ANDHRA UNIVERSITY

DEPARTMENT OF MARINE ENGINERING

M.TECH(MARINE ENGINEERING & MECHANICAL HANDLING)

REGULATION AND SYLLABUS

EFFECTIVE FROM 2021-2022 BATCH

SCHEME OF INSTRUCTION & SCHEME OF EXAMINATIONS

M.Tech (MARINE ENGINEERING & MECHANICAL HANDLING)

Regular Course (Day Time)

I SEMESTER

(with effect from 2019-20 Admitted Batch)

I – SEMESTER

Code No	Course Title	Scheme of Instruction			Scheme of Examination			Total	Credits
		Lec.	Tut.	Total	Exam. Duration	Theory/ Lab./Viva	Sess.		
MEMH 1.1	Core subject 1 Advanced Engineering Mathematics	4	-	4	3	70	30	100	3
MEMH 1.2	Core subject 2 Principles of Material handling devices	4	-	4	3	70	30	100	3
MEMH 1.3	Core subject 3 Advanced Solid Mechanics	4	-	4	3	70	30	100	3
MEMH 1.4	Programme Elective 1 a. Theory of vibrations b. wave engineering c. Marine Engineering - 1	4	-	4	3	70	30	100	3
MEMH 1.5	Programme Elective 2 a. Advanced FEA b. Mechanics and Design of cargo handling equipment c. Marine Power Plant Engineering	4	-	4	3	70	30	100	3
MEMH 1.6	Research Methodology and IPR	3	-	3	-	70	30	100	2
MEMH 1.7	Audit Course-1	3	-	3	-	70	30	100	0
MEMH 1.8P	Seminars	--	3	3	Viva-voce	50	50	100	2
MEMH 1.9P	Computer Aided Ship Design Lab	--	3	3	Viva-voce	50	50	100	2
TOTAL		*26*	*6*	*32*	*15*	*590*	*310*	*900*	*21*

Note: The viva-voce for the labs/seminars shall be held with the course instructor/faculty member and an external examiner nominated by the university from any academic institution/industry/R&D organization.

II - SEMESTER

Code No	Course Title	Scheme of Instruction			Scheme of Examination			Total	Credits
		Lec.	Tut.	Total	Exam. Duration	Theory/Lab/ Viva	Sess.		
MEMH 2.1	Core subject 4 Structural Design of Mechanical Handling equipment	4	-	4	3	70	30	100	3
MEMH 2.2	Core subject 5 Marine Instrumentation & Stress Analysis	4	-	4	3	70	30	100	3
MEMH 2.3	Core subject 6 Marine Engineering 2	4	-	4	3	70	30	100	3
MEMH 2.4	Programme Elective 3 a. Industrial Engg and Mgt b. Subsea Piping c. Automated Material Handling devices	4	-	4	3	70	30	100	3
MEMH 2.5	Programme Elective 4 a Introduction to CFD b Control Engineering c Experimental Hydrodynamics	4	-	4	3	70	30	100	3
MEMH 2.6	Audit Course-2	3	-	3	-	-	-	-	0
MEMH 2.7	CFD Lab	--	3	3	Viva-voce	50	50	100	2
MEMH 2.8	Seminars	--	3	3	Viva-voce	50	50	100	2
MEMH 2.9	Mini project with Seminar	--	3	3	Viva-voce	-	100	100	2
TOTAL		*23*	*9*	*32*	*15*	*450*	*350*	*800*	*21*

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III – SEMESTER

Code No	Course Title	Scheme of Instruction			Scheme of Examination			Total	Credits
		Lec.	Tut.	Total	Exam. Duration	Theory/Lab/ Viva	Sess.		
MEMH 3.1	Programme Elective - 5 a. Naval Architecture b. CAD/CAM in Marine Design and Construction c. Underwater Acoustics	4	-	4	3	70	30	100	3
MEMH 3.2	Open Elective	4	-	4	3	70	30	100	3
MEMH 3.3	Dissertation-I	--	-	-	-	-	100	100	6
TOTAL		*8*	-	*8*	*6*	*140*	*160*	*300*	*12*

Note: The Dissertation shall be evaluated through Viva-voce examination by a committee with HOD, Chairman, Board of studies and Research Guide as members. The marks shall be awarded in the ratio of 30,30 and 40 percent by the members respectively.

IV - SEMESTER

Code No	Subject	Scheme of Examination	Total Marks	Credits
MEMH 4.1	Dissertation –II	Viva-voce	100	14

Note: The Dissertation shall be evaluated through Defence and Viva-voce examination by a committee with an External Examiner nominated by University, HOD, Chairman, Board of studies and Research Guide as members. The marks shall be awarded in the ratio of 20, 20, 20 and 40 percent by the members respectively.

Audit course 1 & 2

1. English for Research Paper Writing
2. Disaster Management
3. Sanskrit for Technical Knowledge
4. Value Education
5. Constitution of India
6. Pedagogy Studies
7. Stress Management by Yoga
8. Personality Development through Life Enlightenment Skills.

