

COURSE STRUCTURE

&

SYLLABUS (3rd – 8th SEMESTER)

FOR B.TECH PROGRAMME IN MARINE ENGINEERING

**BIJU PATNAIK UNIVERSITY OF TECHNOLOGY ORISSA,
ROURKELA**

2007 - 2008

**COURSE STRUCTURE
SECOND YEAR .TECH PROGRAMME
MARINE ENGINEERING**

3rd Semester				4th Semester			
<i>Theory</i>		<i>ContactHrs.</i>	<i>Credit</i>	<i>Theory</i>		<i>Contact Hrs.</i>	<i>Credit</i>
L-T-P				L-T-P			
BSCM 2201	Mathematics - III	3-1-0	4	BSCM 2202	Mathematics - IV	3-1-0	4
BENG 1208	Fluid Mechanics and Hydraulics Machines	3-1-0	4	BENG 1201	Electrical Machines or	3-1-0	4
BENG 1201	Electrical Machines			BENG 1208	Fluid Mechanics and Hydraulics Machines	3-1-0	4
BCSE 3201	Object Oriented Programming	3-0-0	3	BCSE 3202	Relational Database Management System	3-0-0	3
HSSM 4201	Engineering Economics & Costing or	3-0-0	3	HSSM 4202	Organisation Behaviour	3-0-0	3
HSSM 4202	Organisation Behaviour			HSSM 4201	Engineering Economics & Costing		
BSCC 2202	Material Sciences	3-0-0	3	CPME 6202	Mechanics of Materials - I	3-1-0	4
CPMR 6202	Marine Auxillary Machinery – I	3-0-0	3	CPMR 6203	Basic Ship Structure	3-0-0	3
Total			20	Total			21
<i>Practicals/Sessionals</i>		<i>Contact Hrs.</i>	<i>Credit</i>	<i>Practicals/Sessionals</i>		<i>Contact Hrs.</i>	<i>Credit</i>
BENG 9202	Basic Electronics Laboratory or	0-0-3	2	BENG 9201	Basic Electrical Engineering Laboratory or	0-0-3	2
BENG 9201	Basic Electrical Engineering Laboratory			BENG 9202	Basic Electronics Laboratory		
BCSE 9201	OOPs Computer Lab.	0-0-3	2	BCSE 9202	RDBMS Laboratory	0-0-3	2
BENG 9201	Mechanical Engineering Lab.	0-0-3	2	CPMR 9204	Marine Engg. Drawing	0-0-3	2
CPMR 9203	Machine Drawing	0-0-3	2	CPME 9202	Material Testing & Heat Power Laboratory Plant Operation (Summer break)	0-0-3	2
Total			8	Total			8
Total			28	Total			29

L-Lecture

T-Tutorial

P-Practical

3rd Semester

BSCM 2201 MATHEMATICS - III (3-1-0)

Module - I (9 Lectures)

Partial differential equations : The vibrating string. The wave equation & its solution.

The Heat equation and its solution

Module - II (10 Lectures)

Two - dimensional wave equation and its solution.

Laplace equation in polar, cylindrical and spherical coordinates. Potential.

Module - III (13 Lectures)

Complex analysis : Complex numbers and functions conformal mappings

Complex integration. Cauchy's Theorem Cauchy's integral formulas.

Module - IV (8 Lectures)

Taylor's and Laurent's series, Residue theorem, evaluation of real integrals.

The Course covered by : Advance Mathematics by E. Kreyszig, John Wiley & Son's (P) Ltd. (8th Edition)

Chapter 11 (except 11.6)

Chapter 12, 13, 14, 15

BENG 1208 - FLUID MECHANICS AND HYDRAULIC MACHINE (3-1-0)

Module – I

(12 hours)

Introduction : Scope of fluid mechanics and its development as a science

Physical property of Fluid

Density, specific gravity, specific weight, specific volume, surface tension and capillarity, viscosity, compressibility and bulk modulus, Fluid classification.

Fluid static

Pressure, Pascal's Law, Pressure variation for incompressible fluid, atmospheric pressure, absolute pressure, gauge pressure and vacuum pressure, manometer.

Hydrostatic process on submerged surface, force on a horizontal submerged plane surface, force on a vertical submerged plane surface.

Module – II

(12 hours)

Buoyancy and flotation, Archimedes' principle, stability of immersed and floating bodies, determination of metacentric height.

Fluid kinematics : Introduction, description of fluid flow, classification of fluid flow. Acceleration of fluid particles, flow rate and continuity equation, differential equation of continuity.

Fluid dynamics : Introduction, Euler's equation along a streamline, energy equation, Bernoulli's equation, Analysis of finite control volumes and its application to siphon, venturimeter, orifice meter

Module – III

(6 hours)

Turbine : Classification, reaction, Impulse, outward flow, inward flow and mixed flow turbines, Francis & Kaplan turbines, Pelton wheel, Physical description and principle of operation, Governing of Turbine.

Module – IV

(8 hours)

Centrifugal Pump : Principles of classification, Blade angles, Velocity triangle, efficiency, specific speed, characteristics curve.

Reciprocating Pump : Principles of working, slip, work done, effect of acceleration and frictional resistance, separation

Tex Books :

1. Fluid Mechanics, A.K. Mohanty, PHI
2. Introduction to Fluid Mechanics and Fluid Machines, S.K. Som and G. Biswas, TMH
3. Fluid Mechanics, Modi & Seth

BENG 1201 ELECTRICAL MACHINES (3-1-0)

Module I (10 Lectures)

D.C Mechanics :

D.C Generator – construction and principle of operation, E.M.F. equation ; types of generator; no load and load characteristics; Voltage build-up of shunt

Generator; voltage regulation, Application.

D.C Motor –construction and principle of operation ; back E.M.F; torque and speed equations; characteristics and performance curves; speed control of series and shunt motors; motor starters; industrial application.

Losses and Efficiency of D.C machines.

Module II (10 Lectures)

Transformer :

Single phase – construction and principle of operation; E.M.F. equation; Phasor diagram; actual and approximate equivalent circuits; open and short circuit tests, voltage regulation; losses and efficiency.

Three Phase – Construction and principle of operation; connection of three single –phase units in wye, delta, open delta configurations; Autotransformer; conventional transformer connected as Autotransformer. Special Transformers – induction heating and high impedance and high frequency transformer.

Module III (10 Lectures)

Synchronous Machines :

Three- phase alternators – construction and principle of operation; E.M.F. equation; distribution and pitch factors; Synchronous reactance; performance of alternators on no-load and load; Phasor diagram; voltage regulation, power calculations of turbine and hydro-generators,; synchronization of a generator.

Three-Phase Synchronous Motor- construction and principle operation; V- curves; Phasor diagram; methods of starting; applications.

Module IV (10 Lectures)

Three-Phase induction Motor- construction of slip ring and squirrel cage type induction motors; Phasor diagram and equivalent circuit; torque-slip characteristics; maximum torque calculations; open and short-circuit tests; losses and efficiency; starting of induction motors; speed control; Induction generator.

Single-Phase Induction Motor- construction and principle of operation; capacitor- start and capacitor-run motors; Universal motor; Stepper motors.

Books :

1. Electrical Machines, Drives and Power Systems, 5th edition by Theodore Wildi (Pearson) : Text.
2. Electrical Machinery by A.E. Fitzgerald and Charles Kingsley, Jr., and S.D. Umans, Tata McGraw Hill Publication.
3. Principles of Electric Machines by V.K Meheta and R. Meheta , S. Chand Publication.

BCSE 3201 OBJECT ORIENTED PROGRAMMING USING C++ (3-0-0)

Module I (10 hours)

Introduction to object oriented programming, user defined types, polymorphism, and encapsulation. Getting started with C++ -syntax, data-type, variables, strings, functions, exceptions and statements, namespaces and exceptions, operators. Flow control, functions, recursion. Arrays and pointers, structures.

Module II (10 hours)

Abstraction mechanisms : Classes, private, public, constructors, member functions, static members, references etc. Class hierarchy, derived classes.

Inheritance : simple inheritance, polymorphism, object slicing, base initialization, virtual functions.

Module III (12 Hours)

Prototypes, linkages, operator overloading, ambiguity, friends, member operators, operator function, I/O operators etc.

Memory management : new, delete, object copying, copy constructors, assignment operator, this input/output.

Exception handling : Exceptions and derived classes, function exception declarations, Unexpected exceptions, Exceptions when handling exceptions, resource capture and release etc.

Module IV (8 Hours)

Templates and Standard Template library : template classes, declaration, template functions, namespaces, string, iterators, hashes, iostreams and other type.

Design using C++ design and development, design and programming, role of classes.

Text Books :

1. Bhav & Patekar- Object oriented Programming with C++, Pearson Education
2. Ashok N. Kamthane- Object oriented Programming with ANSI & Turbo C++, Pearson Education.
3. Robert Lafore- Object oriented programming in Microsoft C++.
4. Balguru Swamy-C++, TMH publication

HSSM 4201 ENGINEERING ECONOMICS AND COSTING(3-0-0)

Module I (10 hours)

Present worth comparisons, Comparisons of assets with equal, unequal and infinite lives, comparison of deferred investments, Future worth comparison, pay back period comparison.

Module II (10 hours)

Use and situations for equivalent annual worth comparison, Comparison of assets of equal and unequal life. Rate of return, Internal rate of return, comparison of IRR with other methods, IRR misconceptions. Analysis of public Projects : Benefit/ Cost analysis, quantification of project, cost and benefits, benefit/ cost applications, Cost –effectiveness analysis.

Module III (10 hours)

(12 hours)

1. Horn green, C.T., Cost Accounting, Prentice Hall of India
2. Riggs, J.L ., Dedworth, Bedworth, D.B, Randhawa, S.U. Engineering Economics, McGraw Hill International Edition, 1996 (Chapter 2,3,4,5,7,8,9,11,12)

HSSM 4202 ORGANIZATIONAL BEHAVIOUR (3-0-0)

Module I

(8 hours)

The Study of Organizational Behaviour : Learning objectives, Definition and Meaning, Why Study OB, An OB Model, New Challenges for OB Manager.

Learning – Nature of Learning, How Learning occurs, Learning and OB.

Case Analysis

Module II

(10 hours)

Foundations of Individual Behaviour : Personality – Meaning and Definition, Determinants of Personality, Personality Traits, Personality and OB.

Perception – Meaning and Definition, Perceptual Process, Importance of Perception in OB.

Motivation – Nature and Importance, Herzberg's Two Factor Theory, Maslow's Need Hierarchy Theory, Alderfer's ERG Theory, Evaluations.

Case Analysis

Module III

(12 hours)

Organizational Behaviour Process : Communication – Importance, Types, Gateways and Barriers to Communication, Communication as a tool for improving Interpersonal Effectiveness. Groups in Organizations - Nature, Types, Why do people join groups, Group Cohesiveness and Group Decision-making Managerial Implications, Effective Team Building. **Leadership** – Leadership & Management, Theories of Leadership – Trait theory, Leader Behaviour theory, Contingency Theory, Leadership and Followership, How to be an effective Leader. Conflict – Nature of Conflict and Conflict Resolution.

An Introduction to Transactional Analysis (TA).

Case Analysis

Module IV

(10 hours)

Organization : Organizational Culture – Meaning and Definition, Culture and Organizational Effectiveness. Introduction to Human Resource Management – Selection, Orientation, Training and Development, Performance Appraisal, Incentives Organizational Change – Importance of Change, Planned Change and OB techniques. International Organizational Behaviour – Trends in International Business, Cultural Differences and Similarities, Individual and Interpersonal Behaviour in Global Perspective.

Case Analysis

TEXT BOOKS :

Keith Davis, Organizational Behaviour, McGraw – Hill.

K.Asathappa, Organizational Behaviour, Himalaya Publishing House.

REFERENCE BOOKS :

Stephen P. Robbins, Organizational Behaviour, Prentice Hall of India.

Pradip N. Khandwalla, Organizational Behaviour, McGraw – Hill, New Delhi.

BSCC 2202 MATERIAL SCIENCES (3-0-0)

MODULE - I (10 Lectures)

1. Classification of Engineering Materials. Engineering properties of materials. Internal structure and properties.
2. Electron theory of solids : Free electron theory of metals. Electrical conductivity; Thermal conductivity, Quantum theory of free electrons. Band theory of solids, Conductivity of metals

3. Conductors, Insulators, Semiconductors, Intrinsic and extrinsic semiconductors, Band theory of semi conductors Hall effect.

MODULE - II (10 Lectures)

4. Super Conductors - Zero resistivity, Critical magnetic field and critical current density. Type I and II super conductors. Applications of Superconductors.
5. Dielectric Materials : Microscopic Displacement of atoms and molecules in an external dc electric field, Polarization and dielectric constant, Dielectric susceptibility. Temperature dependence, Dielectric Breakdown. Ferro electric material Piezoelectrics, Pyroelectrics, Dielectric Materials as electrical insulators.
6. Magnetic Properties of Materials : Dia, Para and Ferro magnetic materials. Theory of magnetism, Ferro magnetic materials or Ferrites, Comparison of magnetic behaviour and magnetic parameters of Dia, Para and Ferro magnetic materials.

MODULE - III (8 Lectures)

7. Optical Properties of Materials : Scattering, Refraction, Theory of Refraction and absorption, Atomic Theory of optical properties. Lasers, Optical fibres - Principle, structure, application of optical fibre.
8. Organic Materials : Polymers - Mechanism of Polymerization : Addition, condensation and copolymerisation, applications.
Plastics - Types : Thermosetting and thermoplastics.

