

ANNA UNIVERSITY TIRUCHIRAPPALLI**Tiruchirappalli – 620 024****Regulations 2008****Curriculum****B.E. MARINE ENGINEERING****SEMESTER III**

S.No.	Subject Code	Subject	L	T	P	C
Theory						
1	MA1201	Transforms and Partial Differential Equations	3	1	0	4
2	MV1201	Marine Hydraulics and Fluid Machinery	3	0	0	3
3	MV1202	Seamanship, Elementary Navigation and Survival at Sea	3	0	0	3
4	ME1206	Manufacturing Technology	3	0	0	3
5	MV1203	Marine Electrical Machines I	3	0	0	3
6	MV1204	Marine Refrigeration and Air Conditioning	3	0	0	3
7	MV1205	Marine Machinery Drawing	1	0	4	3
Practical						
8	MV1206	Marine Hydraulics and Fluid Machinery Lab	0	0	3	2
9	ME1207	Welding Techniques, Lathe and Special Machine Shop	0	0	6	3
Total						27

SEMESTER IV

S.No.	Subject Code	Subject	L	T	P	C
Theory						
1	MA1255	Mathematics Applied for Marine Engineering	3	0	0	3
2	CE1259	Strength of Materials	3	0	0	3
3	MV1251	Marine Diesel Engines I	3	0	0	3
4	MV1252	Marine Steam Engines	3	0	0	3
5	MV1253	Marine Electrical Machines II	3	0	0	3
6	ME1262	Mechanics of Machines I	3	0	0	3
7	MV1254	Marine Electronics	3	0	0	3
Practical						
8	CE1261	Strength of Materials and Applied Mechanics Laboratory	0	0	4	2
9	MV1255	Heat Engines and Boiler Chemistry Laboratory	0	0	4	2
Total						25

SEMESTER V

S.No.	Subject Code	Subject	L	T	P	C
Theory						
1	MV1301	Material Science and Metallurgy	3	1	0	4
2	MV1302	Marine Auxillary Machinery I	4	0	0	4
3	MV1303	Ship's Fire Fighting System And Safe Working Practices	4	0	0	4
4	MV1304	Naval Architecture I	3	1	0	4
5	MV1305	Ship Construction	4	0	0	4
6	ME1311	Mechanics of Machines II	3	1	0	4
Practical						
7	MV1306	Marine Engineering Design and Drawing	2	0	4	2
8	EC1314	Electrical Engineering Laboratory, Electronics Laboratory and Micro Processor Laboratory	0	0	4	2
9	EI1304	Measurements, Instrumentation and Refrigeration Laboratory	0	0	4	2
Total						30

SEMESTER VI

S.No.	Subject Code	Subject	L	T	P	C
Theory						
1	MV1351	Marine Workshop Practical and afloat training	8hrs per day – 6 days a week, 26 weeks – 10 C			

SEMESTER VII

S.No.	Subject Code	Subject	L	T	P	C
Theory						
1	MV1401	Marine Diesel Engines II	4	0	0	4
2	MV1402	Naval Architecture II	3	1	0	4
3	MV1403	Marine Electrical Technology	4	0	0	4
4	MV1404	Marine Machinery System and Marine Machinery Design	3	1	0	4
5	MV1405	Marine Auxillary Machinery II	4	0	0	4
6	MV1406	Ship's Advanced Fire Prevention and Control	4	0	0	4
7	E1****	Elective I	3	0	0	3
Practical						
8	MV1407	Fire Fighting, Controls and Simulator Laboratory	0	0	4	2
9	MV1408	Marine Propulsion and Auxillary Machineries overhauling Laboratory	0	0	6	2
10	HS1301	Communication and Soft Skills Laboratory	0	0	3	2
Total						33

SEMESTER VIII

S.No.	Subject Code	Subject	L	T	P	C
Theory						
1	HS1201	Environmental Science and Engineering	3	0	0	3
2	MV1451	Ship Operational Management and IMO Requirements	4	0	0	4
3	MV1452	Marine Boilers and Steam Engineering	4	0	0	4
4	MV1453	Marine Control Engineering and Automation	4	0	0	4
5	MV1454	Safe Watch Keeping and Class IV Preparation	4	0	0	4
6	E2****	Elective II	4	0	0	4
Practical						
7	MV1455	Project work, Technical Paper and Viva voce	0	0	12	6
Total						29

LIST OF ELECTIVES

ELECTIVES FOR VII SEMESTER

S.No.	Subject Code	Subject	L	T	P	C
1	MV1001	Tribology	3	0	0	3
2	MV1002	Non - Destructive Testing	3	0	0	3
3	MV1003	Finite – Element Techniques	3	0	0	3
4	GE1001	Intellectual Property Rights (IPR)	3	0	0	3
5	GE1002	Indian Constitution and Society	3	0	0	3

ELECTIVES FOR VIII SEMESTER

S.No.	Subject Code	Subject	L	T	P	C
1	MV1004	Maritime Economics	3	0	0	3
2	MV1005	Ship's Safety and Environmental Protection And Personnel Care	3	0	0	3
3	MV1006	Special Duty Vessels Types and Operation	3	0	0	3
4	GE1301	Professional Ethics and Human Values	3	0	0	3

ANNA UNIVERSITY TIRUCHIRAPPALLI

Tiruchirappalli – 620 024

Regulations 2008

Syllabus

B.E. MARINE ENGINEERING

SEMESTER III

MA1201 – TRANSFORMS AND PARTIAL DIFFERENTIAL EQUATIONS

(Common to all branches)

L	T	P	C
3	1	0	4

UNIT I FOURIER SERIES

9

Dirichlet's conditions – General Fourier series – Odd and even functions – Half range sine series – Half range cosine series – Complex form of Fourier Series – Parseval's identity – Harmonic Analysis.

UNIT II FOURIER TRANSFORMS

9

Fourier integral theorem (without proof) – Fourier transform pair – Sine and Cosine transforms – Properties – Transforms of simple functions – Convolution theorem – Parseval's identity.

UNIT III PARTIAL DIFFERENTIAL EQUATIONS

9

Formation of partial differential equations – Lagrange's linear equation – Solutions of standard types of first order partial differential equations - Linear partial differential equations of second and higher order with constant coefficients.

UNIT IV APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATIONS

9

Solutions of one dimensional wave equation – One dimensional equation of heat conduction – Steady state solution of two-dimensional equation of heat conduction (Insulated edges excluded) – Fourier series solutions in Cartesian coordinates.

UNIT V Z -TRANSFORMS AND DIFFERENCE EQUATIONS

9

Z-transforms – Elementary properties – Inverse Z-transform – Convolution theorem – Formation of difference equations – Solution of difference equations using Z-transform

L: 45 T: 15 Total: 60

TEXT BOOK

1. Grewal, B.S, "Higher Engineering Mathematics", 40th Edition, Khanna publishers, 2007.

REFERENCES

1. Bali.N.P and Manish Goyal, "A Textbook of Engineering Mathematics", 7th Edition, Laxmi Publications (P) Ltd., 2007.
2. Ramana.B.V., "Higher Engineering Mathematics", Tata Mc-GrawHill Publishing Company limited, 2007.
3. Glyn James, "Advanced Modern Engineering Mathematics", 3rd Edition, Pearson Education, 2007.
4. Erwin Kreyszig, "Advanced Engineering Mathematics" 8th Edition, Wiley India, 2007.

MV1201 – MARINE HYDRAULICS AND FLUID MACHINERY

L T P C
3 0 0 3

UNIT I FLUID STATICS 9

Properties of fluid – Pressure head – Pascal’s law – Absolute and gauge pressures – Measurement of pressure – Manometers – Single – U-tube – Differential) – Mechanical gauges – Hydrostatic forces on a submerged plane and curved surfaces – Centre of pressure – Buoyancy and floatation – Meta-centric height – Stability of floating and submerged bodies.

UNIT II FLUID KINEMATICS 9

Types of fluid flow – Types of flow lines – Rate of flow – Continuity equation – Circulation and vorticity – Stream function – Velocity potential – Equipotent line – Cauchy Riemann equations – Flow nets.

Fluid dynamics – Euler’s equation of motion – Bernoulli’s equation – Applications – Venturimeter – Orifice meter – Pilot tube – Free liquid jet – Impulse momentum equation – Coriolis coefficient – Flow through an orifice – Torricelli’s theorem – Hydraulic coefficients.

UNIT III LAMINAR, TURBULENT FLOWS 9

Reynold’s experiment – Critical Reynolds number – Navier – Stokes equations of motion – Relation between shear stress and pressure gradient – Flow of viscous fluid in circular pipes – Haigen poiseuille’s equation – Turbulent flow – Darcy weisbach equation – Major and minor energy losses – Pipes in series and parallel – Power transmission through pipes – Boundary layer – Characteristics – Thickness – Total drag due to laminar and turbulent layer – Boundary layer separation and its control.

UNIT IV PUMPS 9

Rotodynamic pumps – Principles of dimensional analysis – Buckingham’s theorem – Important dimensionless numbers applicable to fluid mechanics – Centrifugal pumps – Some definitions – pump output and efficiencies – Effect of vane angle – Cavitations – Constructional details – Pump characteristics – Multistage pumps.

Axial flow pumps – Characteristics – Constructional details – Non-dimensional parameters – Efficiencies – Vibration and noise in hydraulic pumps.

UNIT V HYDRAULIC TURBINES 9

Classification of hydraulic turbines – Pelton turbines – Velocity triangle – Efficiencies – Non dimensional numbers – Working principle of the Pelton wheel – Francis and Kaplan turbines – Velocity triangles – Efficiencies of the draft tubes – Hydraulic turbine characteristics.

Total: 45

TEXT BOOKS

1. Bansal,R.K., “A Text Book Of Fluid Mechanics and Hydraulic Machines”, 9th Edition, Laxmi Publications (P) Ltd., 2005.
2. Bruce,R.M., Donald, F.Y., Theodore, H.O., “Fundamentals Of Fluid Mechanics”, 5th Edition, John Wiley &Sons (Asia) Pvt. Ltd., 2002

REFERENCES

1. Roberson, J.A. and Crowe C.T., “Engineering Fluid Mechanics”, 6th Edition, Johwiley, 1999.
2. Kothanda Raman C.P. and Rudhramoorthy R. “Basic Fluid Mechanics”, 3rd Edition, New Age International (P) Ltd., 1999.
3. Modi, P.N., Seth, S.M., “Hydraulics and Fluid Mechanics including Hydraulic Machines”, 14th Edition, Standard Book House, 2002.

MV1202 – SEAMANSHIP, ELEMENTARY NAVIGATION AND SURVIVAL AT SEA

L T P C
3 0 0 3

UNIT I SEAMAN AND THEIR DUTIES 9

Ship's department – General ship knowledge and nautical terms like poop-deck forecandle – Bridge etc. – Deck equipment: Wincles – Windlass – Derricks cranes – Gypsy – Capstan – Hatches and function – Navigation lights and signals: Port and Starboard – Forward and aft mast lights – Colors and location – Look out – Precautions and Bad weather – Flags used on ships – Flag etiquette – Mores and semaphore signalling – Sound signals.

UNIT II ROPE KNOTS AND MOORINGS 9

Types of knots – Practice of knot formation – Materials of ropes – Strength – Care and maintenance – Use of mooring line – Heaving line – Rat guards – Canvas and it's use – Anchors: Their use – Drooping and weighing anchor – Cable stopper.

UNIT III NAVIGATION 9

General knowledge of principal stars – Sextant – Navigation compasses – Echo sounder – Log and uses – Barometer and weather classification – G.M.T and Zonal time – Wireless Navigational instruments – Radar satellite navigation etc.

UNIT IV LIFE BOATS AND LIFE RAFTS 9

Construction – Equipment carried – Carrying capacity – Davits and their operation – Launching of life rafts (Inflatable type) embarkation into lifeboat and life raft – Survival pack – Stowage and securing arrangement – Abandon ship: Manning of lifeboat and life raft – Muster list – Radio an alarm signals – Distress signals (S.O.S) Distress calls time and radio frequency – Pyro-techniques.

UNIT V SURVIVAL AT SEA 9

Survival difficulties and factors – Equipment available – Duties of crew members – Initial action on boarding – Maintaining the craft – Practical: Knots – Bends and hitches – Ropes splice – donning of life jackets – Life boat drills – Lowering and hoisting of life boats (model).

Total: 45

TEXT BOOKS

1. Graham Danton, "The theory and practice of Seamanship", 11th Edition, Routledge, 1996.
2. Capt. J. Dinger, Seamanship Primer, 7th Edition, Bhandarkar Publications, 1998.

REFERENCE

1. Cockcroft, A.N., "Seamanship and Nautical knowledge", 27th Edition, Brown son and Ferguson Ltd., 1997.
2. D.J.House, Seamanship Techniques, Second edition, Butterworth Heinemann, 2001
3. IMO, SOLAS (Safety of Life at Sea), Fourth edition. International Maritime Organisation, London UK, 2004

UNIT I METAL JOINING PROCESSES 9

Classification plastic welding – Fusion welding – Solid phase welding and sub classification – Study of power sources – Electrodes – Processes and applications: SMAW – SAWM – GTAW – GMAW – PAW – Electro gas welding and electric – Resistance welding – Gas welding – Oxy acetylene cutting – Brazing and soldering – Under water welding – Defects and Inspection of welded joints.

UNIT II CASTING PROCESSES 9

Sand casting – Pattern and core making – Moulding – Moulding sand properties – Gating and riser – Moulding methods – Melting furnaces – Cupola – Pit furnace and electric furnaces – Special casting processes – Shell – Investment – Die casting – Pressure and gravity types – Plastic moulding – Injection and blow moulding – Defects in casting and moulding – Testing and inspection.

UNIT III SURFACE FINISH PROCESSES 9

Grinding processes – Various types of grinders – Work holding devices – Grinding wheels and specification – Selection of grinding wheels for specific applications – Selection of cutting speed and work speed – Fine finishing process: Lapping – Honing – Super finishing process.

UNIT IV METAL FORMING PROCESSES 9

Hot and cold working processes – Rolling – Forging – Drawing and extrusion processes – Bending – Hot spinning – Shearing – Tube and wire drawing – Cold forming – Shot peening – Sheet metal working – Blanking – Piercing – Punching – Trimming – Bending – Types of dies – Progressive – compound and combination dies – High-energy rate forming processes.

UNIT V MACHINING PROCESSES 9

Lathe – Working principle – Classification – Specification accessories – Lathe and tool holders – Different operations on a lathe – Methods of taper turning machining time and power required for cutting – Turret and capstan lathes.

Drilling and boring – Machines – Classification – Specification – Cutters speed feed – Machining time parts and description of parts parts-boring machines – Jig borer –Description – Types and hole location procedures.

Milling – Classification – Principle – Parts – Specification milling cutters indexing – Selection of milling m/c fundamentals of inches processes – Milling processes and operations

Total: 45**TEXT BOOKS**

1. Hajra Choudhary S.K., “Elements of Manufacturing Technology”, Vol. II, 11th Edition, Media Publishers, 1997.
2. Rao.P.N., “Manufacturing Technology, Metal Cutting and Machine Tools”, Tata McGraw-Hill, 2000.

REFERENCES

1. Jain K.C. Agarwal, L.N. “Metal Cutting Science and Production Technology”, 1st Edition, Khanna Publishers, 1986.
2. Chapman W.A.J., “Workshop Technology”, Vol. II, Arnold Publishers.
3. H.M.T., “Production Technology”, Tata McGraw-Hill, 2000.

MV1203 – MARINE ELECTRICAL MACHINES I

L T P C
3 0 0 3

UNIT I PRINCIPLES OF MEASUREMENT 9

Basic requirements of measuring instrument – Principles of indicating instruments – Control and damping devices – Moving coil and moving iron instruments and their use as voltmeters and ammeters – Dynamometer type wattmeter – Thermocouple type ammeter – Voltmeters and wattmeter – Extension of instrument range

UNIT II PRINCIPLES OF D.C. MACHINES AND GENERATORS 9

Principles of DC machines – Construction – Winding and e.m.f equations – Armature reaction – Commutation – Brush shift – Compensating winding – D.C. generator – Characteristics – Methods of excitation – Parallel operation – Performance equations

UNIT III D.C. MOTORS 9

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

UNIT IV TRANSFORMERS 9

Transformers – Types and applications – Operating principle – e.m.f. Equations – Phase diagrams under no load and load conditions – Leakage resistance – 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-transformers - Single phase – Three phase – Effect of harmonics on transformers

UNIT V TRANSMISSION SYSTEMS 9

Two wire and three wire D.C. distribution – A.C. Transmission – Single and three phase – Comparison of D.C. and A.C. transmission – Use of balancer – 2-wire, 3-wire and 4-wire A.C. Distribution – Copper efficiency under different modes of distribution – One end fed and ring main distributor – Fuses and its materials – D.C. air circuit breaker – A.C. air circuit breakers.

Total: 45

TEXT BOOKS

1. Hughes Edward, “Electrical technology”, 2nd Edition, “ELBS with DP Publications”, 1996.
2. Nagrath, I.J and Kothari, D.P., “Basic Electrical Engineering”, 2nd Edition, McGraw Hill Publishing Co., Ltd., 2002.

REFERENCES

1. Uppal S.L., “Electrical Power”, 13th Edition, Khanna publishers, 2002.
2. Berde M.S., “Electric Motor Drives”, 1st Edition, Khanna Publishers, 1995.
3. Laws, W., “Electricity Applied To Marine Engineering”, 4th Edition, The Institute Of Marine Engineers, 1998.

MV1204 – MARINE REFRIGERATION AND AIR CONDITIONING

L T P C
3 0 0 3

UNIT I RECIPROCATING COMPRESSORS

9

Ideal cycle for compressors work transfer in a single stage compressors – Mass flow – Volume flow – Free air Delivery – Effect of clearance and Volumetric efficiency in single stage compressors – Multi stage compression neglecting clearance volume – Condition for minimum work input and perfect inter cooling – Tandem in line arrangements in compressors – Air motors.

