

EN010401 Engineering Mathematics III

(Common to all branches)

Teaching scheme

Credits: 4

2 hours lecture and 2 hour tutorial per week

Objectives: *Apply standard methods of mathematical & statistical analysis*

MODULE 1 Fourier series (12 hours)

Dirichlet conditions – Fourier series with period 2π and $2l$ – Half range sine and cosine series – Harmonic Analysis – r.m.s Value

MODULE 2 Fourier Transform (12 hours)

Statement of Fourier integral theorem – Fourier transforms – derivative of transforms- convolution theorem (no proof) – Parsevals identity

MODULE 3 Partial differential equations (12 hours)

Formation by eliminating arbitrary constants and arbitrary functions – solution of Lagrange's equation – Charpits method – solution of Homogeneous partial differential equations with constant coefficients

MODULE 4 Probability distribution (12 hours)

Concept of random variable, probability distribution – Bernoulli's trial – Discrete distribution – Binomial distribution – its mean and variance- fitting of Binominal distribution – Poisson distribution as a limiting case of Binominal distribution – its mean and variance – fitting of Poisson distribution – continuous distribution- Uniform distribution – exponential distribution – its mean and variance – Normal distribution – Standard normal curve- its properties

MODULE 5 Testing of hypothesis (12 hours)

Populations and Samples – Hypothesis – level of significance – type I and type II error – Large samples tests – test of significance for single proportion, difference of proportion, single mean, difference of mean – chi-square test for variance- F test for equality of variances for small samples

References

1. Bali & Iyengar – A text books of Engg. Mathematics – Laxmi Publications Ltd.
2. M.K. Venkataraman – Engg. Mathematics vol II 3rd year part A & B – National Publishing Co.
3. I.N. Sneddon – Elements of partial differential equations – Mc Graw Hill
4. B.V. Ramana – Higher Engg. Mathematics – Mc Graw Hill
5. Richard A Johnson – Miller Fread's probability & Statistics for Engineers- Pearson/ PHI

6. T. Veerarajan – Engg. Mathematics – Mc Graw Hill
7. G. Haribaskaran – Probability, Queueing theory and reliability Engg. – Laxmi Publications
8. V. Sundarapandian - probability ,Statistics and Queueing theory – PHI
9. H.C.Taneja – Advanced Engg. Mathematics Vol II – I.K.International
10. A.K.Mukhopadhyay-Mathematical Methods For Engineers and Physicists-I.K.International

EN010 402(ME): Principles of Management

(Common with EN010 502(ME))

Teaching scheme

3 hours lecture and 1 hour tutorial per week

Credits: 4

Objectives

- To develop an understanding of different functional areas of management.
- To understand the functions and duties an individual should perform in an organisation.

Module I (12 hours)

Management Concepts: Vision, Mission, Goals and Objectives of management-MBO- Scientific management- Functions of management- Planning- Organizing- Staffing- Directing- Motivating- Communicating- Coordinating- Controlling- Authority and Responsibility- Delegation- Span of control- Organizational structure- Line, Line and staff and Functional relationship.

Module II (12 hours)

Personnel Management: Definition and concept- Objectives of personnel management- Manpower planning- Recruitment and Selection of manpower- Training and development of manpower- Labour welfare- Labour turnover- Quality circle- Industrial fatigue- Industrial disputes-Method of settling disputes- Trade unions.

Module III (12 hours)

Production management: Objectives and scope of production management- Functions of production department- production management frame work- product life cycle-Types of production- Production procedure- Project planning with CPM and PERT- Basic concepts in network.

Module IV (12 hours)

Financial Management: Objectives and Functions of Financial Management- Types of Capital- Factors affecting working capital- Methods of financing.

Cost Management: Elements of cost- Components of cost- Selling Price of a product.

Module V (12 hours)

Sales and Marketing Management: Sales management- Concept- Functions of sales department- Duties of sales engineer- Selling concept and Marketing concept- Marketing- Definition and principles of marketing- Marketing management and its functions- Sales forecasting- Pricing- Advertising- Sales promotion- Channels of distribution- Market research.

Text Books

1. Koontz and Wehrich, *Essentials of Management*, Tata McGraw Hill.
2. Mahajan M., *Industrial Engineering and Production Management*, Dhanpat Rai and Co.
3. Kemthoshe and Deepak, *Industrial Engineering an Management*, Prentice Hall of India.