Open Elective

1. Business Analytics
2. Industrial Safety
3. Operations Research
4. Cost Management of Engineering Projects
5. Composite Materials
6. Waste to Energy

M.Tech. (Marine Engineering and Mechanical Handling)

Programme Outcomes:

PO1. They should have organizing quality, team spirit and practical thinking and common sense.

PO2. Grow professionally with their Post Graduation subject knowledge and proficient skills throughout their career.

PO3. The Marine Handling graduates are able to apply their knowledge and skills in solving Marine industrial problems effectively and efficiently.

PO4. The post-graduates will undergo technical training programs and management skill development programs frequently acquainted.

PO5. Engage in lifelong learning for professional advancement.

PO6.Ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts

PO7. Demonstrate the knowledge of sustainable development and its importance by comprehending how professional engineering solutions affect the society and the environment.

PO8. Recognize the need for industry, and have the preparation and ability to engage in independent and life-long learning in the shipping industry.

PO9. An ability to communicate effectively.

SCHEME OF INSTRUCTION & SCHEME OF EXAMINATIONS

M.Tech (MARINE ENGINEERING & MECHANICAL HANDLING)

Regular Course (Regular Time)

I SEMESTER

(with effect from 2019-20 Admitted Batch)

I – SEMESTER

Code No	Course Title	Scheme of Instruction			Scheme of Examination			Total	Credits
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MEMH 1.4	Programme Elective 1 a. Theory of vibrations b. wave engineering c. Marine Engineering - 1	4	-	4	3	70	30	100	3
MEMH 1.5	Programme Elective 2 a. Advanced FEA b. Mechanics and Design of cargo handling equipment c. Marine Power Plant Engineering	4	-	4	3	70	30	100	3
MEMH 1.6	Research Methodology and IPR	3	-	3	-	70	30	100	2
MEMH 1.7	Audit Course-1	3	-	3	-	70	30	100	0
MEMH 1.8P	Seminars	--	3	3	Viva-voce	50	50	100	2
MEMH 1.9P	Computer Aided Ship Design Lab	--	3	3	Viva-voce	50	50	100	2
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MEMH 2.5	Programme Elective 4 a Introduction to CFD b Control Engineering c Experimental Hydrodynamics	4	-	4	3	70	30	100	3
MEMH 2.6	Audit Course-2	3	-	3	-	-	-	-	0
MEMH 2.7	CFD Lab	--	3	3	Viva-voce	50	50	100	2
MEMH 2.8	Seminars	--	3	3	Viva-voce	50	50	100	2
MEMH 2.9	Mini project with Seminar	--	3	3	Viva-voce	-	100	100	2
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III – SEMESTER

Code No	Course Title	Scheme of Instruction			Scheme of Examination			Total	Credits
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MEMH 3.3	Dissertation-I	--	-	-	-	-	100	100	6
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IV - SEMESTER

Code No	Subject	Scheme of Examination	Total Marks	Credits
MEMH 4.1	Dissertation –II	Viva-voce	100	14

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Audit course 1 & 2

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Open Elective

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4. Cost Management of Engineering Projects
5. Composite Materials
6. Waste to Energy

M.Tech (MARINE ENGINEERING & MECHANICAL HANDLING)

I SEMESTER

MEMH 1.1 ADVANCED ENGINEERING MATHEMATICS (Core Subject-I)

Periods per week: 4 Examination: 70 Marks

Credits: 3 Sessionals : 30 Marks

Course Objectives: The contents of this course fulfill the fundamental requirements of knowledge of Mathematics for learning Engineering subjects. The main objectives of student learning are:

- The way of obtaining rank, eigen values and eigen vectors of a matrix.
- To know the importance of Cayley-Hamilton theorem and getting canonical form from a given quadratic form.
- To solve the system of equations by using direct and indirect methods.
- To solve first order and higher order differential equations by various methods.
- To obtain the Laplace transforms and inverse Laplace transforms for a given functions and their applications.

Course Outcomes: At the end of this course, the student will understand and be able to apply the basic principles of Linear Algebra, ODEs and Laplace Transforms to various engineering problems. Particularly, the student will be able to

- Find rank, eigen values and eigen vectors of a matrix and understand the importance of Cayley-Hamilton theorem.
- Reduce quadratic form to canonical forms and solving linear systems by direct and indirect methods.
- Discriminate among the structure and procedure of solving higher order differential equations with constant and variable coefficients.
- Understand Laplace transforms and its properties and finding the solution of ordinary differential equations.

1. Matrices and linear systems of equations: Basic classification, solution of linear systems by Matrix inversion method, Gaussion 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, Romberg 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.

M.Tech (MARINE ENGINEERING & MECHANICAL HANDLING)

I SEMESTER

MEMH 1.2 PRINCIPLES OF MATERIAL HANDLING DEVICES (Course Subject-2)

Periods per week: 4 Examination: 70 Marks

Credits: 3 Sessionals : 30 Marks

Course Outcomes: At the End of the course, the student will be able to:

CO1: Classify the Marine Material Handling Equipment.
CO2: Explain the various Material Handling Equipment and Methods in the shipyards & marine workshops.
CO3: Discuss how to connect loading stations to the different discharge conditions.
CO4: Associate the usage of overhead cranes, gantry cranes and monorails in the marine industry.
CO5: Extend the knowledge for working on special material handling equipment such as Fork Lifts, Komogo Trucks used in the shipyards for block movements and erections.