UNIT II BASIC REFRIGERATION AND AIR CONDITIONING

9

Reversed Carnot cycle – Vapour compression cycle – Refrigerating effect – Co-efficient of performance – Cooling capacity – Refrigerants used in marine practice and their justification – Rating of refrigeration plant – Methods for improving C.O.P. – Use of vapour tables – Applied problems.

UNIT III MARINE REFRIGERATING PLANTS

9

Typical marine refrigerating plants with multiple compression and evaporator system – Heat pump cycles – Refrigeration in liquefied gas carriers – Applied problems.

UNIT IV MARINE AIR CONDITIONING

9

Principles of air conditioning – Psychrometric properties of air – Comfort conditions – Control of humidity – Airflow and A.C. capacity – Calculation for ships plants.

UNIT V BASIC DESIGN OF HEAT EXCHANGERS

9

Introduction – Types – LMTD and NTU method – Double-pipe – Shell and tube type – Condenser and evaporator – Problems.

Total: 45

TEXT BOOKS

1. Arora C.P., “Refrigeration & Air Conditioning”, 1st Edition, Sri Eswar Enterprises, 1993.
2. Stoecker, Jones, W.F.and Jerold. W., “Refrigeration and Air Conditioning”, 2nd Edition, Tata McGraw-Hill, 1985.

REFERENCES

1. Taylor, D.A., “Introduction to Marine Engineering”, 2nd Edition, Butter Worth, 1993.
2. Stott, J.R., “Refrigerating Machinery and Air Conditioning Plant”, 1st Edition, The Institute of Marine Engineers, 1974, Reprint 1998.
3. Sachdeva R C, “Fundamentals of Engineering Heat and Mass Transfer”, 3rd Edition, New Age International Publishers, 2008.

MV1205 – MARINE MACHINERY DRAWING

L T P C
1 0 4 3

UNIT I EXPLANATION AND SKETCHING 6

Dimensioning conventions of shafts – Arcs – Angles – Holes – Tapers – Welded joints – Threads and pipes – Conventional representation of metals and materials – Sectioning conventions – Removed sections and revolved sections – Parts not usually sectioned – Conventions of gears.

UNIT II LIMITS, FITS AND TOLERANCES 6

Limits and tolerances – Surface finish – Type of fits – Description – Hole basis system and shaft basis system – Calculations involving minimum and maximum clearances for given combination of tolerance grades – Simple problems – Geometric tolerances.

UNIT III SKETCHING 6

Screw-threads – Screwed fastenings – Rivets and riveted joints keep – Cotter joints and pin joints.

UNIT IV MACHINERY COMPONENT DRAWING 6

Drawing of complete machine components in assembly – Orthographic to isometric – Isometric to Orthographic – Glands – Return and non-return valves – Cocks and plugs – Cylinder – Boiler mountings – Full bore safety valve – Blow down cock – Gauge glass – Main stop valve.

UNIT V MARINE COMPONENT DRAWING 6

Assembly drawings of simple marine components in orthographic projection from isometric view e.g. Bilge strainer boxes – Control valves – Cylinder relief valves – Boiler blow down cock.

L: 15 P: 60 Total: 75

TEXT BOOKS

1. Gopalakrishna K.R., “Machine Drawing”, 17th Edition, Subhas Stores Books Corner, 2003.
2. Bhatt, N.D., “Machine Drawing”, 18th Edition, Charotar Publication, 2001.

REFERENCES

1. Gill P.S., “A text book on Machine Drawing”, S.K. Kataria and sons, 2000.
2. Luzadder, Warren.J., and Duff, Jon.M. “Fundamentals of Engineering Drawing”, 11th Edition, Prentice Hall India Pvt. Ltd., 2001.
3. MacGibbon’s “Pictorial Drawing Book for Marine Engineers-James”, 8th Edition, Holburn, G., Seaton, J.J. and James Munro & Company limited Engineering and Nautical Publishers, 1978.

(A) FLUID MECHANICS LABORATORY

20

Buoyancy Experiment – Meta-centric Height for Cargo and War ship models.
 Fluid flow measurement using Pitot tube, Flow nozzle, Rota-meter, Notches etc.
 Cd of Venturimeter and orifice-meter.
 Determination of frictional losses in pipes.

(B) FLUID MACHINERY LABORATORY

25

Centrifugal pumps- Performance characteristics of a constant speed pump, specific speed
 Performance characteristics of multistage pump.
 Characteristics of Impulse and Reaction Turbine Specific speed and unit quantities.
 Positive displacement pumps.
 Performance characteristics of a deep well pump, Jet pump

Total: 45

LIST OF EQUIPMENTS

(for a batch of 30 students)

FLUID MECHANICS LABORATORY

Sl. No.	Name of the Equipment	Qty.
01.	Buoyancy Experiment Cargo Ship Model War Ship Model	01 01
02.	Pitot tube Flow Nozzle Rotameter Notches	01 01 02 02
03.	Venturimeter	02
04.	Orifice meter	01
05.	Frictional Losses in pipes	01

FLUID MACHINERY LABORATORY

Sl.No.	Name of the Equipment	Qty.
01.	Centrifugal pump	01
02.	Multistage Centrifugal Pump	01
03.	Impulse Turbine (Pelton)	01
04.	Reaction Turbine (Francis)	01
05.	Reciprocating pump	01
06.	Submersible pump	01
07.	Jet pump	01

WELDING TECHNIQUES

45

WELDING - Exercises in Electric Arc welding and Gas welding Advanced Techniques.

HAND TOOLS - Hand tools, sharpening, Powered hand tools, Measurements etc.

Exercise involving above.

SHEET METAL WORKING - Simple Exercise.

PIPE WORK - Experiments involving thin pipes, Joining, bending, welding and inspection.

LATHE AND SPECIAL M/C SHOP

45

Lathe – Straight turning, Step turning, under cut, taper turning, knurling and thread cutting exercises.

Shaping Machine – Making square from round rod and grooving exercises.

Exercises on milling machine.

Grinding: Exercises to the required accuracy on universal cylindrical grinder and surface grinder.

Slotting Machine: Slotting and Key-way cutting.

Total: 90

LIST OF EQUIPMENTS (for a batch of 30 students)

WELDING TECHNIQUES, LATHE AND SPECIAL MACHINE SHOP:

Sl.No.	Name of the Equipment	Qty.
01.	Light duty Lathe	10
02.	Medium duty Lathe	03
03.	Heavy duty Lathe	04
04.	Shaper	01
05.	Slotter	01
06.	Planner	01
07.	Radial drilling m/c	01
08.	Surface grinder	01
09.	Pedestal grinder	01
10.	Vertical milling m/c	01
11.	Universal milling m/c	03
12.	Tool & cutter grinder	01
13.	Gear hobber	01
14.	CNC Lathe Machine	01
15.	Capstan Lathe	01
16.	Cylindrical grinding m/c	01
17.	Power hacksaw	01
18.	Duplicating Lathe	01

WELDING WORK SHOP

S.No.	Description of Equipment	Qty
01.	Welding Transformer Air Cooled with Fan	04
02.	Maxi – MIG 400A Welding Set	01
03.	AOL make TIG Control Outfit	01
04.	Welding Rectifier Throluxe – 401 MMA	01
05.	Water Cooled Torch 0150102071 400 AMPS	02
06.	Bending Machine Pipe dia ½” to 3”	01
07.	Gas welding and cutting set	02

FITTING SHOP

S.No.	Description of Equipment	Qty
01.	Power Hacksaw	01
02.	Vernier Height Gauge	02
03.	Surface Plate with stand	02
04.	Fitting Bench Vice	40
05.	Hand tools (Different types)	-

SEMESTER IV

MA1255 – MATHEMATICS APPLIED FOR MARINE ENGINEERING

L	T	P	C
3	0	0	3

UNIT I TESTING OF HYPOTHESIS

9

Sampling – Distributions – Testing of hypothesis for mean, variance, proportions and differences using normal, t, chi-square and F distributions – Tests for independence of attributes and goodness of fit.

UNIT II PROBABILITY AND RANDOM VARIABLES

9

Axioms of probability – Conditional probability – Total probability bayes theorem – Random variable – Probability mass and density functions – Co-variance, correlation – Regression – Transformation of random variables central limit theorem.

UNIT III STANDARD DISTRIBUTIONS

9

Binomial, poissons, geometric, negative binomial, uniform, exponential, gamma, weibull and normal distributions and their properties – Functions of random variables.

UNIT IV CURVE FITTING AND INTERPOLATION

9

Curve fitting – Method of group averages – Principles of least square – Method of moments – Interpolation – Newton's and Lagrange's methods – Newton's forward and backward different formulae.

UNIT V NUMERICAL SOLUTIONS OF ODE AND PDE

9

Taylor series – Euler and modified Euler – Rungekulta methods – Finite difference methods for second order differential equation – Finite difference solutions for one dimensional heat equations (both implicit and explicit) one dimensional wave equation and two dimensional Laplace and Poisson equations.

Total: 45

TEXT BOOKS

1. Sastras, "Introductory Methods of Numerical Analysis", 3rd Edition, Prentice Hall of India, 2002.
2. Chapra, S.C. and Cannale, R.P., "Numerical Methods for Engineers", 4th Edition Tata - McGraw Hill, 2002.
3. Walpole, R.E., Myers, R.H., Myer, S.L. and Ye, K., "Probability and Statistics for Engineers and Scientists", 7th Edition, Pearsons Education, 2002.
4. Johnson, R.A., Miller and Fraund's, "Probability and Statistics for Engineers", 6th Edition, Prentice Hall of India, 2002.

REFERENCES

1. Jain, M.K., Iyengar, S.R.K. and Jain, R.K., "Numerical Methods for Engineering and Scientific Computation" 3rd Edition, New Age International Private Limited, 1993.
2. Jerald C.F., Wheatly, P.O., "Applied Numerical Analysis", 5th Edition, Addition Wesley, 1998.
3. Sheldon-Ross, "A First Course in Probability", 5th Edition, Pearsons Education, 2002.
4. Lipschut, S. and Schiller, J., "Schaum's Outlines-Introduction to Probality and Statistics, McGraw Hill, 1998.

CE1259 – STRENGTH OF MATERIALS

(Common to Automobile, Mechanical, Marine and Production)

L	T	P	C
3	0	0	3

UNIT I STRESS, STRAIN DEFORMATION OF SOLIDS 9

Rigid and deformable bodies – Strength, stiffness and stability – Stresses: Tensile, compressive and shear – Deformation of simple and compound bars under axial load – Thermal stress – Elastic constants – Strain energy and unit strain energy – Strain energy in uniaxial loads.

UNIT II BEAMS - LOADS AND STRESSES 9

Types of beams: Supports and loads – Shear force and bending moment in beams – Cantilever, simply supported and overhanging beams – Stresses in beams – Theory of simple bending – Stress variation along the length and in the beam section – Effect of shape of beam section on stress induced – Shear stresses in beams – Shear flow.

UNIT III TORSION 9

Analysis of torsion of circular bars – Shear stress distribution – Bars of solid and hollow circular section – Stepped shaft – Twist and torsion stiffness – Compound shafts – Fixed and simply supported shafts – Application to close-coiled helical springs – Maximum shear stress in spring section including Wahl factor – Deflection of helical coil springs under axial loads – Design of helical coil springs – Stresses in helical coil springs under torsion loads.

UNIT IV BEAM DEFLECTION 9

Elastic curve of neutral axis of the beam under normal loads – Evaluation of beam deflection and slope: Double integration method – Macaulay method – Moment-area method – Columns – End conditions – Equivalent length of a column – Euler equation – Slenderness ratio – Rankine formula for columns.

UNIT V ANALYSIS OF STRESSES IN TWO DIMENSIONS 9

Biaxial state of stresses – Thin cylindrical and spherical shells – Deformation in thin cylindrical and spherical shells – Biaxial stresses at a point – Stresses on inclined plane – Principal planes and stresses – Mohr's circle for biaxial stresses – Maximum shear stress – Strain energy in bending and torsion.

Total: 45

TEXT BOOKS

1. Popov, E.P., "Engineering Mechanics of Solids", Prentice Hall of India, 1997.
2. Beer, F. P. and Johnston, R., "Mechanics of Materials", 3rd Edition, McGraw-Hill Book Co, 2002.

REFERENCES

1. Nash, W.A., "Theory and Problems in Strength of Materials", Schaum Outline Series, McGraw-Hill Book Co, 1995.
2. Kazimi, S.M.A., "Solid Mechanics", Tata McGraw-Hill Publishing Co., 1981.
3. Timoshenko, S.P., "Elements of Strength of Materials", Tata McGraw-Hill, 1997.

MV1251 – MARINE DIESEL ENGINES I

L T P C
3 0 0 3

UNIT I PERFORMANCE CHARACTERISTICS OF I.C. ENGINE 9

4-Stroke and 2-Stroke cycles – Deviation from ideal condition in actual engines – Limitation in parameters – Timing diagrams of 2-Stroke and 4-Stroke engines – Comparative study of slow speed – Medium speed and high-speed diesel engines – Suitability and requirements for various purposes – Mean Piston speed, M.C.R. and C.S.R. ratings – Practical heat balance diagrams and thermal efficiency.

UNIT II GENERAL DESCRIPTION OF MARINE DIESEL ENGINE 9

Constructional details of I.C. Engines and marine diesel engines – Components: Jackets, liners, cylinder heads and fittings – Pistons, cross heads, connecting rods, crank shaft, bearings, bed plates, a-frames, welded construction for bedplates and frames and tie rods etc.

Cooling of I.C. Engines: Various cooling media – Their merits and demerits – Cooling of pistons, cylinder jackets and cylinder heads, bore cooling, coolant conveying mechanism and systems – Maintenance of coolant and cooling system – Cooling Water: Testing and treatment.

UNIT III SCAVENGING SYSTEM AND SUPERCHARGING ARRANGEMENTS 9

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 and cross flow scavenging – Their merits and demerits – Scavenge pumps for normally aspirated engines, under piston scavenging, Scavenge manifolds – Pulse and constant pressure type – Merits and demerits in highly rated marine propulsion engines – Air movements inside the cylinders – Turbocharger and its details.

UNIT IV FUEL TECHNOLOGY 9

Liquid fuels – Petroleum – Distillation process – Effects of modern refining on residual fuel properties – Fuel oil for marine diesel engines – Testing and properties of fuel oils – Combustion of fuel – Air for combustion – Combustion of hydro carbons – Compression pressure ratio and its effect on engines – Reasons for variation in compression pressure and peak pressure – Design aspects of combustion chamber – Control of NO_x, SO_x in Exhaust emission.

UNIT V MARINE LUBRICATING OIL and SELECTION OF LUBRICANTS 9

Introduction – Hydrocarbon classification refining of crude petroleum and lubricating oils properties and testing of lubricating oils additives – greases.

Lubrication principles: Introduction – Friction – Functions of lubricants – Basic requirements – Machine components – Surface finish – Types of lubricants – Hydrodynamic or full fluid film lubrication – Lubrication of slider bearings – Hydrostatic lubrication – Boundary lubrication – Elasto hydrodynamic lubrication.

Selection of lubricants: Introduction – Field of application – Cylinder lubrication for large two stroke engines – Crank case oil for large two stroke engines – Lubricants for medium speed trunk piston engines medium / high and high – Speed engines – Air compressor cylinder oil – All purpose oil – refrigeration compressor crank case oil – Lubricating systems for various engines – monitoring engines through lubricating oil analysis reports.

Total: 45

TEXT BOOKS

1. Taylor, D.A., “Introduction to Marine Engineering”, 2nd Edition, Butterworth – Heinemann, 1999.
2. Wood Yard and Doug, “Pounder’s Marine Diesel Engines”, 7th Edition, Butterworth Heinemann Publishing, 2001.

REFERENCES

1. Sanyal, D.K., “Principle and Practice of Marine Diesel Engines”, 2nd Edition, Bhandarkar Publication, 1998.
2. Henshall, S. H., “Medium and High Speed Diesel Engines for Marine Use”, 1st Edition, Institute of Marine Engineers, 1996.
3. Vikram Gokhale and Nanda, N., “Marine Engineering Knowledge for Junior Engineers”, 3rd Edition, Engineer Enterprises, 1999.

MV1252 – MARINE STEAM ENGINES

L T P C
3 0 0 3

UNIT I STEAM AND VAPOUR POWER CYCLES 9

Carnot cycle for steam and ideal efficiency – Rankine cycle with dry, saturated and super heated steam – Modified rankine, reheat and regenerative cycles – Binary vapour power cycles – Feed pump working – Isentropic efficiency, cycle efficiency, work ratio – Reheating and regenerative feed heating and their effect on thermal efficiency.

UNIT II MARINE STEAM ENGINE 9

Modified rankine cycle for steam engines – Hypothetical indicator diagram – Mean effective pressure and work transfer – Diagram factor – Indicated power – Specific steam consumption – Indicated thermal efficiency – Efficiency ratio – Energy balance – Compound steam Engines.

UNIT III STEAM NOZZLES 9

General flow analysis – Velocity at exit – Critical pressure ratio and maximum mass flow – Convergent and convergent – Divergent nozzles – Isentropic flow – Effect of friction – Nozzle area at the throat and exit – Problems of steam flow through nozzles.

UNIT IV MARINE STREAM TURBINE PLANTS 9

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

UNIT V BASIC PRINCIPLE OF HEAT TRANSFER 9

Conduction: Fourier law of conduction – One dimensional heat diffusion equation.

Convection: Forced and free convection.

Radiation: Stefan-Boltzmann's equation – Law of radiation – Problems.