Reference Books

1. Martand Telsang, *Industrial Engineering and Production Management*.
2. Khanna O.P., *Industrial Engineering and Management*, Dhanpat Rai and Co.
3. Philip Kotler, *Marketing Management*, Prentice Hall of India.
4. Sharma S. C. & Banga T. R., *Industrial Organisation and Engineering Economics*, Khanna Publishers.
5. Prasanna Chandra, *Financial Management*, Tata McGraw Hill.

ME010 403: Hydraulic Machines

(Common with PE010 403)

Teaching scheme

3 hours lecture and 1 hour tutorial per week

Credits: 4

Objectives

- *To impart knowledge regarding principles and operations of various hydraulic machines.*

Module I (12 hours)

Dynamic Action of Fluid: Impulse Momentum equation- applications– impact of jet – flow of an incompressible fluid over fixed and moving vanes – workdone and efficiency – reaction principle – propulsion of ships. Basic equation of energy transfer in rotodynamic machines- components of energy transfer-Classification-Axial flow, radial flow, impulse and reaction machines.

Module II (12 hours)

Hydraulic turbines: Classification-- impulse and reaction turbines – Euler`s turbine equation- velocity triangles - Pelton wheel, Francis turbine Kaplan turbine – construction features and performance characteristics – theory of draft tube – speed regulation of turbines – run away speed- selection, type and speed of turbines

Module III (12 hours)

Pumping machinery: General classification –Rotodynamic pumps - construction features- classification of impellers, impeller shapes – types of casings -working of centrifugal pumps, priming, Euler`s head equation – velocity triangles – losses, head and efficiencies– performance pump characteristics: main, operating characteristics curves- selection of pumps from performance curves – $NPSH_{required}$ – $NPSH_{available}$ – multistage pumps – pumps in parallel & series operation- propeller pumps.

Module IV (12 hours)

Dimensional analysis – Rayleigh` s method – Buckingham`s Pi theorem – non dimensional parameters in fluid mechanics and fluid machinery – principle of similitude, geometric, kinematic and dynamic similarity – model studies. Non dimensional numbers (Reynold`s number, Froude`s number, Euler`s number, Weber`s number and Mach`s number) Non dimensional parameters for incompressible flow machines –Capacity coefficient, Head coefficient, Power coefficient, Reynolds number, shape number, specific speed – Non dimensional performance curves for pumps- effect of change of outlet vane angle, impeller diameters and speed–Principle of similitude- Non dimensional parameters for comparative study of turbine performance – unit speed, unit power, unit quantity, geometric similarity – model laws – effect of specific speed on runner speed, runner size, flow type etc. Cavitation in fluid machines – installations susceptible to cavitation – collapse of bubble theory – Thoma`s parameter – factors affecting cavitation in pumps and turbines –prevention of cavitation damage.

Module V (12 hours)

Positive displacement pumps: reciprocating pump, effect of vapour pressure on lifting of liquid – indicator diagram – acceleration head – effect of friction – use of air vessels – work saved – Slip - efficiency – pump characteristics – applications.

Theory & application of self-priming pump, jet pump, airlift or compressor pump, slurry pump, hydraulic ram - Positive displacement Rotary pumps: Gear, screw, vane pumps.

Hydraulic accumulator, intensifier, fluid coupling & lift – principle of operation- hydraulic cranes, hydraulic press- Hydraulic symbols (Description only, no problems).

Text Books

1. Jagdishlal, *Hydraulic Machines*, Metropolitan Publishers.

Reference Books

1. Abdulla Sheriff, *Hydraulic machines*, standard publishers.
2. Govinda Rao N. S, *Fluid flows machines*, TMH.
3. Pippinger, *Industrial hydraulics*.
4. Stepanoff John A. J, *Centrifugal and axial flow pumps*, iley & sons
5. Lewitt E. H, *Hydraulic & Fluid Mechanics*
6. Som S K and Biswas G, *Introduction to fluid mechanics and fluid machines*, TMH.
7. Yahya S M, *Turbines fans and compressors*, TMH.
8. R.K.Rajput, *Hydraulic Machines*, S.Chand & Company.
9. Modi & Seth, *Hydraulic Machines*, Laxmi Publications, New Delhi

ME010 404: Manufacturing Process

(Common with AU010 404)

