Rashtrasant Tukdoji Maharaj Nagpur University, Nagpur

Faculty of Engineering and Technology

B.E. (Power ENGINEERING): Third SEMESTER

Syllabus for

BEPOE301T (BEELE301T) Applied Mathematics- III (EN/ET/EE/Mech/Power Engg)

Scheme (Theory: 4 hrs, Tutorial: 1hr.)

UNIT - I: LAPLACE TRANSFORM (15Hrs)

Definition, Properties, Evaluation of integrals by Laplace Transform, Inverse Laplace Transform and its Properties, Convolution theorem (statement only), Laplace Transform of Periodic Functions (statement only), Unit Step Function and Unit Impulse Function, Applications of Laplace Transform to solve Ordinary Differential Equations, Simultaneous Differential Equations, Integral Equations & Integro-Differential Equations.

UNIT – II: FOURIER SERIES & FOURIER TRANSFORM (08 Hrs)

Periodic functions and their Fourier Expansions, Even and Odd functions, Change of interval, Half Range Expansions.

Fourier Transform: Definition and Properties (excluding FFT), Fourier Integral Theorem, Relation with Laplace Transform, Applications of Fourier Transform to Solve Integral Equation.

UNIT – III: CALCULUS OF VARIATIONS(05 Hrs)

Functionals, Maxima and minima of functionals, Euler‟ s equation(statement only), Functionals dependent on First & Second order derivatives, Isoperimetric Problems, Solution of Boundary Value problems by Rayleigh-Ritz method.

UNIT- IV: FUNCTIONS OF COMPLEX VARIABLE (12 Hrs)

Analytic function, Cauchy- Riemann Conditions, Harmonic Functions (excluding

orthogonal system), Milne-Thomson Method, Cauchy Integral Theorem & Integral Formula (Statement only), Taylor‟ s & Laurent‟ s series (Statement only), Zeros and Singularities of Analytic function, Residue Theorem (Statement only), Contour integration (Evaluation of real definite integral around unit circle and semi-circle).

UNIT - V: PARTIAL DIFFERENTIAL EQUATIONS(08Hrs)

Partial Differential Equations of First Order First Degree i.e. Lagrange‟ s form, Linear Homogeneous Equations of higher order with constant coefficients. Method of separations of variables, Simple Applications of Laplace Transform to solve Partial Differential Equations (One dimensional only).UNIT –VI: MATRICES(12Hrs)

Linear and Orthogonal Transformations, Linear dependence of vectors, Characteristics equation, Eigen values and Eigen vectors, Statement and Verification of Cayley Hamilton Theorem [without proof], Reduction to Diagonal form, Reduction of Quadratic form to Canonical form by Orthogonal transformation, Sylvester‟ s theorem [without proof], Solution of Second Order Linear Differential Equation with Constant Coefficients by Matrix method.

Text Books

1. Higher Engineering Mathematics by B.S. Grewal, 40th Edition, Khanna Publication

2. Advanced Engineering Mathematics by Erwin Kreysizig, 8th Edition, Wiley India

3. Applied Mathematics for Engineers & Physicist by L.R. Pipes and Harville,

4. Calculus of variation by Forrey

Reference Books

1. A Text Book of applied Mathematics, Volume II , by P.N. Wartikar & J.N. Wartikar, Poona Vidyarthi Griha Prakashan

2. Introductory methods of Numerical Analysis, by S.S. Sastry, PHI

3. Mathematics for Engineers by Chandrika Prasad

4. A text book of Engineering Mathematics by N. P. Bali & M. Goyal, Laxmi Publication.

Rashtrasant Tukdoji Maharaj Nagpur University, Nagpur

Faculty of Engineering and Technology

B.E. (MECHANICAL ENGINEERING): THIRD SEMESTER

BEPOE302T (BEME302T): KINEMATICS OF MACHINE (Theory)

CREDITS: 04

Teaching Scheme Examination Scheme

Lectures: 3 Hours/Week Duration of Paper: 03 Hours

Tutorial: 1 Hour/Week University Assessment: 80 Marks

College Assessment: 20 Marks

Course Objectives and Expected Outcomes: The study of kinematics is concerned with understanding of relationships between the geometry and the motions of the parts of a machine. The overall objective of this course is to learn how to analyze the motions of mechanisms, design mechanisms to give desired motions. This course includes relative motion analysis, design of gears, gear trains, cams and linkages, graphical and analytical analysis of position, velocity and acceleration, clutches, brakes & dynamometers. Students will be able to understand the concepts of displacement, velocity and acceleration of simple mechanism, drawing the profile of cams and its analysis, gear kinematics with gear train calculations, theory of friction, clutches, brakes & dynamometers.

UNIT – I [8 Hrs.]

Basic concept of mechanism, link, kinematics pairs, kinematics chain, mechanism, Difference between machine and mechanism, Inversions, machine, simple & compound chain, Degrees of freedom, Estimation of degree of freedom of mechanism by Grubber's criterion and other methods.

Harding's notations, Classification of four bar chain , Class-I & Class-II, Kutchbach theory, Various types of mechanism such as Geneva wheel, Pawl and ratchet mechanism, Exact straight line mechanism, Approx. straight line mechanism, Transport mechanism.

UNIT – II [8 Hrs.]

Quantitative kinematics analysis of mechanisms: - Displacement, Velocity and Acceleration analysis of planer mechanism by graphical method as well as analytical method. Coriolis component of acceleration, Instantaneous center method, Kennedy's theorem.

UNIT – III [8 Hrs.]

Concepts of cam mechanism, Comparison of cam mechanisms with linkages. Types of cams and followers and their applications. Synthesis of cam for different types of follower motion like constant velocity, parabolic, SHM, cycloid etc.

UNIT – IV [8 Hrs.]