MODULE - IV (8 Lectures)

9. Composite Materials : Agglomerated Materials : Cermets, Reinforced Materials : Reinforced Concrete. Glass fibre reinforced plastics, Carbon fibre reinforced plastics. Whiskers, fibre reinforced plastics, Laminated plastic sheets. Tufnol, Properties of composites.
10. Ceramics : Types, Structure, Mechanical properties, applications
11. Performance of Materials in Service : Service performance, failure, design considerations, Corrosion - types, (Atmospheric, Pitting, Stress Corrosion), Control & prevention, protective coating, Performance of metals and Ceramics at high temperature.

Text Books :

1. Callister W.D., Materials Science and Engineering, John Wiley & Sons.
2. Vijaya M. S., Rangarajan G, Materials Science, TMH
3. Rajendra V., Marikani A., Materials Science, TMH
4. Van Vlack L. H., Elements of Material Science and Engineering, Addison Wesley

CPMR 6202 MARINE AUXILLARY MACHINERY - I (3-0-0)

Module I

Engine Room Layout : Lay out of main and auxiliary machinery in engine rooms in different ships.
Layout of Pipe lines, Pipe material, Piping arrangement for steam, blige, ballast and oil and cooling system lines with various fittings. Domestic fresh water and sea water and sea water hydrosphore system. Colour code and safety fittings of bunkering procedure and in the pipe lines etc.

Module II

Bunkering procedure, precautions taken, Line diagram for H.F.O and D.O.
Blowers and Compressors : Operational and constructional details of blowers and compressors used on board ships. Uses of compressed air.

Filters : Strainers and filters, types of marine filters, autocleaner and Duplex filters, Static filters, Priming and core maintenance of filters.

Module III

Deck Machinery : Various types of deck machinery used in ships e.g. Winches and Wind lass and their requirements. Operation and maintenance. Deck Cranes. Hydraulic deck machinery; hydraulic motors, linefilters and systems.

Module IV

Pollution Prevention : Use of coalescers, baffles, grids, STOKES Law; Static and turbo seperators, Oily bilge Seperators their construction and operation, prevention of oil pollution and various International requirements. MARPOL Convention, OLM & OCM, Introduction of IMO Conventions, regulation, rules & arrangements. Job requirement for a watch keeping Engineer.

PRACTICALS

BENG 9202 BASIC ELECTRONICS LAB. (0-0-3)

(At least 8 experiments including 1 - 7 and any one from 8 - 10)

1. Familiarity with electronics components and Devices
Testing of a semiconductor Diode and a Transistor. IC pins connection (Digital Multimeter should be used should be used in testing components and devices).
2. Study and use of Oscilloscope to view waveforms and measure its amplitude and frequency.
3. V - I Characteristic of a semiconductor diode. Determining DC and AC resistance.
4. Half wave and Full wave rectifiers without and with capacitor filter. Record of waveforms, Measurement of Average and rms values.
5. V - I Characteristics of anpn or pnp transistor. DC Biasing and measurement of dc voltages and currents.
6. Gain - frequency response of JFET common source R-C coupled amplifier/BJT CE RC coupled Amplifier.
7. Op amp in Inverting, non inverting, Integrating and Differentiating configuration, Record of wave forms.
8. Truth Tables of logic gates.
9. Study and experiment using MUX - DEMUX ICs / Shift Register IC.
10. Study on CMOS logic Inverter.

BENG 9201 BASIC ELECTRICAL ENGINEERING LAB. (0-0-3)

List of Experiment (Any 8 of the following)

1. Study and measurement the armature and field resistance of a DC machine.
2. Calibration of ammeter, voltmeter and wattmeter with the help of sub-standard instrument.
3. Verification of circuit theorems. Thevenin's and Superposition theorems (with DC source only).
4. Voltage-current characteristics of incandescent lamps and fusing time-current characteristics of fuse wire.
5. Measurement of current, voltages and power in R-L-C series circuit excited by Single Phase AC supply.

6. Connection and starting of a three phase induction motor using direct online (DOL). or star-delta starter.
7. Connection and measurement of power consumption of a fluorescent lamp.
8. Determination of open circuit characteristics (OCC) of DC machine.
9. Starting and speed control of a DC shunt motor.
10. Connection and testing of a single phase energy meter (unity power factor load only)
11. Study of fan motor

BCSE 9201 OOP WITH C++ LAB. (0-0-3)

(10 classes for 10 different programs)

1. Programs on concept of classes and objects.(1 class)
2. Programs using inheritance.(1 class)
3. Programs using polymorphism.(1 class)
4. Programs on use of operator overloading.(1 class)
5. Programs on use of memory management.(1 class)
6. Programs on exception handling and use of templates.(1 class)
7. Programs on File handling in C++.(1 class)
8. Design problem on stock and accounting of a small organization, railway reservation, payroll preparation and optimization problem.(3 classes)

BENG 9201 MECHANICAL ENGINEERING LAB. (0-0-3)

Group A (Mechanics / Material Testing Lab.

1. Determination of equilibrium of coplanar forces.
2. Determination of Moment of Intertia of Flywheel
3. Determination of tensile strength of materials by Universal Testing Machine.

Group B

4. Determination of Metacentric Height and application to stability of floating bodies.
5. Verification of Bernoulli's Theorem and its application to Venturimeter.
6. Determination of Cd and Cd of Orifices.

Group C

7. Calibration of Bourden Type Pressure gauj and measurement pressure using manometers.
8. Study of Cut-Sections of 2 stroke and 4 stroke Diesel Engine.
9. Study of Cut-Sections of 2 stroke and 4 stroke Petrol Engine.

CPMR 9203 MACHINE DRAWING (0-0-3)

Machine drawing related to ship components / parts

4th Semester

BSCM 2202 MATHEMATICS - IV (3-1-0)

Module - I

Solution of equations by iteration, Newton's method, Secant method, Interpolation
Numerical integration and differentiation

Module - II

Gauss Siedel iteration method for solving a system of linear equations, Runge Kutta Methods,
Introductory Linear Programming, Introductory Programming

Module - III

Probability, Random variables, Probability distribution, mean & variance of distribution
Binomial, Poisson, hyper-geometric and normal distributions

Module - IV

Random sampling, estimation of parameters, confidence intervals, Testing of hypothesis, acceptance
sampling, correlation and regression

Course covered by : Advance Mathematics by E. Kreyszig (8th Edition)

Chapter 17 (17.1 - 17.3, 17.5), Chapter 18 (18.4), Chapter 19 (19.1), Chapter 20, Chapter 21, Chapter
22

BENG 1201 ELECTRICAL MACHINES (3-1-0)

Module I (10 Lectures)

D.C Mechanics :

D.C Generator – construction and principle of operation, E.M.F. equation ; types of generator; no load
and load characteristics; Voltage build-up of shunt

Generator; voltage regulation, Application.

D.C Motor –construction and principle of operation ; back E.M.F; torque and speed equations;
characteristics and performance curves; speed control of series and shunt motors; motor starters;
industrial application.

Losses and Efficiency of D.C machines.

Module II (10 Lectures)

Transformer :

Single phase – construction and principle of operation; E.M.F. equation; Phasor diagram; actual and
approximate equivalent circuits; open and short circuit tests, voltage regulation; losses and efficiency.

Three Phase – Construction and principle of operation; connection of three single –phase units in
wye, delta, open delta configurations; Autotransformer; conventional transformer connected as
Autotransformer. Special Transformers – induction heating and high impedance and high frequency
transformer.

Module III (10 Lectures)

Synchronous Machines :

Three- phase alternators – construction and principle of operation; E.M.F. equation; distribution and
pitch factors; Synchronous reactance; performance of alternators on no-load and load; Phasor
diagram; voltage regulation, power calculations of turbine and hydro-generators,; synchronization of a
generator.

Three-Phase Synchronous Motor- construction and principle operation; V- curves; Phasor diagram;
methods of starting; applications.

Module IV (10 Lectures)

Three-Phase induction Motor- construction of slip ring and squirrel cage type induction motors; Phasor diagram and equivalent circuit; torque-slip characteristics; maximum torque calculations; open and short-circuit tests; losses and efficiency; starting of induction motors; speed control; Induction generator.

Single-Phase Induction Motor- construction and principle of operation; capacitor- start and capacitor-run motors; Universal motor; Stepper motors.

Books :

1. Electrical Machines, Drives and Power Systems, 5th edition by Theodore Wildi (Pearson) : Text.
2. Electrical Machinery by A.E. Fitzgerald and Charles Kingsley, Jr., and S.D. Umans, Tata McGraw Hill Publication.
3. Principles of Electric Machines by V.K Meheta and R. Meheta , S. Chand Publication.

BENG 1208 - FLUID MECHANICS AND HYDRAULIC MACHINE (3-1-0)

Module – I

(12 hours)

Introduction : Scope of fluid mechanics and its development as a science

Physical property of Fluid

Density, specific gravity, specific weight, specific volume, surface tension and capillarity, viscosity, compressibility and bulk modulus, Fluid classification.

Fluid static

Pressure, Pascal's Law, Pressure variation for incompressible fluid, atmospheric pressure, absolute pressure, gauge pressure and vacuum pressure, manometer.

Hydrostatic process on submerged surface, force on a horizontal submerged plane surface, force on a vertical submerged plane surface.

Module – II

(12 hours)

Buoyancy and flotation, Archimedes' principle, stability of immersed and floating bodies, determination of metacentric height.

Fluid kinematics : Introduction, description of fluid flow, classification of fluid flow. Acceleration of fluid particles, flow rate and continuity equation, differential equation of continuity.

Fluid dynamics : Introduction, Euler's equation along a streamline, energy equation, Bernoulli's equation, Analysis of finite control volumes and its application to siphon, venturi meter, orifice meter

Module – III

(6 hours)

Turbine : Classification, reaction, Impulse, outward flow, inward flow and mixed flow turbines, Francis & Kaplan turbines, Pelton wheel, Physical description and principle of operation, Governing of Turbine.

Module – IV

(8 hours)

Centrifugal Pump : Principles of classification, Blade angles, Velocity triangle, efficiency, specific speed, characteristics curve.

Reciprocating Pump : Principles of working, slip, work done, effect of acceleration and frictional resistance, separation

Text Books

1. Fluid Mechanics, A.K. Mohanty, PHI
2. Introduction to Fluid Mechanics and Fluid Machines, S.K. Som and G. Biswas, TMH
3. Fluid Mechanics, Modi & Seth

BCSE 3202 RELATIONAL DATABASE MANAGEMENT SYSTEMS (3-0-0)

Module I

(10 hours)

Database System Architecture - Data Abstraction, Data Independence, Data Definitions and Data Manipulation Languages.

Data models - Entity Relationship(ER), Mapping ER Model to Relational Model, Network .Relational and Object Oriented Data Models, Integrity Constraints and Data Manipulation Operations.

Module II (10 hours)

Relation Query Languages, Relational Algebra, Tuple and Domain Relational Calculus, SQL and QBE.

Relational Database Design: Domain and Data dependency, Armstrong's Axioms, Normal Forms, Dependency Preservation, Lossless design, Comparison of Oracle & DB2

Module III (8 hours)

Query Processing and Optimization : Evaluation of Relational Algebra Expressions, Query Equivalence, Join strategies, Query Optimization Algorithms.

Module IV (12 hours)

Storage Strategies : Indices, B-Trees, Hashing, Transaction processing: Recovery and Concurrency Control, Locking and Timestamp based Schedulers, Multiversion and Optimistic Concurrency Control Schemes.

Advanced topics: Object-Oriented and Object Relational databases. Logical Databases, Web Databases, Distributed Databases, Data Warehouse and Data Mining.

Text Books :-

1. Elmaski & Navathe -Fundamentals of Database Systems, 4th Edition, Pearson Education
2. C.J.Date - An introduction to Database Systems, Pearson Education
3. Bipin Desai -An introduction to Database System, Galgotia Publication.

HSSM 4202 ORGANIZATIONAL BEHAVIOUR (3-0-0)

Module I (8 hours)

The Study of Organizational Behaviour : Learning objectives, Definition and Meaning, Why Study OB, An OB Model, New Challenges for OB Manager.

Learning – Nature of Learning, How Learning occurs, Learning and OB.

Case Analysis

Module II (10 hours)

Foundations of Individual Behaviour : Personality – Meaning and Definition, Determinants of Personality, Personality Traits, Personality and OB.

Perception – Meaning and Definition, Perceptual Process, Importance of Perception in OB.

Motivation – Nature and Importance, Herzberg's Two Factor Theory, Maslow's Need Hierarchy Theory, Alderfer's ERG Theory, Evaluations.

Case Analysis

Module III (12 hours)

Organizational Behaviour Process : Communication – Importance, Types, Gateways and Barriers to Communication, Communication as a tool for improving Interpersonal Effectiveness. Groups in Organizations - Nature, Types, Why do people join groups, Group Cohesiveness and Group Decision-making Managerial Implications, Effective Team Building. **Leadership** – Leadership & Management, Theories of Leadership – Trait theory, Leader Behaviour theory, Contingency Theory, Leadership and Followership, How to be an effective Leader. Conflict – Nature of Conflict and Conflict Resolution.

An Introduction to Transactional Analysis (TA).

Case Analysis

Module IV

(10 hours)

Organization : Organizational Culture – Meaning and Definition, Culture and Organizational Effectiveness. Introduction to Human Resource Management – Selection, Orientation, Training and Development, Performance Appraisal, Incentives Organizational Change – Importance of Change, Planned Change and OB techniques. International Organizational Behaviour – Trends in International Business, Cultural Differences and Similarities, Individual and Interpersonal Behaviour in Global Perspective.

