SEMESTER - III

UG11P3301	ELECTRONICS LABORATORY	54 HRS

1. To study the frequency response of a RC coupled amplifier.
2. To study Transistor bias stability.
3. To study Transistor feedback amplifier.
4. Constructing a voltage regulator at given circuit parameter & study its response at no load & loaded condition.
5. To study integrated circuit OP-AMP. (Adder, Sub tractor, integrating, differentiating , inverting, non-inverting)
6. To study 555 timer circuit application (Multivibrator and signal generator)
7. To study 1^{st} order and 2^{nd} order filter using OP-AMP.
8. Determination of V-I characteristics of a JFET.
9. To study V-I characteristics of SCR.
10. To study speed control of a DC Motor Using SCR.
11. To Study Amplitude Modulation of a given modulating & modulated signal specification. Also determine Modulation Index.
12. To Study Frequency Modulation of a given modulating & modulated signal specification. Also determine Modulation Index
13. To study wave nature of pulse code modulation.

SEMESTER – III

UG11P3302	HEAT AND CHEMICAL LABORATORY	54 HRS

BOILER CHEMISTRY:

1. To determine hardness content of the sample of boiler water in P.P.M. in terms of $CaCO_3$
2. To determine Chloride Content of the sample of water in P.P.M. in terms of $CaCO_3$

3. To determine Alkalinity due to Phenolphthaline, 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 given sample of water
7. To determine Ph-value of the given sample of water.
8. To determine total-dissolved solids, turbidity of a sample of water.
9. To determine Hydrazine content of boiler water.
10. Boiler water tests using kits as found in latest types of ships.
11. Study sludges & scale deposit – silica, volatile & non-volatile suspended matter.

FUEL AND LUBRICANT CHEMISTRY:

1. To determine Absolute Viscosity and Kinematic Viscosity of Heavy oil, Diesel oil, Fresh Lubricating Oil & Used Lubricating oil by Red Wood Viscometer.
2. To determine the Flash Point of a given sample of Fuel & Lubricating oil.
3. To determine water content of used Lubricating oil.
4. Conduct spot test for L.O and analyse result.
5. To determine the percentage of CO2, CO and Oxygen in the flue gases.
6. To determine the Calorific value of the fuel with the help of a Bomb Calorimeter.

HEAT TRANSFER EXPERIMENTS:

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 Forced Convection.

SEMESTER III

UG11P3303	WORKSHOP PRACTICALS – III	54 HRS

1. Study of Workshop layout.
2. Steam & Exhaust Line Tracing.
3. Feed & condensate Line Tracing for the Steam Engine Plant.
4. Tracing of Cooling Water, Fuel oil, Lube oil and Air Starting lines for Auxiliary Engine.
5. Smoke tube Boiler Familiarization.
6. Globe valve overhauling
7. Sluice valve overhauling
8. Quick Closing Valve Overhaul.
9. Reducing Valve Overhaul.
10. 2 Way / 3 Way Cock Overhaul.
11. Shaft Key Making.
12. Thread cutting by Taps & Die.
13. Thread cutting by Lathe machine
14. Other important "Jobs" that may be introduced as per current trend, to keep student abreast with latest technology.

SEMESTER III

UG11T3301	COMPUTATIONAL MATHEMATICS	54 HRS

OBJECTIVE: *To impart the knowledge to the students, on various computational methods.*

Sampling Theory:

Population and Sample, Sampling with and without replacement, Random Samples, Population Parameters, Sample Statistics, Sample Mean, Sampling distribution of means, Sample variance, mean, variance and moments for grouped data.

6 Hrs

Curve Fitting, Regression and Correlation:

Curve fitting, Method of least squares, The least squares line, Least square line in terms of sample variance and covariance, Regression lines, Regression coefficients, The least square parabola, Multiple regression, Standard error of estimate, Linear correlation coefficient, Probabilistic interpretations of regression and correlation

12 Hrs

Digital Mathematics:

Binary codes: Weighted and Non weighted Binary codes, Error detecting codes, Error correcting codes, Alphanumeric codes. Basic logic gates: AND, OR, NOT gates, combining logic gates, NAND, NOR, Exclusive-OR, Exclusive-NOR gates, converting gates with inverters.

2 Hrs

Logic Circuits:

Sum-of-Products Boolean expressions, Product-of-Sums Boolean expressions, use of De Morgan's Theorems, use of NAND logic, USE OF NOR logic Numerical Analysis.