Concept of motion transmission by toothed wheels, comparison with cams and linkages, various tooth profiles, their advantages and limitations, gear tooth terminologies, concept of conjugate action, law of conjugate action, kinematics of involute gear tooth pair during the contact duration, highlighting locus of the point of contact, arc of contact, numbers of pairs of teeth in contact, path of approach and path of recess, interference, undercutting for involute profile teeth.

Kinematics of Spiral and helical gears, Kinematic analysis and torque analysis of simple epicyclic gear train.

UNIT – V [8 Hrs.]

Synthesis of Mechanism:- Introduction to type, Number and dimensional synthesis, Synthesis of Mechanism by graphical method, Transmission angle, Freudenstein's equation, Roberts Cognate Linkage.

UNIT – VI [8 Hrs.]

Laws of friction, Friction of inclined plane, Efficiency of inclined plane, Friction in journal bearing-friction circle, Pivots and collar friction-uniform pressure and uniform wear.

Clutches, Brakes & Dynamometers: Single, multiple and cone clutch, Shoe brake, Band brake, Band and Block brake, Absorption and transmission type dynamometers (Numerical are expected on clutches and brakes only).

LIST OF TUTORIALS:

1) Drawing sheets on Inversion of

i) Class I & Class II four bar chain

ii) Single slider crank chain

iii) Double slider crank chain

2) Problem on degree of freedom of mechanisms

3) Problems on kinematic analysis i) Graphical method ii) Analytical method

4) Cam constructions

5) Problem on gears

6) Analysis of epicyclic gear train with torque analysis

7) Problems on synthesis

i) Graphical method

ii) Analytical method

8) Study of construction and working with neat sketch of

i) Clutches

ii) Brakes

iii) Dynamometers

TEXT BOOKS:

1. Theory of Machine, S. S. Rattan, Tata McGraw Hill.

2. Mechanism and Machine Theory, J.S. Rao & Dukki Patti, New Age International (P) Ltd, Publishers.

3. Theory of Machines, P L Ballaney, Khanna Publications.REFERENCE BOOKS:

1. Theory of Machines and Mechanisms, J. E. Shigley and J. J. Uicker, Oxford University Press.

2. Theory of Machines and Mechanism, Ghosh & Mallik, Affiliated East- West Press, New Delhi.

3. Theory of Machine , Thomas Bevan, Pearson publication

4. Advanced Mechanism Design–Analysis and Synthesis, A.G.Erdman and G.N.Sandor, Vol. I and II, Prentice – Hall

5. Theory of Machines, Sadhu Singh, Pearson publications.

BEPOE303T (BEME304T): MANUFACTURING PROCESSES (Theory)

CREDITS: 04

Teaching Scheme Examination Scheme

Lectures: 3 Hours/Week Duration of Paper: 03 Hours

Tutorial: 1 Hour/Week University Assessment: 80 Marks

College Assessment: 20 Marks

Course Objectives and Expected Outcomes: This course is designed to provide students with an overview of a wide variety of manufacturing processes for processing of engineering materials. Students will learn principles, operations and capabilities of various moulding, metal casting, metal forming, press working, metal joining processes & also processing on plastics. Upon completion of this course, students shall understand the importance of manufacturing processes and be able to select and apply suitable processes for an engineering product.

UNIT – I [8 Hrs.]

Pattern Making & Moulding: - Pattern making: Types, materials used, Pattern making allowances, color codes. Core making: - Types, core material & its properties. Moulding: Types of sand moulds, moulding sand composition. moulding sand properties, moulding machines. Shell moulding, CO2 moulding.

UNIT – II [8 Hrs.]

Gating System & Casting Processes: - Gating design -Elements of gating systems, pouring equipments, riser design Melting furnaces -Types, Electric furnace, Induction furnace, Cupolaconstruction & operation. Cleaning, inspection & casting defects. Foundry mechanizing Special casting processes such as investment Casting, Centrifugal Casting, Slush Casting and Die Casting.

UNIT – III [8 Hrs.]

Joining Processes: - Introduction to metal Joining- Types of Welding. Arc Welding & Gas Welding Processes, Defects & Inspection of Welding Joints, Electrodes, weldability of Metals, Welding equipments. Fixtures, TIG Welding, MIG Welding, Spot Welding.

UNIT – IV [8 Hrs.]

Forming Process for metals:- Rolling, Forging, Extrusion, Drawing, Mechanics of forming process, Determination of Rolling pressure and roll specification force, drive force and torque, power loss in bearing, Determination of forging forces and stresses, Equipment (hammer/press) capacity required. (No analytical treatment)

UNIT – V [8 Hrs.]

Press Working: - Classification, types of presses, press terminology, Force analysis in press working, Die cutting operation, types of dies, Die and punch allowance, introduction to shaping operations, bending, forming and drawing.

UNIT – VI [8 Hrs.]

Introduction to Plastics, Properties & types, applications, Forming & Shaping of plastics – Extrusion, injection moulding, Blow moulding, wire drawing, Compression moulding, Transfer moulding, Embossing, Calendaring. Introduction to Joining of Plastics- Mechanical Fastening, Spin Welding, Solvent Bonding,

Ultrasonic welding, Induction welding, Dielectric welding, Hot Plate welding, Vibration welding, Hot gas welding.

TEXT BOOKS:

1. Workshop Practice, H. S. Bawa, Tata Mc-Graw Hill

2. Manufacturing Engineering & Technology, Kalpakjian, Pearson

3. Modern Materials and Manufacturing Process, R. Gregg Bruce, John E. Neely, Pearson Education

4. Workshop Technology (Volume I), Hajra Chaudhary, Media Promoters &

Publishers

5. Workshop Technology (Vol. I & II), B. S. Raghuwanshi, Dhanpat Rai & Co.

6. Manufacturing technology (Vol. I), P. N. Rao, Tata Mc-Graw Hill

7. Manufacturing Science, Ghosh & Malik, East West Press.

8. Textbook of Production Engineering, P.C. Sharma, S. Chand & Co.

REFERENCE BOOKS:

1. Workshop Technology, Vol I & II, WAJ Chapman, Elsevier Butterworth-

Heinemann.