Case Analysis

TEXTBOOKS:

Keith Davis, Organizational Behaviour, McGraw – Hill.

K.Aswhathappa, Organizational Behaviour, Himalaya Publishing House.

REFERENCE BOOKS :

Stephen P. Robbins, Organizational Behaviour, Prentice Hall of India.

Pradip N. Khandwalla, Organizational Behaviour, McGraw – Hill, New Delhi.

HSSM 4201 ENGINEERING ECONOMICS AND COSTING(3-0-0)

Module I

(10 hours)

Present worth comparisons, Comparisons of assets with equal, unequal and infinite lives, comparison of deferred investments, Future worth comparison, pay back period comparison.

Module II

(10 hours)

Benefit/ Cost analysis, quantification of project, cost and benefits, benefit/ cost applications, Cost – effectiveness analysis.

Module III

(10 hours)

hours)

1. Horn green, C.T., Cost Accounting, Prentice Hall of India
2. Riggs, J.L ., Dedworth, Bedworth, D.B, Randhawa, S.U. Engineering Economics, McGraw Hill International Edition, 1996 (Chapter 2,3,4,5,7,8,9,11,12)

CPME 6202 MECHANICS OF MATERIALS - I (3-1-0)

MODULE - I

(10 hours)

1. **Analysis of Axially Loaded Members :**

Composite bars in tension and compression - temperature stresses in composite rods - statically indeterminate problem.

2. **Members in Biaxial State of Stress :**

Stresses in thin cylinders, thin spherical shells under internal pressure - wire winding of thin cylinders.

MODULE - II

(12 hours)

3. **Strain Deformation :**

Two dimensional state of strain, Principal strains and principal axes of strain measurements, Calculation of principal stresses from principal strains.

4. Shear Force and Bending Moment Diagrams for Simple Beams :

Support reactions for statically determinate beams, relationship between bending moment and shear force. Shear force and Bending Moment diagrams.

MODULE - III

(12 hours)

5. Simple Bending of Beams :

Theory of simple bending of initially straight beams, distribution of normal and shear stress, beams of two materials, Co

6. Deflection of Beams :

Slope and deflection of beams by integration method and area - moment method.

MODULE - IV (6 Hours)

7. Torsion in solid and hollow circular shafts, Twisting moment, strength of solid and hollow circular shafts. Strength of

8. Close - Coiled helical springs.

TEXT BOOKS :

1. Elements of Strength of Materials by Timoshenko & Young (Fifth Edition)
Chapter : 1, 2, 3, 4, 5, 6, 7, 8 (Relevant articles only)

REFERENCE BOOKS :

2. Strength of Materials by G. H. Ryder

CPMR 6203 BASIC SHIP STRUCTURE (3-0-0)

Module I

Ships Terms : Various terms used in ship construction with reference to ship's parameter e.g. L.B.P., Moulded draught etc., General Classification of Ships.

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

Module II

Sections and materials use : Type of section like Angles, Bulb Plates, Flanged beams used in ship construction, Rivetting & Welding. Testing of welds. Fabricated components.

Module III

Bottom & Side Framing : Double bottoms, Water tight floors, Solid and bracket floors, Longitudinal framing keels, side framing like Tankside brackets, Beam Knee, Web frame etc.

Module IV

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

PRACTICALS

BENG 9201 BASIC ELECTRICAL ENGINEERING LAB. (0-0-3)

List of Experiment (Any 8 of the following)

1. Study and measurement the armature and field resistance of a DC machine.
2. Calibration of ammeter, voltmeter and wattmeter with the help of sub-standard instrument.
3. Verification of circuit theorems. Thevenin's and Superposition theorems (with DC source only).

4. Voltage-current characteristics of incandescent lamps and fusing time-current characteristics of fuse wire.
5. Measurement of current, voltages and power in R-L-C series circuit excited by Single Phase AC supply.
6. Connection and starting of a three phase induction motor using direct online (DOL). or star-delta starter.
7. Connection and measurement of power consumption of a fluorescent lamp.
8. Determination of open circuit characteristics (OCC) of DC machine.
9. Starting and speed control of a DC shunt motor.
10. Connection and testing of a single phase energy meter (unity power factor load only)
11. Study of fan motor

BENG 9202 BASIC ELECTRONICS LAB. (0-0-3)

(At least 8 experiments including 1 - 7 and any one from 8 - 10)

1. Familiarity with electronics components and Devices
Testing of a semiconductor Diode and a Transistor. IC pins connection (Digital Multimeter should be used should be used in testing components and devices).
2. Study and use of Oscilloscope to view waveforms and measure its amplitude and frequency.
3. V - I Characteristic of a semiconductor diode. Determining DC and AC resistance.
4. Half wave and Full wave rectifiers without and with capacitor filter. Record of waveforms, Measurement of Average and rms values.
5. V - I Characteristics of npn or pnp transistor. DC Biasing and measurement of dc voltages and currents.
6. Gain - frequency response of JFET common source R-C coupled amplifier/BJT CE RC coupled Amplifier.
7. Op amp in Inverting, non inverting, Integrating and Differentiating configuration, Record of wave forms.
8. Truth Tables of logic gates.
9. Study and experiment using MUX - DEMUX ICs / Shift Register IC.
10. Study on CMOS logic Inverter.

BCSE 9202 RDBMS LAB. (0-0-3)

(10 Classes for 10 Different Programs)

1. Use of SQL syntax : Insertion, Deletion, Join), Updation using SQL. (1 class)
2. Program segments in embedded SQL using C as host language to find average grade point of a student, etc.. (1 class)
3. Program for Log based data recovery technique. (1 class)
4. Program on data recovery using check point technique. (1 class)
5. Concurrency control problem using lock operations. (1 class)
6. Use of package (ORACLE) for programming approaches(2 classes)
7. Use of package (DB2) for programming approaches(2 classes)
8. Programs on JDBC/ODBC to print employee's / student's information of a particular department. (1 class)

CPMR 9204 MARINE ENGINEERING DRAWING (0-0-3)

Module I

Drawing : Advanced Marine Machinery assembly drawings.

Part - I (Auxiliary Machine)

Marine machinery components as assorted stop and sluice valves and auxiliary equipment dismantled; to be conceptualised in assembly and laid out as working & functional parts. Sectional views in elevation and plans executed. Part sectional views depiction.

Part - II (Main Machine)

Marine engine components dismantled. Assembled drawings of pistons, thrust blocks, liners, connecting rods, crossheads, injection valves, starting valves, Fuel pumps, stern tube & Tail shaft, Rudder carrier bearing and all equipment with main machinery. Sectional / Outside and plan views of parts fitted / removed and in functional order.

1. Architectural Design-I & Measured Drawing

Objective: to develop the skill of analysis, creative idea finding & their synthesis. Design of simple space through creative ideas by visualizing external & internal dimensions.

Design of small objects with respect to function, structure and aesthetics.

Importance of physical factors in architectural design, orientation, ventilation, adequate protection from rain, insects etc.

The human dimensions in various postures. Their relation to dimensioning of everyday utilities like the table, chair, sinks etc.

Design of small structures- street furniture, kiosks, clock towers, milk booth, cycle stand, shop etc. and objects of interest with respect to form and orientation.

Study of design of part of residential buildings, with respect to Indoor and outdoor spaces of buildings.

Detail layout of residential components such as bathrooms, kitchen, bed room etc.

Minimum two projects and one time problems must be conducted.

Time problem is to be of 8 hours duration.

CPME 9202 MATERIAL TESTING AND HEAT POWER LAB. (0-0-3)

(Any Eight)

Material Testing

1. Impact strength
2. Hardness strength
3. Rigidity modulus
4. Compression / Bending strength
5. Fatigue strength

Thermodynamics

6. Testing of Diesel Engine (single cylinder)
7. Testing of Petrol Engine (single cylinder)
8. Study of cut model of water tubes and fire tube boilers
9. Determination of effy of compressor
10. Valve timing diagram of IC engines

**COURSE STRUCTURE
THIRD YEAR B.TECH PROGRAMME
MARINE ENGINEERING**

5th Semester			6th Semester		
<i>Theory</i>	<i>Contact Hrs.</i>	<i>Credit</i>	<i>Theory</i>	<i>Contact Hrs.</i>	<i>Credit</i>
L-T-P			L-T-P		
HSSM 4301 Optimisation in Engineering	3-0-0	3	HSSM 4302 Production & Operation Management	3-0-0	3
CPMR 8301 Applied Thermodynamics - II	3-1-0	4	CPMR 8304 Marine IC Engine-I	3-1-0	4
CPMR 8302 Ship Construction	3-1-0	4	CPMR 8305 Marine Electrical Technology	3-1-0	4
PEMR 8301 Marine Auxillary Machinery - II	3-0-0	3	PEMR 8303 Naval Architecture - I	3-0-0	3
PEMR 8302 Elementary Design	3-0-0	3	PEMR 8304 Mechanics of Machines - II	3-0-0	3
CPMR 8303 Advanced Fluid Mechanics & Machines	3-0-0	3	CPMR 8306 Advanced electronics	3-0-0	3
Total		20	Total		20
<i>Practicals/Sessionals</i>	<i>Contact Hrs.</i>	<i>Credit</i>	<i>Practicals/Sessionals</i>	<i>Contact Hrs.</i>	<i>Credit</i>
CPMR 9301 Ship Linesplan & Marine Drawing	0-0-3	2	CPMR 9305 Boiler Chemistry	0-0-3	1
CPMR 9302 Hydrostatics & stability Lab.	0-0-3	2	CPMR 9306 Microprocessor & Instrumentation Lab.	0-0-3	2
CPMR 9303 Design Project	0-0-3	2	CPMR 9307 Design Project	0-0-3	2
CPMR 9304 Practical Seamanship & Elementary Navigation	0-0-3	2	CPMR 9308 Plant Operation, Simulation & controls	0-0-6	4
Total		8	Total		9
Total		28	Total		29

L-Lecture

T-Tutorial

P-Practical

5TH Semester

HSSM 4301 OPTIMIZATION IN ENGINEERING (3-0-0)

Course Objective : The course aims at acquainting the students to mathematical modeling of engineering design, operation and maintenance problems and their optimization algorithms.

Module – I

Formulation of engineering optimization problems : Decision variables, objective function and constraints. Example of typical design, operation and maintenance problems in engineering : Design of a water tank, design of a truss, design of a network (electrical, communication, sewerage and water supply networks), product mix problem, transportation and assignment problems, shift scheduling of employees, design of reliable devices, design of reactors, shortest route problem, set covering problem, traveling salesman problems. Only physical problems and their mathematical models to be discussed.

(6 hours)

Classical Optimization methods : Unconstrained local and global optimum for functions of single variable. Concave and Convex functions, Necessary and sufficient conditions of optimum, Extension to functions of several variables, Hessian matrix, and its relations to minimum (maximum) of a function, Quadratic forms, Minimum (maximum) of a concave (convex) function in a convex feasible region.

(3 hours)

Linear Programming Problem : Formulation, Graphical solution, Simplex method, Duality theory, Dual simplex method, Formulation and solution of engineering problems of planning and scheduling.

(4 hours)

Module – II

Sensitivity Analysis, Transportation Problem, Assignment Problem, Network Models : Minimal Spanning Tree Problem, Maximal Flow Problem, Shortest Route Problem, Minimum Cost Flow Problem. Algorithms and applications to be covered.

(10 hours)

Module – III

Integer Linear Programming Problem. Branch and Bound and Cutting Plane Methods. Zero-one Programming Problem, Knapsack Problem, Set covering Problem, Knapsack Problem, Set Partitioning Problem, Traveling Salesman Problem. Deterministic Dynamic Programming Problems. Applications and algorithms to be discussed.

(10 hours)

Module – IV

Single Variable Unconstrained Minimization Problems : (1) Region elimination method : Fibonacci Method, Golden Section method. (2) Point Estimation Method : Successive quadratic estimation method, (3) Gradient Based Methods : Newton – Raphson Method, Bisection method.

Multiple Variable Unconstrained Optimization Algorithms (1) Direct Search Methods : Evolutionary optimization, Simplex search methods, Hookes – Jeeves Pattern Search Method (2) Gradient – based Methods : Steepest descent method, Conjugate gradient method, Variable metric method.

Constrained Optimization Algorithm : Kuhn – Tucker Conditions, Penalty function Method, Lagrangian Multiplier Method, Frank – Wolfe Method. Feasible Direction Method, Generalized Reduced Gradient Method. Geometric Programming Methods.

(12 hours)

References :

1. H. A. Taha – Operations Research, Prentice Hall of India, 2004.
2. K. Deb., Optimization in Engineering Design, Prentice Hall of India, 2003.
3. D. T. Phillips, A Ravindran and J.J. Solaberg, Principles of Operation Research, John Wiley and Sons

CPMR 8301 APPLIED THERMODYNAMICS – II (3-1-0)**Module – I****Fuel Combustion & dissociation :**

Definition of Fuel, Combustion equation, Analysis of the products of combustion, stoichiometric combustion, excess air, mixture strength, dissociation. Effect of dissociation on I.C Engines.

(10 hours)

Module – II**Gas Dynamics :**

One dimensional steady flow of compressible fluids, isentropic flow, effect of friction, Flow through nozzles and diffusers. Critical Condition, Mac number, subsonic, sonic and Supersonic flow. Flow of steam through nozzles and diffusers.

(15 hours)

Module – III**Vapour Power Cycles :**

Carnot's cycle, Rankine cycle, modified Rankine cycle, superheat cycle, reheat cycle, Regenerative cycle, Binary vapour cycle and its effect on thermal efficiency, Steam Machinery plants, Combined steam & gas plant calculations.