Teaching scheme

3 hours lecture and 1 hour tutorial per week

Credits: 4

Objectives

1. *To gain theoretical and practical knowledge in material casting processes and develops an understanding of the dependent and independent variables which control materials casting in a production processes.*
2. *Provide a detailed discussion on the welding process and the physics of welding. Introduce students to different welding processes weld testing and advanced processes to be able to appreciate the practical applications of welding.*
3. *The course will also provide methods of analysis allowing a mathematical/physical description of forming processes.*

Module I (12 hours)

Patterns: - types, allowances, color code – Molding sand:- constituents, types, properties, testing, types of mould, molding machines – Cores:- sands, types prints, machines, chaplets, forces acting on molding flasks - Gating system:- fluid flow and heat transfer in metal casting, elements and design of gating system, sprue, gating ratio, slag trap system – Riser:- riser design, chills, feeding devices - Cupola operation -pouring and cleaning of castings - defects in castings - inspection and quality control - Casting:- continuous, strip, shell mold, vacuum, investment, slush, pressure, die, centrifugal, precision investment, squeeze casting and semi solid metal forming, economics and surface finish obtainable - casting machines - comparison of casting with other production processes. (Include necessary figures and equations).

Module II (12 hours)

Welding:- diffusion, definition of welding, metallurgy of welding, applications, classification, mechanism - welding design:- effect of weld parameters on weld quality, heat input, heat flow and distortions - Gas welding:- details, equipment, fluxes and filler rods – flame cutting - Arc welding:- applications, equipment, polarity, governing factor in fusion welding - electrodes and types – TIG - GMA - CO₂ process - Submerged arc, electroslog, plasma arc and flux cored arc welding - Resistance, thermit solid state welding - Electron and laser beam welding – explosive welding - inspection and defects in welding - heat affected zone, grain size variations in joint strength - Brazing and soldering - adhesive bonding – Extrusion: Metal flow – mechanism and types – extrusion defects.

Module III (12 hours)

Rolling:- principles - types of rolls and rolling mills - mechanics of flat rolling, roll pressure distribution - neutral point - front and back tension, roll forces in hot rolling, roll torque and power, friction, deflection and flattening - friction and lubrication in metal forming - defects - hot and cold rolling - rolling machines - strip velocity and roll velocity - roll and roll pass design - theories of rolling and effect of parameters - load calculation - rolling of tubes, wheels, axles, I-beam thread, gear rolling.

Module IV 12 hours)

Forging:- classification - open die forging, forces and work of deformation - Forging methods analysis:- slab method only, solid cylindrical, rectangular work piece in plane strain, forging under sticking condition - deformation zone geometry – die forging:- impression, close,

coining, skew rolling etc. – defects in forging – forgeability tests – die design and materials – equipments - heating in forging - quality assurance for forging -non destructive testing - mechanics of rod and wire Drawing:- ideal deformation, ideal deformation and friction, drawing of flat strips etc – drawing defects – drawing practices.

Module V (12 hours)

Locating methods:- methods, degrees of freedom - principle of clamping:- clamping types - work holding principle – Die cutting:- Different types - shearing - types of presses –cutting action in punch and die operations – die clearances – types of die:- progressive, compound, combination die – Bending dies:- bending methods, minimum bend radius, bendability, spring back, forces, bend allowances – Forming dies:- solid form, curling, embossing, coining, bulging dies - Shear and tube spinning - High energy rate forming:- need, energy sources - material behavior - pneumatic, mechanical, electrohydraulic, electromagnetic, and explosive forming – Deep drawing:- deep drawability, punch forces.

Text Books

1. Manufacturing Science - Amitabha Ghosh and Ashok Kumar Mallick
2. Manufacturing Engineering and Technology - Kalapakjian and Schmid

Reference Books

1. Principles of Metal Casting - Hine and Rosenthal
2. Foundry Technology - P.R.Beeley

ME010 405: Machine Drawing

(Common with PE010 405 and AU010 405)

Teaching scheme

3 hours practical and 1 hour theory per week

Credits:4

Objectives :

- To impart the fundamental concepts of machine drawing.
- To develop primary knowledge of working drawings.
- To produce orthographic drawing of different machine parts.
- To develop skill to produce assembly drawings.
- To develop skill to produce detailed drawings of machines parts from assembly drawing.

