERING (72 hrs)

Basic concept of electrical circuit, cells, electrostatics and electromagnetism, circuit laws and analysis, maximum power transfer and grouping of cells. -18 hrs.

Laws of magnetic circuit, calculation of ampere-turns from B-H curve, hysteresis, magnetic leakage and fringing, simple magnetic circuit involving air-gaps. -18 hrs.

Self and mutual induction, energy stored in a magnetic field. -6 hrs.

Alternating current and voltage. -6 hrs.

Single phase A.C circuits. -10 hrs.

Three phase circuits – balanced and unbalanced loads. -6hrs

Transient phenomena -2 hrs

Illumination and its measurement -6 hrs.

SEMESTER – 1

ENGINEERING MECHANICS - I (36 Hrs)

Vector Statics: Scalars and vectors. Moments and couple, Couple moment – couple moment as a free vector, addition & subtraction of couple Equilibrium and resultant of co-planar, concurrent and non-concurrent forces, Frame-works. Free body diagrams. Trusses, Method of section, joint to joint method and Bow's notations. - 5 hrs.

Non-coplanar forces: Three rectangular components of vectors Equilibrium and resultant of vectors in space. - 3 hrs.

Virtual work and machines: Principle of virtual work. Ideal machines. Law of machines. Reversibility and irreversibility of lifting machines and it's application to different types of lifting machines. - 5 hrs.

Centroids: Centre of gravity. Centroids of areas, Centroids of lines, Centroids of volume, Centroids of masses. Composite figures. - 4 hrs.

Moment of Inertia: Moment of inertia of area. Transfer formula. Product of inertia of area. Transfer formula. Product of inertia and its transfer formula. Maximum and minimum moment of inertia. Mass moment of inertia and its transfer formula. Radius of gyration. - 5 hrs.

Rectilinear motion: Differential equation. Constant force. - 2 hrs.

Force as function of time and displacement. D' Alambert's principle. Linear momentum. - 3 hrs.

Curvilinear motion: Differential equation. Normal and tangential acceleration. Projectile, D' Alembert's principle. Angular momentum. - 5

Motion of rigid bodies: Rotation about fixed axis. Rotation under constant moment. Periodic motion, Work, power and energy. - 4

SEMESTER – 1

WORKSHOPS PRACTICALS-I (108 hrs)

Fitting shop: (bench Work):

To make a square block from a round bar

To make a hexagon block from a round bar

To make a male-female square fitting from 10 mm thick plate.

To make a V-fitting from a 10 mm thick plate.

Machine Shop (Lathe work)

Straight turning.

To make a round Tensile Test Specimen.

To make a Step Pulley.

Straight Turning under cut with taper.

To make a pin with under cut and threads.

Stepping-down with knurling operation.

Taper turning and inside boring.

Marking of Hexagonal end with under cut taper turning and thread cutting.

Black Smithy Shop

Drawing down from round rod and bending to 90^{o}

To make a square head on a round rod (Square Head Pin).

Bending 90^{o} from a round rod

To make a semi-circular section from a round rod.

To make a Hexagon from a round rod.

To make a flat chisel of Hexagonal stem from a round rod.

Tempering process of tools.

Welding Shop

Half V-welding. (From top face)

Full V-welding. (From top face)

Double V-welding (on opposite faces).

Half-U-welding (From top face).

Double U-welding (on opposite faces).

T-welding (one inner side)

T-welding (both inner sides).

T-welding (both outer sides).

SEMESTER – 1

ELECTRICAL LABORATORY (54 hrs)

1. To Study the dismantled parts of a D.C machine.
2. To study the dismantled parts of an A.C motor.
3. Determination of equivalent resistance under (a) series, (b) parallel and (c) series-parallel connections.
4. Measurement of resistance by voltmeter and ammeter method.
5. Continuity test by ohmmeter and multi-meter.
6 Measurement of high resistance.
7 Calibration of ammeter (D.C & A.C)
8 Calibration of voltmeter (D.C & A.C)
9 Volt-ampere characteristics of lamps.
10. EMF induced in a D.C machine.
11. To study the connection of a fluorescent tube with electromagnetic ballast (To measure input power, voltage and current and to compute power loss in the ballast resistor).
12. To study the connection of a fluorescent tube operated from a 220 V D.C mains. (To measure input power, voltage and current and to compute power loss in the ballast resistor).
13. Coil connections and ratings of a single phase transformer.
14. To study an auto-transformer and load it at about 10% (a) higher and (b) lower input voltage (Take voltmeter, ammeter, and wattmeter readings).
15. Parallel operation of two single phase transformer.
16. Simulation of D.C distributor by a network analyzer.
17. Parallel operation of two identical D.C shunt generators.
18. Study of constant current source.
19. Measurement of low resistance by Kelvin double bridge.
20. Verification of time current characteristics of an over current delay.
21. Localization of faults in electrical circuits.
22. Wattmeter connections and measurement of power
23. Characteristic of an A.C. series circuit and to set resonance.
24. Characteristics of an A.C. parallel circuit and to set resonance.

SEMESTER – 2

MATHEMATICS - II (54 hrs)

Ordinary Differential Equations:

Def., order and degree, formation of differential equation. Solution of first order, first degree equations in variable separable form, homogeneous equations. other substitutions, Equations.

- 12 hrs

Reducible to homogeneous and exact differential equations. - 4 hrs

Equations reducible to exact, IF, Linear differential equation. Of first order first degree, reducible to linear, Applications to electrical circuits and orthogonal trajectories, nth order LDE - def. and complementary solution, Methods of obtaining PI, Method of variation of parameters, Method of undetermined coefficients, Cauchy's homogeneous LDE and Legendre's equation., System of Ordinary differential equations. - 16 hrs

Simultaneous equations. in symmetrical form,

Applications to deflection of beams, struts and columns, Applications to electrical circuits and coupled circuits. - 4 hrs

Calculus of Finite Differences:

Difference operators and relation 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 - def., formation and solution, Linear difference equation. With constant coefficients.

- 18 hrs

SEMESTER – 2

APPLIED THERMODYNAMICS - I (72 hrs)

The second Law of Thermodynamics : Different 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. - 12 hrs.

Steam cycle: Carnot 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. - 14 hrs.

Steam Engines: Modified Rankine cycle for steam Engines, Hypothetical Indicator Diagram. Mean Effective pressure and work transfer, Diagram factors. Indicated power, Specific steam consumption, Indicated Thermal Efficiency. Efficiency Ratio, Engine Efficiency, Energy Balance, Compound steam Engines, Missing quality. Applied problems. - 10 hrs.

Reciprocating Compressors: Ideal cycle for compressors, work Transfer in single stage compressor, Mass and volume flow, Free Air Delivery, Effect of clearance and volumetric Efficiency in Single stage compressors, Multi-stage compression neglecting clearance and with clearance. Condition for Minimum work Input and Perfect Intercooling. Tandem and In-line arrangement in compressors. Rotary positive Displacement Types of compressors. Compressed air Motors. Applied Problems. - 16 hrs.

Properties of Mixtures of Gases and Gas & Vapours: Dalton's Law of partial pressure, Amagat's Law of partial volume, volumetric and Gravimetric Analysis of Gas Mixtures, Gibb's-Dalton Law, Mean value of a Gas constant. Equivalent Molecular weight, Density, specific volume, specific Heat and Molar Heat capacity of gas mixture. Advanced problem on Adiabatic Mixing. - 12 hrs.

Air and Water vapour mixture, Specific Humidity, Relative Humidity, Dew point, unsaturated and saturated Air. Principle of Cooling Tower and Air Leakage Problem in surface condenser. - 8 hrs.

SEMESTER – 2

STRENGTH OF MATERIALS - I (72 hrs)

Simple Stresses and Strain:: Concept of Stress and Strain and their relationship in deformable solids. Normal, shear and hydrostatic stresses and the corresponding strains. Poisson's Ratio and Complementary shear stress. Relationship between three elastic constants. Uniaxial loading and deformations; Thermal Stress; Axial Stresses in composite materials. - 20 hrs.

Strain Energy in Simple Stresses:: Concept of Strain Energy; Strain Energy due to normal and Shear Stresses; Strain Energy due to impact loads; Resilience. - 10 hrs

Shearing Force and Bending Moment:: Sign Convention, Relation between Intensity of Loading, Shearing Force and Bending Moment. Graphical construction of Bending Moment & Shear Force diagrams – 20 hrs.

Thin Walled Shells:: Stresses and Strains in thin Walled Shells subjected to internal pressure; Stresses and Strains in submersibles. Strengthening of Thin Walled Shells by wire or tape winding. Effect of temperature; Volumetric strain on capacity. - 16 hrs.

Welded Joints:: Strength of Welded Joints. Torsion effect on welded joint. - 6 hrs.

SEMESTER – 2

MARINE ENGINEERING MATERIALS (54 hrs)

Characteristics and limitations of materials used in construction and repair of ships and equipment - Basic Metallurgy, Metals and Processes, Properties and Uses, Non-Metallic Materials. – 7 hrs.

Characteristics and limitations of process used for fabrication and repair - Process, Heat Treatment of Carbon Steel. - 7 hrs.

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, Pipework. - 7 hrs.

Iron Carbon Equilibrium Diagram, Non Ferrous alloys, Welding, Gas cutting, Materials under load, Vibrations. Mechanical testing of Materials, Failure modes viz plastic deformation, fracture, fatigue, creep. - 7 hrs.

Design characteristics and selection of materials in construction of equipment. - 4 hrs.

Technology of Material - Metallurgy of Steel and Cast Iron, Properties and application of material used in machinery on board ships, Engineering processes used in construction and repair, - 7 hrs.

Materials and welding - Destructive and non-destructive testing of material. - 7 hrs.
Non-Destructive Examination - Different types of non-destructive examination.

Corrosion Control on Board Ship: Thermodynamics & Kinetics of corrosion, various forms of corrosion, corrosion prevention methods. - 8 hrs

SEMESTER – 2

ENGINEERING MECHANICS - II (36 hrs)

Friction: Static and Kinetic Friction. -, Laws of Friction; Effort required to pull a body up or down an inclined plane. Friction in Square and V-threaded screws, friction in pivots and collars; Conical bearings and thrust bearings plates. Cone clutches and Centrifugal clutches. - 6 hrs.

Dynamics of Rotation: Dynamics of rotation particle and rotating bodies, velocity and acceleration in terms of path variables, cylindrical co-ordinates forces acting on a body having known motion; Torque equation; Work done by application of torque; Kinetic energy of rotation. Total Kinetic energy of a rolling wheel. - 6 hrs.

Periodic Motion: Simple Harmonic motion; Application of S.H.M. to masses and springs. Simple Pendulum and Compound Pendulum. - 3 hrs.

Drives and Brake: Belt and Rope drives; Open and Cross Belt drive; Belt dimensions; Ratio of belt tension; Modification for V-groove pulleys; Power of Belt drives and maximum power transmitted. Effect of Centrifugal tension; Creep in Belts; Different types of band brakes and block brakes. Dynamometers and their working principles; Absorption Dynamometer Band & Rope Brake Dynamometer, Hydraulic Dynamometer. -10 Hrs.

