

SCHEME OF INSTRUCTION & SCHEME OF EXAMINATIONS
M.E.(MARINE ENGINEERING & MECHANICAL HANDLING)

I SEMESTER

Subject Code	Course	Periods L/T/Lab	Exam Hours	Sessional Marks	Exam Marks	Total	Credits
MEMH1.1	Advanced Engineering Mathematics	4	3	30	70	100	4
MEMH1.2	Principles of Material handling devices	4	3	30	70	100	4
MEMH1.3	Advanced Mechanics of solids	4	3	30	70	100	4
MEMH1.4	Marine Engineering-I	4	3	30	70	100	4
MEMH1.5	Theory of vibrations	4	3	30	70	100	4
MEMH1.6	Mechanics and Design of Cargo handling equipment **	4		30	70**	100	4
	Total	24		180	420	600	24

** Viva-Voce Examination with a committee consisting of Head of the Department, concerned teacher & one examiner. No written Examination.

II SEMESTER

Subject Code	Course	Periods L/T/Lab	Exam Hours	Sessional Marks	Exam Marks	Total	Credits
MEMH 2.1	Structural Design of Mechanical Handling equipment	4	3	30	70	100	4
MEMH 2.2	Marine Instrumentation & Stress Analysis	4	3	30	70	100	4
MEMH 2.3	Marine Engineering II	4	3	30	70	100	4
MEMH 2.4	Elective*	4	3	30	70	100	4
MEMH 2.5	Introduction to Computational Fluid Dynamics	4	3	30	70	100	4
MEMH 2.6	Seminars	4		100		100	2
	Total	24		250	350	600	22

III SEMESTER

Course	Periods L/T/Lab	Exam Hours	Sessional Marks	Exam Marks	Total	Credits
Dissertation (to be continued in 4 th semester)						
Total						

IV SEMESTER

Course	Grading of Thesis
Dissertation (continued from 3 rd semester)***	Award of grading such as, A,B,C and F for the thesis. (A= excellent; B= Very good; C= Good F= not accepted.)

Elective* (2nd Semester):

1. Naval Architecture
2. Industrial Management
3. Control Engineering

** Viva-Voce Examination with a committee consisting of Head of the Department, concerned teacher & one examiner. No written Examination.

*** Pre-examination appraisal through Seminar by a committee consisting of BOS Chairman, Head of the Department and Guide.

*** Final presentation followed by Viva-Voce Examination with the following members.

1. Chairman, Board of Studies.
2. Head of the Department.
3. External Examiner (External to the college)
4. Internal Guide
5. (And) External Guide (if any)

The award of class will be given based on CGPA obtained in theory/practical/lab and award a separate grading, such as, A,B,C and F for the thesis.(A= excellent; B= Very good; C= good and F= not accepted.)

SYLLABUS

M.E.(MARINE ENGINEERING & MECHANICAL HANDLING) I SEMESTER

MEMH 1.1 ADVANCED ENGINEERING MATHEMATICS

Periods per week: 4

Examination: 70 Marks

Credits: 4

Sessionals : 30 Marks

1. Matrices and linear systems of equations: Basic classification, solution of linear systems by Matrix inversion method, Gaussian elimination methods, iterative methods and the eigen value problem.
2. Numerical differentiation and integration: Numerical differentiation, Maximum and minimum values of a tabulated function. Numerical integration by Trapezoidal rule and Simpson rule, Rambera integration, Numerical double integration.
3. Numerical solution of ordinary differential equations: Solution by Taylor's series. Picard method of successive approximations, Euler's method. Runge-kutta methods. Predictor corrector methods, simultaneous and Higher-order equations, Boundary value problems.
4. Numerical solution of partial differential equations: Finite difference approximations to derivatives. Laplace equation by Jacobin's method, Gauss-Seidal method, parabolic equations. Interactive methods for the solution of equations.

Text books:

Chapters 4, 5, 6 and 7 of Introductory Methods-- Numerical Analysis by S.S.Sastry, Prentice Hall of India Pvt. Limited. Publication year 1981.