4 Hrs

The Calculus of Finite Differences:

Differences of a function, Fundamental operators of the calculus of Finite Differences, Algebra of Finite Difference operators, Fundamental equations satisfied by Finite Difference operators, Difference tables, Derivative of a tabulated function, Integral of a tabulated function, Summation formula, Difference equation with constant coefficients, Applications to oscillations of a chain of particles connected by strings and an electrical line with discontinuous leaks, Interpolation formulae, Newton's divided difference formula, Lagrange Interpolation formula, Forward and backward Gregory-Newton interpolation formulae, Stirling interpolation formula. Numerical integration by various methods (Trapezoidal Rule, Simpson's Rule etc.), Linear difference equation with constant coefficients. 14 Hrs

Numerical Solution of First Order Differential Equation:

Taylor's method, Picard's method, Ranga-Kutta method, Newton-Raphson method and Regula Falsi method
6 Hrs

Computing:

Design of efficient algorithms for problems like-factorial of a positive integer, Fibonacci Sequence generation, sin x, cos x, e^x series summation Linear search problem, Bubble sort Problem, Merging Problem, Calculation of computational complexity.
10 Hrs

REFERENCE BOOKS:

1. Numerical Methods for Engineering & Scientific Computation – by Jain , M. K. Iyanger, S. R. K. Jain
2. Numerical Methods for Engineers – By Chapra S. C., Canale R. P.
3. GREWAL, B. S. Higher Engineering Mathematics, Khanna Publishers, Delhi.
4. Engineering Mathematics – N P Bali and Narayan Iyengar, N.C.H.S., Laxmi Publications Pvt. Ltd, New Delhi

SEMESTER III

UG11T3302	**ANALOG ELECTRONICS AND COMMUNICATION**	**54 HRS**

OBJECTIVE: *The course is designed for the basic understanding of Analog Electronics and Communication*

Transistors: Low and high frequency Response, Response of Transistor Amplifiers, Effect of negative & positive feedback in transistor amplifier, JFET & MOSFETS, UJT **(**its basic characteristics and biasing), CMOS devices and applications

8 Hrs.

Transistor Power Amplifier: Design theory, Basic Complementary symmetry. Practical complementary push-pull amplifier, Phase inverter Relation between Maximum Output power and load resistance and Transistor dissipation.

5 Hrs

Signal Generators (operating principles, applications) and Oscillators: Requirements for Oscillations, phase shift Oscillator, Wien Bridge Oscillator, Crystal Oscillators, Decoupling Filters, signal generators.

6 Hrs.

Wave Shaping and Switching: Clipping, Clamping, time base or Sweep Generator, Multivibrators & Schmitt Triggers. 4 Hrs.

Operational Amplifier and 555 Timer: Concept of Differential Amplifiers. Its use in OP-AMPS. Linear OP-amp circuits, IC555 and its application (Multivibrator).

13 Hrs.

Industrial Electronics: Power rectification, Silicon Control Rectifier (power control),

Insulated Gate Bipolar Transistor (IGBT), Photo-Electric Devices, Invertors.

4 Hrs.

Communication: Modulation, Demodulation, AM/FM/PM, Wireless communication, Radio Transmitters and Receivers, T-V, Radar, Pulse Communication. Telecommunication system and services.

14 Hrs.

REFERENCE BOOKS:

1. Electronic Devices & Circuit Theory – Robert L.Boylestad, Louis Nachelsky
2. Integrated Electronics – Millman, Halkias
3. Hand Book of Electronics - Kumar V, S I Gupta
4. Electronic Communication – Dennis Roddy, John Coolen
5. Communication Systems – Simon Haykin.

SEMESTER III

UG11T3303	APPLIED THERMODYNAMICS - II	72HRS

OBJECTIVE: *To impart Applied Thermodynamics knowledge to the students. At the end of the course, the student should get complete knowledge on Heat Transfer and its Applications.*

Fuels, Combustion and Dissociation: Definition of fuel, combustion. Combustion equation, analysis of the products of combustion, stoichiometric combustion, actual combustion, excess air, mixture strength, dissociation. Theoretical and Actual Combustion Processes, Effect of dissociation on IC Engines, Enthalpy of Formation and Enthalpy of Combustion, First law analysis, adiabatic flame temperature, entropy change. 14 Hrs

Compressible Flow: One dimensional steady flow of compressible fluids, Stagnation properties, Speed of sound and Mach number, Isentropic flow, Effect of friction, Flow through nozzles and diffusers. Flow of Steam through nozzles and Diffusers. 16 Hrs

