MU B.E./B.Tech CSE Sem 1 syllabus

Engineering Mathematics-I

FEC101

Engineering Mathematics-I

Total 4

01 Complex Numbers
Pre-requisite: Review of Complex Numbers-Algebra of Complex Number, Cartesian, polar and exponential form of complex number.
1.1. Statement of D'Moivre's Theorem.
1.2. Expansion of sinn θ, cosnθ in terms of sines and cosines of multiples of θ and Expansion of sinnθ, cosnθ in powers of sinθ, cosθ
1.3. Powers and Roots of complex number.

02 Hyperbolic function and Logarithm of Complex Numbers
2.1. Circular functions of complex number and Hyperbolic functions. Inverse Circularand Inverse Hyperbolic functions. Separation of real and imaginary parts of all typesof Functions.
2.2 Logarithmic functions, Separation of real and Imaginary parts of Logarithmic Functions.
 # Self learning topics: Applications of complex number in Signal processing,
Electrical circuits.

03 Partial Differentiation
3.1 Partial Differentiation: Function of several variables, Partial derivatives of first andhigher order. Differentiation of composite function.
3.2.Euler's Theorem on Homogeneous functions with two independent variables (with proof). Deductions from Euler's Theorem.
 # Self learning topics: Total differentials, implicit functions, Euler's Theorem on Homogeneous functions with three independent

variables.

04 Applications of Partial Differentiation and Successive differentiation.

4.1 Maxima and Minima of a function of two independent variables, Lagrange‘s method of undetermined multipliers with one constraint.
4.2 Successive differentiation: nth derivative of standard functions. Leibnitz‘s Theorem (without proof) and problems
 # Self learning topics: Jacobian‘s of two and three independent variables (simple problems)

05 Matrices

Pre-requisite: Inverse of a matrix, addition, multiplication and transpose of a matrix
5.1.Types of Matrices (symmetric, skew- symmetric, Hermitian, Skew Hermitian, Unitary, Orthogonal Matrices and properties of Matrices). Rank of a Matrix using Echelon forms, reduction to normal form and PAQ form.
5.2.System of homogeneous and non –homogeneous equations, their consistency and solutions.
 # Self learning topics: Application of inverse of a matrix to coding theory.

06 Numerical Solutions of Transcendental Equations and System of Linear Equations and Expansion of Function.

6.1 Solution of Transcendental Equations: Solution by Newton Raphson method andRegula –Falsi.
6.2 Solution of system of linear algebraic equations, by (1) Gauss Jacobi Iteration Method, (2) Gauss Seidal Iteration Method.
6.3 Taylor‘s Theorem (Statement only) and Taylor‘s series, Maclaurin‘s series (Statement only).Expansion of sin(x), cos(x), tan(x), sinh(x), cosh(x), tanh(x), log(1+x), (x), (x), (x).
 # Self learning topics: Indeterminate forms, L- Hospital Rule, Gauss Elimination
Method, Gauss Jordan Method.

References

1. Higher Engineering Mathematics, Dr. B. S. Grewal, Khanna Publication
2. Advanced Engineering Mathematics, Erwin Kreyszig, Wiley Eastern Limited, 9th Ed.
3. Engineering Mathematics by Srimanta Pal and Subodh,C. Bhunia, Oxford University Press
4. Matrices, Shanti Narayan, .S. Chand publication.

5. Applied Numerical Methods with MATLAB for Engineers and Scientists by Steven Chapra, McGraw Hill
6. Elementary Linear Algebra with Application by Howard Anton and Christ Rorres. 6th edition.John Wiley & Sons, INC.

Engineering Physics-I

FEC102

Engineering Physics-I

Total 2

01 QUANTUM PHYSICS

(Prerequisites : Dual nature of radiation, Photoelectric effect Matter waves- wave nature of particles, de-Broglie relation, Davisson-Germer experiment)

De Broglie hypothesis of matter waves; properties of matter waves; wave packet, phase velocity and group velocity; Wave function; Physical interpretation of wave function; Heisenberg uncertainty principle; non existence of electron in nucleus; Schrodinger‘s time dependent wave equation; time independent wave equation; Particle trapped in one dimensional infinite potential well, Quantum Computing.