(15 hours)

Module – IV**Transmission Of Heat:**

Fourier's law of heat conduction, Thermal conductivity of insulating materials. Conduction through flat and cylindrical surfaces, spherical surfaces in series. Radiation : Basic, Stephan Boltzman law, grey/black bodies etc. Heat Transfer from fluids to fluids through walls. Application of heat transfer in marine heat exchangers, like coolers, heaters, condensers. Prediction of convection heat transfers rates. Use of non-dimensional groups.

(20 hours)

CPMR 8302 SHIP CONSTRUCTION (3-1-0)**Module – I****Statutory Certificates :**

Statutory certificates and their validity. Ships registration formalities, intact stability, criteria under damaged conditions (constructional point of view in compliance with statutory regulations, Enhanced survey requirements, HSSC).

Constructional Features and rule guidelines for a merchant vessel as per MARPOL regulations, IBC and IGC codes.

(15 hrs)

Module – II

Materials for shipbuilding – steel, physical properties, Grades of steel for shipbuilding; aluminium, shipbuilding grade, where used; Fibre Reinforced plastics, types of fibres and resins, moulding methods, precautions during construction; Testing of materials and welds, destructive and non-destructive testing methods, rule requirements for testing.

(12 hrs)

Module – III

Shipyard layout – design office, mould loft, stockyard, plate preparation, hull shop, prefabrication shop, building berth, assembly shops and area, outfitting jetty, building docks; material handling; painting.

(4 hours)

Shipbuilding Practice – preparation, marking, cutting, forming and welding of plates and section; subassembly and assembly of units; unit construction method; outfitting and advanced outfitting; dock trials and sea trials, delivery.

(10 hrs)

Launching – end-on launching, side launching – launching ways, launching schedule.

(3 hours)

Module – IV

Building docks and dry docks – docking and floatation of ships in a dry dock; fitting and removal of propellers and rudders; under water hull inspection and repairs.

(9 hours)

Quality control – Role of Classification Societies; Construction under survey and periodic surveys; Classification Society Rules; Shipyard's own quality control.

(7 hours)

PEMR 8301 MARINE AUXILIARY MACHINERY – II (3-0-0)

Module – I

Propulsion shafting System – intermediate and tail shaft, propeller fitting arrangement, thrust block, shaft bearings, stern tube and water and oil lubricated stern gland, shaft alignment.

(5 hours)

Pumps – types of pumps –Centrifugal pumps and priming methods, positive displacement pumps-reciprocating, screw, gear and lobe pumps, submerged and deep well pumps; characteristics and application of pumps, care and maintenance of pumps.

(6 hours)

Module - II

Fuels – types of fuels: coal, petroleum and natural gas, their physical and chemical properties and classification, testing methods; merits and demerits of use of different fuels in shipboard operation.

(5 hours)

Fuel oil system – HFO and MDO; oil purification theory and systems used in ships; fuel oil system in ships – components and equipment and piping.

(4 hours)

Module – III

Cargo handling system in tankers – cargo pumps, loading and discharge arrangement, tank cleaning system – stripping, crude oil washing, water rinsing and inert gas systems.

(6 hours)

Fresh water system – fresh water system for cooling main engine and auxiliaries; boiler feed water system; fresh water system for domestic use, hydrophore tanks; fresh water generator.

(3 hours)

Sea water system – sea water system for cooling main auxiliary engines and fresh water, sea chests; ballast water system and ship service system – pumps and piping, rule requirement.

20

(3 hours)

Module - IV

Lubrication System – Theories of Lubrication, Types of lubricants, their properties and their shipboard use; lubricants for bearings and machinery; LO analysis and engine condition monitoring; lubricating systems in ships.

(8 hours)

Oily water treatment – bilge well, bilge pump, oily water separator; regulations regarding sewage, garbage and liquid discharge from ships; sludge tank and sludge pump, incinerator.

(5 hours)

PEMR 8302 ELEMENTARY DESIGN (3-0-0)

Module – I

Procedures in Machine Design; Concepts of design, procedure & processes, Design synthesis, Ergonomic consideration in design, Feasibility, Preliminary Design alternative, Final Design Alternative, Preliminary & Final Plans & Drawings.

Use of standards in design, selection of preferred sizes, common useful materials & manufacturing considerations in design.

Review of failure criteria in mechanical design, properties of materials, heat treatment processes, BIS system of designation of Steels, Basis of good design, Deformation, Wear Corrosion.

Common useful materials & manufacturing considerations in design .

Failure criteria in mechanical design : Basis of good design

Failure of machine parts : Deformation, Wear Corrosion.

(8 hours)

Module – II

Machine Design :

Strength consideration for Design : Strength of materials, Reliability, Influence of size, Stress concentration, Strength under combined stresses, Static loads, Impact loads, Repeated loads, Completely reversed loads, Static plus Alternating loads, Cyclic & Combined loads, fatigue strength, Dynamic stresses, Selection of materials.

(7 hours)

Module - III

Specifications : **Fit, Tolerance, Finish- BIS**

Design & Drawing to specifications for parts subjected to direct loads

Fasteners : Bolts & Screws, Cotter & Knuckle joints, keys & Couplings, Pipe joints, riveted & Welded joints. Design of welded machine parts.

(15 hours)

Module – IV

Power Transmission : Shafts & axles, Bearings, Clutches & Brakes, Belt drives, Chain drives, Design & Drawing of tooth gearing like spur & Bevel gears. Rack & Pinion, worm & worm wheels, helical gears etc.

(15 hours)

CPMR 8303 ADVANCED FLUID MECHANICS & MACHINES (3-0-0)

Module – I

Advanced Dimension Analysis :

Non Dimensional performance characteristic of roto-dynamic machinery.

(10 hours)

Module – II

Reciprocating Pumps : Various types, Single and double acting, single and multi cylinder, Co-efficient of discharge, Theoretical indicator diagrams, Effect of acceleration and friction, Use of air-vessel.

(10 hours)

Module – III

Centrifugal Pump : Calculations of various heads, Losses and Efficiency, Work done per unit weight, Dimensions of impellers, Velocity diagrams at inlet and exit, Calculations for power input, Torque on shafts, cavitation in centrifugal pumps, NPSH, Special head.

(15 hours)

Module – IV

Impulse and Reaction Turbines : Pelton Wheel : Inward Flow reaction turbine, Efficiency and Vane Angles, Vane speed and head lost in runner, Specific speed, Applied Problems.

(10 hours)

PRACTICALS

CPMR 9301 SHIP LINESPLAN DRAWING & MARINE DRAWING (0-0-3)

- a. Shell Expansion Plan.
- b. Lines plan.
- c. General Arrangement Plan.
- d. Docking Plan.
- e. Midship Section.

Marine Drawing : Advanced Marine Machinery assembly drawings.

CPMR 9302 HYDROSTATICS & STABILITY LAB. (0-0-3)

- a. Determination of Metacentric height of a floating body.
- b. To determine the meter constant of Venturimeter.
- c. To determine the efficiency of a pelton wheel.
- d. To determine the co-efficient of velocity & co-efficient of discharge of water through various orifices.
- e. To determine the friction co-efficient for flow of water through pipe.
- f. To determine the co-efficient through various notches.
- g. To study & verify Bernoulli's Theorem.
- h. To verify different characteristics of a centrifugal pump.

CPMR 9303 DESIGN PROJECT (0-0-3)

Small Project on designing of

- a. Nuts and Bolts
- b. Cotter Joints

- c. Knuckle Joints
- d. Welded Connections
- e. Muff-Coupling
- f. Flange Coupling
- g. Flexible Coupling

CPMR 9304 PRACTICAL SEAMANSHIP, ELEMENTARY NAVIGATION AND SURVIVAL AT SEA (0-0-3)

Navigational Lights and Signals : Port and Starboard, forward and aft mast lights, Colours and Location. Look out, Precautions and Bad weather, Flags used on ships, Flag etiquette, Morse and Semaphore signaling, Sound signals.

Anchors : Their use, Dropping and weighing anchor, Cable stopper.

Rope Knots and Moorings : Types of knots, Practice of knot formation, Materials of ropes, Strength, Care and maintenance, use of mooring line, heaving line, Rat guards, Canvas and its use.

Survival at sea : Survival difficulties and factors, equipment available, Duties of Crew members, initial action on boarding, Maintaining the craft.

Practical : Knots, bends and hitches, Ropes Splice, Donning of Life jackets, Life boat drills, Lowering and hoisting of life boats (model)

Life Boats and Life rafts : Construction, Equipments 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 and Alarm signals, Distress Signal (S.O.S). Distress Calls time and Radio frequency. Pyro-techniques.

6th Semester

HSSM 4302 PRODUCTION AND OPERATIONS MANAGEMENT (3-0-0)

Objective : This course aims at acquainting all engineering graduates irrespective of their specializations to the basic issues and tools of managing production and operation functions of an organization.

Module I

1. Operation Function in an Organization, Manufacturing Vrs Service Operation, System view of Operations, Strategic Role of Operations, Operations Strategies for Competitive Advantages, Operations Quality and Productivity Focus, Meeting Global Challenges of Production and Operations Imperatives.
(3 hours)
2. Designing Products, Services and Processes New Product Design : Product Life Cycle, Product Development Process, Product Quality and Reliability Design, Process Technology : Project , Jobshop, Batch, Assembly Line, Continuous Manufacturing, Process Technology Life Cycle, Process Technology Trends; FMS, CIM, CAD, CAM, GT, Design for Services, Services Process Technology, Services Automation. Value Engineering, Standardization, Make or buy Decision.
(4 hours)
3. Job Design and Work Measurement, Method Study : Techniques of Analysis, recording, improvement and standardization. Work Measurement : Work Measurement Principles using Stopwatch Time Study, Predetermined Motion Time Standards and Work Sampling, Standard Time Estimation.
(4 hours)

Module II

4. Location and Layout Planning : Factor Influencing Plant and Warehouse Locations, Impact of Location on cost and revenues. Facility Location Procedure and Models : Qualitative Models, Breakeven Analysis, Single Facility, Location Model, Multi-facility Location Model, Mini max Location, Total and Partial Covering Model.
Layout Planning : Layout Types : Process Layout, Product Layout, Fixed Position Layout Planning, Systematic Layout Planning, CRAFT.

Group Technology and Cell Formation, Rank Order Clustering Method for Machine – Component Assignment,. Line Balancing : Basic concepts, General Procedure, Rank Positional Weight Method.

5. Forecasting : Principles and Method, Moving Average, Double Moving Average, Exponential Smoothing, Double Exponential Smoothing, Winter's Method for Seasonal Demand, Forecasting Error Analysis.

Module III

6. Manufacturing Planning and Control : The Framework and Components : Aggregate Planning, Master Production Scheduling, Rough-cut-Capacity Planning, Material Requirements Planning, Capacity Requirements Planning, Shop Order System and Purchase Order System. Transportation Method for Aggregate Production Planning, Material Requirement Planning, Scheduling and Dispatching Functions, Progress Monitoring and Control.

(4 hours)

7. Sequencing and Scheduling : Single Machine Sequencing : Basics and Performance Evaluation Criteria, Methods for Minimizing Mean Flow Time, Parallel Machines : Minimization of Makespan, Flowshop sequencing : 2 and 3 machine cases : Johnson's Rule and CDS heuristic. Jobshop Scheduling : Priority dispatching Rules.

8. Inventory Control : Relevant Costs, Basic EOQ Model, Model with Quantity discount, Economic Batch Quantity, Periodic and Continuous Review Systems for Stochastic Systems, Safety Stock, Reorder Point and Order Quantity Calculations. ABC Analysis.

(4 hours)

Module - IV

9. Project Management : Project Management through PERT / CPM. Network Construction, CPM, Network Calculation, Crashing of Project Network, Project Scheduling with Limited Resources. Line of Balance.

(5 hours)

10. Modern Trends in Manufacturing : Just in Time (JIT) System; Shop Floor Control By Kanbans, Total Quality Management, Total Productive Maintenance, ISO 9000, Quality Circle, Kaizen, Poke Yoke, Supply Chain Management

(6 hours)

Reference :

1. J. L. Riggs : Production Systems : planning Analysis and Control, John Wiley.
2. E. E Adam and R. J. Ebert " Production and Operation Management", Prentice Hall of India, 2004.
3. S.N. Chary, " Production and Operations Management", Tata McGraw Hill.
4. R. Paneerselvam, "Production and Operation Management, Prentice Hall of India, 2005.

CPMR 8304 MARINE INTERNAL COMBUSTION ENGINE – I (3-1-0)

Module – I

Performance and Characteristics of I.C. Engine : 4-stroke and 2-stroke cycles : Deviation from ideal condition in actual engines; Limitation in Parameters, Timing Diagrams of 2-stroke and 4-stroke engines. Comparative study of slow speed, medium speed and high-speed diesel engines – suitability and requirements for various Purposes Mean Piston speed, M.C.R and C.S.R ratings. Practical heat balance diagrams and thermal efficiency.

(4 hours)

General description of I.C. Engines : Marine diesel engine of M.A.N.; Sulzer, B& W make etc..
Constructional Details of I.C Engines.

(12 hours)

Module – II

Principal Components : Jackets & Liners, Cylinder heads. Pistons, Cross heads, Connecting rods, Bed plates, A-frames, Welded construction for bed plates and frames. Tie rods.

(9 hours)

Scavenging and Supercharging Systems : 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, Cross loop and reverse loop scavenging , their merits and demerits , Scavenge pumps for normally aspirated engines; under piston scavenging , Scavenge manifolds.

