# ELECTRICAL MACHINES LABORATORY - I

**III Semester: EEE**

| Course Code | Category | Hours / Week | | | Credits | Maximum Marks | | |
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| | | L | T | P | C | CIA | SEE | Total |
| AEEB13 | Core | - | - | 3 | 1.5 | 30 | 70 | 100 |
| Contact Classes: Nil | Tutorial Classes: Nil | Practical Classes: 48 | | | | Total Classes: 48 | | |

## OBJECTIVES:

The **course should enable the students to:**

I. Conduct various tests on DC series and shunt machines.
II. Develop procedure for speed control of DC machines and test with PLC and Lab VIEW.
III. Utilize Lab VIEW, programmable logic controllers to control various machines.
IV. Simulate DC machine to study the characteristics by using digital simulation.

## COURSE LEARNING OUTCOMES (CLOs):

**The students should enable to:**

1. Identify the different parts of a DC machine and demonstrate the working of each of them.
2. Classify the different types of DC machines and describe the operation of each type of the machine.
3. Draw the magnetization characteristics and explain the importance of residual magnetic flux in self excited generators.
4. Determine the efficiency of a DC shunt, series and compound generator by direct loading.
5. Draw the internal and external characteristics of DC generators.
6. Know the different types of speed control methods for a DC motor
7. Conduct Swinburne's test on DC shunt motor and predetermine the efficiency of the machine without loading.
8. Determine the efficiency of DC shunt and Compound motors by performing brake test
9. Calculate the efficiency of two identical series machines by performing Field's test.
10. Determine the efficiency of two identical shunt machines by performing Hopkinson's test.
11. Calculate the efficiency of DC machine by performing retardation test
12. Classify the different types of losses that occur in a DC machine and separate the core losses of a DC shunt machine with a suitable experiment
13. Know the applications of each type of DC machine and use them in real time applications
14. Describe the importance of MATLAB software in simulating and predicting the performance of DC machines

## LIST OF EXPERIMENTS

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| **Week-1** | **OPEN CIRCUIT CHARACTERISTICS OF DC SHUNT GENERATOR** |
| Magnetization characteristics of DC shunt generator. | |
| **Week-2** | **LOAD TEST ON DC SHUNT GENERATOR** |
| Determination of efficiency by load test in DC shunt generator | |

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| **Week-3** | **LOAD TEST ON DC SERIES GENERATOR** |
| Determination of efficiency by load test on DC series generator. | |
| **Week-4** | **LOAD TEST ON DC COMPOUND GENERATOR** |
| Determination of efficiency by load test on DC compound generator. | |
| **Week-5** | **HOPKINSON'S TEST** |
| Study the performance characteristics of two identical DC shunts machines. | |
| **Week-6** | **FIELD'S TEST** |
| Study the performance characteristics of two identical DC series machines | |
| **Week-7** | **SWINBURNE'S TEST AND SPEED CONTROL OF DC SHUNT MOTOR** |
| Predetermine the efficiency and study the characteristics of DC shunt machine with different speed control techniques | |
| **Week-8** | **BRAKE TEST ON DC COMPOUND MOTOR** |
| Study the performance characteristics of DC compound motor | |
| **Week-9** | **BRAKE TEST ON DC SHUNT MOTOR** |
| Study the performance characteristics of DC shunt motor by brake test | |
| **Week-10** | **RETARDATION TEST** |
| Study the performance characteristics by using retardation test on DC shunt motor | |
| **WeeK-11** | **SEPARATION OF LOSSES IN DC SHUNT MOTOR** |
| Study the method used for separation of losses in DC shunt motor. | |
| **Week-12** | **MAGNETIZATION CHARACTERISTICS OF DC SHUNT GENERATOR** |
| Study the magnetization characteristics of DC shunt generator using digital simulation | |
| **Week 13** | **LOAD TEST ON DC SHUNT GENERATOR USING DIGITAL SIMULATION** |
| Perform the load test on DC shunt generator using digital simulation | |
| **Week 14** | **SPEED CONTROL OF DC SHUNT MOTOR USING DIGITAL SIMULATION** |
| Verify the speed control techniques of DC motor using digital simulation | |

**Reference Books:**


1. P S Bimbhra, "Electrical Machines", Khanna Publishers, 2nd Edition, 2008.
2. M G Say, E O Taylor, "Direct Current Machines", Longman Higher Education, 1st Edition, 1985.
3. Hughes, "Electrical Technology", Prentice Hall, 10th Edition, 2015.
4. Nesimi Ertugrul, "LabVIEW for Electric Circuits, Machines, Drives, and Laboratories", Prentice Hall, 1st Edition, 2002.
5. Gupta, Gupta & John, "Virtual Instrumentation Using LabVIEW", Tata McGraw-Hill, 1st Edition, 2005.