Maharaja Ranjit Singh Punjab Technical University, Punjab
B.E./B.Tech CIVIL Sem 1 syllabus

Basic Electrical Engineering

UNIT-1

DC Circuits:
Electrical circuit elements (R, L and C), voltage and current sources, Ohm's law, Kirchhoff
current and voltage laws, analysis ofsimple circuits with dc excitation Superposition, Thevenin
and Norton Theorems. Step response of RL, RC circuits.

UNIT-2

AC Circuits:
Representation of sinusoidal waveforms, average, peak and rms values, phasor representation,
real power, reactive power, apparent power, power factor. Analysis of single-phase ac circuits
consisting of R, L, C, RL, RC, RLC series and parallel combinations, series and parallel
resonance. Three phase voltage source, phase sequence, three phase balanced circuits, voltage
and current relations in star and delta connections.

UNIT-3

Transformers:
Magnetic materials, BH characteristics, Single-phase Transformer, no load and full load
conditions, phasor diagrams, equivalent circuit, calculation of lossesin transformers, regulation
and efficiency, Auto-transformers, their applications and comparison with two winding
transformers.

UNIT-4

Electrical Machines:
Generation of rotating magnetic fields, Construction and working of a three-phase induction
motor, Direct-On-Line and Star-Delta starters. Construction and working of single-phase
motors (Split phase, shaded pole, capacitor start, capacitor run, capacitor start and run motors).

UNIT 5

Electrical Installations:
Components of LT Switchgear: Switch Fuse Unit (SFU), Miniature Circuit Breaker (MCB),
Earth Leakage Circuit Breaker (ELCB), Moulded Case Circuit Breaker (MCCB), Types of

Wiring, Earthing.
Recommended Books:
1. D.P. Kothari and I.J. Nagrath, 'Basic Electrical Engineering', Tata McGraw Hill, 2010.
2. D.C. Kulshreshtha, 'Basic Electrical Engineering', McGraw Hill, 2009.
3. L.S. Bobrow, 'Fundamentals of Electrical Engineering', Oxford University Press, 2011.
4. E. Hughes, 'Electrical and Electronics Technology', Pearson, 2010.
5. V.D. Toro, 'Electrical Engineering Fundamentals', Prentice Hall, India, 1989.
6. J.P.S. Dhillon. J.S. Dhillon and D. Singh, 'Principles of Electrical & Electronics
Engineering', Kalyani Publishers, New Delhi, 2005.

Engineering Graphics & Design

1. Introduction
Engineering Drawing/Engineering Graphics/Technical Drawing - a Visual Science.Types of
Engineering Drawing, Introduction to drawing equipment and use of instruments. Symbols
and conventions in drawing Practice. Types of lines and their use, BIS codes for lines,
Technical lettering as per BIS codes, Introduction to Dimensioning, Concepts of scale in
drawing, Types of scales. Basic Definition of geometrical objects: Points, lines, planes and

solids.

2. Theory of Projections - Relevance of projection, Type of projections, Perspective,
Orthographic, Axonometric and their basic principles, System of orthographic projection:
in reference to quadrants and octants, illustration through simple problems of projection.

3. Projection of Points- Projection of points in quadrants and octants. Projection of point on
Auxiliary planes.

4. Projection of Lines -Parallel to both H P and V P, Parallel to one and inclined to other,
and inclined to both, contained in profile plane. True length and angle orientation of
straight line: rotation method and auxiliary plane method. Distance between two
nonintersecting lines, and trace of line.

5. Projection of Planes- Difference between plane and lamina. Projection of lamina Parallel
to one and perpendicular to other, Perpendicular to one and inclined to other, Inclined to
both reference planes, and Lamina oblique to three reference planes. Application of
auxiliary planes, and trace of planes.

6. Projection of Solids- Definition of solids, types of solids, and elements of solids.
Projection of solids in first or third quadrant, with axis parallel to one and perpendicular
to other, axis parallel to one inclined to other, axis inclined to both the principle plane,
axis perpendicular to profile plane and parallel to both H P and V P. Visible and invisible
details in the projection. Use rotation and auxiliary plane method to draw the projections.

7. Section of Solids Definition of Sectioning and its purpose. Procedure of Sectioning,
Types of sectional planes. Illustration through examples.