Total: 45

TEXT BOOKS

1. Nag, P.K., “Basic and Applied Thermodynamics”, 1st Edition, Tata McGraw–Hill Publishing Co., Ltd., 2002.
2. R.K.Rajput, “Thermal engineering”, 6th Edition, Laxmi Publications, New Delhi, 2006

REFERENCES

1. Rao, Y.V.C., “Thermodynamics”, 2nd Edition, Wiley Eastern Ltd., 1993.
2. Ratha Krishnan, E., “Fundamentals of Engineering Thermodynamics”, 1st Edition, Prentice Hall of India, 2000.
3. Eastop, T.D. and Mc Conkey, “Applied Thermodynamics for Engineering Technologist SI Units”, 2nd Edition, ELBS with DP Publications, 1993.

MV1253 – MARINE ELECTRICAL MACHINES II

L T P C
3 0 0 3

UNIT I ELECTRICAL MEASUREMENTS 9

Induction type energy meters – Megger (Basic construction and principles of operation only) – Single phase and three phase wattmeter for power measurement – Measurement of energy, speed, frequency and phase difference – Measurement of resistance, inductance and capacitance by Bridge method – Magnetic measurement – Location of cable faults – Transducers and its application in the measurement of pressure, flow, temperature etc – Simple electronic measuring devices – CRO, IC tester, signal generator, timers etc.,

UNIT II ALTERNATORS 9

Alternators – General arrangement – Construction of salient pole and cylindrical rotor types – Types of stator windings – E.M.F equation – Distribution and pitch factor – Waveform of E.M.F. generated – Rotating magnetic field – Armature reaction – Voltage regulation – Load characteristics – Open circuit and short circuit tests – E.M.F and M.M.F. methods – Parallel operation of alternators – KW and KVA sharing – Brushless alternator – Static excitation system.

UNIT III SYNCHRONOUS MOTORS 9

Principles of operation of 3-phase synchronous motor – Operation of infinite bus bars torque/angle characteristics – Hunting – Methods of starting – Merits and limits of synchronous motor over others.

UNIT IV INDUCTION MACHINES 9

Three phase induction motor – Principle of operation and theory of action – Slip speed – Rotor to stator relationship – Rotor frequency – Rotor E.M.F. and current – Equivalent circuit relationship between rotor IR loss and rotor slip – Torque/Slip characteristics – Starting torque and maximum running torque.

UNIT V CONTROL OF INDUCTION MACHINES 9

Reversing – Speed control of induction motor – Starting of induction motor – Method of starting – Direct on-line starters – Star – Delta starter – Auto-transformer starter – Starting of special high torque induction motors – Single phase induction motor – Principle and operational characteristics – Starting control – Constructional details – Failure and repairs of electrical machines.

Total: 45

TEXT BOOKS

1. Hughes Edward, “Electrical Technology”, 2nd Edition, ELBS with DP Publications, 1996.
2. Nagrath, I.J. and Kothari, D.P., “Basic Electrical Engineering”, 2nd Edition, McGraw Hill Publishing Corporation Ltd., 2002.

REFERENCES

1. Uppal, S.L., “Electrical Power”, 13th Edition, Khanna publishers, 2002.
2. Berde, M.S., “Electric Motor Drives”, 1st Edition, Khanna Publishers, 1995.
3. Laws, W., “Electricity Applied to Marine Engineering”, 4th Edition, The Institute of Marine Engineers, 1998.

ME1262 – MECHANICS OF MACHINES I

L T P C
3 0 0 3

UNIT I MECHANISMS 9

Introduction – Science of mechanisms – Terms and definitions – Planar, spherical and spatial mechanisms – Mobility classification of mechanisms (indexing mechanism, reciprocating mechanisms) – Straight line generators – Kinematic inversion – Slider crank chain inversions – Four bar chain inversions – Grashoff's law– Mechanical advantage.

Determination of velocities and acceleration in mechanisms – Relative motion method (graphical) for mechanisms having turning, sliding and rolling pair – Coriolis acceleration – Analysis using vector mathematics for a four bar mechanism – Analysis using complex numbers and loop closure equations for slider crank mechanism – Inverted slider crank mechanism – Four bar mechanism.

UNIT II SYNTHESIS OF MECHANISMS 9

Classification of kinematics synthesis problems – Tchebycheff spacing – Two points synthesis – Slider crank mechanism – Three position synthesis – Four bar mechanism and slider crank mechanism – Freudenstein method – Analytical and graphical design – Four bar linkage for body guidance – Design of four bar linkage as a path generator.

UNIT III CAMS 9

Types of cams and followers – Followers motions – Uniform, parabolic, SHM, cycloidal and polynomial – Synthesis of cam profiles for different followers – Undercutting in cams – Pressure angle – Determination of minimum radius of curvature using design charts – Vamum's Nomogram – Cams of specified contour – Eccentric circle cam.

UNIT IV THEORY OF GEARING 9

Classification of gears – Law of gearing – Nomenclature – Involute as a gear tooth profile – Lay out of an involute gear – Producing gear tooth – Interference and undercutting – Minimum number of teeth to avoid interference – Contact ratio – Internal gears – Cycloid tooth profiles – Comparison of involutes and cycloidal tooth forms – Non standard spur gears – Extended centre distance system – Long and short addendum system – Epicyclic gear trains – Inversions of epicyclic gear trains, Specified ratio and torque calculations – Automobile differential – Wilson four speed automobile gear box.

UNIT V CONTROL MECHANISMS 9

Governors – Gravity controlled and spring controlled – Governor characteristics – Governor effort and power – Gyroscopes – Gyroscopic forces and couple – Forces on bearing due to gyroscopic action – Gyroscopic effects on the movement of air planes and ships – Stability of two wheel drive and four wheel drive – Gyroscopic effects in grinding machines.

Total: 45

TEXT BOOKS

1. Rattan, S.S., “Theory of Machines”, Tata McGraw-Hill Publishing Company Ltd., 1998.
2. Rao, J.S. and Duggipati, R.V., “Mechanism and machinery theory”, 2nd Edition, New age international, 1992.

REFERENCES

1. Shingley, J.E. and John Joseph Uivker, Jr., “Theory of Machines and Mechanisms”, 2nd Edition, McGraw–Hill International Editions, 1981.
2. Ghosh, A. and Mallick, A.K., “Theory of Mechanisms and Machines”, Affiliated East-West Pvt. Ltd., 1988.
3. Sadhu Singh, “Theory of Machines”, 1st Indian Reprint, Pearson Education, 2002

MV1254 – MARINE ELECTRONICS

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UNIT I OPERATION AMPLIFIER THEORY 9

Concept of differential amplifiers – Its use in DP AMPS – Linear OP amp circuits.

UNIT II DIGITAL CIRCUITS, ITL and CMOS GATES 9

Logic systems and gates – Binary and BCD codes – Boolean algebra – Simplifications – Flip, flops, Counters, Registers and multiplexers – Digital integrated circuits – Semi conductor memories – ROM – RAM and PROM.

UNIT III CONVERTERS (A-D AND D- A) and ELECTRONIC INSTRUMENT 9

Analog to digital and digital to analog converters and their use in data – Loggers – Cathode ray Oscilloscope – Digital voltmeters and frequency meters – Multimeters – Vacuum tube voltmeter and signal Generators – Q-Meters – Transducers for vibration – Pressure – Volume – Velocity measurement.

UNIT IV INDUSTRIAL ELECTRONICS 9

Power rectification – Silicon control rectifier power control – Photoelectric devices – Invertors – Satellite communication as applicable to GMDSS, GPS, Inmarsat.

UNIT V MICROPROCESSORS 9

8085 Architecture – Programming – Interfacing and control of motors – Temperature / Speed control.

Total: 45

TEXT BOOKS

1. Ramakant, A. and Geakwad, “Linear Integrated circuits”, 3rd Edition, Prentice Hall of India, 2001.
2. Malvino Leach, “Digital Principles and Applications”, 5th Edition, Tata McGraw-Hill, Publishing Co., 1995.

REFERENCES

1. Bimbhra, P.S., “Power Electronics”, 3rd Edition, Khanna Publisher, 2001.
2. Ramesh Gaonkar, “Microprocessors and Microcomputers”, 4th Edition, Ulhasthatak, 1999.
3. Ray choudhary and Shail Jain, “Linear Integrated Circuits and Applications”, 3rd Edition, New Age international Publishers, 2007.
4. Shawney, A.K., “Electrical and Electronic Measurements and Instrumentation”, Dhanpat Raj and Sons, 1999.
5. Sedha, R.S., “Electronic Devices”, Chand (S.) and Co Ltd, 2005.

STRENGTH OF MATERIALS LABORATORY

42

1. Tension Test on M.S. Rod.
2. Compression test – Bricks, concrete cubes.
3. Deflection Test - Bench type verification of Maxwell theorem.
4. Tension test on thin wire.
5. Hardness test on various machines.
6. Tests on wood - Tension, compression, bending, impact in work testing machine.
7. Tests on springs - Tension, compression.

APPLIED MECHANICS LABORATORY

33

1. Impact test.
2. Double shear Test in U.T.M.
3. Load measurement using load indicator, load coils.
4. Fatigue test.
5. Strain measurement using Rosette strain gauge.

Total: 75

LIST OF EQUIPMENTS

(for a batch of 30 students)

S.No	Name of the Equipments	Qty.
01.	UTM (Universal Testing Machine)	01 No.
02.	Compression Testing Machine	01 No.
03.	Deflection Testing Rig	01 No.
04.	Hardness – Vickers, Brinell, Rockwell, Testing Machines	01 No.
05.	Spring Testing Machines – Tension, Compression	01 No.
06.	Impact Testing Machines – (Izod, Charpy)	01 No.
07.	Load Cells	01 No.
08.	Fatigue Testing Machine	01 No.

S.No.	Description of Equipments	Qty
01.	Crucible furnace	01 No.
02.	Sand Strength Testing Machine	01 No.
03.	Permeability	01 No.
04.	Shear Strength Testing Machine	01 No.
05.	Compression Strength Testing Machine	01 No.
06.	Transfer Strength Testing Machine	01 No.

HEAT ENGINES LABORATORY**45**

1. Flue gas analysis by Orsat apparatus.
2. Study and performance characteristics of steam turbine.
3. Dryness fraction of steam using calorimeters.
4. Performance characteristics of a constant speed air blower.
5. Verification of fan laws and static efficiency of air blower.
6. Test on Reciprocating compressor.
7. C.O.P. of a Refrigeration plant.
8. Performance test on A/C plant.
9. Testing of fuels - calorific value, proximate analysis
10. Testing of fuels - Ultimate analysis, octane number, cetane number.
11. Testing of lubricants - flash point, fire point, pour point.
12. Testing of lubricants- Viscosity index, corrosion stability, carbon residue.
13. Testing of lubricants - Mechanical stability, ash content.
14. Wind Tunnel - Drag and lift measurements.
15. Performance test on IC Engine as per BIS specifications.

BOILER CHEMISTRY LABORATORY**30**

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 Alk. and Caustic Alk. 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. Boiler trial.
9. Water Testing - Dissolved oxygen, total-dissolved solids, turbidity.
10. Water Analysis (Fresh and sea water) – Chloride, sulphate, hardness.
11. Sludges and scale deposit - Silica, volatile and non-volatile suspended matter.

Total: 75

LIST OF EQUIPMENTS

(for a batch of 30 students)

HEAT ENGINES LABORATORY

S.No	Name of the Equipment	Qty.
01	Orsat Apparatus	02 Nos.
02	Steam Turbine	01 No.
03	Steam Calorimeter	01 No.
04	Air Blower	01 No.
05	Air Compressor	02 Nos.
06	Vapour Compression Refrigeration test rig	01 No.
07	Vapour compression Air Conditioning test rig	01 No.
08	Bomb calorimeter and Junker's calorimeter	01 No.
09	Crucible Metener Burner, Electric Benser Hot air oven	01 No.
10	Flash and Fire point – closed cup apparatus	01 No.
	Redwood's Viscometer	01 No.
	Say bolt's Viscometer	01 No.
12	Carbon residue apparatus.	01 No.
13	Wind Tunnel	01 No.

FUELS AND LUBRICATION OIL TESTING EQUIPMENTS

S.No	Name of the Equipment	Qty.
01	Redwood Viscometer	01 No.
02	Saybolt's Viscometer	01 No.
03	Abel's flash point and fire point apparatus	01 No.
04	Closed cup apparatus (Pensky)	01 No.
05	Bomb Calorimeter with Beckman (Digital)	01 No.
06	Junker's Gas Calorimeter	01 No.

BOILER CHEMISTRY LABORATORY

S.No.	Description of Equipment	Qty
01	Burette, Pipette, Beaker, Conical Flask, Bunsen Burner	1 each
02	Burette, Pipette, Conical Flask, STD Flask 100ml	1 each
03	Burette, Pipette, Conical Flask, STD Flask	1 each
04	Burette, Pipette, Conical Flask.	1 each
05	Do Bottle, Burette, Pipette, Conical Flask.	1 each
06	Wephlo turbidity meter, STD Flask Pipette.	1 each

07	PH meter, Buffer tablets, beaker.	1 each
08	Petridish, Hot air Oven, Weighing Balance	1 each
09	Water Analysis kit.	1 no.
10	Meker Burner, Silica, Crucible, Electric Bunsen, Petridish Hot air Oven	1 each
11	Burette, Pipette, Conical Flask, turbidity meter, Bunsen Burner, Beaker, STD Flask.	1 each

THERMAL ENGINEERING

S.No	Name of the Equipment	Qty.
01	Internal Combustion Engines Section	01 No.
02	Fuel and Lubrication Oil Testing Equipments	01 No.
03	Heat Transfer Equipments	01 No.
04	Steam Lab. Equipments	01 No.
05	Refrigeration and Air Conditioning Equipments	01 set
06	Automobile Components	01 No.
07	Engine Research Centre	01 No.
08	Computers with UPS	01 No.
09	Miscellaneous Equipments	01 No.

INTERNAL COMBUSTION ENGINES SECTION

S.No	Name of the Equipment	Qty.
01	Multi Cylinder Petrol Engine	01 No.
02	Twin Cylinder Diesel Engine	01 No.
03	Kirloskar Diesel Engine	01 No.
04	Greaves Cotton diesel engine	01 No.
05	Two Stroke Petrol Engine	03 Nos.
06	Two Stroke Diesel Engine Model	01 No.
07	Four Stroke Petrol Engine	01 No.
08	Four Stroke Diesel Engine Model	01 No.
09	Two Stroke Petrol Engine Model	01 No.
10	Multi Cylinder Petrol Engine	01 No.
11	Four Stroke Single Cylinder Diesel Engine (Anil)	01 No.
12	MK-12 Petrol Start Kerosene run Engine	01 No.
13	Battery charger	01 No.

SEMESTER V

MV1301 – MATERIAL SCIENCE AND METALLURGY

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3	1	0	4

UNIT I CRYSTAL STRUCTURES AND PHASE DIAGRAMS 9

Simple cubic structure BCC, FCC, HCP – Atomic packing factor coordination number – Miller – Bravais space lattice system – Single crystal – Poly crystal – Grain – Allotropy and polymorphism – Bragg's law – Simple problems – Defects in crystalline solid – Vacancy – interstitial and impurity defects – Edge and screw dislocation – Low angle grain boundaries – grain size measurement – Solid solution – Inter metallic – Cooling curves – Non -equilibrium cooling – Phase rule – Interpretation of equilibrium diagrams of Fe-Fe₃C, Cu-Ni, Cu-Zn, Al-Ti – Simple problems.

UNIT II DEFORMATION AND STRENGTHENING MECHANISM OF MATERIALS 9

Deformation by slip – Twinning – Dislocation move – Sources – Elastic and elastic behaviour – Critically resolved shear stress – Deformation in BCC – FCC and HCP materials – Damping capacity and viscous deformation – Strengthening from grain boundaries – Solid solution strengthening – Fine particles – Fibre – Point defects – Martensic strengthening – Yield point phenomenon – Deformation hardening – Annealing – Preferred orientation and directional properties.

UNIT III MECHANICAL BEHAVIOUR AND TESTING OF MATERIALS 9

Engineering and true stress – Strain curves for different materials like mild steel – Alloy steel – Cast iron and rubber – Proof stress – Upper and lower yield stress – Ductility measurement – Different types of testing machines – Compression test – Various hardness tests and impact tests – Codes and standards for different tests – Definition of fatigue – Endurance limit and stress ratio S–N curves for ferrous and non –Ferrous materials – Stress concentration factor – Fatigue failure and its prevention – Brittle ductile fracture – Griffith's theory of brittle fracture – Definition of fracture toughness – Definition of creep – Curve.

UNIT IV METALS, ALLOYS AND MODERN MATERIALS 9

Classification and designation of ferrous and non – Ferrous materials according to BIS – ASTM and unified numbering system (UNS) – Wrought and forged product forms – Effects of alloying elements on properties of steel – Carbon steel – Low alloy steels – Micro alloyed steel – Stainless steels – Tool steels and die steels – Classification of cast iron – Properties and their applications – Alloys of Al, Ti, Cu, Mg, Ni, Zn and Pb – Properties and applications – Bearing materials – Brazing and soldering alloys – Shape memory alloy – Inter metallic materials – Functionally graded materials – Composite and ceramic materials – Properties and their applications.

UNIT V HEAT TREATMENT 9

Critical temperature on heating – Annealing – Spheroidizing – Normalizing – Hardening – Isothermal transformation diagrams – CCT and TTT diagrams – Martensic transformation – Tempering – Austempering and martempering – Hardenability and its testing – Simple problems – Surface hardening processes – Industrial application of different heat treatment processes – Different heat treatment furnaces and cooling medium – Heat treatment of tool steels – Thermo mechanical treatment – Precautions and defects.

