ANNA UNIVERSITY, CHENNAI

AFFILIATED INSTITUTIONS

R - 2008

B.E. MARINE ENGINEERING

II TO VIII SEMESTERS CURRICULA AND SYLLABI

SEMESTER – II

SL. No.	COURSES CODE	COURSE TITLE	L	T	P	C
THEORY						
1.	HS 2161	Technical English – II*	3	1	0	4
2.	MA 2161	Mathematics –II*	3	1	0	4
3.	PH 2161	Engineering Physics – II*	3	0	0	3
4.	GE 2151	Basic Electrical and Electronics Engineering*	4	0	0	4
5.	MR 2151	Marine Engineering Thermodynamics	3	0	0	3
6.	ME 2151	Engineering Mechanics*	3	1	0	4
PRACTICAL						
7.	GE 2155	Computer Practices Lab –II*	0	1	2	2
8.	GS 2165	Physics & Chemistry Lab II*	0	0	3	2
9.	ME 2155	Computer Aided Drafting & Modeling Lab*	0	1	2	2
10.	MR 2155	Workshop Fitting**	0	0	3	2
11.	-	English Language Lab*+	0	0	2	-
		TOTAL	**19**	**5**	**12**	**30**

* **The Syllabus is common as of other B.E. / B.Tech. Programmes.**

**** This course and syllabi are prescribed as per the directions of the Director General of Shipping. Govt. of India**

+ Offering English Language Laboratory as an additional subject (with no marks) during 2nd semester may be decided by the respective Colleges affiliated to Anna University Chennai.

SEMESTER – III

(Applicable to the students admitted from the Academic year 2008 – 2009 onwards)

CODE NO.	COURSE TITLE	L	T	P	C
THEORY					
MA 2211	Transforms And Partial Differential Equations	3	1	0	4
MV 2201	Marine Hydraulics & Fluid Machinery	3	0	0	3
MV 2205	Seamanship, Elementary Navigation and Survival At Sea	3	0	0	3
MV 2206	Manufacturing Technology	3	0	0	3
MV 2202	Marine Electrical Machine – I	3	0	0	3
MV 2203	Marine Refrigeration and Air Conditioning	3	0	0	3
MV 2204	Marine Machinery Drawing	1	0	4	3
PRACTICAL					
MV 2208	Marine Hydraulics & Fluid Machinery Lab	0	0	3	2
MV 2209	Welding Techniques, Lathe and Special Machine Shop	0	0	6	3
	TOTAL	**19**	**1**	**13**	**27**

SEMESTER – IV

(Applicable to the students admitted from the Academic year 2008 – 2009 onwards)

CODE NO.	COURSE TITLE	L	T	P	C
THEORY					
MV 2251	Applied Mathematics for Marine Engineering	3	0	0	3
MV 2257	Strength of Materials	3	0	0	3
MV 2252	Marine Diesel Engines – I	3	0	0	3
MV 2253	Marine Steam Engines	3	0	0	3
MV 2254	Marine Electrical Machines – II	3	0	0	3
MV 2255	Mechanics of Machines – I	3	0	0	3
MV 2256	Marine Electronics	3	0	0	3
PRACTICAL					
MV 2258	Strength of Materials and Applied Mechanics Lab	0	0	4	2
MV 2259	Heat Engines and Boiler Chemistry Lab	0	0	4	2
	TOTAL	**21**	**0**	**8**	**25**

SEMESTER V

CODE NO.	COURSE TITLE	L	T	P	C
THEORY					
MV2301	Marine Auxiliary Machinery – I	3	0	0	3
MV2302	Marine Diesel Engine – II	3	0	0	3
MV2303	Stability of Ships	3	1	0	4
MV2304	Ship Construction	3	0	0	3
MV2305	Mechanics of Machines – II	3	0	0	3
MV2306	Marine Boilers and Steam Engineering	3	0	0	3
PRACTICAL					
MV2308	Computer Aided Marine Engineering Design and Analysis Lab	2	0	3	4
MV2309	Electrical Engg., Electronics & Microprocessor Lab	0	0	4	2
MV2310	Measurement, Instrumentation & Refrigeration lab	0	0	4	2
	TOTAL	**20**	**1**	**11**	**27**

Note:- * This course and syllabi are prescribed as per directions of the Director General of Shipping, Government of India.

SEMESTER –VI

CODE NO.	COURSE TITLE	L	T	P	C
PRACTICAL					
MV2351	Marine Workshop Practical and afloat training	8hrs per day – 6 days a week, 26 weeks, 500 Marks. Sessional Marks 200 Report + Viva 300			12

SEMESTER –VII

CODE NO.	COURSE TITLE	L	T	P	C
THEORY					
MV2401	Marine System and Machinery design	2	2	0	4
MV2402	Marine Electrical Technology	3	0	0	3
MV2403	Marine Vehicles Performance	2	2	0	4
MV2404	Marine Auxiliary Machinery – II	3	0	0	3
MV2405	Ship's Fire Prevention and Control	3	0	0	3
	ELECTIVE – I	3	0	0	3
PRACTICAL					
MV2406	Fire Fighting, Controls and Simulator Lab	0	0	4	2
MV2407	Marine Propulsion and Auxiliary Machineries Overhauling Lab	0	0	4	2
GE 2321	Communication Skills Laboratory	0	0	4	2
	TOTAL	**16**	**4**	**12**	**26**

SEMESTER –VIII

CODE NO.	COURSE TITLE	L	T	P	C
THEORY					
GE 2021	Environmental Science and Engineering	3	0	0	3
MV2451	Ship Operational Management and IMO Requirements	3	0	0	3
MV2452	Marine Control Engineering and Automation	3	0	0	3
MV2453	Safety Precautions and Watch Keeping	3	0	0	3
	ELECTIVE – II	3	0	0	3
PRACTICAL					
MV 2454	Comprehension	0	0	2	1
MV 2455	Project work, Technical Paper and Viva Voce	0	0	12	6
	TOTAL	**15**	**0**	**14**	**22**

ELECTIVES – I

CODE NO.	COURSE TITLE	L	T	P	C
GE 2022	Total Quality Management	3	0	0	3
MV 2020	Double Hull Tankers	3	0	0	3
MV 2022	Marine Propellers and Propulsion	3	0	0	3
MV 2023	Advanced Marine Heat Engines	3	0	0	3
MV 2024	Supercharging and scavenging in Marine Diesel Engines	3	0	0	3
MV 2025	Ship safety and environmental protection	3	0	0	3

ELECTIVES – II

CODE NO.	COURSE TITLE	L	T	P	C
GE 2025	Professional Ethics In Engineering	3	0	0	3
MV 2021	Maritime Economics & Insurance	3	0	0	3
MV 2026	Ship Recycling	3	0	0	3
MV 2027	Marine corrosion and prevention	3	0	0	3
MV 2028	Special duty vessels and type of operation	3	0	0	3
MV 2029	Marine systems modelling and simulation	3	0	0	3

HS 2161 **TECHNICAL ENGLISH II** **L T P C**
3 1 0 4

AIM:

To encourage students to actively involve in participative learning of English and to help them acquire Communication Skills.

OBJECTIVES:

- To help students develop listening skills for academic and professional purposes.
- To help students acquire the ability to speak effectively in English in real-life situations.
- To inculcate reading habit and to develop effective reading skills.
- To help students improve their active and passive vocabulary.
- To familiarize students with different rhetorical functions of scientific English.
- To enable students write letters and reports effectively in formal and business situations.

UNIT I **12**

Technical Vocabulary - meanings in context, sequencing words, Articles- Prepositions, intensive reading& predicting content, Reading and interpretation, extended definitions, Process description

Suggested activities:

1. Exercises on word formation using the prefix 'self' - Gap filling with preposition.
2. Exercises - Using sequence words.
3. Reading comprehension exercise with questions based on inference – Reading headings
4. and predicting the content – Reading advertisements and interpretation.
5. Writing extended definitions – Writing descriptions of processes – Writing paragraphs based on discussions – Writing paragraphs describing the future.

UNIT II **12**

Phrases / Structures indicating use / purpose – Adverbs-Skimming – Non-verbal communication - Listening – correlating verbal and non-verbal communication -Speaking in group discussions – Formal Letter writing – Writing analytical paragraphs.

Suggested activities:

1. Reading comprehension exercises with questions on overall content – Discussions analyzing stylistic features (creative and factual description) - Reading comprehension exercises with texts including graphic communication - Exercises in interpreting non-verbal communication.
2. Listening comprehension exercises to categorise data in tables.
3. Writing formal letters, quotations, clarification, complaint – Letter seeking permission for Industrial visits– Writing analytical paragraphs on different debatable issues.

UNIT III **12**

Cause and effect expressions – Different grammatical forms of the same word - Speaking – stress and intonation, Group Discussions - Reading – Critical reading - Listening, - Writing – using connectives, report writing – types, structure, data collection, content, form, recommendations .

Suggested activities:

1. Exercises combining sentences using cause and effect expressions – Gap filling

exercises using the appropriate tense forms – Making sentences using different grammatical forms of the same word. (Eg: object –verb / object – noun)

2. Speaking exercises involving the use of stress and intonation – Group discussions– analysis of problems and offering solutions.
3. Reading comprehension exercises with critical questions, Multiple choice question.
4. Sequencing of jumbled sentences using connectives – Writing different types of reports like industrial accident report and survey report – Writing recommendations.

UNIT IV **12**

Numerical adjectives – Oral instructions – Descriptive writing – Argumentative paragraphs – Letter of application - content, format (CV / Bio-data) - Instructions, imperative forms - Checklists, Yes/No question form – E-mail communication.

Suggested Activities:

1. Rewriting exercises using numerical adjectives.
2. Reading comprehension exercises with analytical questions on content – Evaluation of content.
3. Listening comprehension – entering information in tabular form, intensive listening exercise and completing the steps of a process.
4. Speaking - Role play – group discussions – Activities giving oral instructions.
5. Writing descriptions, expanding hints – Writing argumentative paragraphs – Writing formal letters – Writing letter of application with CV/Bio-data – Writing general and safety instructions – Preparing checklists – Writing e-mail messages.

UNIT V **9**

Speaking - Discussion of Problems and solutions - Creative and critical thinking – Writing an essay, Writing a proposal.

Suggested Activities:

1. Case Studies on problems and solutions
2. Brain storming and discussion
3. Writing Critical essays
4. Writing short proposals of 2 pages for starting a project, solving problems, etc.
5. Writing advertisements.

TOTAL: 60 PERIODS

TEXT BOOK:

1. Chapters 5 – 8. Department of Humanities & Social Sciences, Anna University, 'English for Engineers and Technologists' Combined Edition (Volumes 1 & 2), Chennai: Orient Longman Pvt. Ltd., 2006. Themes 5 – 8 (Technology, Communication, Environment, Industry)

REFERENCES:

1. P. K. Dutt, G. Rajeevan and C.L.N Prakash, 'A Course in Communication Skills', Cambridge University Press, India 2007.
2. Krishna Mohan and Meera Banerjee, 'Developing Communication Skills', Macmillan India Ltd., (Reprinted 1994 – 2007).
3. Edgar Thorpe, Showick Thorpe, 'Objective English', Second Edition, Pearson Education, 2007.

Extensive Reading:

1. Robin Sharma**, '**The Monk Who Sold His Ferrari', Jaico Publishing House, 2007

Note:

The book listed under Extensive Reading is meant for inculcating the reading habit of the students. They need not be used for testing purposes.

MA2161 MATHEMATICS – II L T P C
3 1 0 4

UNIT I ORDINARY DIFFERENTIAL EQUATIONS 12

Higher order linear differential equations with constant coefficients – Method of variation of parameters – Cauchy's and Legendre's linear equations – Simultaneous first order linear equations with constant coefficients.

UNIT II VECTOR CALCULUS 12

Gradient Divergence and Curl – Directional derivative – Irrotational and solenoidal vector fields – Vector integration – Green's theorem in a plane, Gauss divergence theorem and stokes' theorem (excluding proofs) – Simple applications involving cubes and rectangular parallelpipeds.

UNIT III ANALYTIC FUNCTIONS 12

Functions of a complex variable – Analytic functions – Necessary conditions, Cauchy – Riemann equation and Sufficient conditions (excluding proofs) – Harmonic and orthogonal properties of analytic function – Harmonic conjugate – Construction of analytic functions – Conformal mapping : w= z+c, cz, 1/z, and bilinear transformation.

UNIT IV COMPLEX INTEGRATION 12

Complex integration – Statement and applications of Cauchy's integral theorem and Cauchy's integral formula – Taylor and Laurent expansions – Singular points – Residues – Residue theorem – Application of residue theorem to evaluate real integrals – Unit circle and semi-circular contour(excluding poles on boundaries).

UNIT V LAPLACE TRANSFORM 12

Laplace transform – Conditions for existence – Transform of elementary functions – Basic properties – Transform of derivatives and integrals – Transform of unit step function and impulse functions – Transform of periodic functions.

Definition of Inverse Laplace transform as contour integral – Convolution theorem (excluding proof) – Initial and Final value theorems – Solution of linear ODE of second order with constant coefficients using Laplace transformation techniques.

TOTAL : 60 PERIODS

TEXT BOOK:

1. Bali N. P and Manish Goyal, "Text book of Engineering Mathematics", 3rd Edition, Laxmi Publications (p) Ltd., (2008).
2. Grewal. B.S, "Higher Engineering Mathematics", 40th Edition, Khanna Publications, Delhi, (2007).

REFERENCES:

1. Ramana B.V, “Higher Engineering Mathematics”,Tata McGraw Hill Publishing Company, New Delhi, (2007).
2. Glyn James, “Advanced Engineering Mathematics”, 3rd Edition, Pearson Education, (2007).
3. Erwin Kreyszig, “Advanced Engineering Mathematics”, 7th Edition, Wiley India, (2007).
4. Jain R.K and Iyengar S.R.K, “Advanced Engineering Mathematics”, 3rd Edition, Narosa Publishing House Pvt. Ltd., (2007).

PH2161 ENGINEERING PHYSICS – II L T P C
3 0 0 3

UNIT I CONDUCTING MATERIALS 9

Conductors – classical free electron theory of metals – Electrical and thermal conductivity – Wiedemann – Franz law – Lorentz number – Draw backs of classical theory – Quantum theory – Fermi distribution function – Effect of temperature on Fermi Function – Density of energy states – carrier concentration in metals.

UNIT II SEMICONDUCTING MATERIALS 9

Intrinsic semiconductor – carrier concentration derivation – Fermi level – Variation of Fermi level with temperature – electrical conductivity – band gap determination – extrinsic semiconductors – carrier concentration derivation in n-type and p-type semiconductor – variation of Fermi level with temperature and impurity concentration – compound semiconductors – Hall effect –Determination of Hall coefficient – Applications.

