

Maulana Abul Kalam Azad University of Technology, West Bengal

(Formerly West Bengal University of Technology)

Syllabus for B. Tech in Electrical Engineering

(Applicable from the academic session 2018-2019)

Semester-V

Name of the course	ELECTRIC MACHINE-II
Course Code: PC-EE-501	Semester: 5th
Duration: 6 months	Maximum Marks: 100
Teaching Scheme	Examination Scheme
Theory: 3 hrs/week	Mid Semester Exam: 15 Marks
Tutorial: 0hr/week	Assignment & Quiz: 10 Marks
Practical: hrs/week	Attendance: 05 Marks
Credit Points: 3	End Semester Exam: 70 Marks

Objective:

1. To understand the arrangement of windings of AC machines.
2. To understand the principle of production of pulsating and revolving magnetic fields.
3. To understand the principle of operation and characteristics of three phase Induction machines
4. To understand the principle of operation and characteristics of single phase Induction machines
5. To understand the principle of operation and characteristics of synchronous machine
6. To understand the principle of operation and characteristics of special electromechanical devices.
7. To solve problems of Induction machines, synchronous machines and special electromechanical devices.

Pre-Requisite

1. Basic Electrical Engineering (ES-EE-101)
2. Electric Circuit Theory (PC-EE-301)
3. Electromagnetic field theory (PC-EE-303)
4. Electric Machine-I (PC-EE-401)

Unit	Content	Hrs	Marks
1	Fundamentals of AC machine windings: Physical arrangement of windings in stator and cylindrical rotor; slots for windings; single-turn coil - active portion and overhang; full-pitch coils, concentrated winding, distributed winding, winding axis, 3D visualization of the above winding types, Air-gap MMF distribution with fixed current through winding-concentrated and distributed, Sinusoidally distributed winding, winding distribution factor	5	
2	Pulsating and revolving magnetic fields: Constant magnetic field, pulsating magnetic field - alternating current in windings with spatial displacement, Magnetic field produced by a single winding - fixed current and alternating current Pulsating fields produced by spatially displaced windings, Windings spatially shifted by 90 degrees, Addition of pulsating magnetic fields, Three windings spatially shifted by 120 degrees (carrying three-phase balanced currents), revolving magnetic field.	5	
3	Induction Machines: Construction, Types (squirrel cage and slip-ring), Torque Slip Characteristics, Starting and Maximum Torque. Equivalent circuit. Phasor Diagram, Losses and Efficiency. Effect of parameter variation on torque speed characteristics (variation of rotor and stator resistances, stator voltage, frequency). Methods of starting, braking and speed control for induction motors. Generator operation. Self-excitation. Doubly-Fed Induction Machines.	10	
	Single-phase induction motors:		

4	Constructional features, double revolving field theory, equivalent circuit, determination of parameters. Split-phase starting methods and applications	5	
5	Synchronous machines: Constructional features, cylindrical rotor synchronous machine - generated EMF, equivalent circuit and phasor diagram, armature reaction, synchronous impedance, voltage regulation. Operating characteristics of synchronous machines, V-curves. Salient pole machine - two reaction theory, analysis of phasor diagram, power angle characteristics. Parallel operation of alternators - synchronization and load division.	10	
6	Special Electromechanical devices: Principle and construction of switched Reluctance motor, Permanent magnet machines, Brushless DC machines, Hysteresis motor, Stepper motor, Tacho generators.	5	

Text books:

1. Electrical Machinery, P.S. Bhimra, Khanna Publishers.
2. Electrical Machines, Nagrath & Kothary, TMH
3. Electrical Machines, P.K. Mukherjee and S. Chakravorti, Dhanpat Rai Publications.
4. Electrical Machines, Theory & Applications, M.N. Bandyopadhyay, PHI

Reference books

1. Electric Machinery & Transformer, Bhag S. Guru and H.R. Hiziroglu, 3rd Edition, Oxford University press.
2. Electric Machinery & Transformes, Irving L. Kosow, PHI
3. Electric Machinery, A.E.Fitzgerald, Charles Kingsley,Jr. & Stephen D. Umans, 6th Edition, Tata McGraw Hill Edition.
4. Electrical Machines, R.K. Srivastava, Cengage Learning
5. Theory of Alternating Current Machinery, Alexander S Langsdorf, Tata Mc Graw Hill Edition
6. The performance and Design of Alternating Current Machines, M.G.Say, CBS publishers & distributors
7. Electric Machines, Charles A. Gross, CRC press.
8. Problems in Electrical Engineering, Parker smith, 9th Edition, CBS publishers & distributors.

Course Outcome:

After completion of this course, the learners will be able to

1. describe the arrangement of winding of AC machines.
2. explain the principle of operation of Induction machines, Synchronous machines and special machines.
3. solve numerical problems of Induction machines, Synchronous machines and Special machines.
4. estimate the parameters and efficiency of Induction machines and Synchronous machines.
5. determine the characteristics of Induction machines and Synchronous machines.
6. select appropriate methods for starting, braking and speed control of Induction machines.

Special Remarks (if any)

The above-mentioned outcomes are not limited. Institute may redefine outcomes based their program educational objective.