UEE606: ELECTRICAL MACHINES AND DRIVES

L	T	P	Cr
3	1	2	4.5

Course Objectives: In this course fundamental electromechanical, power electronic, and control theory in the context of electric drive systems will be covered. The capabilities and limitations of different types of electric machines in various drive applications will also be addressed.

Fundmentals of electromechanical devices:flux linkage/current relationships, concept of energy and co-energy, calculation of forces and torques.

Power Electronic Converters: voltage control using uncontrolled switches, controlled rectification, inversion, voltage controllers, converter waveforms, acoustic noise and cooling

Control Theory: Importance of Feedback control, requirement of feedback loops in drive applications, current-limit control, speed, torque and position control for electric drives, concept of PLL in speed control application.

DC Motor Drives: EMF and torque production of DC motor, dc motor types, transient and steady-state characteristics, four quadrant operation, thyristor and chopper fed dc motor drives.

Induction Motor Drives:concept of rotating magnetic field and torque production, motor types, torque-speed and torque-slip characteristics, methods of starting of squirrel cage motors, generating and braking modes, speed control using stator voltage control, variable frequency operation, rotor resistance control and slip power recovery schemes.

Motor/Drive Selection:power ratings and capabilities, drive characteristics, load requirements and general application considerations.

Laboratory work: The lab will consist of giving the students hands-on experience with electric machines (AC and DC), power electronic circuitry, and control algorithms for electric drives.

Course Learning Outcomes:
On successful completion of this course, the student should be able to:

1. Analyse the various forces and torques in electromechanical devices
2. explain the working of power electronic converters and inverters
3. elucidate the concepts of feedback control theory
4. analyze and compare the performance of DC and AC machines in various drive applications
5. design controllers for electric drives which achieve the regulation of torque, speed, or position in the above machines.

Text Books:

1. *Dubey, G.K., Fundamentals of Electric Drives, Narosa Publications (2001).*
2. *Mohan, N., Electric Drives: An Integrative Approach. MNPERE, (2001).*
3. *Krishnan, R., Electric Motor Drives: Modeling, Analysis, and Control. Prentice Hall, (2001).*

Reference Books:

1. *Hughes, A. and Drury, B., Electric Motors and Drives: Fundamentals, Types and Applications, Newnes,4th Ed., (2014).*
2. *Sharkawi, Mohammed.A.El, Fundamentals of Electric Drives, PWS- Brooks/Cole Pub. Company, (2000).*

Evaluation Scheme:

Sr. No.	Evaluation Elements	Weightage (%)
1	MST	25
2	EST	35
3	Sessional	40