Heat Transfer: Basic concepts and review of thermodynamics of heat transfer, Heat transfer mechanisms, Conduction, Convection and Radiation. Simultaneous Heat transfer mechanisms. Steady, Transient Heat transfer, Heat generation, Multidimensional heat transfer, One dimensional heat conduction equation in large plane wall, long cylinder and sphere. Combined one dimensional heat conduction equation. Steady heat conduction in plane walls including multi-layered walls, Insulation. Fundamentals of convection, Fundamentals of Thermal radiation. 16 Hrs

Convection and Radiation: Physical mechanisms of convection, Boundary layer, Classification of fluid flows – Laminar and Turbulent flows. Forced convection and Natural convection. Importance and use of non-dimensional groups in heat transfer applications – Prandtl number, Nusselt Number, Reynolds Number, Stanton Number, Grashof Number, Graetz Number. Thermal

radiation, Black body radiation, Radiation intensity, Radiative properties. 14 Hrs

Heat Exchangers: Types of heat exchangers, Application of heat transfer in Marine Heat Exchangers like Coolers, Condensers, Heaters and Evaporators. The Overall heat transfer coefficient, Analysis of Heat Exchangers, LMTD Method, Sizing and Selection of Heat Exchangers 12 Hrs

REFERENCE BOOKS:

1. Heat and Mass Transfer : Fundamentals & Applications, Yunus A Cengel and Afshin J Ghajar
2. A Heat Transfer Textbook, J H Leinhard IV / J H Leinhard V
3. Fundamentals of Engineering Thermodynamics, MJ Moran, HN Shapiro, DD Boettner & MB Bailey
4. ASHRAE Hand Book, HVAC Fundamentals SI Units
5. Applied Thermodynamics for Engineering Technologists, T D Eastop and A McConkey
6. Basic and Applied Thermodynamics, P K Nag
7. Steam : Its generation and use, Babcock & Wilcox Company

SEMESTER III

UG11T3304	STRENGTH OF MATERIALS-II	72 HRS

OBJECTIVE: *To impart knowledge about principal stress, deflection of Beams design of shafts and thick cylinder in the field of strength of materials.*

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. 12 Hrs

Deflection of Beams: Strain energy due to bending. Application of impact. Deflection by integration, Macaulay's Method. Moment area Methods of deflection co-efficients. Deflection due to shear, Deflection by graphical method. Applied problems. 15 Hrs

Built-in and Continuous Beams: Moment-area method, built-in beam with central concentrated load, built-in beam with uniformly distributed load, with load not at center, Macaulay's method,

Continuous beam, Claperyrons three moment theorem. Applied problems.
15 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. 10 Hrs

REFERENCE BOOKS:

1. Strength of Materials — G. H. Ryder
2. Strength of Materials — Stephen Timoshenko
3. Strength of Materials — R. K. Rajput

SEMESTER III

UG11T3305	MECHANICS OF MACHINES-I	54 HRS

OBJECTIVE: *To impart the knowledge of velocity and acceleration of various kinematic linkages, cam profiles for different cam followers, various parameters of gears and gear trains.*

Turning Moment and 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. 7 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 linked connecting rods, Effect of friction. 7 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.

Analytical design procedure for cams with Straight flank, Curved flank, Circular flank with various types of followers Spring force and Reaction Torque. In-line cams and off center cams. 13 Hrs

Spur Gearing: Various definition e.g. p.c.d., profile of gear teeth, module, path of contact, velocity of sliding, Interference, Gear ratio and center distance of simple and compound gear trains. 8 Hrs

Toothed Gearing: Types of gears, Transmission of power by gear trains on parallel shafts; Rack and pinion, Bevel gears, Worm and Worm wheel, Spur gear, Helical gears, Spiral gears;

Double helical gears, cross-axis helical gears. Different types of gear train, Epicyclic gear trains, Torque on gear trains, acceleration of gear trains.

Conditions for constant velocity ratio; methods of avoiding interference. 12 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, reaction on gearbox bearings & other bearings . 7 Hrs

REFERENCE BOOKS:

1. Advanced Mechanics of Machines - J. Hannah & R.C. Stephens
2. Theory of Machines – P. L. Ballaney
3. Engineering Mechanics – S. Timoshenko & D. H. Young

SEMESTER – III

UG11T3306	ELECTRICAL MACHINES -I	72 HRS

OBJECTIVE: *To expose the students to the concepts of electrical D.C. machines, transformers and distribution system.*

Fundamentals of DC Machines: Electromechanical Energy Conversion Principle, DC machines- Principle of working, construction, winding, EMF and Torque equation, Armature reaction, commutation, brush shift, compensating winding, Circuit model of DC Machines. 8 Hrs

DC Generators: Characteristics of DC Generators, Performance equations, Methods of Excitations, Parallel Operation, Equalizer Bus-bar.
8 Hrs

DC Motors: Classification and Characteristics of DC Motors, Starting and Reversing, Speed-Torque equations, Starters, Speed control including electronic method of control. Braking of D.C. Motor.