(4 hours)

Supercharging Arrangements : Pulse and constant Pressure types; Their relative merits and demerits in highly rated marine propulsion engines. Air movements inside the cylinders. Turbocharger and its details. Two stage, un-cooled, radial turbochargers.

(3 hours)

Module – III

Combustion of Fuels in I.C Engines : Grade of suitable fuels. Preparation of fuels for efficient combustion. Fuel atomization, Ignition Quality, Fuel Injectors, and its details., Ignition delay, after burning.

(5 hours)

Compression Pressure ratio and its effect on engines. Reasons for variation in compression pressure and peak pressure, Design aspects of combustion chamber. Control of NOX, SOX in Exhaust emission.

(3 hours)

Cooling of I.C Engines : Various cooling media used; their merits and demerits, Cooling of Pistons, Cylinder jackets & Cylinder heads, Bore Cooling, Coolant conveying mechanism and systems, maintenance of coolant and cooling system.

(3 hours)

Module – IV

Safety and Prevention of mishaps in I.C Engines : Causes and Prevention of crank-case explosions, and Scavenge fires. Detection of same and safety fittings provided to prevent damage, Uptake fire, Starting airline explosion. Thermal stresses.

(4 hours)

Special features of I.C Engines : Development of long stroke Engines, Implication of stroke-bore ratio, Development in materials of construction & heat treatment of M.E components.

(4 hours)

Gas Turbine Plants : Constant volume or Explosion cycle Gas Turbine plant, constant pressure cycle or Joule – Brayton cycle Gas Turbine plant, simple C-B-T-H cycle, condition for maximum work output and thermal efficiency and work ratio of Gas Turbine plants, their merits and demerits. Total head or stagnation condition.

(8 hours)

CPMR 8305 MARINE ELECTRICAL TECHNOLOGY (3-0-0)

MARINE ELECTRICAL TECHNOLOGY –I

Module – I

Power Generation: Merits and Demerits of A.C & D.C on board; Rules and Regulations governing electrical machineries on ships; Different alternator Excitations – Systems on board – (indirect, Direct, static excitations).

Brushless generator construction & operational diagram. Automatic Voltage Regulator

Alternative Source of Power : Emergency Generator & Different starting method including auto-start, emergency batteries construction and its different types & duties, Location of emergency power, Different Emergency Loads.

Rules and Regulation, Emergency power, Maintenance of Emergency power source on board. Shore supply – Specifications as per Voltage / frequency, precaution while taking shore supply.

(14 hours)

Module – II

Distribution : Different electrical diagrams and their uses, electrical signals. Types of Distribution, Distribution network on board; Main & Emergency switch board, construction, different switch gear & protective devices.

Grounded and insulated neutral systems, Precautions adopted in High voltage distribution system. Cables and temperature classification.

Motor & Control Equipments : Types of Marine motor, types of enclosures, protective devices on motors, motor characteristic curves, sequential starting (e.g. Refrigerating plants, automatic fired boiler).

(18 hours)

Module – III

Miscellaneous marine electrical equipment Alarm system : Engine Room Telegraph, Rudder Angle Indicator, R.P.M & Revolution Counter, Centralised Salinity Indicator, Watertight door operation, Alarm system (types, supply) on board's oxygen analyzer, High and low level alarms, Navigational lights, Emergency Radio operation, Electrical Deck Auxiliaries.

Maintenance of Electrical systems, fault finding & Repair : Type of faults and indications in Generator, motor and distribution systems, Different Testing equipments and meters (multimeter/megger, clampmeter etc.) . Salvaging a motor, detection of faults on electronic circuits & cards – indications & corrective arrangements, Necessary Precautions & care while fault finding and repair, preventive maintenance, periodic surveys, spares requirement.

(15 hours)

Module – IV

Special Electrical Practice : Rules and Regulations & Operation of electrohydraulic & Electric steering gear, Diesel-electric and Turbo electric propulsion system, Pod / Azipod drive unit, Superconductivity applied in propulsion, Turbo alternator, Special electrical practice for oil, gas and chemical Tankers (Tanker classification, Dangerous spaces, hazardous Zones, Temperature classes), Flame proof Ex 'd' and intrinsic safety Ex 'i' , Ex 'e', and Ex 'n' equipments and their application in Zones, Maintenance of Ex-protected apparatus.

Safe Electrical Practice : Safe watch-keeping, Points to check on electrical machineries, Switch gears & equipments, microprocessor control and maintenance, electrical fire fighting, Precaution against electric shock and related hazards.

(13 hours)

PEMR 8303 NAVAL ARCHITECTURE – I (3-0-0)

Module – I

Ship Geometry and hydrostatic calculations – ship geometry, body plan, half-breadth plan, profile and buttocks; offset table; Numerical integration methods – Trapezoidal rule, Simpson's rules, three-eight-minus-one rule, Tchebycheff's rule and other methods; Sectional area and vertical moment calculation; hydrostatic calculations and curves.

Weights – total weight of ship as a sum of light weight and deadweight; light weight – steel, machinery and outfit; deadweight – cargo, ballast and consumables; inclining experiment; LCG and VCG estimation.

Capacities – volumetric capacity of cargo spaces, tanks and other spaces; capacity table and diagram; GRT and NRT computation.

(15 hours)

Module – II

Transverse stability at small angles – Definition of stable, unstable and neutral equilibrium; stability at small angles – metacentric radius and metacentric height; effect of free surface, lifting of weight, grounding etc., stability of submerged bodies, stability of catamarans.

Transverse stability at large angles – cross curves of stability; stability lever/ stability moment curve; inclining moment, dynamical stability; angle of loll, angle of vanishing stability; IMO regulations on stability.

(10 hours)

Module – III

Longitudinal stability and trim – Longitudinal BM, MCT1, change of L.C.B with change of trim, change of trim due to adding or deducting weights, change in draft and trim because of filling / flooding several tanks with different densities, alteration of draft due to change in density, Flooding calculations, Floodable length curves, M.O.T method for determination of floodable lengths, factors of subdivision, Loss of stability due to grounding, Docking stability, Pressure on chocks.

Strength of Ships : Curves of buoyancy and weight, Curves of Load, Shearing force and bending moments, Alternate methods, Standard conditions, Balancing ship on wave, Approximation for max. Shearing force and bending moment, method of estimating B.M & Deflection. Longitudinal strength, Moment of Inertia of Section, Section Modulus.

(10 hours)

Module IV

Freeboard – freeboard and reserve buoyancy; damage stability – introduction; ILLC guidelines for freeboard – Class A and class B freeboards; Water-tight Closing appliances on deck; Plimsol mark and assignment of freeboard; draught marks forward and aft.

Vibration – Calculation of hull natural frequency at different modes, propeller RPM and hull resonance diagram

PEMR 8304 MECHANICS OF MACHINES -II (3-0-0)

Module- I

Turning Moment & Flywheel : Functions of Flywheel, Crank Effort Diagrams, Fluctuation of speed and energy. Effect of centrifugal tension on flywheel, inertia torque and its effects on crank effort diagrams.

(3 hours)

Kinematics and Link-Mechanisms : Relative motion between bodies moving in different planes. Instantaneous center method, Rubbing velocities at pin joints. Graphical Construction for relative velocity and acceleration in different link and sliding mechanisms. Analytical determination of velocity and acceleration. Forces in crank and connecting rods. Inertia force on link connecting rods etc. Effect of friction.

(3 hours)

Module – II

Cams : Types of cams and followers. Specified motion of followers. Uniform acceleration and deceleration, S.H.M and uniform velocity, Graphical construction of cam-profile.

(4 hours)

Analytical design procedure for cams with Straight Flank, Curved Flank, Circular flank with various types of followers, spring force and reaction torque. In-line cams and off center cams.

(4 hours)

Balancing : Balancing of masses rotating in different planes, dynamic forces at bearings, Primary and secondary balance of multi-cylinder in-line engines and configurations.

(3 hours)

Module – III

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

(5 hours)

Toothed Gearing : Types of gear, conditions for transmission of constant velocity ratio, methods of avoiding interference, Transmission of power by gear trains on parallel shafts, Rack and pinion, Bevel

gears, worm and worm wheel, Spur gear, Helical gears, Spiral gears, Epicyclic gear trains, Torque on gear trains, acceleration in gear trains.

(3 hours)

Gyroscope : Gyroscopic couple, Vector representation of torque and angular momentum, steady rectangular precession, Vector treatment, Steady conical precession, Motion involving steady precession, Application to ship stabilization.

(3 hours)

Module – IV

Vibration : Free harmonic vibration, Linear motion of an elastic system, Angular motion of an elastic system, Differential equation of motion, Free vibration of springs in series and parallel, Simple and Compound pendulums, Single and two degrees of freedom.

(3 hours)

Torsional Vibrations : Single rotor system, rotor at end and rotor in the middle, Effect of Inertia of shaft, Two rotor system, rotors at both ends and rotors at one end, Three rotor and multirotor system. Torsionally equivalent shaft, Geared shaft system.

(3 hours)

Forced Vibrations : Forced Linear and Angular vibrations, Periodic force transmitted to support, Periodic moment of the support.

(3 hours)

Transverse Vibrations of beams : Single concentrated load, effect of the mass of the beam, Energy method – several concentrated Loads, Uniformly distributed load, Dunkerley's empirical method for several Concentrated loads.

(3 hours)

Whirling of Shafts : Whirling of shafts, Critical speed, Effect of slope of the disc, Effect of end thrust.

(3 hours)

Damped Vibrations : Idea of viscous and coloumb damping, Linear and Angular vibrations with viscous damping, Forced damped linear and angular vibrations, Periodic movement of the support.

(2 hours)

CPMR 8306 ADVANCED ELECTRONICS (3-0-0)

Module – I

1. **Review of combinational circuit** : Adder, Multiplier, Multiplexer; General idea about Flip Flop - shift register and counter. (12 hours)

Module – II

2. **Transducers** : Strain gauge, Thermo couple, LVDT, Piezo electric Transducers, Optical Transducers, Inductive-Torque Transducers. (3 hours)

3. **Electronic Instruments** : Basic Principle of operation of transistor voltmeter, Digital Frequency meter, Digital multimeter. (4 hours)

4. Silicon controlled Rectifier, Thyristor, Power control and inverters.

(4 hours)

Module – III

5. **Microprocessor architecture** : Introduction to 8085 up, pins and signal register organization, timing and control modes. (5 hours)

6. **Instruction set and Assembly Language Programming of 8085** – Instruction set, memory and I/O addressing, Assembly Language Programming. (5 hours)

7. Memory interfacing and interrupts.

(2 hours)

8. Introduction to 8051, 8255 – only architecture & pin diagram (2 hours)

Module – IV

9. Intel 8086 (16 bit processor) - Architecture, Addressing mode, pins and signal, Instruction format (5 hours)

10. Digital Data Acquisition system : Interfacing transducers to Electronics control and measuring system, instrument (3 hours)

Reference books :

1. Digital Electronics by A.Anand Kumar, PHI publication (module I)
2. Electronics Instrumentation and measurement Technique by w.o.cooper (module II)
3. Introduction to microprocessor for scientist and Engineers by Ghosh & Sridhar (PHI) (module III)
4. Advanced microprocessor and peripherals by A.K.Ray and K.M.Bhurchandi (TMH) (module IV).
5. Elements of Electronic Instrumentation and Measurement by Joseph J. Carr (Pearson)
6. Power Electronics by P. S. Bhimbra (Module II)

PRACTICALS

CPMR 9305 BOILER CHEMISTRY LAB. (0-0-3)

- (a) To determine hardness content of the sample of boiler water in P.P.M - in terms of CaCO_3 .
- (b) To determine Chloride content of the sample of water in P.P.M in terms of CaCO_3 .
- (c) To determine alkalinity due to Phenolphthalein, total Alk. and Caustic Alk. Of the sample of water in P.P.M.
- (d) To determine Phosphate Content of the sample of water.
- (e) To determine dissolved Oxygen content of the sample of water.
- (f) To determine Sulphate content of the given sample of water.
- (g) To determine Ph – Value of the given sample of water.

CPMR 9306 MICROPROCESSOR AND INSTRUMENTATION LAB. (0-0-3)

1. Addition of 2 8 bit nos. result 16 bit
2. Addition of 2 16 bit nos.
3. Subtraction of 2 16 bit nos.
4. Multiplication of 2 nos.
5. Division of 2 8 bit nos.
6. Find out the smallest/ largest no. from an array of nos.
7. Arrange the given sequence of no. in ascending/descending order.
8. Measurement of Amplitude, frequency, phase of a signal using CRO, for sine wave, square wave and triangular wave.
9. Measurement using LVDT.
10. Measurement using strain gage.
11. Measurement using thermo couple
12. Verification of piezo electric effect
13. Verification of shifting operation using universal shift register IC 74153.
14. Counter operation – using IC 7490.

CPMR 9307 DESIGN PROJECTS (0-0-3)

1. Shaft & Axle Design.
2. Brake Design.
3. Design of flywheel.
4. Design of cams.
5. Design of gears.
6. Design of springs.
7. Design of bearings.

CPMR 9308 PLANT OPERATION & SIMULATION & CONTROL (0-0-6)

1. Working in college workshop & practice running Diesel engines.
2. To work with simulators & study different parameters.
3. Study of automatic controllers.
 - 3.1. Level Control.
 - 3.2. Temp. Control.
 - 3.3. Proportional, Integral & derivative Controls & their combinations.
 - 3.4. Viscosity Controller
 - 3.5. Study of oil mist detector.