L: 45 T: 15 Total: 60

TEXT BOOKS

1. Gupta A.B., "Material Science and Engineering", First Edition, Academic Scientific, 1986
2. Marc Andre Meyers and Krishnan Kumar Chawla, "Mechanical Behaviour of Materials", 3rd Edition, Prentice Hall, 1999

REFERENCES

1. Mills, Kathleen, Davis and Joseph. R, "Metals handbook", Vol. 2 3, and 4, 9th Edition, ASM International, 1987.
2. John Vernon. B., "Engineering Materials", Third Edition, Macmillan, 1999.
3. Raghavan.V, "Material science and Engineering", Prentice Hall India,2007.

MV1302 – MARINE AUXILIARY MACHINERY I

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4	0	0	4

UNIT I ENGINE ROOM LAYOUT AND PIPING 12

Engine Room Layout: Layout of main and auxiliary machinery in Engine Rooms in different ships.

Engine Room Piping Arrangements & Fittings: Steam and condensate system, water hammering in pipes, Expansion joints in pipelines, bilge – Ballast, fuel oil bunkering and transfer system, bunkering procedure, precautions taken, fuel oil service system to main and auxiliary engines, lubricating oil and engine cooling system to main and auxiliary engines, central cooling and central priming systems, control and service air system, domestic fresh water and sea water (Hydrophore) service system, drinking water system, fire main system.

UNIT II VALVES, JOINTING AND FILTERS 10

Valves and cocks: Straight way cocks, right angled cock, ‘T’ cock, spherical cock, Boiler gauge glass cock (cylindrical cock).

Valves: Globe valves, SDNR valve, swing check valve (storm valve), gate valves, butterfly valves, relief valves, quick closing valves, pressure reducing valves, control valves, change over valve chests, fuel oil transfer chest, valve actuators, steam traps.

Jointing: Packings, Insulation of materials – Types – Various applications – Seals – Purpose of bearing seal, description and application of non rubbing seals and rubbing seals, simple felt seal, seals suitable for various peripheral speeds, V-ring seals, lip seals.

Filters and strainers: Filtration, filter elements basket strainers, duplex strainers, edge type strainers, auto-kleen strainers, back flushing strainers, magnetic filter, rotary filters, fine filters.

UNIT III PUMPS 12

Pumps: Types of pumps for various requirements – Their characteristics, performance and application in ships – Centrifugal pumps – Gear pumps – Screw pumps and reciprocating pumps – Care and maintenance of pumps.

UNIT IV HEAT EXCHANGERS AND EVAPORATORS 12

Heat Exchangers, Evaporators and Distillers: Principle of surface heat transfer – Description, contact heat transfer, construction of shell and tube type – Flat plate type, single and double pass – Lubricating oil coolers, fuel-oil heaters, fresh water coolers, compressed air coolers, main engine charge air cooler, fresh water heaters, steam condensers, evaporators and condensers in refrigeration system – Materials used in all the above heat exchangers, expansion allowance – Temperature controls effect of air in the system – Maintenance.

Evaporators and Distillers: Distillation of water, distilling equipment, problem of scale formation and method of controlling, methods of distillation, single effect and double effect shell type evaporator, low pressure vacuum type evaporator, flash evaporators, salt water leaks and detection, reverse osmosis desalination plant, membranes, drinking water and treatment.

UNIT V STEERING SYSTEM

14

Hydraulic telemotor system (Transmitter and receiver), bypass valve – Charging system – Hydraulic power unit – Hunting gear heleshaw pump principle, construction and operation – Pawl and ratchet mechanism, 2-ram and 4-ram steering gear – All-electric steering gear, principle and operation – Hunting gear and emergency steering gear – Electro-hydraulic steering gear, Raphson and slide actuators, rotary vane steering gear – Principle – Construction – Operation – Safety features, relief, isolating and bypass valves, steering system regulations and testing – Trouble shooting – Rectification maintenance – Navigational safety of a ship – Case history, cause and /or errors – How to avoid rudder restraining, general requirements – Requirements for large tankers and gas carrier, additional requirements (electrical) definitions – Controls – Automatic system, general arrangement – Rudder and pintle, rudder wear down – Rudder carrier.

Total: 60

TEXT BOOKS

1. McGeorge, H.D., “Marine Auxillary Machinery”, 7th Edition, Butter worth, 2001.
2. Dhar, J.K., “Basic Marine Engineering”, 2nd Edition, G.Maritime Publications, 2000.

REFERENCES

1. Taylor, D.A., “Introduction to Marine Engineering”, 2nd Edition, Butter Worth, 1993.
2. Vikram Gokhale and Nanda, N., “Advanced Marine Engineering Knowledge Vol. II”, 2nd Edition, Engineer Enterprises, 2001.
3. Vikram Gokhale and Nanda, N., “Marine Engineering Knowledge for Junior Engineers”, 3rd Edition, Engineer Enterprises, 1999.

MV1303 – SHIP'S FIRE FIGHTING SYSTEM AND SAFE WORKING PRACTICES

	L	T	P	C
	4	0	0	4
UNIT I				12

FIRE CHEMISTRY AND CAUSES OF SHIP BOARD FIRES

Fire Triangle and concept of fire, common causes, welding practices, sources of fire in machinery spaces, bilge fire, crank case and air starting line explosion, boiler furnace blow back and up take fire.

UNIT II

TYPES OF FIRE AND FIRE FIGHTING APPLIANCES

12

Classification and Types of fires Methods of extinguishing fire, fire detection types of detectors extinguishing agents construction, contents, operations and performance of various portable extinguishers, fixed fire installations, fire main system and emergency fire pump, fire hoses, nozzles, couplings, hydrants, maintenance and testing.

UNIT III

LIFE SAVING APPLIANCES

12

Life boat, life raft, bulk heads, water tight doors, emergency escapes blower flaps, funnel flaps, various quick closing arrangements, remote stopping of various machines, Fire man's outfit, breathing apparatus, constructional fire safety in ships.

UNIT IV

SAFE WORKING OF ORGANIZATION AND EQUIPMENTS

12

Guidance, need of adoption of safe practices, identification of different Hazards and dangerous.Organizations structure of emergency organization, duties to crewmembers and importance of rehearsals and drills.

Equipment, protective equipments, power operated tools, maintenance lifting gears and electrical systems.

UNIT V

OPERATIONAL SAFE WORKING PRACTICES.

12

Knowledge of (a) Oils spills and leaks, (b) cleanliness of bilges (c) All I discharges and over flows (d) temperature of oil in bulker and service tanks, gas bottles, spare gear chuck.

Permit to work system, operation of emergency machinery systems and ventilation systems precautions of welding and gas cutting, battery room.

Total : 60

TEXT BOOKS

1. Frank Rush Brook, Fire Aboard, 3rd Edition, Brown, son & ferguson ltd., Glassgow 1988.
2. Leslie Jackson, Reed's General Engineering Knowledge for Marine Engineers Vol.8, 4th Edition, Thomas Reed publication, Great Britain, 1986.

REFERENCE S

1. M.G. Stavitskiy, V.I. Vostryakov, M.F.Kortunov, V.I. Martynenko & V.M. Sidoryok, Fire Fighting Aboard ships Vol. I & Vol. II Structural Design and Fire Extinguishing System, first edition, published by Gulf publishing company, Houston, London, 1983.
2. D.G. Shipping, Fire Fighting Appliances Rules (1969/1990), 3rd edition published by Bhandarkar Publications, Mumbai, 1996
3. IMO, SOLAS (Safety of Life At Sea) Third Edition, International Maritime Organization, London, UK, 2001.

MV1304 – NAVAL ARCHITECTURE I

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3	1	0	4

UNIT I HYDROSTATICS 9

Pressure exerted by a liquid – Load on an immersed plane – Center of pressure – Load diagram – Shearing force on bulkhead stiffeners – Archimedes’ principle– Displacement – T.P.C. immersion – Coefficients of form – Wetted surface area – Similar figures – Shearing force and bending moment – Problems.

UNIT II GEOMETRY AND SHIP FORM CALCULATIONS 9

Ship lines – First and second moment of area – Simpson’s first and second rules – Application to area and volume – Use of intermediate ordinates – Trapezoidal rule – Mean and mid-ordinate rule– Tchebycheff’s rule and their applications – Centre of gravity – Effect of addition and removal of masses – Effect of movement of mass and suspended masses – Problems.

UNIT III TRANSVERSE STABILITY AND HEEL 9

Static stability at small angles of heel – Calculation of BM and Metacentric height – Inclining experiment – Free surface effect – Stability at large angles of heel – Curves of static stability – Dynamic stability – Angle of roll – Stability of wall sided ship – Problems.

UNIT IV LONGITUDINAL STABILITY AND TRIM 9

Longitudinal BM, MCT1 cm – Change of trim – Change of LCB with change of trim – Alteration of trim due to adding or deducting weights – Change in mean draught and end draughts due to density and due to bilging – Flooding calculations – Floodable lengths – Factors of sub division – Loss of stability due to grounding – Problems.

UNIT V LAUNCHING AND DOCKING 9

Launching curves – Construction of launching curves – Ground ways – The dynamics of launching – Strength and stability – Sideways launching.

Docking – Docking stability, pressure on chocks, load distribution, block behaviour, strength of floating docks, stability during docking, ship lifts – Problems.

L: 45 T: 15 Total: 60

TEXT BOOKS

1. Eric.Tupper, “Introduction to Naval Architecture”, 3rd Edition, Butter worth – Heinemann, 2001.
2. Stokoe E.A., “Reeds Naval Architecture for Marine Engineers”, New Edition, Thomas Reed Publications, 1982.

REFERENCES

1. Rawson, K. J. and Tupper, E.C., “Basic Ship Theory” (Vol. I), 5th Edition, Butterworth Heinemann, 2001.
2. Muckle and Taylor, D.A., “Muckle’s Naval Architecture”, 2nd Edition, Butter worth, 1987.
3. Hatch, G.N., “Creative Naval Architecture”, 1st Edition, Thomas Reed Publications, 1971.

MV1305 – SHIP CONSTRUCTION

L	T	P	C
4	0	0	4

UNIT I SHIP TERMS, SECTIONS AND MATERIALS 12

Various terms used in ship construction with reference to ship's parameter e.g. L.B.P. - Moulded Depth - Moulded draught etc. – General classification of ships.

Stresses in ship's structure: Hogging – Sagging – Racking – Pounding – Panting etc., and Strength members to counteract the same.

Type of sections like angles – Bulb plates flanged beams used in ship construction – Riveting and Welding testing of welds – Fabricated components.

UNIT II SHIP BUILDING 11

Bottom & Side Framing: Double bottoms, watertight floors solid and bracket floors – Longitudinal framing keels – side framing like tank side brackets – Beam knee – Web frame etc.,

Shell & Decks: Plating systems for shells – Deck plating & Deck Girders – discontinuities like hatches and other openings – supporting & closing arrangements – mid-ship section of ships.

Bulk heads & Deep Tanks: water tight bulkheads – Arrangement of platings and stiffeners – water tight sliding doors – Water tight openings through bulkheads for electric cables pipes and shafting – Deep tank for oil fuel or oil cargo corrugated bulk heads.

UNIT III FORE & AFT END ARRANGEMENTS 14

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

UNIT IV SHIPYARD AND SHIP TYPES 11

Free board and tonnage: Significance and details of markings various international Regulations.

Practice: layout of a shipyard – Mould loft –Optical marking – Automatic plate cutting, Fabrication and assembly etc.,

Tankers – Bulk Carriers – Container ships – L.N.G., L.P.G., and Chemical carriers – Lash ships – Passenger ships – Dredgers – Tugs etc., – Constructional details and requirements.

UNIT V OFFSHORE TECHNOLOGY AND SHIP SURVEYS 12

Drilling ships and platforms – Supply vessels – Fire fighting arrangement – Pipe laying ships – Special auxiliary service ships.

Survey rules – Functions of ship classification – Societies – Surveys during construction – Periodical surveys for retention of class.

Total: 60

TEXT BOOKS

1. Stokoe, E.A., “Reed’s Ship Construction for Marine Engineers”, 1st Edition, Thomas Reed Publication, 2000.
2. Eyres, D.J., “Ship Construction”, 4th Edition, Butter worth – Heinemann, 1994.

REFERENCES

1. Young, A.J., “Ship Construction sketch & Notes”, 1st Edition, Butter worth – Heinemann, 1980.
2. Pursey, H.J., “Merchant Ship Construction”, 7th Edition, Brown Son & Ferguson Ltd., 1994.
3. Vikram Gokhale and Nanda, N., “Naval Architecture and Ship Construction”, 1st Edition, Engee Enterprises, 2002.

ME1311 – MECHANICS OF MACHINES II

L	T	P	C
3	1	0	4

UNIT I **FORCE ANALYSIS OF MECHANISMS** 9

Static, Inertia and combined force analysis – Graphical and analytical method – Slider crank mechanism and four bar mechanism, turning moment diagram and flywheel – Applications in engine, punching presses.

UNIT II **BALANCING** 7

Static and dynamic balancing – Balancing of rotating masses – Balancing of several masses in different planes – Balancing of rotors, balancing machine, unbalance due to reciprocating parts – Balancing of inline engines – Firing order – Balancing of V and W engines – balancing of radial engines – Lanchester technique of engine balancing.

UNIT III **FREE VIBRATION OF SINGLE DEGREE FREEDOM SYSTEMS** 9

Periodic motion – Non harmonic periodic motion – Fourier analysis – Undamped free vibration – Linear and torsion solution – Natural frequency of single degree freedom system – Bifilar, Trifilar suspensions – Free vibrations with viscous damping of single degree freedom system and solution – Logarithmic decrement.

UNIT IV **FORCED VIBRATION OF SINGLE DEGREE FREEDOM SYSTEMS** 9

Forced vibration of single degree freedom system with damping – Reciprocating and rotating unbalance – Vibration isolation and transmissibility – Base excitation – Self excited vibrations with examples.

UNIT V **TWO AND MULTI DEGREE FREEDOM SYSTEMS** 11

System with two degrees of freedom – Shaft with two rotors, vehicle suspension – Vibration absorber – Torsion vibration dampers, system with many degrees of freedom – Holzer's analysis of free torsion vibrations with multi rotor systems – Three rotor system – Geared system – Method of influence coefficients, continuous system – Axial vibration of bars, lateral vibration of cantilevers, simply supported beams – Rayleigh's method, torsion vibrations of shafts, Dunkerley's method for lateral and torsion vibration problem.

(NB: Using method of influence coefficients (not for Exam) student may be asked to write computer programs for a few problems e.g. 3 mass 3 spring system, beam with 3 lumped masses – natural frequencies and mode shapes may be determined. Internal marks can be awarded for the work).

L: 45 T: 15 Total: 60

TEXT BOOKS

1. Grover.G.K., "Mechanical vibrations", 7th Edition, Nem Chand and Bros, 2001.
2. Rao, J.S., and Dukkippatti, R.V., "Mechanism and machinery theory", 2nd Edition, New age international, 1992.

REFERENCES

1. Shingley, J.E. and John Joseph Uivker, Jr., "Theory of Machines and Mechanisms", 2nd Edition, McGraw – Hill International Editions, 1981.
2. Ghosh A. and Malik, A.M. "Theory of Mechanisms and Machines", 2nd Edition, Affiliated East – West Press Pvt. Ltd., 1988.
3. Francis. TSE. Ivan E-Morse Roll and Hinkle, T., "Mechanical Vibrations", 2nd Edition, CBS Publishers and Distributed, 1983.

MV1306 – MARINE ENGINEERING DESIGN AND DRAWING

L	T	P	C
2	0	4	2

UNIT I ENGINEERING DESIGN 6+14

The design process, concept, analysis, feasibility – Functional design – Production designs– Selection of materials and manufacturing considerations in design.

Economics, aesthetic appeal, initial and recurring costs, plans, drawings and manuals – Design with reference to repairs and reconditioning, specifically for working out at sea with its restrictions and limitations.

UNIT II TYPES OF LOADING AND DESIGN CRITERIA 6+14

Strength, rigidity and deflection of machine elements stresses due to static loads – Impact loads – Repeated loads – Variable and cyclic loads – Combined and reversible loads.

Stress concentration and design factors – Fatigue strength – Modes of failure – Design stresses – Factor of safety – Theories of failure, wear, corrosion, design criteria, S-N curve Goodman and Soderberg equations.

UNIT III FASTENERS AND CONNECTIONS 6+10

Design of bolts and nuts, cotter and knuckle joints, keys – Design of welded joints, riveted joints, and pipe joints.

UNIT IV POWER TRANSMISSION ELEMENTS 6+10

Shafting with bending, twisting and axial loading based on strength and rigidity, rigid and flexible couplings.

Belt drives and hoists (Wire ropes).

UNIT V FRICTION CLUTCHES AND BRAKES 6+12

Multiple plate clutches – Cone clutch – Centrifugal clutch block brakes – Internally expanding shoe brakes – External band brakes – Differential band brakes.

Total: 90

TEXT BOOKS

1. Shigley, J.E., “Mechanical Engineering Design”, 1st Edition, McGraw-Hill, 1986.
2. Maleev, V.L., “Internal Combustion Engines”, 2nd Edition, McGraw-Hill book co., 1987.

REFERENCES

1. Abdulla Sharif, “Machine Design”, 3rd Edition, Dhanpat Roy and Sons, 1995.
2. Pandya and Shaw, “Elements of Machine Design”, 1st Edition, Charotar Publishing, 1997.
3. Gopalakrishna K.R., “Machine Drawing”, 17th Edition, Subhas Stores Books Corner, 2003.