02 CRYSTALLOGRAPHY

(Prerequisites : Crystal Physics (Unit cell, Space lattice, Crystal structure, Simple Cubic, Body Centered Cubic, Face Centered Cubic, Diamond Structure, Production of X-rays)
Miller indices; interplanar spacing; X-ray diffraction and Bragg‘s law; Determination of Crystal structure using Bragg‘s diffractometer;

03 SEMICONDUCTOR PHYSICS

(Prerequisites: Intrinsic and extrinsic semiconductors, Energy bands in conductors, semiconductors and insulators, Semiconductor diode, I-V characteristics in forward and reverse bias)
Direct & indirect band gap semiconductor; Fermi level; Fermi dirac distribution; Fermi energy level in intrinsic & extrinsic semiconductors; effect of impurity concentration and temperature on fermi level; mobility, current density; Hall Effect; Fermi Level

diagram for p-n junction (unbiased, forward bias, reverse bias);

04 INTERFERENCE IN THIN FILM

(Prerequisites : Wave front and Huygen's principle, reflection and refraction, Interference by division of wave front, Youngs double slit experiment)

Interference by division of amplitude, Interference in thin film of constant thickness due to reflected and transmitted light; origin of colours in thin film; Wedge shaped film; Newton‘s rings.

Applications of interference - Determination of thickness of very thin wire or foil; determination ofrefractive index of liquid; wavelength of incident light; radius of curvature of lens; testing of surfaceflatness; Anti-reflecting films and Highly reflecting film.

Applications of semiconductors: LED, Zener diode, Photovoltaic cell.

05 SUPERCONDUCTORS AND SUPERCAPACITORS

(Prerequisites : Electric current, flow of electric charges in a metallic conductor, drift velocity, mobility and their relation with electric current, Ohm's law, electrical resistance, V-I characteristics (linear and non-linear), electrical resistivity and conductivity temperature dependence of resistance)

Superconductors: Critical temperature, critical magnetic field, Meissner‘s effect, Type I and Type II and high Tc superconductors;

Supercapacitors: Principle, construction, materials and applications, comparison with capacitor and batteries : Energy density, Power density,

06 ENGINEERING MATERIALS AND APPLICATIONS

(Prerequisites: Paramagnetic materials, diamagnetic materials, ferromagnetic materials, crystal physics, Conductors and insulators, free charges and bound charges inside a conductor. Dielectrics and electric polarisation, capacitors and capacitance)

Liquid crystals: Nematic, Smectic and cholesteric phases, Liquid crystal display. Multiferroics : Type I & Type II multiferroics and applications,

Magnetoresistive Oxides: Magnetoresistance, GMR and CMR materials, introduction to spintronics.

References

1. A text book of Engineering Physics-Avadhanulu&Kshirsagar, S. Chand
2. A textbook of Optics - N. Subramanyam and Brijlal, S.Chand
3. Fundamentals of optics by Jenkins and White, McGrawHill

4. Solid State Electronic Devices- B. G. Streetman, Prentice Hall Publisher
5. Modern Engineering Physics – Vasudeva, S.Chand
6. Concepts of Modern Physics- ArtherBeiser, Tata McGraw Hill
7. A Text Book of Engineering Physics, S. O. Pillai, New Age International Publishers.
8. Introduction to Solid State Physics- C. Kittle, John Wiley& Sons publisher
9. Ultracapacitors: The future of energy storage- R.P Deshpande, McGraw Hill
10. Advanced functional materials – AshutoshTiwari, LokmanUzun, Scrivener Publishing LLC.

Engineering Chemistry-I

FEC103

Engineering Chemistry-I

Credits Assigned 2

01 Atomic and Molecular Structure
Atomic orbitals (s,p,d,f) orbital shapes, Electronic Configuration, Molecular orbital theory (MOT), bonding and anti-bonding orbitals, Molecular orbital diagrams of Homonuclear and Heteronuclear diatomic molecules-Be2, O2, CO, NO their bond order and magnetic properties,

02 Aromatic systems &their molecular structure
Define Aromaticity, Huckel‘s rule, Structure and bonding of benzene and pyrrole.