Governors: Function of Governor; Comparison between a Governor and a fly wheel; Various types of Governors; Centrifugal and Inertia types of Governors, Sensitiveness; Stability and Hunting of Governors; Governor effort and Power, Consideration of friction in Governors. -11 hrs.

SEMESTER – 2

MACHINE DRAWING (72 hrs)

Machinery Components Drawing:

Drawing of complete machine components in assembly (Orthographic to Orthographic and isometric to Orthographic) with details Screw threads and fasteners, Locking and retaining devices, Riveted type fastenings, Welded connections, Design Characteristics of Bearings, Seals, Lubrication arrangement, ball and roller bearings. - 44 hrs

Machinery Components and Assembly drawings, and Blue Print Reading. Interpretation of machinery drawings and handbooks marine engineering drawing and design. The interpretation of piping, hydraulic and pneumatic diagrams. - 28 hrs

SEMESTER – 2

MECHANICS LABORATORY (54 HRS)

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 co-efficient of friction between leather and metal in an inclined plane.

4 To prove that if a system of uniplanar forces are in equilibrium, the links respectively given in magnitude and direction taken in order, from a closed polygon.

5 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 prove in a frictionless simple machine that Mechanical Advantage is the same as the Velocity Ratio.

7 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.

8 To verify that the efficiency of a square thread is greater than that of V-thread. To verify that-$E_1 \times E_2 = E_3$

Where-

i. E_1 = Efficiency of Simple Screw Jack;

ii. E_2 = Efficiency of Worm Wheel; and

iii. E_3 = Efficiency of Combined Screw Jack and Worm Wheel.

9 To determine the value of ‘g’ (acceleration due to gravity) by means of –(a) Atwood’s Machine, and (b) Fletcher’s trolley.

10 To determine the moment of inertia and radius of gyration of a flywheel.

SEMESTER – 2

WORKSHOP PRACTICALS-II (108 hrs)

Fitting Shop (Bench Work):

- To make a square block from a round bar.
- To make a hexagon block from a round bar.
- To make male-female square fitting from a 10mm thick plate.
- To make a V-fitting from a 10mm thick plate.

Machine Shop (Lathe Work):

- Straight Turning.
- To make a round Tensile Test Specimen.
- To make a Step Pulley.
- Straight turning under-cut with taper.
- To make a pin with under-cut and threads.
- Straight down with knurling operation.]
- Taper turning and inside boring.
- Making of hexagonal end with under-cut taper turning and thread cutting.

Black-smithy shop:

- Drawing down from round rod and bending to 90^{o}
- To make a square head on a round rod (Square Head Pin)
- Bending 90^{0} from a round rod.
- To make a semi-circular section from a round rod.
- To make a hexagon from a round rod.
- To make a flat chisel of hexagon stem from a round rod.
- Tempering process of tools.

Welding Shop:

- Half V-welding (from top face)
- Full V-welding (from top face)
- Double V-welding (on opposite faces)
- Half U-welding (from top face)
- Double U-welding (on opposite faces)
- T-welding (on inner side)
- T-welding (both inner sides)
- T-welding (both outer sides)
- L-welding (outside corner)
- L-welding (inside corner)
- Angular welding (both sides)

General Overhauling Work:

Dismantling, refitting and studying of a return-type and non-return-type valves.
Overhauling of a globe Valve.
Dismantling, refitting and studying the operation of a Sluice Valve.
Overhauling of a Steam stop Valve.
Cutting of joints and packing for various uses.

SEMESTER – 3

ELECTRONICS-I (54 hrs)

Electron Emission: Thermionic Emission, Photoelectric emission, Electric field emission and their applications. - 5 hrs.

Semi Conductors: Types of Semi Conductors, Electrical characteristics, Diffusion and Drift, Mobility, Varistors Thermistors and Non Linear Resistors. - 6 hrs.

Semi Conductor & Diodes: Characteristics of diodes, Diode as a rectifier, Zener diodes, tunnel Diodes. - 7 hrs

Transistors: The junction transistor and its basic characteristics, the transistor as a switch. The transistor as an amplifier, Stabilized biased circuits, Self biased, low and high frequency Response, Response of Transistor Amplifiers, Effect of negative & positive feedback in transistor amplifier, JFET & MOSFETS, BJT, UJT, SCR, Full wave & Bridge Rectifiers, TRIAC, DIAC. -10 hrs.

Regulated Power Suppliers: Series Regulators, Shunt Regulators, PNM Regulator. - 7 hrs

Oscillators: Requirements for Oscillations phase shift Oscillator, Wien Bridge Oscillator, and Crystal Oscillators. - 11 hrs.

Transistor Power Amplifier: Clipping, Clamping, time base or Sweep Generator, Multi-vibrators & Schmitt Triggers, Operational amplifier. - 8 hrs.

SEMESTER – 3

STRENGTH OF MATERIALS - II (72 hrs)

Bending Stress: Pure Bending, 2nd moment of area, Stresses due to bending. Position of Neutral axis, Radius of Curvature, Combined bending and direct stress. Short Column with eccentric loading. Composite beams. Bending beyond the limit of proportionality. - 18 hrs.

Shear & Torsion: Shear Stress and Shear Strain. Twisting of solid and hollow shafts, Stiffness and Strength. Power and Torque relation. Shafts with linear and compound shafts, Partial hollow shafts, Calculation for Coupling bolts, Torsion applied to closed coil springs, springs with axial load, Calculations for mean diameter Of springs, wire diameter & number of coils. Strain Energy in torsion. Plastic yielding of materials in Torsion. - 27 hrs.

Compound Stress and Strain: Stresses on an Oblique section, General two dimensional stress system, Materials subjected to Direct & Shear Stresses, Principal plane & Principal Stresses. Strain on an oblique section. Determination of principal strains. Principal strains in 3-dimensions. Principal Stresses determined from Principal Strains. Mohr's Diagrams for Stress, Strain and Strain Rosette. Combined bending and Twisting, Equivalent bending moment and Torsion, shear, bending and torsion, Theories of failure. - 27 hrs.

SEMESTER – 3

ELEMENTARY DESIGN & DRAWING (72 hrs)

Procedure in Machine Design: Concepts of design, procedure & processes, Design synthesis, Economic consideration in design, feasibility, preliminary Design alternative, Final design alternative, preliminary & final plans & drawings. - 10 hrs.

Use of standards in design, selection of preferred sizes, common useful materials manufacturing considerations in design. - 6 hrs.

Review of failure criteria in mechanical design, properties of materials, heat treatment processes, BIS system of designation of steels, basis of good design, deformation, wear, corrosion. - 6 hrs.

Common useful materials & manufacturing considerations in design. Failure Criteria in Mechanical Design: Basis of good design. Failure of machine parts. Deformation, wear corrosion. - 6 hrs.

Specifications: -Fit, tolerance, finish-BIS, Design & Drawing to specifications for parts subjected to direct loads. - 6 hrs.

Marine component drawings: - 38 hrs.

1. Air Inlet Valve
2. Automatic Valve
3. Ballast Chest
4. Bilge Suction Strainer
5. Burner Carrier
6. Connecting Road and Bearings
7. Control Valve
8. Crosshead and Guide Shoe,

SEMSTER – 3

APPLIED THERMODYNAMICS - II (72 hrs)

Fuels, Combustion & Dissociation: Definition of Fuel, combustion, Combustion Equation, Analysis of the Products of Combustion, Actual combustion, Excess Air, Mixture strength, Dissociation Effect of Dissociation on IC Engines - 10 hrs.

Gas Dynamics: One Dimensional steady flow of compressible fluids, Isentropic flow, Effect of Friction, Flow through Nozzles and Diffuser Critical condition, Mach number, Subsonic, Sonic, Sonic and Supersonic Flow of steam through Nozzles and Diffusers. - 10 hrs.

Supersaturated Flow of steam; Applied Problems,
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. - 14 hrs.

Refrigeration: Reversed Carnot cycle, Vapour compression cycles, Refrigerating Effect, Co-efficient of performance, cooling capacity, rating of a Refrigerating Plant, Methods of improving C.O.P. Use of vapour Tables, Applied Problems. - 10 hrs.

Typical Marine Refrigerating Plants with multiple compression and Evaporator system. Refrigeration in liquefied gas carriers. - 6 hrs.

Transmission of Heat: Fourier's Law of Heat conduction. Thermal conductivity of Insulating materials. Conduction through flat & cylindrical, spherical surfaces in series. Heat Transfer from fluids to fluids through walls. Application of Heat Transfer in Marine Heat Exchangers, like Coolers, Heaters, Condensers. Pre-diction of convection Heat Transfer rates. Use of Non-Dimensional Groups. -14 hrs.

Prandtl number, Nusselt number, Reynolds number, Stanton number, Grashof number, Graetz number, etc., Natural and Forced Convection. - 4 hrs.

Radiation: Basic, Stephen-Boltzman law, Grey / Black bodies etc. - 4 hrs.

SEMESTER 3

MECHANICS OF MACHINES - I (36 HRS)

Turning Moment & flywheel: Function of a flywheel. Crank effort diagrams. Fluctuation of speed and energy. Effect of centrifugal tension on flywheel, Inertia torque and its effects on Crank effort diagrams - 8 hrs.

Kinematics and Link-Mechanisms: Relative motion between bodies moving in different planes. Instantaneous center method: Rubbing velocities at pin joints. Graphical construction for relative velocity and acceleration in different link and sliding mechanisms. Analytical determination of velocity and acceleration. Forces in Crank and connecting rods. Inertia force on link connecting rods etc. effect of friction. - 12 hrs.

Cams: Types of cams and followers. Specified motion of followers. Uniform acceleration and deceleration, S.H.M. and uniform velocity graphical construction of cam-profile. - 8 hrs.

Spur Gearing: Various definitions e.g. pitch circle diameter, module, path of contact, velocity of sliding, interference, gear ratio and center distance of simple and compound gear trains. - 8 hrs.

SEMESTER – 3

ELECTRICAL MACHINE - I (54 hrs)

Principle of Direct current machines: Their construction, winding, & e.m.f. equations. Armature reaction, commutation, brush shift, compensating winding etc. -14 hrs.

D.C. generator: their characteristics, methods of excitation, parallel operation and load sharing, performance equations. - 10 hrs.

D.C. motor: their characteristics, starting and reversing, speed-torque equations, starters, speed control including electronic method of control, testing of D.C machines for finding out losses and efficiency, braking of D.C motor. - 14 hrs.

Distribution systems: HV and LV switch gear, distribution and equipment. Coupling and breaking connection between switchboard and distribution panels. Basics of Electrical Propulsion System. Power Distribution Systems – Distribution, Insulation, Types. - 16 hrs

SEMESTER – 3

ELECTRONICS LABORATORY - I (54 Hrs)

1 To study the charging and discharging action of a capacitor.
2 To study the half wave and full wave rectification circuit without and with filter circuit.
3 To study the volt ampere characteristics of a high current semi conductor diode.
4 To study the volt-ampere characteristics of a diode and Zener diode.
5 To study the characteristics of Junction Transistor.