1. 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.
2. 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.
3. 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.

M.Tech (MARINE ENGINEERING & MECHANICAL HANDLING)

I SEMESTER

MEMH 1.3 ADVANCED MECHANICS OF SOLIDS (Course Subject-3)

Periods per week: 4 Examination: 70 Marks

Credits: 3 Sessionals : 30 Marks

Course objectives:

- To provide basic knowledge in mechanics of materials so that the students can on, compression, torsion, bending and combined loads using fundamental concepts of stress, strain, elastic and inelastic behavior.solve real engineering problems and design engineering systems.
- Analyze and design components and structural members subjected to tension

Course Outcomes:

- Understand the fundamental concepts of stress and strain and the relationship between both through the strain-stress equations in order to solve problems for simple tridimensional elastic solids.
- Calculate and represent the stress diagrams in bars and simple structures Solve problems relating to pure and non-uniform bending of beams and other simple structures.
- Solve problems relating to torsional deformation of bars and other simple tri-dimensional structures.
- Understand the concept of buckling and be able to solve the problems related to isolated bars.

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.

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I SEMESTER

MEMH 1.4 Programme Elective-I

(A) Theory of Vibrations

Periods per week: 4 Examination: 70 Marks

Credits: 3 Sessionals : 30 Marks

Course objective:

Presentation of the basic notions of the vibration theory and ship vibration. Definition of vibration problems and consideration of possibilities for their solutions. Reliable prediction of vibration level in the ship design stage. Review of vibration measurement procedures and vibration remedy

Course outcomes:

Upon completion of the course, students will be able to:

- understand basic principles of ship vibration.
- prepare input data for global hull-girder ship vibration analysis.
- apply analytical and numerical solutions of free and forced global hull-girder vibration.
- apply FEM to ship vibration problems.
- understand problem of the fatigue of ship structural details and calculation procedures for estimation of the fatigue life

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 iteraction 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. Ship Hull Vibrations: Todd
2. Mechanical vibrations, Schaum's outline series- William W. Seto
3. Mechanical Vibrations by S.S. Rao Mc-Graw Hill Publications

M.Tech (MARINE ENGINEERING & MECHANICAL HANDLING)

I SEMESTER

MEMH 1.4 Programme Elective-I

(B) Wave Engineering

Periods per week: 4 | Examination: 70 Marks

Credits: 3 | Sessionals : 30 Marks

Course Outcomes: At the End of the course, the student will be able to develop:

CO1: An ability to apply the knowledge of mathematics for formulation and analysis of ocean wave and boundary-value fluids problems

CO2: A thorough knowledge of the basic properties of ocean waves in deep and coastal waters, and mechanisms of wave generation

CO3: ability to determine wave forces on fixed and floating structures

CO4: basic knowledge of the relation between atmosphere and sea states, and wave modeling and spectra.

CO5: ability to make measurements of surface waves and analyze experimental data

1. Conservation of mass, moment and Energy. Euler Equation – Bernoullis Equation. Potential and Stream function.
2. Classification of Ocean Waves. Linear wave theory: Governing Equation, Boundary Conditions and solutions, Dispersion relation, Constancy of wave period.
3. Wave Kinematics : Wave celerity, water particle velocities, accelerations, displacements and pressures. Approximations for deep and shallow water conditions. Integral properties of waves: Mass flux, Energy and energy flux, Group speed, Momentum and momentum flux.
4. Wave Transformations: Shoaling, bottom friction and damping, refraction, reflection and diffraction. Wave Breaking: Type of breaking, Surf similarity parameter. Keulegan-Carpenter number, Ursell Parameter, Scattering parameter, Reynolds Number. Wave Loads: Non breaking wave forces on slender structures – Morison equation; Diffraction theory, source distribution method-Introduction to non-linear wave theories-Strokes, Cycloidal and Solitary wave theory.
5. Mass transport velocity.
6. Introduction to Random and directional waves.

Text Books:

Ippen, A.T., Estuary and Coastline Hydrodynamics, McGraw-Hill Book Company, inc., New York, 1978

Dean, R.G. and Dalrymple, R.A., Water wave mechanics for Engineers and Scientists, Prentice-Hall, Inc., Englewood Cliffs, New Jersey, 1994

Sarpkaya, T. and Isaacson, M., Mechanics of Wave Forces on Offshore Structures, Van Nostrand Reinhold Co., New York, 1981

References:

Shore Protection Manual Volume I and II, Coastal Engineering Research Centre, Dept, of the Army, US Army Corps of Engineers, Washington DC, 1984

Weigel, R.L.Oceanographical Engineering, Prenticxe Hall Inc, 1982.

Sorenson, R.M., Basic Coastal Engineering, A Wiley-Interscience Publication, New York, 1978.

