TAS 301

MATHEMATICS-III

L	T	P
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Unit - I : Integral Transforms **8**

Fourier integral, Fourier complex transform, Fourier sine and cosine transforms and applications to simple heat transfer equations.

Z – transform and its application to solve difference equations.

Unit - II : Functions of a Complex Variable - I **9**

Analytic functions, C-R equations and harmonic functions, Line integral in the complex plane, Cauchy's integral theorem, Cauchy's integral formula for derivatives of analytic functions, Liouvilles theorem, Fundamental theorem of algebra.

Unit - III : Functions of a Complex Variable - II **8**

Representation of a function by power series, Taylor's and Laurent's series, Singularities, zeroes and poles, Residue theorem, evaluation of real integrals of type $\int_0^{2\pi} f(\cos\theta, \sin\theta)\, d\theta$ and $\int_{-\infty}^{+\infty} f(x)\, dx$, Conformal mapping and bilinear transformations.

Unit - IV : Statistics and Probability **8**

Moments, Moment generating functions, Skewness, Kurtosis,Correlation and Regression, Binomial distribution, Poisson distribution, Normal distribution.

Unit - V : Curve Fitting and Solution of Equations **5**

Method of least squares and curve fitting of straight line and parabola, Solution of cubic and bi-quadratic equations.

TME-301

MATERIAL SCIENCE

L	T	P
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Unit-I

Introduction : Historical perspective, importance of materials. Brief review of modern & atomic concepts in Physics and Chemistry. Atomic models, Periodic table, Chemical bondings. 4

Crystallography and Imperfections : Concept of unit cell space lattice, Bravais lattices, common crystal structures, Atomic packing factor and density. Miller indices. X-ray crystallography techniques. Imperfections, Defects & Dislocations in solids. 3

Unit-II

Mechanical properties and Testing : Stress strain diagram, Ductile & brittle material, Stress VS strength. Toughness, Hardness, Fracture, Fatigue and Creep. Testings such as Strength testings, Hardness testing, Impact testings, Fatitue testing Creep testing, Non-destructive testing (NDT) 4

Microstructural Exam : Microscope principle and methods. Preperation of samples and Microstructure exam and grain size determination. Comparative study of microstructure of varuious metals & alloys such as Mild steel, CI, Brass. 2

Phase Diagram and Equilibrium Diagram : Uniary and Binary diagrams, Phase rules. Types of equilibrium diagrams: Solid solution type, eutectic type and combination type. Iron-carbon equilibrium diagram. 4

Unit-III

Ferrous materials : Iron and steel manufacture, furnaces. Various types of carbon steels, alloy steels and cast irons, its properties and uses. 3

Heat Treatment : Various types of heat treatment such as Annealing, Normalizing, Quenching, Tempering and Case hardening. Time Temperature Transformation (TTT) diagrams. 2

Non-Ferrous metals and alloys : Non-ferrrous metals such as Cu, Al, Zn, Cr, Ni etc. and its applications. Various type Brass, Bronze, bearing materials, its properties and uses. Aluminum alloys such as Duralumin. Other advanced materials/alloys. 3

Unit-IV

Magnetic properties : Concept of magnetism - Dia, para, ferro Hysteresis. Soft and hard magnetic materials, Magnetic storages. 2

Electric properties : Energy band concept of conductor, insulator and semi-conductor. Intrinsic & extrinsic semi-conductors. P-n junction and transistors. Basic devices and its application. Diffusion of Solid. 3

Super conductivity and its applications. Messier effect. Type I & II superconductors. High Te superconductors. 2

Unit-V

Ceramics : Structure types and properties and applications of ceramics. Mechanickal/Electrical behaviour and processing of Ceramics. 2

Plastics : Various types of polymers/plastics and its applications. Mechanical behavious and processing of plastics. Future of plastics. 2

Other materials : Brief description of other material such as optical and thermal materials concrete, Composite Materials and its uses. 2

Performance of materials in service: Brief theoretical consi-deration of Fracture, Fatigue, and Corrosion and its control. 3

References :

1. W.D. Callister, Jr, - Material Science & Engineering Addition-Wesly Publishing Co.
2. Van Vlash - Elements of Material Science & Engineering John Wiley & Sons.
3. V. Raghvan - Material Science, Pretice Hall of India
4. Narula - Material Science, TMH
5. Srivastava, Srinivasan - Science of Materials Engineering Newage.
6. K.M. Gupta – Material Science.