SEMESTER – 3

MATERIAL TESTING LABORATORY (54 hrs)

1 To determine the behavior of different materials when subjected to Tension and to obtain the following tensile properties of materials on Universal Testing Machine:

2 (i) UTS, (ii) Yield Stress, (iii) Young's Modulus, (iv) Breaking Stress, (v) Percentage Elongation, (vi) Percentage reduction in area and (vii) Plotting of Curve of Stress vs. Strain.

3 To determine the behavior of materials under direct shear force and to study the effect of it and to calculate the shear stress of material.

4 To study the behavior of materials when subjected to bending and to find out the effect of such act on material and to calculate the bending stress of materials.

5 Determination of the behavior of different materials when subjected to sudden shock and to calculate the impact resistance quality or the impact strength of the materials.

6 To determine the hardness of materials by indenting a hardened steel ball into the specimen under test by an applied specified load on the ball.

7 Determination of behavior of ductile materials when subjected to torsion and to obtain (i) Maximum Torsion Stress, (ii) Modulus of Rigidity and (iii) Plotting of curve of Angle of Twist Vs. Torque.

8 To determine the stiffness of springs for (a) round wire and (b) square section wire when subjected to compression.

9 Determination of compressive stress and strain of materials under compressive force applied to the material.

10 To find out the tensile stress of materials on hand operated Tensile Testing Machine.

SEMESTER – 3

WORKSHOP PRACTICALS-III (54 hrs)

1 Workshop layout;
2 Steam & Exhaust Line Tracing;
3 Scotch Boiler Familiarization;
4 Globe Valve & Sluice Valve Overhauling;
5 Return & Non-return Valve Overhauling;
6 Cock Overhauling;
7 Shaft Key making
8 Thread cutting by Taps & Die;
9 Thread cutting by Lathe Machine

SEMESTER – 3

WORKSHOP (SHIP IN CAMPUS) (108 hrs)

As per the contents of Trainee Assessment Record (TAR) book as issued by the D G Shipping.

SEMESTER – 4

SHIP STRUCTURE & CONSTRUCTION (72 hrs)

Common terms used in the measurement of steel ships. e.g. length between perpendiculars, breadth overall, moulded depth, draught and freeboard. - 6 hrs

Definitions of shipbuilding terms in general use. Descriptions and sketches of structural members in ordinary types of steel ships. Load Lines, Deck line, Free board, Plimsol line, Watertight doors. Hatches, Rudders, Bow-thrusters. Propellers, Watertight bulkheads. Double bottoms. Anchors and cables. Descriptive treatment of the effect of free surface of liquids on stability. Arrangements for the carriage of dangerous goods in bulk. -20 hrs

Ventilation arrangements (natural and mechanical) for pump rooms in tankers and for holds and oil fuel tanks. - 4 hrs

Fore and aft peak tanks, double bottom and deep tank filling and pumping arrangements. Compartmental drainage. Levelling arrangements for damaged side compartments. - 8 hrs

Ship dimensions and form: General arrangement of General cargo, tankers, bulk carriers, combination carriers, containers, ro-ro and passenger ships, definitions of camber, rise of floor, flare, sheer, rake etc. -10 hrs

Ship stresses: Hogging, sagging, racking, panting, pounding, slamming etc, Hull structure: Proper names for the various parts, standard steel sections etc., Bow and stern: Stern frame, structural arrangement forward and aft to withstand panting and pounding etc., -12 hrs

Fittings: Water tightness to the hatches, opening in oil tankers, chain lockers and attachment of cables, bilge piping system, ballast system, sounding and air pipes etc., Rudders and propellers: Construction of rudders and propeller, controllable pitch propeller, stern tube arrangement etc., Process of welding. -12 hrs

SEMESTER – 4

MARINE BOILERS (54 hrs)

Steam boiler mountings and feed water systems; Auxiliary steam boilers and associated equipment, Boiler water testing and conditioning. - 12 hrs

Operation of auxiliary steam plant, pipelines, condenser, drain cooler. Auxiliary boiler fuel and air blower system. - 12 hrs

Methods of checking water level in steam boilers and action necessary if water level is abnormal. - 10 hrs

Marine Boiler - Steam boiler fuel atomization and combustion, Marine boiler fundamentals, Marine Boiler construction, Boiler mountings and steam distribution, Marine boiler operation. - 20 hrs

SEMESTER – 4

MECHANICS OF MACHINES - II (36 hrs)

Toothed gearing: Types of gears, conditions for transmission of constant velocity ratio; methods of avoiding interference; Transmission of power by gear trains on parallel shafts; rack and pinion, Bevel gears, Worm and Worm wheel, spur gear Helical gears, spiral gears, epicyclic gear trains, torque on gear trains, acceleration of gear trains. - 8 hrs

Balancing: Balancing of masses rotating inn different planes, dynamic forces at bearings; primary and secondary balance of multi-cylinder in-line engines and configurations. - 4 hrs

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. - 4 hrs

Vibration: Free Harmonic Vibrations, linear motion of an elastic system, Angular motion of an elastic system. Differential equation of motion. Free vibration of springs in series and parallel. Simple and compound pendulums. Single and two degrees of freedom. - 6 hrs

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. - 3 hrs

Forced Vibrations: Forced linear and angular vibrations, Periodic force transmitted to support, periodic movement of the support - 3 hrs

Transverse vibrations of beams: Single concentrated load, effect of the mass of the beams, energy method-several concentrated loads uniformly distributed load, Dunkerley's empirical method for several concentrated - 3 hrs.

Whirling of shafts-whirling of shafts, critical speed, effect off slope of the disc, effect of end thrust. - 3 hrs

Damped Vibrations: Idea of viscous and coulomb damping, Linear and angular vibrations with viscous damping, forced damped linear and angular vibrations, periodic movement of support. - 2 hrs.

SEMESTER – 4

ELECTRICAL MACHINE - II (72 hrs)

Transformers – principle of action, e.m.f. equation, phasor diagrams under no load and load conditions, leakage reactance, equivalent circuits, voltage regulation, losses and efficiency, open circuit and short circuit tests, parallel operation, three phase transformers – core and shell type, current and potential transformers, auto-transformer (single phase & 3-phases), Theory of transformers and their onboard usage, specifications of coolant -36 hrs.

Alternators-general arrangement of alternators, construction of salient pole and cylindrical-rotor types, types of stator windings, e.m.f. equation of an alternator, distribution and pitch factor, waveform of generated e.m.f., load characteristics & regulation, parallel operation of alternator, KW & KVA sharing - 18 hrs

Synchronous alternator & motor: Production of rotating magnetic field, conditions for its production and reversal of its direction Principle of operation of 3-phase synchronous motor Armature reaction, open circuit & short circuit tests, torque/angle characteristics & hunting, Methods of starting, Merits & limits of synchronous motor over others. Three phase induction motor – principle of operation, Single phase induction motor – principle and operational characteristics, starting control, constructional details, Failure & repairs of electrical machines. - 18 hrs.

SEMESTER – 4

STRENGTH OF MATERIALS - III (72 hrs)

Deflection of Beams: Strain energy due to bending. Application of impact. Deflection by integration, Macaulay's Method. Moment area Methods of deflection coefficients. Deflection due to shear, Deflection by graphical method. Applied problems. -20 hrs.

Built-in and continuous beams: Moment-area method, built-in beam with central concentrated load, built-in beams with uniformly distributed load, with load not at center, Macaulay's method, Continuous beam, Clapeyron's three moment theorem. Applied problems. -20 hrs.

Thin Curved bar: Strain energy due to bending Castigliano's theorem, and its application to curved bars, strain energy due to twisting. Applied problems -10 hrs.

Thick Cylinders: Thick cylinders, Lame's theory, compound cylinders, solid shaft subjected to radial pressure, shrinkage allowance. Applied problems. -10 hrs.

Struts: Euler's theory and Euler's buckling load. Struts with both ends pin joined, both ends fixed, one end fixed and one end free, one end hinged. Pin joined strut with eccentric load, Rankine-Gordon Formula. Applied problems. -12 hrs.

SEMESTER – 4

MARINE HEAT ENGINES (54 hrs)

Steam turbines, Gearing and Lubricating systems, Steam distribution systems, and associated equipment, condensers, ejectors, heat exchangers and feed heaters, air heaters and economisers and draining system of turbine and plants including steam traps. Heat exchangers – Operation, Principles, Types, Material of construction. Manoeuvring system including astern running. - 10 hrs

Gas Turbine Plants: Constant volume or Explosion cycle Gas Turbine plant constant pressure cycle or Joule – Brayton cycle Gas Turbine plant simple cycle, conditions for maximum work output and thermal efficiency in simple cycle. Methods of improvement of thermal efficiency and work ratio of Gas Turbine plants. complex cycles, closed cycle operation of Gas turbine plants, their merits and demerits. Total head or stagnation conditions. -14 hrs

Gas Turbines: General Constructional and Design features for marine plants, Materials of construction, Heat Exchangers and Reheat arrangements, Comparison of Free Piston engine gasifiers and conventional air-stream combustion chambers. Marine gas turbines (trunk and cross-head types) gearing systems and clutches - 10 hrs.

Centrifugal Compressors: Principle of centrifugal compression and pressure rise in centrifugal compressor, change in Angular Momentum. Pre-whirl and pre-whirl vanes. Mach number at inlet to a centrifugal compressor, slip and slip factor, multi-stage centrifugal compressor. -10 hrs

SEMESTER – 4

ELECTRONICS-II (72 hrs):

Operation Amplifier Theory: Concept of Differential Amplifiers Linear OP-amp circuits - 8 hrs

Digital Circuits: Logic systems and Gates Binary and BCD codes, Boolean Algebra, Simplifications, Flip-flops; Counters; Registers and Multiplexers -10 hrs

Converters (A-D and D-A) : Analog to Digital and Digital to Analog Converters and their use in Data-Loggers. - 10 hrs

TTL & CMOS GATES: Digital Integrated Circuits, Semi-conductor Memories-ROM, RAM and PROM. -8hrs.

Industrial Electronics: Power rectification, Silicon Control rectifier power control, Photo-Electric Devices, Invertors. - 6 hrs.

Communication: Modulation, Demodulation, AM/FM/PM Wireless, Radio Transmitters and Receivers, T-V Radar, Pulse Communication. - 8 hrs.

Electronic Instruments: Cathode Ray Oscilloscope, Digital Voltmeters and frequency-meters, Multimeters; Voltmeter and signal Generators, Q-meters. -4 hrs.

SEMESTER – 4

ELECTRONICS LABORATORY - II (54 hrs)

1 To study the volt-ampere characteristic of Field Effect Transistor.
2 To study the characteristics of Silicon Controlled Rectifier.
3 To study the Transistor Bias stability.
4 To study the Transistor Feed Back Amplifier.
5 To study the Integrated Circuit operational Amplifier.
6 To study the Integrating, Differentiating Clamping and Clipping Circuit.
7 To study the Logic Training Board.
8 To study the Speed control of a D.C. motor by Thyristor.

