

GANPAT UNIVERSITY

FACULTY OF ENGINEERING & TECHNOLOGY

Programme		Master of Technology				Branch/Spec.	Electrical (Electrical Power System)		
Semester		I				Version	1.0.0.0		
Effective from Academic Year			2025-2026			Effective for the batch Admitted in		July 2025	
Course code		3EE11PE3	Course Name			Power Apparatus Design			
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	40	60	100
Hours	3	0	2	0	5	Practical	20	30	50

Pre-requisites:

Course Outcomes:

On successful completion of the course, the students will be able to:

CO1	Describe the construction and operation of transformers and rotating machines.
CO2	Apply electromagnetic design principles to compute winding parameters and losses.
CO3	Analyze performance characteristics of machines using equivalent circuit models.
CO4	Evaluate design alternatives of power apparatus based on technical and economic criteria.

Theory syllabus

Unit	Content	Hrs.
1	Design Considerations of Power Apparatus: Specific loadings, Choice of magnetic and electric loadings, Real and apparent flux densities, Temperature rise calculation, Separation of main dimension for DC machines, Induction machines and synchronous machines, Design of transformers, General considerations, Output equation, Emf per turn, Choice of flux density and current density, main dimensions, leakage reactance and conductor size, design of tank and cooling	08
2	Specific Design Consideration of Rotating Machines: Specific loadings, Choice of magnetic and electric loadings, Real and apparent flux densities, Temperature rise calculation, Separation of main dimension for DC machines, Induction machines and synchronous machines, Heating and cooling of machines, Types of ventilation, Continuous and intermittent rating	08
3	Design of Transformer: Introduction, Specifications of a transformer, Design of transformer, Volt per turn of Winding, Choice of flux density, Choice of current density, Design of core, Design of yoke, Window and core proportions, Over all dimension, Design of windings, Resistance and reactance calculation, Flowchart for overall design of transformer, No load current of a transformer. efficiency, Optimum design, cooling of transformer, Temperature Rise, Design of tank, Mechanical force, Computer-aided design of transformer, Problems.	10
4	Design of Induction Machine: 3 phase Induction motor : Introduction, Construction, Specifications, Output equation of 3 phase induction motor, Choice of specific loadings, Calculation of main dimensions, Design of stator of three-phase induction motor, Calculation of length of air gap, Design of rotor of 3 phase induction motor, Estimation of operating characteristic, Harmonic torques, Short circuit current. Single phase induction motor: Construction, Design considerations, Design of single-phase induction motor, Performance calculation problems of 3 phase and single-phase machines.	10
5	Design of Alternator: Types of alternators, Comparison, Specific loadings, Output co-efficient, Design of main dimensions.	05
6	Computer-aided Design and Analysis of Electric Motors: Introduction, Salient pole synchronous motor, Induction Motor, Separately excited DC motor.	04

Practical content

Practicals, assignments and tutorials are based on above syllabus.

Text Books

1.	Sawhney A.K, “A course in Electrical Machine Design”, Dhanpat Rai & Sons, 5th Edition
2.	V.Rajini and V.S.Nagarajan, “Electrical Machine Design” Pearson publication, 1st edition

Reference Books

1.	M.G. Say, “The Performance and Design of A.C. Machines “, Pitman
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2.	A. E. Fitzgerald and C. Kingsley, "Electric Machinery", New York, McGraw Hill Education.
ICT/MOOCs	
1.	https://nptel.ac.in/courses/108/102/108102146/
2.	https://nptel.ac.in/courses/108/106/108106023/

Mapping of CO with PO and PSO:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1	3	2	2	1	1	1	1	2	2	1	1	3	3
CO2	2	0	3	2	3	1	0	1	0	0	2	0	3	1	0
CO3	2	0	1	1	1	0	0	2	0	0	0	0	1	3	0
CO4	1	2	1	1	0	0	2	2	3	3	1	1	3	1	2