TME 302

APPLIED THERMODYNAMICS

L T P
3 1 0

Unit-I

Review of Thermodynamics : Brief review of basic laws of thermodynamics, Helmholtz & Gibb's function, Mathematical conditions for exact differentials. Maxwell Relations, Clapeyron Equation, Joule-Thompson coefficient and Inversion curve. Coefficient of volume expansion, Adiabatic & Isothermal compressibility. Availability & Irreversibility. 7

Unit-II

Properties of Steam and Boilers : Properties of steam. Use of stream table & Mollier Chart. Steam generators-classifications. Working of fire-tube and water-tube boilers, boiler mountings & accessories, Draught & its calculations, air pre heater, feed water heater, super heater. Boiler efficiency, Equivalent evaporation. Boiler trial and heat balance. 6

Unit-III

Steam Engines : Rankine and modified Rankine cycles, working of stream engine Indicator diagram. 4

Steam & Gas Nozzles : Flow through nozzle, variation of velocity, area and sp. Volume, nozzle efficiency, Throat area. Super saturated flow. 4

Unit-IV

Vapour Power cycles: Effect of Pressure & temp. on Rankine cycle Reheat cycle, Regenerative cycle, feed water heaters.

Steam Turbines : Classification, impulse and reaction turbines, Staging, Stage and overall efficiency, re-heat factor, bleeding, comparison with steam engines. Governing of turbines. Velocity diagram of simple & compound multistage impulse & reaction turbines & related calculations work done efficiencies of reaction, impulse Reaction Turbines, state point locus, Reheat factor. 6

Unit-V

Gas Turbine & Jet Propulsion: Gas turbine classification Brayton cycle, Principles of gas turbine, Gas turbine cycles with intercooling, reheat & regeneration stage efficiency, polytropic efficiency. Deviation of actual cycles from ideal cycles. 5

Introduction to the principles of jet propulsion, Turbojet & turboprop engines & their processes, Introduction to Rocket Engine. 4

References :

1. Applied thermodynamics by Onkar Singh, New Age International (P) Publishers Ltd.
2. Thermal Engg. By P.L. Blallaney, Khanna Publisher
3. Theory of Stream Turbine by W.J. Kearton
4. Steam & Gas Turbine by R.Yadav, CPH Allahabad
5. Thermal Engg. By R.K. Rajput, Laxmi Publication
6. Turbine Compressons & Fans by S.M. Yahya, TMH
7. Gas Turbine, by Ganeshan, Tata McGraHill Publishers.
8. Heat Engines byb R. Yadav, CPH Allahabad.
9. Engg. Thermodynamics by Nag
10. Engg. Thermodynamics by C.P. Arora..
11. Gas turbine Theory & Practice, by Cohen & Rogers, Addison Weslay Long man Ltd.

TCE -301

FLUID MECHANICS

L	T	P
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UNIT I:

Introduction: Fluids and continuum; Physical properties of fluids: Viscosity, Compressibility, Surface Tension, Capillarity, Vapour Pressure; Cavitation; Classification of fluids including rheological classification. [03]

Fluid Statics: Pascal's law; Pressure-density-height relationship; Measurement of pressure by Manometers and mechanical gauges; Pressure on plane and curved surfaces; The Hydrostatic law; Total Pressure and Centre of pressure; Buoyancy; Stability of immersed and floating bodies; Fluid masses subjected to uniform horizontal and vertical accelerations. [03]

Dimensional Analysis: Units and Dimensions, Dimensional analysis, Rayleigh's method, Buckingham's $\prod$ theorem, Important dimensionless numbers used in fluid mechanics and their significance. [02]

UNIT II:

Hydraulic Similitude and Model Studies: Model and prototype; Similitude; Geometric, Kinematic and Dynamic similarity; Model Laws; Un-distorted model studies. [01]

Fluid Kinematics: Description of Fluid flow: Lagrangian and Eulerian approach; Types of fluid Flows: Steady and unsteady, Uniform and non-uniform, Laminar and turbulent flows, 1, 2 and 3-D flows; Stream lines, Path lines and Streak lines; Stream tube; Acceleration of a fluid particle along a straight and curved path; Differential and Integral form of Continuity equation; Rotation, Vorticity and Circulation; Elementary explanation of Stream function and Velocity potential; Flow net characteristics, uses and experimental and graphical methods of drawing. [03]

Fluid Dynamics-I: Concept of control volume and control surface, Reynolds Transport Theorem, Introduction to Navier-Stokes Equations, Euler's equation of motion along a streamline and its integration, Bernoulli's equation and its applications – Pitot tube, Flow through orifices, Mouthpieces, Nozzles, Notches, Weirs, Sluice gates under free and submerged flow conditions; Free and Forced vortex motion. [04]

UNIT III:

Fluid Dynamics-II: Impulse-Momentum Principle; Moment of momentum equation; Momentum equation application to stationary and moving vanes, pipe bends, ***Problems related to,*** combined application of energy and momentum equations, flow measurements, determination of coefficients of discharge, velocity and contraction and energy loss. [02]

Laminar Flow: Reynolds Experiment**;** Equation of motion for laminar flow through pipes; Flow between parallel plates; Kinetic energy and Momentum correction factors; Stokes law; Flow through porous media; Darcy's Law; Fluidization; Measurement of viscosity; Transition from laminar to turbulent flow. [03]