SEMESTER – 4

FUEL/LUBRICANT TESTING & BOILER CHEMISTRY LABORATORY (36 HRS)

Industrial Chemistry

1 To determine Absolute Viscosity and Kinematic. Viscosity and Kinematic. Viscosity of oils by Red Wood Viscometer.

2 To determine the Flash Point of a given sample of oil.

3 To determine the percentage of CO_2. CO and Oxygen in the flue gases.

4 To determine the Calorific value of the fuel with the help of a Bomb Calorimeter).

BOILER CHEMISTRY LABORATORY EXPERIMENTS

1 To determine hardness content of the samples of boiler water in PPM. – in terms of $CaCo_3$.

2 To determine chloride content of the sample of water in PPM in terms of $CaCo_3$.

3 To determine alkalinity due to phenolphthalein, total alkalinity. and Caustic alkalinity of the sample of water in P.P.M.

4 To determine phosphate content of the sample of water.

5 To determine dissolved oxygen content of the sample of water.

6 To determine sulphate content of the given sample of water.

7 To determine PH value of the given sample.

SEMESTER – 4

WORKSHOP PRACTICALS - IV (54 hrs)

1 Rectangular Block making by Shaping Machine.
2 Key Way making by Milling Machine.
3 Reciprocating Pump Overhauling;
4 Centrifugal Pump Overhauling;
5 Air Compressor Overhauling;
6 Double-V Weld;
7 T-Weld (Inner & Outer);
8 Pipe repair & Fabrication;
9 Diesel Engine Familiarization & Overhauling.

SEMESTER – 4

WORKSHOP (SHIP – IN – CAMPUS) (54 hrs)

As per the contents of Trainee Assessment Record (TAR) book as issued by the D G Shipping.

SEMESTER – 5

COMPUTER SCIENCE (36 hrs)

C Programming

C Fundamentals	:	The C Character set, Identifiers & keywords, Data Types, Constants, Variables & Arrays, Declarations, Expressions, Statements, Symbolic constants. – 4 hrs.
Operators & Expressions	:	Arithmetic operators, Unary operators, Relational & Logical operators, Assignment operators, The conditional operators. – 4 hrs.
Data input & output	:	The getchar & putchar functions, The scanf & printf functions, the gets & puts functions. – 2 hrs.
Control Statements	:	The while, do-while, for statements, nested loops, The if-else statement, The Switch & break statements, The goto statements. – 2 hrs.
Functions	:	Definition of a function, accessing a function, passing argument to a function, Function prototypes, Recursion. – 2 hrs.
Program Structure	:	Storage classes, Automatic variables, External variables, Static variables. – 2 hrs.
Arrays	:	Definition of an array, Processing of an array, Passing arrays to a function, Multidimensional arrays. – 2 hrs.
Pointers	:	Pointers declarations, Passing pointers to a function, Pointers & one-dimensional arrays, Operation on pointers, Arrays of pointers, Passing function to other function. – 2 hrs.

Windows 98 Fundamentals

What is Windows? Introduction to Windows 95/98. Running application from Windows 98, organizing programs and documents, sharing data between applications, customizing the control panel, File system and Windows Explorer, supplied applications with Windows 98, Networking with Windows 98, The internet with Windows 98. - 6 hrs.

Fundamentals of Computer Network

Uses of computer network hardware, Network software, Reference models, Examples of networks, Example of data communication services, Network standardization. - 4 hrs.

Fundamentals of Internet

The concept of internet, Internet Explorer, How internet works, connecting to internet, Running a mail program, Different types of e-mail programs, Composing and Sending an e-mail, Reading / Replying an e-mail, Deleting mails, Exiting a mail program. - 6 hrs.

SEMESTER – 5

MARINE STEAM ENGINEERING (54 hrs)

Reciprocating / Steam engines: History of multiple expansion marine reciprocating engines & steam turbines. Description of different types of steam turbines. - 5 hrs

Layout of Plant: General layout of plant & description of a modern geared steam turbine installation including auxiliaries in modern use. - 6 hrs

Selection of materials: Materials used in various components like blades, rotors, castings, sealing glands, gears etc & their justification. - 2 hrs

Constructional details: Types of blades, method of fixing, solid built-up drum, rotor for impulse and reaction turbines, castings for HP and LP impulse and reaction turbines, diaphragms, nozzles, glands, carbon glands, labyrinth packing glands, main bearings and thrust bearings. - 18 hrs

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. - 4 hrs

Reduction gears: Reduction ratio, type of gear teeth, gear construction – various arrangement of marine gearing, gear defects, flexible coupling, quill shaft. - 6 hrs

Condensers: Shapes and types of condensers, constructional details, location & method of securing, working principles, contraction and expansion allowances, leak test. Effect – change of temperature, circulating water quantity, change of main engine power, condenser surface. - 6 hrs

Operation and maintenance: Turbine drain system, turbine gland steam, warming through a turbine plant, control of speed and power of propulsion, throttle valve control and nozzle control, emergency operation of turbines, vibration in marine steam turbine, steam loses. Breakdown and fault finding. - 4 hrs

Alignment checking: By bridge gauge and poker gauge, allowances for expansion, sliding foot, thrust bearing static and dynamic balancing. - 3 hrs

SEMESTER – 5

NAVAL ARCHITECTURE - I (54 hrs)

Geometry of Ship & hydrostatic Calculations: Ships lines, Displacement Calculations, First and Second moment of area, Simpson's rules, application to area and volume, Trapezoidal rule, mean and mid-ordinate rule, Tchebycheff's rule and their applications, Tonnes per Cm. Immersion, Co-efficient of forms, wetted surface area, Similar figures, Centre of gravity, effect of addition and removal of masses, effect of suspended mass. -30 hrs

Transverse Stability of Ships: Static stability at small angles of heel, Calculation of B.M. Metacentric height, inclining experiment, Free surface effect, Stability at large angles of heel, curves of static stability, dynamical stability, Different characteristic curves of Dynamic stability. AITC formula. - 16 hrs

Resistance & Powering: Frictional, Residuary & Total resistance, Froude's Law of comparison, Effective power calculations, Ships co-relation Factor (SCF), Admiralty co-efficient and Fuel consumption. Effect of viscosity and application of AITC Formula. IMO recommendations concerning Ship Stability. -8 hrs

SEMESTER – 5

FLUID MECHANICS-I (54 hrs)

Introduction: Definition of Fluid. Different properties i.e. Capillarity Surface tension, Viscosity etc . -2 hrs.

Dimensional Analysis & Dynamical Similarity: Use of Dimensions for dinging conversion factors; Dimension of Common Quantities; Dimensions equations; Method of Finding dimensionless groups; Geometrical and dynamical similarity, General principle; Dynamical similarity problems. -6 hrs.

Hydrostatics: Equilibrium of floating bodies; Fluid pressure; Measurement of pressure; Total thrust due to liquid pressure on immersed plane surface, Curved surfaces, Centre of pressure; Total force and center of pressure on immersed surfaces such as tanks, bulkheads, lock gates, manhole doors etc. -10 hrs.

Fluid in Motion: Energy of flowing fluid, pressure energy, potential energy, kinetic energy total energy; Bernoulli's Equation for steady motion; Variation in pressure head along a pipe. Measurement of pipe flow rate by venturimeter, Discharge through a small orifice under a constant head; co-efficient of discharge for a small orifice, Experimental determination of orifice co-efficient. Power of a jet; Force exerted by a jet normal to a stationary or a moving flat vane; jet inclined to a stationary or moving flat vane. -12 hrs.

Flow though pipes: Losses of energy in pipe lines; Losses due to sudden increase in pipe diameter, Losses due to sudden contraction in diameter, Friction losses, Shock losses, derivation of Darcy and Chezy's formula; Parallel flow through pipes; transmission of power by pipe line; Condition for maximum power transmission. Time required to empty reservoirs of various shapes flow from one reservoir to the other reservoir; inflow and outflow. -10 hrs.

Fluid Friction, Viscous and Laminar flow: Resistance co-efficient, variation of resistance co-efficient with Reynold's number; oiled bearings; Viscous flow; Flow between parallel planes; Critical velocity; Viscous flow in pipes, Power required for viscous flow. -8 hrs.

Vortex Motion & Radial Flow: Real & Ideal Fluid flow: Steady & unsteady flow. Two dimensional flow theory, forced vortex, free vortex, Radial flow free spiral vortex, compound vortex, illustrative problems related with centrifugal pumps and separators -6 hrs.

SEMESTER – 5

MARINE AUXILIARY MACHINERY – I (72 hrs)

Ship Bilge/ Ballast/ oil – Pumps and pumping system. Hydrophore system:

Various types of pumps, construction, operation, Principles and characteristics.

Operational characteristics of pumps and piping systems including control systems.

Operation of pumping systems - Routine Pumping Operation, Operation of bilge, ballast and cargo pumping systems.

Fluid flow and characteristics of major systems – Description of all fluid flow systems on board, Operation and material construction of devices/ equipment in the system.

Air compressor and system principles - Material of construction, Compressors construction, operation, Principles and characteristics & Types. Compression process, Inter and after coolers.

Compressed air system. Air bottles, construction, mountings and associated system.

Oily water separator/ similar equipment and operation – Prevention of pollution, Requirements, Principles, Construction and operation. - 20 hrs

Fresh water generators and vacuum evaporators:

Evaporators and distillers – Operation, Principles, Types, Material of construction - Flash evaporators, Multiple effect evaporation. Construction, characteristics and operation of fresh water generators and vacuum evaporators.

– 10 hrs

Deck Machinery - Operation, Principles, Types, Material of construction, Windlass/ mooring winch, Winch, Boat winch. - 6 hrs

Physical and Chemical Properties of Fuels and Lubricants - Production of Oils from Crude Oil, Properties and characteristics of fuels and lubricants, Shore side and shipboard sampling and testing, Interpretation of test results, Contaminants including microbiological infection, Treatments of fuels and lubricants including storage, centrifuging, blending, pretreatment and handling. - 6 hrs

Safety & emergency procedures:

Changeover of remote/automatic to local control of all main and auxiliary systems.

