B. Tech. Chemical Technology

Electrical & Electronics Engineering: CT-GES-105T **Total Credits: 03**
Teaching Scheme: Lectures: 03 Hours/ Week
Examination Scheme: Theory T (U): 70 Marks T (I): 30 Marks
Duration of University Exam.: 03 Hours

Course Objectives:

An insight to the importance of electrical energy in chemical plants. Basics of electricity, concept of AC and DC power supply, insight into bulk power generation, selection of different types of drives for a given application process, basic insight into power supplies, electronic devices and electronic equipment, instrumentation amplifiers in industries.

Unit I:
DC Circuits: Resistor. Inductor, Capacitor, Diode, Concept of Voltage and Current sources, resistance in series and parallel, Kirchhoff's Laws, Superposition Theorem, Thevenin's theorem, Norton's theorem, Star-Delta transformation, Analysis of simple circuit with DC excitation, Node and Mesh analysis.

Unit II:
AC Fundamentals: Concept of ac current and voltages, difference between ac and dc, Periodic functions, Average & RMS values, Form factor and Peak factor, Steady state behaviour with sinusoidal excitation, Phasor representation, Phase and Phase difference concept.

Unit III:
Steady State Analysis of AC Circuits consisting of components R, L, C, RL, RC and RLC in series AC circuits, concept of resonance.
Introduction to three phase ac circuits, three phase energy conversion: insight into working of Thermal, Hydro and Nuclear power plants.

Unit IV:
Transformer Modelling and Analysis: Introduction, General theory of Transformer, Basic Principles, construction phasor diagram for transformer under no load, Transformer on load, Balance of MMF on two sides, Phasor diagrams, Equivalent Circuit, loses in transformer, Normal and all day Efficiency, Regulation, Open- circuits and short-circuits tests.

Unit V:
Basic Electronics: Introduction, Diode, BJT and its characteristics, BJT configurations, MOSFET, SCR, Introduction to digital circuits.

Suggested Text Books:

1. B. L. Thereja, A Text Book of Electrical Technology, Vol. 1, 2 and 4, S. Chand & Co., New Delhi.
2. D. P. Kothari and I. J. Nagrath, Basic Electrical Engineering, 3rd edition, Tata McGraw Hill, 2010.
3. D. C. Kulshrestha, Basic Electrical Engineering, Tata McGraw Hill, 2009.

7.12.21 DO (MDS) S.N. Rao
07/12/21 (M.L. Meshram)
07/12/21 (P.N. Belkhode)
07/12/21 (C P S Agrawal)
7/12/21 (R.A. Puranik)

Suggested Reference Books:

1. L. S. Bobrow, Fundamentals of Electrical Engineering, Oxford University Press, 2011.
2. E. Huges, Electrical and Electronics Technology, 10th edition, PEARSON, 2010.
3. Vincent Del Toro, Electrical Engineering Fundamentals, 2nd edition, Prentice Hall India 1989.

Course Outcome: Students completing the course will be able to:

CO1: Understand and apply the basic knowledge of electrical engineering to solve any electrical circuit in real sense using circuit simplification techniques like Kirchhoff's laws, Star-delta transformation, Network theorem, etc.

CO2: Develop the knowledge of the AC fundamentals based on fundamental principles of electrical engineering that will help to analyse electrical and magnetic circuits....

CO3: Analyse and evaluate various alternating current electrical circuits with series and parallel connected circuit elements using basic mathematical and electrical principles.

CO4: Understand and Evaluate operation of AC machines like single phase transformer, and acquire method of analysing AC machines using Phasor diagrams and equivalent circuit modelling.

CO5: Understand the fundamentals of basic solid state electronic devices and its application in electronic circuitry.

7.12.21 (M.L. Meshram) 07/12/21 (P.N. Bukhode) 7/12/21 (P S Agrawal) 7/12/21

Thermodynamics-I: CT-GES-205T **Total Credits: 03**

Teaching Scheme: Lectures: 03 Hours/ Week

Examination Scheme: Theory T (U): 70 Marks **T (I): 30 Marks**

Duration of University Exam.: 03 Hours

Course Objectives:

- To learn the basic principles of thermodynamics, laws of thermodynamics.
- To study graphs and tables of thermodynamic properties, properties of steam.
- To study and analyse the performance of compressors and turbines.
- To make student understand the thermodynamic analysis of steam power plants, Rankine cycle and internal combustion engine.
- To make student understand the basic working of refrigerator, various cycles.

Unit I:

Introduction- Scope of thermodynamics, Dimensions and Units, Temperature, Pressure, Work, Energy, Heat, First law of thermodynamics; State functions; Equilibrium; Reversible process; Constant P, V, T processes; Steady Flow Energy Equation for open systems; Vander Waals. Second law of thermodynamics; Carnot Cycle, Entropy.