2. Manufacturing Processes, M. Begman.

3. Processes & Materials of Manufacturing, R. Lindberg, Allyn & Bacon.

BEPOE303P(BEME304P): **MANUFACTURING PROCESSES (Practical)**

CREDITS: 01

Teaching Scheme Examination Scheme

Practical: 2 Hours/Week University Assessment: 25 Marks

College Assessment: 25 Marks

LIST OF PRACTICALS:

Minimum Eight out of the following shall be performed:

1. Study of Cupola Furnace

2. Study of Moulding Techniques

3. Study of Casting Process

4. Study of Pattern Making

5. Study of Joining Processes

6. Study of Forming Processes

7. Study of Drawing Processes

8. One Job – Pattern Making

9. One Job – Casting

10. One Job – Welding

BEPOE304T (BEME303T): FLUID MECHANICS (Theory)

CREDITS: 04

Teaching Scheme Examination Scheme

Lectures: 3 Hours/Week Duration of Paper: 03 Hours

Tutorial: 1 Hour/Week University Assessment: 80 Marks

College Assessment: 20 Marks

Course Objectives and Expected Outcomes: This course is designed to develop an understanding of the behavior of fluids at rest or in motion and the subsequent effects of the fluids on the boundaries as the mechanical engineers has to deal with fluids in various applications. This course will also develop analytical abilities related to fluid flow. It is expected that students will gain conceptual understanding of fluids and their properties and will be able to apply the analytical tools to solve different types of problems related to fluid & fluid flow.

UNIT – I [8 Hrs.]

Fluid Properties :- Types of fluids, Mass Density, Specific Weight, Specific Gravity, Newton's Law of Viscosity, Dynamic Viscosity, Stroke's Theorem, Surface Tension, Capillarity, Compressibility, Vapour pressure.

Fluid Kinematics :- Types of Flow- steady, unsteady, uniform, non-uniform, laminar, turbulent, one, two and three dimensional, compressible, incompressible, rotational, irrotational, stream lines, path lines, streak lines, velocity components, convective and local acceleration, velocity potential, stream function, continuity equation in Cartesian co-ordinates.

UNIT – II [8 Hrs.]

Fluid Statics :- Pressure, Measurement of pressure using manometers, Hydrostatic law, Pascal's law, Pressure at a point, Total pressure, Centre of pressure, Pressure on a plane (Horizontal, vertical, Inclined) and Curved Surfaces, Archimedes's principle, Buoyancy and stability of floating and submerged bodies, Metacentric height.

UNIT – III [8 Hrs.]

Fluid Dynamics :- Introduction to Navier-Stroke's Equation, Euler equation of motion along a stream line, Bernoulli's equation, application of Bernoulli's equation to pitot tube, venturi meter, orifices, orifice meter.

UNIT – IV [8 Hrs.]

Laminar And Turbulent Flow :- Definition, Relation between pressure and shear stresses, Laminar flow through round pipe, Fixed parallel plates, Turbulent flow and velocity distribution.

Dimensional Analysis: - Dimensional Analysis, Dimensional Homogeneity, Rayleigh method & Buckingham's pi Theorem.

UNIT – V [8 Hrs.]

Flow Through Pipes :- TEL, HGL, Energy losses through pipe, Darcy-Weisbach equation, Minor losses in pipes, TEL, HGL, Moody diagram, pipes in series and parallel, Siphons, Transmission of power. UNIT – VI [8 Hrs.]

Boundary Layer Theory :- Development of Boundary Layer on a flat plate, Laminar and Turbulent Boundary Layers, Laminar Sub Layer, Separation of Boundary Layer.

Flow around Immersed Bodies: - Lift and Drag, Classification of Drag, Flow around circular cylinder and Aerofoil, Development of lift on Aerofoil.

LIST OF TUTORIALS:

1) Applications based on fluid properties such as block sliding over an inclined plane, capillary phenomenon etc.

2) Study of Manometers

3) Study of stability of floating bodies and submerged bodies

4) Determination of coefficient of discharge of flow meters

5) Verification of Bernoulli's equation

6) Stokes Law

7) Case study of pipe network

8) Reynold number & its significance

9) Losses in pipes (Hagen Pois. Equation)

TEXT BOOKS:

1. Fluid Mechanics, Dr. R.K. Bansal, Laxmi Publication (P) Ltd. New Delhi

2. Engineering Fluid Mechanics, Kumar K.L.,S. Chand & company Ltd. Eurasia Publication House

3. Fluid Mechanics & Hydraulic Machines, R.K. Rajput, S. Chand & Company Ltd.

4. Hydraulic and Fluid Mechanics, Modi P.N. and Seth S.M., Standard Book House.

REFERENCE BOOKS:

1. Introduction to Fluid Mechanics, James E.A., John and Haberm W.A., Prentice Hall of India

2. Fluid Mechanics, Jain A.K., Khanna Publication

3. Engineering Fluid Mechanics, Garde R.J. and Miraj Goankar, Nem chand & Bros, Roorkee, SCITECH, Publication (India) Pvt. Ltd.