Safe working practices. Safe practices in carrying out hot work and welding. Procedure to be taken while handling heavy machinery parts and overhauling of engines. Cleaning, man-entry and hot work in enclosed compartments. Emergency procedures such as actions to be taken in case of fire including fire drill, flooding of engine room compartment, rescue operation of injured persons, actions to be taken in case of stoppage of main engine, auxiliary engine and associated system. - 20 hrs

Oil Purification: Theory of oil purifications, various methods of oil purifications, principles of operation and construction of different centrifuges for heavy fuel and lubricating oil like FOPX system, self desludging etc. uses of homogenizers. Use of setting / service tanks & precautions taken before entering / cleaning tanks -4 hrs

Pumps: Types of pumps for various requirements, their characteristics and application in ships. Centrifugal pumps, gear pumps, screw pumps and Reciprocating pumps, care and maintenance of pumps. -6 hrs

SEMESTER – 5

MARINE INTERNAL COMBUSTION ENGINEERING - I (72 hrs)

Performance 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 sloe speed, medium speed and high speed diesel engines-suitability and requirements for balance diagrams and thermal efficiency. - 10 hrs

General Description of I.C. Engines: Marine Diesel Engine of M.A.N. Sulzer, B & W make etc., constructional details of I.C. Engines: Principal components: Jackets and Linear, Cylinder heads, pistons, Cross heads, Connecting rods, Bed Plates, A-frames, Welded construction for Bed Plates & Frames. Tie rods. - 16 hrs

Scavenging and Supercharging system: 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 loop and reverse loop scavenging, their merits and demerits, Scavenge pumps for normally aspirated engines: under piston scavenging, Scavenge manifolds. - 6 hrs

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. - 6 hrs

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 details ignition delay, after burning. - 8 hrs

Compression pressure ration 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. - 6 hrs

Cooling of I.C. Engines; 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. - 6 hrs

Safety and prevention of mishaps in I.C. Engines: Causes and prevention of crank-case explosions and Scavenger fires. Detection of same and safety fittings provided to prevent damage, uptake fire, starting air line explosion. Thermal stresses. - 8 hrs

Special features of I.C. engines: Development of long-stroke engines, implication of stroke-bore ratio, Development in materials in construction & heat treat in M.E. components. - 6 hrs

SEMESTER – 5

COMPUTER SCIENCE PRACTICALS (54 hrs)

The following programs are to be written & compiled

1. Evaluation of Polynomial for single and multiple values.
2. lowercase to uppercase text conversion (using while, do-while, for statements)
3. Averaging a set of numbers.
4. Repeated averaging of set of numbers.
5. Calculating averages for different set of numbers using nested loops.
6. Programs illustrating switch & break statements.
7. Programs of lowercase to uppercase character conversion using function.
8. Largest & smallest of a set of numbers using function.
9. Calculating factorial of a positive number using function.
10. Calculating factorial of a positive number using recursion.
11. Generating Fibonacci numbers using static variables.
12. Programs illustrating relationship between array elements & their addresses.
13. Adding two tables of numbers.
14. Arranging an array of numbers I an order using different sorting algorithms.

SEMESTER – 5

ELECTRICAL MACHINES LABORATORY (54 hrs)

1. To study and run rotary converter under different conditions to record the generated voltage on D.C side against variation of load.
2. To perform load test on a 6-pulse, 2 way bridge rectifier and to obtain the characteristic curves.
3. To study the slip-torque characteristics of an induction motor and to fund out the full load slip.
4. To study the different types of motors, connect the motor A.C. supply, run the motor and obtain its speed load characteristics. (The experimental multi-motor set).
5. To determine the regulation of a 3-phase alternator by synchronous impedance method.
6. To compute full load input, torque, slip, power factor and efficiency of 3-phase induction motor from circle diagram. Also to compare the results from the circle diagram with actual full load test on the motor.
7. Synchro-transmitter and repeater.
8. Transformer connections.
9. Determination of phase sequence of the given 3-phase supply.
10. Study of single-phase controller.
11. Observation of the wave-form of magnetizing current and hysterics loop.
12. Study of transformer differential relay.

SEMESTER – 5

MARINE ENGINEERING DRAWING (54 hrs)

Advanced Marine machinery assembly drawing

(1)	Cylinder Relief Valve	(2)	Feed Check Valve
(3)	Flow Regulator	(4)	Full Bore Safety Valve
(5)	Gauge Glass (Plate Type)	(6)	Gear Pump
(7)	High Lift Safety Valve	(8)	Oil Strainer
(9)	Parallel Slide Stop Valve	(10)	Pedestal Bearing
(11)	Piston (4 Stroke)	(12)	Piston (Upper and Rod)
(13)	Piston Type Stop Valve	(14)	Reducing Valve
(15)	Starting Air Valve	(16)	Starting Air Pilot Valve
(17)	Stern Tube and Tail Shaft	(18)	Telemotor Receiver
(19)	Tunnel Bearing	(20)	Valve Actuator

SEMESTER – 5

WORKSHOP (SHIP – IN – CAMPUS) (108 hrs)

As per the contents of Trainee Assessment Record (TAR) book as issued by the D G Shipping.

SEMESTER – 6

SHIP FIRE PREVENTION & CONTROL (54 hrs)

Fire hazard aboard ships: Fire triangle, Fire tetrahedron, Fire-chemistry, spontaneous combustion, limits of inflammability. Advantages of various fire extinguishing agents including vaporizing fluids and their suitability for ships use. Control of class A, B, C & D fires, combustion products & their effects on life safety. -10 hrs

Fire protection built in the ships: SOLAS convention, requirements in respect of materials of construction and design of ships (class A, B type BHDS) fire detection and extinction systems, fire test escape means, electrical installations, ventilation system and venting system for tankers. Statutory requirements fire fighting systems and equipments on different vessels, fire doors & fire doors & fire zones.

-10 hrs

Detection and safety systems: Fire safety precautions on cargo ships and tankers during working. Types of detectors, selection of fire detectors and alarm systems and their operational limits. Commissioning and periodic testing of sensor and detection system. Description of various systems fitted on ships.

-8 hrs

Fire Fighting Equipment: Fire pimps, 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 Di-Oxide and inert gas systems. Fireman's outfit, its use and care. Maintenance, testing and recharging of appliances, preparation fire appliance survey. Breathing apparatus types, uses, principle

-12 hrs

Fire Control: Action to Limit Damage and Salve the Ship Following Fire, Explosion, Collision or Grounding - Contingency plans for response to emergencies, Means of limiting damage and salving the ship following a fire or explosion, Procedures for abandoning ship. Procedure for re-entry after putting off fire, Rescue operations from affected compartments. First aid, fire organization on ships, shipboard organization for fire and emergences. Combustion products and their effects on life safety. Fire signal and muster. Fire drill. Leadership and duties, Fire control plan, Human behavior, special precautions for prevention/fighting fire in takers, chemical carriers, Gas carriers, Chemical carriers, safe working practice. Case studies -14 hrs

SEMESTER – 6

FLUID MACHANICS-II (36 hrs)

Reciprocating pumps: Various types, single and double acting, single and multi cylinder, co-efficient of discharge: Theoretical indicator diagrams; Effect of acceleration and friction; Use of air vessel.

-12 hrs

Centrifugal Pump: Calculations of various heads; Losses and Efficiency, work done per unit weight, Dimensions of Impellers; Velocity diagrams at inlet and exit; Calculation for power input; Torque on shafts, Cavitations in Centrifugal pumps. NPSH, Special Head. -12 hrs

Impulse and reaction turbines: Pelton wheel: inward flow reaction turbine; Efficiency and vane angles, vane speed and head lost in runner, specific speed, characteristics of reaction turbines, applied problems.

-12 hrs

SEMESTER – 6

MARINE INTERNAL COMBUSTION ENGINES - II (72 hrs)

Forces and stresses: Balancing, overloading, Different type of vibrations its effects, A/F vibration.–2 hrs.

Fuel pumps and metering devices: Jerk and Common rail systems; Fuel injection systems Helical groove and spill valve type Fuel Pumps. System for burning heavy oil in slow and medium speed marine engine, V.I.T. & Electronic injection system.

- Effects of viscosity on liquid fuel combustion.
- Measuring equipment and its working principle.
- Necessity of variable fuel injection system.
- Procedure of application on a modern slow speed long stroke engine.
- Necessity for adoption of fuel quality setting system.
- Incorporation of FQSL along with the V.I.T. system on the engine. - 16 hrs.

Maneuverings Systems: Starting and reversing systems of different Marine Diesel engines with safety provisions. - 06 hrs.

Indicatory diagrams; and Power calculations: Construction details of indicator instrument. Significance of diagram Power Calculations, fault detection, simple draw cards and out of Phase diagrams. Power balancing, Performance Characteristic Curves, Test bed and Sea trails of diesel engines. - 12 hrs.

Lubrication Systems: Lubrication arrangement in diesel engines including Coolers & Filters, Cylinder

- Improvement sin Lubricating oils through use of additives. Types of additives.
- Monitoring engines through lubricating oil analysis reports. - 10 hrs.

Medium Speed Engines: Different types of medium speed marine diesel engines, couplings and reduction gear used in conjunction with medium speed Engine, Development in exhaust valve design, V-type engine details.

- Use of poor quality residual fuels and their consequences.
- Improvements in designs for higher power output.
- Fuels, combustion process – fundamentals. - 12 hrs.

Automation in modern diesel engines plants: Remote operation, Alarm and fail sage system, Governors and their basic function constant speed and over speed governors. Constructional details and hunting of governor.

- Computerized monitoring and diagnostic applications in propulsion engines. The intelligent engine concept.
- NOX-Control of Marine Diesel Engines.
- Improvement in designs for increased T.B.O. (Time between overhauls). - 6 hrs.

Maintenance of diesel engines: Electronic Governor, Inspection and replacement of various Component members such as Piston, Piston ring. - 2 hrs.

Cylinder Head, Liner, Bearings Driving Chain and gears etc. Crankshaft deflection and alignment, Engine holding down arrangements, Tightening of Tie bolts. - 2 hrs.

Trouble Shooting in Diesel Engines: Hot & Cold Corrosion, Crankshaft web slip, H-head bearing problems, microbial degradation in fuel & lubricating oil. - 2 hrs.

Modern trends in development: Current Engines (Sulzer ETA, B&W CMC&SMC, SEMT Peilstick) Intelligent Engine (Cam-less concept), improvement design for increased TBO.
U.M.S. operation of ships. - 2 hrs.

SEMESTER – 6

MARINE MACHINERY SYSTEM DESIGN (72 hrs)

Design Considerations: Manufacturing methods, castings, forgings, fabrication & plastic moulding: Machining tolerances, surface finishes: Application to basic design principles in respect of function, Available material, Production methods, Economics, Aesthetic appeal. Initial and servicing costs, analysis of force, flow through an assembly and its effect on the design. Design with reference to repairs and reconditioning specifically "at sea" work with its normal restrictions and limitations.

-14 hrs

Marine Machinery component Designs & Drawing: Design and Drawing of marine machinery components subject to combined bending, twisting and direct loading like Crankshafts, propeller shafts etc., Design and drawing of flywheel, piston, connecting rod, safety valves, reducing valves, comparison & torsion springs, journal bearings, thrust bearings etc. Design of lifting equipment e.g. Engine room overhead Crane, Globe & other valves mechanical pilot etc. -12 hrs

Advanced Design of Marine Design & Drawing

- Power Transmission system including thrust blocks, intermediate shaft and Tail-End shaft.
- Water cooling systems including pumps, filters, heat exchangers for diesel and steam engine plants.
- Lubricating oil systems including pumps, purifiers pressure by-pass valves.
- Electro-hydraulic steering gear system including rudder, rudder stock, tiller arm ram & cylinder.
- Marine Diesel engine air starting systems including air receivers, compressors and air starting valves.
- Marine Diesel Engine Scavenge and exhaust system.
- Marine Diesel Engine Fuel Injection system including fuel pumps and fuel-injectors.
- Design of Steam Turbine plants.
- Design of Gas turbine plants.
- Life boat and it's launching device.
- Refrigeration plant.
- Bulk CO_2 system.
- Fire fighting system including emergency fire pump. -40 hrs

Note: Latest development and IMO requirements are to be considered in each design project.