8 Hrs

Testing of DC Machines: Testing of DC Machines for finding out losses and efficiency. 4 Hrs

Distribution Systems: D.C. and A.C. transmission and distribution - Two wire and Three wire DC system, Use of balancer, AC transmission single phase and three phase, Three wire and Four wire distribution, comparison of DC and AC transmission, effect of voltage drop, Copper loss reduction under different systems, single and double fed distributors, Fuses, DC air circuit breaker, AC air and oil circuit breakers. HV & LV switchgears.
10 Hrs

TRANSFORMERS:

Construction of Transformers: Core Material, Transformer windings, Insulations, Leads & Terminals, Bushings, Tap Changers, Transformer Tank, Transformer oil. 6 Hrs

Principles of Transformer Operation: Principle of Transformer operation, Ideal two-winding transformer, Concept of Phasor, Phasor diagram of a transformer (no load & on load), Rating of transformers, Equivalent circuit of a transformer, Determination of parameters by tests (Open circuit & Short circuit), Voltage regulation, Per-Unit calculation, Transformer losses & Efficiency, All-day efficiency and Cooling methods of transformer.

16 Hrs

Transformer Connections and Operation: Transformer Polarity, Sumpner's test, Auto Transformers, Parallel Operation of Transformers, Load sharing, Current and Potential Transformers, Tap Changers on Transformers. 8 Hrs

Three-Phase Transformer: Construction, Different types of Connections, Phase conversion.

4Hrs

REFERENCE BOOKS:

1. Hughes Electrical & Electronic Technology – Revised by I McKenzie Smith
2. "Electricity applied to Marine Engineering" – W.Laws
3. Dr. P. S. Bimbhra: "Electrical Machinery", Khanna Publishers.
4. D. P. Kothari & I. J. Nagrath: "Electric Machines", Tata McGraw Hill.
5. Smarajit Ghosh, "Electrical Machines", Person Publications.
6. P. K. Mukherjee & S. Chakraborty: "Electrical Machines", Dhanpat Rai Publications
7. B. L. Theraja & A. K. Theraja: "Electrical Technology", S Chand.
8. S. K. Sen: "Electrical Machines", Khanna Publishers.
9. Parker Smith: "Problems in Electrical Engineering", CBS Publishers & Distributors.
10. V. K. Mehta & Rohit Mehta: "Principles of Power System", S. Chand.
11. Dr. S. L. Uppal: "Electrical Power", Khanna Publishers.

SEMESTER III

UG11T3307	MARINE ENGINEERING DRAWING	72 HRS

OBJECTIVE: *To impart training to students how to draw assembly drawing of various marine machinery components.*

Machinery Components Drawing : Drawing of complete machine components in assembly (Orthographic to Orthographic and isometric to Orthographic) with details like couplings, Glands, Return and non-return valves, cocks & plugs, interpretation of machinery drawings and handbooks marine engineering drawing and design. The interpretation of piping, hydraulic and pneumatic diagrams.

36 Hrs

Marine Machinery Components and Assembly Drawings : Assembly Drawings of marine components in Orthographic projection from Isometric views e,g, Bilge Suction Strainer Boxes, Ship's Side Discharge Valve Chest, Cylinder Relief Valve, Control Valve, Oil Fuel Strainer, Parallel Slide Stop Valve, Ballast Chest for Water, Feed Check Valve, Gear Pump, Control Valves, Boiler Blow-down valves, Diesel Engines' Rocker arms, cylinder liner, connecting rod with bearings, Boiler Full bore safety valve, Hydraulic Exhaust Valve with air spring, Air Inlet Valve, Automatic Valve. (Minimum of 9 drawings to be completed in the class. Remaining drawings to be given as home assignment).

36 Hrs

(Sample list drawings para 17 DGS Annex-II).

REFERENCE BOOKS:

1. MacGIBBON'S Pictorial Drawing Book for Marine Engineers - H. Barr & J.G. Holburn

2. Reeds Engineering Drawing for Marine Engineers - Volume II - H. G. Beck