4. Fluid Mechanics and Fluid Power Engineering, Dr. D.S. Kumar, S.K. Kataria & sons

5. Fluid Mechanics, Frank M. White, McGraw Hill Publication

6. Introduction to Fluid Mechanics, James A. Fay

7. Fluid Mechanics, Cengel & Cimbla, Tata McGraw Hill

8. Fundamentals of CFD, Anderson, McGraw Hill, International Edition, Mechanical

Engineering series

9. Fluid Mechanics, Streeter V.L. and Wylie E.B., McGraw Hill International Book co.

BEPOE305T (BEME305T): ENGINEERING METALLURGY (Theory)

CREDITS: 04

Teaching Scheme Examination Scheme

Lectures: 3 Hours/Week Duration of Paper: 03 Hours

Tutorial: 1 Hour/Week University Assessment: 80 Marks

College Assessment: 20 Marks

Course Objectives and Expected Outcomes: This course is designed to develop fundamental concepts of crystallography, phase transformation and heat treatment processes. Students will learn the atomic structure of metals, imperfections, diffusion mechanisms and mechanism of plastic deformation, various ferrous & non ferrous metals & their alloys. They will also understand equilibrium diagrams, time-temperature transformation curves and heat treatment processes. Upon completion of this course, students will be able to understand the concepts of crystal structure, microstructure and deformation. They will also acquire the knowledge of phase diagrams which are useful for design and control of heat treating processes, various ferrous & non ferrous metals & alloys with engineering applications, non-destructive tests & powder metallurgy with applications.

UNIT – I [8 Hrs.]

Introduction to engineering materials their classification, properties & application. Difference between metals & non metals, Mechanical properties of metal, Study of crystal structure, Polymorphism & allotropy, Macroscopic & microscopic examination; Imperfections in crystal, Miller indices, Mechanism of plastic deformation, slip, dislocation & twinning.

UNIT – II [8 Hrs.]

Solidification of pure metal, nucleation & grain growth, directional & progressive solidification, Ingot structure, Dendritic solidification, Solid solution & their types, Alloy & their formation, Mechanical Mixture, Hume Rothery Rule, grain shape & size, its effect on the properties. Binary equilibrium diagrams, Isomorphus system, Study of Fe Fe-C diagram - uses & limitations, Invarient reactions.

UNIT – III [8 Hrs.]

TTT Curve – Construction & limitations, Heat treatment – Principle, purpose, Annealing & its types, Normalizing, Tempering, Austempering, Martempering, Hardening, Retained austenite & its elimination, Maraging, Patenting; Surface hardening such as Carburising, Nitriding, Induction hardening, Jomini End quench test for hardenability

UNIT-IV [8 Hrs.]

Plain carbon steel, Classification based on Carbon Percent & application; Limitations, Effect of impurities; Alloy steel, Effects of various alloying elements, Tool steel & its classification, Red hardness; Stainless steel – Classification, composition & application; Hadfield Manganese steel, Maraging Steel, O.H.N.S. Steel, Selection of steel for various applications.

UNIT-V [8 Hrs.]

Cast iron – Classification, gray cast iron, white cast iron, nodular cast iron, malleable cast iron, Mottled cast iron, Ni – hard & Ni – Resist cast iron, Meehanite Alloy; Study of non- ferrous alloys – Brasses, its types, Cu-Zn diagram; Bronzes, its types, Cu-Sn diagram; Al-Si diagram.

UNIT-VI [8 Hrs.]

Principles of hardness measurement, Hardness Test – Brinell, Rockwell, Vicker

Non-destructive tests – Ultrasound Test, Die Penetration Test, radiography test

Powder metallurgy – Introduction, metal powder & its production, blending & mixing, compaction, sintering, Hot Isostatic Pressing, Secondary processes, Advantages, limitations & application of powder metallurgy, few products such as self Lubricating Bearing, Gears & Pump

Rotors, Electric Contacts & Electrodes, Magnets, Diamond Impregnated Tools etc.

TEXT BOOKS:

1. Introduction to Physical Metallurgy, Sidney H. Avner, Tata McGraw-Hill

2. Introduction to Engineering Materials, B.K.Agrawal, Tata McGraw-Hill

3. Heat Treatment – Principles & Techniques, T.V.Rajan, C.P. Sharma, Ashok Sharma, Prentice – Hall India

4. Materials Science & Metallurgy, Dr. V.D.Kotgire, Everest Publishing House

5. Text Book of Materials Science & Metallurgy, O.P.Khanna , Dhanpat Rai Publication

6. Engineering Materials & Metallurgy, Srinivasan, Tata Mc-Graw Hill

REFERENCE BOOKS:

1. Materials Science, Willium Callister, John Wiley & Sons

2. Material Science, Narula & Gupta, Tata Mc-Graw Hill

3. Material Science & Metallurgy, Parashivamurthy, Pearson

4. A First course on Material Science, Raghavan, PHI Learning

5. Introduction to Material Science for Engineers, Shakeford & Murlidhara, Pearson

6. Engineering Physical Metallurgy and Heat Treatment, Yu M Lakhtin, CBS Publisher

7. Metallurgy for Engineers, E C Rollason, ButterWorth & Heineman Ltd.

8. Engineering Metallurgy, R A Higgins, Viva Books

9. Fundamentals of Solidification, W Kurtz and D J Fisher, Springer

10. Physical Metallurgy, Clark, CBS Publisher

BEPOE306T (BEELE305T) ELECTRONIC DEVICES & CIRCUITS

L = 4 T = 1 P = 2 Credits = 6

Examination Scheme

College Assessment University Examination Total Univ. Exam.

Duration

20 80 100 3 Hrs

Learning Objective Learning Outcomes

The course objective is to impart knowledge of basic

semiconductor devices, transistors, amplifiers, FET &

MOSFETS. Students also learn digital circuits with

Boolean Algebra, logic gates etc.

students will be able to understand

principle & working of basic semiconductor devices,

transistors, amplifiers, FET & MOSFETS.

Conversion of numbers from one code to other code.

Logic gates and truth tables of digital circuits.