03 Intermolecular Forces & Critical Phenomena
Ionic, dipolar and Vander Waal‘s interactions, Equations of state of real gases and critical phenomena

04 Phase Rule-Gibb’s Phase Rule
Statement of Gibbs‘ Phase Rule, Terms involved with examples, One Component System (Water), Reduced Phase Rule, Two Component System (Pb- Ag), Advantages and Limitations of Phase Rule. Numerical problems on Phase Rule.

05 Polymers

Introduction: Definition- Polymer, polymerization, Properties of Polymers- Molecular weight (Number average and Weight average), Numerical problems on molecular weight, effect of heat on polymers (glass transition temperature), Viscoelasticity,Conducting Polymers, Classification-Thermoplastic and
Thermosetting polymers; Compounding of plastic, Fabrication of plastic by Compression, Injection, Transfer and Extrusion moulding, Preparation, properties and uses of PMMA and Kevlar.

06 Water
Introduction - Impurities in water, hardness of water- units (no conversions), types and numerical problems, determination of hardness of water by EDTA method and numerical problems.Softening of water by Ion Exchange process and numerical problems, BOD, COD- definition, significance and Numerical problems. Water purification-membrane technology- Electrodialysis, Reverse osmosis, and Ultra filtration.

References
1. Engineering Chemistry - Jain & Jain (DhanpatRai)
2. Engineering Chemistry – Dara &Dara (S Chand)
3. Engineering Chemistry - Wiley India (ISBN – 9788126519880)
4. A Text Book of Engineering Chemistry – ShashiChawla (DhanpatRai)
5. Engineering Chemistry – Payal Joshi &Shashank Deep (Oxford University Press)
6. Concise Inorganic Chemistry – J D LEE
7. Essentials of Physical Chemistry—B S BahlArunBahl G D Tuli.

Engineering Mechanics

FEC104

Engineering Mechanics

Credits Assigned 3

01

1.1 System of Coplanar Forces:
Classification of force systems, Principle of transmissibility, composition and resolution of forces.
1.2 Resultant:
Resultant of coplanar and Non Coplanar (Space Force) force system

(Concurrent forces, parallel forces and non-concurrent Non-parallel system of forces).
Moment of force about a point, Couples, Varignon's Theorem. Force couple system. Distributed Forces in plane.

02 Centroid: First moment of Area, Centroid of composite plane Laminas

2.1 Equilibrium of System of Coplanar Forces:

Conditions of equilibrium for concurrent forces, parallel forces and non- concurrent non- parallel general forces and Couples.
Equilibrium of rigid bodies- free body diagrams.

2.2 Equilibrium of Beams:
Types of beams, simple and compound beams, type of supports and reaction: Determination of reactions at supports for various types of loads on beams. (Excluding problems on internal hinges)

03 Friction:
Revision of Static Friction, Dynamic/ Kinetic Friction, Coefficient of Friction, Angle of Friction, Laws of friction. Concept of Cone of friction.
Equilibrium of bodies on inclined plane. Application to problems involving wedges and ladders.

04 Kinematics of Particle:
Motion of particle with variable acceleration. General curvilinear motion. Tangential & Normal component of acceleration, Motion curves (a-t, v-t, s-t curves). Application of concepts of projectile motion and related numerical.

05 Kinematics of Rigid Body:
Translation, Rotation and General Plane motion of Rigid body. The concept of Instantaneous center of rotation (ICR) for the velocity. Location of ICR for 2 link mechanism. Velocity analysis of rigid body using ICR.

06

6.1 Kinetics of a Particle:
Force and Acceleration: -Introduction to basic concepts, D'Alemberts Principle, concept of Inertia force, Equations of dynamic equilibrium, Newton's second law of motion. (Analysis limited to simple systems

only.)