**EC1314 – ELECTRICAL ENGINEERING, ELECTRONICS AND MICRO PROCESSOR
LABORATORY**

L	T	P	C
0	0	4	2
			30

(A) ELECTRICAL ENGG. LABORATORY

1. Load Test on D.C. Shunt Motor
2. Load Test on D.C. Series Motor
3. O.C.C. & load characteristic of self/separately excited D.C. Generator.
4. Parallel operation of D.C. Shunt Generator
5. Speed control of D.C. Shunt Motor.
6. Load O.C. & S.C. test on single-phase transformer.
7. Parallel operation of single-phase transformers.
8. To connect similar single-phase transformers in the following ways.
9. Y-Y, A-A, A-Y and Y-A.
10. Pole changing motor for various speeds.
11. Determination of characteristics of an A/C brush less generator.
12. Synchronization of 3-phase alternator.
13. Trouble shooting in Electric Motors and Transformers.
14. Exercises in Power Wiring and earthing.

(B) ELECTRONICS / MICROPROCESSOR LABORATORY

30

1. To study the volt-ampere characteristics of a high current semi conductor diode.
2. To study the volt-ampere characteristics of a diode and Zener diode.
3. To study the half wave and full wave rectification circuit without and with filter circuit.
4. To study the volt-ampere characteristics of a Transistor.
5. To study the volt-ampere characteristics of Field Effect Transistor.
6. To study the characteristics of Silicon Control Rectifier.
7. To study the Transistor Feed Back Amplifier.
8. To study the Integrated Circuit operational amplifier.
9. To study the logic training board.
10. To study the speed control of D.C. motor using Thyristor.
11. Arithmetic operations using 8085
12. Logical operations using 8085
13. Array operations using 8085
14. Speed & Direction Control of Stepper motor using 8085.

Total: 60

LIST OF EQUIPMENTS

(for a batch of 30 students)

ELECTRICAL ENGINEERING LABORATORY

S.No.	Name of the Equipment	Qty.
01	D. C. Motor Generator Set	02
02	D.C. Compound Motor	04
03	Single Phase Transformer	04
04	Three Phase Induction Motor	02
05	Single Phase Induction Motor	02
06	Three Phase Alternator Set	02
07	Ammeter A.C and D.C	20
08	Voltmeters A.C and D.C	20
09	Watt meters LPF and UPF	12
10	Resistors & Breadboards	1 set

ELECTRONICS / MICROPROCESSOR LABORATORY

S.No.	Name of the Equipment	Qty.
01	Cathode Ray Oscilloscopes	04
02	Dual Regulated power supplies	06
03	A.C. Signal Generators	04
04	8085 Microprocessor Trainer kits	10
05	Voltmeters D.C.	10
06	Ammeters D.C.	10
07	Resistors, Capacitors, Diodes	1 set
08	Transistors (BJT, JFET), SCR, Logic Gates	1 set
09	Stepper Motor, Interface Card and Power Supply	01
10	Breadboards, Probes	1 set

**EI1304 – MEASUREMENTS LAB, INSTRUMENTATION LAB AND
REFRIGERATION LABORATORY**

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0 0 4 2

(A) MEASUREMENTS LABORATORY 25

1. Use of precision measuring instruments like micrometer, vernier, height and depth gauges, surface plate, etc.
2. Checking dimensions of a part using slip gauge.
3. Use of sine bar for measuring angles and tapers.
4. Measurement of tooth thickness by gear tooth vernier.
5. Calibration of dial gauge.
6. Taper and bore measurement-using spheres.
7. Fundamental dimension of a gear using contour projector.
8. Testing squareness of a try square using slip gauges.
9. Checking straightness of a surface plate using autocollimator.
10. Measurement of angles between centre lines of holes drilled radially on a shaft.
11. Measurements of thread parameters using floating carriage micrometer.
12. Use of pneumatic comparator and mechanical comparator.

(B) INSTRUMENTATION LABORATORY 20

1. Pressure measuring devices-pressure and vacuum gauge calibration.
2. Temperature measuring devices like Platinum resistance thermometer, thermocouple, radiation pyrometer, etc.
3. Flow measuring devices like orifice meter, rotameter, etc.
4. Speed measuring devices like tachometer, stroboscope, etc.
5. Force measuring devices, load cells and proving rings.
6. Torque measuring devices
7. Power measurement using rope, prony brake, mechanical, hydraulic and electrical dynamometers.
8. Study and use of strain, displacement devices-strain gauge indicator, LVDT.
9. Study and use of velocity and acceleration-accelerometer.
10. Study and use of vibration devices-vibrometer.

(C) REFRIGERATION LABORATORY 15

1. Watch keeping: Parameters to be monitored during running of refrigeration unit.
2. Various cut-outs, viz, pressure, temperature
3. Determination of actual COP, theoretical COP and Carnot COP.

Total: 60

LIST OF EQUIPMENTS

(for a batch of 30 students)

MEASUREMENT LABORATORY

S.No.	Description of Equipment	Qty
1	Slip Gauge and Dial gauge.	6 set
2	Sine Bar.	2 nos
3	Four sphere & Two sphere height gauge	2 nos.
4	Bore Dial gauge.	1
5	Sphere	2
6	Vernier calliper	12
7	Profile projector.	1
8	Tri-square.	2
9	Bevel protractor.	2
10	Floating carriage Micrometer	1
11	Pneumatic comparator.	1
12	Optical flat interferometer.	1
13	Gear tester.	1
14	Auto collimator	1
15	Tool Maker's Microscope	1
16	Surface test 301	1

INSTRUMENTATION LABORATORY

S.No.	Description of Equipment	Qty
1	Dead weight type pressure gauge 0-2kgf/cm ²	1
2	Bourdon type Pressure gauge 0-400kgf/cm ²	1
3	Vacuum pressure gauge – McLeod gauge.	1
4	Thermocouple	4
5	Resistance Temperature Detector	2
6	Proving ring mechanical type	2
7	Speed stroboscope	1
8	Strain gauge.	4
9	Linear Variable differential transformer 20mm	4
10	Static torque meters	1
11	Piezoelectric sensor analog	1
12	Piezoelectric Crystal Sensor	2
13	Orifice meter, Venturimeter, Rotameter.	3

MARINE AC AND REFRIGERATION LABORATORY

S.No.	Description	Qty.
1	Marine Refrigeration Plant (10 ton capacity)	01
2	Marine Air Conditioning Plant (10 ton capacity)	01

SEMESTER VI

MV1351 – MARINE WORKSHOP PRACTICAL AND AFLOAT TRAINING

The students are required to undergo Marine Workshop Training in DG Shipping approved Marine Engineering Workshop for a duration of 6 months. The training should be as per the Merchant Shipping (Standard of Training Certification and Watch keeping for Seafarers) Rule 1998.

-	use of hand tools used for marine equipments for dismantling, maintenance, repair and reassembly of shipboard equipments.	100 hrs.
-	use of hand tools used for electrical and electronic equipments, measuring and test equipment's for locating and repairing faults and malfunctions.	100 hrs.
Competency on	- Operation of Main and Auxillary machinery and associated control systems.	30 hrs.
Competency on	- Operating pumping systems & associated control systems.	90 hrs.
Competency on	- Operating alternators, generators & control systems.	100 hrs.
Competency on	- Maintaining alternators, generators and Control systems.	20 hrs.
-	Maintaining Marine Engineering system including control systems (overhauling and maintenance of Marine Diesel Engines, air compressors, heat exchangers, oil separators etc.,)	700 hrs.
Competency on	- Controlling and fighting fire onboard.	6 hrs.
Competency on	- Operation of life saving appliances.	6 hrs.
	Total hrs. of Training:	1152 hrs.

The competency of the students are evaluated by the Marine Engineering Workshop and a report is sent to the college. During the training the students have to maintain a work diary. After completion of this training the students will be examined as follows:

a)	Assessment on work diary (Internal)	200 Marks.
b)*	(i) Written test for 1 hour. 10 questions	10 X 10 = 100 Marks
	(ii) Viva voce	200 Marks
	Total	500 Marks

* Valuation by both Internal and External Examiners.

One Professor has to constantly monitor the progress of the Workshop training.

SEMESTER VII
MV1401 – MARINE DIESEL ENGINES II

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UNIT I FUEL PUMPS AND METERING DEVICES 14

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 engines, V.I.T. and Electronic injection systems.

1. Effects of viscosity on liquid fuel combustion.
2. Measuring equipment and its working principle.
3. Necessity of variable fuel injection system.
4. Procedure of application on modern slow speed long stroke engine.
5. Necessity for adoption of fuel quality setting system.
6. Incorporation of FQSL along with the V.I.T. system on the engine.

UNIT II MANOUVERING SYSTEMS, INDICATOR DIAGRAMS AND POWER CALCULATIONS 14

Starting and reversing systems of different Marine diesel engines with safety provisions.

Constructional 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 trials of diesel engines.

UNIT III MEDIUM SPEED ENGINES 10

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.

UNIT IV FORCES AND STRESSES 8

Balancing, overloading, different types of vibration & its effects, forces and stresses acting on various components of I.C. Engine parts.

UNIT V CONSTRUCTION AND OPERATION 14

Sulzer, B&W, MAN, Piel-stick, Doxford, Marine Main diesel engines.

Latest development in marine diesel engines – Sulzer RTA, B&W CMC & SMC, SEMT Piel-stick, etc camless concept, improvement in design for increased TBO.

U.M.S. Operation of ships.

Total: 60

TEXT BOOKS

1. Pounder, C.C., “Marine Diesel Engines”, 6th Edition, Butter worth – Heinemann, 1995.
2. Sanyal, D.K., Principle and Practice of Marine Diesel Engines”, 2nd Edition, Bhandarkar Publicatiion, 1998.

REFERENCES

1. Maleev, V.L., “Internal Combustion Engines”, 2nd Edition, McGraw-Hill book co., 1987.
2. John Lamb, “Marine Diesel Engines”, 8th Edition, Butter worth – Heinemann, 1990. Publishing, 2001.
3. Morton, T.D., “Motor Engineering Knowledge for Marine Engineers”, 3rd Edition, Thomas Reed Publications, London 1979.

MV1402 – NAVAL ARCHITECTURE II

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3	1	0	4

UNIT I RESISTANCE 7

Types of resistance, frictional, residuary and total resistance, air, appendage, wave making, eddy and form resistances, model testing, propeller tests in open water, admiralty coefficient, fuel coefficient and consumption, sea trials – Problems.

UNIT II PROPELLERS 9

Types of propellers – Apparent and real slip – Wake – Thrust – Relation between powers – Relation between mean pressure and speed – Measurement of pitch – Cavitation – Built and solid propellers – Interaction between the ship and propeller – Hull efficiency – Overall propulsive efficiency – Problems.

UNIT III RUDDER THEORY 7

Types of rudders – Model experiments and turning trials – Area and shape of rudder – Position of rudder – Stern rudders Vs bow rudders – Forces on rudder – Torque on stock – Angle of heel due to force on rudder – Angle of heel when turning – Problems.

UNIT IV MOTION OF SHIP ON WAVES 11

Theory of waves – Trochoidal waves – Relationship between line of orbit centres and the undisturbed surface – Sinusoidal wave – Irregular wave pattern – Wave spectra – Wave amplitudes – Rolling in unresisting media – Rolling in resisting media – Practical aspects of rolling – Anti rolling devices – Forces caused by rolling – Pitching – Heaving and yawing.

UNIT V SHIP DESIGN 11

Design requirements – Influence of nature of cargo on ship type – Determination of principal dimensions – Calculation of steel and outfit masses – The ship form – Stability and trim – determination of scantlings of the structure – General arrangement – Cost – Design optimization.

L: 45 T: 15 Total: 60

TEXT BOOKS

1. Rawson, K.J. and Tupper, E.C., “Basic Ship Theory” (Vol.II), 5th Edition, Butterworth Heinemann, 2001.
2. Stokoe, E.A., “Reeds Naval Architecture for Marine Engineers”, 2nd Edition, Thomas Reed Publications, 1982.

REFERENCES

1. Vikram Gokhale, N.Nanda, “Naval Architecture and Ship construction”, 1st Edition, Engee Enterprises, 2002.
2. EricTupper, “Introduction to Naval Architecture”, 3rd Edition, Butter worth – Heinemann, 2001.
3. Hatch, G.N., “Creative Naval Architecture”, 1st Edition, Thomas Reed Publications, 1971.

MV1403 – MARINE ELECTRICAL TECHNOLOGY

L	T	P	C
4	0	0	4

UNIT I POWER DISTRIBUTION AND REGULATIONS 14

The marine environment – Effects of inclination – Generators – Power supply commonly available – Main switchboard – Motor controls – Emergency services – Emergency stop panel – Ships auxillary services – Load analysis – Electrical diagrams – Inherent dangers and avoidance of disastrous consequences – Active and passive safety measures – Do's and Don'ts – Electric shock – First aid – Conditions of shock risk – Selection of AC and DC generators for use on ships – Merits and demerits – Location and installation of generator sets.

Requirements and Regulations – Safe electrical equipments for hazardous areas – American safety standards – Common definitions – British and European standards – Tanker installations – Installations ashore – Indian standards.

Systems of AC distribution – General concept – Single, two and three phase systems with 2,3 and 4 wires – Power distribution – General Distribution scheme – Specific systems for ship's service – tankers schemes – Primary power bus – Need for emergency power supply – Method of supply – Passenger and cargo vessels requirements – Shore supply – Precautions to be taken while consuming shore supply – Arrangement to ensure proper phase supply – Remote switches to ventilating fans – Fuel pumps – Lubricating oil pumps and purifiers.

UNIT II INSTRUMENTATION AND SWITCHGEAR 10

Insulated and earthed neutral systems – Introduction – Circuit faults – Causes – Prevention – Earth fault indicators – Detection and clearance – Alternators.

AVR: excitation systems – Carbon pile regulator – Vibrating contact and static automatic regulator – Transient voltage dip and alternator response – Effect of kW and kVAR loading.

Panel Instrumentation: Introduction – System terminology – Phase sequence indicators.

Paralleling of alternators: Manual and auto synchronizing – Lamps – Parallel operation – excitation and throttle control – Load sharing – kW, kVAR and Manual.

Switchboards and switchgear: Main and sub switchboard-rating and Characteristics of main switchboards – Group starter boards – Distribution fuse boards – Bus bars – Instrumentation and controls – Circuit breakers – Alternator CB's – MCCB's – Miniature CB's-RCCB's – Arc fault Current interrupts – Fused isolators – Fault protection devices – Introduction – Over-voltage-Surge-transients – Ripple – Spikes – DC generator protection –Alternator and system protection – Protection through fuses – Protection discrimination motor protection.

UNIT III CABLES AND LIGHTING SYSTEMS 10

Electrical Cables: Cables – Conductors – Wire sizes - Current rating – Testing-codes - Practical tips.

Insulation – Protection and temperature ratings – Insulation classes – A, B, E, F,H- Insulation for High temperatures – Insulating materials – Cable insulation and sheath – Formation of polymers – Classification – Polymerization mechanisms – Filters – Cross – Linking – Cable gland – Degrees of protection – Temperature ratings – Temperature rise – Determination of hot temperature.

Lighting Systems: Introduction – Incandescent lamps – Discharge lamps – HCLPMF lamps – High pressure mercury fluorescent lamps – High and low pressure sodium vapour lamps – Lamp caps – Effect of voltage on lamp performance – Navigation and signal lights – Signals for a power driven ship under way (At night) – Emergency lighting – Requirement of lighting of deck and pump house of oil tankers – Alarm indication systems: Fire alarms and detection – Heat detectors – Smoke detectors – Combustion detectors – Miscellaneous alarm indicator systems – Scanning type system – Sequential starting and cut outs for an automatic fired boiler incorporating safety devices and combustion control equipments – Incinerators – Sewage plants – Bilge oil separators.

UNIT IV PROPULSION AND STEERING SYSTEMS

12

Propulsion Systems: Auxiliary propulsion systems – Layout and optimizing storage space – Electrical propulsion – Advantages and disadvantages DC constant current systems – DC motor supplied from alternators – Turbo – electric propulsion – AC single speed and induction motor drives – Fixed speed alternators – Cycloconverter device - Diesel electric propulsion – Thruster and water jet propulsion.

Steering Systems & Gyrocompasses: Fundamentals – Auto navy steering systems – Type P – Electro hydraulic Steering – Control systems – Typical system configuration – Components – Auto steer-types – Structure – Gyroscopes – Compass considerations – Deck machinery and cargo equipment: Anchor windlass – Cargo winches – Hydra lift marine cranes-maritime GMC A.S.-hagglunds drives and H.W. Carlsen AB-magnetic disc brakes.

Automation of Air Compressors: Selection – Choice of a correct machine – Oil-free and non-oil free air – Instrument air – Air Vs Water cooled – Reciprocating compressors – Starting and control – Safety protection equipment – Automatic operation.

UNIT V AUXILIARIES AND MAINTENANCE

14

Batteries & Battery charging: Battery supplies – Lead-acid batteries – Electrical characteristics – Nickel – Cadmium batteries – Sealed Ni-Cd batteries – Battery charging – Charging from AC and DC mains – Standby emergency batteries – Voltage regulators – Battery insulation and safety measures – First aid treatment – Rotary generators.

Gas analysers: Combustible gas indicator – Portable oxygen analyzer – CO₂ Analysis – Tank scope – Fixed oxygen analyser – Miscellaneous systems: Cathodic protection system – Crankcase oil mist detector – Air drier – Dynic water purity meter – Salinometer – Electric tachometer – Rudder position indicator – Ship’s roll stabilizer – Galley equipment – Laundry equipment – Refrigerating machinery – Temperature monitoring for R and AC systems.

Maintenance & Troubleshooting: Introduction – Planned preventive maintenance – Life, breakdown and condition maintenance, troubleshooting and maintenance of specific equipments – Recommended list of spares, tools and accessories.

Total: 60

TEXT BOOKS

1. Bowic C.T., Marine Electrical Practice, 5th Edition, “Butter Worthy”, 1981.
2. LAW S.W., “Electricity applied to Marine Engineering”, 4th Edition, “The Institute of Marine Engineers”, 1998.