Unit 1: Theory of PN-junction diodes, operation and characteristics, Zener diodes and voltage regulators, Half and Full Wave Rectifiers, Filters, Ripple factor, Voltage doublers.

Unit 2: BJT, Theory of operation, characteristics, Biasing arrangements, Stability factor,Small signal analysis of CE, CB, CC amplifiers and their comparison, Power Transistors, Transistor as a switch.

Unit 3: Power amplifiers- classification as A,B, AB, C, Push pull amplifiers, Cross over distortion, Positive and Negative amplifiers- classification, feedback amplifiers, advantages and applications.

Unit 4: Oscillators- Barkhausen‟ s criterion, RC and Crystal oscillators. Field effect transistors and MOSFETs- Principle of operation and characteristics, biasing arrangements.

Unit 5: Differential amplifier circuits and their stages, current source, biasing, level Shifting techniques, Common mode and differential mode gain, Impedance of different stages.

Unit 6: Boolean Identities, Binary, Gray, Octal, Hex & ASCII, Codes, Logic gates and their truth tables, De Morgan‟ s Laws, Concept of Sum of Products and Product of Sums.

Text Books

Title of Book Name of Author/s Edition & Publisher

Electronic Devices and Circuits Millman and Halkias McGraw Hill

Integrated Electronics Millman and Halkias McGraw Hill

Digital Integrated Electronics H. Taub McGraw Hill

Introduction to Operation Amplifiers Wait Tata McGraw Hill

Reference Books

BEPOE306P (BEELE305P) ELECTRONIC DEVICES & CIRCUITS

Practical based on above syllabus

Rashtrasant Tukdoji Maharaj Nagpur University, Nagpur

Faculty of Engineering and Technology

B.E. (Power ENGINEERING): FOURTH SEMESTER

BEPOE401T (BEME402T): ENGINEERING THERMODYNAMICS (Theory)

CREDITS: 04

Teaching Scheme Examination Scheme

Lectures: 3 Hours/Week Duration of Paper: 03 Hours

Tutorial: 1 Hour/Week University Assessment: 80 Marks

College Assessment: 20 Marks

Course Objectives and Expected Outcomes: This course provides the basic knowledge about Thermodynamic laws and relations, their application to various processes. At the end of this course, student will be able to understand the thermodynamic laws and their applications, the concept of entropy and availability, thermodynamic relations, and shall understand the various thermodynamic processes & cycles.

UNIT – I [8 Hrs.]

Introduction to Thermodynamics: Basic concepts of Thermodynamics, Systems and its forms, Property, State, Process, Cycles, Thermodynamics equilibrium, temperature, Zeroth law of thermodynamics, Introduction to First law of thermodynamics, Energy transfer, Heat and Work, Mechanical form of work, Non-mechanical form of work.

Ideal Gas: Gas laws-Boyle's law, Charle's law, Avagadro's law, Equation of state, Specific Heat, Universal gas constant, Constant pressure, Constant volume, Isothermal, Isentropic and Polytropic process on P-V Diagram.

Calculation of Heat transfer, Work done, Change in Internal Energy and Enthalpy.

UNIT – II [8 Hrs.]

First law of Thermodynamics for Closed System undergoing a process and cycle (Control Mass

System) and Open System (Control Volume System), Steady Flow process apply to Nozzle, Turbine, Compressor, Pump, Boiler, Throttling Device, Heat Exchanger. (Analytical treatment on First law applied to closed and open system is expected).

UNIT – III [8 Hrs.]

Second Law of Thermodynamics:- Introduction, Thermal Energy Reservoirs, Kelvin-Plank and Clausius Statements, Heat Engine, Refrigerator, Heat Pump, Perpetual Motion Machine I and II, Carnot Cycle, Thermodynamic Temperature scale.

Entropy: Clausius Inequility, Entropy, Principle of increase of Entropy, Change in Entropy for different Thermodynamics Processes with T-S Diagram, Reversible and Irreversible Processes, Availibility.(Simple analytical treatment is expected)

UNIT – IV [8 Hrs.]

Properties of Steam: - Sensible Heat, Latent Heat, Critical State, Triple Point, Wet Steam, Dry Steam, Superheated Steam, Dryness Fraction, Internal Energy of Steam, External Work Done during Evaporation, T-S Diagram, Mollier Chart, Work and Heat Transfer during various Thermodynamic Processes with steam as working fluid, Determination of Dryness Fraction using various Calorimeter. (Analytical Treatment using steam table and Mollier chart is expected)

UNIT – V [8 Hrs.]

Vapour Power Cycle:- Introduction, Vapour Carnot Cycle, Rankine Cycle, Method to increase Thermal Efficiency, Reheat-Rankine Cycle, Regenerative Rankine Cycle with opened and closed feed water heaters.

UNIT – VI [8 Hrs.]

Air Standard Cycles: - Otto Cycle, Diesel Cycle, Dual Cycle, Brayton Cycle, Stirling Cycle, Ericsson Cycle (Work done & efficiency analysis is expected)

TEXT BOOKS:

1. Engineering Thermodynamics, P. K. Nag, Tata McGraw-Hill Publications

2. Thermal Engineering, P. L. Ballani, Khanna Publications

3. Engineering Thermodynamics, S.S. Khandare, Charotar Publication House

REFERENCE BOOKS:

1. Thermodynamics and Engineering approach, Yunus A. Cengel, Michael A. Boles,

Tata McGraw-Hill Publications

2. Engineering Thermodynamics, D. P. Mishra, Cengage Learning Publications

3. Engineering Thermodynamics, Gordon Rogers, Pearson Publications

4. Thermodynamics, S. C. Gupta, Pearson Publications

BEPOE402T (BEELE405T) COMPUTER PROGRAMMING

L = 4 T = 1 P = 2 Credits = 6

Examination Scheme

College Assessment University Examination Total Univ. Exam.