UNIT III MAGNETIC AND SUPERCONDUCTING MATERIALS 9

Origin of magnetic moment – Bohr magneton – Dia and para magnetism – Ferro magnetism – Domain theory – Hysteresis – soft and hard magnetic materials – anti – ferromagnetic materials – Ferrites – applications – magnetic recording and readout – storage of magnetic data – tapes, floppy and magnetic disc drives.

Superconductivity : properties - Types of super conductors – BCS theory of superconductivity(Qualitative) - High Tc superconductors – Applications of superconductors – SQUID, cryotron, magnetic levitation.

UNIT IV DIELECTRIC MATERIALS 9

Electrical susceptibility – dielectric constant – electronic, ionic, orientational and space charge polarization – frequency and temperature dependence of polarisation – internal field – Claussius – Mosotti relation (derivation) – dielectric loss – dielectric breakdown – uses of dielectric materials (capacitor and transformer) – ferroelectricity and applications.

UNIT V MODERN ENGINEERING MATERIALS 9

Metallic glasses: preparation, properties and applications.

Shape memory alloys (SMA): Characteristics, properties of NiTi alloy, application, advantages and disadvantages of SMA

Nanomaterials: synthesis –plasma arcing – chemical vapour deposition – sol-gels – electrodeposition – ball milling - properties of nanoparticles and applications. Carbon nanotubes: fabrication – arc method – pulsed laser deposition – chemical vapour deposition - structure – properties and applications.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Charles Kittel ' Introduction to Solid State Physics', John Wiley & sons, 7th edition, Singapore (2007)
2. Charles P. Poole and Frank J.Ownen, 'Introduction to Nanotechnology', Wiley India(2007) (for Unit V)

REFERENCES:

1. Rajendran, V, and Marikani A, 'Materials science'Tata McGraw Hill publications, (2004) New delhi.
2. Jayakumar, S. 'Materials science', R.K. Publishers, Coimbatore, (2008).
3. Palanisamy P.K, 'Materials science', Scitech publications(India) Pvt. LTd., Chennai, second Edition(2007)
4. M. Arumugam, 'Materials Science' Anuradha publications, Kumbakonam, (2006).

GE2151 BASIC ELECTRICAL AND ELECTRONICS ENGINEERING L T P C

(Common to branches under Civil, Mechanical and Technology faculty) 4 **0 0 4**

UNIT I ELECTRICAL CIRCUITS & MEASURMENTS 12

Ohm's Law – Kirchoff's Laws – Steady State Solution of DC Circuits – Introduction to AC Circuits – Waveforms and RMS Value – Power and Power factor – Single Phase and Three Phase Balanced Circuits.

Operating Principles of Moving Coil and Moving Iron Instruments (Ammeters and Voltmeters), Dynamometer type Watt meters and Energy meters.

UNIT II ELECTRICAL MECHANICS 12

Construction, Principle of Operation, Basic Equations and Applications of DC Generators, DC Motors, Single Phase Transformer, single phase induction Motor.

UNIT III SEMICONDUCTOR DEVICES AND APPLICATIONS 12

Characteristics of PN Junction Diode – Zener Effect – Zener Diode and its Characteristics – Half wave and Full wave Rectifiers – Voltage Regulation.

Bipolar Junction Transistor – CB, CE, CC Configurations and Characteristics – Elementary Treatment of Small Signal Amplifier.

UNIT IV DIGITAL ELECTRONICS 12

Binary Number System – Logic Gates – Boolean Algebra – Half and Full Adders – Flip-Flops – Registers and Counters – A/D and D/A Conversion (single concepts)

UNIT V FUNDAMENTALS OF COMMUNICATION ENGINEERING 12

Types of Signals: Analog and Digital Signals – Modulation and Demodulation: Principles of Amplitude and Frequency Modulations.

Communication Systems: Radio, TV, Fax, Microwave, Satellite and Optical Fibre (Block Diagram Approach only).

TOTAL: 60 PERIODS

TEXT BOOKS:

1. V.N. Mittle “Basic Electrical Engineering”,Tata McGraw Hill Edition, New Delhi, 1990.
2. R.S. Sedha, “Applied Electronics” S. Chand & Co., 2006.

REFERENCES:

1. Muthusubramanian R, Salivahanan S and Muraleedharan K A, “Basic Electrical, Electronics and Computer Engineering”,Tata McGraw Hill, Second Edition, (2006).
2. Nagsarkar T K and Sukhija M S, “Basics of Electrical Engineering”, Oxford press (2005).
3. Mehta V K, “Principles of Electronics”, S.Chand & Company Ltd, (1994).
4. Mahmood Nahvi and Joseph A. Edminister, “Electric Circuits”, Schaum’ Outline Series, McGraw Hill, (2002).
5. Premkumar N, “Basic Electrical Engineering”, Anuradha Publishers, (2003).

MR 2151 MARINE ENGINEERING THERMODYNAMICS L T P C
3 0 0 3

AIM

To impart knowledge to the students about Marine Engineering Thermodynamics.

OBJECTIVES

At the end of the study of this topic the students should have the knowledge on basic Thermodynamics and solve the problems on First and Second Law of Thermodynamics and Gas power cycles. Also should have the knowledge on fuel used in IC Engines and Combustion of Fuels.

UNIT I BASIC CONCEPTS AND FIRST LAW OF THERMODYNAMICS 9

Thermodynamic systems, concepts of continuum, thermodynamic properties, equilibrium, processes, cycle, work, heat, temperature, Zeroth law of thermodynamics. First law of thermodynamics – applications to closed and open systems, internal energy, specific heats, enthalpy,. – applications to steady and unsteady flow conditions.

UNIT II BASIC CONCEPTS OF SECOND LAW OF THERMODYNAMICS 9

Thermodynamic systems, Second law of thermodynamics Statements, Reversibility, causes of irreversibility, Carnot cycle, reversed Carnot cycle, heat engines, refrigerators, and heat pumps. Clausius inequality, entropy, principles of increase in entropy, Carnot theorem, available energy, availability.

UNIT III FLUID CYCLES 9

Thermo dynamic properties of pure substances, property diagram, PVT surface of water and other substances, calculation of properties, first law and second law analysis using tables and charts,

UNIT IV GAS POWER CYCLES 9

properties of ideal and real gases, equation of state, gas laws. Gas power cycles – Carnot, Otto, Diesel, Dual, Brayton, Ericsson, Sterling, Lenoir, Atkinson Cycles.

UNIT V THERMODYNAMIC RELATIONS AND COMBUSTION OF FUELS 9

Exact differentials, T-D diagrams, Maxwell relations, Clasius Claperon Equations, Joule-Thomson coefficients. Heat value of fuels, Combustion equations, Theoretical and excess air, Air fuel ratio and Exhaust gas analysis

TOTAL: 45 PERIODS

TEXT BOOKS

1. Nag, P.K., "Engineering Thermodynamics", 1st Edition, Tata McGraw-Hill Publishing Company Limited New Delhi, 1993.
2. Russel, "Engineering Thermodynamics", 1st Edition, Oxford University Press, 2007

REFERENCES

1. Holmann, "Thermodynamics", 4th Edition, McGraw-Hill Book Company,New York,1888.
2. Rao, Y.V.C., "Thermodynamics",4th Edition,Wiley Eastern Ltd.,New Delhi,1993.

ME2151 ENGINEERING MECHANICS L T P C
3 1 0 4

OBJECTIVE

At the end of this course the student should be able to understand the vectorial and scalar representation of forces and moments, static equilibrium of particles and rigid bodies both in two dimensions and also in three dimensions. Further, he should understand the principle of work and energy. He should be able to comprehend the effect of friction on equilibrium. He should be able to understand the laws of motion, the kinematics of motion and the interrelationship. He should also be able to write the dynamic equilibrium equation. All these should be achieved both conceptually and through solved examples.

UNIT I BASICS & STATICS OF PARTICLES 12

Introduction – Units and Dimensions – Laws of Mechanics – Lame's theorem, Parallelogram and triangular Law of forces – Vectors – Vectorial representation of forces and moments – Vector operations: additions, subtraction, dot product, cross product – Coplanar Forces – Resolution and Composition of forces – Equilibrium of a particle – Forces in space – Equilibrium of a particle in space – Equivalent systems of forces – Principle of transmissibility – Single equivalent force.

UNIT II EQUILIBRIUM OF RIGID BODIES 12

Free body diagram – Types of supports and their reactions – requirements of stable equilibrium – Moments and Couples – Moment of a force about a point and about an axis – Vectorial representation of moments and couples – Scalar components of a moment – Varignon's theorem – Equilibrium of Rigid bodies in two dimensions – Equilibrium of Rigid bodies in three dimensions – Examples

UNIT III PROPERTIES OF SURFACES AND SOLIDS 12

Determination of Areas and Volumes – First moment of area and the Centroid of sections – Rectangle, circle, triangle from integration – T section, I section, - Angle

section, Hollow section by using standard formula – second and product moments of plane area – Rectangle, triangle, circle from integration – T section, I section, Angle section, Hollow section by using standard formula – Parallel axis theorem and perpendicular axis theorem – Polar moment of inertia – Principal moments of inertia of plane areas – Principal axes of inertia – Mass moment of inertia – Derivation of mass moment of inertia for rectangular section, prism, sphere from first principle – Relation to area moments of inertia.

UNIT IV DYNAMICS OF PARTICLES 12

Displacements, Velocity and acceleration, their relationship – Relative motion – Curvilinear motion – Newton's law – Work Energy Equation of particles – Impulse and Momentum – Impact of elastic bodies.

UNIT V FRICTION AND ELEMENTS OF RIGID BODY DYNAMICS 12

Frictional force – Laws of Coloumb friction – simple contact friction – Rolling resistance – Belt friction. Translation and Rotation of Rigid Bodies – Velocity and acceleration – General Plane motion.

TOTAL: 60 PERIODS

TEXT BOOK:

1. Beer, F.P and Johnson Jr. E.R. "Vector Mechanics for Engineers", Vol. 1 Statics and Vol. 2 Dynamics, McGraw-Hill International Edition, (1997).

REFERENCES:

1. Rajasekaran, S, Sankarasubramanian, G., "Fundamentals of Engineering Mechanics", Vikas Publishing House Pvt. Ltd., (2000).
2. Hibbeller, R.C., "Engineering Mechanics", Vol. 1 Statics, Vol. 2 Dynamics, Pearson Education Asia Pvt. Ltd., (2000).
3. Palanichamy, M.S., Nagam, S., "Engineering Mechanics – Statics & Dynamics", Tata McGraw-Hill, (2001).
4. Irving H. Shames, "Engineering Mechanics – Statics and Dynamics", IV Edition – Pearson Education Asia Pvt. Ltd., (2003).
5. Ashok Gupta, "Interactive Engineering Mechanics – Statics – A Virtual Tutor (CDROM)", Pearson Education Asia Pvt., Ltd., (2002).

GE2155 COMPUTER PRACTICE LABORATORY – II

L	T	P	C
0	1	2	2

LIST OF EXPERIMENTS

1. UNIX COMMANDS 15

Study of Unix OS - Basic Shell Commands - Unix Editor

2. SHELL PROGRAMMING 15

Simple Shell program - Conditional Statements - Testing and Loops

3. C PROGRAMMING ON UNIX 15

Dynamic Storage Allocation-Pointers-Functions-File Handling

TOTAL: 45 PERIODS

HARDWARE / SOFTWARE REQUIREMENTS FOR A BATCH OF 30 STUDENTS

Hardware

- 1 UNIX Clone Server
- 33 Nodes (thin client or PCs)
- Printer – 3 Nos.

Software

- OS – UNIX Clone (33 user license or License free Linux)
- Compiler - C

GS2165	PHYSICS LABORATORY – II	L T P C 0 0 3 2

LIST OF EXPERIMENTS

1. Determination of Young's modulus of the material – non uniform bending.
2. Determination of Band Gap of a semiconductor material.
3. Determination of specific resistance of a given coil of wire – Carey Foster Bridge.
4. Determination of viscosity of liquid – Poiseuille's method.
5. Spectrometer dispersive power of a prism.
6. Determination of Young's modulus of the material – uniform bending.
7. Torsional pendulum – Determination of rigidity modulus.

- **A minimum of FIVE experiments shall be offered.**
- **Laboratory classes on alternate weeks for Physics and Chemistry.**
- **The lab examinations will be held only in the second semester.**

GS2165	CHEMISTRY LABORATORY – II	L T P C 0 0 3 2

LIST OF EXPERIMENTS

1. Conduct metric titration (Simple acid base)
2. Conduct metric titration (Mixture of weak and strong acids)
3. Conduct metric titration using $BaCl_2$ vs Na_2SO_4
4. Potentiometric Titration (Fe^{2+} / $KMnO_4$ or $K_2Cr_2O_7$)
5. PH titration (acid & base)
6. Determination of water of crystallization of a crystalline salt (Copper sulphate)
7. Estimation of Ferric iron by spectrophotometry.

- **A minimum of FIVE experiments shall be offered.**
- **Laboratory classes on alternate weeks for Physics and Chemistry.**
- **The lab examinations will be held only in the second semester.**

ME2155 COMPUTER AIDED DRAFTING AND MODELING LABORATORY L T P C
0 1 2 2

List of Exercises using software capable of Drafting and Modeling

1. Study of capabilities of software for Drafting and Modeling – Coordinate systems (absolute, relative, polar, etc.) – Creation of simple figures like polygon and general multi-line figures.
2. Drawing of a Title Block with necessary text and projection symbol.
3. Drawing of curves like parabola, spiral, involute using Bspline or cubic spline.
4. Drawing of front view and top view of simple solids like prism, pyramid, cylinder, cone, etc, and dimensioning.
5. Drawing front view, top view and side view of objects from the given pictorial views (eg. V-block, Base of a mixie, Simple stool, Objects with hole and curves).
6. Drawing of a plan of residential building (Two bed rooms, kitchen, hall, etc.)
7. Drawing of a simple steel truss.
8. Drawing sectional views of prism, pyramid, cylinder, cone, etc,
9. Drawing isometric projection of simple objects.
10. Creation of 3-D models of simple objects and obtaining 2-D multi-view drawings from 3-D model.

TOTAL: 45 PERIODS

Note: Plotting of drawings must be made for each exercise and attached to the records written by students.

List of Equipments for a batch of 30 students:

1. Pentium IV computer or better hardware, with suitable graphics facility -30 No.
2. Licensed software for Drafting and Modeling. – 30 Licenses
3. Laser Printer or Plotter to print / plot drawings – 2 No.

MR 2155 WORKSHOP FITTING L T P C
0 0 3 2

AIM:

To impart knowledge on the Fitting methods of Metal joining Process

OBJECTIVES:

On Completion of the Course The Students are expected to have the Knowledge of Metal Cutting and Joining Process Tools and equipments used in Smithy, Carpentry, Fitting, Foundry, Welding and Sheet Metal.