MEMH 1.2 PRINCIPLES OF MATERIAL HANDLING DEVICES

Periods per week: 4
Credits: 4

Examination: 70 Marks
Sessionals : 30 Marks

(a) Principles of Material Handling: Classifications of the materials handling equipment, their characteristics and application, principles, packaging and storage of materials, operation analysis and study of travel diagrams and flow process charts. Preparation of a new proposal for an integrated materials handling system. Protective devices handling of fluids and multiphase systems. Handling of refrigerated cargo.

(b) Theory and construction of the various parts of Mechanical Handling devices, wire ropes and chains, hooks, shackles, grabs, ladles and lifting electromagnets, sheaves, sprockets and drums, runners and rails, buffers and limit switches.

(c) Design of simple mechanical handling devices, viz., screw jacks, pulley blocks, winches, hoists and capstans, wind lasses.

Text Books:

1. Materials Handling - John R. Immer and Mc Graw Hill, 1953.
2. Materials Handling Equipment - N. Rudenco, MIR Publish.
3. Materials Handling - Apple.

MEMH 1.3 ADVANCED MECHANICS OF SOLIDS

Periods per week: 4
Credits: 4

Examination: 70 Marks
Sessionals : 30 Marks

1. Three dimensional stress and strain - Principal stresses and strains-Mohr's circle representation of triaxial state of stresses and strains, theories of failure. Elementary treatment of contact stresses for point and line contacts
2. Shear Centre: Shear Centre for sections having one axis of symmetry - open channel sections, I-sections, t- sections.
3. Unsymmetrical bending: Unsymmetrical bending in sections having double axis of symmetry - Unsymmetrical bending in sections having one axis of symmetry.
4. Torsion: Torsional resistance of bars having rectangular sections - Membrane analogy.
5. Beams on elastic foundation: Beams on continuous elastic foundation, Infinite beams and semi-infinite beams.
6. Buckling of columns, beams and shafts.
7. Elementary treatment of flat plates: Rectangular and circular plates freely supported and clamped edges.
8. A brief introduction to the Mathematical theory of Elasticity: Introduction, Elementary theory of Elasticity, Essential Difference between method of ordinary Mechanics and theory of Elasticity.

Text books:

1. Advanced Mechanics of Materials by Seely and Smith.
2. Mechanics of Materials by R.C. Hibbeler
3. Advanced Strength of Materials by Den Hartog.
4. Strength of Materials Vols I and II by S. Timoshenko.

MEMH 1.4 MARINE ENGINEERING –I

Periods per week: 4
Credits: 4

Examination: 70 Marks
Sessionals : 30 Marks

1. Marine Diesel Engines – Low speed and medium speed engines – Auxiliary engines – Scavenging and supercharging systems – Starting and reversing gear – Maintenance – Automation – Hazards in engine room.
2. Marine Nuclear power installation - Principles of operation of Atomic Reactors – Different types of Reactors – Use of Nuclear reactors in sea going vessels - Radiation hazards and safety – Radioactive waste disposal.
3. Marine Turbines – Steam turbine Classification based on impulse and reaction principles – Flow thro' blade passages and design – Losses and performance – Compounding, velocity triangles – Starting and Maintenance procedures.
4. Marine gas turbines – Practical cycles and shaft arrangements - Power turbine – Applications.
5. Marine Refrigeration – Cycles – Compressors, Condensers, Evaporators and thermostatic valves – Space coolers – Maintenance and Auxiliary equipment.
6. Marine Air-conditioning – cooling, Heating, Humidification process – Types of Air conditioning systems – Ducting controls.
7. Ventilation – Requirements and provision – Insulation protection of materials and maintenance.
8. Marine Boilers – Composite and water tube boilers – Waste heat boilers Arrangement of boiler room – Feed water treatment for Marine boilers – feed supply systems and control.

Text Books:

1. Marine Power plant Engineering - Akimov.P
2. Marine I.C Engines-A.B Kane
3. Principles and practice of Marine Diesel Engines – D.K Sanyal
4. Refrigeration and air-conditioning- P.L. Ballaney
5. Marine Steam Boilers- Milton J.H.

