GANPAT UNIVERSITY

FACULTY OF ENGINEERING & TECHNOLOGY

Programme	Bachelor of Technology	Branch/Spec.	ALL
Semester	I / II	Version	1.0.0.0
Effective from Academic Year	2026-27	Effective from the batch admitted in	July 2026
Course Code	2ESC1101	Course Name	Basics of Electrical Engineering
Course Category	Engineering Science Courses (ESC)		

Teaching Scheme						Examination scheme (Marks)			
(Per week)	Lecture (DT)		Practical (Lab.)		Total		CE	SEE	Total
	L	TU	P	TW					
Credit	3	0	1	0	4	Theory	50	50	100
Hours	3	0	2	0	5	Practical	25	25	50

Pre-requisites:

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Course Outcomes

COs	Description
CO1	Understand and apply fundamental related to AC-DC and magnetic circuits.
CO2	Analyse single phase and three phase AC circuits.
CO3	Elaborate the construction, working principles, and applications of electrical machines, batteries, and power supplies.
CO4	Apply electrical components, protection devices, and wiring practices for safe installations.

Theory Syllabus

Unit	Content	Hours
1	**D.C. Circuits:** Types of electrical circuits, KVL and KCL, Active and passive elements, voltage and current sources, source transformations, star-delta connection, loop and nodal methods of analysis, Thevenin's theorem, Norton's theorem, Superposition Theorem, Maximum power transfer theorem.	**08**
2	**Magnetic Circuit and Electromagnetic Induction-** Magnetic circuit, Amperes circuital law, analogy between electric & magnetic circuits, magnetic circuits with DC and AC excitation, magnetic leakage, BH curve, hysteresis and eddy current losses, mutual coupling. fringing, leakage, series, parallel, series-parallel circuits, Faradays law, Lenz law, self-inductance, mutual inductance, coefficient of coupling, inductance in series, parallel, series parallel, Analysis of coupled coils, dot rule, conductively coupled equivalent circuit.	**07**
3	**AC Circuits:** 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, power factor improvement, parallel AC circuit, series and parallel resonance, bandwidth and quality factors.	**08**
4	**3-Phase Circuits:** Necessity and advantages of 3 Phase circuits, Phase sequence, Balanced system, voltage and current relations in star and delta connections, Three phase power measurements.	**06**

5	**Batteries and Power Supply:** Types of Batteries, Important Characteristics for Batteries, Charging and discharging of batteries, the concept of depth of charging, Maintenance of batteries, series-parallel connection of batteries, Introduction to UPS, SMPS.	**04**
6	**Electrical Machines:** **Transformer:** Construction and Working principle, E.M.F. equation, Types and applications of transformer, Autotransformer **Electrical machines**: Construction, working principle and types of DC generator and motor, construction, working principle, and applications of Induction Motor. Types of Induction motor, Construction, Working principle, Types, and Applications of Synchronous motor.	**06**
7	**Electrical Installations,** The components of a basic electrical circuit, the function of the "hot" wire, "neutral" wire, and "ground" wire, complete the electrical circuit. Overview of Generation, Transmission & Distribution of Electrical Power. Components of LT Switchgear: Switch Fuse Unit, MCB, ELCB, MCCB, Elementary calculations for energy consumption,	**06**
Practical and Self Learning Content		
Practical, assignments, quiz, industrial visit, field survey and tutorials are based on the above syllabus.		
Text Books		
1	U.A. Patel, “Elements of Electrical & Electronics Engineering”, Atul Prakashan.	
2	B.L.Thereja, ”Electrical Technology “, S. Chand Volume-I.	
3	B.L.Thereja, ”Electrical Technology “, S. Chand Volume-II.	
Reference Books		
1	V.N. Mittal,” Basic Electrical Engineering”, Tata Mc Graw hill, New Delhi.	
2	V.K.Mehta,” Principles of Power Systems “, Pub. By Chand.	
3	D.P. Kothari and I.J. Nagrath, “Basic Electrical Engineering”, Tata McGraw Hill, 2010.	
4	D.C. Kulshreshtha, “Basic Electrical Engineering”, McGraw Hill, 2009.	
5	L.S. Bobrow, “Fundamentals of Electrical Engineering”, Oxford University Press, 2011.	
6	V.D. Toro, “Electrical Engineering Fundamentals”, Prentice Hall India, 1989.	
ICT/MOOCs Reference		
1	https://www.youtube.com/watch?v=3TR_DS_7z2w&list=PLbRMhDVUMngfdEXVcdf_ijj2Eub-UHs_y	
2	https://www.youtube.com/watch?v=hkQW0Izk1Cg	
3	https://www.youtube.com/watch?v=TJU3tqtW6AY	
4	https://www.youtube.com/watch?v=8AfdmidxbNI&list=PLbRMhDVUMngfdEXVcdf_ijj2Eub-UHs_y&index=47	
5	https://www.youtube.com/watch?v=wFE7J6_9c6w&list=PLbRMhDVUMngfdEXVcdf_ijj2Eub-UHs_y&index=54	
6	https://www.youtube.com/watch?v=UvoILYVPpDc&list=PLD5miFz4oDd4tU-pg5Z3e1pJKyN0idR3B&index=46	

Mapping of COs, POs, and PSOs

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	3	1	1	1	1	0	1	1	1	1	3	1	1
CO2	3	3	2	2	1	1	1	1	1	1	2	3	3	2
CO3	3	2	2	1	0	2	1	1	2	1	1	2	2	3

CO4	3	2	1	1	1	3	1	1	1	1	2	2	2	3

Bloom's Taxonomy Level				
Unit	**Unit Title**	**Aligned COs**	**Learning Hours**	**BTL Level**
1	D.C. Circuits	CO1	08	A
2	Magnetic Circuit and Electromagnetic Induction	CO1	07	A
3	AC Circuits	CO1, CO2	08	A–N
4	3-Phase Circuits	CO2	06	N
5	Batteries and Power Supply	CO3, CO4	04	U–A
6	Electrical Machines	CO3	06	U
7	Electrical Installations	CO4	06	A

Note:

- Version 1.0.0.0 (First Digit= New syllabus/Revision in Full Syllabus, Second Digit=Revision in Teaching Scheme, Third Digit=Revision in Exam Scheme, Forth Digit= Content Revision)
- 1 Hour Lecture = 1 Credit, 1 Hour Tutorial = 1 Credit, 2 Hours Practical = 1 Credit, 2 Hours Internship/Project/Seminar = 1 Credit
- Bloom's Taxonomy Level (BTL): R: Remember, U: Understand, A: Apply, N: Analyze, E: Evaluate, and C: Create