LIST OF EXPERIMENTS

SHEET METAL

Fabrication of tray, cone etc. with sheet metal.

WELDING

Arc Welding of butt joint, Lap joint, Tee fillet etc. Demonstration of gas welding.

FITTING

Practice in chipping, filing, drilling – Making Vee, square and dove tail joints.

TOTAL: 45 PERIODS

REFERENCES:

1. V.S.Venkatachalapathy, First Year Engineering Workshop Practice, Raamalinga Publications, Madurai, 1999.
2. P.Kannaiah and K.C.Narayana, Manual on Workshop Practice, Scitech Publications, Chennai, 1999.

ENGLISH LANGUAGE LABORATORY (Optional) **L T P C**
0 0 2 -

1. Listening: **5**

Listening & answering questions – gap filling – Listening and Note taking- Listening to telephone conversations

2. Speaking: **5**

Pronouncing words & sentences correctly – word stress – Conversation practice.

Classroom Session **20**

1. Speaking: Introducing oneself, Introducing others, Role play, Debate- Presentations: Body language, gestures, postures. Group Discussions etc
2. Goal setting – interviews – stress time management – situational reasons

Evaluation

(1) Lab Session – 40 marks
- Listening – 10 marks
- Speaking – 10 marks
- Reading – 10 marks
- Writing – 10 marks

(2) Classroom Session – 60 marks
- Role play activities giving real life context – 30 marks
- Presentation – 30 marks

Note on Evaluation

1. Examples for role play situations:
   a. Marketing engineer convincing a customer to buy his product.
   b. Telephone conversation – Fixing an official appointment / Enquiry on availability of flight or train tickets / placing an order. etc.
2. Presentations could be just a Minute (JAM activity) or an Extempore on simple topics or visuals could be provided and students could be asked to talk about it.

REFERENCES:

1. Hartley, Peter, Group Communication, London: Routledge, (2004).
2. Doff, Adrian and Christopher Jones, Language in Use – (Intermediate level), Cambridge University Press, (1994).
3. Gammidge, Mick, Speaking Extra – A resource book of multi-level skills activities , Cambridge University Press, (2004).
4. Craven, Miles, Listening Extra - A resource book of multi-level skills activities, Cambridge, Cambridge University Press, (2004).
5. Naterop, Jean & Rod Revell, Telephoning in English, Cambridge University Press, (1987).

LAB REQUIREMENTS

1. Teacher – Console and systems for students
2. English Language Lab Software
3. Tape Recorders.

MA 2211 TRANSFORMS AND PARTIAL DIFFERENTIAL EQUATIONS L T P C
(Common to all branches) 3 1 0 4

OBJECTIVES

The course objective is to develop the skills of the students in the areas of Transforms and Partial Differtial Equations. This will be necessary for their effective studies in a large number of engineering subjects like heat conduction, communication systems, electro-optics and electromagnetic theory. The course will also serve as a prerequisite for post graduate and specialized studies and research.

UNIT I FOURIER SERIES 9 + 3

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 identify – Harmonic Analysis.

UNIT II FOURIER TRANSFORMS 9 + 3

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 + 3

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 + 3

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 + 3

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 PE3RIODS

TEXT BOOK:

1. Grewal, B.S, 'Higher Engineering Mathematics' 40th Edition, Khanna publishers, Delhi, (2007)

REFERENCES:

1. Bali.N.P and Manish Goyal 'A Textbook of Engineering Mathematics', Seventh Edition, Laxmi Publications(P) Ltd. (2007)
2. Ramana.B.V. 'Higher Engineering Mathematics' Tata Mc-GrawHill Publishing Company limited, New Delhi (2007).
3. Glyn James, 'Advanced Modern Engineering Mathematics', Third edition-Pearson Education (2007).
4. Erwin Kreyszig 'Advanced Engineering Mathematics', Eighth edition-Wiley India (2007).

MV 2201 MARINE HYDRAULICS & FLUID MACHINERY L T P C
3 0 0 3

AIM

To develop the theoretical and application skills in Marine Hydraulics and Fluid Machinery.

OBJECTIVES

At the end the course the students are expected to have knowledge of
The Fluid properties and effect of various forces acting on different planes and surfaces and Pipes.
The In-viscid flow and Real Viscous flow.
The pumps and hydraulic turbines.

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 co-efficients – 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 – Buckinghams theorem – important dimensionless numbers applicable to fluid mechanics – centrifugal pumps – some definitions – pump output and efficiencies – effect of vane angle– cavitation – constructional details, pump characteristics, multistage pumps.

Axial flow pumps – characteristics – constructional details, non-dimensional parameters – efficiencies. Vibration & 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 PERIODS

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. India,2002
3. Modi, P.N., Seth, S.M., "Hydraulics and Fluid Mechanics including Hydraulic Machines" 14th Edition, Standard Book House, Delhi, 2002.
4. R K Rajput, "Fluid Mechanics and Hydraulic Machines" 2nd revised Edition, S.Chand&Company Ltd., New Delhi, 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 Mechanic", 3rd Edition, New age international (P) Ltd., Chennai, 1999.

MV2205	SEAMANSHIP, ELEMENTARY NAVIGATION AND SURVIVAL AT SEA	LT P C 3 0 0 3

AIM

- To develop skill and knowledge about Navigation and Operation of ship.
- To develop self confidence and stuff ness for survival at sea.

OBJECTIVES

On completion of the course the students are expected to

- Have learnt operation of various deck machinery.
  (a) Navigation equipment
- Have sound knowledge of Navigation.
- Have learnt survival techniques at sea.
- Have learnt operation of life boats and life rafts.

UNIT I SEAMAN & THEIR DUTIES 9

Ship's Department, General ship knowledge ad nautical terms like o\poop-deck forecastle, Bridge etc. Deck Equipment: Winces, 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 nad Zonal time, wireless Navigational Instruments, radar satellite navigation etc.

UNIT IV LIFE BOATS & 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 & hoisting of life boats (model).

TOTAL: 45 PERIODS

TEXT BOOKS :

1. Graham Danton, The theory and practice of seamanship, 11th Edition, Routledge, Newyork, USA and Canada, 1996.
2. Capt. J. Dinger, Seamenship Primer, 7th Edition, Bhandarkar Publications, Mumbai 1998.

REFERENCE:

1. A.N. Cockcroft, Seamenship and Nautical knowledge, 27th Edition, Brown son & Ferguson Ltd., Glasgow 1997.

MV 2206 MANUFACTURING TECHNOLOGY L T P C
3 0 0 3

AIM

To develop theoretical skill of students.

OBJECTIVES

To impart knowledge to the students about

- Metal joining processes
- Casting processes.
- Metal forming, Machining and finishing processes.

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, TAW, 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 FINISH PROCESSES 9

Surface finishing processes: 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, and 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 PERIODS

TEXT BOOKS

1. Hajra Choudhary S.K., "Elements of Manufacturing Technology", Vol. II, 11th edition, Media Publishers, Mumbai, 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, New Delhi, 2000.

MV 2202 MARINE ELECTRICAL MACHINES – I L T P C
3 0 0 3

AIM

- To expose the students to the concepts of electrical measurements, D.C. machine, transformers and transmission system.

OBJECTIVES

- To introduce the concepts about measurement practices and measuring instruments.
- To impart knowledge about construction and operation of D.C. Machines in general and generators in particular.
- To familiarize the students with the operation and control of D.C. motors.
- To study the construction and operation of transformer.
- To study the structure and functioning of transmission and distribution.

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 – their 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 and 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 PERIODS

TEXT BOOKS

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

REFERENCES

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

MV 2203 MARINE REFRIGERATION AND AIR CONDITIONING L T P C
3 0 0 3

AIM

To develop the knowledge of students in Marine Refrigeration and Air conditioning.

OBJECTIVES

At the end of the course the students are expected to have completed the detailed study of Reciprocating Compressors, Marine refrigeration and air-conditioning plants.

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, Condensor and Evaporator - Problems

TOTAL: 45 PERIODS

TEXT BOOKS

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

REFERENCES

1. D.A. Taylor, "Introduction to Marine Engineering", 2nd Edition, Butter Worth, London, 1993.
2. J.R. Stott, "Refrigerating Machinery and Air Conditioning Plant", 1st Edition, The Institute of Marine Engineers, London, 1974, Reprint 1998.

MV 2204 MARINE MACHINERY DRAWING L T P C
1 0 4 3

AIM

To make the students understand and practice Machine Drawing.

OBJECTIVES

To make the students practice in,

- Understanding limits, Fits and Tolerances.
- Explaining and Sketching Valves, Cocks and Plugs.
- Various parts of Marine Machinery.

UNIT I 3 + 12

Explanation and sketching of the following aspects: 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 **3 + 12**

Limits, Fits and Tolerances 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 **3 + 10**

Sketching of the following: Screw-threads, screwed fastenings, Rivets and Riveted joints keep. Cotter joints & pin joints.

UNIT IV **3 + 12**

Machinery Component drawing: Drawing of complete machine components in assembly (Orthographic to isometric and isometric to Orthographic) with details like couplings, Glands, Return and non-return valves, cocks & plugs, cylinder, Boiler mountings – Full bore safety valve, Blow down cock, Gauge glass, Main stop valve.

UNIT V **3 + 14**

Marine Component Drawing: 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.

TOTAL: 75 PERIODS

TEXT BOOKS:

1. MacGibbon's "Pictorial Drawing Book for Marine Engineers-James", 8th Edition, G.Holburn & John J. Seaton, James Munro & Company limited Engineering and Nautical Publishers, Mumbai, 1978.
2. N.D.Bhatt, "Machine Drawing", 18th Edition, Charotar Publication, Mumbai, 2001.

REFERENCES:

1. Gopalakrishna K.R., "Machine Drawing", 17th Edition, Subhas Stores Books Corner, Bangalore, 2003.
2. Gill P.S., "A text book on Machine Drawing", S.K. Kataria & sons, Mumbai, 2000.

MV 2208 MARINE HYDRAULICS & FLUID MACHINERY LAB **L T P C**
0 0 3 2

(A) FLUID MECHANICS LAB. **20**

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

(B) FLUID MACHINERY LAB. **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 PERIODS

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

MV 2209 WELDING TECHNIQUES, LATHE AND SPECIAL MACHINE SHOP L T P C
0 0 6 3

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 & 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 PERIODS

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)	-

MV 2251 APPLIED MATHEMATICS 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, corretation – 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 – newtons and Lagrange's methods – newtons 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 & explicit) one dimensional wave equation and two dimensional Laplace and Poisson equations.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Sastras- Introductory methods of Numerical analysis, 3rd edition printice – Hall of India Private Limited, India, 2002.
2. Chapra S.C and Cannale R.P. Numerical methods for engineers, 4th edition tata McGraw Hill New Delhi, 2002.
3. Walpole, R.E., Myers, R.H., Myer, S.L, and Ye, K. Probability & Statistics for Engineers and scientists, 7th edition, Reason Education, Delhi, 2002.
4. Johnson, R.A., Miller & Fraund's probability & statistics for engineers, 6th edition Printice Hall of India, 2002.

REFERENCES:
1. Jain, M.K. Iyengar, S.R.K., Jain, R.K., Numerical Methods for Engineering and Scientific computation 3rd edition, Newage International Private Limited, New Delhi, 1993.
2. Jerald C.F., wheatly, P.O., Applied Numerical Analysis, 5th edition, addition Wesley, Newyork, 1998.
3. Sheldon – Ross "A First course in probability", 5th edition, Reason education, Delhi, 2002.
4. Lipschut 3, S, Schiller J. "Schaum's outlines – Introduction to probality and statistics, McGraw Hill, New Delhi, 1998.

MV2257 STRENGTH OF MATERIALS L T P C
3 0 0 3

AIM
To impart knowledge to the students about the Strength of Materials.

OBJECTIVES
To make the student learner, able to determine various stresses and strains in simple and composite members under external load, strength of simple connections and strain energy stored in members.
To make the student learner able to design beams which can resist bending and shearing stresses and to teach the concept of principal stresses and maximum shear stresses.
To teach the students to calculate the Shear force and Bending moment for the various types of statically determinate and indeterminate beams and the method of drawing the SFD and BMD.
To make the student learner able to calculate the deflections caused by the application of loads and design of solid, hollow shafts, open coiled and closed coiled helical springs based on shear and bending.

UNIT I 9
Concept of stress- tensile and compressive stresses- shear stress- Elastic limit – Hooke's law- Elastic constants and their relationship – Poisson's ratio – Generalized Hooke's law – Elongation of Simple and composite bars under external load - allowable stress – Factor of safety- Thermal stresses of Simple members – strength of simple connections for cotter joints and screwed joints, Resilience-suddenly applied loads, strain gauges.

UNIT II 9
Stresses in beams – neutral axis- theory of simple bending- bending stresses in rectangular, I-sections and circular section beams. Bending stresses in composite section beams. Shear stresses in beams –rectangular, I-sections and circular sections. Stress components on a general plane and oblique plane - Principal stresses and Principal Planes, Maximum shear stresses and their planes.

UNIT III 9
Bending moment-shear force, BMD and SFD for statically determinate beams-cantilever-simply supported--overhanging beams- with or without applied moments, point of contra

flexure. Statically indeterminate beams-BMD and SFD for fixed beams, propped cantilever beams and continuous beams-theorem of three moments.

UNIT IV **9**

Slope and deflection of Cantilever, overhanging and simply supported beams - Double integration method - Moment area method- problems with various types of load with or without applied moments and varying flexural rigidity (EI).

Torsion of solid and hollow circular shafts – power transmitted by shafts – compound shafts - shafts subjected to both twisting and bending moment - Open coil and closed coil helical springs.

UNIT V **9**

Columns and struts - long and short columns- Euler's formula for long column – equivalent length – slenderness ratio - Eccentric loaded long and short columns - Rankine Gordon formula, use of Strut formulae. Thin cylinders and thin spherical shells-under internal pressure-change in volume due to internal pressure. Thick cylinders – simple treatment of thick cylindrical walled pressure vessels

TOTAL: 45 PERIODS

TEXT BOOKS:

1. S. Timoshenko, "Strength of Materials", 3rd Edition, CBS Publishers & Distributers, Delhi, 1986.
2. Rajput. R.K. "Strength of Materials", 2nd Edition, S. Chand &Co., New Delhi, 1999.

REFERENCES:

1. Andrew, Pytel, Singer, Ferdriand L., "Strength of Materials", 4th Edition, Harper & Ron Publishers, New York, 1980.
2. Gere & S. Timoshenko, "Mechanics of Materials", 2nd Edition, CBS Publishers & Distributors, New Delhi, 1986.

MV 2252 **MARINE DIESEL ENGINES – I** **L T P C**
3 0 0 3

AIM

To develop knowledge in Marine Diesel Engines, the students will be taught in detail.

