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**Maharaja Ranjit Singh Punjab  
Technical University, Punjab  
B.E./B.Tech MECH 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 of simple 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 losses in 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.