Turbulent Flow: Turbulence; Equation for turbulent flow; Reynolds stresses; Eddy viscosity; Mixing length concept and velocity distribution in turbulent flow; Working principle of Hot-wire anemometer and Laser Doppler anemometer (LDA). [03]

UNIT IV:

Boundary Layer Analysis: Boundary layer thicknesses; Boundary layer over a flat plate; Laminar boundary layer; Application of Von-Karman Integral Momentum Equation; Turbulent boundary layer; Laminar sub-layer; Hydro-dynamically Smooth and rough boundaries; Local and average friction coefficient; Total drag; Boundary layer separation and its control. [03]

Flow Through Pipes: Nature of turbulent flow in pipes; Equation for velocity distribution over smooth and rough surfaces; Major and Minor energy losses; Resistance coefficient and its variation; Hydraulic gradient and total energy lines; Flow in sudden expansion, contraction, diffusers, bends, valves and siphons; Concept of equivalent length; Branched pipes; Pipes in series and parallel; Simple pipe networks. [05]

Unit V:

Compressibility Effects in Pipe Flow: Transmission of pressure waves in rigid and elastic pipes; Water hammer; Analysis of simple surge tank excluding friction. [03]

Ideal (Potential) Fluid Flow: Importance; Elementary concept of the uniform flow, the source flow, the sink flow and the free vortex flow. [02]

Flow Past Submerged Bodies: Drag and lift, Types of drag force, Drag on sphere, Cylinder and airfoil; Circulation and Lift on a cylinder and airfoil; Magnus effect. [03]

REFERENCES:

1. R J Fox: Introduction to Fluid Mechanics
2. Hunter Rouse: Elementary Mechanics of Fluids, John Wiley and sons, Omc/ 1946.
3. L H Shames: Mechanics of Fluids, McGraw Hill, International student edition.
4. Garde, R J and A G Mirajgaonkar: Engineering Fluid Mechanics (including Hydraulic machines), second ed., Nemchand and Bros, Roorkee, 1983.
5. K L Kumar: Engineering Fluid Mechanics
6. Munson, Bruce R, Donald F Young and T H Okishi, Fundamentals of Fluid Mechanics, 2nd ed, wiley Eastern.
7. V Gupta and S K Gupta, Fluid Mechanics and its Applications, Wiley eastern ltd.
8. Som and Biswas: Introduction to Fluid Mechanics and Machines, TMH.
9. R K Bansal: Fluid Mechanics and Hydraulic Machines
10. Modi and Seth: Fluid Mechanics and Fluid Machines

TME-303

STRENGTH OF MATERIALS

L	T	P
3	1	0

UNIT-I

Review: Review of simple and compound stresses, Mohr's Circle. 1

3-D Stress, Theory of failure, Castingliona's Theorem, Impact load: Three-dimensional state of stress & strain, equilibrium equations. Generalized Hook's Law. Theories of Failure. Castigliano's Theorem. Impact load & stresses. 4

Airy's Stress Fuction: Airy's stress function and its applications 3

UNIT –II

Stresses in Beams: Review of pure Bending**.** Direct and shear stresses in beams due to transverse and axial loads, composite beams. 2

Deflection of Beams: Equation of elastic curve, cantilever and simply supported beams, Macaulys method, area moment method, fixed and continuous beams. 4

Torsion: Review of Torsion, combined bending & torsion of solid & hollow shafts. 2

UNIT-III

Helical and Leaf Springs: deflection of springs by energy method, helical springs under axial load and under axial twist (respectively for circular and square cross sections) axial load and twisting moment acting simultaneously both for open and closed coiled springs, laminated springs. 4

Columns and Struts: Combined bending and direct stress, middle third and middle quarter rules. Struts with different end conditions. Euler's theory and experimental results, Ranking Gardon Formulae, Examples of columns in mechanical equipments and machines. 4

UNIT-IV

Thin cylinders & spheres: Hoop and axial stresses and strain. Volumetric strain. 2

Thick cylinders: Radial, axial and circumferential stresses in thick cylinders subjected to internal or external pressures, Compound cylinders. Stress due to interference fits. 5

UNIT-V

Curved Beams: Bending of beams with large initial curvature, position of neutral axis for rectangular, trapezoidal and circular cross sections, stress in crane hooks, stress in circular rings subjected to tension or compression. 4

Unsymmetrical Bending : Properties of beam cross-section, slope of beutral axis, stress and deflection in unsymmetrical bending, determination of shear center and flexural axis (for symmetry about both axis and about one axis) for I-section and channel-section. 5

Books :

1. Strength of Materials by Ryder
2. Strength of Materials by Singer
3. Strength of Materials by Timoshenko and Timoshenko & Yσung

4. Engineering Mechanics of Solids by Popov
5. Mechanics of Materials by Bear Jhonson
6. Strength of Materials by R.K. Rajput
7. Strength of Materials by Ramamrutham & Narain
8. Advanced Mechanics of Solids by Kazami, TMH

TME- 351

MATERIAL SCIENCE AND TESTING LAB

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A. Material Science Lab Experiments : (at least 5 of the following)

1. Making a plastic mould for small metallic specimen.
2. Specimen preparation for micro structural examination-cutting, grinding, polishing, etching.
3. Grain Size determination of a given specimen.
4. Comparative study of microstructures of different given specimens (mild steel, gray C.I., brass, cooper etc.)
5. Heat treatment experiments such as annealing, normalizing, quenching, case hardening and comparison of hardness before and after.
6. Material identification of say 50 common items kekpt in a box.
7. Faradays law of electrolysis experiment.
8. Study of corrosion and its effects.
9. Study of microstructure of welded component and HAZ. Macro & Micro examination.