Module-1(15hrs)

Conversion of pictorial views into orthographic views-dimensioning techniques-preparation of drawing- - Limits and tolerances of machine parts - Hole system and shaft system of tolerances - Designation of fundamental deviation - Types of fits and their selection - Indication of dimensional tolerances and fits on simple machine parts - Geometrical tolerances – Recommended symbols - Indication of geometrical tolerances on simple machine parts - Surface roughness – Indication of surface finish on drawings - Preparation of shop floor drawings of simple machine parts.

Types of screw threads-different forms-conventional representation-sketching orthographic views of hexagonal bolts and nuts -dimensional drawing-square headed bolts and nuts –sketching of different types of lock nuts and locking devices- foundation bolts.

Forms of rivet heads – riveted joints-lap and butt joints with single and multiple riveting in chain and zig – zag arrangements –dimensional drawing. Sketching of conventional representation of welded joint.

Module-2 (20 hrs)

Fully dimensioned and sectional drawing of the following Joints-
knuckle joint-jib and cotter

shaft couplings-types of keys- protected types of flanged couplings-bushed pin type flexible coupling-
Oldham's coupling

Pipe joints-spigot and socket joint-flanged joint-

Shaft bearings and support-Plummer block IC engine parts-piston-connecting rod

Module-3(25hrs)

Assembly and working drawings of the following Valves

-stop valve-spring loaded safety valve –dead weight safety valve-feed check valve-feed check valve

Machine elements-screw jack –lathe tool post-spindle-tailstock

Note:

- Drawing practical classes have to be conducted by using any standard CAD software and using drawing instruments in alternate weeks (3Hours) preferably for each half of the student.
Semester End examination (3Hours) shall be conducted by using drawing instruments only
- All drawing exercises mentioned above are for class work. Additional exercises wherever necessary may be given as homework
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References:

1. N.D.Bhatt and Panchal, *Machine Drawing*, Charator Publishing House
2. P I.Varghese, *Machine Drawing*, VIP Publishers, Thrissur
3. Ajeet Singh, *Machine Drawing*, Tata McGraw Hill Education Private Ltd
4. P.S.Gill , *Machine Drawing*, S.K.Kataria & Sons

University examination pattern

Question I: Two questions of 7.5 marks each out of three questions from module-1

Question II: One questions of 25 marks from module-2.

Question III: One question of 60 marks from module-3

ME 010 406(EE) Electrical Technology
(Common with PE010 406 (EE) and AU010 406 (EE))

Teaching scheme

3 hours lecture and 1 hour tutorial per week

Credits: 4

Objectives

Understanding the basic working principles of DC machines Ac machines and its drives

Module I (8 hours)

D.C. Generator - O.C.C. – Condition for self excitation – field critical resistance – critical speed - Load characteristics of generators- Losses- power flow diagram- efficiency- condition for maximum efficiency- Application.

Module II (16 hours)

D.C. Motors: Back emf – speed and torque equation- starting and speed control – testing of D.C. Motors – brake test – Swinburn's test- Performance characteristics of Shunt, Series and Compound motors. - Applications

Transformer – Emf equation: No load current – equivalent circuit – regulation- efficiency. Determination of regulation and efficiency from O.C. and S.C. tests – cooling of transformer. Basic principle of 3 phase transformer - Applications

Module III (13 hours)

Alternators - Construction details: Type – emf equation (winding factor need not be derived) – synchronous impedance – regulation by emf and mmf method.

Synchronous Motors: Principle of operation – method of starting.

Three phase induction motor: Production of rotating magnetic field - equivalent circuit – torque equation – torque slip characteristics – no load and blocked rotor tests – starting and speed control – Application

Single Phase motor: Different types - Application.

Module IV (13 hours)

Industrial drives – electric drives – advantages – individual drive and group drive – factors affecting choice of motor – mechanical characteristics of a.C. and D.C. motors – motors for particular application like textile mill, steel mill, paper mill, mine, hoists, crane etc. – size and rating of motor . Electric traction – Different systems of traction – comparison – track electrification – different systems – traction motor characteristics – electric braking – plugging – Dynamic and regenerative braking.

Module V (10 hours)

Power semiconductor devices: power diodes – SCR's - principle of operation of SCR's – two transistor analogy of SCR – characteristics – SCR rating (basic principle only). High frequency heating – induction and dielectric heating – resistance heating resistance welding-block schematic of resistance welding scheme.