Computer Aided Design: Analysis of stress, strain, vibration, thermal stress, deflection through method of Finite Element Analysis by use of various software like MSC NASTRAN, I-DDEAS, AUTO-CAD, Pro-engineer. - 6 hrs

SEMESTER – 6

MARINE AUXILIARY MACHINERY - II (54hrs)

Sensing and monitoring devices associated with marine equipment; Propulsion transmission systems, including thrust and shaft bearings, stern tubes and propellers, Shafting Installations and Propeller – Equipment constructing shafting, Types of propeller and features, Material of construction and definitions, Cavitation. - 18 hrs

Steering and stabilising systems, including bow thrusters, Steering gear principles - Operation, Principles, Types, Material of construction, Steering gear electric control, Hydraulic power operated rudder systems, Hydraulic power rotary pumps, Automatic control systems. - 18 hrs

Dry Docking: Methods of dry docking of ships. Inspection and routine overhauling of underwater fittings and hull. Measurements of clearances and drops. Removal and fitting of propellers (with and without key). -8 hrs

Other ship board equipments: Incinerators, Sewage treatment plant, Engine room crane, chain blocks, tackles, anchor chain, its testing and survey requirements. -4 hrs

Different types of ship stabilizer. Bow thrusters, Hull protection arrangements, overhauling procedure for various Aux. M/c., Bad weather precaution taken, maintenance of E.R. stores etc. -3 hrs

Importance of LO/FO testing, method of testing etc. use of oil mist detector. -3 hrs

SEMESTER – 6

MARINE ELECTRICAL TECHNOLOGY - I (54 hrs)

Trouble Shooting Of Electrical and Electronic Control Equipment

Electrical safety, Test equipment, Interpretation of circuit symbols, Logical six step trouble shooting procedure, Generation, Prime mover electrical control, Main air circuit breaker, Protection of generators, Electrical distribution systems, Motors, Electrical survey requirements, Calibrate and adjust transmitters and controllers, Control system fault finding. - 18 hrs

Function test of electrical, electronic control equipment and safety devices

Software Version Control - Programmable logic controllers (PLC), Microcontrollers, Digital techniques.

Construction and operation of electrical testing and measuring equipment – Construction, Operation & Principles of insulation tester, Continuity tester, Multi tester, Clampmeter. - 18 hrs

Function and performance test and configuration - Monitoring Systems, Automatic Control Devices (Process control & system control), Protective Devices.

Electrical and simple electronic diagrams – Electric and Electronic symbols and Interpretations of Flow diagrams and Circuits. - 18 hrs

SEMESTER – 6

NAVAL ARCHITECTURE - II (54 hrs)

Longitudinal Stability and Trim: Longitudinal BM, MCT1, change of L.C.B. with change of trim, change of trim, change of trim due to adding or deducting weights, change in draft & trim because of filling / flooding several tanks with different densities, alteration of draft due to change in density, Flooding calculations, Floodable length curves, M.O.T. method for determination of floodable lengths, factors of subdivision, Loss of stability due to grounding, docking stability, pressure on chocks. - 18 hrs

Strength of ships: Curves of buoyancy and weight, curves of load, shearing force and bending moments, Alternate methods, Standard conditions, Balancing ship on wave, approximation for max, shearing force and bending moment, method of estimating B.M. & Deflection. Longitudinal strength, moment of inertia of section, section modulus. Theoretical knowledge of Naval Architecture and Ship Construction including damage control. -15 hrs

Propulsion & Propellers: Definition, apparent and real ship wake, thrust relation between powers, relation between mean pressure and speed, measurement of pitch, cavitations. -6 hrs

Propeller types, fixed pitch, variable pitch, ring propeller, Kort nozzles, Voith Schneider propeller, propeller theory -5 hrs

Blade element theory, law of similitude and model tests with propellers, propulsion tests, geometry and geometrical properties of screw propellers, ship model correlation ship trails. -5 hrs

Rudder theory: Action of the Rudder in turning a ship, force on rudder torque on stock, calculation of force torque on non-rectangular rudder, angle of heel due to force torque on rudder, angle of heel when turning. Types of rudder, model experiments and turning trails, area and shape of rudder, position of rudder, stern rudders bow rudders. -14 hrs

Motion of ship on wages: Theory of waves, trochoidal waves, relationship between line of orbit centers and the undisturbed surface, sinusoidal waves. Irregular wave pattern, wave spectra, wave amplitudes, rolling in unresisting media, practical aspects of rolling, anti-rolling devices, forces caused by rolling and pitching, heaving and yawing. -9 hrs.

SEMESTER 6

HEAT TRANSFER LABORATORY (54 hrs)

1. To determine the Thermal Conductivity of good conductors.
2. To determine the Thermal conductivity of insulating materials.
3. Heat transfer through fins or extended surface.
4. Heat transfer through force convection.

SEMESTER – 6

FIRE CONTROL LABORATORY (54 hrs)

1.Maintain Safety And Security Of The Vessel, Crew And Passengers And The Operational Condition Of The Life Saving, Fire Fighting And Other Safety Systems

Life Saving Appliances Regulations (SOLAS) - Life-Saving appliances and arrangements (Chapter III of SOLAS) and life-saving appliance code.

2. Organisation of fire and abandon ship drill.

3. Testing and operation of jet and spray type nozzles and fire hoses.

4. Operation, charging and maintenance of portable fire extinguishers

a. Soda acid type
b. Foam type
c. Dry power type

5. Operation, use and function of breathing apparatus.

a. Self contained type
b. Bellow type

6. Use of fireman's outfit.

7. Principles of survival; Use of survival equipment; Survival craft and rescue boat; Methods of helicopter rescue; Launching arrangements; Lifeboat engine and accessories; Evacuation; Signalling equipment and pyrotechnics; First aid; Radio equipment; Launching and handling survival craft in rough weather.

8. Construction and operational details of life raft giving importance to manual and hydrostatic release device.

SEMESTER – 6

WORKSHOP (SHIP – IN – CAMPUS) (126 hrs)

As per the contents of Trainee Assessment Record (TAR) book as issued by the D G Shipping.

SEMESTER – 7

SHIP OPERATION AND MANAGEMENT (36 hrs)

Conference systems – Organization & concerns Shippers Council. Chartering, Charter parties. Theory of freight rates and fares. Rate fixation machinery and governmental control. Responsibilities of ship owners & Charters. Tankers chartering. Freight rates & fares – various terms, influencing factors, market pricing. - 2 hrs

Bill of lading – Function & Uniqueness & related problems. Carriage of goods by sea act. Cargo surveys and protests. - 3 hrs

Marine Insurance: Underwriting and loss adjusting principles applied to Marine cargo insurance. Hull / Machinery policy, particular average. General average, P & I Clubs – making claims. - 5 hrs

Shipping companies – Organizational structure, Restructuring on the basis of functional coherence, ship management companies. Turn around strategy for sick shipping companies. Ownerships of vessels, shipping company and its administration. - 5 hrs

Capitalization and finance. Characteristics, cost ratios & allied definition. Sources, Financing package, lender security, Relation between insurance premium & non-conformity / condition of class. Economics of new and second hand tonnage. Subsidies, procedure & implication of buying & selling new / old vessels. - 4 hrs

Ship Operations:

Leadership and team working skills:

Introduction to Management, Related Conventions and National Legislations, applies task and workload management, applies effective resource management and decision making. - 4 hrs

Engine room resource management, effective corrections, allocation of resources. Planning and coordination, work load management, time and resource constraints. Personal relationship on board ship, working in multi cultural environment. - 5 hrs

Leadership and Managerial Skills:

Knowledge of Shipboard Personnel Management and Training - Engineer and Manager, Human Resource Management, Training and Development, Maintenance Management.

Ability to Apply Task and workload management – Communication, Team building, Planning and co-ordination, Personal assignments, Time and resource constraints, Prioritization. - 4 hrs

Knowledge and ability to apply effective Resource Management - Allocation, assignment and prioritization of resources, Effective communication on board and ashore, Decisions reflect consideration of team experience. Knowledge and ability to apply Decision-Making Techniques - Management processes and functions, Negotiating skills, Situation and risk assessment, Identify and generate options, Select course of action, Evaluation of outcome effectiveness. Development, Implementation, and Oversight of Standard Operating Procedures - Project planning and controlling. - 4 hrs

SEMESTER – 7

MARINE CONTROL SYSTEMS & AUTOMATION (72 hrs)

Instrumentation & Control Systems:

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, humidity and water content with calibration. - 20 hrs

Basic control engineering: Fundamentals of Automatic Control, Various Automatic Control, ON-OFF Control, Sequential Control, Proportional-Integral-Derivative (PID) Control.

Measurement of Process Value – Temperature (Mechanical, Electrical), Pressure, Level (Direct methods and Inferential methods), Flow, General measurement and process.

Transmission of Signals – Transmitters, Controlling elements (Pneumatic, Electrical, Receivers).

Manipulator Elements – Principles, Operation, Application, Pneumatic, Electrical Servomotor, Hydraulic Servomotor. - 26 hrs

Functions and mechanism of automatic control for main engines and auxiliary machinery - Generator distribution system, Steam boiler, Oil purifier, Refrigeration system, Pumping and piping system, Steering gear system, Cargo-handling equipment and deck machinery. - 12 hrs

Design features and system configuration of automatic control equipment and safety devices for the following - General Requirements, Main Engine, Generator and distribution system, Steam boiler. - 10 hrs

Features of Pneumatic and Hydraulic Control Equipment. - 4 hrs

SEMESTER – 7

STCW CONVENTION & CLASS IV PREPARATION (54 hrs)

Standards of training, Certification and watch-keeping for sea-farers-international conference of 1978 and modifications under STCW 1995 and 2010. Knowledge of relevant international maritime law embodied in international agreements and applicable conventions. Requirements and responsibilities under Safety of Life at Sea Convention, 1974; Load Lines Convention, 1966 and Standards of Training, Certification & Watch keeping Convention, 1978. Surveys and audits, certification and their validity. Certificates and other documents that are required to be on board ships. - 6 hrs

International Conventions, as amended from time to time:

Safety of Life at Sea Convention, 1974; Load Lines Convention, 1966; Tonnage Convention, 1969; Standards of Training, Certification & Watch keeping Convention, 1978; Responsibilities under the relevant requirements of the International Convention for the safety of life at sea

1. Brief description of International Convention for the safety of life at sea 2. Obligation to carry out surveys and maintain validity of certificates 3. Obligation to maintain records 4. Obligation and rights of master

***A. Pollution related* – Marine environment:**

Marine environmental awareness; marine ecology, seas and coastal areas; discharges to sea and their environmental impact; accidental & operational discharges; emissions to air from ships; other pollutants; proactive measures to control pollution and maintain environment.