B. Material Testing Lab Experiments : (at least 5 of the following)

1. Strength testing of a given mild steel specimen on UTM with full details and s-e plot on the machine.
2. Other tests such as shear, bend tests on UTM.
3. Impact testing on impact testing machine like Charpy, Izod or both.
4. Hardness testing of given specimen using Rockwell and Vickers/Brinell testing machines.
5. Spring index testing on spring testing machine.
6. Fatigue testing on fatigue testing machine.
7. Creep testing on creep testing machine.
8. Deflection of beam experiment, comparison of actual measurement of deflection with dial gauge to the calculated one, and or evaluation of young's modulus of beam.
9. Torsion testing of a rod on torsion testing machine.
10. Study of non-destructive testing methods like magnetic flaw detector, ultrasonic flaw detector, eddy current testing machine, dye penetrant tests.

TMM-351

MACHINE DRAWING-I

L	T	P
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[Sr. No. 1 to 8 common to Mechanical Engineering/Industrial & Production Engineering]

1. Introduction : Graphic language, Classification of drawings, Principles of drawing; IS codes for Machine drawing, Lines, Scales, Sections, Dimensioning, Standard abbreviations.
2. Orthographic Projections : Principles of first and third angle projections, drawing and sketching of machine elements in orthographic projections, spacing of views.
3. Screwed (Threaded) fastners : Introduction, Screw thread nomenclature, Forms of threads, Thread series, Thread designation. Representation of threads, Bolted joints, Locking arrangements for nuts, foundation bolts.
4. Keys and Cotters : Keys, Cotter Joints.
5. Shaft couplings : Introduction, Rigid and flexible coupling.
6. Riveted Joints : Introduction, Rivets and riveting, Rivet heads, Classification of riveted joints.
7. Assembly drawing : Introduction, Engine parts, Stuffing box etc.
8. Free hand sketching : Introduction, Need for free hand sketching, Free hand of sketching of some threaded fastners and simple machine components.

*9 Machine components drawing ; Assembly drawing of simple Marine components in Orthographic projection from isometric views e.g. Bilge strainer, cylinder relief valve, Fuel control limit, control valves & Pedestal bearing.

(* indicates compulsory for B.Tech Marine Engg.)

References:

1. N.Siddeshwar, P.K. Kannaiah, V.V.S. Shastry : Machine drawing, TMH, New Delhi.
2. K.L. Narayana, P.Kannaiah, K.V.enkat Reddy : Machine drawing, New Age International Publications, 2nd edition.
3. Engineering drawing practice for schools and colleges, SP46-1998 (BIS)
4. Marine Engineering Drawing Reeds series Thomos Reed Publication.

TCE-351

FLUID MECHANICS LAB

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1. To measure the surface tension of a liquid.
2. To determine the metacentric height of a ship model experimentally.

3. To study the transition from laminar to turbulent flow and to determine the lower critical Reynolds number.
4. To determine the coefficients of velocity, contraction and discharge of an orifice (or a mouth piece) of a given shape. To plot the flow net for a given model using the concept of electrical analogy.
5. To find the velocity distribution in a pipe and hence to compute the discharge by integrating the velocity profile obtained.
6. To verify the Bernoulli's theorem.
7. To calibrate an orifice meter and venturimeter and to study the variation of the coefficient of discharge with the Reynolds number.
8. To calibrate and to determine the coefficient of discharge for rectangular and triangular notches.
9. To verify Darcy's law and to find out the coefficient of permeability of the given medium.
10. To verify the momentum equation.
11. To study the boundary layer velocity profile and to determine boundary layer thickness and displacement thickness. Also to determine the exponent in the power law of velocity distribution.
12. To study the variation of friction factor, 'f' for turbulent flow in smooth and rough commercial pipes.
13. To determine the loss coefficients for the various pipe fittings.
14. To study the flow behaviour in a pipe bend and to calibrate the pipe bend for discharge measurement.