Duration

20 80 100 3 Hrs

Learning Objective Learning Outcomes

The student will learn the concept of programming and

topics using C & C++ language and apply it in the field of

engineering and technology. Similarly student will know

about the Matrix operation and use of graphic tools for

representation.

The student on completion has understood

General information of computers and operating systems

Structure of “C” program, Data types, Storage class,

variables, expressions and Operators

Use of arrays and sorting techniques

Pointers and structures.

Basics of strings and arrays

C++ concepts

Matrix operation using programming.

Use of graphic tools for presentation.

Unit-I: Structure of „C“ program, Data types, Variables, Input/output statements, Storage class, operators,

Program control statements, Concept of function & Recursion.

Unit-II: Arrays, Searching (Linear & Binary), Sorting (Bubble & Selection).

Unit III: Structure(Arrays of Structures, Copying elements of one structure into another, Nested Structure,

Structure Pointer)Pointer, File Handling(File open, close, read , write, Copy).

Unit IV: Introduction to C++ concepts.

Unit-V: Introduction to MATLAB Programming

Import/export data, Program and run simple scripts (M-files), Use graphics tools to display data,

Conditional Statements (If-else, if-elseif), and Iterative statements (While, For loop).

Unit -VI: Matrix operation (Transpose, determinant, Inverse), Plotting of graphs (Basic plot, generating waveforms) using Matlab Programming. Manipulating text (Writing to a text file, Reading from a text file, Randomising and sorting a list, Searching a list), Programming using MATLAB functions.

Text Books

Title of Book Name of Author/s Edition & Publisher

A text book on Programming languages C& C++ Kakade & Deshpande DREAMTECH PRESS 2ndEd.

Pascal & C Programming Venugopal TATA MCGRAW-HILL

EDUCATION PVT. LTD.Let us C Y. Kanetkar 8

The BPB PUBLICATIONS

Computer Programming in C Balguru Swami

Reference Books

C Programming languages B.W. Kernighan and D.M.

Ritchie 2nd EDITION PEARSON EDUCATION

METLAB-A Practical introduction to programming problem Solving Stormy Attaway Elsevier

Mastering METLAB 7 Duane Hansselman BruceLittlefield Pearson

BEPOE402P (BEELE405P) COMPUTER PROGRAMMING

Practical based on above syllabus

BEPOE403T (BEELE404T) ELECTRICAL MACHINES-I

L = 4 T = 1 P = 2 Credits = 6

Examination Scheme

College Assessment University Examination Total Univ. Exam.

Duration

20 80 100 3 Hrs

Learning Objective Learning OutcomesStudent will learn

The basic principle of transfer of electrical power,

operation, construction of 3-phase transformers, their

classification, connections and phasor diagrams.

The basic principle, construction, operation, performance

characteristics, steady state analysis and applications of

electrical motors and induction generator.

The student will be able to understand

Principle, construction, connections, vector grouping,

operation and testing of 3-phase transformer

conversion of 3-phasse supply to 2-phase supply, parallel

operation of 3-ph. Transformers.

Principle, armature and field construction, types, operation

characteristics, armature reaction, commutation, methods

to improve commutation in dc generators.

Principle, types, voltage build up, performance

characteristics, torque evaluation in dc motors

Principle, construction, types, torque development,

performance characteristics, tests to determine

performance indices & parameters of equivalent circuit of

3-phase and double cage induction motors, methods of

starting, speed control and braking of induction motors.

Revolving and cross field theories, operation,

characteristics, types, equivalent circuit & tests.

UNIT-1

SINGLE PHASE TRANSFORMER :- Transformer phasor diagram, equivalent circuit diagram.

Transformer equivalent circuit parameter calculation using O.C. & S.C. test. Polarity test and parallel

operation of single phase transformer.

3-PHASE TRANSFORMER: principle and operation of three phase transformer and, O.C. & S.C. test on

three phase transformer, determination of equivalent circuit parameters, Regulation, Efficiency,

Magnetizing current and harmonics, winding identifications, various connections with vector group.

UNIT-2

Three phase to two conversion, parallel operation of three phase transformer, methods of cooling, back to

back test, maintenance of transformer, insulation of transformer.

UNIT-3

D.C. MACHNIES: - Basis principle & operation, Armature reaction & commutation,

Compensating winding, interpoles. Type of excitation. Characteristics of shunt series & compound motor

and generator speed control of d.c. shunt & series motor, constant horse power & constant torque drive of

d.c. motor.

UNIT-4

THREE PHASE INDCTION MOTOR: - Types of induction motor and production of torque. Torque-slip

characteristics, No load blocked rotor test, circle diagram, losses, efficiency, double cage motor, operating

characteristics & influence of machine parameter on the performance of motor. Induction motor as a induction generator.

UNIT-5

Starting of 3 phase I.M. speed control of I.M. by pole changing, frequency control, rotor resistance by varying supply voltage, braking regenerative braking, plugging, dynamic braking Crawling & cogging.

UNIT-6

SINGLE PHASE I.M.: - Double field revolving and cross field theory split phase motor shaded pole motor, equivalent circuit, Torque-slip characteristics.

Text Books

Title of Book Name of Author/s Edition & Publisher

Electrical Machines P.K. Mukherjee & S. Chakraborty Dhanpat Rai Publication (P) Ltd.

Electrical Machines I. J. Nagrath & Dr. D.P. Kothari 3

rd , Tata McGraw Hill

Electrical Machines P. S. Bhimbra Tata McGraw Hill

Reference Books

Performance & Design of A.C. M/C M.G. Say CBS PUBLISHERS AND

DISTRIBUTORS PVT. LTD.

3rd ed. Rev.