OBJECTIVES

- On completion of the course the students are expected to have knowledge of Various types of Marine Diesel Engines.
- The Various systems used in Marine Diesel Engine plants.
- The Scavenging and super charging system.
- The qualities and behavior of various types of fuel Oil and Lubricating Oil used in Marine Diesel Engines.

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. & 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 and Liners, Cylinder heads and fittings, Pistons, Cross heads, Connecting rods, Crank shaft, bearings, Bed Plates, A-frames, Welded construction for Bedplates & frames and Tie rods etc.

Cooling of I.C. Engines: Various Cooling media, their merits and demerits, cooling of Pistons, cylinder jackets & cylinder heads, Bore cooling, coolant conveying mechanism and systems, maintenance of coolant and cooling system, Cooling Water: Testing and Treatment.

UNIT III SCAVENGING SYSTEM 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.

Supercharging arrangements: 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 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 PERIODS

TEXT BOOKS

1. D.A. Taylor, “Introduction to Marine Engineering”, 2nd Edition, Butter worth – Heinemann, London, 1999
2. Wood yard, Doug, “Pounder’s Marine Diesel Engines”, 7th Edition, Butter Worth Heinemann Publishing, London, 2001.

REFERENCES

1. S. H. Henshall, “Medium and High Speed Diesel Engines for Marine Use”, 1st Edition, Institute of Marine Engineers, Mumbai, 1996.
2. D.K. Sanyal, “Principle & Practice of Marine Diesel Engines”, 2nd Edition, Bhandarkar Publication, Mumbai, 1998.

MV 2253 MARINE STEAM ENGINES L T P C
3 0 0 3

AIM

To develop the knowledge of students in Marine Heat Engines and Applied Thermodynamics.

OBJECTIVES

At the end the course the students are expected to have
Completed the detailed study of steam cycles, steam engines, steam nozzle and steam turbines.
Learnt about basic heat transfer.

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 PERIODS

TEXT BOOKS:

1. P.K. Nag, "Basic & Applied Thermodynamics", 1st Edition, Tata McGraw–Hill Publishing Co., Ltd., New Delhi, 2002.
2. T.D. Eastop and McConkey, "Applied Thermodynamics for Engineering Technologist SI units", 2nd Edition, ELBS with DP Publications, London, 1993.

REFERENCES:

1. Y.V.C. Rao, "Thermodynamics", 2nd Edition, Wiley Eastern Ltd., New Delhi, 1993.
2. E. Ratha Krishnan, "Fundamentals of Engineering Thermodynamics", 1st Edition, Prentice – Hall of India, New Delhi, 2000.

MV 2254 MARINE ELECTRICAL MACHINES – II L T P C
3 0 0 3

AIM

To expose the students to the concepts about energy meters, cable faults and AC Machines used in Marine engineering.

OBJECTIVES

To impart knowledge about

- Energy meters, power measurement and cable faults.
- Alternators – their construction and operation.
- Principles of operation of synchronous motors.
- Construction and operation of induction machines.
- Speed control and trouble shooting in induction machines.

UNIT I ELECTRICAL MEASUREMENTS 9

Induction type energy meters-megger (Basic construction & 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

Principle 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 PERIODS

TEXT BOOKS:

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

REFERENCES:

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

MV 2255 MECHANICS OF MACHINES - I L T P C
3 0 0 3

AIM

To make the students gain knowledge in the fundamentals of Mechanics of Machines, synthesis of various Mechanisms, CAM profiles, theory of gearing, governors, gyroscopic effects.

OBJECTIVES

At the completion of the course the students are expected to have Knowledge of,
Velocity and acceleration of various kinematic linkages.
Four bar and slider crank mechanisms using analytical and graphical methods.
Cam profiles for different cam followers.
Various parameters of gears and gear trains.
Gyroscopic effect on aeroplanes, ships, two and four wheelers.

UNIT I MECHANISMS 9

Introduction – science of mechanisms – terms and definitions – planar, spherical and spatial mechanisms, mobility classification of mechanisms (indexing mechanism, reciprocating mechanisms, etc.,) 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 – involutes 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 PERIODS

TEXT BOOKS

1. Rao, J.S., and Dukkipatti, R.V., "Mechanism and machinery theory", 2nd Edition, New age international, Mumbai, 1992.
2. Rattan S.S, ''Theory of Machines'', Tata McGraw-Hill Publishing Company Ltd., New Delhi, 1998.

REFERENCES

1. Shingley J.E. & John Joseph Uivker, Jr., "Theory of Machines and Mechanisms", 2nd edition, McGraw–Hill International Editions, London, 1981.
2. Ghosh A and A.K.Mallick, "Theory of Mechanisms and Machines", Affiliated East-West Pvt. Ltd., New Delhi, 1988.

MV 2256 **MARINE ELECTRONICS** **L T P C**
3 0 0 3

AIM

To make the students understand the Marine Electronics and its applications.

OBJECTIVE

- At the end of the course the students are expected to have learnt,
- Amplifier Theory, Digital Circuits, Logic systems and Gates.
- Analog and Digital Converters and their applications
- Electronic Instruments and Micro Processors

UNIT I OPERATION AMPLIFIER THEORY **9**

Concept of Differential Amplifiers – its use in DP AMPS, Linear OP amp circuits.

UNIT II DIGITAL CIRCUITS **9**

Logic Systems and Gates – Binary and BCD codes – Boolean algebra – Simplifications – Flip – flops – Counters – Registers and multiplexers.

ITL & CMOS GATES: Digital integrated circuits – Semi conductor memories – ROM – RAM and PROM.

UNIT III CONVERTERS; (A-D AND D- A) **9**

Analog to Digital and Digital to Analog Converters and their use in Data – Loggers.

Electronic instruments: 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 PERIODS

TEXT BOOKS:

1. Ramakant.A. Geakwad, “Linear integrated circuits”, 3rd edition, Prentice – Hall of India, New Delhi, 2001
2. Malvino Leach, “Digital principles and applications”, 5th edition, Tata McGraw-Hill, Publishing co., New Delhi, 1995.

REFERENCES:

1. P.S.Bimbhra, “Power Electronics”, 3rd edition, Khanna Publisher, New Delhi, 2001.
2. Ramesh Gaonkar, “Microprocessors and Microcomputers”, 4th edition, Ulhasthatak, India, 1999.
3. Ray choudhary & shail jain, “Linear Integrated Circuits & Applications”.

4. A.K. Shawney “Electrical & Electronic Measurements & Instrumentation”.
5. R.S. Sedha, “Electronic Devices”.

MV 2258 STRENGTH OF MATERIALS AND APPLIED MECHANICS LAB **L T P C**
0 0 4 2

STRENGTH OF MATERIALS LAB

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

APPLIED MECHANICS LAB

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

TOTAL: 60 PERIODS

LIST OF EQUIPMENTS
(for a batch of 30 students)

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

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

MV 2259 HEAT ENGINES LAB AND BOILER CHEMISTRY LAB L T P C
0 0 4 2

HEAT ENGINES LAB

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

BOILER CHEMISTRY LABORATORY

To determine hardness content of the sample of boiler water in P.P.M. in terms of $CaCO_3$.
To determine Chloride Content of the sample of water in P.P.M. in terms of $CaCO_3$.
To determine Alkalinity due to Phenolphthaline, total Alk. and Caustic Alk. Of the sample of water (in P.P.M).
To determine Phosphate Content of the sample of water.
To determine dissolved Oxygen content of the sample of water.
To determine sulphate content of given sample of water.
To determine Ph-value of the given sample of water.
Boiler trial.
Water Testing - Dissolved oxygen, total-dissolved solids, turbidity.
Water Analysis (Fresh and sea water)- Chloride, sulphate, hardness.
Sludges and scale deposit - Silica, volatile and non-volatile suspended matter.

TOTAL: 60 PERIODS

LIST OF EQUIPMENTS

(for a batch of 30 students)

HEAT ENGINES LAB

Sl.No	Name of the Equipment	Qty.
01.	Orsat Apparatus	02 nos
02.	Steam Turbine	01
03.	Steam Calorimeter	01

04.	Air Blower	01
05.	Air Compressor	02 nos
06.	Vapour Compression Refrigeration test rig	01
07.	Vapour compression Air Conditioning test rig	01
08.	Bomb calorimeter and Junker's calorimeter	01
09.	Crucible Metener Burner, Electric Benser Hot air oven	01
10.	Flash & Fire point – closed cup apparatus	01
	Redwood's Viscometer	01
	Say bolt's Viscometer	01
11.	Carbon residue apparatus.	
12.	Wind Tunnel	01

FUELS AND LUBRICATION OIL TESTING EQUIPMENTS

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

BOILER CHEMISTRY LAB

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

Sl.No	Name of the Equipment	Qty.
01.	Internal Combustion Engines Section	01
02.	Fuel and Lubrication Oil Testing Equipments	01
03.	Heat Transfer Equipments	01
04.	Steam Lab. Equipments	01
05.	Refrigeration and Air Conditioning Equipments	01 set

06.	Automobile Components	01
07.	Engine Research Centre	01
08.	Computers with UPS	01
09.	Miscellaneous Equipments	01

INTERNAL COMBUSTION ENGINES SECTION

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

MV2301 MARINE AUXILIARY MACHINERY – I L T P C
3 0 0 3

AIM

To impart Knowledge on Ship's Auxiliary Machines.

OBJECTIVES

- On completion of the course the students will acquire knowledge of
- Ship's Engine Room Layout, Piping systems and fittings.
- Various types of Pumps and its applications.
- Ship's steering systems.

UNIT I ENGINE ROOM LAYOUT 9

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 AND COCKS 9

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.

Jointings: 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 8

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, EVAPORATORS AND DISTILLERS 9

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 10

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: 45 PERIODS

TEXT BOOKS:

1. D.W. Smith, “Marine Auxillary Machinery”, 6th Edition, Butter worths, London, 1987.
2. H.D. McGeorge, “Marine Auxillary Machinery”, 7th Edition, Butter worth, London, 2001.

REFERENCE:

1. H.D. McGeorge, “General Engineering Knowledge”, 3rd edition, Butter worth – Heineman, London, 1991.

MV2302 MARINE DIESEL ENGINES – II L T P C
3 0 0 3

AIM:

To make the students learn the concept and working of Marine Diesel Engines.

OBJECTIVES:

- At the completion of the course the students will have knowledge of,
- Marine fuel injection pumps and its applications.
- Manouvering systems of various marine diesel engines.
- Forces and stresses in slow speed and medium speed engines.
- Construction and operation of various Marine slow speed engines.

UNIT I FUEL PUMPS AND METERING DEVICES 9

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

UNIT II MANOUVERING SYSTEMS 9

Starting and reversing systems of different Marine diesel engines with safety provisions.
Indicator diagrams and Power Calculations: 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 9

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 TYPE OF ENGINES 10

Construction and Operation of Sulzer, B&W, MAN, Piel-stick, Doxford, Main Propulsion diesel engines - Latest development in marine diesel engines – camless concept, improvement in design for increased TBO
U.M.S. Operation of ships.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. C.C Pounder, “Marine Diesel Engines”, 6th Edition, Butter worth – Heinemann, Scotland, 1995.
2. D.A. Taylor, “Introduction to Marine Engineering”, 2nd Edition, Butter worth – Heinemann, London, 1996.

REFERENCES:

1. S. H. Henshall, “Medium and High Speed Diesel Engines for Marine Use”, 1st Edition, Institute of Marine Engineers, Mumbai, 1996.
2. A.B. Kane, “Marine Internal Combustion Engines”, 1st Edition, Shroff Publishers & Distributors, Mumbai, 1984.
3. D.K. Sanyal, Principle & Practice of Marine Diesel Engines”, 2nd Edition, Bhandarkar Publicatiion, Mumbai, 1998.
4. VL Maleev, “Internal Combustion Engines”, 2nd edition, McGraw-Hill book co., Singapore, 1987.
5. Christen Knak, “Diesel Motor Ships Engines and Machinery”, 1st Edition, Marine Management Ltd., London, 1990.
6. John Lamb, “Marine Diesel Engines”, 8th Edition, Butter worth – Heinemann, London, 1990.
7. Wood yard, Doug, “Pounder’s Marine Diesel Engines”, 7th Edition, Butter Worth Heinemann Publishing, London, 2001.

MV2303 STABILITY OF SHIPS L T P C
3 1 0 4

AIM:

To impart the Knowledge on the Basic Hydrostatics and Stability Calculations of Ships

OBJECTIVES:

At the End of the Course the Students will

- Have the knowledge of Basic hydrostatics , Geometry of Ships
- Have the know how of Calculations Viz. various coefficients,
- Have the Knowledge of calculating the Area of wetted Surface , Volume etc.,
- Have the Knowledge on Transverse Stability and Heel etc.,

UNIT I HYDROSTATICS 9+3

Density , relative density, pressure exerted by a liquid on an immersed plane, centre of pressure, load on immersed plane, load diagram, shearing forces on bulk head stiffeners – problems.

UNIT II GEOMETRY AND SHIP FORM CALCULATION 9+3

Archimedes principle, displacement, tonne per cm immersion. Coefficients of form, wetted surface area, similar figures, shearing force and bending moment – problems.

UNIT III CALCULATION OF AREA,VOLUME, FIRST AND SECOND MOMENTS 9+3

Simpsons first rule and second rule, application to area and volume, use of intermediate ordinate rule, trapezoidal rule, mean and mid – ordinate rule, application of simpson rule to first and second moments of area **–** Centre of gravity, effect of addition of mass, effect of movement of mass, effect of suspended mass – problems.

UNIT IV TRANSVERSE STABILITY AND HEEL 9+3

Static stability at small angles of heel, calculation of BM and meta centric height, meta centric diagram, inclining experiment, free surface effect, stability at large angles of heel, curves of static stability, dynamic stability, angle of loll, stability of a wall sided ship – problems.

UNIT V LONGITUDINAL STABILITY 9+3

Longitudinal BM – MCT1 cm – Change of trim, change of LCB with change of trim, alteration of trim by adding or removing weights, mean draft, change in mean and end draft due to density and bilging – flooding calculation – floodable length – factor of sub division – loss of stability due to grounding - problems

L: 45, T: 15, TOTAL : 60 PERIODS

TEXT BOOKS:

1. Stokoe, E.A., "Reeds Naval Architecture for Marine Engineers", 2nd Edition, Thomas Reed Publications, London, 1982.
2. K.J. Rawson and E.C Tupper "Basic ship theory" volume – I & II – 5th edition butterworth and heine mann, London , 2001.

REFERENCES:

1. Rawson, K.J.Tupper E.C, "Basic Ship theory", 5th Edition, Butter worth – Heinemann, London, 2001.
2. G.N.Hatch, "Creative Naval Architecture", 1st Edition, Thomas Reed Publications, London, 1971.

MV2304 SHIP CONSTRUCTION L T P C
3 0 0 3

AIM:

To impart knowledge to the students on Construction of ships.