8. Development of Surface Purpose of development, Parallel line, radial line and
triangulation method. Development of prism, cylinder, cone and pyramid surface for both
right angled and oblique solids, and development of surface of sphere.

9. Isometric Projection Classification of pictorial views, Basic Principle of Isometric
projection, Difference between isometric projection and isometric drawing. Isometric
projection of solids such as cube, prism, pyramid and cylinder, and assignments on
isometric projection of simple machine parts.
10. Orthographic Projection Review of principle of Orthographic Projection, Sketch/drawing
of blocks, and of simple machine parts.

Recommended Text/Reference Books
1. N.D. Bhatt, V.M. Panchal& P.R. Ingle, 'Engineering Drawing', Charotar Publishing
House, 2014.
2. M.B. Shah & B.C. Rana, 'Engineering Drawing and Computer Graphics', Pearson
Education, 2008.
3. B. Agrawal& C.M. Agrawal, 'Engineering Graphics', TMH Publication, 2012.
4. K.L. Narayana& P. Kannaiah, 'Text book on Engineering Drawing', Scitech Publishers,
2008.

Mathematics-I (Calculus, Multivariable Calculus & Linear Algebra)

UNIT–I Calculus:
Rolle's theorem, Mean value theorems, Taylor's and Maclaurin

theorems with remainders; Indeterminate forms and L'Hospital's rule; Maxima and minima. Evaluation of definite and improper integrals; Beta and Gamma functions and their properties; Applications of definite integrals to evaluate surface areas and volumes of revolutions. The convergence of sequence and series, tests for convergence, power series, Taylor's series. series for exponential, trigonometric, and logarithmic functions.

UNIT–II Multivariable Calculus:
Limit, continuity and partial derivatives, Tangent plane, and normal line; Maxima, minima and saddle points; Method of Lagrange multipliers; Gradient, curl and divergence: Geometrical interpretation and basic properties, Directional derivative.

UNIT–III Multiple Integration:
Double and triple integrals (Cartesian and polar), change of order of integration in double integrals, Change of variables (Cartesian to polar), Applications: areas and volumes by (double integration) Center of mass and Gravity (constant and variable densities). Theorems of Green, Gauss, and Stokes (Statement only), simple applications involving cubes, sphere, and rectangular parallelepipeds.

UNIT–IV Linear Algebra:
Inverse and rank of a matrix, rank-nullity theorem; System of linear equations; Symmetric, skew-symmetric and orthogonal matrices; Determinants; Eigenvalues and eigenvectors; Diagonalization of matrices; Cayley-Hamilton Theorem, and Orthogonal transformation.

Physics (Mechanics and Mechanics of Solids)

UNIT-I Friction and Mechanics of Solids:
A brief introduction to friction, its laws, types, motion on a horizontal and inclined plane, methods of changing friction, and applications of friction. Concept of stress-strain, elasticity, plasticity, strain hardening, failure (fracture/yielding), Generalized Hooke’s law, one-dimensional stress-strain curve. Force analysis -- axial force, shear force, bending moment, and twisting moment. Bending stress; Shear stress; Concept of strain energy; Yield criteria.

UNIT-II Simple Harmonic Oscillator:

Mechanical and electrical simple harmonic oscillators, damped harmonic oscillator- heavy, critical and light damping, energy decay in a damped harmonic oscillator, quality factor, forced oscillations and resonance (electrical and mechanical).

UNIT-III Vector Mechanics:
Transformation of scalar and vector under rotation transformation, Forces in Nature, Newton's laws and its completeness in describing particle motion; Form invariance of Newton's Second Law; Potential energy function; F = - Grad V, equipotential surfaces and meaning of gradient; Conservative and non-conservative forces, curl of a force field; Concept of Central forces; Conservation of Angular Momentum.

UNIT-IV Frames of References and Rigid Body Dynamics:
Inertial and Non-inertial frames of reference; Galilean and Lorentz transformations, Introduction to Cartesian, spherical and cylindrical coordinate system. The basic idea of Centripetal and Coriolis forces along with their applications. Definition and motion of a rigid body in the plane; Rotation in the plane, Angular momentum about a point of a rigid body in planar motion; introduction to three-dimension rigid body motion- only need to highlight the distinction from two-dimensional motion with examples.