M.Tech (MARINE ENGINEERING & MECHANICAL HANDLING)

I SEMESTER

MEMH 1.4 Programme Elective-I

Marine Engineering -1

Examination: 70 Sessionals : 30

Periods per week : 4 credits: 3

Course Outcomes: At the End of the course, the student will be able to develop:
CO1: An ability to understand various machinery and equipment used onboard ships and their arrangement & layout within the Engine Rooms of a ship.
CO2: An ability to understand and design various piping systems within the Engine Rooms of a ship.
CO3: A detailed knowledge of the functioning of certain marine machinery such as compressors, condensers, Centrifugal pumps and Positive Displacement pumps etc.
CO4: Understand the functioning of the Stern Gear and Steering systems.
CO5: ability to understand the various electro-hydraulic and pneumatic systems used onboard the ships.

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.

M.Tech (MARINE ENGINEERING & MECHANICAL HANDLING)

I SEMESTER

MEMH 1.5 Programme Elective-II

(A)Advanced Finite Element Analysis

Periods per week: 4 Examination: 70 Marks

Credits: 3 Sessionals : 30 Marks

Course Outcomes: At the end of the course, a student will be able to

- CO1: apply direct stiffness, Rayleigh-Ritz, Galerkin method to solve engineering problems and outline the requirements for convergence.
- CO2: analyze linear 1D problems like bars and trusses; 2D structural problems using CST element and analyse the axi-symmetric problems with triangular elements.
- CO3: write shape functions for 4 and 8 node quadrilateral, 6 node triangle elements and apply numerical integration to solve; 1D and 2D; stiffness integrations.
- CO4: solve linear 2D structural beams and frames problems; 1Dheat conduction and convection heat transfer problems.
- CO5: evaluate the Eigenvalues and Eigenvectors for stepped bar and beam, explain nonlinear geometric and material non linearity

1. Overview of finite element method, Discretization of the domain, Interpolation models, Higher order and isoparametric elements, Derivation of element matrices and vectors, Assembly of element matrices and vectors and derivation of system equations, Numerical solution of finite element equations, Analysis of trusses, beams, and frames
2. Analysis of plates and Shells
3. Three-dimensional problems
4. Vibration Analysis - Modal and Harmonic analysis
5. Fluid flow problems - Basic equations of fluid mechanics, Inviscid and incompressible flows

Textbook

1. The Finite Element Method in Engineering - S S Rao, 4th Edition, Elsevier Publications

2. Finite Element Modeling for Stress Analysis - R D Cook - John Wiley

M.Tech (MARINE ENGINEERING & MECHANICAL HANDLING)

I SEMESTER

MEMH 1.5 Programme Elective-II

(B) MECHANICS AND DESIGN OF CARGO HANDLING EQUIPMENT

Periods per week: 4 Examination: 70 Marks

Credits: 3 Sessionals : 30 Marks

Course Outcomes: At the End of the course, the student will be able to develop:

CO1: An ability to understand the various components of Marine Cargo Handling Equipment.

CO2: An ability to Design & analyze the component designs of cranes such as Jib, Stick, Tackles & booms etc.

CO3: Knowledge on various types of cargo handling equipment on the shop floor of marine workshops such as EOT cranes, Knuckle Boom cranes, Telescopic cranes

CO4: Basic knowledge of the differences between various cargo hadling equipment onboard ships such as Goliath Cranes, Derricks and articulating cranes.

1. 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.

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

M.Tech (MARINE ENGINEERING & MECHANICAL HANDLING)

I SEMESTER

MEMH 1.5 Programme Elective-II

(C) Marine Power Plant Engineering

Periods per week: 4 Examination: 70 Marks

Credits: 3 Sessionals : 30 Marks

Course Outcomes: At the End of the course, the student will be able to:

CO1: Analyze the working and layout of marine power plant with diesel engines and steam turbines and the different systems comprising the plant

CO2: Combine concepts of previously learnt courses to define the working principle of diesel power plant, its layout, safety principles and compare it with plants of other types

CO3: Describe the working principle and basic components of the nuclear power plant in ships and submarines and the safety principles involved with it

CO4: Discuss and analyze the mathematical and working principles of different electrical equipments involved in the generation of power

SYLLABUS

Introduction: Classification of Power Plants, Comparison between land based and Marine Power Plants Performance Characteristics of Marine Power Plants, Fuel Consumption under varying conditions, Marine Power Plants layout.

Marine boilers: Marine Boilers of Fire Tube, Composite and water-tube boilers. Feed water treatment. Feed water supply systems and controls.

Marine steam turbines: Construction details, Compounded steam turbines for Marine applications, Operation and maintenance.

Marine gas turbines: Gas Turbine cycles for Marine applications, Recent trends and developments, Free piston engines, Combined Cycle Plants.

Nuclear power plants: Nuclear fission reaction, types of reactors, Fuels, moderators, Coolants, Control and safety rods, radiation hazards and shielding, Radioisotope applications, Radioactive Waste disposal, Nuclear Powered propulsion, Indian reactor developments.