Precaution to be taken to prevent pollution of the Marine environment:

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 other specialized ships. MARPOL, 73/78 (all Annexes, equipment requirements and their operations, documentation, including necessary record books); Ballast Water Management Convention, 2004; Antifouling Convention, 2001; National legislations of other countries like Oil Pollution Act, 1990.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.

Requirements and responsibilities under MARPOL, 73/78 (all Annexes, equipment requirements and their operations, documentation, including necessary record books); Ballast Water Management Convention, 2004; Antifouling Convention, 2001; National legislations of other countries like Oil Pollution Act, 1990.

Environmental impact of accidental & operational discharges; emissions to air from ships; other pollutants; proactive measures to control pollution and maintain environment.

Emergency situations; actions to be taken for protecting and safeguarding environment. - 14 hrs

a.Security related – Security awareness; identification of security threats; security related duties; ISPS Code and its requirements - ship security plan; levels of security; controlling measures; drills & exercises; documentation; audits and certification.

b.Liability related – Concept of Liability & Compensation as related to Marine Pollution.

c.ISM Code and its requirements - Safety management system, Documentation and Certification.

d.*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. - 10 hrs

Other aspects:

a.International Organizations – International Maritime Organization (IMO) and its functions; International Labour Organization (ILO) and Maritime Labour Convention, 2006.

b.Classification Societies – Classification; role of societies; surveys and certification; International Association of Classification Societies.

International health regulations; Understands practical applications of medical guides; Understands process of radio medical advice; Demonstrates knowledge of actions to be taken in case of accidents or illnesses that are likely to occur on board ships.

Knowledge of Relevant International Maritime Law Embodied In International Agreements and Conventions

1. United Nations Convention on the Law of Sea (UNCLOS) 2. Treaties, conventions, protocols, rules and regulations 3. International Maritime Organisation (IMO) 4. List of IMO Conventions 5. Introduction to International Labour Organisation (ILO) 6. World Health Organisation (WHO) 7. Authorities & Regulations

Certificates and other documents to be carried on board ships by International Conventions, how they may be obtained and period of their legal validity

1. List of Certificates and documents to be carried on board ships as per SOLAS Annex 1, how they are obtained and their period of validity

2. Additional certificates and documents required on board ships

Maritime Declarations of Health and the requirements of the International Health Regulations

1. WHO's International Health Regulations 2005 (IHR) 2. International Medical Guide for ships (IMGS)

3. IMO's Medical First Aid Guide (MFAG) 4. WHO's Guidelines for drinking water quality

Responsibilities under International Instruments Affecting the Safety of the Ships, Passengers, Crew or Cargo

1. ILO's Maritime Labour Convention 2006 (MLC 2006) 2. Convention on the International Regulation for Preventing Collisions at Sea (COLREG) 1972 3. International Convention on Salvage 1989; Lloyd's Standard Form of Salvage Agreement (LOF 2000) 4. Convention on Limitation of Liability of Maritime Claims 1976 5. International Convention for the Unification of certain Rules of Law relating to Bills of Lading (Hague-Visby Rules) 6. Charter parties 7. Marine Insurance, General Average and P & I Club

Methods and Aids to Prevent Pollution of the Environment by Ships

1. List of Conventions – Refer to 4.2.1.4 2. Sources of Marine Pollution 3. Effects of Marine oil spills

4. Regulations for prevention of oil pollution as per Annex I of MARPOL 73/78 5. Regulations for control of pollution from Noxious liquid substances carried in bulk as per Annex II of MARPOL 73/78 6. Regulations for the Prevention of Pollution by Harmful substances carried by sea in packaged form as per Annex III of MARPOL 73/78 7. Requirements covering the carriage of dangerous goods by sea as per Chapter VII of the SOLAS Convention 8. Regulations for the Prevention of Pollution by Sewage from Ships as per Annex IV of MARPOL 73/78 9. Regulations for the Prevention of Pollution by Garbage from Ships as per Annex V of MARPOL 73/78 10. Regulations for the Prevention of Air Pollution as per Annex VI of MARPOL 73/78 11. International Convention for the Control and Management of Ship's Ballast Water and Sediments 12. International Convention for the Control of Harmful Anti-Fouling Systems on Ships (AFS) 2001 13. Noise - 24 hrs

SEMESTER – 7

MARINE AUXILIARY MACHINERY – III (72 hrs)

Refrigeration: Principles of refrigeration, overview of refrigeration cycles, different refrigeration systems, classifications of refrigerators, uses of refrigeration at sea, cryogenic technology – definition, temperature range, insulation. - 4 hrs

Different refrigerants, chemicals formula, desire properties (general, physical, chemical, thermodynamic) comparison, effect on environment, Montreal protocol, new refrigerants. - 4 hrs

Design and construction of various components of refrigeration plants, i.e. compressor, condenser, evaporator, expansion valves, control and safety equipments. - 6 hrs

Operation and maintenance of refrigeration plants, control of temperature in different chambers, charging of refrigerant / oil, purging of air, defrosting methods, trouble shooting. - 6 hrs

Refrigeration of cargo holds, brine system and its operation & maintenance, methods of air circulation in holds, insulting materials, insulation, micro-organism, dead and live cargo, factors affecting refrigerated cargo, container ship refrigeration, preparation for loading cargo, survey of refrigeration equipments. - 6 hrs

Heat load calculation on refrigeration and conditioning plant. - 2 hrs

Air conditioning: Necessity on board ships, different systems, control of room air temperature, humidity, noise, dust and purity. Construction of duct & diffuser, fans, ventilation of accommodation, fire safety balancing of system - 6 hrs

Ventilation: Ventilation of engine room, pump room, CO_2 and battery rooms, air change requirements, design considerations, maintenance. - 2 hrs

Noise and Vibrations: Elements of aerodynamics and hydrodynamics sound, Noise sources on ships and noise suppression techniques, Noise level measurement. Various modes of vibration in a ship (i.e. free, forced, transverse, axial, torsional – Their sources and effects), resonance and critical speed, structure borne, and air borne vibration, anti vibration mountings of machineries, De-turners, dampers with reference to torsional vibrations dampers use of torsiographs. - 10 hrs

Fuels: Source of supply, Study of primary fuels, coal, petroleum, Natural gas, classification of fuels. Treatment of fuels for combustion in marine I.C.E. and steam plans. Residual fuels, emulsified fuels, merits and demerits of such fuel in marine engines. - 8 hrs

Lubrication: Theories of Lubrication, Types of lubricants and their properties suitability of lubricants for various uses: solid and fluid lubricants. Additive oils and their specific use. Terminology used in lubrication systems. Loading pattern of various bearing in marine use and lubrication system adopted. Different types of bearings used for marine machineries. L.O. analysis & monitoring engine through report. -18 hrs

SEMESTER – 7

MARINE ELECTRICAL TECHNOLOGY - II (54 hrs)

Internal communication systems:

Operation of all internal communication systems on board and maintain Statutory communication Records.

The systems would include ship's telephone system, communication system between engine room and wheel house, two-way communication system and public address systems. Operation and maintenance at respective control station for all alarms and indicators. Record keeping of all communication systems. -14hrs

Maintenance and repair of electrical and electronic equipment: Safety requirements for working on ship board electrical systems, including isolation of all electrical plants and equipment required before personnel are permitted to work on such plant and equipment. - 6 hrs

Maintenance and repair - Principles of Maintenance, Generator, Switchboard, Electrical Motors, Starters, Distribution System – Transformer, Distribution, Cables, D.C Electrical Systems and Equipment – Battery system, Remote automatic control equipment.
Detection of electric malfunction and measures to prevent damage - Essential requirements for Fault Protection, Fault Location.

- 8 hrs

Special Electrical practice: Rules and regulations & operation of electro-hydraulic & electric steering gear, Diesel-electric and turbo electric propulsion system, pod / Azipod drive unit, superconductivity applied in propulsion, turbo alternator, 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. -14 hrs

Safe Electrical practice; Safe watch-keeping, points to check on electrical machineries, switch gears & equipments, microprocessor control and maintenance electrical fire fighting, precaution against electric shock and related hazards. -12 hrs.

SEMESTER – 7

ELECTIVE* (ONE ELECTIVE TO BE CHOSEN FROM THE GIVEN LIST OF ELECTIVES) (54 hrs)

ELECTIVE 1- DOUBLE HULL TANK VESSELS

Origin of double hull ships, their usefulness and superiority over conventional single skin ships, use of double hull tank ships for transport of different types of commodities, prevention of oil-spill and pollution of sea, IMO requirements, schedule for phasing out single hull tank vessels of different sizes.

Design considerations, main dimension, hull-weight estimate, double hull requirements, minimum depth of double bottom tank, wing tank width, clearance for inspection etc. maximum cargo tank size, capacity, effect of free surface, damage stability, hydrostatically balanced loading, sloshing loads, its elimination or minimization.

Structural design, non-uniform and uniform stress distribution, unidirectional (longitudinal) structural members, elimination of transverse structural members (except transverse bulkheads), minimization of structural discontinuities and stress concentration zones, use of steel of higher strength, resistance to grounding and collision, classification society requirements, access to inside and bottom spaces.

Cargo handling system, use of submerged pumps, ordinary pumps of new independent pumps, cargo transfer system, assurance of quality of cargo of oil, complete elimination of risk of admixture of different grades of oil, concealed pipe lines, easy maintenance, inspection and cleaning, elimination of explosion risks.

Economic aspects, fast loading discharging of oil cargo, quicker cleaning, ballasting and deballasting, larger number of trips per year.

SEMESTER – 7

ELECTIVE 2 - ADVANCED MARINE HEAT ENGINES (CO-CYCLES)

Complex Heat Engine Plants;

Combined Steam Turbine and Diesel Engine Cycles. Combined steam turbine and gas turbine cycles. Combined gas turbine and diesel engine cycles / plants. Different methods of improving the overall thermal efficiency of the entire plant. Design of the most optimum condition and combination of complex plants. Cascade refrigeration plants. Free piston gas generators.

Turbo Blowers and Turbo Compressors:

Compressor Characteristics for Axial flow compressor and centrifugal compressors. Stalling of compressors. Turbine characteristics. Matching of components like compressor and turbine. Performance of different unit sin combination in single shaft arrangement.

Combustion and Flam stabilization:

Combustion of liquid fuels, atomization, mixing, combustion curve an different method of flame stabilization, Design & combustion chamber. Spray of fuel. Pre-mixing of gaseous fuels for combustion. Stability of the flame.

Design of different types of compact heat exchangers for different applications, e.g. air pre-heater, gas and oil heaters etc.

SEMESTER – 7

ELECTIVE 3 - ADVANCED HYDRAULICS

Hydraulic Transmission of Power

Hydraulic Motors, Valves, types of hydrostatic drives. Types of hydraulic transmission systems-multimotor open-circuit systems and closed-circuit systems and closed-circuit systems. applications of hydraulic transmission. Advantages and disadvantages of Hydrostatic transmission.

Rotodynamic Transmission

Hydraulic Coupling, Torque converter and characteristics of hydraulic coupling and torque converter. Linear transmission of hydraulic power. Circuit for devices like hydraulic press, jack, accumulator, intensifier and hydraulic lift.