Unit II:

Thermodynamic property of fluids, Maxwell relations, graphs and tables of thermodynamic properties. Properties of Steam, Use of steam tables, measurement of dryness fraction, entropy of steam, temperature entropy and Mollier charts.

Unit III:

Application of thermodynamics to flow processes - compressors and turbines.

Unit IV:

Thermodynamic analysis of steam power plants; Rankine cycle; Internal combustion engine, Otto engine; Diesel engine

Unit V:

The Carnot refrigerator; Vapor-compression cycle; Absorption refrigeration; Heat pump

Books Recommended:

1. J. M. Smith, H. C. Van Ness and M. M. Abbott, Introduction to Chemical Engineering Thermodynamics, 7th edition, McGraw-Hill International Edition, 2005.
2. P. K. Nag, Engineering Thermodynamics, Tata McGraw-Hill Publications.
3. P. L. Ballani, Thermal Engineering, Khanna Publications.
4. M. J. Moran, H. N. Shapiro, D. D. Boettner and M. B. Bailey, Principles of Engineering Thermodynamics, 8th Edition, Willey.
5. Yunus A. Cengel and Michael A. Boles, Thermodynamics and Engineering approach, Tata McGraw-Hill Publications.

7-12-21

07/12/21 (M.L. Meshram)

07/12/21 (P.N. Belkhode)

7/12/21 (P.S Agrawal)

7/12/21

Course Outcome: Students completing the course will be able to:

CO1: Apply steady flow energy equation and develop familiarity with thermodynamic applications to a wide range of systems.

CO2: Evaluate the properties of non-ideal gases, dryness fraction and problem on the properties of steam using steam table and Mollier charts.

CO3: Evaluate thermodynamics flow processes- compressors and turbines turbine.

CO4: Relate various internal combustion engine and analysing its performance.

CO5: Explain the working refrigeration cycle.

7.12.21

07/12/21
(M.L.Meshram)

07/12/21
(P.N.Belkhode)

7/12/21
(P S Agrawal)

7/12/21

Engineering and Solid Mechanics: CT-GES-206T **Total Credits: 03**

Teaching Scheme: Lectures: 03Hours/Week

Examination Scheme: Theory T (U): 70 Marks T (I): 30 Marks

Duration of University Exam.: 03 Hours

Course Objectives:

- Students would be introduced to fundamentals of Engineering Mechanics with emphasis on force systems, statics of rigid bodies and ability to draw free body diagrams.
- Second part of the course would be an introduction to Solid Mechanics, and students would be introduced to basic concepts of mechanics of deformable bodies: concept of stress, strain, elastic moduli, constitutive relations, and applications to the problems.

Unit I:

Force: Definition, Characteristics of a force, System of forces, Resolution and composition of forces.

Resultant force: Definition, Analytical and graphical methods for resultant force in two dimensions, Moments and Couples, Varignon's theorem of moments.

Equilibrium of rigid bodies: Principles of equilibrium, types of equilibrium, conditions of equilibrium, free body diagrams, Analytical and graphical methods for equilibrium of rigid bodies in two dimensions.

Unit II:

Support reactions: Types of supports and loading in beams, determination of support reactions in cantilever, simply supported and overhang beams.

Trusses and Frames: Types of frames, Analysis of simple plane trusses in equilibrium by the method of joints and method of sections.

Friction: Frictional forces, types, limiting friction, coefficient of friction, angle of friction, laws of friction, Equilibrium of bodies lying on rough horizontal and inclined planes.

Unit III:

Centroid and Moment of Inertia: Centroid of plane standard geometric figures and composite figures, Moment of inertia (second moment of area) of plane standard geometric figures and composite figures, parallel and perpendicular axis theorems, Radius of gyration.

Simple lifting machines: Types of machines, efficiency of a machine, ideal machine, friction in machines, law of machine, Maximum M.A. and Maximum efficiency of a machine, reversible and non-reversible machines, Differential wheel & axle, single and double purchase winch crabs.

Unit IV:

Simple stresses and strains: Types of stresses and strains, modulus of elasticity, modulus of rigidity, bulk modulus, relation between elastic constants, stress-strain diagram for mild steel, lateral strain, Poisson's ratio, volumetric strain, triaxial loading in rectangular sections, stresses in bars of varying and composite sections.

Stresses in beams: Theory of simple bending, simple bending equation, bending stress, moment of resistance, assumptions in theory of simple bending, section modulus.