OBJECTIVES:

- At the completion of the course the students are expected to have learnt,
- Ships terms and stresses in ships.
- Primary and Secondary girders used in ships.
- Fore-end and After-end arrangements.

UNIT I SHIP TERMS 9

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.

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

UNIT II BOTTOM & SIDE FRAMING 9

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 9

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 FREE BOARD AND TONNAGE 9

Significance and details of markings various international Regulations.
Shipyard Practice: layout of a shipyard – Mould loft –Optical marking – Automatic plate cutting, Fabrication and assembly etc.,
Ship Types: 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 9

Drilling ships and Platforms – Supply vessels – fire fighting arrangement – Pipe laying ships – special auxiliary service ships.
Ship Surveys: Survey rules – Functions of ship classification – Societies – Surveys during construction – Periodical surveys for retention of class.

TOTAL: 45 PERIODS

TEXT BOOKS:

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

REFERENCES:

1. A.J. Young, "Ship Construction sketch & Notes", 1st Edition, Butter worth – Heinemann, London,1980.
2. H.J. Pursey, "Merchant Ship Construction", 7th Edition, Brown Son & Ferguson Ltd. GlasGow Great Britain, 1994.

MV2305 MECHANICS OF MACHINES – II L T P C
3 0 0 3

AIM:

To develop the theoretical skill of students in Mechanics of Machines – II.

OBJECTIVES:

- At the completion of the course the students are expected to have knowledge of,
- Force analysis of Mechanisms and Balancing.
- Free and Forced Vibration of Single degree of freedom systems.
- Two and Multi Degree Freedom Systems.

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 8

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, Trifler 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 MULTI DEGREE FREEDOM SYSTEMS FOR MARINE COMPONENTS 10

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 – Rayleigh's method & Dunkerley's method for lateral and torsional vibration of major components in Ships - problems.

(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).

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Grover.G.K., "Mechanical vibrations", 7th Edition, Nem Chand & Bros, Roorkee, India, 2001.
2. Thomson, W.T. "Theory of Vibration with Applications", 3rd Edition, CBS Publishers, New Delhi, 2002.

REFERENCES:

1. Shingley, J.E. & John Joseph Uivker, Jr., "Theory of Machines and Mechanisms", 2nd edition, McGraw – Hill International Editions, London, 1981.
2. Ghosh A. and Malik, A.M. "Theory of Mechanisms and machines", 2nd edition, Affiliated East – West Press Pvt. Ltd., New Delhi, 1988.
3. Francis. TSE. Ivan E-Morse Rolland T. Hinkle, "Mechanical Vibrations", 2nd edition, CBS Publishers and Distributed, India, 1983.
4. Rao, J.S., and Dukkipatti, R.V., "Mechanism and machinery theory", 2nd Edition, New age international, Mumbai, 1992.

5. Thomson,W.T. and Dahleh,M.D., “Theory Of Vibration with Applications” 5th Edition, PearsonEducation(Singapore0 Pvt., Ltd., Indian branch, Delhi,2005

MV2306 MARINE BOILERS AND STEAM ENGINES L T P C
3 0 0 3

AIM:
To provide knowledge to the students about Marine Boilers and Steam Engines.

OBJECTIVE:
- At the end of the course the students are expected to have learnt,
- Waste heat boilers and boiler mountings.
- Operation and Maintenance of boilers.
- Construction of steam turbines and steam engines.
- How Lubrication of turbines carried out.
- Operation and maintenance of steam turbines.

UNIT I MARINE BOILERS & BOILER MOUNTINGS 9
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.
Boiler Mountings: 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 & Low water level alarms, Main Steam stop valve, Retractable type Soot blower etc.

UNIT II OPERATION & MAINTENANCE OF BOILERS 9
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, etc., 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 PLANTS 9
Reciprocating/Steam Engines: History of multiple expansion marine reciprocating engines &steam turbines. Description of different types of steam turbines.
Layout of Plant: General layout of plant & description of a modern geared steam turbine installation including auxiliaries in modern use, open and closed feed system.

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

UNIT IV LUBRICATION 9

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 OPERATION AND MAINTENANCE OF TURBINES 9

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

TOTAL: 45 PERIODS

TEXT BOOKS:

1. J.H. Milton & R.M. Leach, "Marine Steam Boilers", 4th Edition, Butter worth, London, 1980
2. C. McBirnie, "Marine Steam Engines and Turbines", 4th Edition, Butter worth, London 1980.

REFERENCES:

1. GTH. Flanagan, "Marine Boilers" 3rd Edition, Butter worth, London, 2001.
2. K.M.B. Donald, "Marine Steam Turbines", 1st Edition, Institute of Marine Engineers, London, 1977.
3. L. Jackson & T.D. Morton, "General Engineering Knowledge for Marine Engineers", 4th Edition, Thomas Reeds Publication, United Kingdom, 1986.
4. Thomas D. Morton, "Steam Engineering Knowledge for Marine Engineers", 3rd Edition, Thomas Reed Publications, London 1979.

MV2308 COMPUTER AIDED MARINE ENGINEERING DESIGN AND ANALYSIS LAB

L T P C
2 0 3 4

AIM:

To impart practical knowledge to the students about Computer Aided Design and Drawing of Marine Machine Elements

OBJECTIVES:

- At the end of the course the students are expected to have been taught,
- Design concept, selection of materials and manufacturing considerations in design.
- Computer Aided Design concepts and applications
- Design and Drawing of Fasteners and connection and Power transmission elements.
- Design and Drawing of Friction clutches and Brakes.

UNIT I ENGINEERING DESIGN AND COMPUTER AIDED DESIGN 6+9

The design process, concept, analysis, feasibility, Selection of materials and manufacturing considerations in design, Design with reference to repairs and reconditioning, specifically for working out at sea with its restrictions and limitations.

Role of computers - Computer Aided Engineering - Computer Aided Design - Design for Manufacturability – Computer Aided Manufacturing - Benefits of CAD.

UNIT II COMPUTER AIDED DESIGN AND FINITE ELEMENT ANALYSIS 6+9

Creation of Graphic Primitives - Graphical input techniques - Display transformation in 2-D and 3-D – Viewing transformation - Clipping - hidden line elimination - Mathematical formulation for graphics - Curve generation techniques - Geometric Modeling - Wire frame, Surface and Solid models - CSG and B-REP Techniques - Features of Solid Modeling Packages - Parametric and features - Interfaces to drafting, Design Analysis - Exposure to FEA packages.

UNIT III TYPES OF LOADING AND DESIGN CRITERIA 6+9

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 IV JOINTS, SHAFTS AND COUPLINGS 6+9

Design of cotter joints, knuckle joints, bolted joints, welded joints, riveted joints. Design of shafts and couplings – Drafting using CAD packages

UNIT V BELTS, FRICTION CLUTCHES AND BRAKES 6 +9

Design of Belt drives and hoists (Wire ropes), Multiple plate clutches, cone clutch, centrifugal clutch block brakes, internally expanding shoe brakes, external band brakes, differential band brakes - Solid modelling using CAD packages.

TOTAL: 75 PERIODS

TEXT BOOKS:

1. Goutam Prohit and Goutam Ghosh,"Machine Drawing with AutoCAD", 1st Impression,Dorling Kindersley(India) Pvt., Ltd., New Delhi,2007ist
2. J.E.Shigley, "Mechanical Engineering Design", 1st metric edition, McGraw-Hill, New Delhi, 1986.
3. R.S.Khurmi and J.K.Gupta, "Machine Design", 5th Edition, Eurasia publishing, New Delhi, 2005.
4. Sadhu Singh, " Computer Aided Design and Manufacturing ", Khanna Publishers, New Delhi, 1998.

REFERENCES:

1. Abdulla Sharif, "Machine Design", 3rd Edition, Dhanpat Roy & Sons, New Delhi, 1995.
2. Pandya & Shaw, "Elements Of Machine Design", 1st Edition, Charotar Publishing, Mumbai, 1997.
3. Groover and Zimmers, " CAD / CAM : Computer Aided Design and Manufacturing ",Prentice Hall of India, New Delhi, 1994.

LIST OF EQUIPMENTS

(Requirement for a batch of 30 students)

S.No.	Description of Equipment	Quantity Required
1.	Desktop computers with following configuration CPU (High End), Main Memory (1GB), HDD 80 GB and above, High Resolution SVGA Graphics interface, 17" or 19" Monitor, Ethernet Card	40 Nos.
2.	Licensed Operating System	Adequate
3.	Licensed Application Software with 20 and above seats Softwares like AutoCAD, ProEngineer, CATIA etc.,	20 seats & above
4.	A4/A3 Printer	1 No.
5.	7.5/10 KVA online UPS	1 unit

MV2309 ELECTRICAL ENGINEERING ELECTRONICS AND MICRO PROCESSOR LAB **L T P C 0 0 4 2**

(A) ELECTRICAL ENGG. LABORATORY **30**

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

(B) ELECTRONICS / MICROPROCESSOR LABORATORY **30**

To study the volt-ampere characteristics of a high current semi conductor diode.
To study the volt-ampere characteristics of a diode and Zener diode.
To study the half wave and full wave rectification circuit without and with filter circuit.
To study the volt-ampere characteristics of a Transistor.
To study the volt-ampere characteristics of Field Effect Transistor.
To study the characteristics of Silicon Control Rectifier.

To study the Transistor Feed Back Amplifier.
To study the Integrated Circuit operational amplifier.
To study the logic training board.
To study the speed control of D.C. motor using Thyristor.
Arithmetic operations using 8085
Logical operations using 8085
Array operations using 8085
Speed & Direction Control of Stepper motor using 8085.

TOTAL: 60 PERIODS

LIST OF EQUIPMENTS

(for a batch of 30 students)

ELECTRICAL ENGINEERING. LAB

Sl.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 LAB

Sl.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

MV2310 MEASUREMENTS LAB, INSTRUMENTATION LAB AND REFRIGERATION LAB. **L T P C 0 0 4 2**

(A) MEASUREMENTS LAB. **25**

Use of precision measuring instruments like micrometer, vernier, height and depth gauges,
surface plate, etc.
Checking dimensions of a part using slip gauge.

Use of sine bar for measuring angles and tapers.
Measurement of tooth thickness by gear tooth vernier.
Calibration of dial gauge.
Taper and bore measurement-using spheres.
Fundamental dimension of a gear using contour projector.
Testing squareness of a try square using slip gauges.
Checking straightness of a surface plate using autocollimator.
Measurement of angles between centre lines of holes drilled radially on a shaft.
Measurements of thread parameters using floating carriage micrometer.
Use of pneumatic comparator and mechanical comparator.

(B) INSTRUMENTATION LAB. 20

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

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
01.	1. Dead weight type pressure gauge 0-2kgf/cm^2	1
02.	2. Bourdon type Pressure gauge 0-400kgf/cm^2	1
03.	Vacuum pressure gauge – McLeod gauge.	1
04.	Thermocouple	4
05.	Resistance Temperature Detector	2
06.	Proving ring mechanical type	2
07.	Speed stroboscope	1
08.	Strain gauge.	4
09.	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 & REFRIGERATION LABORATORY

Sl.No.	Description	Qty.
01.	Marine Refrigeration Plant (10 ton capacity)	01
02.	Marine Air Conditioning Plant (10 ton capacity)	01
03	Vapour compression and Vapour Absorbtion refrigeration test RIG	01 each

MV2351 MARINE WORKSHOP PRACTICAL AND AFLOAT TRAINING 12

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.

Competency on - use of hand tools used for marine equipments for dismantling, maintenance, repair and reassembly of shipboard equipments. **100 hrs.**

Competency on - 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.**
Competency on	-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 dairy. 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.

MV2401 MARINE SYSTEM AND MACHINERY DESIGN L T P C
2 2 0 4

AIM

To impart training and knowledge to the students about Marine Machinery system and Design.

OBJECTIVE

- At the completion of the course the students are expected to have knowledge of,
- Different types of Bearings.
- Design of IC Engine parts and gears.
- Design of Marine Machinery systems.

UNIT I SLIDING CONTACT BEARINGS 11+3

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 SPUR AND HELICAL GEARS 9+3

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 ENGINE PARTS 7+3

Piston, connecting rod with bearings, crankshaft, flywheel and rocker arms.

UNIT IV VALVES & LIFTING DEVICES 7+3

Valves, safety valves and reducing valves - crane hooks, lifting chains, chain blocks, E.O.T.Crane.

UNIT V DESIGN CRITERIA FOR MARINE SYSTEMS 11+3

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

TOTAL: 60 PERIODS

TEXT BOOKS:

1. Pandya & Shah, “Machine Design”, 13th Edition, Charotar Publishing House, Gujarath, 1997.
2. Sam Had Dad, Neil Watson, “Design and Application in Diesel Engines”, 1st Edition, Ellis Horwood Limited, London, 1984.
3. khurmi,R.S. and Gupta,J.K., “

REFERENCES:

1. Indian Register of Shipping Part 1 to Part 7, “Rules and Regulations & Classification of steel ships” 1st Edition, Mumbai, 1999.
2. PSG College of Technology, Faculty of Mechanical Engineering, ”Design Data”, 2nd Edition, M/s DPU printer, Coimbatore, 1978.

MV2402 MARINE ELECTRICAL TECHNOLOGY L T P C
3 0 0 3

AIM

The aim of the course is to develop skills of students in Marine Electrical Technology. The students will be imparted training in handling various electrical instruments to find out faults on various electrical equipments onboard ships and rectify such faults.

OBJECTIVES

- On completion of the course the students are expected to

- Know the regulations observed onboard ships regarding electrical equipments wherever applicable.
- Know the use of electrical instruments, to find out and rectify various kinds of faults onboard ships.

UNIT I POWER DISTRIBUTION AND REGULATIONS 9

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 & 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 9

Insulated & 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 & Switchgear: Main and sub switchboard-Rating and Characteristics of Main switchboards – group starter boards – distribution Fuse boards – bus bars – instrumentation & 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 9

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 & 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 & 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 9

Propulsion Systems: Auxiliary propulsion systems – Layout and Optimizing storage space – Electrical Propulsion – Advantages & 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 & Cargo Equipment: Anchor Windlass – Cargo winches – Hydra lift Marine cranes-Maritime GMC A.S.-Hagglunds Drives & 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 & control-Safety protection Equipment – Automatic Operation**.**

UNIT V AUXILLARIES AND MAINTENANCE 9

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 & safety measures – First Aid treatment – Rotary generators.

Gas analysers: Combustible gas indicator – Portable oxygen analyzer – CO_2 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 & AC systems.

Maintenance & Troubleshooting: Introduction – Planned Preventive Maintenance – Life, Breakdown and Condition maintenance, Troubleshooting, Maintenance of specific equipments – Recommended list of spares, tools & Accessories.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. BOWIC C.T., Marine Electrical Practice, 5th Edition, "Butter Worth", London, 1981.
2. LAW S.W., "Electricity applied to Marine Engineering", 4th Edition, "The Institute of Marine Engineers", London, 1998.