MEMH 1.5 THEORY OF VIBRATIONS

Periods per week: 4
Credits: 4

Examination: 70 Marks
Sessionals : 30 Marks

1. Single degree of freedom systems: Free and forced vibrations, damping, classification and damped systems. Energy methods. Vibration isolation and transmissibility. Vibration measuring instruments such as displacement, velocity, acceleration and frequency measurements, Dunkerley's equation.
2. Two degrees of freedom system. Free, forced, damped and undamped motions matrix formulation, matrix method, using of Lagrange's equations to determine equations of motion, Dynamic vibration absorbers, principle of Orthogonality. Semi-definite systems. Combined rectilinear and angular modes. Torsional systems.
3. Multi degrees of freedom systems: Free and forced vibrations of Longitudinal, torsional, and lateral modes. Critical speeds of rotors Matrix formulation, stiffness and flexibility influence coefficients. Eigen value problem Matrix method, Matrix iteration technique for eigen values and eigen vectors. Stodola's method, Hozler's Method.
4. Continuous Systems: Axial vibrations of bars, torisonal vibrations of shafts, transverse vibrations of strings and bending vibrations of beams. Free and forced vibration of strings classical and energy methods.
5. Ship vibration : Introduction to ship hull vibration-- Mathematical basis of ship vibration - calculation of ship hull vibration.

Text books:

1. Mechanical Vibrations - G.K. Grover
2. Elements of Mechanical Vibration : Merovitch
3. Theory of Vibrations with applications: W.T. Thomson
4. Ship Hull Vibrations: Todd
5. Mechanical vibrations, Schaum's outline series- William W. Seto

MEMH 1.6 MECHANICS AND DESIGN OF CARGO HANDLING EQUIPMENT

Periods per week: 4
Credits: 4

Examination: 70 Marks
Sessionals : 30 Marks

Kinematic, dynamic analysis and design procedures of various components, Mechanisms of (a) scraper, apron and flight conveyors, (b) roller and belt conveyors, (c) belt and chain bucket elevators (d) screw and ribbon conveyors (e) overhead chain trolley conveyors and (f) vibrating trough and shaker conveyors, rope ways.

Kinematic and dynamic analysis of the various components, mechanisms and design procedures of (a) floor and wall mounted jib cranes (b) hand chain and electric operated overhead travelling cranes (c) Stationery and travelling rotary jib cranes with fixed adjustable level luffing arrangements (d) Goliath and semi goliath cranes, (e) Derrick Cranes (f) tower cranes (g) mobile cranes (h) Telphers.

Text books:

1. Materials handling equipment - N. Ruderno, Mir publications.
2. Materials handling equipment- M.P. Alexandrov, Mir Publications.
3. Conveyors and related equipment - A Spirakovsky and V.Dyachkov, Mir Publications

**M.E.(MARINE ENGINEERING & MECHANICAL HANDLING)
II SEMESTER**

**MEMH 2.1 STRUCTURAL DESIGN OF MECHANICAL HANDLING
EQUIPMENT**

Periods per week: 4
Credits: 4

Examination: 70 Marks
Sessionals : 30 Marks

Analysis of forces of determinate, indeterminate and redundant framed structure, detailed force analysis and design of overhead travelling crane structures. Analysis of force and detailed design of the Jib of fixed and luffing types of rotary jib cranes. Design of structures pertaining to derricks, gantries, columns, portals and supporting trusses for belt conveyers.

Text books:

1. Theory of structures - Morley, Lonmans.
2. Materials Handling Equipment - N. Rudenko

MEMH 2.2 MARINE INSTRUMENTATION & STRESS ANALYSIS

Periods per week: 4
Credits: 4

Examination: 70 Marks
Sessionals : 30 Marks

Generalized measuring systems – calibration – damping - Dynamic signals – Basic detectors Transducer elements – Intermediate modifying systems – terminating devices.

Measurement of force and torque, Measurement of pressure – High pressure and low pressure, Measurement of fuel flow – Positive displacement methods – Obstruction meters – Hotwire anemometer.

Measure of temperature – Thermocouples – Pyrometry, Vibration and shock measurement – Accelerometers – Vibrometers – Seismic devices. Acoustic measurements – Sound measuring techniques.

Strain gauges – Photo elastic, Electrical, resistance gauges, cements and cementing of Gauges – Bridge circuits – balanced and unbalanced, Calibration gauge rosettes – Evaluation of Principal stresses – Static and dynamic gauges for various applications.

Stress analysis – Whole field techniques by photo elasticity, brittle coatings, Grid methods & Moire – Applications to the solution of engineering problems.