**COURSE STRUCTURE
FOURTH YEAR B.TECH PROGRAMME
MARINE ENGINEERING**

7th Semester			8th Semester		
<i>Theory</i>	<i>Contact Hrs. Credit</i>		<i>Theory</i>	<i>Contact Hrs. Credit</i>	
	L-T-P			L-T-P	
HSSM 4430 Environmental Engineering	3-0-0	3	CPMR 8405 Ship Operation & Management	3-0-0	3
CPMR 8402 Marine Refrigeration & Air Conditioning	3-0-0	3	CPMR 8406 Marine Control Engg. & Automation	3-1-0	4
CPMR 8403 Marine Machine System Design	3-1-0	4	CPMR 8407 Marine Auxiliary Machinery -III	3-0-0	3
CPMR 8404 Marine IC Engine -II	3-0-0	3	CPMR 8408 Marine Boiler & Steam Engg.	3-1-0	4
PEMR 8401 Naval Architecture -II	3-0-0	3	PEMR 8402 Maritime Regulation Elective - II (Any one)	2-0-0	2
Elective - I (Any one)	3-0-0	3	PEMR 8406 Doble Hull Tank Vessels	3-0-0	
PEMR 8403 Advanced Marine Heat Engines (Co-Cycles)			PEMR 8407 Renewable Energy Sources & Application	3-0-0	
PEMR 8404 Advanced Hydraulics			PEMR 8408 Luid Circuits & Control	3-0-0	
PEMR 8405 Electromagnetic Interference (EMI) and Electromagnetic Compatibility (EMC)					
Total		19	Total		16
<i>Practicals/Sessionals</i>	<i>Contact Hrs. Credit</i>		<i>Practicals/Sessionals</i>	<i>Contact Hrs. Credit</i>	
CPMR 9401 Project		3	CPMR 9406 Project		7
CPMR 9402 Mechanical Lab/ Vibration Lab/Heat	0-0-3	2	CPMR 9407 Seminar	0-0-2	1
CPMR 9403 STCW & Class IV Preparatory	0-0-3	2	CPME 9406 Entrepreneurship Project	0-0-3	2
CPMR 9404 Fire Preventions & Control Lab.	0-0-3	2	CPMR 9409 Comprehensive Viva Voice	0-0-3	2
CPMR 9405 Seminar	0-0-2	1			
Total		10	Total		12
Total		29	Total		32

L-Lecture

T-Tutorial

P-Practical

7TH Semester

HSSM 4430 ENVIRONMENTAL ENGINEERING (3-0-0)

Objective : This course introduces the students to the environmental consequences of Industries, development actions etc. and the methods of minimizing their impact through technology and legal systems.

Module – I

Ecological Concepts and Natural Resources : Ecological perspective and value of environment. Environmental auditing, Biotic components, Ecosystem Process : Energy, Food Chain, Water cycle, Air cycle etc., Environmental gradients, Tolerance levels of environment factor, EU, US and Indian Environmental Law, Global Perspective.

Chemistry and Microbiology in Environmental Engineering : Physical and chemical properties of water, Atmospheric chemistry, Soil chemistry, Microbiology, Chemical and biochemical reactions, Material balances and Reactor configurations.

Concept in Hydrology : Hydrological cycle, Water balance, Energy budget, Precipitation, Infiltration, evaporation and evapotranspiration, Rainfall-runoff relationships, Urban hydrology, Ground water, Ground water chemistry, Water contamination and pollution prevention.

(10 hours)

Module – II

Water Pollution : water quality standards and parameters, Assessment of water quality, Aquatic pollution, Freshwater pollution, Estuarine water quality, Marine pollution, Organic content parameters, DO and BOD demand in streams, Transformation process in water bodies, Oxygen transfer by water bodies, Turbulent mixing, Water quality in lakes and preservers , Ground water quality.

Air Pollution : Air pollution and pollutants, criteria pollutants, Acid deposition, Global climate change –green house gases, non-criteria pollutants, emission standard form industrial sources, air pollution metereology, Atmospheric dispersion.

Noise Pollution : Physical Properties of sound, Noise criteria, Noise Standards, Noise measurement, Noise control.

(10 hours)

Module – III

Water Treatment : Water quality standards, Water sources and their quality, Water treatment processes, Pre-treatment of water, Conventional process, Advanced water treatment process.

Waste Water Treatment : Water flow rate and characteristics, Design of waste water network, Waste water treatment process, pretreatment, primary and secondary treatment of waste water, Activated sludge treatment : Anaerobic digestion and its microbiology, Reactor configurations and methane production. Application of anaerobic digestion. Bio-solids regulations, Characteristics and processing of bio-solids, first and second stage processing of sludge. Sludge disposal,. Integrated sewage and sludge management.

Solid Waste Management

Source classification and composition of MSW : properties and separation, storage and transportation, MSW Management, Waste minimization of MSW, Reuse and recycling, Biological treatment, Thermal treatment, Landfill, Integrated waste management.

Hazardous Waste Management, Hazardous waste and their generation, Medical hazardous waste, Household waste, Transportation and treatment of hazardous waste : Incinerators, Inorganic waste treatment, Treatment systems for hazardous waste, handling of treatment plant residue.

Industrial Air Emission Control :

Characterization of air stream, Equipment selection, Equipment design, Special Methods : Flue gas desulphurization, NOx removal, Fugitive emissions.

(15 hours)

Module – IV

Waste Minimization : Concept, Life Cycle Assessment, Elements of waste minimization strategy, Benefits of waste minimization, Elements of waste minimization programme, Waste reduction techniques.

Environment impact Assessment, Origin and procedure of EIA, Project Screening for EIA, Scope studies, Preparation and review of EIS.

(10 hours)

Reference :

1. G. Kiely – Environmental Engineering Irwin/ McGraw Hill International Edition, 1997
2. M. L. Davis and S. J. Masen, Principles of Environmental Engineering and Science, McGraw Hill International Edition, 2004

CPMR 8402 MARINE REFRIGERATION AND AIR CONDITIONING (3-0-0)

Module - I

Reversed Carnot Cycle, Vapour compression cycles, Refrigerating effect, Co-efficient of performance, Cooling capacity, rating of a refrigerating plant, Methods of improving C.O.P. Use of vapour tables, Applied problems.

(5 hours)

Typical Marine Refrigerating Plants with multiple compression and Evaporator system. Refrigeration in liquefied gas carriers.

(5 hours)

Module - II

Principles of Refrigeration , different refrigeration systems, classifications of refrigerators, uses of refrigeration at sea, Cryogenic Technology – Definition, Temperature range, Insulation.

(4 hours)

Different Refrigerants , chemical formula, desired properties (general, physical, chemical, thermodynamic) comparison, effect on environment, Montreal protocol, new refrigerants.

(3 hours)

Design and Construction of various components of refrigeration plants, i.e. Compressor, condenser, evaporator, expansion valves, control and safety equipments.

(10 hours)

Module - III

Operation and maintenance of refrigeration plants, control of temperature in different chambers, charging of refrigerant/oil, purging of air, defrosting methods, trouble shooting.

(6 hours)

Refrigeration of cargo holds, brine system and its operation & maintenance, methods of air circulation in holds, insulating materials, insulation, micro-organism, dead and live cargo, factors affecting refrigerated cargo, container ship refrigeration, preparation for loading cargo, survey of refrigeration equipments.

(6 hours)

Module - IV

Heat load calculation on refrigeration and air conditioning plant.

Air Conditioning : necessity on board ships, different systems, control of room air temperature, humidity, noise, dust and purity. Construction of duct and diffuser, fans, ventilation of accommodation, fire safety balancing of system.

(6 hours)

CPMR 8403 MARINE MACHINE SYSTEM & DESIGN (3-1-0)

Module - I

Manufacturing Methods , Castings, Forgings, Fabrication & Plastic Moulding: Maching Tolerances, Surface Finishes: Application to basic design principles in respect of Function, Available materials, Production Methods, Economics, Aesthetic appeal. Initial and Servicing costs, Analysis of Force, Flow through an Assembly and its effect on the design. Design with reference to Repairs and reconditioning specifically “at sea” work with its normal restrictions and limitations.

Module - II

(5 hours)

Marine Machinery Component Designs & Drawing :

Design and drawing of marine machinery components subject to combined bending, twisting and direct loading like Crankshafts, Propeller Shafts etc., Design and Drawing of Flywheel, Piston, connecting rod, safety valves, Reducing valves, Compression & Torsion springs, Journal bearings, Thrust bearings etc. Design of lifting equipment e.g. Engine room overhead crane, Globe & other valves, Mechanical pilot etc.

(15 hours)

Module - III

Advanced Design of Marine Systems Design & Drawing :

- (a) Power transmission system including Thrust blocks, Intermediate shaft and tail-end Shaft.
- (b) Water cooling systems including pumps, filters, Heat exchangers for Diesel and Steam Engine Plants.
- (c) Lubricating oil systems including pumps, Purifiers pressure by-pass valves.
- (d) Marine Diesel Engine Air starting systems including air-receivers, Compressors and Air starting Valves
- (e) Marine Diesel Engine Scavenge and Exhaust system.
- (f) Marine Diesel Engine Fuel Injection system including fuel pumps and fuel injectors.

(20 hours)

Module - IV

Advanced Design of Marine system Design & Drawing :

- (a) Design of Steam Turbine Plants.
- (b) Design of Gas Turbine Plants.
- (c) Electro-hydraulic Steering gear systems including Rudder, Rudder Stock, Tiller arm, ram and cylinder.
- (d) Life Boat and its launching device.
- (e) Refrigeration Plant.
- (f) Bulk CO₂ system
- (g) Fire fighting system including emergency fire pump.

(20 hours)

CPMR 8404 MARINE INTERNAL COMBUSTION ENGINE – II (3-0-0)

Module - I

Forces and Stresses : Balancing, Overloading, Different type of vibrations & its effects, A/F Vibration.

(2 hours)

Fuel pumps and metering devices : 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 engine, V.I.T & Electronic injection system.

(2 hours)

Effects of viscosity on liquid fuel combustion.

Measuring equipment and its working principle.

Necessity of variable fuel injection system.

Procedures of application on a 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.

(2 hours)

Manoeuvring Systems : Starting and reversing systems of different marine Diesel Engines with safety provisions.

(5 hours)

Module - II

Indicator Diagrams and Power Calculations : Construction 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.

(4 hours)

Lubrication Systems : Lubrication arrangement in Diesel Engines including Coolers & Filters, Cylinder-lubrication, Linear wear and preventive measures, Combinations of lubricating oil its effect and preventive measures.

- a. Improvements in Lubricating oils through use of additives. Type of additives.
- b. Monitoring engines through lubricating oil analysis reports.

(3 hours)

Medium Speed Engines : 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.

- (a) Use of poor quality residual fuels and their consequences.
- (b) Improvements in designs for higher power output.
- (c) Fuels, combustion process – fundamentals.

(4 hours)

Module - III

Automation in modern diesel engine plants : Remote operation, Alarm and fail safe system, Governors and their basic functions Constant speed and overspeed governors. Constructional details and hunting of governor.

- (a) Computerised monitoring and diagnostic application in Propulsion engines. The intelligent engine concept.
- (b) Nox-control of marine Diesel Engines.
- (c) Improvement in designs for increased T.B.O. (Time between Overhauls)

(8 hours)

Maintenance of Diesel Engines : Electronic Governor, Inspection and replacement of various component members such as Piston, Piston ring.

Cylinder Head , Liner, Bearings Driving Chain and gears etc. Crankshaft deflection and alignment, Engine holding down arrangements, Tightening of Tie bolts.

(3 hours)

Module - IV

Trouble shooting in Diesel engines : Hot & Cold corrosion, Crankshaft web slip, X-head bearing problems, microbial degradation in fuel & lub oil.

(7 hours)

Modern trends in development : Current Engines (Sulzer RTA, B&W, CMC & SMC, SEMT Pillistich) Intelligent Engine (Camless concept), Improvement in design for increased TBO.

(3 hours)

U.M.S Operations in ships.

(2 hours)

PEMR 8401 NAVAL ARCHITECTURE - II (3-0-0)

Module - I

Calm water resistance of ships – components of resistance – viscous and wave making, frictional and residuary components; other components – appendages, wind, roughness and fouling, waves etc; shallow water resistance; resistance of high speed craft; model experiments – Froude number, Reynold's number, Froude's law of similarity, ITTc friction line, towing experiments, extrapolation of model experiment results, correlation allowance, EHP – naked hull, trial and service.

(10 hours)

Propulsion & Propellers : Definitions, apparent and real ship wake, Thrust relation between powers, relation between mean pressure and speed, measurement of pitch, Cavitation.

Propeller types, Fixed pitch, Variable Pitch, Ring propeller, Kort nozzles, Voith Schneider Propeller, Propeller theory.

Blade element theory, Law of similitude and model tests with propellers, propulsion tests, Geometry and geometrical properties of screw propellers, ship model correlation, ship trials.

(15 hours)

Module - II

Motion of Ship on waves : Theory of waves, Trochoidal waves, relationship between line of orbit centers and the undisturbed surface, Sinusoidal waves. Irregular wave pattern , Wave spectra, Wave amplitudes, Rolling in unresisting media, rolling in resisting media, practical aspects of rolling, Antirolling devices, Forces caused by rolling and pitching, Heaving and Yawing.

Structural performance – simple beam theory, buoyancy, weight and load curves, shear force and bending moment calculation, deflection of hull girder, midship section modulus and stresses at deck and keel, wave bending moment, classification requirement for section modulus, in-plane stresses, buckling, bulkhead analysis.

(11 hours)

Module - III

Rudder Theory : Action of the Rudder in turning a ship, Force on rudder, Torque on stock, calculation of force torque on nonrectangular rudder, angle of heel due to force torque on rudder, Angle of heel when turning.