REFERENCES:

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

MV2403 MARINE VEHICLES PERFORMANCE L T P C
2 2 0 4

AIM:
To impart Knowledge to students about Marine Vehicle Performance while sailing

OBJECTIVES:
- On Completion of Course the Students are expected to have knowledge about, Ships Models and the Sea Trials
- Various types of Propellers and Rudders
- Wave motions and the Ships Vibration s

UNIT I RESISTANCE 14
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 PROPELLER THEORY 12
Types of propellers, apparent slip, real slip, wake, thrust, relation between powers and relation between mean problem and speed, measurement of pitch, cavitations, built and solid propellers, interaction between the ship and propeller, hull efficiency over all propulsive efficiency – problems.

UNIT III RUDDER THEORY 10
Types of rudders, model experiments and turning trials, area and shape of rudder, position of rudder, bow rudders vs stern rudder, forces on rudder, torque on stock, angle of heel, due to force on rudder and angle of heel when turning – problems.

UNIT IV WAVE THEORY 12
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 VIBRATION & NOISE 12
Hull vibration, Engine vibration, vibration of shafting system, balancing of engine.

TOTAL : 60 PERIODS

TEXT BOOKS
1. K.J. Rawson and E.C. Tupper, “Basic Ship Theory” (Vol. II), 5th Edition, Butterworth Heinemann, London, 2001.
2. Eric C.Tupper, “Introduction to Naval Architecture”, 3rd Edition, Butter worth – Heinemann, London, 2001.

REFERENCES
1. “Principles of Naval Architecture”,SNAME Publication
2. R. Battaharjee. ”Dynamics of Marine vehicles “SNAME Publication.

MV2404 MARINE AUXILIARY MACHINERY – II L T P C
3 0 0 3

AIM:

To impart knowledge on the Working Principle of Marine Auxiliary Machineries

OBJECTIVES

At The end of the course the students are expected to have the knowledge on

- The Construction, operation, maintenance of incinerator.,and sewage plant.
- The Construction, operation, maintenance of Oily water Seperator and Purifiers
- The Construction operation, maintenance of sewage plant.

UNIT I OPERATION & MAINTENANCE 9

Prevention of oil, garbage, sewage, air pollution and IMO requirement as per MARPOL act. Operation, construction, maintenance of oil water separator both manual and automatic versions.Construction, operation, maintenance of incinerator and the of sewage plant.

UNIT II THEORY OF OIL PURIFICATION 9

Construction, operation, maintenance of fuel oil and lub oil purifiers, clarifiers together with self de sludge operation. Theory of air compression and uses of compressed air on board.

Construction, operation, maintenance of main air compress and emergency air compressors.

Types of bow thrusters, operation, maintenance of the same and Deck machinery, operation, maintenance of cargo winches, windless mooring winches.

UNIT III METHODS OF SHAFT ALIGNMENT 9

Construction, operation, maintenance of - thrust block. - intermediate shaft.

Construction, operation, maintenance stern tube and stern tube bearing both water cooled and oil cooled together with sealing glands .Stresses in shafting, i.e. intermediate shaft, thrust shaft and screw shaft.

UNIT IV DRY DOCKING 9

Preparation and procedure to dry docking vessel. Maintenance of hull, underwater fittings and machine maintenance and repairs during dry dock Removal and maintenance of rudder and propeller.

Removal and maintenance of tail shaft and stern tube bearing.

UNIT V LINE SYSTEMS 9

Piping diagrams - Drawing and working principle of the line diagram of – Bilge-Ballast-Fuel oil transfer- Fuel oil Service- . Cooling Water – Lubricating oil – Compressed Air - Steam Line – Exhaust Gas - Feed Water.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. DW Smith “Marine Auxiliary Machinery”, 6th edition, Butter Worths,London,1987.
2. HDMcGeorge,”MarineAuxiliary Machinery"7th edition, Butter Worths,London,2001.

REFERENCES:

1. D.K. Sanyal, " Principle and practices of Marine Diesel Engine" 2nd Edition, Bhandarkar Publication, Mumbai, 1998
2. MARPOL 73/78, IMO Publications , 2001.
3. Wood Yard , Doug, "Pounder"s Marine Diesel Engine" 7thedition, Butter Worths Heinemann Publications ,London 2001
4. " Pumping and Piping Diagram", IME publication

MV2405 SHIP'S FIRE PREVENTION AND CONTROL L T P C
3 0 0 3

AIM

To provide knowledge an understanding of advanced Fire Prevention and Control to the students.

OBJECTIVES

At the end of the course the students will have learnt about,

- Fire protection, Detection and Safety systems in ships.
- Construction, Operation and Maintenance of Fixed and portable Fire Extinguishers in ships.
- Fire prevention and control in oil tankers – LPG / LNG carriers – Chemical tankers – oil rigs – supply vessels – Fire fighting ships – operation.

UNIT I FIRE PROTECTION BUILT IN SHIPS 9

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 & fire zones.

UNIT II DETECTION AND SAFETY SYSTEMS 9

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 9

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 & class D fires, Combustion products & their effects on life safety.

UNIT IV FIRE CONTROL 9

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 9

- 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:45 PERIODS

TEXT BOOKS

1. Frank Rush Brook, "Fire Aboard", 3rd Edition, Brown, son & ferguson Ltd., Glassgow 1988.
2. E.A. Stokoe, "Reed's Ship Construction for Marine Students", Vol.5, 5th edition, Thomas Reed Publications, Great Britain 1999.

REFERENCES:

1. M.G. Stavitsky, 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, 1st 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) 3rd Edition, International Maritime Organization, London, UK, 2001.
4. Leslie Jackson, Reed's General Engineering Knowledge for Marine Engineers Vol.8, 4th Edition, Thomas Reed publication, Great Britain, 1986.

MV2406 FIRE FIGHTING ,CONTROLS AND SIMULATOR LABORATORY LT 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 cabon-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.
6. CNC & VMC machines, microprocessor controlled DC & AC machines, SCADA.

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 PERIODS

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.	Air Compressor Suitable for above system	01

MARINE SIMULATOR LABORATORY

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

MV2407 MARINE PROPULSION AND AUXILIARY MACHINERY OVERHAULING LABORATORY

L T P C
0 0 4 2

MAINE ENGINE

Study of Lubricating oil cooler
Study of Jacket water cooler
Study of Scavenge Air cooler
Study of crank case inspection and bearing clearances
Fuel injection valve and pump
starting air valve
cylinder relief valve and indicator cock

AUXILIARY ENGINE

Study of Turbo charger
Study of Cylinder Head and fittings
Study of Fuel Injection pump

AUXILIARY MACHINES

Study of Lubricating oil screw pump
Study of S.W. Centrifugal pump
Reciprocating Bilge pump
Study of Boiler safety valve and water level gauge glass
Study of 2 RAM hydraulic steering gear
Study of various types of values, filters, oil separators, Incinerator, Heat Exchange etc.
Study of boilers, cargo oil pump, F.W. Generator.

TOTAL : 60 PERIODS

LIST OF EQUIPMENTS
(for a batch of 30 students)

MARINE PROPULSION LABORATORY

Sl. No.	Description of Equipment	Qty.
01.	Fuel Oil Separator	01
02.	Lub Oil Separator	01
03.	Bilge Pump	01
04.	Ballast Pump 130 cu.m/hr.	01
05.	Main Engine Sea Water Pump	01
06.	Sludge Pump	01
07.	Fuel Oil Transfer Pump	01
08.	Ballast Pump 65 cu.m /hr.	01
09.	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 / 100 KW	01

MARINE AUXILIARY MACHINERY LABORATORY

Sl. No.	Description of Equipment	Qty.
01.	Air Compressor	01
02.	Heat Exchanger	01
03.	Incinerator	01
04.	Oily Water Separator	01
05.	Steering Gear	01
06.	Cargo Turbine Oil Pump	01
07.	Cargo Winch	01
08.	Governor	01
09.	Thermostat	01
10.	Crankshaft	01

MARINE DISMANTLING AND ASSEMBLING LABORATORY

Sl.No.	Description of Equipment	Qty.
01.	Heleshaw Pump	01
02.	Piston Pump	01
03.	Centrifugal Pump	01
04.	Gear Pump	01
05.	Fire & G.S Pump	01
06.	Screw Displacement pump	01
07.	Sewage Treatment Plant	01
08.	Cargo Oil Pump	01

09.	Different types of valves (quick closing valve, non-return valve, butterfly valve)	01Each
10.	Water gauge glass	01

MARINE BOILER WORKSHOP

Sl.No.	Description	Qty.
01.	Auxillary Water Tube Boiler	01
02.	Fresh Water Generator	01

GE2321 COMMUNICATION SKILLS LABORATORY L T P C
(Fifth / Sixth Semester) **0 0 4 2**

Globalisation has brought in numerous opportunities for the teeming millions, with more focus on the students' overall capability apart from academic competence. Many students, particularly those from non-English medium schools, find that they are not preferred due to their inadequacy of communication skills and soft skills, despite possessing sound knowledge in their subject area along with technical capability. Keeping in view their pre-employment needs and career requirements, this course on Communication Skills Laboratory will prepare students to adapt themselves with ease to the industry environment, thus rendering them as prospective assets to industries. The course will equip the students with the necessary communication skills that would go a long way in helping them in their profession.

OBJECTIVES:

- To equip students of engineering and technology with effective speaking and listening skills in English.
- To help them develop their soft skills and interpersonal skills, which will make the transition from college to workplace smoother and help them excel in their job.
- To enhance the performance of students at Placement Interviews, Group Discussions and other recruitment exercises.

I. PC based session	**(Weightage 40%)**	**24 periods**

A. ENGLISH LANGUAGE LAB (18 Periods)

1. **LISTENING COMPREHENSION: (6)**
Listening and typing – Listening and sequencing of sentences – Filling in the blanks - Listening and answering questions.

2. READING COMPREHENSION: (6)
Filling in the blanks - Close exercises – Vocabulary building - Reading and answering questions.

3. SPEAKING: **(6)**

Phonetics: Intonation – Ear training - Correct Pronunciation – Sound recognition exercises – Common Errors in English.

Conversations: Face to Face Conversation – Telephone conversation – Role play activities (Students take on roles and engage in conversation)

B. DISCUSSION OF AUDIO-VISUAL MATERIALS (6 PERIODS)
(Samples are available to learn and practice)

1. RESUME / REPORT PREPARATION / LETTER WRITING **(1)**

Structuring the resume / report - Letter writing / Email Communication - Samples.

2. PRESENTATION SKILLS: **(1)**

Elements of effective presentation – Structure of presentation - Presentation tools – Voice Modulation – Audience analysis - Body language – Video samples

3. SOFT SKILLS: **(2)**

Time management – Articulateness – Assertiveness – Psychometrics – Innovation and Creativity - Stress Management & Poise - Video Samples

4. GROUP DISCUSSION: **(1)**

Why is GD part of selection process ? - Structure of GD – Moderator – led and other GDs - Strategies in GD – Team work - Body Language - Mock GD -Video samples

5. INTERVIEW SKILLS: **(1)**

Kinds of interviews – Required Key Skills – Corporate culture – Mock interviews-Video samples.

II. Practice Session	**(Weightage – 60%)**	**24 periods**

1. **Resume / Report Preparation / Letter writing**: Students prepare their own resume and report. (2)
2. **Presentation Skills:** Students make presentations on given topics. (8)
3. **Group Discussion**: Students participate in group discussions. (6)
4. **Interview Skills**: Students participate in Mock Interviews (8)

REFERENCES:

1. Anderson, P.V, **Technical Communication**, Thomson Wadsworth, Sixth Edition, New Delhi, 2007.
2. Prakash, P, **Verbal and Non-Verbal Reasoning**, Macmillan India Ltd., Second Edition, New Delhi, 2004.
3. John Seely, **The Oxford Guide to Writing and Speaking**, Oxford University Press, New Delhi, 2004.
4. Evans, D, **Decisionmaker**, Cambridge University Press, 1997.
5. Thorpe, E, and Thorpe, S, **Objective English**, Pearson Education, Second Edition, New Delhi, 2007.
6. Turton, N.D and Heaton, J.B, **Dictionary of Common Errors**, Addison Wesley Longman Ltd., Indian reprint 1998.

LAB REQUIREMENTS:

1. Teacher console and systems for students.
2. English Language Lab Software
3. Career Lab Software

Requirement for a batch of 60 students

Sl.No.	Description of Equipment	Quantity required
1.	**Server**	1 No.
	o PIV system	
	o 1 GB RAM / 40 GB HDD	
	o OS: Win 2000 server	
	o Audio card with headphones (with mike)	
	o JRE 1.3	
2.	Client Systems	60 No.
	o **PIII or above**	
	o **256 or 512 MB RAM / 40 GB HDD**	
	o **OS: Win 2000**	
	o Audio card with headphones (with mike)	
	o JRE 1.3	
3.	**Handicam Video Camera (with video lights and mic input)**	1 No.
4.	Television - 29”	1 No.
5.	Collar mike	1 No.
6.	Cordless mikes	1 No.
7.	Audio Mixer	1 No.
8.	DVD Recorder / Player	1 No.
9.	LCD Projector with MP3 /CD /DVD provision for audio / video facility – **Desirable**	1 No.

GE 2021 ENVIRONMENTAL SCIENCE AND ENGINEERING L T P C
3 0 0 3

UNIT I COMPONENTS OF ENVIRONMENT 9

Components – Water, air and land – Inter-relationship between components – Subcomponents; Ecosystem – Structure and functional components of ecosystem – Development and evolution of ecosystem – Energy flow and material cycling in ecosystem – Natural and man made impacts on water, air and land; Environment and development – Concept of sustainable development.

UNIT II SCIENCE OF ENVIRONMENT 9

Chemistry, Physics and biology of water, air and land; Stress on the Chemistry, Physics and Biology of water, air and land owing to the impacts; Environmental quality objective and goles – policies on development projects and their impacts, with emphasis on the branch of engineering of the student.

UNIT III CURRENT ENVIRONMENTAL ISSUES 9

Current Environmental issues at country level – management of municipal sewage, municipal solid waste, Hazardous waste and Bio-medical waste – Air pollution due to industries and vehicles; Global issues – Biodiversity, Climate change, Ozone layer depletion.

UNIT IV ENGINEERING INTERVENTIONS TO REDUCE THE ENVIRONMENTAL STRESSES 9

Minimisation of Stress – Principles of Physics, chemistry and biology in engineering interventions such as waste treatment – Flow sheets of engineering interventions relevant to the Engineering discipline of the student – Waste minimization techniques – Clean technology options – Standards of performance of the interventions.