Marine Refrigeration and Air Conditioning: Marine refrigeration systems- operation and maintenance-application in modern passenger ships, bulk carriers and refrigerated vessels. Air conditioning systems on board the ships-temperature and humidity control-comfort conditioning. Cabin and cargo ventilation- piping and ducting-insulating materials

Text books:

1) Marine Power Plants -- P.Akinov

2) Nuclear Engineering -- D.K.Singhal

3) Marine Engineering -- R.Harrington

4) Introduction to Marine Engineering -- D.A.Taylor

I SEMESTER

M.Tech (MARINE ENGINEERING & MECHANICAL HANDLING)

MEMH 1.6 Research Methodology and IPR

Periods per week: 4 Examination: 70 Marks

Credits: 2 Sessionals : 30 Marks

M.Tech (MARINE ENGINEERING & MECHANICAL HANDLING)

I SEMESTER

MEMH 1.7 Audit Course-1

Periods per week: 4 Examination: 70 Marks

Credits: -- Sessionals : 30 Marks

II SEMESTER

M.Tech (MARINE ENINEERING & MECHANICAL HANDLING)

MEMH 1.8P

Seminars

Periods/week: 3	Ses : 50	Exam: 50
Examination Theory: 3hrs.	Credits: 2	

Each student has to present at least 4 seminars on a topic that is approved by the concerned teacher. The final seminar should be presented before a committee constituted by the Head of the Department

MEMH 1.9

Computer Aided Ship Design Lab

Periods/week: 3	Ses : 50	Exam: 50
Examination Theory: 3hrs.	Credits: 2	

Course Objectives

- The objectives of the course are to provide training and provide hands on experience to the students on CAD software

Course Outcomes

- At the end of the course, the student will be in a position to model a ship using the software

1. Ship Structural Analysis using FEA Packages: Modelling, Meshing and solving using FEM packages. Automatic mesh generation- presentation of results - 3-dimensional shape description and mesh generation- Application of FEA packages in the analysis of ship components.
2. CASD (Computer Aided Ship Design)
3. Exposure to CASD packages like Rhino, NAPA, TRIBON, Shipflow etc:
4. Generation of ship hull parametric model using Modelling Softwares

II SEMESTER

M.Tech.(MARINE ENGINEERING & MECHANICAL HANDLING)

MEMH 2.1 STRUCTURAL DESIGN OF MECHANICAL HANDLING EQUIPMENT (Core Subject -4)

Periods per week: 4 Examination: 70 Marks

Credits: 3 Sessionals : 30 Marks

Course Outcomes: At the End of the course, the student will be able to:

CO1: Classify the marine structures into Statically determinate, indeterminate or compliant structures.

CO2: Design and analysis various components of cranes.

CO3: Design and analyse the Slewing and Luffing processes of a crane.

CO4: Design and analyse the various marine mechanical handling equipment such as derricks, EOT cranes, knuckle boom cranes etc.

CO5: Extend the knowledge for working on special material handling equipment crane boom rests, A-frames, Stern Frames etc.

1. Analysis of forces of determinate, indeterminate and redundant framed structure
2. Detailed force analysis and design of overhead travelling crane structures.
3. Analysis of force and detailed design of the Jib of fixed and luffing types of rotary jib cranes.
4. 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

II SEMESTER

M.Tech.(MARINE ENGINEERING & MECHANICAL HANDLING)

MEMH 2.2 MARINE INSTRUMENTATION & STRESS ANALYSIS (Core Subject-5)

Periods per week: 4	Examination: 70 Marks
Credits: 3	Sessionals : 30 Marks

Course Outcomes: At the End of the course, the student will be able to:

CO1: Outline the importance of calibration and traceability as applied to instrumentation.
CO2: Explain and apply the procedures required to achieve reliable calibration data and identify inherent errors.
CO3: Describe the physical principles underlying the instruments and sensors used such as Strain Gauges, Electrical Resistance Gauges etc.
CO4: Identify and select instrumentation for basic marine application environments.
CO5: Apply the Photo elasticity method for the Stress Analysis.

1. Generalized measuring systems – calibration – damping - Dynamic signals – Basic detectors Transducer elements – Intermediate modifying systems – terminating devices.
2. Measurement of force and torque, Measurement of pressure – High pressure and low pressure, Measurement of fuel flow – Positive displacement methods – Obstruction meters – Hotwire anemometer.
3. Measure of temperature – Thermocouples – Pyrometry, Vibration and shock measurement – Accelerometers – Vibrometers – Seismic devices. Acoustic measurements – Sound measuring techniques.
4. Stain 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.
5. 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.

II SEMESTER

M.Tech.(MARINE ENGINEERING & MECHANICAL HANDLING)

MEMH2.3 MARINE ENGINEERING –2 (Core Subject -6)

Periods per week: 4 Examination: 70 Marks

Credits: 4 Sessionals : 30 Marks

Course Outcomes: At the End of the course, the student will be able to:

CO1: Outline the importance of Marine Diesel Engines, Steam Turbines, Gas Turbines and Nuclear power systems for marine propulsion units.

CO2: Extend the knowledge in understanding the various mechanical features of steam turbines & gas turbines, impulse turbines, reaction turbines and compounding of turbines.

