AMITY UNIVERSITY
UTTAR PRADESH

Course Title: Advanced Drives & Control

Credit Units:

L	T	P/S	SW/FW	TOTAL CREDIT UNITS
4	1	-	-	5

Course Level: PG

Course Code: ELEC712

Course Objectives: To acquaint the students with the concept of advanced level power electronic devices, AC drives, DC drives & design of control schemes for these drives.

Pre-requisites: Advanced Power Electronics, Electrical Machines-1, Electrical Machines-II.

Course Contents/Syllabus:

	Weightage (%)
Module I : Introduction to motor drives.	**20**
Classification, comparison of AC and DC drives, Basic elements, torque equations, component of load torque, multi-quadrant operation, equivalent drive parameters, components of power electronic drives criteria for selection of drive components match between the motor and the load characteristics, calculation of time and energy in transient conditions, characteristics of mechanical systems, stability consideration, thermal consideration, thermal model of motor for heating and cooling, match between the motor and power electronics converter, closed loop control of drives.	
Module II: DC drives	**20**
System model, motor rating, motor mechanism dynamics, drive transfer function, effect of armature current waveform, torque pulsations, adjustable speed drives, chopper fed and 1 phase converter fed drives, effect of field weakening.	
Module III : Induction Motor drives	**20**
Basic Principle of operation of 3 Phase motor, equivalent circuit, MMF space harmonics due to fundamental current, fundamental spatial MMF distributions due to time harmonics simulation, effect of time and space harmonics, speed control by varying stator frequency and voltage, impact of non sinusoidal excitation on induction motors, variable square wave VSI drives, variable frequency CSI drives, line frequency variable voltage drives.	
Module IV	**20**
Review of induction motor equivalent circuit, effect of voltage, frequency and stator current on performance of the m/c, effect of harmonics, slip power recovery schemes-static Kramer drive and dynamic d.q model, small signal model, voltage and current fed scalar control, direct and indirect vector control, sensor less vector control, direct torque and flux control.	

Module V: Closed loop control	20
Motor transfer function-P, PI and PID controllers, current control-Design procedure, phase locked loop (PLL) control-microcomputer control. Industrial applications and modern trends in drive, effect of RMS voltage variation on drive behavior.	

Student Learning Outcomes: After completing this course, students will be able to

1. Learn the core knowledge of automation of Electric Drives.
2. understand of power electronic system which make drives work
3. Understand related control and switching mechanism.
4. Experimentally study responses and output waveforms of various powers electronic based drives on software setups.

Pedagogy for Course Delivery:

- **Class Room Lectures, assignments, Quizes.**
- **Practical on the Hardware and Software setups.**

Assessment/ Examination Scheme:

Theory L/T (%)	Lab/Practical/Studio (%)	Total(%)
100	-	100

Theory Assessment (L&T):

Continuous Assessment/Internal Assessment					End Term Examination
Components (Drop down)	**A**	**CT**	**S/V/Q**	**HA**	
Weightage (%)	5	10	8	7	70

Text Reading:

- B. K. Bose, "Modern Power Electronics and AC drives", Pearson Education, Asia, 2003.
- M. H. Rashid, "Power Electronics", Third Edition, PHI
- G. K. Dubey, "Fundamentals of Electrical Drives", Narosa Publishing house.

References:

- V. Subrahmanyam, "Electric Drives-Concepts and Applications", TMH
- G. K. Dubey, "Power Semiconductor controlled drives", PH 1989.
- R. Krishnan, "Electric Motor Drives: Modeling, Analysis and Control", PH, 1998.
- P. Vas, "Sensor less vector and direct torque control", Oxford Press, 1998.
- W. Leonard, "Control of Electric Drives", Springer Verlag, 1985