FACULTY OF ENGINEERING & TECHNOLOGY

Effective from Academic Batch: 2022-23

Programme: **Bachelor of Technology (Electrical Engineering)**

Semester: **II**

Course Code: **202001203**

Course Title: **Basics of Electrical and Electronics Engineering**

Course Group: **Engineering Science**

Course Objectives: Electricity has been the main source of energy for the developing and developed countries. Per capita consumption of electricity of a country can be considered as an indicator of the development of the country. In view of this, it is essential for all engineering graduates to know the basic aspects of electrical engineering. This subject deals with basic circuit solution methods, introduction to electrical machines.

Teaching & Examination Scheme:

Contact hours per week			Course Credits	Examination Marks (Maximum / Passing)				
				Theory		J/V/P*		Total
Lecture	Tutorial	Practical		Internal	External	Internal	External	
3	0	2	4	50 / 18	50/17	25/9	25/9	150 / 53

* **J**: Jury; **V**: Viva; **P**: Practical

Detailed Syllabus:

Sr.	Contents	Hours
1	DC Circuits: Electrical circuit elements (R, L and C), voltage and current sources, Kirchhoff's current and voltage laws, star-delta transformation, Electromagnetism: Faraday's laws, Lenz's law, self-induction, mutual induction, coefficient of coupling. Electrostatics: Coulomb's laws, Capacitor, capacitance of parallel plate capacitor, DC response of RL & RC circuits.	09
2	AC Circuits: Representation of sinusoidal waveforms, peak and RMS values, phasor representation of AC quantities, 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), series and parallel resonance. Three-phase balanced circuits, voltage and current relations in star and delta connections, power measurement in three-phase circuits.	09

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3	Electrical Machines : Static machines: BH characteristics, construction & working principle of single-phase and three-phase transformers. Rotating machines: Generation of rotating magnetic fields, construction and working of DC machines, three-phase induction motor, single-phase induction motor, synchronous generators.	**05**
4	Semiconductor Devices And Applications: Junction Diode Characteristics and Special Semiconductor Devices – Zener, LED, Tunnel, Photodiode, Shockley, SCR; Rectifiers – Half wave, Full Wave and Bridge – Voltage regulations; Transistor Operations, Configuration and Characteristics; Operation and Characteristics of FET; Operational Amplifier – Introduction and Applications.	**09**
5	Digital Electronics: Binary Number System – Logic Gates – Boolean Algebra – Half and Full Adders – Flip- Flops – Registers and Counters – A/D and D/A Conversion (Block Diagram Approach only).	**07**
6	Fundamentals of Communication Engineering: Types of Signals: Analog and Digital Signals – Modulation and Demodulation: Principles of Amplitude and Frequency Modulations. Communication Systems: Radio, TV, Mobile, Microwave, Satellite and Optical Fiber (Block Diagram Approach only).	**07**

List of Practicals / Tutorials:

1	Study of electrical symbols and measurements of electrical parameters.
2	To study and verify Ohm's Law, Kirchhoff's Current Law (KCL) & Kirchhoff's Voltage Law (KVL).
3	To study Faraday's law of electromagnetic induction..
4	To analyze AC series RL, RC and RLC circuits.
5	To verify the current and voltage relationships in 3-phase star-delta connections.
6	Measurement of 3-phase power using 2-wattmeter method.
7	Construction and working of static and rotating electrical machines.
8	To observe the relation between the voltage and current of p-n Junction and Zener diode
9	To study input and output characteristics of a NPN Bipolar Junction Transistor (BJT) in Common-emitter configuration.
10	a) Design and realize Inverting and Non-inverting amplifier using 741 Op-amp. b) To study the applications of IC 741 as adder, subtractor.
11	To study the characteristics and operation of half wave and full wave rectifier circuits.
12	Method of setting and measuring the depth of modulation; waveforms and spectra by modeling an amplitude modulated (AM) signal.
13	a) To study and verify all digital logic gates based on truth table. b) To study and verify Universal gates
14	To realize and implement Set-Reset (SR) latch using NOR gates (active high circuit). SR, JK, D, and T Flip-Flops using IC's and breadboard.

Reference Books:

1	B. L. Theraja, "Electrical Technology –Part I and II", S. Chand and Co. 2012.
2	D. C. Kulshreshtha, "Basic Electrical Engineering", McGraw Hill, 2009.
3	V. N. Mittal, "Basic Electrical Engineering", TMH Publication, New Delhi.

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4	V. K. Mehta, "Basic Electrical Engineering", S.Chandand Company Ltd., New Delhi.
5	David A. Bell, "Electronic Devices and Circuits", Oxford University Press, Fifth edition
6	Albert Malvino & David, "Electronic Principles", Tata McGraw-Hill, Seventh edition
7	Jaccob Millman, Chritos Halkias, Chetan D Parikh, "Integrated Electronics", Tata McGraw-Hill, Second edition
8	B.P.Lathi, "Linear Systems and Signals", Oxford University Press

Supplementary learning Material:	
1	https://electrical-engineering-portal.com/
2	https://www.electrical4u.com/
3	www.allaboutcircuits.com
4	https://interestingengineering.com/electrical-engineering-salaries-worldwide

Pedagogy:

- Direct classroom teaching
- Audio Visual presentations/demonstrations
- Assignments/Quiz
- Continuous assessment
- Interactive methods
- Seminar/Poster Presentation

Internal Evaluation: The internal evaluation comprised of written exam (40% weightage) along with combination of various components such as Certification courses, Assignments, Mini Project, Simulation, Model making, Case study, Group activity, Seminar, Poster Presentation, Unit test, Quiz, Class Participation, Attendance, Achievements etc. where individual component weightage should not exceed 20%.

Suggested Specification table with Marks (Theory) (Revised Bloom's Taxonomy):

Distribution of Theory Marks in %						**R**: Remembering; **U**: Understanding; **A**: Applying; **N**: Analyzing; **E**: Evaluating; **C**: Creating
R	**U**	**A**	**N**	**E**	**C**	
40%	20%	20%	20%	0%	0%	

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

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Course Outcomes (CO):

Sr.	Course Outcome Statements	%weightage
CO-1	Apply fundamental electrical laws and circuit theorems to electrical circuits.	**18**
CO-2	Analyze single-phase and three-phase AC circuits.	**18**
CO-3	Describe operating principle and applications of static and rotating electrical machines.	**14**
CO-4	Analyze the general – and special-Purpose diode, BJT and FET circuits	**18**
CO-5	Verify the functionalities of basic digital gates and logic families	**14**
CO-6	Create strong foundation of communication and signal processing to be studied in the subsequent semester	**18**

Curriculum Revision:	
Version:	2.0
Drafted on (Month-Year):	June-2022
Last Reviewed on (Month-Year):	
Next Review on (Month-Year):	June-2025

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