Text Books

1. Dr. P S Bimbra, *Electrical Machinery*, Khanna Publishers
2. J B Gupta, *Electrical Machines*, S K Kataria and Sons
3. Dr. P S Bimbra, *Power Electronics*, Khanna Publishers

Reference Books

1. Alexander Langsdorf A S: *Theory of AC Machinery*, Mc-Graw Hill
2. Say M G: *Performance and design of AC Machines*, ELBS
3. *Electrical machines, Drives and Power Systems*: Theodore Wildi, Pearson Ed.
4. P.C. Sen, *Thyristor DC Drives*, Wiley-Interscience Publication 1984
5. Joseph Vithayathil, *Power Electronics-Principles and applications*, TMH, 2010
6. B. K. Bose, *Modern Power Electronics and A.C. Drives*, PHI, 2002.
7. G.K. Dubey, *Fundamentals of Electrical Drives*, Narosa Publishing House, New Delhi, 2005

ME010 407: Hydraulic Machines Laboratory (Common with PE010 407)

Teaching scheme

3 hours practical per week

Credits: 2

Objectives

- To provide experience on various Hydraulic machineries.
- To acquaint the students with the measurement of various parameters.

Experiments

Performance characteristic tests on Pelton wheel (Load test & best speed).

Performance characteristic tests on Francis turbine (Load test & best gate opening).

Performance characteristic tests on Kaplan turbine (Load test & best gate, vane angle opening).

Performance characteristic tests on single stage, multi stage centrifugal pumps at constant speed & at variable speed. Actual & predicted curves.

Performance characteristic tests on self-priming pump, Jet pump, Airlift pump and deep well pump

Performance characteristic tests on axial flow pump.

Performance characteristic tests on Hydraulic ram.

Performance characteristic tests on reciprocating pump at constant speed.

Performance characteristic tests on Gear pump.

Performance characteristic tests on Screw pump.

Text Books

1. Abdulla Sheriff, *Fluid Mechanics & Hydraulic Machines*: Standard Publ.
2. R.K Bansal, *Fluid Machines and Hydraulic Machines*, Lakshmi publications New Delhi

Reference Books

1. K Subramanya, *Fluid Machines and Hydraulic Machines*, TMH.
2. Govinda Rao N.S, *Fluid Flows Machines*, TMH.
3. Shiv Kumar, *Fluid Mechanics & Fluid machines*, Ane books.
4. Massey B. S, *Fluid Mechanics*, ELBS
5. Stepanoff John A. J, *Centrifugal and Axial Flow Pump*, Wiley & Sons

Internal Continuous Assessment (Maximum Marks-50)

50%-Laboratory practical and record

30%- Test/s

20%- Regularity in the class

End Semester Examination (Maximum Marks-100)

70% - Procedure, conducting experiment, results, tabulation, and inference

30% - Viva voce

ME010 408 STRENGTH OF MATERIALS LAB
(Common with PE010 307 and AU010 408)

Teaching scheme

3 hours practical per week

Credits: 2

Objective: *To study properties of various materials*

List of Experiments

1. Tests on springs (open and close coiled)
2. Bending Test on Wooden Beams using U. T. M.
3. Verification of Clerk. Maxwell's Law of reciprocal deflection and Determination of Young's modulus 'E' for steel.
4. Torsion Pendulum (M.S. wires. Aluminum wires and brass wires)
5. Tension test using U. T. M. on M. S. Rod, torsteel and High Tensile steel.
6. Torsion Test on M. S. Rod.
7. Shear Test on M.S. Rod.
8. Fatigue Test
9. Impact Test (Izod and Charpy)
10. Hardness Test (Brinell, Vicker's and Rebound)
11. Strut Test.

Note

All tests should be done as per relevant BIS.

References

1. Timoshenko.S.P, Strength of Materials, Part-1, D.Van Nostrand company, Inc.Newyork.
2. Bansal R.K., Strength of Materials, Lakshmi Publications, New Delhi.
3. Bhavikatti S.S , Strength of Materials, Vikas Publishing House (P) Ltd.
4. D.S. Prakash Rao, Strength of Materials, Vol. I, University Press (India) Ltd.
5. Popov E.P., Engineering Mechanics of solids, Prentice Hall of India, New Deihi.
6. Punmia B.C, Strength of Materials and Mechanics of structures, Vol.1, Lakshmi Publications, New Delhi.