6.2 Kinetics of a Particle: Work and Energy:
Work Energy principle for a particle in motion. Application of Work – Energy principle to a system consists of connected masses and Springs.

6.3 Kinetics of a Particle: Impulse and Momentum:
Principle of linear impulse and momentum.
Impact and collision: Law of conservation of momentum, Coefficient of Restitution. Direct Central Impact and Oblique Central Impact. Loss of Kinetic
Energy in collision of inelastic bodies.

References:
1. Engineering Mechanics by R. C.Hibbeler.
2. Engineering Mechanics by Beer &Johnston, Tata McGrawHill
3. Engineering Mechanics by F. L. Singer, Harper& RawPublication
4. Engineering Mechanics by Macklin & Nelson, Tata McGrawHill
5. Engineering Mechanics by ShaumSeries
6. Engineering Mechanics by A K Tayal, UmeshPublication.
7. Engineering Mechanics by Kumar, Tata McGrawHill
8. Engineering Mechanics (Statics) by Meriam and Kraige, WileyBools
9. Engineering Mechanics (Dynamics) by Meriam and Kraige, WileyBools

Basic Electrical Engineering

FEC105

Basic Electrical Engineering

Credits Assigned 3

Prerequisite

Resistance, inductance, capacitance, series and parallel connections of resistance, concepts of voltage, current, power and energy and its units. Working of wattmeter, Magnetic circuits, MMF, Magnetic field strength, reluctance, series and parallel magnetic circuits, BH Curve, Time domain analysis of first order RL and RC circuits

01 DC Circuits: (Only independent source) Kirchhoff‘s Laws, Ideal

and practical Voltage and current Sources, Source Transformation, Mesh and Nodal Analysis, Star-Delta / Delta-Star Transformations, Superposition, Thevenin's Theorem, Norton's Theorem and Maximum Power Transfer Theorem.

02 AC Circuits :Generation of alternating voltage, basic definitions, average and r.m.s values, phasor and phase difference, sums on phasors, Single-phase ca series and parallel circuits consisting of R, L, C, RL, RC, RLC combinations, definitions - real, reactive and apparent power, admittance (Y), Series and parallel resonance, Q factor

03 Generation of Three-Phase Voltages, voltage & current relationships in Star and Delta Connections, power measurement in three phase balanced circuit(Only two wattmeter method).

04 Transformers: Working principle of single-phase transformer, EMF equation of a transformer, Transformer losses, Actual (practical) and ideal transformer, Phasor diagram (considering winding resistance and magnetic leakage), Equivalent circuit, Open-circuit test (no-load test), short circuit (SC) test, efficiency.

05 Electrical Machines (Numerical not expected): Rotating magnetic field produced by three phase ac, principle of operation of Three-phase induction motor, constructional details and classification of Induction machines.

06 Principle of operation of Single-Phase induction motors, stepper motor (Single stack variable reluctance and permanent magnet) (Numerical not expected)

Self- study Topic
Principle of operation of DC generators and DC motors, constructional details and classification of DC machines, e.m.f equation of generator/motor, applications.
(Theory question can be asked in University exam, no numericals. The percentage of marks allotted should be maximum of 10% (max. 08marks))

Text Books:
1. V. N. Mittal and Arvind Mittal —Basic Electrical Engineering‖ Tata McGraw Hill, (Revised Edition)
2. Vincent Del Toro —Electrical Engineering Fundamentals‖, PHI Second edition, 2011

3. Edward Hughes —Hughes Electrical and Electronic Technology‖, Pearson Education (Tenth edition)
4. D P Kothari and I J Nagrath —Theory and Problems of Basic Electrical Engineering‖, PHI 13th edition 2011.
5. M. Naidu,S. Kamakshaiah —Introduction to Electrical Engineering‖ McGraw-Hill Education, 2004
6. B.R Patil —Basic Electrical Engineering‖ Oxford Higher Education

References:

1. B.L.Theraja —Electrical Engineering — Vol-I and II.
2. S.N.Singh, —Basic Electrical Engineering‖ PHI , 2011Book