REFERENCE

1. Fernandez, E.A., “Marine Electrical Technology”, 1st Edition, “Sterling Book House”, 2002.

MV1404 – MARINE MACHINERY SYSTEM AND MARINE MACHINERY DESIGN

L T P C
3 1 0 4

UNIT I BEARINGS 11

Sliding contact bearings: Journal bearings, thrust bearings, friction in journal bearings, bearing loads, bearing design using various equations –Thermal Equilibrium.

Rolling Contact Bearings: Load ratings, types of radial ball bearings, selection of bearings, lubrication of ball and roller bearings, methods of failure.

UNIT II GEARS 9

Spur and Helical Gears: Basic design principles of spur gears, helical gears, dynamic tooth loads, design for strength and wear – Lewis and Buckingham equations.

Bevel and Worm Gears: Basic design principles of bevel gears and worm gears – Lewis formula, thermal rating of worm gears.

UNIT III IC ENGINES 7

Design of IC engine parts: Piston, connecting rod with bearings, crankshaft, flywheel and rocker arms.

UNIT IV VALVES AND LIFTING EQUIPMENTS 7

Design: safety valve and reducing valves.

Design of lifting equipment: Crane hooks, lifting chains – Engine room E.O.T.Crane.

UNIT V DESIGN CRITERIA OF MARINE SYSTEMS 11

1. Water cooling systems for diesel engines and steam plants.
2. Lubricating oil systems for propulsion and auxiliary engines.
3. Electro hydraulic steering gear system including rudder, rudderstock, tiller, rams.
4. Marine Diesel Engine air starting system including air receiver, compressors and air starting valves.
5. Marine Diesel Engine Scavenge and Exhaust systems.
6. Marine diesel Engine fuel injection system including fuel pumps and fuel injectors.
7. Power transmission system including thrust blocks, intermediate shaft and tail end shaft.
8. Steam turbine plants.
9. Gas turbine plants.

L: 45 T: 15 Total: 60

TEXT BOOKS

1. Pandya and Shah, “Machine Design”, 13th, Charotar Publishing House, 1997.
2. Sam Had Dad, Neil Watson, “Design and Application in Diesel Engines”, 1st Edition, Ellis Horwood Limited, 1984.

REFERENCES

1. PSG College of Technology, Faculty of Mechanical Engineering, “Design Data”, 2nd Edition, M/s DPU printer, 1978.
2. Indian Register of Shipping Part 1 to Part 7, “Rules and Regulations & Classification of steel ships” 1st Edition, 1999.
3. Taylor, D.A., “Introduction to Marine Engineering”, 2nd Edition, Butter Worth, 1993.

MV1405 – MARINE AUXILIARY MACHINERY II

L	T	P	C
4	0	0	4

UNIT I POLLUTION PREVENTION 13

Oily water separators their construction and operation – Use of coalesces – Prevention of oil pollution and various international requirements – (MARPOL ACT).

Other shipboard equipments: Incinerators – Sewage treatment plant – Principle of operation – Construction – Maintenance and fault finding analysis.

UNIT II DECK MACHINERY, OIL PURIFICATION, BLOWERS AND COMPRESSORS 13

Various types of deck machinery used in ships e.g. – Deck cranes winches and windlass – Their requirements – Operation and maintenance – Hatch covers – Different types of stabilizers – Bow thrusters – Theory of oil purification – Principles of operation and construction of different centrifuges for heavy fuel and lubricating oil – Operational and constructional details of blowers and compressors used on board ships – Uses of compressed air.

UNIT III SHAFTING 11

Methods of shaft alignment, constructional details and working of thrust block – Intermediate shaft bearing and stern tube bearing – Oil and water lubricated stern tubes – Sealing glands – Stresses in tail end shaft, intermediate shaft and thrust shaft.

UNIT IV DRYDOCKING 11

Methods of drydocking of ships – Inspection and routine overhauling of underwater fittings and hull – Measurement of clearances and drops – Removal and fitting of propellers and rudders, main and stern tubes – Inspection and maintenance.

UNIT V NOISE AND VIBRATIONS 12

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, torsion – Their sources and effects) – Resonance and critical speed – Structure borne and air borne – Vibration – Anti vibration mountings of machineries – Detuners – Dampers with reference to torsion vibrations dampers – Use of torsionographs.

Total: 60

TEXT BOOKS

1. McGeorge, H.D., “Marine Auxiliary Machinery”, 7th Edition, Butter worth, 2001.
2. Leslie Jackson, “Engineering Knowledge for Marine Engineers Vol-8”, 4th Edition, Thomas Reed Publications, 1986.

REFERENCES

1. McGeorge, H.D., “General Engineering Knowledge”, 3rd Edition, Butter worth – Heineman, 1991.
2. Vikram Gokhale, and Nanda, N., “Advanced Marine Engineering Knowledge Vol. II”, 2nd Edition, Engineer Enterprises, 2001.
3. Vikram Gokhale and Nanda, N., “Marine Engineering Knowledge for Junior Engineers, 3rd Edition, Engineer Enterprises, 1999.

MV1406 – SHIP'S ADVANCED FIRE PREVENTION AND CONTROL

L	T	P	C
4	0	0	4

UNIT I FIRE PROTECTION BUILT IN THE SHIPS 14

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 for fire fighting systems and equipments on different vessels – Fire doors and fire zones.

UNIT II DETECTION AND SAFETY SYSTEMS 10

Fire safety precautions on cargo ships – Tankers and passenger ships during working – Types of detectors – Selection of fire detectors and alarm systems and their operational limits – Commissioning and periodic testing of sensors and detection system – Description of various systems fitted on ships.

UNIT III FIRE FIGHTING EQUIPMENT 14

Fire pumps – Hydrants and hoses – Couplings – Nozzles and international shore connection – Construction – Operation and merits of different types of portable – Non-portable and fixed fire extinguishers installations for ships – Properties of chemicals used – Water-mist fire suppression system – Advantages of various fire extinguishing agents including vaporizing fluids and their suitability for ship's use – Control of class A,B,C and class D fires, Combustion products and their effects on life safety.

UNIT IV FIRE CONTROL 12

Action required and practical techniques adopted for extinguishing fires in accommodation – Machinery spaces – Boiler rooms – Cargo holds – Galley, etc – Fire fighting in port and dry dock – Procedure for re-entry after putting off fire – Rescue operations from affected compartments – First aid – Fire organization on ships – Shipboard organization for fire and emergencies – Combustion products and their effects on life safety – Fire signal and muster – Fire drill – Leadership and duties – Fire control plan – Human behaviour.

UNIT V SAFETY MEASURES 10

Special safety measures for preventing – Fighting fire in tankers – Chemical carriers – Oil rigs – Supply vessels, and fire fighting ships – Safe working practice with respect to fire on board ships and first aid for hazards arising from fire in ships.

Total: 60

TEXT BOOKS

1. Frank Rush Brook, "Fire Aboard", 3rd Edition, Brown, son and ferguson Ltd., Glassgow 1988.
2. Vikram Gokhale and Nanda, N., "Marine Engineering Knowledge for Junior Engineers", New Edition, Engee Enterprises, 2009.

REFERENCES

1. IMO, SOLAS (Safety of Life At Sea), 3rd Edition, International Maritime Organization, London, UK, 2001.
2. Shipping, D.G., "Fire Fighting Appliances Rules (1969/1990)", 3rd Edition published by Bhandarkar Publications, Mumbai, 1996
3. Leslie Jackson, "Reed's General Engineering Knowledge for Marine Engineers" Vol.8, 4th Edition, Thomas Reed publication, Great Britain, 1986.

**MV1407 – FIRE FIGHTING LABORATORY, CONTROLS LABORATORY AND
SIMULATOR LABORATORY**

L T P C
0 0 4 2

MARINE ENGINEERING FIRE FIGHTING LABORATORY **25**

1. Fire hazard aboard ships – inflammability, fire extinguishing use. Control of class A, B & C fires.
2. Fire protection built in ships, extinction systems, and escape means.
3. System for tankers, statutory requirements for fire fighting systems and equipments on different vessels.
4. Fire fighting equipment: fire pumps, hydrants and hoses, couplings, nozzles and International shore connection, Construction, Operation and merits of different types of portable extinguishers.
5. Non-portable and fixed fire extinguishers, installation for ships. Properties of chemical used, bulk carbon-di-oxide, and inert gas systems.
6. Firemen outfit its use and care, maintenance, testing and recharging of appliances, preparation, and fire appliance survey.
7. Fire Control: Action required and practical techniques adopted for extinguishing fires in accommodation, machinery spaces, boiler rooms, Cargo holds, galley etc.,
8. Fire fighting in port and dry dock. Procedure for re-entry after putting off fire, rescue operations from affected compartments.
9. First aid, Fire organisation on ships. Fire signal and muster.
10. Fire drill.

REFERENCE

Laboratory Manual.

CONTROLS LAB. EXPERIMENTS **15**

1. Operation of Automatic Viscosity Controller and maintaining a specific viscosity of a given fuel.
2. Operation of an Automatic flow controller and measuring the flow from a given pipe.
3. Operation and utility of a 3 Term (P+I+D) Pneumatic controller.
4. To study the functioning of a Mist Detector and checking the alarm when the Pre-set value is exceeded.
5. Study the operation of fire detection unit using Ionization chamber type detector.

SIMULATOR LAB. EXPERIMENTS **20**

1. Description of basic engine functions and their simulation.
2. Manual Method of operation of engine from engine room station.
3. Engine operation from Remote stations – i.e. engine control room and Navigation Bridge.
4. Safety and interlocks in UMS – ships and effect of malfunction of main engine auxiliaries.
5. Electronic logic circuits in remote control stations.
6. Simulation of engine functions in logic circuits.
7. Study and adjustments of Logic circuits for remote control operation of main engine and troubleshooting.
8. Interfacing Input/output and pneumatic interfacing in the systems.
9. Role of classification societies with reference to UMS – ships.

Total: 60

LIST OF EQUIPMENTS

for a batch of 30 students

MARINE FIRE FIGHTING LABORATORY

Sl.No.	Description of Equipment	Qty.
01.	Fixed CO2 fire fighting system	01
02.	Smoke Detection Unit	01
03.	Fire main system	01
04.	Fire call point & Gong Bell	01
05.	Portable extinguishers (Water, CO2, dry powder, mechanical type extinguishers)	01
06.	Non-Portable Extinguisher – Mechanical Extinguisher	01
07.	Smoke & Heat detectors	01
08.	C.A.B.A	01
09.	Bellow type foot pump	01
10.	First aid kit and stretcher	01

MARINE CONTROLS LABORATORY

Sl.No.	Description of Equipment	Qty.
01.	Transparent Hydraulic Trainer	01
02.	Transparent Pneumatic Trainer	01
03.	Electro Hydraulic and Pneumatic Trainer	01
04.	PID Trainer – Hydraulic	01
05.	PID Trainer – Pneumatic	01
06.	PC Interface	01
07.	ELGI Air Compressor	01

MARINE SIMULATOR LABORATORY

Sl.No.	Description of Equipment	Qty.
01.	Engine Room Simulation Master Panel	01
02.	Engine Room Simulation Trainee Panels	04

**MV1408 – MARINE PROPULSION AND AUXILLARY MACHINERIES
OVERHAULING LABORATORY**

L T P C
0 0 6 2

(A) MAIN ENGINE ROUTINES

50

1. Cleaning of Lubricating oil filters.
2. Cleaning of Lubricating oil coolers.
3. Cleaning of Jacket water coolers.
4. Cleaning of Air Coolers.
5. Crank case inspection.
6. Checking bearing clearances.
7. Main Engine Over hauling of cylinder heads and fittings.
8. Main Engine over Hauling of Fuel Injection pumps.
9. Cleaning of Turbo charger filters.
10. Cleaning of Fuel oil filters.
11. Measurement of crank web deflection.

(B) AUXILIARY ENGINE ROUTINES

40

1. Over hauling of cylinder head and fittings.
2. Checking tappet clearances.
3. Overhauling of air coolers.
4. Overhauling of fuel injection pump.
5. Crank case inspection and checking of all bearing clearances
6. Overhauling of crank case relief door.
7. Overhauling of Turbocharger.
8. Cleaning of Air coolers.
9. Measurement of crank web deflection.

Total: 90

LIST OF EQUIPMENTS

(for a batch of 30 students)

MARINE PROPULSION LABORATORY

S.No.	Description of Equipment	Qty.
1	Fuel Oil Separator	01
2	Lub Oil Separator	01
3	Bilge Pump	01
4	Ballast Pump 130 cu.m/hr.	01
5	Main Engine Sea Water Pump	01
6	Sludge Pump	01
7	Fuel Oil Transfer Pump	01
8	Ballast Pump 65 cu.m /hr.	01
9	Lub Oil Filter	01
10	Fuel Oil Filter	01
11	Lub Oil Cooler	01
12	Sea Water Cooler	01
13	Main Engine	01
14	Air Compressor with bottle	01
15	Main Engine Lub Oil Pump	01
16	Portable Compressor	01
17	Diesel Generator 300 KW	01

MARINE AUXILIARY MACHINERY LABORATORY

S.No	Description of Equipment	Qty.
1	Air Compressor	01
2	Heat Exchanger	01
3	Incinerator	01
4	Oily Water Separator	01
5	Steering Gear	01
6	Cargo Turbine Oil Pump	01
7	Cargo Winch	01
8	Governor	01
9	Thermostat	01
10	Crankshaft	01

MARINE DISMANTLING AND ASSEMBLING LABORATORY

S.No.	Description of Equipment	Qty.
1	Heleshaw Pump	01
2	Piston Pump	01
3	Centrifugal Pump	01
4	Gear Pump	01
5	Fire & G.S Pump	01
6	Screw Displacement pump	01
7	Sewage Treatment Plant	01
8	Cargo Oil Pump	01
9	Different types of valves (quick closing valve, non-return valve, butterfly valve)	01 Each
10	Water gauge glass	01

MARINE BOILER WORKSHOP

S.No.	Description	Qty.
1	Auxillary Water Tube Boiler	01
2	Fresh Water Generator	01

HS1301 – COMMUNICATION AND SOFT SKILLS LABORATORY

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The aim of the course is two-fold: to enable the students to develop communication skills in the language laboratory and to arrange discussions for developing soft skills in the lab and/or the classroom. Each lab session shall last for three periods.

List of activities that are to be carried out: (15 sessions x 3 periods = 45)

Lab session # 1: Listening and speaking practice exercises with communicative functions. Learning material: the ACD of Spoken English: A Foundation Course for Speakers of Indian Languages (Orient Longman, 2008)

Lab session # 2: Practice with more advanced communicative functions. Learning material: the ACD of Spoken English: A Foundation Course for Speakers of Indian Languages (Orient Longman, 2008)

Lab session # 3: Pronunciation exercises with Oxford Advanced Learners' Dictionary of Current English or any other standard Dictionary

Lab session # 4: Making an oral presentation in English. Learning Material: Professional Presentations VCD (Cambridge University Press)

Lab session # 5: Listening to telephone conversations in English and completing the tasks. Learning material: Essential Telephoning in English ACD (Cambridge University Press)

Lab session # 6: Giving an exposure to and practice with model group discussion and interviews. Learning material: How to Prepare for Group Discussion and Interview Audio Cassette (McGraw-Hill)

Lab session # 7: Giving insights into the format and the task types in the IELTS (International English Language Testing System). Learning Material: Objective IELTS, Intermediate Level (CUP)

Lab session # 8: Understanding the format and the task types in the TOEFL (Test of English as a Foreign Language). Learning Material: Understanding the TOEFL (Educational Testing Services, Princeton)

Lab session # 9: Administering the BEC (Business English Certificate) Diagnostic Test. Learning Material: BEC Practice Materials (British Council, Chennai)

Lab session # 10: Completing the steps involved in Career, Life Planning and Change Management. Learning Material: Developing Soft Skills (Pearson Education)

Lab session # 11: Setting goals and objectives exercises. Learning Material: Developing Soft Skills (Pearson Education)

Lab session # 12: Prioritizing and time planning exercises. Learning Material: Managing Time Multimedia Program CD

Lab session # 13: Taking a Personality Typing/ Psychometric Test Learning Material: 200 Psychometric Test prepared by the CUIC, Anna University Chennai

Lab session # 14: Critical and creative thinking exercises.

Lab session # 15: Improving body language and cross-cultural communication with pictures. Learning material: Body Language (S. Chand and Co.)

For a detailed plan, refer to the topics given below;

UNIT I LISTENING AND SPEAKING PRACTICE IN COMMUNICATIVE FUNCTIONS

Introductions and Meetings – Talking about Studies and/or Job – Expressing Likes and Dislikes – Describing Daily Routines and Current Activities – Talking about Past States and Events – Talking about Future Plans and Intentions – Expressing Preferences – Giving Reasons – Expressing Opinions, agreement and Disagreement – Seeking and Giving Advice – Making Suggestions.

UNIT II SPEAKING APPLICATIONS

Making an Oral Presentation – Preparing the Presentation – Performing the Presentation – Beginning – Language – Visual Aids and Body Language – Voice – Ending – Questions – Telephone Conversations – Group Discussion and Interview.

UNIT III UNDERSTANDING AND PREPARING FOR INTERNATIONAL ENGLISH LANGUAGE EXAMINATIONS

International English Language Testing System (IELTS) – Test of English as a Foreign Language (TOEFL) – Business English Certificate (BEC)

UNIT IV SOFT SKILLS (1)

Preparing for and Dealing With Change – Motivation, Goal-Setting and Self-Esteem – Managing Time and Stress – Career and Life Planning – Team Work – Leadership Traits.

UNIT V SOFT SKILLS (2)

Multiple Intelligences – Learning Styles and Personality Typing – Critical and Creative Thinking – People, Cultures and Self – Intercultural Communication.

