

COURSE CODE: 1152EE118	COURSE TITLE: SOLID STATE DRIVES	L	T	P	C
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COURSE CATEGORY:

Program **Elective**

PREAMBLE :

This course Solid State Drives, provides an introduction to the operation of electric drives controlled from a power electronic converter and also provides the design concepts of controllers

PREREQUISITE COURSES:

Knowledge on Electrical machines., Knowledge on Power Electronics converters.

RELATED COURSES:

Forms the basics of dealing with non linearity in any system

COURSE EDUCATIONAL OBJECTIVES :

The objectives of the course are to make the students,

- To understand the stable steady-state operation and transient dynamics of a motor-load system.
- To study and analyze the operation of the converter / chopper fed dc drive and to solve simple problems.
- To study and understand the operation of both classical and modern induction motor drives.
- To understand the differences between synchronous motor drive and induction motor drive and to learn the basics of permanent magnet synchronous motor drives.
- To analyze and design the current and speed controllers for a closed loop solid-state d.c motor drive

COURSE OUTCOMES :

Upon the successful completion of the course, students will be able to:

CO Nos.	Course Outcomes	Knowledge Level (Based on revised Bloom's Taxonomy)
CO1	understand the operation of the converter / chopper fed dc drive and to solve simple problems	K2
CO2	understand the operation of both classical and modern induction motor drives	K2
CO3	apply this skills to design the current and speed controllers for a closed loop solid-state DC motor drive	K3
CO4	understand the concept of AC AND DC drive system	K2
CO5	discriminates to drive the systems required for special machines	K2

CORRELATION OF COs AND POs

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

COURSE CONTENT:

UNIT I	FUNDAMENTALS OF ELECTRIC DRIVES	9
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Advantage of electric drives – Parts and choice of electrical drives – Status of DC and AC drives – Torque-speed characteristics of motor and load – Selection of motor power rating – Thermal model of motor for heating and cooling – Classes of duty cycle – Determination of motor rating – Control of electric drives – Modes of operation – Speed control and drive classifications – Closed loop control of drives.

UNIT II	CONVERTER / CHOPPER FED DC MOTOR DRIVE	9
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Steady state and transient analysis of the single and three phase fully controlled converter fed separately excited D.C motor drive – Continuous and discontinuous conduction mode – Multiquadrant operation– Converter control – Chopper-fed D.C drive – Steady-state analysis – Block diagram of closed loop dc drive.

UNIT III	INDUCTION MOTOR DRIVES	9
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Analysis and performance of three-phase induction motor – Operation with unbalanced source voltage, single-phasing and unbalanced rotor impedance – Starting – Braking – Transient analysis – Stator voltage control –Adjustable frequency control of VSI and CSI fed induction motor – Static rotor resistance control – Slip-power recovery drives – Open loop Volts/Hz control – Principle of vector control – Vector control of induction motor – Block diagram of closed loop drive.

UNIT IV	SYNCHRONOUS MOTOR DRIVES	9
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Open loop Volts/Hz control and self-control of CSI and VSI fed synchronous motor – Cycloconverter fed synchronous motor – Microprocessor based synchronous motor control – Marginal angle control and power factor control – Permanent magnet (PM) synchronous motor – vector control of PM Synchronous Motor (PMSM).

UNIT V	BLDC, STEPPER AND SWITCHED RELUCTANCE MOTOR DRIVES	9
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Brushless DC motor drives and its applications – Variable reluctance and permanent magnet stepper motor Drives – Operation and control of switched reluctance motor – Applications, modern trends in industrial drive.

TOTAL: 45 PERIODS**TEXT BOOKS:**

1. Bimal K. Bose, "Modern Power Electronics and AC Drives", Pearson Education, 2002.
2. Dubey, G.K., "Fundamentals of Electrical Drives", 2nd Edition, Narosa Publishing House, 2001.

REFERENCE BOOKS:

1. Pillai, S.K., "A First Course on Electrical Drives", Wiley Eastern Limited, 1993.
2. Krishnan, R., "Electric Motor and Drives Modelling, Analysis and Control", Prentice Hall of India, 2001.
3. VedamSubrahmanyam., "Electrical Drives", TataMcGraw-hill Publishing company limited, 1994.
4. Gopal K.Dubey., "Power semiconductor Controlled Drives", Prentice Hall, 1989