

B.E. Semester: 3
Electronics & Communication Engineering
Subject Name: Electrical Machines
Subject Code: EC-305

A. Course Objective :

- To present a problem oriented introductory knowledge of Electrical Machines.
- To focus on the study of electro mechanical energy conversion & different parts of electrical machine.
- To address the underlying concepts & methods behind Electrical Engineering machines.
- To identify & formulate solutions to problems relevant to Electrical Machines and find the efficiency of machine.

B. Teaching / Examination Scheme :

SUBJECT		Teaching Scheme				Total Credit	Evaluation Scheme					Total Marks
CODE	NAME	L	T	P	Total		THEORY		IE	CIA	PR. / VIVO	
		Hrs	Hrs	Hrs	Hrs		Hrs	Marks	Marks	Marks	Marks	
EM	Electrical Machines	3	0	2	5	4	3	70	30	20	30	150

C. Detailed Syllabus :

1. **Generating equipments:** Classification, 2 wire DC generators, working principle of generator, construction of DC Machines, open circuit characteristic, external characteristic and internal characteristic of DC generator.
2. **DC Motors:** Construction, Types, Principle of operation, torque equation, losses and efficiency, speed torque characteristics of shunt, series and compound motor, D.C. shunt motor starter, speed control of D.C. shunt and series motors.
3. **3-Phase induction motor:** Construction, production of rotating magnetic field, principle of operation, speed and slip, rotor current, relation between rotor copper loss and rotor input, torque of an induction motor, torque slip curve, Losses and Efficiency, starters for 3 phase induction motor, speed control.
4. **Single phase induction motor:** Production of magnetic field, comparison between three phase & single phase Induction motors, starting of single phase induction motor by capacitor and shaded pole motor, Universal motors.
5. **Alternator:** Introduction, construction, details, exciters, alternator operation on load, voltage regulation, losses & efficiency, parallel operation of alternators, synchronizing procedure of alternators, cooling of alternators.
6. **Transformers:** General aspects, Basic definition, working principle of transformer, Types of transformers, Transformer construction: core/ shell/ spiral transformers, Transformers windings terminals, tapping, bushing, transformers cooling, oil conservators and breather.
7. **Three Phase Transformer:** Construction, Working of three phase transformer, Comparison with single phase transformer.

D. Lesson Planning :

SR No.	No. of Hours.	% Weight-age in Exam	Topic
1	02	Unit:1 Wt. 13%	Generating equipments: Classification, 2 wire DC generators, working principle of generator, construction of DC Machines
2	03		Open circuit characteristic, external characteristic and internal characteristic of DC generator.
3	05	Unit: 2 Wt. 18%	DC Motors: Construction, Types, Principle of operation, torque equation,
4	03		Losses and efficiency, speed torque characteristics of shunt, series and compound motor, D.C. shunt motor starter
5	02		Speed control of D.C. shunt and series motors.
6	03	Unit: 3 Wt. 18%	3-Phase induction motor: Construction, production of rotating magnetic field, principle of operation, speed and slip
7	03		Rotor current , relation between rotor copper loss and rotor input, torque of an induction motor, torque slip curve,
8	03		Losses and Efficiency, starters for 3 phase induction motor, speed control.
9	02	Unit: 4 Wt. 16%	Single phase induction motor: Production of magnetic field, comparison between three phase & single phase Induction motors,
10	02		Starting of single phase induction motor by capacitor and shaded pole motor, Universal motors.
11	04	Uni:5 Wt. 13%	Alternator: Introduction, construction details, exciters, alternator operation on load, voltage regulation, losses & efficiency,
12	03		Parallel operation of alternators, synchronizing procedure of alternators, cooling of alternators.
13	03	Unit:6 Wt. 22%	General aspects, Basic definition, working principle of transformer, Types of transformers,
14	04		Transformer construction: core/ shell/ spiral transformers, Transformers windings terminals, tapping, bushing
15	03		Transformers cooling, oil conservators and breather. Three Phase Transformer: Construction, Working of three phase transformer, Comparison with single phase transformer.
TOTAL	45	100	

E. Instructional Method & Pedagogy :

- At the start of course, the course delivery pattern , prerequisite of the subject will be discussed
- Lecture may be conducted with the aid of multi-media projector, black board, OHP etc. & equal weightage should be given to all topics while teaching and conduction of all examinations.
- Attendance is compulsory in lectures and laboratory, which may carries five marks in overall evaluation.
- One/Two internal exams may be conducted and total/average/best of the same may be converted to equivalent of 30 marks as a part of internal theory evaluation.
- Assignment based on course content will be given to the student for each unit/topic and will be evaluated at regular interval. It may carry an importance of ten marks in the overall internal evaluation.
- Surprise tests/Quizzes/Seminar/Tutorial may be conducted and having share of five marks in the overall internal evaluation.

F. Students Learning Outcomes :

On successful completion of the course

- The student can be acquired the basic knowledge of energy conversion principle and electrical machine thus being prepared to pursue any area of engineering spectrum in depth as desired.
- The students will be able to effectively employ electrical systems and lead the exploration of new applications and techniques for their use.

G. Recommended Study Materials :

Text & Reference Books:

1. Electrical Machines. by Nagarath & Kothari,TMH Publications
2. Electrical Technology Vol II. B. L. Theraja,S .Chand Publications
3. Performance and Design of A.C. machines by M. G. Say
4. Electrical Machines by P S Bhimbra
5. Electrical Machines by J. B. Gupta, Kataria Pub