BEPOE403P (BEELE404P) ELECTRICAL MACHINES-I

Practical based on above syllabus

BEPOE404T (BEME403T): HYDRAULIC MACHINES (Theory)

CREDITS: 04

Teaching Scheme Examination Scheme

Lectures: 3 Hours/Week Duration of Paper: 03 Hours

Tutorial: 1 Hour/Week University Assessment: 80 Marks

College Assessment: 20 Marks

Course Objectives and Expected Outcomes: This course includes hydraulic turbines, centrifugal pumps, positive displacement pumps and miscellaneous water lifting devices. At the end of this course, students will understand practical applications of fluid; based on momentum and angular momentum principles involved in hydraulic machines. They will also understand design parameters and performance characteristics of various hydraulic machines & devices.

UNIT – I [8 Hrs.]

Compressible Flow:- Speed of Sound and the Mach Number, Isentropic Nozzle Flow, Normal Shock Wave, Shock Wave in Convergent-Divergent Nozzle, Vapour flow through Nozzle, Oblique Shock Wave, Isentropic Expansion. Introduction to impact of jet.

UNIT – II [8 Hrs.]

Theory of turbo machines and their classification, Elements of hydro-electric power plant, Impulse Turbine:- principle, constructional features, Installation of Pelton Turbine, Velocity Diagram and Analysis, Working proportions, Design parameters, Performance characteristics, Governing.

UNIT – III [8 Hrs.]

Reaction or pressure Turbine:- principles of operation, Degree of reaction, comparison over Pelton Turbine, Development of reaction turbine, Classification, Draft tube, Cavitation in Turbine, Francis Turbine, Propeller Turbine, Kaplan Turbine:- Types, Constructional features, Installations, Velocity Diagram and analysis, Working proportions, Design parameters, Performance characteristics, Governing, selection of turbines.

UNIT – IV [8 Hrs.]

Hydrodynamic pumps:- Classification and Applications, Centrifugal pumps:- Principle of operation, Classification, Component of Centrifugal Pump installation, Priming methods, Fundamental equation, Various heads, Velocity heads, Velocity triangles and their analysis, slip factor, Effect of outlet blade angle, Vane shapes, Losses and Efficiencies of pumps, Multi staging of pumps, Design Consideration, Working proportions, N.P.S.H., Cavitations in pumps, Installation and operation, Performance characteristics, Pump and system matching and Introduction to self priming pumps.

UNIT – V [8 Hrs.]

Positive Displacement Pumps:- Basic principle, Classification, Reciprocating Piston / Plunger Pumps:- Types, Main Components, Slip, Work Done, Indicator Diagram, Cavitations, Air vessels, Gear pump, Screw pump, Vane pump. UNIT – VI [8 Hrs.]

Similitude: - Types of similarities, Dimensionless number and their significance, Unit and Specific Quantities, Model Testing: - Application to hydraulic turbine and hydrodynamic pumps, Miscellaneous Water Lifting Device: - Air lift pumps, Hydraulic Ram, Submersible pump, Regenerative pumps.

LIST OF TUTORIALS:

1) Selection of Turbine
2) Design of centrifugal Pumps
3) Design of Francis Turbine
4) Design of reciprocating Pumps
5) Governing of Turbines
6) Study of Hydro-Kinetic System

TEXT BOOKS:

1. Fluid Mechanics & Fluid Power Engineering – D. S. Kumar, S.K. Kataria & Sons

Publications

2. Fluid Mechanics & Machines – R. K. Bansal, Laxmi Publications

REFERENCE BOOKS:

1. Fluid Mechanics with Engineering Applications, E. Finnemore & Franzini, Tata Mc-Graw Hill

2. Hydraulic Machines-Theory and Design, V. P. Vasandani, Khanna Publishers

3. Fluid Mechanics, A. K. Jain, Khanna Publishers

4. Hydraulic & Compressible Flow Turbo-machines, A. T. Sayers, Mc-Graw Hill

5. Mechanics of Fluids, Merle C. Potter, CL-Engineering

6. Fluid Mechanics, John F. Douglas, Pearson

BEPOE404P (BEME403P): HYDRAULIC MACHINES (Practical)

CREDITS: 01

Teaching Scheme Examination Scheme

Practical: 2 Hours/Week University Assessment: 25 Marks

College Assessment: 25 Marks

LIST OF PRACTICALS:

Minimum Eight out of following shall be performed:

1. To determine the metacentric height of given floating vessel.

2. To verify Bernoulli's theorem.

3. To find the value of co-efficient of given venture meter fitted in a pipe.

4. To find the value of co-efficient of Discharge for a given orifice meter.

5. Performance characteristics of Pelton wheel.

6. Performance characteristic of Francis Turbine.

7. Performance characteristic of Kaplan Turbine.

8. Performance characteristic of Reciprocating pump.

9. Performance characteristic of Variable speed pump.

10. Performance characteristic of Axial Flow Pump.

11. To find friction losses in pipe.

12. To determine co-efficient of discharge in pipes.

BEPOE405T (BEELE406T) ENVIRONMENTAL STUDIES

L = 3 T = 0 P = 0 Credits = 0

Examination Scheme

College Assessment University Examination Total Univ. Exam.

Duration

20 80 100 3 Hrs

Learning Objective Learning Outcomes

Student will be able to learn the natural sources available.

Students will also learn about ecosystem, biodiversity,

pollution.

Student will also learn the effect on environment on

social aspects and Human population.

The student on completion of course will understood the

Ecosystem

Environmental issues related with social and human

population.

Biodiversity and its conversion

Unit 1 : Multidisciplinary nature of environmental studies

Definition, scope and importance (2 lectures)

Need for public awareness.

