



# INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

Dundigal - 500 043, Hyderabad, Telangana

## COURSE CONTENT

DC MACHINES LABORATORY								
<b>III Semester: EEE</b>								
CourseCode	Category	Hours/Week			Credits	MaximumMarks		
		L	T	P		C	CIA	SEE
AEED09	Core	0	0	2	1	40	60	100
<b>Contact Classes: Nil</b>	<b>Tutorial Classes: Nil</b>	<b>Practical Classes: 45</b>			<b>Total Classes: 45</b>			
<b>Prerequisite: Electronic Devices and Circuits Laboratory</b>								

### I. COURSE OVERVIEW:

This laboratory course is to meet the requirements of practical work meant for basic operation, analysis and design of electrical machines. It provides hands-on experience by examining the electrical and mechanical characteristics of various DC machines. Analyze the characteristics of DC machines and separate the various losses in electrical machines by conducting different tests.

### II. COURSES OBJECTIVES:

#### The students will try to learn

- I. The elementary experimental and modelling skills for handling problems with electrical machines in the industries and domestic applications to excel in professional career.
- II. The operation of DC Machines and its role in power transmission and distribution.
- III. The intuitive knowledge needed to test and analyze the performance leading to design of electric machines by conducting various tests and calculate the performance parameters.

### III. COURSE OUTCOMES:

#### At the end of the course students should be able to:

- CO 1 Analyze the performance characteristics of dc machine under various loading conditions.
- CO 2 Determine the critical field resistance and speed of dc shunt generator using open circuit characteristics.
- CO 3 Examine the performance of DC shunt machine with different speed control techniques and predetermine the efficiency.
- CO 4 Estimate and separate the core losses in dc machine by conducting a suitable test.
- CO 5 Examine the performance and speed control of dc machines using simulation tools.

### IV. COURSE CONTENT:

#### Week 1: OPEN CIRCUIT CHARACTERISTICS OF DC SHUNT GENERATOR

Develop the circuit for analyzing the characteristics of DC shunt generator

#### Week 2: LOAD TEST ON DC SHUNT GENERATOR

Design the DC shunt generator circuit under full,  $3/4^{\text{th}}$ , half and  $1/4^{\text{th}}$  load conditions for analyzing the performance of the machine

#### Week 3: LOAD TEST ON DC SERIES GENERATOR

Design the DC series generator circuit under full,  $3/4^{\text{th}}$ , half and  $1/4^{\text{th}}$  load conditions for analyzing the performance of the machine

#### Week 4: LOAD TEST ON DC COMPOUND GENERATOR

Design the DC compound generator circuit under full,  $3/4^{\text{th}}$ , half and  $1/4^{\text{th}}$  load conditions for analyzing the performance of the machine

#### Week 5: HOPKINSON'S TEST

Develop a method of testing for two identical dc shunt machines which are mechanically coupled and also electrically connected in parallel

#### **Week 6: FIELD'S TEST**

Develop a method of testing for two similar dc series machines depend on the accuracy with which the motor input and generator output are measured

#### **Week 7: SWINBURNE'S TEST AND SPEED CONTROL OF DC SHUNT MOTOR**

Design the suitable test under no load conditions to measure no load losses in Dc shunt machines and speed control of DC shunt motor.

#### **Week 8: BRAKE TEST ON DC COMPOUND MOTOR**

Develop the circuit for conducting brake test on DC compound motor.

#### **Week 9: BRAKE TEST ON DC SHUNT MOTOR**

Develop the circuit for conducting brake test on DC shunt motor.

#### **Week 10: RETARDATION TEST**

Develop the test for separating the mechanical losses of the DC shunt machine

#### **Week 11: SEPARATION OF LOSSES IN DC SHUNT MOTOR**

Design the circuit for separating the iron losses in DC shunt motor

#### **Week 12: MAGNETIZATION CHARACTERISTICS OF DC SHUNT GENERATOR USING DIGITAL SIMULATION**

Develop the circuit for analyzing the magnetization characteristics of DC shunt generator using MATLAB.

#### **Week 13: LOAD TEST ON DC SHUNT GENERATOR USING DIGITAL SIMULATION**

Design the DC shunt generator circuit under full,  $3/4^{\text{th}}$ , half and  $1/4^{\text{th}}$  load conditions for analyzing the performance of the machine using MATLAB

#### **Week 14: SPEED CONTROL OF DC SHUNT MOTOR USING DIGITAL SIMULATION**

Design the suitable test for speed control of DC shunt motor using MATAB

#### **V. TEXTBOOKS:**

1. J B Gupta "Theory and performance of Electrical machiines", S.K.Kataria and Sons Publishers 14<sup>th</sup> edition, 2009
2. M G Say, E O Taylor, "Direct Current Machines", Longman Higher Education, 1<sup>st</sup> edition,1985

#### **VI. REFERENCE BOOKS:**

1. P S Bimbhra, R.P., "Electrical Machinery", Khanna Publishers, New Delhi 2011
2. I J Nagrath and D P Kothari., Electric Machines, McGraw Hill Education Co. Ltd., 2010.
3. A E Fitzgerald and C Kingsley, "Electric Machinery", New York, McGraw Hill Education, 1<sup>st</sup> edition, 2013.

#### **VII. ELECTRONIC RESOURCES:**

1. <http://www.udacity.com/>
2. <http://www.library.thinkquest.org/2705/>
3. <http://www.ai.eecs.umich.edu/>

#### **VIII. MATERIALS ONLINE:**

1. Course template
2. Lab Manual