UNIT V

(A) TOOLS FOR ENVIRONMENTAL MANAGEMENT 9

Environmental impact assessment; Precautionary Principle and Polluter Pays Principle; Constitutional provisions, Legal and economic instruments in Environmental Management; Role of Non-government organisations – Community participation environmental management works; International conventions and protocols; Pollution Control Boards and Pollution Control Acts.

(B) FIELD STUDY

In-depth study of environmental issues at least one environmentally sensitive site relevant to the discipline of the student and preparation of a report thereupon.

TOTAL : 45 PERIODS

TEXT BOOKS:

1. G.M. Master, “Introduction to Environmental Engineering & Science”, Prentice Hall, New Delhi, 1997.
2. J.G. Henry and G.W. Heike, “Environmental Science & Engineering”, Prentice Hall International Inc., New Jersy, 1996.

REFERENCES:

1. S.K. Dhameja, Environmental Engineering and Management, S. K. Kataria and Sons, New Delhi, 1999.
2. State of India’s Environment – A Citizen’s Report, Centre for Science and Environment and others, 1999.
3. Shyam Divan and Armin Rosancranz, Environmental Law and Policy in India, Cases, Materials and Statutes, Oxford University Press, 2001.

MV2451 SHIP OPERATIONAL MANAGEMENT AND IMO REQUIREMENTS L T P C
3 0 0 3

AIM

To teach the students about management of ships and impart knowledge on statutory regulations.

OBJECTIVES

At the end of the course the students would have learnt about,

- Structure and functioning of a shipping company.
- Planning and estimating of a voyage besides executing the same.
- Marine Insurance as applicable to ship, cargo and crew.
- Statutory regulations applicable to shipping industry.
- Manning of ships, STCW and Port state control.

UNIT I STRUCTURE OF A SHIPPING COMPANY 9

Structure of a shipping company and functioning of its various departments, financing, economics of new and second hand tonnage, subsidies, ownership of vessels, registration of ships, flags of convenience, IMO identification number.

UNIT II COMMERCIAL SHIPPING PRACTICE 9

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 9

Underwriting and loss adjusting principles applied to Marine cargo insurance, hull / machinery policy, particular average, general average, P & I Clubs – making claims.

UNIT IV STATUTORY REGULATIONS 9

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 9

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: 45 PERIODS

TEXT BOOKS:

1. E.F. Stevens & C.S.J. Butterfield "Shipping Practice" 11th Edition, Sterling Book House, Mumbai, 1999.
2. John.M.Downard, "Ship Management Series - Managing Ships", I Edition, Fairplay Publications, Coulsdon, Surrey - 1990.
3. Capt.Dara E.Driver, "Advanced Shipboard Management", I Edition, Rumar Publications, Mumbai, 1985.

REFERENCES:

1. Nilima, M.Chanidiramani, "Carriage of goods by Sea and Multimodal Transport", 1st Edition, Saptarang Publication, Mumbai, 1996.
2. SOLAS – 1974 - International Maritime Organisation Publications
3. MARPOL – 1973/78 - International Maritime Organisation Publications
4. STCW -1978/95 - International Maritime Organisation Publications

5. G.Raghuram, “Shipping Management”, 1st Edition, Vasant J.Sheth Memorial Foundation, Delhi, 1992
6. Merchant Shipping Act, Govt. of India - 1958.

MV2452 MARINE CONTROL ENGINEERING AND AUTOMATION L T P C
3 0 0 3

AIM

To provide knowledge about Automation and Control Engineering in ships.

OBJECTIVES

At the end of the course the students would have learnt,

- Introduction of control systems.
- Graphical representation of signals.
- Electrical, Electronics, Pneumatic and Hydraulic control systems.
- Application of controls in ships.

UNIT I CONTROL SYSTEM 9

Introduction to control terms, Block diagrams for control systems, Block diagram reduction, open loop and closed feed back control, comparison of closed and open loop, feed forward control. Feed forward modification. Regulators, Proportional plus integral plus derivative controls. Use of various control modes.
Mathematical Model : Developing Mathematical Models For Mechanical, Hydraulic, Pneumatic, Thermal, Electrical and Electro mechanical Systems

UNIT II GRAPHICAL REPRESENTATION OF SIGNALS 9

Inputs of step, Ramp, Sinusoid, Pulse and Impulse, Exponential Function etc Error Detector, Controller output elements. Dynamics of a simple servomechanism for Angular position Control: Torque Proportional to error, Different responses of servomechanism. Frequency response test. Series compensation using Nyquist Diagram

UNIT III PROCESS CONTROL SYSTEMS 9

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 9

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 9

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: 45 PERIODS

TEXT BOOKS

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

REFERENCES

1. L.F. Adams, "Engineering Instrumentation and Control", 1st Edition, English Language Book Society (ELBS), Hodder, Stoughton, Great Britain, 1984.
2. Peter Harriott, " Process Control", 26th reprint, Tata Mc Graw Hill Publishing Co.Ltd.,2005

MV2453 SAFETY PRECAUTIONS AND WATCH KEEPING L T P C
3 0 0 3

AIM

To impart knowledge to the students in Watch-keeping of Engine Room in various types of ships and to prepare for Class IV MOT Examinations

OBJECTIVES

At the end of the course the students are expected to have learnt,

- STCW standards of training, requirements of officers and ratings.
- Watch-keeping in various ships.
- Prevention, rectification and maintenance with respect to trouble shooting of machineries in the Engine Room.

UNIT I SAFE WATCH KEEPING 9

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.

Trouble shooting during watch keeping: Emergency measures taken in case of – flooding of engine room, engine room bilge fire, general fire, Incase of any system failure or breakage of pipe lines, etc.

UNIT II TROUBLE SHOOTING IN AUXILIARY MACHINERIES 9

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 & systems.

Repairs and maintenance of propeller, rudder, drydocking methods, drydocking inspection and repair works.

UNIT III TROUBLE SHOOTING IN MAIN ENGINE 9

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 ENGINE COMPONENTS 9

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 & 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 9

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: 45 PERIODS

TEXT BOOKS:

1. Vikram Gokhale & N.Nanda," Marine Engineering Practice and Ship safety and Environmental protection", 3rd Edition, Engee Enterprises Mumbai, 2002.
2. Sulzer brothers, "Sumitomo – Sulzer Diesel Engines", Service Instruction for Sumitomo Sulzer Diesel Engines RND Sumitomo ship building & Machining co., Ltd., Japan.

REFERENCES:

1. IME Manuals and Ship's Marine Manuals.
2. Manual instruction for MAN Diesel Engine and spare parts, 1968.
3. Instruction Manual for Mitsui – B & W Diesel Engine data, Mitsui Engineering & Ship Building co., Mitsui B & W, 1976.
4. Manual De Maintenance & operation MAN type K.270 120E DMR.
5. Daihatsu Diesel Engine instruction book, Operation & maintenance manual for Daihatsu Diesel Engine Model – DV26, Model 6 PKT – TB-16.

MV2454 COMPREHENSION L T P C
0 0 2 1

Syllabus: Diesel Engines, Marine Auxiliary machineries, controls, Naval Architecture and Marine electrical machineries.

After completion of 4 years training, the Marine Engineering students will be tested on the Marine Engineering knowledge acquired by way of comprehension test. Valuation is done by both Internal and External Examiners for 100 Marks.

MV2455 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.

GE2022 TOTAL QUALITY MANAGEMENT L T P C
3 0 0 3

UNIT I INTRODUCTION 9

Introduction - Need for quality - Evolution of quality - Definition of quality - Dimensions of manufacturing and service quality - Basic concepts of TQM - Definition of TQM – TQM Framework - Contributions of Deming, Juran and Crosby – Barriers to TQM.

UNIT II TQM PRINCIPLES 9

Leadership – Strategic quality planning, Quality statements - Customer focus – Customer orientation, Customer satisfaction, Customer complaints, Customer retention - Employee involvement – Motivation, Empowerment, Team and Teamwork, Recognition and Reward, Performance appraisal - Continuous process improvement – PDSA cycle, 5s, Kaizen - Supplier partnership – Partnering, Supplier selection, Supplier Rating.

UNIT III TQM TOOLS & TECHNIQUES I 9

The seven traditional tools of quality – New management tools – Six-sigma: Concepts, methodology, applications to manufacturing, service sector including IT – Bench marking – Reason to bench mark, Bench marking process – FMEA – Stages, Types.

UNIT IV TQM TOOLS & TECHNIQUES II 9

Quality circles – Quality Function Deployment (QFD) – Taguchi quality loss function – TPM – Concepts, improvement needs – Cost of Quality – Performance measures.

UNIT V QUALITY SYSTEMS 9

Need for ISO 9000- ISO 9000-2000 Quality System – Elements, Documentation, Quality auditing- QS 9000 – ISO 14000 – Concepts, Requirements and Benefits – Case studies of TQM implementation in manufacturing and service sectors including IT.

TOTAL: 45 PERIODS

TEXT BOOK

1. Dale H.Besterfiled, et at., "Total Quality Management", Pearson Education Asia, 3rd Edition, Indian Reprint (2006).

REFERENCES

1. James R. Evans and William M. Lindsay, "The Management and Control of Quality", 6th Edition, South-Western (Thomson Learning), 2005.
2. Oakland, J.S., "TQM – Text with Cases", Butterworth – Heinemann Ltd., Oxford, 3rd Edition, 2003.
3. Suganthi,L and Anand Samuel, "Total Quality Management", Prentice Hall (India) Pvt. Ltd.,2006.
4. Janakiraman, B and Gopal, R.K, "Total Quality Management – Text and Cases", Prentice Hall (India) Pvt. Ltd., 2006

GE2025 PROFESSIONAL ETHICS IN ENGINEERING

L	T	P	C
3	0	0	3

UNIT I ENGINEERING ETHICS **9**

Senses of 'Engineering Ethics' – Variety of moral issues – Types of inquiry – Moral dilemmas – Moral Autonomy – Kohlberg's theory – Gilligan's theory – Consensus and Controversy – Professions and Professionalism – Professional Ideals and Virtues – Uses of Ethical Theories

UNIT II ENGINEERING AS SOCIAL EXPERIMENTATION **9**

Engineering as Experimentation – Engineers as responsible Experimenters – Research Ethics - Codes of Ethics – Industrial Standards - A Balanced Outlook on Law – The Challenger Case Study

UNIT III ENGINEER'S RESPONSIBILITY FOR SAFETY **9**

Safety and Risk – Assessment of Safety and Risk – Risk Benefit Analysis – Reducing Risk – The Government Regulator's Approach to Risk - Chernobyl Case Studies and Bhopal

UNIT IV RESPONSIBILITIES AND RIGHTS **9**

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 **9**

Multinational Corporations – Business Ethics - Environmental Ethics – Computer Ethics - Role in Technological Development – Weapons Development – Engineers as Managers – Consulting Engineers – Engineers as Expert Witnesses and Advisors – Honesty – Moral Leadership – Sample Code of Conduct

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Mike Martin and Roland Schinzinger, “Ethics in Engineering”, McGraw Hill, New York (2005).
2. Charles E Harris, Michael S Pritchard and Michael J Rabins, “Engineering Ethics – Concepts and Cases”, Thompson Learning, (2000).

REFERENCES:

1. Charles D Fleddermann, “Engineering Ethics”, Prentice Hall, New Mexico, (1999).
2. John R Boatright, “Ethics and the Conduct of Business”, Pearson Education, (2003)
3. Edmund G Seebauer and Robert L Barry, “Fundamentals of Ethics for Scientists and Engineers”, Oxford University Press, (2001)
4. Prof. (Col) P S Bajaj and Dr. Raj Agrawal, “Business Ethics – An Indian Perspective”, Biztantra, New Delhi, (2004)
5. David Ermann and Michele S Shauf, “Computers, Ethics and Society”, Oxford University Press, (2003)

MV2020 DOUBLE HULL TANKERS L T P C
3 0 0 3

AIM:

To impart knowledge on the design features and utility of Double Hull Tankers

OBJECTIVES

On completion of the course the students are expected to have the knowledge on the

- Advantages and superiority of double hull tankers
- Design Consideration and Storage of Oil Space
- Structural design of double hull and oil handling devices
- Economic Aspect of Double Hull tankers

UNIT I INTRODUCTION 9

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

UNIT II DESIGN 9

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

UNIT III STRUCTURAL ANALYSIS 9

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

UNIT IV CARGO HANDLING SYSTEM 9

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

UNIT V ECONOMICAL OPERATIONS 9

Economical aspects, fast loading discharging or oil cargo, quicker cleaning, ballasting and de-ballasting, larger number of trips per year.

TOTAL: 45 PERIODS

TEXT BOOKS

1. Indian Register of Shipping Notes on Design of Double Hull Tankers
2. Lloyd Register of Shipping Notes on Design of Double Hull Tankers
3. "Ship Design", SNAME

MV2021 MARITIME ECONOMICS & INSURANCE L T P C
3 0 0 3

AIM:

To understand the principles of Maritime Economics.

OBJECTIVES:

- Learn about various shipping markets.
- Learn about freight rates and financing of ships.
- Understand Maritime trade and Economics of bulk shipping.
- Understand General Cargo shipping and Regulating Maritime trade.
- Understand Forecasting and Market Research in shipping.

UNIT I SHIPPING MARKET 9

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

UNIT II SUPPLY AND DEMAND ,FINANCING 9

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

UNIT III TRADE AND CARGO 9

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

UNIT IV ECONOMICS OF SHIPS AND FORE CASTING 9

The general cargo and the economics of liner shipping. The economics of ships and ship Designs The regulatory framework of maritime economics. The economics of shipbuilding and scrapping
Maritime forecasting and market research.

UNIT V LAW AND MARINE INSURANCE 9

Information about law, Maritime Law. Marine Insurance, Clauses, General average Franchise, Maritime perils, Protection and Indemnity Association, Warranties.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Martin Stopford, "Maritime Economics", 2nd Edition, Routledge, London, 1997.
2. Dr. K.V. Hariharan, "Containerisation & Multimodal Transport in India", 2nd Edition, Shroff Publishers & Distributors Pvt. Ltd., Mumbai,1997.
3. F. N. Hepkins "Business Law for the Ship Master".
4. J.Bes "Chartering & Shipping Terms".

REFERENCES:

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

MV2022 MARINE PROPELLERS AND PROPULSION L T P C
3 0 0 3

AIM:

To impart knowledge on the Propeller, Geometry, Design, Performance and defects

OBJECTIVES

On completion of the course the students are expected to have the knowledge on the

- Various types of Propulsion systems, Propeller geometry
- Propeller theory , propeller operating environment
- Interaction between hull and the propeller
- Performance and maintenance of proppellers

UNIT I PROPULSION SYSTEMS AND PROPELLER GEOMETRY 9

Fixed pitch propellers, Ducted propellers, Podded and azimuthing propulsors, Contrarotating propellers, Overlapping propellers, Tandem propellers, Controllable pitch propellers, Waterjet propulsion, Cycloidal propellers paddle wheels, Magnetohydro dynamic propulsion, Superconducting motors for marine propulsion.