CO3: Understanding the Marine Refrigeration, Air Conditioning and Marine Ventilation systems (Heating, Ventilation & Air conditioning systems).

CO4: Identify and select various steam boilers for the ship's use.

CO5: Apply the theory of steam for heating of fuel in tanks, cargo and cleaning of utensils and workshop items etc.

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, Humidication 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.

II SEMESTER

M.Tech.(MARINE ENGINEERING & MECHANICAL HANDLING)

MEMH 2.4 Programme Elective-III

(A) INDUSTRIAL ENGINEERING AND MANAGEMENT

Periods per week: 4 Examination: 70 Marks

Credits: 3 Sessionals : 30 Marks

Course Outcomes: On completion of the course, the students will be able to:

1. Understand the roles, skills and functions of management.
2. Distinguish the different types of business organizations.
3. Identify the factors involved in Production Operations Management.
4. Diagnose organizational problems and take suitable decisions.
5. Establish good Human Resource Management practices.
6. Acquire necessary knowledge and skills required for organizing and carrying out entrepreneurial activities.

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, Hawthrone 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.

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II SEMESTER

MEMH 2.4 Programme Elective-III

(B) Subsea Piping

Periods per week: 4	Examination: 70 Marks
Credits: 3	Sessionals : 30 Marks

Course Outcomes: At the End of the course, the student will be able to:

CO1: Discussion on the latest development in subsea and pipeline engineering

CO2: Learn the interconnectivity of subsea systems and pipelines

CO3: Improved understanding and knowledge of subsea, marine life, and pipelines and their field of operation with the globally recommended best practices and standards

CO4: Identify the methods of finding of hydrodynamics around the pipelines and demonstrate various corrosion reduction methods.

CO5: Understand the Vortex Induced Vibrations and Fatigue Analysis

1. Introduction: Material properties ,pipe production, pipe fabrication, specifications, Mothods of increasing corrosion resistance, CR alloys and their manufacturing, Evaluating corrosion resistance and external protection, Welding of pipelines,welding sequence, Manual, semiautomatic and automatic welding
2. Flexible and Composite Pipelines: Introduction, Fabrication techniques, Internal and external corrosion, sour service, Failure modes of flexible pipes, Composite pipelines
3. Internal Corrosion and its prevention: Corrosion mechanisms, Sweet corrosion, Corrosion in oil pipeline and effect of flow, Solids in Oil Pipelines, Corrosion in Gas pipelines and effect of flow, Sour corrosion, Corrosion Inhibition.
4. External Corrosion and pipeline hydraulics: External corrosion and coatings, Cathodic protection, concrete weight coatings, thermal insulation, Single-phase flow Newtonion fluids, heat transfer and flow temperature, hydrates, multiphase flow
5. Strength and stability: Introduction, Design to resist Internal and external pressures, Longitudinal stress, Bending , Indentation, and Impact, Design currentsand waves, Hydrodynamic forces, laterl resistance, Stability design
6. Marine pipeline construction and Shore approaches: Lay-Barge construction, reel construction, pull and tow, trenching, costal Environment, site Investigation, horizontal drilling, Tunnels and tidal flat

Reference: Plamer, Andrew C.(Andrew Clennel),1938-Subsea Pipeline engineering, / Andrew C. Palmer and Roger A

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II SEMESTER

MEMH 2.4 Programme Elective-III

(C) Automated Material Handling devices

Periods per week: 4 Examination: 70 Marks

Credits: 3 Sessionals : 30 Marks

Course Outcomes: At the End of the course, the student will be able to:
CO1: Understand the principles of Automaton in Material Handling Equipment
CO2: Demonstrate the automation process in cargo handling systems such as Conveyor Systems, AGV systems.
CO3: Understanding the AS & RS systems
CO4: Understand the concepts of Industry 4.0 and Internet of Things (IoT)

AUTOMATED MATERIAL HANDLING

1. Introduction & Definition
2. Principle of material handling
3. Classification of Material Handling equipment
4. Conveyor and AGV system
5. AS/RS System
6. Carousel storage system
7. WIP storage system,

MEMH 2.5 Programme Elective-IV

(A) Introduction to Computational Fluid Dynamics

Periods per week: 4 Examination: 70 Marks

Credits: 3 Sessionals : 30 Marks

Course Outcomes: At the End of the course, the student will be able to:
CO1: Assess the quality of numerical results and the efficiency of numerical methods for basic fluid flow model problems
CO2: Gain knowledge on Classification of the basic equations of fluid dynamics
CO3: Improved understanding and knowledge of Practical use and programming of numerical methods in fluid dynamics
CO4: perform the numerical solution of model problems by developing and testing own MATLAB programs

1. Introduction and Basic Numerical Methods:
2. Introduction to CFD, Approximation and interpolation, Numerical integration, Finite difference approximations of derivatives
3. The Finite Volume Method for Model Problems: 1-D diffusion, Thomas algorithm for tri-diagonal systems, 1-D convection-diffusion, 2-D model problems
4. 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
5. 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 Pletchen.