TMM-352

APPLIED THERMODYNAMICS LAB

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[Sn.No.1 to 17 common to Mechanical Engineering/Industrial & Production Engineering]

Experiments: say minimum 10 experiments out of following in depth and details according to theory covered in applied thermodynamics theory subject (TME-302)

1. Study of Fire tube boiler.
2. Study of water Tube boiler.
3. Study & working of Refrigerator
4. Study of velocity compounded steam turbine
5. Study of pressure compounded steam turbine
6. Study of impulse & Reaction turbine
7. Study of steam Engine model.
8. Study and working of two stroke petrol Engine
9. Study and working of Four stroke petrol Engine
10. Determination of Indicated H.P of I.C. Engine by Morse Test
11. Study of Gas Turbine Model
12. Study & working of Air conditioner
13. Prepare the energy balance for Diesel/ Petrol Engine
14. Study & working of two stroke Diesel Engine
15. Study & working of four stroke Diesel Engine.
16. Study of Ignition system of I.C. Engine

17. Study of breaking system of any vehicle.

(In addition to above the following experiments marked * are compulsory for B.Tech Marine Engineering).

*18. Study Marine Multistage Air compressor
*19. Study Indicator diagrams and Calculation of work done.
*20. Study Refrigerator trainer
*21. Study of Air vessel
*22. Study of Lubricating oil / Fuel oil Purifier & Clarifier

TMM-401 : BASIC SHIP STRUCTURE & CONSTRUCTION

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3 1 0

Unit – I

Ship Terms : Various terms used in ship construction. General Classification of Ships. Stresses in Ship's structure and strength members to counteract the same.

Sections and materials use : Types of sections used in ship construction. Rivetting & Welding, Testing of welds, Fabricated components.

Unit – II

Bottom & Side Framing : Double bottoms, Water tight floors, Solid and braket floors, Longitudinal framing keels, side framing like Tankside brakets, Beam Knee, Web frame etc. Shell & Decks : Plating systems for shells, deck plating & Deck girders, mid-ship section of ships.

Bulk heads , Water tight bulkheads, water tight openings through bulkheads for electric cables pipes and shafting. Deep tank for oil fuel or oil cargo corrugated bulk heads.

Unit – III

Fore – End Arrangements: Stem construction, arrangement to resist panting, panting stringers, Forepeak – collision bulk heads, Bulbous bows, Anchor and cable arrangements.

After – End - Arrangements: Types of Stems, Stem frame and rudder. Types of rudder. Supporting of rudder. Locking pintle bearing pintle, Pedastal bearing, Shaft tunnel, Tunnel bearings.

Unit – IV

Loadline and Tonnage: – Definition of freeboard and various assigning conditions, Loadline surveys, tonnage regulations, calculation as per 1969 convention, details of markings permanently carved. Shipyard Practice.

Basic difference of construction in various types of ships.

Unit – V

Ship Surveys : Survey rules, Functioning of classification Societies, Surveys during construction, Periodical surveys as per statutory regulations, retention / suspension of

class or a ship, constructional features and rule guidelines for a merchant vessel as per Manpol regulations.

References

1. Reed's Ship Construction for Marine students- Thomos Reed publication, 19 - Bridge Road, Hampton Court, Ess Moksey, Surrey KT 8 9 EU U.K.
2. Merchant Ship Construction by H.J.Pursey
3. Ships And Naval Architecture by Munro Smitch

TME 402

KINEMATICS OF MACHINES

L T P
3 1 0

UNIT I

Introduction

Links-types, Kinematics pairs-classification, Constraints-types, Degree of Freedom, Grubler's equation, linkage mechanisms, inversions of four bar linkage, slider crank chain and double slider crank chain **6**

Velocity in Mechanisms

Velocity of point in mechanism, relative velocity method, instantaneous point in mechanism, Kennedy's theorem, instantaneous center method. **3**

UNIT II

Acceleration in Mechanisms

Acceleration diagram, Coriolis component of acceleration, Klein's construction for Slider Crank and Four Bar mechanism, Analytic method for slider crank mechanism. **4**

Mechanisms with Lower Pairs

Pantograph, Exact straight line motion mechanisms - Peaucellier's, Hart and Scott Russell mechanisms, Approximate straight line motion mechanisms – Grass-Hopper, Watt and Tchebicheff mechanisms, Analysis of Hook's joint, Davis and Ackermann Steering gears. **5**

UNIT III

Kinematics Synthesis of Planar Linkages

Movability of four bar linkages, Grashoff's law, Graphical methods of synthesis – Two and Three position synthesis of four bar and slider crank mechanisms, Analytical method-Freudenstein's equation for function generation (three position) **7**

UNIT IV

CAMS

Cams and Followers - Classification & terminology, Cam profile by graphical methods for uniform velocity, simple harmonic motion and parabolic motion of followers, Analytical cam design – tangent and circular cams. **7**

UNIT V

Gears

Classification & terminology, law of gearing, tooth forms, interference, under cutting, minimum number of teeth on gear and pinion to avoid interference, simple, compound and planetary gear trains. **8**

Books and References:

1. Theory of machines - Thomas Bevan
2. Theory of machines and mechanisms- Shigley
3. Theory of machines and mechanisms-Ghosh & Mallik
4. Theory of machines and mechanisms- Rao & Dukkipati
5. Theory of Machines – R. K. Bansal
6. Theory of Machines – V. P. Singh
7. Theory of Machines – Malhotra & Gupta
8. Theory of Machines – Khurmi & Gupta
9. Mechanics of Machines – V. Ramamurti

TMM-402 : MARINE AUXILIARY MACHINERY – I

L T P
3 1 0

Unit – I

Engine Room Layout : Layout of main and auxiliary machinery in engine rooms in different ships. Piping arrangement for steam, bilge, ballast and oil fuel systems, Lub oil and Cooling system lines with various fittings. Domestic fresh water and sea water and sea water hydrophore system.

