

COURSE CODE: 1152EE116	COURSE TITLE: SPECIAL ELECTRICAL MACHINES	L	T	P	C
		2	0	0	2
COURSE CATEGORY:					
Program Elective					
PREAMBLE :					
This course exposes the students to the construction, principle of operation and performance of special electrical machines as an extension to the study of AC & DC electrical machines.					
PREREQUISITE COURSES:					
• Basic Electrical Engineering					
RELATED COURSES:					
AC Machines, DC Machines & Transformers					
COURSE EDUCATIONAL OBJECTIVES :					
The objectives of the course are to make the students, <ul style="list-style-type: none"> • Construction, principle of operation and performance of synchronous reluctance motors. • Construction, principle of operation, control and performance of stepping motors. • Construction, principle of operation, control and performance of switched reluctance motors. • Construction, principle of operation, control and performance of permanent magnet brushless D.C. motors. • Construction, principle of operation and performance of permanent magnet synchronous motors. 					
COURSE OUTCOMES :					
Upon the successful completion of the course, students will be able to:					
CO Nos.	Course Outcomes	Level of learning domain (Based on revised Bloom's taxonomy)			
C01	Understand the Construction, principle of operation and performance of synchronous reluctance motors.	K2			
C02	Understand the Construction, principle of operation, control and performance of stepping motors.	K2			
C03	Understand the Construction, principle of operation, control and performance of switched reluctance motors.	K2			
C04	Understand the Construction, principle of operation, control and performance of permanent magnet brushless D.C. motors.	K2			
C05	Understand the Construction, principle of operation and performance of permanent magnet synchronous motors.	K2			

CORRELATION OF COs AND POs

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1			M					L	M			L
CO2	L		M	M				L	M			
CO3			M	L				L	M			
CO4				L				L			M	
CO5	M			H				L	M			

COURSE CONTENT:**UNIT I | SYNCHRONOUS RELUCTANCE MOTORS | 9**

Constructional features – Types – Axial and Radial flux motors – Operating principles – Variable Reluctance and Hybrid Motors – SYNREL Motors – Voltage and Torque Equations - Phasor diagram- Characteristics.

UNIT II | STEPPING MOTORS | 9

Constructional features – Principle of operation – Variable reluctance motor – Hybrid motor – Single and multi stack configurations – Torque equations – Modes of excitations – Characteristics – Drive circuits – Microprocessor control of stepping motors – Closed loop control.

UNIT III | SWITCHED RELUCTANCE MOTORS | 9

Constructional features – Rotary and Linear SRMs - Principle of operation – Torque production – Steady state performance prediction- Analytical method -Power Converters and their controllers –Methods of Rotor position sensing – Sensorless operation – Closed loop control of SRM -Characteristics.

UNIT IV | PERMANENT MAGNET BRUSHLESS D.C. MOTORS | 9

Permanent Magnet materials – Magnetic Characteristics – Permeance coefficient -Principle of operation – Types – Magnetic circuit analysis – EMF and torque equations –Commutation – Power controllers – Motor characteristics and control.

UNIT V | PERMANENT MAGNET SYNCHRONOUS MOTORS | 9

Principle of operation – Ideal PMSM – EMF and Torque equations – Armature reaction MMF – Synchronous Reactance – Sinewave motor with practical windings - Phasor diagram – Torque/speed characteristics - Power controllers - Converter Volt-ampere requirements.

TOTAL: 45 PERIODS**TEXT BOOKS:**

1. T.J.E. Miller, 'Brushless Permanent Magnet and Reluctance Motor Drives', Clarendon Press, Oxford, 1989.
2. T. Kenjo, 'Stepping Motors and Their Microprocessor Controls', Clarendon Press London, 1984.

REFERENCE BOOKS:

1. R.Krishnan, 'Switched Reluctance Motor Drives – Modeling, Simulation, Analysis, Design