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II SEMESTER

MEMH 2.5 Programme Elective-IV

(B) CONTROL ENGINEERING

Periods per week: 4 Examination: 70 Marks

Credits: 3 Sessionals : 30 Marks

1. 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.
2. Equations of physical systems: Introduction, mechanical system - translational, rotational, mechanical systems, thermal, hydraulic, pneumatic and electrical systems.
3. Transient analysis of servo mechanisms, block diagram concept of a control system, analysis of proportional error, servo mechanism time and frequency responses.
4. Transfer functions: Definition, deviation of transfer functions - algebra of block diagrams and transfer functions.
5. 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.
6. 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.
7. Control system components: Error detectors, controllers, servo motors for DC, AC, Mechanical, hydraulic, pneumatic and thermal systems (one example each).

Text Books:

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

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II SEMESTER

MEMH 2.5 Programme Elective-IV

(c) Experimental Hydrodynamics

Examination: 70	Sessionals : 30
Periods per week : 4	credits: 3

Course Outcomes:

1. To provide students with a sufficient introduction to each of the topics of the course so that he/she will be able to understand the background of current literature in the hydrodynamics of marine vehicles, offshore engineering, and other ocean-related activities.
2. Students with ocean- and marine-related interest will develop the necessary theoretical and experimental background to keep up with existing literature and begin research on contemporary topics.

Requirement of ship model experiments, ITTC and it's role, Hydrodynamic test facilities, Dynamometry and instrumentation in model testing, Methodical series data, Statistical/ empirical method of resistance and powering estimation, Experimental techniques and methods for full scale predictions, Resistance, open water and propulsion experiments, Wake survey, Analysis of results, Cavitation experiments, Full scale sea trials.

N.B. The above course will mostly practical and tutorial oriented

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II SEMESTER

MEMH 2.6 Audit Course-2

Periods per week: 3 Examination: -----

Credits: --- Sessionals : ----

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II SEMESTER

MEMH 2.7 CFD Lab

Periods per week: 3	Examination: 50
Credits: 2	Sessionals : 50

1. Exposure to CFD packages like Star-CCM+, Ansys
2. Geometry creation of simple 2-D and 3-D Objects
3. Mesh Generation
4. Boundary conditions
5. Solution for varying parameters like Reynolds Numbers, Froude Number etc
6. Application to Ship Drag calculation (pressure and Friction)
7. Presentation of results of ship drag compared with IITC values

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II SEMESTER

MEMH 2.8

Seminars

Periods per week: 3	Examination: 50
Credits: 2	Sessionals : 50

Each student has to present at least 4 seminars on a topic that is approved by the concerned teacher. The final seminar should be presented before a committee constituted by the Head of the Department.

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II SEMESTER

MEMH 2.9

Mini Project with Seminar

Periods per week: 3 Examination: 100

Credits: 2 Sessionals : -----

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III SEMESTER

Programme Elective-5

MEMH 3.1 (A) Naval Architecture

Periods per week: 4 Examination: 70

Credits: 3 Sessionals : 30

Course Outcomes: At the End of the course, the student will be able to:

CO1: Understand the ship design process and the main terms and definitions used, including the lines plan, the form coefficients used in ship design, and the area and volume properties.
CO2: Know the basic concepts of intact and damage stability.
CO3: Get familiar with the main aspects of marine hydrodynamics acting on ship resistance, propulsion and seakeeping.
CO4: Understand the basic principles of ship structures, structural design, scantling determination and typical structural arrangements of different ship types.
CO5: Know the most common failure modes and structural defects. Get familiar with shipbuilding technology processes, materials used and shipyard layout.

1. Introduction: Types of ships, Geometry 0f 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.
5. Resistance: Frictional, residuary and total resistance, admiralty Coefficient, fuel Coefficient and Consumption.
6. Propellers: Apparent and real slip, Wake, Thrust, relation between mean pressure and speed, measurement of pitch, Cavitation, Solid propellers and other systems of propellers.
7. Rudder theory: Force on rudder, Torque on stock, angle of heel due to force on rudder, angle of heel on turning.
8. 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.

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III SEMESTER

Programme Elective-5

MEMH 3.1 (B) CAD/CAM in Marine Design and Construction

Examination: 70 Sessionals : 30

Periods per week : 4 credits: 3

Course Outcomes: At the End of the course, the student will be able to:

CO1: Describe the Surface Modeling techniques such as interpolation and approximation
CO2: Relate Graphics and computing standards. Assemble and modeling various mechanical components.
CO3: Categorize the capabilities of modeling and analysis packages such as solid works, Pro-E and ANSYS.
CO4: Demonstrate the need of the CAD/CAM and apply the CAD-CAM in Marine Design and Construction.
CO5: Understand the differences between the CAD-CAM-CAE & CIM. Apply the principles of Computer Integrated Manufacturing (CIM) in Marine Industry.