Unit – II

Pumps : Types of pumps for various requirements, their characteristics and application in ships, Centrifugal Pumps, Gear Pumps, Screw, Pumps and Reciprocating pumps, operation care & maintenance.

Unit – III

Evaporators : Construction and operation of different types of evaporators. Fresh Water generators, distillers & Reverse osmosis plants. Conditioning arrangements of distilled water for drinking purpose. Operation, Care & Maintenance of pumps of various types.

Unit – IV

Pollution Prevention : Oily bilge Separators – their construction and operation, use of coalescers, prevention of oil pollution and various International requirements (MARPOL ACT),Incinator. Seawagetreatment plant.

Unit – V

Deck Machinery : Various Types of deck machinery used in ship eg. Wind- lass, winches &deck cranes. Operation and maintenance,.

References

1. Marine Auxiliary Machinery - by Mc George
2. Running and Maintenance of Marine Machinery- Institute of Marine Engineers
3. Advance Marine Enggineering Knowledge- Gokhale and Vikram
4. Marine Auxiliary Machinery – D.W.Smith

5. Reeds General Engineering Knowledge for Engineers-Thomas Reed Publication
6. Indroduction to Marine Engineering by D.A. Taylor

TEE – 405

ELECTRICAL MACHINES

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Unit – I :

Transformers: Construction, polarity test, Sumpner's test, all day efficiency
Autotransformer: Volt-amp relation, efficiency, advantages & disadvantages and applications; Three-phase transformers: Connections, three-phase bank of single phase transformers, Scott connections; Instrument Transformers. (8)

Unit – II :

D.C. Machines:
D.C.machine: Construction, emf and torque equations. Armature reaction, commutation, performance characteristics of motors and generators, starting of motors, speed control losses and efficiency. (8)

Unit – III :

Three-Phase Induction Motor:
Construction, rotating magnetic field and principle of operation, of equivalent circuit, torque production, Torque-slip characteristics, speed control, starting of squirrel cage and slip ring induction motors. (7)

Unit – IV:

Three-phase Synchronous Machines :
Alternator: Construction, emf equation & effects of pitch and distribution factors phasor diagram, armature reaction, Voltage regulation and its determination by synchronous impedance method, methods of synchronization
Synchronous motor: Principle of operation and starting torque and mechanical power developed, effect of excitation on line current, (v – curves) (8)

Unit – V :

1. **Fractional H.P. Motors:**

Single phase induction motor: Construction, revolving field theory and principle of operation, equivalent circuit and starting methods. Two-phase servo-motor, stepper motor, and their applications.

2. **Industrial Applications** :

Concept of braking in dc and ac motors, two quadrant and four quadrant operation of dc and three phase induction motors, industrial applications of dc and ac motors.(9)

REFERENCES :

1 Electric Machines by I J Nagrath & D P Kothari , Tata McGraw Hill , 1997
2 Electric Machines by Ashfaq Husain , Dhanpat Rai & Com. , 2005
3 Generalised Theory of Electrical Machines by Dr. P S Bimbhra , 1996
4 Irvin L.Kosow,"Electric Machinery and Transformers" Prentice Hall of India.
5 P.S. Bimbhra,"Electric Machinery" Khanna Publishers.

Lecture Plan

TEE 405 : Electrical Machines

L T P
3 1 0

Unit	Name of Topics	Text Book	Chapter No	No of Leccture
Unit – I Transformer:				
1.1	Polarity test , Sumpner's test, all day efficiency	1,4	3, 14	2
1.2	**Autotransformer:** volt ampere relations, efficiency, advantages and disadvantages, applications	2,4	2,14	2
1.3	**Three phase transformer:** three-phase transformer connections , three-phase bank of single phase transformers, Scot connection, Instrument Transformers	1	3	4
Unit –II	**D.C. Machine :**			
2.1	Construction, emf and torque equations	1	7	2
2.2	Armature reaction, commutation	1	7	2
2.3	Performance Characteristics of d.c. Generators and motors			1
2.4	Starting and speed control of d.c. motors			2
2.5	Losses and efficiency			1
Unit – III	**Three Phase Induction Motor :**			
3.1	Construction, rotating magnetic field and Principle of operation.	2	4	2
3.2	Equivalent circuit, torque production Torque-slip characteristics			2
3.3	Speed control of induction motor.			1
3.4	Starting of induction motor			2
Unit-IV	**Three – phase Synchronous Machine:**			
4.1	Alternators: Construction, emf equation	2,4	3,6&8	1
4.2	Effect of coil-span factor, distribution factor	2	3	1
4.3	Armature reaction	2,4	3,6	2
4.4	Voltage regulation and its determination by synchronous impedance method			1
4.5	Methods of Synchronization			1
4.6	Synchronous Motors: Principle of Operation, starting	2,4	5,8	1
4.7	Torque & Mechanical Power			1
4.8	Effect of excitation on line current (V-Curves),synchronous condenser	2,4	5,8	1