Fluid Power

Introduction, Applications of control systems. control signals hydraulic servo mechanisms. Servo valves, valve operated servo mechanisms and pump controlled servo mechanisms.

Fluidics

Introduction and definition. Terms used in fluidics, efficiency of a fluidic device. Digital devices and analog devices.

SEMESTER – 7

ELECTIVE 4 - RENEWABLE ENERGY SOURCES & APPLICATIONS

Principles of Renewable Energy:

Introduction Fundamentals Scientific principles of Renewable energy. Technical implications. Social implications.

Solar Radiation:

- Introduction. Extra terrestrial solar radiation. Components of Radiation. Geometry of earth & sun. Geometry of the collector solar beam.
- Effects of eastern atmosphere measurement
- Estimation of solar radiation problems

Solar heating:

Introduction; Heat Balance; Unsheltered & sheltered heaters, systems with separate storage. Selective surfaces. Evacuated collectors. Use of solar heat. Air heater. Space heating & cooling water desalination. Solar ponds. Solar concentrators electrical power systems problems

Photo Voltaic Generation:

Silicon P-N junction photo absorption solar radiation input photo voltaic circuit properties & loads, limit to cell efficiency. Solar cell construction. Types & adaptation of photo voltaic. Other types of photo voltaics & thermoelectric generation. Problems.

Wind Power:

Introduction. Turbine types & terms. Linear momentum & basic theory. Dynamic matching. Stream tube theory. Characteristics of the wind. Power extraction by a turbine, electricity generation. Mechanical power. Total systems. problems.

Wave Energy:

Tidal Power:

Introduction: The cause of tides. Enhancement of Tides. Tidal flow power. Tidal Range power. World Range power sites problems.

Ocean Thermal Energy Conversion:

Principles, heat Exchangers, pumping requirements, Other practical considerations, problems, Hydro power & Geothermal, Energy.

Brief Review & Description

Energy storage & Distribution:

Importance of Energy Storage & Distribution, Biological Storage. Chemical Storage, Heat Storage, Electrical Storage, Fuel cells, Mechanical storage, distribution of Energy problems.

Biomass

Principles of using Biomass. Availability

Economics

Bio-fuels

Introduction. Bio-fuel classification, thermo-chemical, Bio-chemical, Agro-chemical

Biomass production for energy farming, Energy farming-advantages & disadvantages. Geographical distribution. Crop yield, Energy analysis. Direct combustion for heat. Domestic cooling & heating, crop drying. Process heat & electricity.

Pyrolysis. Solid, Liquid, Gases

Hydrogen Reduction. Acid & enzyme hydrolysis. Conversion of oil (coco) TO Ester. Methanol liquid Alcoholic fermentation. Directly from sugar cane sugar beet. Starch crops. Cellulose. Ethanol fuel use. Ethanol production.

Anaerobic digestion for biogas-basic process & energetic digester sizing. Working digesters. Agrochemical fuel extraction – advantages & disadvantages.

SEMESTER – 7

ELECTIVE 5 - ADVANCED FLUID MECHANICS

Hydraulic Transmission of Power:
Hydraulic pumps:

Gear, Screw, Vane pumps of fixed and variable displacement types, Axial piston pumps of fixed and variable displacement types, swash plate and Bent Axis design; Radial piston pump.

Hydraulic Accumulators:

Various types weight, spring or gas pressure loaded, different principles – piston, bladder of diaphragm type. Change of condition of the fluid in a loaded accumulator – Adiabatic, Isothermic, Polytropic. Flow graph, sizing, pressure setting and the economics.

Hydraulic Rotary Motors:

Fixed or variable displacement type, axial piston unit. Of Swash plate and bent axis design, fixed displacement axial piston unit of wobble plate design, vane type.

Rotodyne Transmission

Fluid Coupling, Hydraulic Torque converter and their characteristics, Hydraulic Rotary Actuator of parallel piston type and piston type with rack-pinion, crank lever mechanism.

SEMESTER – 7

ELECTIVE 6 - FLUID CIRCUITS & CONTROL

Introduction – Historical Background

System components and functions: Valves, tank, flexible hose, piping and fittings. Seal and packing, actuators, pipe couplings, assembly of different hydraulic components without using piping, e.g. Vertical/Horizontal stacking, manifold block etc. Different types of filters, instrument sand control elements, e.g. float switch, thermostat, pressure switch, etc. Different valves for pressure control, velocity and discharge control direction control etc. symbols of components along with various hydraulic terms.

Different control systems, hydraulic and pneumatic systems, typical circuit for a pump set, advantages of fluid circuit.

Fluid hydraulic and p0neumatic control: properties of liquids for hydraulic control hydraulic reservoir, properties of air for pneumatic control, reservoir for compressed gases and compressed air, compressibility and inertia loading, hydraulic stiffness, system natural frequency and allied problems.

Fluid power units: Pumps, compressors and blowers, positive displacement pumps; reciprocating pump, gear pump, vane pump screw pump, rotary piston pump; Pressure accumulators and intensifiers.

System Circuits – Linear circuits, regenerative circuits, accumulator circuits, intensifier circuits.

Open loop and closed loop systems, block diagram, application of Laplace transform, transfer function, characteristic equation different physical systems of first order and second order, spring mass damper systems liquid levels systems, thermal systems etc. systems of nth order

Stability of a system – Root locus methods, Routh criterion. Fluid logic and control systems.

Application of hydraulic control in machine tools and other devices.

Hydraulic systems – Hydraulic press, Hydraulic crane, hydraulic life, hydraulic riveter etc. Hydraulic systems – Fluid coupling and fluid torque converter.

SEMESTER – 7

ELECTIVE 7 - ELECTROMAGNETIC INTERFERENCE (EMI) AND ELECTROMAGNETIC COMPATIBILITY (EMC)

Introduction to causes of EMI
Sources of conducted interference and its characteristics

(a) Non-Functional sources (b) Functional sources of EMI Characteristics of interference.
(b) (a) Bandwidth (b) Amplitude behaviour (c) Waveform (d) Occurrence

Design practice for minimizing conducted interference.
Sources of Radiated interference and its characteristics nature of sources of radiated interference.
(a) Non-functional sources (b) Functional sources (c) Electromagnetic pulse (d) Design practices

Interference coupling by conduction and radiation
(a) Coupling via conducted path (b) Radiation coupling (c) Design Practice

Grounding and Bonding Shielding
(a) Cable and connector shielding

Filtering
(a) Filter Design (b) Transient suppression (c) Power Line Filters (d) Materials and special devices

Mathematical Model
(a) Source Model (b) Coupling Model (c) Suscepter Model

EMC Specification
(a) Military standards and specification (b) Industrial and Government specification

EMC test plans and procedures
(a) Measurement methods for field strength and for conducted interference.

SEMESTER – 7

MECHANICAL LABORATORY (54 hrs)

To measure circular and linear displacements of cam and follower in case of

a. Plate cam-reciprocating follower
b. Tangent cam-with roller oscillating follower and plot the displacement curves hence differentiate the velocity and accelerating curves.

To find the co-efficient of friction both for flat belt and V-belt with belt friction apparatus and hence find the slip.

Centrifugal clutch to demonstrate the process of power parameters of the Hartnell governor.

i. Rotating masses
ii. Spring rate
iii. Initial Spring Compression

Note the effects of varying the mass of the centre sleeve of the Porter Governor and compare the same with that of proell governor.

To determine the characteristic curves of sleeve position against speed of rotation in case of:

i. Hartnell Governor
ii. Porter Governor and
iii. Proell Governor

To determine the moment of inertia of different bodies by the Trifilar suspension by experiment and by calculation.

Experiments related to vibrations:

The following experiments in vibrations are performed with VIBLAB APPARATUS:

To verify the relation T + 2□ $\sqrt{1/g}$ in case of a simple pendulum and to plot the graph T^2 vs. L.

To verify the relation T = 2 □ $\sqrt{\frac{K_2 + OG_2}{g.OG}}$ in case of a compound

Pendulum and find the radius of gyration and equivalent length of compound pendulum.

To determine the method of Torsional Oscillation, the radius of gyration of a body, about the centre of gravity by using the relation.

$T = 2\pi \sqrt{\frac{K}{a} \frac{L}{g}}$

To verify the relation, $T = 2\pi \sqrt{\frac{W}{kg}}$ and plot a graph T_2 Vs W

Study of undamped natural vibrations of a beam pivoted at one end supported by tension at the other end.

To find out the natural frequency of a beam with and without load and to verify the Dunkerley's Rule.

Study of forced vibrations for various amounts of damping of beam pivoted at one end and supported by tension spring at the other end and top plot a graph of amplitude factor Vs frequency ratio (LONG VIB).

To study the force vibrations for various amounts of damping and to plot a graph of amplitude factor Vs frequency ratio (Lat. Vib)

experimentally $T = 2\pi \sqrt{\frac{L}{Kt}}$ and study

the relationship between the periodical time and shaft length.

FLUID MECHANICS LABORATORY

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 the various orifices.
4. To determine the friction co-efficient for the flow of water through a pipe.
5. To determine 'GM' (Metacentric Height) of a floating body.
6. To determine the co-efficient of discharge through the various notches.
7. Board of impellers of pumps for practical demonstration specially required for design work.

SEMESTER 7

TECHNICAL PAPER & PROJECT (108 HRS)

Topic for technical paper and project shall be allocated basing on the curriculum.

SEMESTER – 7

CONTROL & SIMULATOR LABORATORY (54 hrs)

Simulator Lab Experiments

- Description of basic engine functions and their simulations introduced in Auto-Chief-II system of Nor-Control.
- Manual method of engine operation from engine room station.
- Engine operator form Remote stations i.e. control room and navigation bridge.
- Safety and interlocks in UMS-ships and effect of malfunction of main engine auxiliaries.
- Electronic logic circuits in remote control stations.
- Simulation of engine functions in logic circuits.
- Study and adjustments of logic circuits for remote control operation of main engine and trouble shooting.
- Interfacing Input/Output interfacing and pneumatic Interfacing in the system.

Control Lab. Experiments

- Operation of Automatic viscosity controller and maintaining a specific viscosity of a given fuel.
- Operation of an Automatic flow controller and measuring the flow from in a given pipe.
- Operation and utility of a 3 Term (P + I + D) Pneumatic controller.
- To study the functioning of a mist Detector and checking the alarm when the pre-set value is exceeded.
- Study the operation of fire detection unit using ionization chamber type detector.
- Study of CNC & VMC machines, microprocessor controlled DC & AC machines, SCADA.

SEMESTER – 7

WORKSHOP (SHIP – IN – CAMPUS) (54 hrs)

As per the contents of Trainee Assessment Record (TAR) book as issued by the D G Shipping.

SEMESTER – 8

Shipyard training (432 hrs)

Student shall under practical marine engineering training linked to Shipyard / Ship-in-campus

SEMESTER – 8

CONTROL & SIMULATOR LABORATORY (108 hrs)

Relevant to the curriculum

SEMESTER – 8
VIVA – VOCE

A grand overall viva-voce covering various important aspects of the discipline shall be conducted.