Slope and defection of beams: Basic concepts, slope and deflection of cantilever and simply supported beams under standard loading conditions, Macaulay's method, simple problems.

7.12.21 07/12/21 (M.L. Meshram) 07/12/21 (P.N. Belkhode) 7/12/21 (P S Agrawal) 7/12/21

Unit V:

Torsion: Theory of pure torsion, torsional moment of resistance, torsion equation, assumptions in the theory of pure torsion, polar modulus, power transmitted by solid and hollow circular shafts.

Columns and struts: Axially loaded compression members, Euler's and Rankine's formula for buckling of columns, end conditions of column, buckling load, effective length of columns, slenderness ratio.

Suggested Text Books:

1. R. S. Khurmi, A Textbook of Engineering Mechanics, S. Chand & Co., New Delhi.
2. S. N. Saluja, A Textbook of Engineering Applied Mechanics, Satya Prakashan.
3. R. S. Khurmi and N. Khurmi, Strength of Materials, S. Chand & Co., New Delhi.
4. B. C. Punmia, Mechanics of Materials, Laxmi Publications (P) Ltd.

Suggested Reference Books:

1. F. L. Singer, Engineering Mechanics, Harper & Row Publishers.
2. S. Timoshenko and D. H. Young, Engineering Mechanics, McGraw Hill Publications.
3. Andrew Pytel and F. L. Singer, Strength of Materials, Harper & Row Publishers.

Course Outcome: Students completing the course will be able to:

CO1: Understand the use of basic concepts of resolution & composition of forces and its application in solving engineering problems.

CO2: Analyse beams, truss or any engineering component by applying conditions of equilibrium.

CO3: Use of various geometric sections used in engineering design and to determine velocity ratio & efficiency of simple lifting machines.

CO4: Calculate different stresses and strains and the deformations such as axial, normal deflections occurring in components of structure under different loading conditions.

CO5: Apply the appropriate theory of failure in deformable bodies to estimate critical load of columns and power in rotating shafts.

7.12.21 07/12/21 (M.L. Meshram) 07/12/21 (P.N. Belkhode) 7/12/21 (P S Agrawal) 7/12/21

Maths – II

(Total Credits: 03)

Teaching Scheme

Lectures: 3Hours/ Week

Examination Scheme Theory

T (U) : 70 Marks T (I) : 30 Marks

Duration of University Exam. : 03 Hours

Course Code : CT-BS-201T

Students will able to

CO1 Solve different types of Differential equation and apply it to explain the engineering problems

CO 2 Understand fundamental concepts of Partial Differential Equation and solve various type of PDEs.

CO 3 Apply Partial differential equation to solve engineering problems related to heat conduction and wave motion equation.

CO4 Understand the complex number and functions of complex variable and apply it to determine analytic and harmonic functions

CO5 Apply the concept of Fourier series representation to analyze continuous & discrete time periodic signal.

Unit I : Ordinary differential Equation and Higher Order Differential Equation

Differential Equations: First order first degree differential equations: Linear, reducible to linear and exact differential equations. Higher order differential equations with constant coefficient, method of variation of parameters. Cauchy's and Legendre's homogeneous differential equations, simultaneous differential equations.

Unit II : Partial Differential Equations

First order Lagrange's Linear Partial Differential Equation, Solution of higher order linear homogeneous Partial Differential Equations and linear non-homogeneous Partial Differential Equations.

Unit III : Application of Partial Differential Equations

Method of separation of variables for Partial Differential Equations, Applications of Partial Differential Equations: (i) One dimensional wave equation, (ii) One dimensional heat conduction equation in Cartesian co-ordinates and polar co-ordinates and (iii) Two dimensional steady state heat conduction equation

7.12.21 7.12.21 07/12/21 (M.L. Meshram) 7/12/21 (P.N. Bakhode) 7/12/21 (P.S. Agrawal)

Unit IV : Function of Complex Variables

Basic Concepts of Complex numbers, De-Moivre's Theorem, Calculus of Functions of Complex variables : Analytic functions, Cauchy –Riemann conditions in Cartesian co-ordinates and polar co-ordinates, methods for finding conjugate functions,

Unit V : Fourier Series

Fourier series, expansion of function, Even and odd function, Half range fourier series, Change of interval, Harmonic analysis.

References

1. Higher Engineering Mathematics by H. K. Das, Er. Rajnish Verma
2. A text book of Engineering Mathematics by N. P. Bali, Manish Goyal
3. Applied Engineering Mathematics (Vol- I & II) by J. N. Wartikar
4. Higher Engineering Mathematics by B. S. Grewal
5. Text book of Engineering Mathematics by Bali, Iyenger (Laxmi Prakashan)