Text Books:

1. Mechanical Measurements - T.G Beckwith & N.Lewis Buck.
2. Mechanical and industrial Measurements - R.K Jain.
3. Experimental methods for engineers. - J.P Holman
4. Applied Stress Analysis- A.J. Durelli.

MEMH 2.3 MARINE ENGINEERING II

Periods per week: 4
Credits: 4

Examination: 70 Marks
Sessionals : 30 Marks

1. Engine room arrangements for different power plants – Functions of Auxiliary equipment – Bilge and ballast systems – Other Auxiliaries.
2. Piping – Piping fittings and valves – Control valves, materials and corrosion in pipes – Colorcodes – Steam traps, Drains and glands.
3. Pumping systems. General principles - Simple and duplex pumps – Rotary positive displacement pumps — Centrifugal pumps – Axial flow pumps - Bilge , ballast & sanitary pumps – Boiler feed pumps – air pumps and Ejectors.
4. Centrifugal compressors – Working principles – Impeller and diffuser design.- Performance characteristics – Blade profiles.
5. Airflow compressors –Working principles – Types – Performance characters – Aerofoil theory – Blade design.
6. Condensers, Evaporators, Deaerators and purifiers - Auxiliary condensers – Evaporating plant – Distillation plant – Feed heaters deaerators oil purifiers – Self-changing purifiers.
7. Steering gear- Types Steam steering gear, Telemotor gear, Hand steering gear, Hydraulic systems, Electro hydraulic steering gear – Electrical steering gear.

Text Books:

1. The running and maintenance of marine Machinery - J Cowley.
2. Marine Auxiliary machinery - W.J Fox.
3. Marine Auxiliary machinery and systems - M Khetaguroo
4. Theory and design of steam and gas turbines - Lee.

ELECTIVE
MEMH 2.4(1). NAVAL ARCHITECTURE

Periods per week: 4
Credits: 4

Examination: 70 Marks
Sessionals : 30 Marks

1. Introduction: Types of ships, Geometry Of ship, Displacement, TPC, Coefficient of form, Wetted surface area.
2. Area Volume, First and second moments using Simpson's rule, Center of gravity, Effect of addition of mass, Effect of movement of mass, Effect of suspended mass.
3. Transverse Stability of ships: Statistical stability at small angles of heel, Calculation of B.M, metacentric diagram, Inclining experiment, free surface effect.
4. Trim: Change on draughts due to added masses, Change of mean draught and end draughts due to density, Change in mean draught and end draughts due to bilging.
6. Resistance: Frictional, residuary and total resistance, admiralty Coefficient, fuel Coefficient and Consumption.
7. Propellers: Apparent and real slip, Wake, Thrust, relation between mean pressure and speed, measurement of pitch, Cavitation, Solid propellers and other systems of propellers.
8. Rudder theory: Force on rudder, Torque on stock, angle of heel due to force on rudder, angle of heel on turning.
9. Launching: Launching curves, Ground ways and sliding ways, Dynamics of launching Docking stability – Launching lubricants and their properties.

Text Books:

1. Reed's Naval Architecture for Marine Engineering.
2. Naval Architecture for Marine Engineers by W.Muckle.
3. Basic ship theory by K.J Rawson & E.C Tupper.

ELECTIVE

MEMH 2.4 (2) INDUSTRIAL ENGINEERING AND MANAGEMENT

Periods per week: 4

Examination: 70 Marks

Credits: 4

Sessionals : 30 Marks

1. Management and Organization: Functions of Management, Principles of Management, Principles of Organization: Line, Staff and functional organizations, Forms of business ownership, Entrepreneurship.

2. Facilities location and Layout: Factors for selection of a location, Urban, Suburban and rural locations, Types of layouts, process and product layouts, Line balancing, Shipyards and port layouts.

3. Material Handling: Principles of material handling, Types of material handling equipment, Selection of material handling equipment.

4. Inventory control: Costs of inventory, ABC Analysis, Economic order quantity, Economic lot-size quantity, Basic inventory models.

5. Quality Control: Quality and product design, Control charts.

6. Network analysis: Network techniques of program management, CPM and its advantages, Difference in PERT & CPM, steps in CPM technique, Steps in the technique of PERT planning, Estimation of activity duration. Float or slack, Latest finish time, resource leveling program, crash of the project.

