University of Engineering and Management
Institute of Engineering & Management, Salt Lake Campus Institute of Engineering & Management, New Town Campus
University of Engineering & Management, Jaipur

Syllabus for B.Tech Admission Batch 2025-2029

Subject Name: Basic Electrical Engineering **Credit: 4** **Lecture Hours: 42**

Subject Code: ESCEE101

Pre-requisite: Basic knowledge of Physics and Mathematics in Class- XI and XII level

Relevant Links:

COURSE OBJECTIVES:

CO1: Students can recognize different network elements, identify different network connections, and understand the concept of voltages and currents in AC or DC circuits.
CO2: Students can apply and relevant laws of electricity, network theorems to analyze electrical and magnetic circuits.
CO3: Students will be acquainted with the operations and characteristics of machines and converter circuits. They can understand the realistic applications of these machines. They will gain knowledge on requirement of deferent electrical safety tools which are mandatory during electric installations.
CO4: Develop an ability to analyze and solve theoretical problems of Basic Electrical Engineering.

COURSE OUTCOMES:

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Module number	Topic	Text Book, Chapter	Sub-topics (Yellow highlighted portion: AICTE syllabus; Red highlighted portion: MIT Syllabus)	Mapping with Industry and International Academia	Lecture Hours	Corresponding Lab Assignment
1	DC Circuits	Basic Electrical Engineering By B.L.Theraja S.Chand Publication Chapter 1,2,21	Electrical circuit elements (R, L and C), voltage and current sources, Fundamentals of linear systems, Kirchoff current and voltage laws, analysis of simple circuits with dc excitation. Superposition, Thevenin and Norton Theorems. Time-domain analysis of first-order RL and RC circuits.	***International Academia:*** https://catalog.mit.edu/subjects/6/ ***AICTE-prescribed syllabus:*** https://www.aicte-india.org/sites/default/files/Untitled 1-min.pdf	8	Basic safety precautions. Introduction and use of measuring instruments – voltmeter, ammeter, multi-meter, oscilloscope. Real-life resistors, capacitors and inductors.
2	AC Circuits	Basic Electrical Engineering By B.L.Theraja S.Chand Publication Chapter 11,12,13,14	Representation of sinusoidal waveforms, 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 combinations (series and parallel), resonance. Three phase balanced circuits, voltage and current relations in star and delta connections.	***International Academia:*** https://catalog.mit.edu/subjects/6/ ***AICTE-prescribed syllabus:*** https://www.aicte-india.org/sites/default/files/Model Curriculum/AICTE%20-%20UG%20CSE.pdf	8	Measuring the steady-state and transient time-response of R-L, R-C, and R-L-C circuits to a step change in voltage (transient may be observed on a storage oscilloscope). Sinusoidal steady state response of R-L, and R-C circuits –

						impedance calculation and verification. Observation of phase differences between current and voltage. Resonance in R-L-C circuits.
3	Transformers	Basic Electrical Engineering By B.L.Theraja S.Chand Publication Chapter 6, 7, 32, 33	Magnetic materials, BH characteristics, ideal and practical transformer, equivalent circuit, losses in transformers, regulation and efficiency. Auto-transformer and three-phase transformer connections. Analysis and design of modern energy conversion and delivery systems.	***International Academia:*** *https://catalog.mit.edu/subjects/6/* ***AICTE Syllabus*:** https://www.aicte-india.org/sites/default/files/Model Curriculum/AICTE%20-%20UG%20CSE.pdf .	6	Observation of the no-load current waveform on an oscilloscope (nonsinusoidal wave-shape due to B-H curve nonlinearity should be shown along with a discussion about harmonics). Loading of a transformer: measurement of primary and secondary voltages and currents, and power. Three-phase transformers: Star and Delta connections. Voltage and Current relationships (line-line voltage, phase-to-

						neutral voltage, line and phase currents). Phase-shifts between the primary and secondary side. Cumulative three-phase power in balanced three-phase circuits.
4	Electrical Machines	Basic Electrical Engineering By B.L.Theraja S.Chand Publication Chapter 26, 27, 28, 29, 30, 34, 35	Generation of rotating magnetic fields, Construction and working of a three-phase induction motor, Significance of torque-slip characteristic. Loss components and efficiency, starting and speed control of induction motor. Single-phase induction motor. Construction, working, torque-speed characteristic and speed control of separately excited dc motor. Construction and working of synchronous generators.	***International Academia:*** https://catalog.mit.edu/subjects/6/ ***AICTE-prescribed syllabus:*** https://www.aicte-india.org/sites/default/files/Untitled_1-min.pdf	8	Demonstration of cut-out sections of machines: dc machine (commutator-brush arrangement), induction machine (squirrel cage rotor), synchronous machine (field winging - slip ring arrangement) and single-phase induction machine. Torque Speed Characteristic of separately excited dc motor. Synchronous speed of two and four-pole, three-phase induction motors. Direction reversal by change of phase-sequence of connections. Torque-

						Slip Characteristic of an induction motor. Generator operation of an induction machine driven at super synchronous speed.
5	Power Converters	Power Electronics By P.S. Bhimbra New Age Publication Chapter 7	DC-DC buck and boost converters, duty ratio control. Single-phase and three-phase voltage source inverters; sinusoidal modulation.	***International Academia:*** https://catalog.mit.edu/subjects/6/ ***AICTE-prescribed syllabus:*** https://www.aicte-india.org/sites/default/files/Untitled_1-min.pdf	6	Demonstration of (a) dc-dc converters (b) dc-ac converters – PWM waveform (c) the use of dc-ac converter for speed control of an induction motor and (d) Components of LT switchgear.
6	Electrical Installations	Power Electronics By P.S. Bhimbra New Age Publication Chapter 11	Components of LT Switchgear: Switch Fuse Unit (SFU), MCB, ELCB, MCCB, Types of Wires and Cables, Earthing. Types of Batteries, Important Characteristics for Batteries. Elementary calculations for energy consumption, power factor improvement and battery backup. critical challenges associated with global energy systems	***International Academia:*** https://catalog.mit.edu/subjects/6/ ***AICTE-prescribed syllabus:*** https://www.aicte-india.org/sites/default/files/Untitled_1-min.pdf	6	Demonstration of (a) dc-dc converters (b) dc-ac converters – PWM waveform (c) the use of dc-ac converter for speed control of an induction motor and (d) Components of LT switchgear.

TEXT BOOK:

1. Basic Electrical Engineering (Vol. 1 & 2) - B.L.Theraja; S.Chand Publication

REFERENCE BOOKS:

1. Basic Electrical Engineering –Dr. Jagadish Pal; Aryan Publication
2. Basic Electrical engineering- 1St Edition Paperback – P.V. Prasad | S. Sivanagaraju | K. R. Varmah | Chikku Abraham
3. Basic Electrical and Electronics Engineering – 2nd Edition Dr. Vinoth Kumar K; Dr. Saravanakumar R; Dr. Jegathesan, Wiley Publication

NPTEL Link:

https://nptel.ac.in/courses/108105053- NPTEL course link
https://nptel.ac.in/courses/108106172- NPTEL course link
https://nptel.ac.in/courses/108108076- NPTEL course link
https://nptel.ac.in/courses/117106108- NPTEL course link

MATLAB Assignment:

Design an R-L-C series circuit using MATLAB Simulation (values of R,L,C may be advised in class)
Design an R-L-C parallel circuit using MATLAB Simulation (values of R,L,C may be advised in class)