Frames of references, Propeller reference lines, Pitch, Rake and skew, Propeller outlines and area, Propeller drawing methods Section geometry and definition, Blade thickness distribution and thickness fraction, Blade interference limits for controllable pitch propellers, Controllable pitch propeller off-design section geometry, Miscellaneous conventional propeller geometry terminology.

UNIT II PROPELLER ENVIRONMENT & PERFORMANCE CHARACTERISTICS 9

Density of water, Salinity, Water temperature, Viscosity, Vapour pressure, Dissolved gases in sea water, Surface tension, Weather, Silt and marine organisms.

UNIT III PROPELLER THEORY, CAVITATION & NOISE 9

Momentum theory – Ranking, R.E. Froude , Blade element theory – W. Froude ,Propeller Theoretical development, Burrill's analysis procedure, Lerbs analysis method, Eckhardt and Morgan's design method, Lifting surface correction factors – Morgan, Lifting surface models, Lifting-line – lifting-surface hybrid models, Vortex lattice methods, Boundary element methods, Methods for specialist propulsors, Computational fluid dynamics methods.

The basic physics of cavitation, Types of cavitation experienced by propellers, Cavitation considerations in design, Cavitation inception, Cavitation-induced damage, Cavitation testing of propellers, Analysis of measured pressure data from a cavitating propeller, Propeller – rudder interaction.

Physics of underwater sound, Nature of propeller noise, Noise scaling relationships, Noise prediction and control, Transverse propulsion unit noise, Measurement of radiated noise.

UNIT IV PROPELLER-SHIP INTERACTION, SHIP RESISTANCE AND PROPULSION 9

Bearing forces, Hydrodynamic interaction, Froude's analysis procedure, Components of calm water resistance, Methods of resistance evaluation, Propulsive coefficients, The influence of rough water, Restricted water effects, High-speed hull form resistance, Air resistance.

UNIT V SERVICE PERFORMANCE, TOLERANCE AND MAINTENANCE 9

Effects of weather, Hull roughness and fouling, Hull drag reduction, Propeller roughness and fouling, Generalized equations for the roughness-induced power penalties in ship operation, Monitoring of ship performance.

Propeller tolerances, Propeller inspection, Causes of propeller damage, Propeller repair, Welding and the extent of weld repairs, stress relief

TOTAL: 45 PERIODS

TEXT BOOK:

1. John Carlton, Marine Propellers and Propulsion, (2nd Edition) published by Elservier limited, 2007.

MV2023 ADVANCED MARINE HEAT ENGINES L T P C
3 0 0 3

AIM

To impart the knowledge of Latest Designed Marine Heat Engines

OBJECTIVES

On completion of this course the students are expected to have the

- Knowledge on the co- generation plant engines
- Design Concept of Turbo blowers and compressors
- Design Concept of Heat Exchangers
- Recent trends in the design changes of IC Engines and Propulsion engines

UNIT I COMPLEX HEAT ENGINE PLANTS 9

Combined Steam Turbine and Diesel Engine Cycles. Combined steam Turbine and Gas Turbine cycles. Combined Gas Turbine and Diesel Engine cycles/Plants. Methods of improving the overall thermal efficiency of the entire plant. Cascade Refrigeration plants. Free piston Gas Generators.

UNIT II COMBUSTION AND FLAME STABILISATION 9

Combustion of liquid fuels, atomisation, mixing, combustion curve and different methods of flame stabilisation, design and combustion chamber. Spray of fuel. Pre-mixing of gaseous fuels for combustion. Stability of the flame.

UNIT III TURBO BLOWERS AND TURBO COMPRESSORS:- 9

Compressor characteristics for axial flow compressors and centrifugal compressors. Stalling of compressors. Turbine characteristics. Matching of components like compressor and turbine. Performance of different units in combination in single shaft arrangement. Variable Geometry turbo charges.

UNIT IV HEAT EXCHANGER 9

Types – construction – design – applications.

UNIT V RECENT TRENDS 9

Diesel Engines using LNG vapour camless intelligent Engines , CRDI, NOX and SOX control by various types – Exhaust gas recirculation – water injection selective cat reduction – Emission variable injection timing.

TOTAL: 45 PERIODS

TEXT BOOK:

1. Reed"s Marine Engineering Series, "Heat and Heat Engines", Thomas Reed Publications Ltd., 1983

MV2024 SUPERCHARGING AND SCAVENGING IN MARINE DIESEL ENGINES

L	T	P	C
3	0	0	3

AIM:

To impart knowledge on the Principle , Method and Design of Super charger and Scavenging devices

OBJECTIVES

On completion of the course the students are expected to have a knowledge on

- Selection of type of super chargers
- Method of Super charging and Scavenging
- Design of Port and Mufflers
- How to improve the performance of these systems

UNIT I SUPER CHARGING PRINCIPLES 9

Objectives, thermodynamic consideration of the mechanical super charging and turbo charging.

UNIT II SUPERCHARGERS 9

Types of compressors, positive displacement blowers, centrifugal compressors, characteristics, and suitability for engine application, Phenomena of surging in centrifugal compressors, matching.

UNIT III SCAVENGING OF TWO STROKE ENGINE 9

Peculiarities of 2S cycle engines, clarification, mixture control through port versus read value induction, charging process in a two stroke cycle engine, terminology, relation between scavenging terms, concepts of perfect mixing and perfect scavenging.

UNIT IV PORTS AND MUFFLER DESIGN 9

Porting, design considerations, and intake and exhaust systems turning.

UNIT V EXPERIMENTAL METHODS 9

Kadenacy System, experimental methods, and disadvantages of two stroke petrol engines – steps to overcome – orbital engine combustion system, sonic system.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Supercharging the I.C. Engines – Vincent.
2. Turbocharging the I.C. Engine-Watsun & Junota.

REFERENCE:

1. Scavenging of two stroke cycle diesel engines – Schweitzer.

MV2025 SHIP SAFETY AND ENVIRONMENTAL PROTECTION L T P C
3 0 0 3

AIM:

To ensure awareness regarding Environmental Protection at Sea and impart commitment.

OBJECTIVES:

- Learn precautions required for oil tanker operations.
- Learn about MARPOL 73/78 requirements and Safe Working Practices.
- Learn Life Saving and Survival at Sea techniques.
- Learn about IMO, its conventions and statutory certificates of ships.
- To understand Personnel Management, Training and Emergency drills of ships

UNIT I OIL POLLUTION PREVENTION 9

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 LEGISLATIONS 9

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 & safe working practices.

UNIT III SURVIVAL TECHNIQUES AND LIFE SAVING APPLIANCES ON SHIP 9

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 RULES & REGULATIONS 9

IMO & 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 PERSONNEL MANAGEMENT 9

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 PERIODS

TEXT BOOK:

1. STCW – 1995 Hand Book

REFERENCES:

1. Bhandarkar V.K. "MS & M Notices", 1st Edition, Bhandarkar Publishers, Mumbai,1998.
2. International Maritime Organisation, "SOLAS consolidated Edition 1997", 2nd Edition, Sterling Book House, Mumbai, 1997.
3. International Maritime Organisation, "MARPOL 73/78 consolidated edition 1997", 2nd Edition, Sterling Book House, Mumbai, 1997.
4. R. H. B. Sturt, "The Collision Regulations", 2nd Edition, Lloyd's of London Press Ltd., London, 1984.

MV2026 **SHIP RECYCLING** **L T P C**
3 0 0 3

AIM:
To impart knowledge on the Ship Recycling

OBJECTIVES
On completion of the course the students are expected to have the knowledge on the
- Method of preparation and breaking of the Ships
- Hazards involved in while breaking the ships Method of controlling the same
- Types of Recycling and designing the ships Regulations in force for Recycling
- Ship Breaking Yards in INDIA

UNIT I SHIP BREAKING METHODS **9**
Introduction on ship breaking, 'Afloat method', Dry dock method, type of components to be removed. Towing – Beaching – Preparation of diagram combustible and non-combustible - re usable materials and components, recovering metals, which are mixed with non-metal – metal cutting and scraping.

UNIT II SHIP BREAKING SAFE PRACTICES **9**
Objective – definition of enclosed space – assessment of risk – authorisation – authorisation of entry – precautions – testing of atmosphere known unsafe space – additional precautions – hazardous cargo – fumigation – example of an enclosed space entry permit – potentially hazardous materials – hazardous wastes and substances.

UNIT III SHIP RECYCLING DOWNSTREAM **9**
Define recyclable –recycled content, recycling plan, pollution prevention procedure for existing ships – Green passport – minimising reducing waste generation, for new ships – minimising hazardous substance, designing recyclable ships – minimising waste generation.

UNIT IV REGULATION ON RECYCLING **9**
MEPC 53, MEPC 54, MEPC 55, Basel convention, Role of Flag State, Port State recycling state – ILO, London Convention 1972/ 1996 Protocol, Shipping Industry. Ship recycling industry, interested stakeholder, and operational safety hazard conventions, recommended code of practice.

UNIT V SHIP BREAKING INDUSTRY **9**
Ship breaking industry in India, present scenario, Gujarat Maritime Board, Gujarat Enviro protection and Infrastructure Ltd. Growth of Ship breaking industry – Alang Ship Breaking Yard – Role of pollution control board – Alang –Sosiya Ship breaking yard, Valanar Ship breaking yard. Hazards associated with ship breaking metallurgical & engineering consultant(India) finding.

TOTAL: 45 PERIODS

TEXT BOOKS:
1. Misra Dr.P., Ship Recycling, 1st Edition, Nanosa Publishers 2007.
2. IMO Guidelines on ship recycling

MV 2027 MARINE CORROSION AND PREVENTION L T P C
3 0 0 3

AIM

To impart knowledge on the Type of corrosion and how this is being controlled in marine environment

OBJECTIVES

On completion of the course the students are expected to have the knowledge on the

- Causes of corrosion
- Method of prevention during operation and during construction
- Anti-corrosive paints
- Corrosion in BOILERS and IC ENGINES

UNIT I INTRODUCTION 9

Cathodic Protection – Sacrificial anodes protection – Impressed current system protection – Bimetallic corrosion – Design faults causing corrosion – corrosion of metals in sea water, metallic corrosion.

UNIT II HULL PLATE PREPARATION 9

Plate preparation during building and repair periods -Atmospheric corrosion Mill scale – flame cleaning – Acid Pickling – Blast cleaning – causes of paint failure – shipboard preparations for painting – power wire brushing – power discing – air hammer – high pressure water blasting – sand blasting shot blasting.

UNIT III MODERN PAINT TYPES 9

Basic composition of paint Albyd – bitumen or pitch – chlorinated rubber – coaltar epoxy – Epoxy – oleoresinous – phenolic – polyurethane – primers – vinyl – self polrshing copolymers – shipboard paint systems – underwater AF paints – boot top anti corrosive paints – super structure paints.

UNIT IV CORROSION IN BOILER 9

Atoms & Ions, Ph value eletrochmical corrosion, Direct chemical attack – Electro chemical attack – reason – remedial measures. Effect of salts & Grease in feed water. Effect of corrosion while boiler not in service – preservation to avoid corrosion.

Corrosion in Marine Diesel Engines:

Corrosive wear of cylinder liners – Reasons and remedies – corrosion of Main Engine Jacket cooling spaces – Reasons and remedies – corrosion in bearings.

UNIT V CORROSION AND ITS PREVENTION 9

Mechanism of corrosion – Chemical corrosion – Electro chemical corrosion – Anomic & cathodic protection – forms of metallic coatings – anodizing – phosphating.

TOTAL: 45 PERIODS

TEXT BOOK:

1. Shipboard operations by H.I. Lavery

MV2028 SPECIAL DUTY VESSELS AND TYPE OF OPERATION L T P C
3 0 0 3

AIM:

To impart knowledge to the students about special duty ships operation and classification society regulations.

OBJECTIVE:

After the completion of the course the students will have learnt

- History of trade of special duty vessels.
- Cargo Operations of Oil tankers.
- About Inert Gas Systems and Tank Washing Operations of Tankers.
- Cargo Operations of Chemical tankers, LPG / LNG vessels.
- About rules of classification societies for Cargo Ships and Tankers.

UNIT I INTRODUCTION 9

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 9

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 – 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 9

Inert Gas system – principle – components of system, plant and distribution system – uses of inert gas during tanker operating cycle.

Tank washing: 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 INTRINSICALLY DANGEROUS CARGOS 9

- Dangerous goods – loaded in bulk – packaging – IMDG code – emergency procedures – ‘MS & 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 RULES AND REGULATIONS 9

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 PERIODS

TEXT BOOKS:

1. Lavery, "Ship board operation", 2nd Edition, Butter Worth- Heinemann, London, 1990.
2. V.K. Bhandarkar, "MS & M Notices to Mariners", 1st Edition, Bhandarkar Publications, Mumbai, 1998.
3. D.J. Eyres, "Ship Construction", 4th Edition, Butter worth – Heinemann, Oxford, 1994.

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, Mumbai, 1999.
2. International of Maritime Organisation, "SOLAS consolidated Edition 1997", 2nd Edition, Sterling Book House, Mumbai, 1997.

MV2029 MARINE SYSTEMS MODELLING AND SIMULATION L T P C
3 0 0 3

AIM:

To impart knowledge on the Modelling of Marine Systems

OBJECTIVES

On completion of the course the students are expected to have the knowledge on the

- Modelling Approach
- Mathematical Models
- Simulation of discrete systems
- Simulation and Modelling of important sector viz. transport, shipping economics

UNIT I SYSTEM 9

Components – continuous and discrete systems – model of a system – modelling approaches.

UNIT II TESTING METHODS 9

Mid square method – the midproduct method – constant multiplier method – additive congruential method – linear congruential method – test for random numbers – the chi-square test – the kolmograv – Smirnov test – runs test – Gap test.

UNIT III STATISTICAL TECHNIQUES 9

Inverse transform technique – exponential distribution – Poisson distribution – uniform distribution – waybill distribution – empirical distribution – normal distribution – building an empirical distribution – the rejection method.

UNIT IV SIMULATION 9

simulation of an event occurrence using random number table – simulation of component failures using exponential and waybill models – simulation of a single server queue and a two server queue – simulation of an inventory system.

UNIT V SIMULATION & MODELLING APPLICATIONS 9

Transportation and logistics, shipping economics, human resource – Simulation languages

TOTAL: 45 PERIODS

TEXT BOOK:

1. Narasingh Deo, System Simulation with digital computers, PHI, 1979.
2. Dr. P. Misra, Simulation and Modelling.

REFERENCES:

1. Gottfried, B.S., Elements of stochastic process simulation, Prentice Hall, London, 1984.
2. Barnhs, J., and Carson, J.S., Discrete-event system simulation, Prentice Hall, London, 1984.