Types of Rudder, model experiments and turning trials, Area and shape of rudder, position of rudder, position, stern rudders Bow rudders.

Maneuverability – rudder – aerofoil theory, lift, drag and Centre of pressure; turning moment on a ship due to ship and rudder; turning and control characteristics, control loop; different maneuvering devices.

(10 hours)

Module - IV

Powering Performance Characteristic - Powering performance characteristics, matching engine and propeller, sea trial procedure for speed measurement, change of performance in a sea way and with ageing.

Maneuvering performance Characteristics - Maneuvering trials during sea trials, heel during turn, IMO criteria for collision prevention.

(9 hours)

ELECTIVE – I

PEMR 8403 ADVANCED MARINE HEAT ENGINES (CO-CYCLES) (3 - 0 - 0)

Module – I

Complex Heat Engine Plants :- Combined steam turbine and diesel engine cycles. Combined steam turbine and gas turbine cycles. Combined gas turbine and diesel engine cycles/plants. Different methods of improving the overall thermal efficiency of the entire plant. Design of the most optimum condition and combination of complex plants. Cascade refrigeration plants. Free piston gas generators.

(12 hours)

Module – II

Turbo Blowers and Turbo Compressors :- 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.

(12 hours)

Module – III

Combustion and Flame stabilization :- Combustion of liquid fuels, Atomisation, mixing, combustion curve and different methods of flame stabilization, design & combustion chamber. Spray of fuel. Premixing of gaseous fuels for combustion. Stability of the flame.

(11 hours)

Module – IV

Design of different types of compact Heat Exchangers for different applications : - e.g. Air preheater, Gas and Oil

(10 hours)

PEMR 8404 ADVANCED HYDRAULICS (3 - 0 - 0)

Module – I

Hydraulic Transmission of Power

Hydraulic Motors, Valves, Types of Hydrostatic drives. Types of Hydraulic transmission System- Multimotor open-circuit systems and closed-circuit systems. Application of hydraulic transmission. Advantages and disadvantages of Hydrostatic transmission.

(12 hours)

Module – II

Rotodynamic Transmission : Hydraulic Coupling, Torque converter and characteristics of hydraulic coupling and Torque Converter. Linear Transmission of Hydraulic Power. Circuit for devices like Hydraulic Press, Jack, Accumulator, intensifier and Hydraulic lift.

(12 hours)

Module – III

Fluid Power

Introduction: Applications of control systems. Control Signals Hydraulic Servo mechanisms. Servo valves, valve operated servo mechanisms and Pump controlled servo mechanisms.

(11 hours)

Module – IV

Fluidics

Introduction and definition. Terms used in fluidics, efficiency of a fluidic device Digital devices and analog devices.

(10 hours)

PEMR 8405 ELECTROMAGNETIC INTERFERENCE (EMI) AND ELECTROMAGNETIC COMPATIBILITY (EMC) (3 - 0 - 0)

Module – I

Introduction to causes of EMI

Sources of conducted interference and its characteristics.

- (a) Non-Functional Sources
- (b) Functional Sources of EMI Characteristics of Interference
Bandwidth, Amplitude behaviour, Waveform, Occurrence

(8 hours)

Module – II

Design practice for minimizing conducted interference.

Sources of Radiated Interference and its characteristics Nature of Sources of Radiated Interference,

- (a) Non-functional sources
- (b) Functional Sources
- (c) Electromagnetic Pulse
- (d) Design Practice.

(9 hours)

Interference coupling by conduction and radiation.

- (a) Coupling via conducted path
- (b) Radiation coupling
- (c) Design Practice

Module – III

Grounding and Bonding

Shielding

Cable and connector Shielding

Filtering :

- (a) Filter Design
- (b) Transient Suppression
- (c) Power Line Filters
- (d) Materials and special devices

(14 hours)

Module – IV

Mathematical Model

- (a) Source Model
- (b) Coupling Model
- (c) Susceptor Model

EMC Specification

- (a) Military standards and specification.
- (b) Industrial and Government specification.

EMC Test Plans and procedures.

- (a) Measurement methods for Field strength and for conducted interference.

(14 hours)

PRACTICALS

CPMR 9401 PROJECT (0-0-3)

CPMR 9402 MECH. LAB / VIBRATION LAB / HEAT TRANSFER LAB. (3-0-0)

1. To determine Torque on internal gear and planet gear in epicyclic gear train & holding torque apparatus.
2. To determine the balancing weights required for static & dynamic balancing of an unbalanced system.
3. To calculate the velocity of spin and velocity of precession of a rotor, rotating about a horizontal axis.
4. To find the critical speed of a whirling shaft.
5. To study the torsional vibration of two rotor system.
6. To study damped torsional vibration of single rotor system.
7. To verify Dunkerley's rule for transverse vibration.
8. To study the forced damped vibration of a simply supported beam.
9. To determine the radius of gyration of a compound pendulum.
10. To determine the radius of gyration of a disc using tri-filar suspension.
11. To determine the characteristic curves of sleeve position against speed of rotation in case of:
 - a. Hartnell Governor
 - b. Porter Governor and
 - c. Proell Governor.
12. Heat Transfer Experiments
 - a) To determine the Thermal Conductivity of good conductors.
 - b) To determine the Thermal Conductivity of insulating materials.
 - c) Heat transfer through Fins or extended surface.
 - d) Heat transfer through Forced Convection.

CPMR 9403 STCW CONVENTION & CLASS IV PREPARATORY (0-0-3)

Standards of Training, Certification and Watch-keeping for sea-farers International Conference of 1978 and modifications under STCS 1995.

Basic principles to be observed in keeping an engineering watch.

Criteria for composing the engine room watch. Operation & Watch requirements. Fitness for duty. Protection for marine environment. Requirement for certification; minimum knowledge requirement for certification-theoretical, practical; Duties & responsibilities concerning safety & protection of environment. Requirements for watch keeping duties. Physical training & experience in watch keeping routine; Main and aux. Machines, Pumping systems, Generating plant.

Safety and emergency procedures. First aid.

Minimum requirement for Ratings of Engine Room watch. Special requirement for engineer officers for Oil Tankers, Chemical Tankers and Gas Tankers. Details of operational guidance for In-charge of an engineering watch.

Engineering watch (underway)., General, Taking over watch, Periodic checks of machinery, Engine Room Log, Preventive repair and maintenance; Bridge notification. Navigation in congested water and during restricted visibility, calling the

attention of the Chief Engineer Officer, Watch-keeping personnel.

Engineering Watch (Unsheltered anchorage) - Conditions to be ensured. Watch-keeping (in Port-) Watch arrangements; Taking over the watch; Keeping a watch. Oil, Chemical & Gas Tankers- Principles, characteristics of Cargo; Toxicity hazards; Safety equipments; Protection of Personnel; Pollutions.

Shipboard Applications-Regulations & Code of Practice; Ship design & equipment of Oil, Chemical & Gas Tankers; Ship operation, repair & maintenance; Emergency operations; Training of other personnel. Requirement of continued updating of proficiency, Definition of flag state/port state. Port state control inspection,

Implication of ship's detention.

ISM Code: Statutory certificates and documents to be provided on board for safe trading of vessel and port state control inspection. Basic safety concept on board a merchant vessel & operational knowledge of the relevant IMO instruments like SOLAS, MARPOL, LOADLINE, TONNAGE, COLREG, STCW with latest amendments, how above instruments are adopted under Explicit/Tacit acceptance procedures, how statutory/Class certificates and documents obtained. Surveys special/intermediate/annual to be conducted on ocean going ships. Related conventions for the certificates, period of validity, involvement of ISM, issue of DOC/SMC and maintenance of SMC.

CPMR 9404 FIRE PREVENTION AND FIRE CONTROL LAB. (0-0-3)

(a)Fire hazards & demonstration : Fire triangle, Fire Tetrahedron, Fire-chemistry, Spontaneous combustion, Limits of
(3 hours)

(b)Fire protection built in ships : SOLAS covention, requirements in respect of materials of construction and design
(3 hours)

Fire test, escape means, electrical installations, ventilation system and venting system for tankers. Statutory requirements fire fighting systems and equipments on different vessels, fire doors & fire zones.

(3 hours)

(c)Detection of safety Systems & demonstration: Fire safety precautions on cargo ships and tankers during working
(5 hours)

(d)Fire Fighting Equipment & demonstration: Fire pumps, hydrant and hoses, Couplings, nozzles and international Maintenance, testing and recharging of appliances, preparation, Fire appliance survey. Breathing apparatus types, uses, Principle.

(8 hours)

(e)Fire Control & Practice : Action required and practical techniques adopted for extinguishing fires in accommodation organization for fire and emergencies. Combustion products and their effects on life safety. Fire signals and muster. Fire drill. Leadership and duties, Fire control plan, Human behaviour, Special precautions for prevention /fighting fire in tankers, chemical carriers, Gas carriers, safe working practice.

(8 hours)

- i) Study & Testing and operation of Jet and spray type nozzles and fire hoses.
- ii) Operation, charging and maintenance of portable fire extinguishers
- iii) Operation, use and functions of Breathing apparatus.
 - (a) Self contained type.
 - (b) Bellow Type.
- iv) Study of working of life boat and provisions for life boat.
- v) Use of life jackets.
- vi) Study of construction and operational details of life raft giving importance to manual and hydrostatic release

(15 hours)

CPMR 9405 SEMINAR (0-0-2)

To be given by students in subjects as determined by teacher.

8TH Semester

CPMR 8405 SHIP OPERATION AND MANGEMENT (3-1-0)

Module - I

Brief History of shipping : Modern shipping Practice. Marine vehicles and cargo, care of cargo against damage. Development in Shipping and cargo handling Multimodal transportation, Factors affecting universal adoption. Liner and tramp shipping services.

(3 hours)

Conference systems – Organisation & concerns Shippers Council. Chartering, Charter parties. Theory of freight rates and fares. Rate fixation machinery and government control. Responsibilities of ship owners & charterers. Tanker chartering. Freight rates & fares – various terms, influencing factors, market pricing.

(5 hours)

Bill of lading – Function & Uniqueness & related problems. Carriage of goods by sea act . Cargo Surveys and protests.

(3 hours)

Module – II

Marine Insurance : **Underwriting and loss adjusting principles applied to Marine cargo insurance. Hull / machinery policy, particular average. General average , P & I**

Clubs – making claims.

(6 hours)

Shipping Companies – Organisational structure, Restructuring on the basis of functional coherence, ship management companies. Turn around strategy for sink shipping companies. Ownerships of vessels, Shipping Company and its administration.

(5 hours)

Module – III

Capitalization and finance : **Characteristics, cost ratios & allied definition. Sources, Financing package, Lender security, Relation between Insurance premium, & non-conformity / condition of class. Economics of new and second hand tonnage. Subsidies, procedure & implication of buying & selling new / old vessels.**

(5 hours)

Ship Operations : Planning sailing schedules. Influencing factors, Unbalance in sea trade, counter – action, Voyage estimation, Manning of ships, engagement & discharge of crew. Economic factors. Commercial Shipping

(5 hours)

Module – IV

Merchant Shipping act : Registration of ship, Ship's papers. Port Procedures. Pilotage, Flags of convenience, flags of discrimination and their effects on shipping. Duties regarding pollution. Collision, Explosion, fire etc. Vessels in distress. Shipping casualties penalties under Merchant Shipping Act.

(8 hours)

Marine Fraud : Genesis and Prevention.

Indian Shipping : Current scenario and few case studies.

(5 hours)

CPMR 8406 MARINE CONTROL ENGG. & AUTOMATION (3-1-0)

Module – I

Measuring Devices :

Pressure, Temperature, Level and Flow measuring devices. Miscellaneous Instruments;

- (a) Shaft Power meters, Unbonded Strain Gauges, Bonded Strain Gauges, Troductor
- (b) Tachometers (Electric and Mechanical)
- (c) Water Purity Meters: Salinity indicator, PH meters
- (d) Oil in Water Monitor: Photo Electric Cells, Photo Conductive Cells, Photo Voltaic Cells.
- (e) Viscosity Sensors.
- (f) Oil Mist Detector.

Signal Transmitting Devices: Flapper Nozzle, Electro Pneumatic signal converter, Electrical signal transmission. Pneumatic, Types of Controllers: hydraulic electric and electronic controllers for generation for control action, Variable Inductance and capacitance transducer, Force Balance Transducer, Synchros.

(15 hours)

Module – II

Automatic Control Theory: Process Control, Feedback, Closed Loop and Open Loop Control, Two Step (On-Off) Control, Modulating Control, Off Set or Droop, Desired Value, Set Value, Proportional, Integral and Derivative Control, Split Range, Ratio and Cascade Control, System Response: Distance Velocity, Measurement and Transfer and Transfer Lags.

(6 hours)

Automatic Controllers: Functions of a proportional, Integral and Derivative Action Controllers, Stacked Type, Electronic, and Pulse type Controllers, Controller Adjustments Relays On-Off Cut Off Switches.

(4 hours)

Correcting Units : Diaphragm actuators, Valve-positioners, piston actuators, Electro-pneumatic transducers. Electro-hydraulic actuators and Electric actuator control valves.

(2 hours)

Module- III

System Analysis

Examination of system behaviour as a result of different inputs with respect to time or frequency response.

Mathematical Models: System behaviour considered in a mathematical sense using Differential Equation. System description using mathematics terms for Mechanical, Electrical, Thermal and Liquid Level system.

Laplace Transforms, Transfer Functions and Block Diagrams. Concept of stability, Routh & Hurwitz stability criteria. Analysis of System Performance under dynamic or transient operating condition using Laplace Transforms. Performance characteristics. Nyquist stability criterion.