RESOURCES

1. Kamalesh Sadanand and Susheela Punitha, “Spoken English: A Foundation Course” for Speakers of Indian Languages, Part 2 Audio CD, Hyderabad: Orient Longman, 2008
2. Malcome Goodale, “Professional Presentations”, (VCD) New Delhi: Cambridge University Press, 2005
3. Barbara Garside and Tony Garside, Essential Telephoning in English (Audio CD), Cambridge: Cambridge University Press, 2002
4. Hari Mohan Prasad and Rajnish Mohan, “How to Prepare for Group Discussion and Interview (Audio Cassette)”, Tata McGraw-Hill Publishing
5. International English Language Testing System Practice Tests, CUP
6. Business English Certificate Materials, Cambridge University Press
7. Understanding the TOEFL. Educational Testing Services, Princeton, US
8. Interactive Multimedia Programs on Managing Time and Stress
9. Robert M. Sherfield and et al “Developing Soft Skills”, 4th Edition, New Delhi, Pearson Education, 2009.

Total: 60

SEMESTER VIII

HS1201 – ENVIRONMENTAL SCIENCE AND ENGINEERING

(Common to all branches)

L	T	P	C
3	0	0	3

UNIT I INTRODUCTION TO ENVIRONMENTAL STUDIES AND NATURAL RESOURCES 10

Definition, scope and importance – Need for public awareness – Forest resources: Use and over-exploitation, deforestation, case studies – Timber extraction, mining, dams and their ground water, floods, drought, conflicts over water, dams-benefits and problems – Mineral resources: Use effects on forests and tribal people – Water resources: use and over-utilization of surface and exploitation, environmental effects of extracting and using mineral resources, case studies – food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies – Energy resources: Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources. Case studies – Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification – Role of an individual in conservation of natural resources – Equitable use of resources for sustainable lifestyles.

Field study of local area to document environmental assets – River / forest / grassland / hill / mountain.

UNIT II ECOSYSTEMS AND BIODIVERSITY 14

Concept of an ecosystem – Structure and function of an ecosystem – Producers, consumers and decomposers – Energy flow in the ecosystem – Ecological succession – Food chains, food webs and ecological pyramids – Introduction, types, characteristic features, structure and function of the (a) forest ecosystem (b) grassland ecosystem (c) desert ecosystem (d) aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries) – Introduction to biodiversity – Definition: genetic, species and ecosystem diversity – Biogeographical classification of India – Value of biodiversity: Consumptive use, productive use, social, ethical, aesthetic and option values – Biodiversity at global, national and local levels – India as a mega-diversity nation – Hot-spots of biodiversity – Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – Endangered and endemic species of India – Conservation of biodiversity: in-situ and ex-situ conservation of biodiversity – Field study of common plants, insects, birds – Field study of simple ecosystems – Pond, river, hill slopes, etc.

UNIT III ENVIRONMENTAL POLLUTION 8

Definition – Causes, effects and control measures of: (a) air pollution (b) water pollution (c) soil pollution (d) marine pollution (e) noise pollution (f) thermal pollution (g) nuclear hazards – Solid waste management: causes, effects and control measures of urban and industrial wastes – Role of an individual in prevention of pollution – Pollution case studies – Disaster management: floods, earthquake, cyclone and landslides.

Field study of local polluted site – Urban / rural / industrial / agricultural

UNIT IV SOCIAL ISSUES AND THE ENVIRONMENT

7

From unsustainable to sustainable development – Urban problems related to energy – Water conservation, rain water harvesting, watershed management – Resettlement and rehabilitation of people; its problems and concerns, case studies – Environmental ethics: Issues and possible solutions – Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust, case studies – Wasteland reclamation – Consumerism and waste products – Environment protection act – Air (prevention and control of pollution) act – Water (prevention and control of pollution) act – Wildlife protection act – Forest conservation act – Issues involved in enforcement of environmental legislation – Public awareness

UNIT V HUMAN POPULATION AND THE ENVIRONMENT

6

Population growth, variation among nations – Population explosion – Family welfare programme – Environment and human health – Human rights – Value education – HIV / AIDS – Women and child welfare – Role of information technology in environment and human health – Case studies.

Total: 45

TEXT BOOKS

1. Masters, G.M., “Introduction to Environmental Engineering and Science”, 2nd Edition, Pearson Education Pvt., Ltd., 2004.
2. Trivedi R.K. And Goel, P.K., “Introduction to Air Pollution”, Techno-Science Publications, 2003

REFERENCES

1. Bharucha Erach, “The Biodiversity of India”, Mapin Publishing Pvt. Ltd., India,
2. Trivedi R.K., “Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards, Vol. I and II”, Enviro Media.
3. Cunningham, Cooper, W.P. and Gorhani, T.H., “Environmental Encyclopedia”, Jaico Publications, 2001.
4. Wager K.D., “Environmental Management”, W.B. Saunders Co., Philadelphia, 1998.

MV1451 – SHIP OPERATIONAL, MANAGEMENT AND IMO REQUIREMENTS

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UNIT I STRUCTURE OF A SHIPPING COMPANY 12

Principal shipping organisations various types of marine vessels and cargo – Classification – Ownership of vessels – Registration of ships – Flags of convenience – IMO identification number – Structure of a shipping company and functioning of its various departments – Financing – Economics of new and second hand tonnage – Subsidies.

UNIT II COMMERCIAL SHIPPING PRACTICE 14

Planning sailing schedules and voyage estimates – Liner and tramp shipping services – Conference systems – Chartering and charter parties – Ship’s papers for arrival and departure – Port procedures – Role of agents – Theory of freight rates – Bills of lading – Pilotage – Cargo surveys and note of protests – Carriage of goods by sea act.

UNIT III MARINE INSURANCE 10

Underwriting and loss adjusting principles applied to marine cargo insurance – Hull / machinery policy – Particular average – General average – P and I Clubs – Making claims.

UNIT IV STATUTORY REGULATIONS 12

IMO Conventions – Legislations – MARPOL acts and conventions – Annexes I to VI, SOLAS 1974 and amendments – Main objectives – Overview of all chapters and articles with an emphasis on ISM and ISPS codes – OPA 90 – Ballast water management.

UNIT V STCW 12

International convention on STCW for seafarers 1978 with 1995 amendments – An overview of all sections – Manning of ships – Engagement and discharge of ship’s crew – Ship’s articles – Merchant shipping act – Port state control – PSC mandatory certificate check list – Grounds for PSC inspection criteria for detention – Case studies.

Total: 60

TEXT BOOKS

1. Stevens, E.F., and Butterfield, C.S.J., “Shipping Practice” 11th Edition, Sterling Book House, 1999.
2. Downard, J.M., “Ship Management Series - Managing Ships”, 1st Edition, Fairplay Publications, Coulsdon, Surrey - 1990.

REFERENCES

1. SOLAS – 1974, MARPOL – 1973/78 and STCW -1978/95 International Maritime Organisation Publications.
2. Merchant Shipping Act, Govt. of India - 1958.
3. Institute of chartered ShipBrokers, Ship Management, 1999.

UNIT I VARIOUS TYPES OF MARINE BOILERS & BOILER MOUNTINGS 12

Scotch boiler – Cochran – Spanner – Clarkson thimble tube – Waste heat recovery calculation – Lamont exhaust gas boiler – Composite boilers – Water tube boilers – Babcock Wilcox – Foster wheeler – D-type – Double evaporation boilers – Safety valves – Improved high lift – Full lift and full bore type: Gauge glass – Ordinary plate type and remote indicator – Automatic feed regulator – Three element high and low water level alarms – Main steam stop valve – Retractable type soot blower etc.

UNIT II OPERATION, CARE & MAINTENANCE OF BOILERS 12

Pre-commissioning procedures – Hydraulic tests – Steam raising and operating procedures – Action in the event of shortage of water – Blowing down of boiler – Laying up a boiler: General maintenance – External and internal tube cleaning – Tube renewals – Maintenance – Inspection and survey of boilers.

Refractory: Purposes of refractory – Types of refractory and reasons for failure.

Oil burning: Procedure of liquid fuel burning in open furnace – Various types of atomizer – Furnace arrangement for oil burning – Boiler control system i.e. Master control, fuel control, air control and viscosity control – Introduction to automation.

UNIT III MARINE STEAM ENGINEERING 14

Reciprocating/Steam Engines: History of multiple expansion marine reciprocating engines and steam turbines – Description of different types of steam turbines.

Layout of Plant: General layout of plant and description of a modern geared steam turbine installation including auxiliaries in modern use – Open and closed feed system.

Selection of materials: Materials used in various components like blades, rotors, casings, sealing glands, gears – Their justification.

UNIT IV LUBRICATION OF TURBINES 10

Suitable oils and their properties – Lubrication of main bearings – Thrust bearings and gears – Gravity and pressure lubrication-oil system and emergency lubrication arrangement.

UNIT V CONDENSERS 12

Types of condensers – Constructional details – Location and working principles – Contraction and expansion allowances – Leak test – Effect of change of temperature – Circulating water quantity – Change of main engine power – Condenser surface.

Operation and Maintenance: Turbine drain system – Turbine gland system – Warming through a turbine plant – Control of speed and power of propulsion – Throttle valve control and nozzle control – Emergency controls – Emergency operation of turbines – Vibration in marine steam turbine – Steam turbine losses – Breakdown and faultfinding.

Total: 60

TEXT BOOKS

1. Milton, J.H. and Leach, R.M., "Marine Steam Boilers", 4th Edition, Butter worth, 1980.
2. Morton, T.D., "Steam Engineering Knowledge for Marine Engineers", 3rd Edition, Thomas Reed Publications, 1979.

REFERENCES

1. Flanagan, GTH., "Marine Boilers" 3rd Edition, Butter worth, 2001.
2. Donald, K.M.B., "Marine Steam Turbines", 1st Edition, Institute of Marine Engineers, 1977.
3. McBirnie, C., "Marine Steam Engines and Turbines", 4th Edition, Butter worth, 1980.

MV1453 – MARINE CONTROL ENGINEERING AND AUTOMATION

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UNIT I CONTROL SYSTEM 12

Introduction to control terms – Block diagrams for control systems – Open loop and closed feed back control – Comparison of closed and open loop – Feed forward control – Feed forward modification – Regulators and servomechanism – Proportional plus integral plus derivative controls – Use of various control modes.

UNIT II GRAPHICAL REPRESENTATION OF SIGNALS 12

Inputs of step – Ramp – Sinusoid – Pulse and impulse – Exponential function – Error detector – Controller output elements – The dynamics of a simple servomechanism for angular position Control: The torque proportional to error – Servomechanism and different response of servomechanism – Technique for improving the general performance of servomechanism – The frequency response test – Series compensation using Nyquist diagram.

UNIT III PROCESS CONTROL SYSTEMS 12

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

UNIT IV TRANSMISSION 10

Pneumatic and electric transmission – Suitability for marine use – Pneumatic and types of controllers hydraulic – Electric and electronic controllers for generation of control action time function controllers – Correcting Units: Diaphragm actuators – Valve positioners – Piston actuators and electro pneumatic transducers – Electro-hydraulic actuators and electric actuator control valves.

UNIT V APPLICATION OF CONTROLS ON SHIPS 14

Marine boiler – Automatic combustion control – Air - Fuel ratio control – Feed water control single, two and three-element type – Steam pressure control – Combustion chamber pressure control – Fuel oil temperature control – Control in main machinery units for temperature of lubricating oil – Jacket cooling water – Fuel valve cooling water – Piston cooling water and scavenge air, fuel oil viscosity control – Bridge control of main machinery – Instruments for UMS classification.

Total: 60

TEXT BOOKS

1. Taylor, D.A., “Marine Control Practice”, 2nd Edition, Butter worth & Co (Publishers) Ltd., 1987.
2. Leslie Jackson, “Instrumentation and Control Systems”, 3rd Edition, Thomas Reed Publication Ltd., 1992.

REFERENCE

1. Adams, L.F., “Engineering Instrumentation and Control”, 1st Edition, English Language Book Society (ELBS), Hodder, Stoughton, 1984.

MV1454 – SAFE WATCH KEEPING AND CLASS IV PREPARATION

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4	0	0	4

UNIT I SAFE WATCH KEEPING AND TROUBLE SHOOTING 12

Definition of watch – Operating principles – Requirements of watch keeping, requirements of certification – Duties of engineer officers – Operation of engine room in general, log book writing – Watch keeping under way – Watch keeping at port – At unsheltered anchorage, fitness for duty, preparation of diesel engines for a long voyage – Bad weather precautions, safe working practices – During overhauling at port, and during bad weather, change over from diesel oil to heavy oil and vice versa – Emergency measures taken in case of – Flooding of engine room, engine room bilge fire, general fire, in case of any system failure or breakage of pipe lines, etc.

UNIT II TROUBLE SHOOTING IN AUXILIARY MACHINERIES 10

Malfunctioning – Partial or total failure of auxiliary machineries such as auxiliary engines – Purifiers – Heat exchangers – Air compressors – Reefer and air conditioning compressors and systems – Boilers and accessories – Fresh water generators – Hydrophore tanks and systems – All pumps and systems.

Repairs and maintenance of propeller – Rudder – Drydocking methods – Drydocking inspection and repair works.

UNIT III TROUBLE SHOOTING IN MAIN ENGINE 12

Trouble shooting related to various types of marine diesel engines and condition monitoring – Causes – Effects – Remedies and prevention of engine not turning on air and fuel – Knocking at TDC and BDC – Black smoke in funnel – Poor compression and combustion – Early or advanced injection – Turbocharger surging – Scavenge fire – Air starting line explosion – Crank case explosion – Exhaust uptake fire – Failure of bottom end bolts.

UNIT IV MAINTENANCE OF VARIOUS COMPONENTS OF MARINE DIESEL ENGINES 14

Checking of holding down bolts – Resin chocking – Tie-rods tensioning – Checking and tightening of 2-stroke and 4-stroke bottom end bolts – Inspection and maintenance of crankshaft and cam shaft – Dismantle inspection and reassemble of main bearings – Cross head bearings and bottom end bearings – Connecting rod – Piston and piston assembly – Stuffing box – Cylinder head and all mountings – Governor and over speed trip – Checking of all clearances – Adjustments – Effect of improper clearances – Prevention and rectification – Cylinder liner and cylinder lubrication – Thrust bearing – Running gears inspection – Engine alignment – Chains drive adjustment and tensioning.

UNIT V TROUBLE SHOOTING AND MAINTENANCE OF ELECTRICAL MACHINERIES 12

Circuit testing – Shore supply arrangement – Maintenance of circuit breakers – Transformers – Electrical motors – Navigational lights – Batteries – Starters – Electrical equipments – Maintenance of switchboard – Maintenance of electrical equipments in oil tankers – LNG / LPG carriers.

Total: 60

TEXT BOOKS

1. Vikram Gokhale and Nanda, N. “Marine Engineering Practice and Ship safety and Environmental protection”, 3rd Edition, Engee Enterprises Mumbai, 2002.
2. John Lamb, “Marine Diesel Engines”, 8th Edition, Butter worth – Heinemann, 1990,Publishing, 2001.

REFERENCES

1. Vikram Gokhale, Nanda, N., “Advanced Marine Engineering Knowledge Vol. II”, 2nd Edition, Engineer Enterprises, 2001.
2. IME Manuals and Ship’s Marine Manuals.
3. Sulzer brothers, “Sumitomo – Sulzer Diesel Engines”, Service Instruction for Sumitomo Sulzer Diesel Engines RND Sumitomo ship building and Machining co., Ltd., Japan.

MV1455 – PROJECT WORK, TECHNICAL PAPER AND VIVA VOCE

L	T	P	C
0	0	12	6

It is mandatory on the part of the students to do a project and submit a report containing not more than 100 pages. A project should be undertaken by not exceeding 4 students in a batch.

The project can be of working model, PC based training module and theoretical design and analysis. This will be evaluated by both Internal and External Examiners.

The projects will be done in the eighth semester and will be reviewed three times by project guide and HOD. The internal mark of 100, for this will be allotted by the guide.

The thesis work will be evaluated by both Internal and External Examiners for a maximum of 100 Marks.

LIST OF ELECTIVES

ELECTIVES FOR VII SEMESTER

MV1001 – TRIBOLOGY

L	T	P	C
3	0	0	3

UNIT I

9

Dry friction – Topography of surfaces – Contact between surfaces – Sliding friction – Energy dissipation – Theory of molecular attraction – Fretting corrosion and prevention – Variables in dry friction – Present concept of friction – Boundary friction – Oiliness – Variables of boundary friction – Friction characteristics of metals and non-metal – Rolling friction – Sources of measurement of friction.

UNIT II

7

Wear – Types – Mechanism – Factors affecting wear – Adhesive wear – Abrasive wear – Fatigue wear – Corrosive wear – Brittle fracture wear – Delamination – Wear measurement.

UNIT III

11

Viscosity and flow; fundamentals of viscosity and flow – Petroff's equation – Friction torque – Viscosity measurement – Factors affecting viscosity – Principle of hydrostatic lubrication – Hydrostatic step bearing – Multi recess bearing – Design problems – Different types of compensation and their effect on bearing, parameters – Hydrostatic lift, simple problems – Hydrostatic journal bearing, simple problems – Hydrostatic squeeze films.

UNIT IV

9

Hydrodynamic lubrication: solution of Reynolds equation – Application to tilting pad thrust bearing – Design of hydrodynamic journal bearings – Force feed on oil flow with various type of grooves – Dynamic bearings and rotor systems – Brief discussion, lubrication systems, bearing materials – Gas bearings – Brief discussion – Elastohydro dynamic lubrication – Brief discussion.

UNIT V

9

Lubricants and maintenance: Lubricants – Types – Solid and liquid – Properties – Additives – Testing – Reclamation of lubricants, surface treatment – Phosphating of metal surface, teflon coating – Predictive maintenance – Signature analysis and condition monitoring – Basic principles – Instrumentation.