Unit – V : Fractional Horse Power Motors:				
5.1	Single phase induction motors: Construction, revolving field theory and principle of operation	3,4	6,10	2
5.2	Equivalent circuit			1
5.3	Starting methods			1
5.4	Two phase servo-motors and applications And their applications.	3,4	6,11	1
5.5	Stepper motors & applications			
5.6	Concept of braking in dc and ac motors			1
5.7	Two and four quadrant operation of dc and three phase induction motors, industrial applications of dc and ac motors.	2	9	1 2

REFERENCES :

1. Electric Machines by I J Nagrath & D P Kothari , Tata McGraw Hill , 1997
2. Electric Machines by Ashfaq Husain , Dhanpat Rai & Com. , 2005
3. Generalised Theory of Electrical Machines by Dr. P S Bimbhra , 1996
4. Irvin L.Kosow,"Electric Machinery and Transformers" Prentice Hall of India.
5. P.S. Bimbhra,"Electric Machinery" Khanna Publishers.

TME -404

MEASUREMENT, METROLOGY AND CONTROL **L T P**

Unit-I **3 1 0**

I. Mechanical Measurements

Introduction : Introduction to measurement and measuring instruments, Generalised measuring system and functional elements, units of measurement, static and dynamic performance characteristics of measurement devices, calibration, concept of error, sources of error, statistical analysis of errors. 4

Sensors and Transducers :

Types of sensors, types of transducers and their characteristics. 2

Signal transmission and processing :

Devices and systems. 2

Signal Display & Recording Devices 1

Unit-II

Time related measurements :

Counters, stroboscope, frequency measurement by direct comparison. 1

Measurement of displacement 1

Measurement of pressure :

Gravitational, directing acting, elastic and indirect type pressure transducers. Measurement of very low pressures. 1

Strain measurement :

Types of strain gauges and their working, strain gauge circuits, temperature compensation. Strain rosettes, calibration. 2

Measurements of force and torque :

Different types of load cells, elastic transducers, pneumalic & hydraulic systems. 1

Temperature measurement :

By thermometers, bimetallic, thermocouples, thermistors and pyrometers. 2

Vibration:

Seismic instruments, vibration pick ups and decibel meters, vibrometers accelerometers. 2

Unit-III :

METROLOGY

II. Metrology and Inspection :

Standards of linear measurement, line and end standards. Limit, fits and tolerances. Interchangeability and standarisation. 2

Linear and angular measurements devices and systems Comparators: Sigma, Johansson's Microkrator. 2

Limit gauges classification, Taylor's Principle of Gauge Design. 2

Unit-IV

Measurement of geometric forms like straightness, flatness, roundness. 2

Tool makers microscope, profile project autocollimator. 1

Interferometry : principle and use of interferometry, optical flat. 2

Measurement of screw threads and gears. 2

Surface texture : quantitative evaluation of surface roughness and its measurement. 1

Unit-V

Controls

Introduction: Concept of Automatic Controls – open loop & closed loop systems. Servomechanisms. Block diagrams, transfer functions. Applications of Laplace-Transform in control systems with simple examples / numericals. 5

Representation of control components & Systems: Translation & rotational mechanical components, series & parallel combinations, cascade system, analogous system. 2

Controllers: Brief introduction to Pneumatic, hydraulic and electric controllers 1

References

1. Beckwith Thomas G., Mechanical Measurements, Narosa Publishing House, N. Delhi.
2. Doeblein E.O., "Measurement Systems, Application Design", McGraw Hill, 1990.
3. Kumar D.S., "Mechanical Measurements and Control", Metropolitan, N. Delhi.
4. Hume K.J., "Engineering Metrology", MacDonald and Co. 1963
5. Gupta, I.C., "Engineering Metrology", Dhanpat Rai & Sons, New Delhi, 1994
6. Sirohi, "Mechanical Measurement" New Age Publishers
7. Jain, R.K., "Engineering Metrology" Khanna Publishers
8. Jain, R.K., "Mechanical Measurement" Khanna Publishers

9. Raven, "Automatic Control Theory", McGraw Hill Publishers.
10 Nagrath and Gopal, "Control System Engineering", New Age Publishers.