III

Unit 2 : Natural Resources :

Renewable and non-renewable resources :

Natural resources and associated problems.

a) Forest resources : Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forest and tribal people.

b) Water resources : Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems.

c) Mineral resources : Use and exploitation, environmental effects of extracting and using mineral resources, case studies.

d) Food resources : World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies.

e) Energy resources : Growing energy needs, renewable and non renewable, energy sources, use of alternate energy sources. Case studies.

f) Land resources : Land as a resource, land degradation, man induced landslides, soil erosion and desertification. Role of an individual in conservation of natural resources. Equitable use of resoureces for sustainable lifestyles. (8 lectures)

Unit 3 : Ecosystems

• Concept of an ecosystem.

• Structure and function of an ecosystem.

• Producers, consumers and decomposers.

• Energy flow in the ecosystem.

• Ecological succession.

• Food chains, food webs and ecological pyramids.• Introduction, types, characteristic features, structure and function of the

following ecosystem :-

a. Forest ecosystem

b. Grassland ecosystem

c. Desert ecosystem

d. Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries) (6 lectures)

Unit 4 : Biodiversity and its conservation

• Introduction – Definition : genetic, species and ecosystem diversity.

• Biogeographical classification of India

• Value of biodiversity : consumptive use, productive use, social, ethical, aesthetic

and option values

• Biodiversity at global, National and local levels.

• Inida as a mega-diversity nation

V

• Hot-sports of biodiversity.

• Threats to biodiversity : habitat loss, poaching of wildlife, man-wildlife conflicts.

• Endangered and endemic species of India

• Conservation of biodiversity : In-situ and Ex-situ conservation of biodiversity. (8 lectures)

Unit 5 : Environmental Pollution

Definition

• Cause, effects and control measures of :-

a. Air pollution

b. Water pollution

c. Soil pollution

d. Marine pollution

e. Noise pollution

f. Thermal pollution

g. Nuclear hazards

• Solid waste Management : Causes, effects and control measures of urban and

industrial wastes.

• Role of an individual in prevention of pollution.

• Pollution case studies.

• Diaster management : floods, earthquake, cyclone and landslides. (8 lectures)

VI

Unit 6 : Social Issues and the Environment

• From Unsustainable to Sustainable development

• Urban problems related to energy

• Water conservation, rain water harvesting, watershed management

• Resettlement and rahabilitation of people; its problems and concerns. Case Studies

• Environmental ethics : Issues and possible solutions.

• Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case Studies.

• Wasteland reclamation.

• Consumerism and waste products.

• Environment Protection Act.

• Air (Prevention and Control of Pollution) Act.

• Water (Prevention and control of Pollution) Act

• Wildlife Protection Act• Forest Conservation Act

• Issues involved in enforcement of environmental legislation.

• Public awareness. (7 lectures)

Unit 7 : Human Population and the Environment

• Population growth, variation among nations.

• Population explosion – Family Welfare Programme.

VII

• Environment and human health.

• Human Rights.

• Value Education.

• HIV/AIDS.

• Women and Child Welfare.

• Role of Information Technology in Environment and human health.

• Case Studies. (6 lectures)

Unit 8 : Field work

• Visit to a local area to document environmental assetsriver/

forest/grassland/hill/mountain

• Visit to a local polluted site-Urban/Rural/Industrial/Agricultural

• Study of common plants, insects, birds.

• Study of simple ecosystems-pond, river, hill slopes, etc. (Field work Equal to 5 lecture hours)

BEPOE406T (BEELE403T) DIGITAL AND LINEARELECTRONIC CIRCUITS

L = 3 T = 1 P = 2 Credits = 5

Examination Scheme

College Assessment University Examination Total Univ. Exam.

Duration

20 80 100 3 Hrs

Learning Objective Learning Outcomes

To introduce the basics of logic families, multiplexers, Flip

flops, timers.

Students will introduce with operational amplifiers, Linear

IC‟ s and multivibrators used in digital electronics.

students will be able to understand

Basic fundamentals of logic gates, , Flip flops, timers.

Basic Operational amplifier circuits:

Simple linear circuitApplications of Operational amplifier

Study of Linear ICS

Unit 1:

TTL, CMOS Logic Families, Combinational Logic concepts, Decoders, Encoders, Multiplexers, Demultiplexers, Code converters, Karanaugh map Principle.

Unit 2:

Introduction to Flip-flop, Latch, Concept of Clock, Overview of RAM, ROM, EPROM & EEPROM,

Master slave Flip-flop and conversion of one type to another.

Unit 3:

Introduction to sequential circuits, Synchronous and Asynchronous Counters, Different module

counters with reset/ clear facility, Adders, Subtractors, Concept of ALU.

Unit 4:

Basics of Operational Amplifiers, Ideal and non-ideal OPAMPs, Inverting & non-inverting OPAMPs, Integrators, Differentiators, Summer and Averaging circuits, Instrumentation amplifiers, Grounding & Shielding Problems in opamps

Unit 5:

Precision rectifiers, Constant Current & Constant Voltage sources, Introduction to Active filters, Butterworth 2nd order filter – Design & operation, Clipping, clamping and comparator circuits, Sample & Hold circuits, A/D & D/A converters, Phase locked loops.

Unit 6:

Study of Linear ICs : LM 741, LM 555, LM 339, LM 723, LM 78xx & 79xx series, Astable, monostable and bistable multivibrators using IC LM 555.

Text Books

Title of Book Name of Author/s Edition & Publisher

Digital Integrated Electronics Herbert Taub McGraw Hill

Introduction to Operation Amplifiers Wait Tata McGraw Hill

Operational Amplifiers- Design and applications Tobey Grahame-Huelsman TMH

Reference Books

Operational Amplifiers and applications R. Gaikwad

Linear ICs Manual I, II, III National Semiconductors

BEPOE406P (BEELE403P) DIGITAL AND LINEARELECTRONIC CIRCUITS

Practical based on above syllabus