Gyanmanjari Innovative University

Course Syllabus
Gyanmanjari Diploma Engineering College
Semester – 3

Subject: Electrical Machine-I – DETEE13203

Type of course: Major

Prerequisite: Basic knowledge of electrical circuit

Rationale:

This course deals with single phase transformer and DC Machines which are widely used in power systems, industries and commercial applications. This course will enable the students to develop skills to select, install, operate, and maintain various types of DC machines and transformers. Practical aspects of the course will make the students capable of performing various tests on these machines. It is therefore very important for every electrical engineer to learn this course if he/she wants to excel in his/her professional life.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks					Total Marks
				Theory Marks		Practical Marks		CA	
CI	T	P	C	ESE	MSE	V	P	ALA	150
4	0	2	5	60	30	10	20	30	

Legends: CI-Class Room Instructions; T – Tutorial; P - Practical; C – Credit; ESE - End Semester Examination; MSE- Mid Semester Examination; V – Viva; CA - Continuous Assessment;

Course Content:

Sr. No.	Content	Total Hrs	% Weightage
1	**DC Generator** • Energy conversion principle • Construction of D.C. machine • Working principle of D.C. generator (single loop generator, action of commutator) • EMF equation of D.C. generator • Armature winding terminology and its types • Dummy coils, Equalizer rings • Types of D.C. generators • Power stage and Losses in D.C. machines • Efficiency and condition for maximum efficiency • Applications of various types of D.C. generator • Numerical on D.C. generators	15	25%
2	**DC Motor** • Working principle of D.C. Motor • Significance of the Back EMF • Torque in D.C. Motor (armature torque, shaft torque, BHP) and Numerical • D.C. motor starter (necessity, two-point, three point and four point starter) • Types of D.C. motors and Numerical • Speed control of D.C. motor • Electronic speed control, reversal of rotation • Power stages, Losses, and Efficiency of D.C. Motor and Numerical • Testing of D.C. Machines. (Brake test, Swinburne's test, Hopkinson test, field test) • Applications of D.C. Motors • Numerical on D.C. motors	18	30%
3	**Single Phase Transformer** • Construction and working principle of Transformer	18	30%

	• Material used for core, winding and insulations • EMF equation and transformation ratio and Numerical • Equivalent circuit of transformer • Losses of transformer, separation of core loss components and Numerical • Efficiency of single-phase transformer and condition for maximum efficiency and Numerical • All day efficiency or Energy efficiency • Voltage regulation, application of transformer • Auto transformer and its application • Saving of copper in auto transformer • Numerical on transformer		
4	**Examination of Transformer** • Regulation of transformer • Direct load test • OC and SC test • Back-to-Back test or Sumpner's test • Need of parallel operation • Conditions of parallel operation in single phase transformer • Numerical on Various Testing of Transformer	09	15%

Continuous Assessment:

Sr. No	Active Learning Activities	Marks
1	**Power Up** Students must identify the type of transformer assigned by the faculty by looking at the name plate and uploading their report to the GMIU portal.	10
2	**Know Your Machine** Faculty will designate various nameplates for DC Generators, and students are required to recognize the type of generator it represents. They must then upload their findings to the GMIU portal.	10
3	**Latest Trends in Machine** Students must research Brushless DC (BLDC) motors and submit a report on the GMIU Portal.	10
Total		**30**

Suggested Specification table with Marks (Theory):60

Distribution of Theory Marks (Revised Bloom's Taxonomy)						
Level	Remembrance (R)	Understanding (U)	Application (A)	Analyze (N)	Evaluate (E)	Create (C)
Weightage	28%	40%	32%	-	-	-

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.

Course Outcomes:

After learning the course the students should be able to:	
CO1	Identify different kinds of DC generators.
CO2	Distinguish between various types of DC motors.
CO3	Examine the operational and structural attributes of different single-phase transformer variants.
CO4	Perform experiments to evaluate the performance of single-phase transformers.

List of Practicals:

Sr. No.	Descriptions	Unit. No	Hrs
1	Identify various parts of D.C. Machine	1	2
3	Test the performance of D.C. series generator	1	2
4	Troubleshoot of D.C. shunt Machine	1	2
5	Troubleshoot of D.C. series Machine	1	2
1	Identify various parts of D.C. Motor	2	2
6	Connect three four-point starter for D.C. Motor	2	2
7	Connect three point starter for D.C. Motor	2	2
8	Study construction of BLDC Motor and it's parts	2	2
9	Control the speed of DC Motor	2	2
10	Reverse direction of various D.C. Motors	2	2

11	Perform Sumpner's test on single phase transformer.	3	**2**
12	Identify various parts of single phase transformer	3	**2**
13	Troubleshoot of single-phase transformer	3	**2**
14	Perform direct load test on single phase transformer	4	**2**
15	Perform open circuit and short circuit test of single-phase transformer	4	**2**
	TOTAL		**30**

Instructional Method:

- Students should be shown in animations/video films to explain the working concept of DC machines and transformers based on the principle of electromagnetic induction
- Students should be taken to nearby industries/substation where medium or big size DC Machines/Transformers are installed. Students should be shown major parts/accessories and their features and functions should be explained to them.
- The course delivery method will depend upon the requirement of content and need of students. The teacher in addition to conventional teaching method by black board and may also use any of tools such as demonstration, role play, Quiz, brainstorming, MOOCs etc.
- From the content 10% topics are suggested for flipped mode instruction.
- Students will use supplementary resources such as online videos, NPTEL/SWAYAM videos, e-courses, Virtual Laboratory
- The internal evaluation will be done on the basis of Active Learning Assignment
- Practical/Viva examination will be conducted at the end of semester for evaluation of performance of students in laboratory.

Reference Books:

[1] B. L. Theraja, "Electrical Technology Vol-II", S. Chand & Co. Ltd.

[2] Despande, M.V., "Electrical Machines ", PHI Learning.

[3] J. B. Gupta, "Electrical Machine-I", Kataria & Sons,

[4] Nagrath, I.J. and Kothari, D.P., "Electrical Machine", Tata McGraw Hill

[5] Uppal, S.L., "Electrical Technology", Khanna Publication