TMM-451 : MEASUREMENT, METROLOGY AND CONTROL LAB

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[Sr. No. 1 to 15 common to Mechanical Engineering/Industrial & Production Engineering/ Manufacturing Technology]

Experiments:-

Say minimum 8 out of following 15 experiments

1. Study & working of simple measuring instruments. Like vernier calipers, micrometer, tachometer etc.
2. Measurement of effective diameter of a screw thread using 3 wire method.
3. Measurement of angle using sinebar & slip gauges.
4. Study of limit gauges.
5. Study & angular measurement using level protector
6. Adjustment of spark plug gap using feeler gauges.
7. Study of dial indicator & its constructional details.
8. Use of dial indicator to check a shape run use.
9. Study and understanding of limits, fits & tolerances
10. Pressure measuring experiment.
11. Temperature measurement experiment
12. Strain gauge measurement
13. Speed measurement using stroboscope
14. Flow measurement experiment
15. Vibration / work measuring experiment.

(In addition to 8 experiments as mentioned above the following experiments marked***** are compulsory for B.Tech Marine Engineering)

*16 Experiments on hydraulic controls of a crane
*17 Experiments using pneumatic controls trainer
*18 Experiment of boiler controls (boiler simulator)
*19 Experiment of main engine controls. (engine simulator)

TMM-452: MARINE AUXILIARY WORKSHOP - I

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1. To study and operate L.O, F.O, S.W, Cooling water, Ballast, bilge and boiler system pipe lines in Engine Simulator.
2. To study & overhaul Globe and gate valves.
3. To study & overhaul Butterfly valves.
4. To study & overhaul quick closing valves.
5. To study oily bilge separator.
6. To study and overhaul screw pump.
7. To study and overhaul centrifugal pump

8. To study and overhaul Gear pump.
9. To study and overhaul Duplex filter.

TMM-453: MACHINE DRAWING-II LAB

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Review (1 class)
Orthographic projection, missing lines, interpretation of views and sectioning.
Part and Assembly drawing (2 classes)
Introduction, assemblies drawing of stuffing box, steam engine cross head, air valve, late tailstock, gate valve, screw jack, connecting rods, spark plug, tool post, safety valves etc. Drawing exercises.
Specification of Materials : (1 class)
Engineering materials, code designation of steels, copper and aluminum and its alloys.
Limits, Tolerance and fits : (1 class)
Introduction, Limit systems, tolerance, fits, Drawings and exercises.
Surface Roughness : (1 class)
Introduction, surface roughness, machining symbols, indication of surface roughness, drawing exercises.
Production Drawing : (2 classes)
Introduction to developing and reading of production drawing of simple machine elements like helical gear, bevel gear, flange, pinion shaft, connecting rod, crankshaft, belt pulley, piston detains etc. Idea about tool drawing.
Computer Aided Drafting : (3 classes)
Introduction, input, output devices, introduction to drafting software like Auto CAD, basic commands and development of simple 2 D and 3 D drawings.

[Note : The above Syllabus is Common to Mechanical Engineering/ Industrial & Production Engineering]
*Following additional, sectional Marine assembly drawing to be drawn by the B. Tech (Marine) students.

- Oil Fuel Strainer, Parallel slide stop valve, Piston type stop valve, Feed check valve, Starting Air pilot valve, Automatic valve, Starting Air valve, Rudder Carrier Bearing, Four stroke piston and Rod, Flow Regulator

References:-

1. Machine Drawing by Narayana, et.all, New Age
2. Production drawing by narayana, et. All, New Age
3. Auto CAD 14 for Engineering Drawing by P. Nageshwara Rao, TMH.
4. Marine Engineering Drawing Reeds series Thomos Reed Publication

TEE 455

ELECTRICAL MACHINES LABORATORY

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Note : Minimum nine experiments are to be performed from the following list.

1 To obtain magnetization characteristics of a dc shunt generator
2 To obtain load characteristics of a dc shunt generator
3 To obtain load characteristics of a dc series generator
4 To obtain load characteristics of a dc compound generator (a) cumulatively compounded (b) differentially compounded
5 To obtain speed – torque characteristics of a dc shunt motor
6 To obtain efficiency & voltage regulation of a single phase transformer by Sumpner's (back to back) test
7 To perform no load test & block rotor test on a three phase induction motor and determine parameters of equivalent circuit and efficiency
8 To perform no load test and blocked rotor test on a single phase induction motor and determine efficiency
9 To obtain variation of stator current with excitation current (V/curve) of a three phase synchronous motor at no load ½ load and full load.
10 To perform open circuit and short circuit tests on a three phase alternator and determine voltage regulation by synchronous impedance method at a power factor of unity 0.8 lagging & 0.8 leading
11 To study operation of a 2-phase ac servomotor and a stepper motor
12 To study parallel operation of three phase alternators

U.P. TECHNICAL UNIVERSITY

LUCKNOW

Syllabus

of

MARINE ENGINEERING

2nd Year (3rd & 4th Semester)

[Effective from the session 2006-07]

B.TECH.