(13 hours)

Module – IV

Application of Controls on ships: Marine Boiler-Automatic Combustion control, Air/fuel ratio control, feed water control 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, and piston cooling water and scavenge air, fuel oil viscosity control, working of control system during Manoeuvring of Direct Reversing Diesel Engine Bridge control of main machinery. Instrument for UMS classification.

(20 hours)

CPMR 8407 MARINE AUXILIARY MACHINERY – III (3-0-0)

Module – I

Ship protection and maintenance – Corrosion – causes and prevention, painting and cathodic protection, sacrificial anodes; overhaul procedure of machinery, maintenance of stores, ISM code.

(10 hours)

Module – II

Control of ship's behaviour – hydraulic pumps and systems; Rotary vane, Rapson slide steering gears – mechanism and operation, telemotor arrangement for bridge control, emergency arrangement; bow thrusters and their location; Dynamic positioning systems; Motion stabilization – bilge keels, active and passive roll stabilizers.

(10 hours)

Anchoring and Mooring – Anchors, anchor windlass, hawse pipe, anchoring arrangement; mooring fittings, mooring and towing winches, mooring arrangement in forward and aft.

(5 hours)

Module – III

Dry cargo handling – cargo winches, light and heavy derrick systems, cranes; types of cargo hatch covers and their operation; automatic loading and unloading of bulk cargo; RORO ships, stern and side doors for horizontal loading of cargo and vehicles.

(8 hours)

Module – IV

Ventilation – Ventilation of cargo holds, pump rooms, CO₂ and battery rooms, air change requirements; Total air requirement of engine room for efficient combustion – air changes, compressed air system in engine room; Regulatory requirement for ventilation, ventilator openings on deck, fans, their installation and maintenance.

(5 hours)

Vibration and Noise – Causes and types of vibration- hull, propeller and machinery, resonance and other harmful effects, vibration dampers, vibration measurement and analysis; causes of shipboard noise, dB levels, noise level measurement, rule requirement, structure-borne and air-borne noise, sound isolators and absorbers, noise protection.

(7 hours)

CPMR 8408 MARINE BOILER & STEAM ENGINEERING (3-1-0)

Module – I

General considerations governing the design of Boilers: Types of marine boilers, comparison of smoke tube and water tube boilers; Destructive and Non Destructive tests on plates, rivets, welded seams, classification societies requirements for boiler construction.

(2 hours)

Smoke Tube Boilers : Various types in Marine use, Principal dimensions and staying of flat surface of multitubular cylindrical Boilers. Vertical Auxiliary Boilers.

(2 hours)

Water Tube Boilers : General description with sketches of principal types of boilers in marine use, Super heater, Economizer, Air pre-heater & Steam pre- heater . Circulation and use of unheated Down comers in highly rated boilers. Superheat temperature control, Attemperators and De-superheaters.

(6 hours)

Waste heat Boilers : Waste heat recovery calculation, Lamont exhaust gas boiler. Scotch composite Boiler, Cochran exhaust gas and composite boiler.

(3 hours)

Exhaust Gas (Spanner, Composite boiler), Forced water circulation boiler, Double evaporation boilers.

(2 hours)

Module - II

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 valves, Retractable type soot blower etc.

(8 hours)

Operation Care & Maintenance : Precommissioning procedures, Hydraulic tests, steam raising and operating procedures.

(3 hours)

Refractory : Purposes of Refractory, types of Refractory and reasons for failure.

(2 hours)

Oil Burning :

1. Procedures of liquid fuel burning in open furnace.
2. Various types of atomizer.
3. Furnace arrangement for oil burning.
4. Boiler control system i.e. master control, fuel control, air control and viscosity control.

(5 hours)

Module - III

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

(2 hours)

Layout of Plant : General layout of plant & description of a modern geared steam turbine installation including auxiliaries in modern use.

(2 hours)

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

(2 hours)

Constructional details : Types of blades, method of fixing , solid built-up & drum rotor for impulse and reaction turbines, castings for HP and LP impulse and reaction turbines, diaphragms, nozzles, glands, carbon glands, labyrinth packing glands, main bearings and thrust bearings.

(5 hours)

Module - IV

Lubrication of Turbines : Suitable oils and their properties, lubrication of main bearings, thrust bearings, thrust bearings and gears. Gravity and pressure lubrication-oil system and emergency lubrication arrangement.

(3 hours)

Reduction gears : Reduction ratio, type of gear teeth, gear construction various arrangement of marine gearing , gear defects, flexible coupling, quill shaft.

(2 hours)

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

(2 hours)

Operation and maintenance : Turbine drain system, turbine gland steam, 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 fault finding.

Alignment checking . : By bridge gauge and poker gauge, allowances for expansion, sliding foot, thrust bearing static and dynamic balancing.

(9 hours)

PEMR 8402 MARITIME REGULATION (2-0-0)

Module – I

M. S. Act

Provisions of the Act :

Purpose of the act.

Preliminary & Definition.

Formation of National Shipping Board & its power.

General Administration – D.G, MMD. Surveyor, Shipping Office, Seaman's welfare and employment.

Procedure for register Indian ship.

Application, marking, Ownership, Documents to be retained , Change of Ownership, name of the ship.

National columns for Indian ships.

Certificates of Officers: Grades of certificates, Examination to grant of certificates, Loss of Certificates, Certificated officers required for foreign ships.

Duties of shipping master.

Safeties and other certificates for construction of ships.(Safety certificate, safety equipment certificate, safety radio certificates, Exemption certificates etc.)

Marine Board formation & power.

Provisions relating to cancellation & suppression of certificates.

Break & Salvage – Salient Features.

STCW – 95 – Brief history & synopsis of STCW 95 & minimum manning requirement.

(7 hours)

Module – II

SOLAS :

Brief description of Articles of the International Convention for safeties of life at sea, 1974.

Chapter – I – Part 'a' & 'b' Surveys & certificates.

Chapter – II – 1 (Part A,B,C,D,E)

Chapter – II – 2 (Part A,B,C,D,E,F,G)

Chapter – III – Part A & B

Chapter – IV – Part A,B & C

Chapter – V – Safety of Navigation

Chapter – VI – Carriage of Cargo (Part A,B,C)

Chapter – VII – Part A,B,C,D & E

IMDG, IGC, IBC, INF codes

Chapter – VIII , Chapter IX & X
Chapter – XI-1 & Chapter XI-2 & XII

(8 hours)

Module – III

Marpol :

- (i) a. International Convention for prevention of pollution from ships, 1973 & its articles.
b. 1978 Protocol & its articles.
c. 1997 Protocol & its articles.
- (ii) Annex – I & regulation & appendices.
- (iii) Annex – II & its regulation & appendices.
- (iv) Annex III, IV & V & VI.
- (v) New Annexes like water ballast, exhaust, emission etc.

(8 hours)

Module – IV

- 1. Statutory certificates & their validity periods.
- 2. Amendments at different chapters, annexes & latest status.
Procedure of amendments, tacit acceptance etc.
- 3. ISPS, FSS codes, ISM
- 4. Collision Regulations (Col - Reg)
- 5. Surveys, Enhanced survey, HSSC
IACS, Classification Society.

ELECTIVE – II

PEMR 8406 DOBLE HULL TANK VESSELS (3-0-0)

Module - I

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.

(9 hours)

Module – II

Design considerations, 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.

(12 hours)

Module – III

Structural design, 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.

(12 hours)

Module – IV

Cargo handling system, 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.

Economic aspects, fast loading discharging of oil cargo, quicker cleaning, ballasting and deballasting, larger number of trips per year.

(12 hours)

PEMR 8407 RENEWABLE ENERGY SOURCES & APPLICATIONS (3-0-0)

Module – I

Principles of Renewable Energy :

Introduction. Fundamentals, Scientific principles of renewable energy. Technical implications, social implications.

Solar Radiation :

Introduction, Extra terrestrial Solar Radiation. Components of Radiation. Geometry of Earth & Sun. Geometry of the Collector. Solar Beam.

Effects of Eastern Atmosphere. Measurement.

Estimation of Solar Radiation. Problems.

Solar Water Heating:

Introduction: Heat Balance. Unsheltered & Sheltered Heaters, Systems with Separate storage.

Selective Surfaces. Evacuated collectors. Uses of Solar Heat. Air Heater. Space Heating & Cooling.

Water desalination. Solar Ponds. Solar Concentrators Electrical Power systems. Problems.

(10 hours)

Module - II

Photo Voltaic Generation :

Silicon P-N Junction. Photo absorption. Solar Radiation Input. Photo Voltaic Circuit properties & Loads, Limit to Cell efficiency. Solar Cell Construction. Types & adaptation of Photo voltaic. Other types of Photo voltaics & thermoelectric Generation. Problems.

Wind Power :

Introduction. Turbine Types & Terms. Linear Momentum & Basic Theory. Dynamic Matching. Stream Tube Theory, Characteristics of the Wind. Power Extraction by a Turbine, Electricity Generation.

Mechanical Power. Total systems. Problems.

(15 hours)

Module – III

Wave Energy :

Tidal Power :

Introduction. The cause of Tides. Enhancement of Tides. Tidal Flow Power. Tidal Range Power. World Range Power sites. Problems.

Ocean Thermal Energy Conversion :

Principles. Heat Exchangers. Pumping Requirements. Other practical considerations, Problems.

Hydro Power & Geothermal Energy.

Brief Review & Description

Energy storage & Distribution :

Importance of Energy Storage & Distribution. Biological Storage. Chemical Storage. Heat Storage.

Electrical Storage. Fuel Cells, Mechanical Storage. Distribution of Energy Problems.

(10 hours)

Module - IV

Bio mass :

Principles of using Biomass, Availability.

Economics.

Biofuels

Introduction. Biofuel Classification, Thermochemical, Biochemical. Agrochemical. Biomass Production for energy farming, Energy farming-advantages & disadvantages. Geographical Distribution. Crop yield, Energy analysis. Direct combustion for heat. Domestic cooling & heating, Crop yield, Energy analysis. Direct combustion for heat. Domestic cooling & heating, Crop drying. Process heat & electricity.

Hyrolysis. Solid, Liquid, Gases, Hydrogen Reduction. Acid & enzyme hydrolysis. Conversion of oil (coco) to Ester. Methanol liquid Alcoholic fermentation. Directly from sugar cane, sugar Beet. Starch crops. Cellulose. Ethanol fuel use. Ethanol production.

Anaerobic Digestion for Biogas-Basic process & energetics Digester sizing. Working Digesters. Agrochemical fuel Extraction-advantages & disadvantages.

(10 hours)

PEMR 8408 LUID CIRCUITS & CONTROL (3-0-0)

Module - I

Introduction – Historical background.

System components and functions : Valves, Tank, Flexible hose, piping and fittings. Seal and packing, actuators, pipe couplings, Assembly of different hydraulic components without using piping, e.g : Vertical/Horizontal stacking, manifold block etc. Different types of filters, instruments and control elements, e.g. Float switch, thermostat, pressure switch, etc. Different valves for pressure control, velocity and discharge control, direction control, etc. Symbols of components along with various hydraulic terms.

(11 hours)

Module - II

Different control systems, Hydraulic and Pneumatic systems, Typical circuit for pump set, Advantages of fluid circuit.

Fluid for hydraulic and pneumatic control; properties of liquids for hydraulic control, hydraulic reservoir, properties of air for pneumatic control, reservoir for compressed gases and compressed air, Compressibility and Inertia loading, Hydraulic stiffness, System natural frequency and allied problems.

(10 hours)

Module – III

Fluid power units :- Pumps, compressors and blowers, Positive displacement pumps:- reciprocating pump, gear pump, vane pump, screw pump, rotary piston pump; Pressure accumulators and intensifiers.

System Circuits - Linear circuits, regenerative circuits, accumulator circuits, intensifier circuits.

Open loop and closed loop system, block diagram, application of Laplace transform, transfer function, Characteristic equation different physical systems of first order and second order, spring-mass damper systems, liquid level systems, thermal systems etc, systems of nth order.

(15 hours)

Module – IV

Stability of a system – Root locus methods, Rouths criterion. Fluid logic and control systems.

Application of hydraulic control in machine tools and other devices.

Hydraulic Systems – Hydraulic press, hydraulic crane, hydraulic lift, hydraulic riveter etc. Hydraulic systems – Fluid coupling and fluid torque converter.

(9 hours)

PRACTICALS

CPMR 9406 ENTREPRENEURSHIP PROJECT (0-0-3)

1. The project will be for 2 credits and 3 periods per week is to be devoted for the project.
2. The teacher has to give elementary idea about entrepreneurship through classroom teaching before a project report is prepared by the student.
3. The teacher will first cover the following topics through lecturer and exercises on motivation and games.
 - Entrepreneurship concept, EDP in India, Indian middle class value.
 - Entrepreneurial qualities, motivation perception, risk taking etc.
 - Market survey, Business opportunity guidance
 - Role of DIC, SFC, Bank etc.
 - Working capital assessment, Balance Sheet, Costing, Book keeping.
 - Decision making, Leadership, Communication skill
 - Preliminary Project Report, preparation for a specific product and submission of the report.
4. Evaluation
 - (a) The teacher has to conduct tests/ motivational exercises to assess entrepreneurial capability of the student (20%)

- (b) The teacher has to test the knowledge of the student on the above topic through a written test. (20%)
- (c) The teacher has to evaluate the report submitted by the student (i.e. Project report within 50 pages) (60%).

Reference Books

1. Entrepreneurship of Small Industries, M. V. Deshpande, Deep and Deep Publication
2. Management of Small Scale Industry, Vasant Desai, Himalaya Pub. House