Total: 45

TEXT BOOKS

1. Cameron, A. "Basic Lubrication Theory", 3rd Edition, Wiley Eastern, 1988.
2. Majumdar, "Introduction of Tribology of bearings", 1st Edition, Prentice – Hall International.

REFERENCES

1. Hutchings.L.M, "Tribology - Friction and wear of Engineering Materials", 1st Edition, Edward Arnold, Great Britain, 1992.
2. Bharat Bhusan and B.K.Gupta, Handbook of Tribology.
3. Sahoo Prasanta, "Engineering Tribology", Hardbound Edition, PHI Publishers

MV1002 – NON-DESTRUCTIVE TESTING

L	T	P	C
3	0	0	3

UNIT I

11

Basic principles of Non-destructive examination-defects in material – Types of material failure – Service conditions leading to failure – Fundamental aspects of corrosion fatigue – Quality and standardisation – Various tests of non destructive testing practice: – Magnetic particle inspection, X-rays, Ultrasonic and other methods.

UNIT II

7

Ultra sonics terminology – Physical principles and fundamentals of ultrasonic – Testing techniques and limitations – Types of sensors.

UNIT III

9

Equipment and accessories – Ultrasonic flaw detector – Transmitter, receiver, monitor and gate control – Frequency selector control – Resolution – Noise suppression – Scan presentation – Types of ultrasonic instruments – Inspection of elements.

UNIT IV

9

X Rays – Radiography – Calibration and testing system – Specific applications – Inspection of welds.

UNIT V

9

Codes, standards, specifications and procedures – Recording and evaluation of results – Special techniques in ultrasonic.

Total: 45

TEXT BOOKS

1. Krautkramer. J., “Ultra Sonic Testing of Materials”, 1st Edition, Springer – Verlag Publication, 1996.
2. BaldevRaj, T. Jayakumar, M. Thavasimuthu, “Practical Non Destructive Testing”, Narosa Publishing House, 2002.

REFERENCES

1. Thavasimuthu, M., IGCAR, “Basic principles of Non-destructive Examination”
2. BaldevRaj, B. Venkataraman, “Practical Radiography”, 1st Edition, Narosa Publishing House, 2003.

MV1003 – FINITE-ELEMENT TECHNIQUES

L	T	P	C
3	0	0	3

UNIT I INTRODUCTION - VARIATIONAL FORMULATION 9

General fields problems in engineering – Modelling – Discrete and Continuous models – characteristics – difficulties involved in solution – The relevance and place of finite element method – Historical comments – Basic concept of FEM.

Boundary and initial value problems – Gradient and divergence theorems – Functional – Variational calculus – Variational formulation of BVPs – The method of weighted residuals – The Ritz method.

UNIT II FINITE ELEMENT ANALYSIS OF ONE DIMENSIONAL PROBLEMS 9

One dimensional second order equations – Discretisation of domain into elements – Generalized coordinates approach – Derivation of element equations – Assembly of element equations – Imposition of boundary conditions – Solution of equations – Cholesky method – Post processing – Extension of the method to fourth order equations and their solutions – Time dependent problems and their solutions – Example from heat transfer, fluid flow and solid mechanics.

UNIT III FINITE ELEMENT ANALYSIS TO TWO DIMENSIONAL PROBLEMS 9

Second order equations involving a scalar valued function – Model equation – Variational formulation – Finite element formulation through generalized coordinates approach – Triangular elements and quadrilateral elements – Convergence criteria for chosen models – Interpolation functions – Element matrices and vectors – Assembly of element matrices – Boundary conditions – Solution techniques.

UNIT IV ISOPARAMETRIC ELEMENTS OF FORMULATION 9

Natural coordinates in 1, 2 and 3 dimensions – Use of area coordinates for triangular elements in 2 dimensional problems – Isoparametric elements in 1,2 and 3 dimensions – Lagrangean and serendipity elements – Formulation of element equations in one and two dimensions – Numerical integration.

UNIT V APPLICATIONS TO FIELD PROBLEMS IN TWO DIMENSIONS 9

Equations of elasticity – Plane elasticity problems – asymmetric problems in elasticity – Bending of elastic plates – Time dependent problems in elasticity – Heat transfer in two dimensions – Incompressible fluid flow.

INTRODUCTION TO ADVANCED TOPICS: (Only preliminaries covered. Not included for examination) Three-dimensional problems – Mixed Formulation – Use of software packages.

Total: 45

TEXT BOOKS

1. Reddy, J.N., “Introduction to the Finite Element Method”, 2nd Edition, McGraw Hill, Intl., 1993.
2. Rao, S.S., “The Finite Element Method in Engineering”, 3rd Edition, “Butter Worth, 2001.

REFERENCES

1. Desai, C.S. and Abel, J.P., “Introduction to the Finite Element”, 1st Edition, Affiliated East West Press Pvt. Ltd., 1972.
2. Bathe, K.J., “Finite Element Procedures in Engineering Analysis”, 6th Edition, Prentice Hall of India Pvt. Ltd., 2002.

GE1001 – INTELLECTUAL PROPERTY RIGHTS (IPR)

L	T	P	C
3	0	0	3

UNIT I

5

Introduction – Invention and creativity – Intellectual Property (IP) – Importance – Protection of IPR – Basic types of property (i. Movable Property ii. Immovable property and iii. Intellectual property).

UNIT II

10

IP – Patents – Copyrights and related rights – Trade marks and rights arising from trademark registration – Definitions – Industrial designs and integrated circuits – Protection of geographical indications at national and international levels – Application procedures.

UNIT III

10

International convention relating to intellectual property – Establishment of WIPO – Mission and activities – History – General Agreement on Trade and Tariff (GATT).

UNIT IV

10

Indian position Vs WTO and strategies – Indian IPR legislations – Commitments to WTO – Patent ordinance and the Bill – Draft of a national intellectual property policy – Present against unfair competition.

UNIT V

10

Case studies on – Patents (Basumati rice, turmeric, Neem, etc.) – Copyright and related rights – Trade Marks – Industrial design and integrated circuits – Geographic indications – Protection against unfair competition.

Total: 45

TEXT BOOK

1. Subbaram N.R. “Handbook of Indian Patent Law and Practice”, S. Viswanathan (Printers and Publishers) Pvt. Ltd., 1998.

REFERENCES

1. Eli Whitney, United States Patent Number: 72X, Cotton Gin, March 14, 1794.
2. Intellectual Property Today: Volume 8, No. 5, May 2001, [www.iptoday.com].
3. Using the Internet for non-patent prior art searches, Derwent IP Matters, July 2000. [www.ipmatters.net/features/000707_gibbs.html.]

GE1002 – INDIAN CONSTITUTION AND SOCIETY

L	T	P	C
3	0	0	3

UNIT I 9

Historical background – Constituent assembly of India – Philosophical foundations of the Indian constitution – Preamble – Fundamental rights – Directive principles of state policy – Fundamental duties – Citizenship – Constitutional remedies for citizens.

UNIT II 9

Union government – Structures of the union government and functions – President – Vice president – Prime minister – Cabinet – Parliament – Supreme Court of India – Judicial review.

UNIT III 9

State government – Structure and functions – Governor – Chief Minister – Cabinet – State legislature – Judicial system in states – High courts and other subordinate courts.

UNIT IV 9

Indian federal system – Center – State relations – President's rule – Constitutional amendments – Constitutional functionaries – Assessment of working of the parliamentary system in India.

UNIT V 9

Society : Nature, Meaning and definition; Indian Social Structure; Caste, Religion, Language in India; Constitutional Remedies for citizens – Political parties and pressure groups; Right of women, Children and scheduled castes and scheduled tribes and other weaker sections.

Total: 45

TEXT BOOKS

1. Durga Das Basu, "Introduction to the Constitution of India", Prentice Hall of India.
2. Agarwal, R.C., "Indian Political System", S.Chand and Company, 1997.
3. Maciver and Page, "Society: An Introduction Analysis", Mac Milan India Ltd.
4. Sharma, K.L., "Social Stratification in India: Issues and Themes", Jawaharlal Nehru University, 1997.

REFERENCES

1. Sharma, Brij Kishore, "Introduction to the Constitution of India", Prentice Hall of India
2. Gahai, U.R., "Indian Political System", New Academic Publishing House, Jalaendhar, 1998.
3. Sharma, R.N., "Indian Social Problems", Media Promoters and Publishers Pvt. Ltd.
4. Yogendra Singh, "Social Stratification and Change in India", Manohar, 1997.

ELECTIVES FOR VIII SEMESTER
MV1004 – MARITIME ECONOMICS

L T P C
3 0 0 3

UNIT I **9**

The Economic Organization of the Shipping market
The shipping market cycles
The four shipping markets

UNIT II **9**

Supply, demand and freight rates
Costs, revenue and financial performance
Financing ships and shipping companies

UNIT III **9**

The economic principles of maritime trade
The global pattern of maritime trade
Bulk cargo and the economics of bulk shipping

UNIT IV **9**

The general cargo and the economics of liner shipping
The economics of ships and ship designs
The regulatory framework of maritime economics

UNIT V **9**

The economics of shipbuilding and scrapping
Maritime forecasting and market research

Total: 45

TEXT BOOKS

1. Martin Stopford, “Maritime Economics”, 2nd Edition, Routledge, London, 1997.
2. Dr. Hariharan, K.V., “Containerisation and Multimodal Transport in India”, 2nd Edition, Shroff Publishers and Distributors Pvt. Ltd., 1997.

REFERENCES

1. Raghuram, G. and others, “Shipping Management Cases and Concepts”, 1st Edition, MacMillan India Ltd., 1998.
2. Gill, J.S., “Manual of Merchant Shipping Act, 1958”, 1st Edition, Bhandarkar Publications, 1999.
3. Hardy Ivamy, E.R. “Casebook on Shipping Law”, 4th Edition, Lloyd’s of London Press Ltd., 1987.

MV1005 – SHIP'S SAFETY, ENVIRONMENTAL PROTECTION AND PERSONNEL CARE

L T P C
3 0 0 3

UNIT I 7

Precautions to be taken to prevent pollution of the marine environment: While bunkering, loading/discharging oil cargo – Tank cleaning – Pumping out bilges etc., – Knowledge of construction and operation of oil pollution prevention equipment in engine room and on tankers.

UNIT II 9

Legislation with regard to pollution prevention: MARPOL 73/78 and other country legislations like OPA-90 MARPOL equipment – Knowledge of codes of safety working practices as published – Knowledge of type of information issued by D.G. shipping with regard to safety at sea and safe working practices.

UNIT III 11

Personal survival techniques and life saving appliances on ship: Introduction and safety – Emergency situations – 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 – Understand practical applications of medical guides – Understand process of radio medical advice – Demonstrate knowledge of actions to be taken in case of accidents or illnesses that are likely to occur on board ships.

UNIT IV 11

Knowledge of national and International legislation: IMO and its conventions – Indian Merchant Shipping Act & Rules – Classification society – Charterers – Personal relationship onboard ship.

Knowledge of the appropriate statutes of concern to marine engineer officers: The administrative duties of a chief engineer – The organisation and training of staff for both normal and emergency duties.

The various statutory certificates and documents to be carried onboard ships by all ships: Dangerous goods codes– Carrying more than 2000 tonnes of oil – Chemical tankers and gas carriers.

UNIT V 7

Personnel Management: Principles of controlling subordinates and maintaining good relationship – staff attitudes – Exercise of authority – Group behaviour – Conditions of employment.

Organisation of Staff: Manning arrangements – Analysis of work – Allocation of staff – Organisation of safety and emergencies, staff duties, maintenances, ship's records, communication on the ship, meeting techniques.

Training on board ships: Training methods – Training in safety – Emergency drills – Training in ship operations.

Total: 45

TEXT BOOKS

1. Vikram Gokhale and Nanda, N., “Advanced Marine Engineering Knowledge Vol. IV – Ship’s Safety and Environmental Protection”, 2nd Edition, NG Engee Enterprises, 2003.
2. STCW – 1995 Hand Book

REFERENCES

1. International Maritime Organisation, “SOLAS”, 4th Edition 2004”, Sterling Book House, 2004
2. International Maritime Organisation, “MARPOL 73/78 Consolidated Edition 2006”, Sterling Book House, 2006.
3. Sturt, R. H. B., “The Collision Regulations”, 2nd Edition, Lloyd’s of London Press Ltd., London, 1984.

MV1006 – SPECIAL DUTY VESSELS – TYPES AND OPERATION

L	T	P	C
3	0	0	3

UNIT I

5

Need for special duty vessels with reference to development of trade and necessities of the trade – Operation of bulk carriers – Bulk grain and ore etc., – Banana carriers – Coal carriers – Forest products carriers – Timber carriers – Container vessels.

UNIT II OIL TANKER CARGO OPERATIONS

11

Pipeline systems – Ring main – Direct line – Combined – Free flow system – Stripping lines – Lining up pipe lines and cargo operations – Loading more than one grade – Discharging – Ballasting – Precautions – Ship / shore check list safety goods – Sources of ignition on tankers – Static electricity – Precautions to prevent ignition due to static electricity cargo operations when not secured alongside – Procedure if oil spill occurs – Oil record books.

UNIT III OIL TANKERS ROUTINE OPERATIONS AND TANK WASHING

11

Inert gas system – Principle – Components of system, plant and distribution system – Uses of inert gas during tanker operating cycle – Procedure – Portable and fixed machines – Tank washing with water – Washing atmospheres – Crude oil washing (COW) – Advantages and disadvantages of COW – Operating and safety procedures – Gas freeing – Pressure vacuum values – “Load on Top” system (LOT) regulations and operation – Segregated Ballast Tanks (SBT).

UNIT IV CARGOES WHICH ARE INTRINSICALLY DANGEROUS

11

Dangerous goods – Loaded in bulk – Packaging – IMDG code – Emergency procedures – ‘MS and M’ notices – General fire precautions, during loading / discharging – Fire fighting and detection system – Liquefied gas cargoes – Regulations types of cargo and carriers – LPG and LNG – Cargo handling equipments tank monitors and controls – Operational procedures loading and discharging of LPG/LNG cargoes – Chemical cargoes regulations, operations – Bulk chemical carriers – Tank material and coatings – Tank washing – Cargo record book – Equipment items precautions to be observed during cargo operations in port – Fire protection – Personnel protection.

UNIT V

7

Rules and regulations of classification societies for hull – Equipment and machineries of cargo ships and oil tankers – Requirements of various types of surveys and certification of merchant ships.

Total: 45

TEXT BOOKS

1. Lavery, “Ship board operation”, 2nd Edition, Butter Worth- Heinemann, London, 1990.
2. Bhandarkar, V.K., “MS and M Notices to Mariners”, 1st Edition, Bhandarkar Publications, 1998.

REFERENCES

1. Indian Register of Shipping Part1 to Part7, “Rules and Regulations for the construction and classification of steel ships”, 1st Edition, Indian Register of Shipping, 1999.
2. International of Maritime Organisation, “SOLAS Consolidated Edition 1997”, 2nd Edition, Sterling Book House, 1997.
3. Capt.Mistree, .K.S.D. and Sharma, B.K. Safe Oil Tanker operations, 5th Edition, A Marinez Publication, 2009.

GE1301 – PROFESSIONAL ETHICS AND HUMAN VALUES

(Common to all branches)

L	T	P	C
3	0	0	3

UNIT I HUMAN VALUES 10

Morals, values and ethics – Integrity – Work ethic – Service learning – Civic virtue – Respect for others – Living peacefully – Caring – Sharing – Honesty – Courage – Valuing time – Co-operation – Commitment – Empathy – Self-confidence – Character – Spirituality.

UNIT II ENGINEERING ETHICS 9

Senses of 'Engineering Ethics' – Variety of moral issued – Types of inquiry – Moral dilemmas – Moral autonomy – Kohlberg's theory – Gilligan's theory – Consensus and controversy – Models of professional roles – Theories about right action – Self-interest – Customs and religion – Uses of ethical theories.

UNIT III ENGINEERING AS SOCIAL EXPERIMENTATION 9

Engineering as experimentation – Engineers as responsible experimenters – Codes of ethics – A balanced outlook on law – The challenger case study.

UNIT IV SAFETY, RESPONSIBILITIES AND RIGHTS 9

Safety and risk – Assessment of safety and risk – Risk benefit analysis and reducing risk – The three mile island and chernobyl case studies.

Collegiality and loyalty – Respect for authority – Collective bargaining – Confidentiality – Conflicts of interest – Occupational crime – Professional rights – Employee rights – Intellectual Property Rights (IPR) – Discrimination.

UNIT V GLOBAL ISSUES 8

Multinational corporations - Environmental ethics - Computer ethics - Weapons development - Engineers as managers - Consulting engineers - Engineers as expert witnesses and advisors - Moral leadership- Sample code of ethics like ASME, ASCE, IEEE, institution of engineers (India), Indian Institute of Materials Management, Institution of electronics and telecommunication engineers (IETE), India, etc.

Total: 45

TEXT BOOKS

1. Mike Martin and Roland Schinzinger, "Ethics in Engineering", McGraw-Hill, 1996.
2. Govindarajan M, Natarajan S, and Senthil Kumar V. S, "Engineering Ethics", Prentice Hall of India, 2004.

REFERENCES

1. Fleddermann, C.D., "Engineering Ethics", Pearson Education / Prentice Hall, New Jersey, 2004.
2. Harris, C. E., Protchard, M. S. and Rabins, M.J., "Engineering Ethics – Concepts and Cases", Wadsworth Thompson Learning, United States, 2000.
3. Boatright, J.R., "Ethics and the Conduct of Business", Pearson Education, 2003.
4. Seebauer, E.G, and Barry, R.L., "Fundamentals of Ethics for Scientists and Engineers", Oxford University Press, Oxford, 2001.