

Course code	Course Name	L-T-P-Credits	Year of Introduction
EE308	Electric Drives	3-0-0-3	2016
<b>Prerequisite:</b> EE202 & EE205			
<b>Course Objectives</b> <ul style="list-style-type: none"> <li>To provide fundamental knowledge in dynamics and control of Electric Drives.</li> <li>To justify the selection of Drives for various applications.</li> <li>To familiarize the various semiconductor controlled drives employing various motors.</li> </ul>			
<b>Syllabus</b> Fundamentals of dynamics and control of electric drives– separately excited dc motor drives using controlled rectifiers — chopper controlled dc drives – ac voltage controllers – three phase induction motor speed control – VSI and CSI fed induction motor drives – synchronous motor drives			
<b>Expected outcome.</b> The students will be able to select a drive for a particular application. They will familiarize with the various control techniques employed for controlling drives with ac and dc motors.			
<b>Text books</b> <ol style="list-style-type: none"> <li>Bimal K. Bose “Modern power electronics and AC drives” Pearson Education, Asia 2003</li> <li>Dubey G. K. “Power semiconductor control drives” Prentice Hall, Englewood Cliffs, New Jersey, 1989</li> </ol>			
<b>References:</b> <ol style="list-style-type: none"> <li>Dewan S.B. , G. R. Slemon, A. Strauven, “Power semiconductor drives”, John Wiley and sons</li> <li>Dr. P. S. Bimbra “Power electronics”, Khanna publishers</li> <li>J. M. D. Murphy “Thyristor control of AC drives”</li> <li>N. K. De, P. K. Sen “Electric drives” Prentice Hall of India 2002</li> <li>Ned Mohan, Tore m Undeland, William P Robbins, “Power electronics converters applications and design”, John Wiley and Sons.</li> <li>Pillai S. K. “A first course on electric drives”, Wielely Eastern Ltd, New Delhi</li> <li>Vedam Subrahmanyam, “Electric Drives”, MC Graw Hill Education, New Delhi</li> <li>W. Shepherd, L. N. Hulley and D. T. Liang, “Power Electronocs and motor control”, Second Edition, Cambridge University Press, 1995.</li> </ol>			
<b>Course Plan</b>			
Module	Contents	Hours	Sem. Exam Marks
I	Introduction to electric drives – Block diagram – advantages of electric drives – Dynamics of motor load system, fundamental equations, and types of load – classification of load torque, four quadrant operation of drives. Steady state stability. Introduction to closed loop control of drives.	7	15%
II	DC motor drives- constant torque and constant power operation, separately excited dc motor drives using controlled rectifiers, single phase semi converter and single phase fully controlled converter drives. Three phase semi converter and fully controlled converter drives. Dual converters, applications of dual converter for speed control of DC motor. Closed loop control of separately excited dc motor drive. DC series motor drive for traction application.	7	15%
<b>FIRST INTERNAL EXAMINATION</b>			

<b>III</b>	Chopper controlled DC drives. Analysis of single quadrant chopper drives. Regenerative braking control. Two quadrant chopper drives. Four quadrant chopper drives. Cycloconverters for drive applications – different types – basic principle.	7	15%
<b>IV</b>	Three phase induction motor speed control. Using semiconductor devices. Stator voltage control – stator frequency control - Stator voltage and frequency control (v/f). Rotor chopper speed control - slip power recovery control schemes – sub synchronous and super synchronous speed variations.	7	15%
<b>SECOND INTERNAL EXAMINATION</b>			
<b>V</b>	Voltage source inverter fed induction motor drives, Current source inverter fed induction motor drives. Concept of space vector – Basic transformation in reference frame theory – field orientation principle.	7	20%
<b>VI</b>	Synchronous motor drives – introduction to v/f control. Permanent Magnet synchronous motor drives – different types – control requirements, converter circuits, modes of operation. Microcontroller based permanent magnet synchronous motor drives (schematic only).	7	20%
<b>END SEMESTER EXAM</b>			

**QUESTION PAPER PATTERN:**

Maximum Marks: 100

Exam Duration: 3Hours.

**Part A:** 8 compulsory questions.

One question from each module of Modules I - IV; and two each from Module V & VI.

Student has to answer all questions. (8 x5)=40

**Part B:** 3 questions uniformly covering Modules I & II. Student has to answer any 2 from the 3 questions: (2 x 10) =20. Each question can have maximum of 4 sub questions (a,b,c,d), if needed.

**Part C:** 3 questions uniformly covering Modules III & IV. Student has to answer any 2 from the 3 questions: (2 x 10) =20. Each question can have maximum of 4 sub questions (a,b,c,d), if needed.

**Part D:** 3 questions uniformly covering Modules V & VI. Student has to answer any 2 from the 3 questions: (2 x 10) =20. Each question can have maximum of 4 sub questions (a,b,c,d), if needed.