7. Management information Systems (MIS): Impact of MIS on management, accounting information system, Objective of information systems, Computer based information management system, Management by direction, by result, management in objectives, Influence of computer based on management by direction.

8. Industrial Psychology and personnel management: Functions of functional management, Industrial legislation of India, Factories act and the industrial disputes act, Elements of industrial psychology, Hawthorne studies, Theories of motivation- Maslow, Mc Gregor.

Text Books:

1. Industrial engineering and management -O.P Khanna
2. Industrial Management - K.K.Ahuja, Khanna Publishers.

References:

1. Principles of Management - Koontz & O Donnel.
2. Production and Operations Management - Everette Adam & Ronald Ebert.
3. Operations Management - John Mc Clain & Joseph Thames.

ELECTIVE

MEMH 2.4 (3) CONTROL ENGINEERING

Periods per week: 4
Credits: 4

Examination: 70 Marks
Sessionals : 30 Marks

Introduction, automatic control systems, on/off controllers, step controllers, continuous controllers, basic equation of a servo mechanism, transient analysis, transfer - function analysis, the laplace transformation.

Equations of physical systems: Introduction, mechanical system - translational, rotational, mechanical systems, thermal, hydraulic, pneumatic and electrical systems .

Transient analysis of servo mechanisms, block diagram concept of a control system, analysis of proportional error, servo mechanism time and frequency responses.
Transfer functions: Definition, deviation of transfer functions - algebra of block diagrams and transfer functions.

Graphical representation of transfer functions: The frequency response concept and transfer function, basic relationship between amplitudes and phase, logarithm of the transfer functions, bode diagrams, diagrams of the basic terms.

Analysis of servo mechanism performance, absolute stability, general discussion, instability from inspection of the differential equation, routh's criterion. Ny quists, criterion steady state and transient performance from transfer function plots.

Control system components: Error detectors, controllers, servo motors for DC, AC, Mechanical, hydraulic, pneumatic and thermal systems (one example each).

Text Books:

1. Thalore and Bronz, Analysis and design of feed back control systems - International students edition (chapters 1, 2, 4, 5, 6, 7) and appendix B.C.D)

MEMH 2.5 Introduction to Computational Fluid Dynamics

Periods per week: 4

Examination: 70 Marks

Credits: 4

Sessionals : 30 Marks

I Introduction and Basic Numerical Methods:

Introduction to CFD, Approximation and interpolation, Numerical integration, Finite difference approximations of derivatives

II The Finite Volume Method for Model Problems:

1-D diffusion, Thomas algorithm for tri-diagonal systems, 1-D convection-diffusion, 2-D model problems

III Modelling Navier Stokes Equations:

Governing equations for fluid mechanics, Staggered grids, Pressure-velocity coupling – the SIMPLE algorithm, Steady flows, Unsteady flows, Implementation of boundary conditions

Commercial CFD codes, Reynolds averaged Navier-Stokes (RANS) equations and turbulence modeling

Text Books:

1. Introduction to CFD the finite volume method by Malalasekera & Versfeeg
2. Computational FM and heat transfer by Anderson, Tennehill and Pletcher.

MEMH 2.6 SEMINARS

Periods per week: 4

Credits: 2

Sessionals : 100 Marks

The student has to give at least three seminars on relevant topics of his choice but related to Marine Engineering and Mechanical handling.

**M.E.(MARINE ENGINEERING & MECHANICAL HANDLING) III SEMESTER
Dissertation (to be continued in 4th semester)****

**M.E.(MARINE ENGINEERING & MECHANICAL HANDLING) IV SEMESTER
Dissertation (continued from III semester)****

** Pre-examination appraisal thro' Seminar by a committee consisting of BOS
Chairman, Head of the
Department and Guide.

** Final presentation followed by Viva-Voce Examination with the following members.

1. Chairman, Board of Studies.
2. Head of the Department.
3. External Examiner (External to the college)
4. Internal Guide
5. (And) External Guide (if any)

The award of class will be given based on CGPA obtained in theory/practical/lab
and award a separate grading, such as, A,B,C and F for the thesis.(A= excellent;
B= Very good; C= good and F= not accepted.)