Introduction to CAD/CAM, Commercial software for 3-D modeling and analysis, areas of application, Computer graphics, Geometrical modeling, Wire frame and solid models, Database systems, structures, entity-relation models, Application to ship design, model manufacturing and testing, CAD applications in ship building, Computer aided manufacture, Numerical control, Part programming,

Programme Elective-5

MEMH 3.1 (C) Underwater Acoustics

Examination: 70 Sessionals : 30

Periods per week : 4 credits: 3

Course Outcomes: At the End of the course, the student will be able to:

CO1: Demonstrate the basic and applied knowledge of underwater sound generation, propagation and reception as required in the design of underwater acoustic systems and experiments
CO2: Understand the theory of sound generation, propagation, and reception in the ocean
CO3: Demonstrate and understand the various sources of ambient noise in the sea
CO4: Gain the ability to design basic sonar systems and basic ocean acoustic experiments
CO5: Recognition of the need for Underwater Acoustics, and Knowledge of contemporary issues related to sonar equation and basic signal processing concepts essential to sonar system design.

Introduction

Sound

Wave motion, Sound pressure, Reference intensity, Source level, Radiated power, Limitations to sonar power, Cavitation, Interaction, Changes to arrays, Projector sensitivity, Hydrophone sensitivity, Spectrum level, Sound in air and in sea water,

Arrays

Need for projector arrays, Need for hydrophone arrays, Beam patterns, Directivity of a dipole, The general line array, Shading, Shaded arrays: transmit source levels, Directivity index, Line array: beam pattern vs. steer angle, Broadside array: length and spacing, Beam pattern for a continuous line, DI of a simple dipole, DI of a line array, DI of a planar array, DI of a cylindrical array, DI formulae based for simple arrays, Conformal arrays, Spherical arrays, Volumetric arrays, Beam formers, Domes and arrays.

Propagation of Sound in the Sea

Propagation loss, Losses, Spreading losses, Absorption losses, Spherical spreading and absorption, Propagation in the real ocean, The speed of sound, Sound speed profiles, Deep sound channel, Reliable acoustic path, Surface duct propagation, Convergence zone propagation, Bottom bounce propagation,

Propagation loss models, Ray theory and the Hodgson model, Hodgson example, Performance prediction, Multipath propagation

Target Strength

Definition, Formulae, Measurement, Dependence on pulse type and duration, TS of a sphere, TS of some simple shapes, TS of small targets, Mine target strength, Torpedo target strength, Submarine echoes, Beam aspect target strength, Bow aspect target strength, Submarine target strengths, Towed arrays, Target strength reduction, Practical values.

Noise in Sonar Systems

Sources of noise, Thermal noise, Noise from the sea, Noise from a vessel, the sonar environment, Self-noise

Electrical noise, Machinery noise, Flow noise, Propeller noise, Variation with speed, Variation with frequency,

Directivity, Self-noise and radiated noise, Addition of noise levels, Receiver noise factor, Noise factor of a sonar, Acceptable receiver noise level, Alternative calculation, Practical values

Reverberation

Sources of reverberation, Scattering and reflection, Boundary roughness, Classes of reverberation, Backscattering strength, Reverberation target strength, Volume reverberation, Boundary reverberation, Scattering layers, Volume scattering strength, Sea surface scattering strength, Bottom scattering strength, Variation with fi-equency, Reverberation under ice

The Sonar Equations

The basic sonar equation, The basic passive equation, The basic active equation, Detection threshold and detection index, Receiver operating characteristics, ROC curves,

Passive Sonar

Radiated noise, Radiated noise: source level, Nature of radiated noise, Practical values, Broadband and narrowband, Normalization, A Note on Swaths, Passive arrays, Passive aural, Passive displays, Formulae for detection threshold, Broadband square law detector, Broadband cross-correlator detector, Narrowband processor, Narrowband amplitude detector processor, Passive ranging, Triangulation, Vertical direct passive ranging, Horizontal direct passive ranging, Towed arrays, Bearing ambiguity, Self-noise,

Activesonar

Pulse types, Active sonar equations, Reverberation index, Reverberation and Target Echoes in the main lobe, and sidelobes, Range, pings and doppler shift, Reverberation rejection by CW pulses, Practical reverberation envelopes, Full- and half-beam processing, Beam forming, FM phase binning process, CW processing, Large aperture array, Detection performance, Noise and reverberation-limited detection ranges:, Ambiguity diagrams, Very long pulses, Operational degradation factor, Active displays, Unified detection and classification, Bandwidth, Beamwidth, CADAC, Levels of CADAC, CADAC and pulse features, Statistical analysis, Amplitude profiles, Multipath affects classification

Textbook: Sonar for Practicing Engineers – A.D. Waite - Third Edition – John Wiley

References:

1. Principles of Underwater Sound – (1983) Robert J Urick – Mc Graw Hill Publications
2. Understanding Active Noise Control C.H. Hansen
3. Underwater Acoustic Systems Rodney F.W. Coates
4. Underwater acoustics Leon Camp

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III SEMESTER

MEMH 3.1 Dissertation-I

Examination: 100 Sessionals : ---

Periods per week : 4 credits: 6

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IV SEMESTER

MEMH 4.1 Dissertation-II

Examination: 100 Sessionals : ---

Periods per week : 4 credits: 14