NIRMA UNIVERSITY

Institute:	Institute of Technology
Name of Programme:	B. Tech. in Electronics and Instrumentation Engineering
Semester:	V
Course Code:	3EI102CC24
Course Title:	Industrial Drives
Course Type:	Core
Year of Introduction:	2024-25

L	T	Practical component				C
		LPW	PW	W	S	
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Course Learning Outcomes (CLOs):

At the end of the course, the students will be able to –

1. illustrate the operation of various power converters and electric drives **(BL3)**
2. justify the role of power converters and electric drives in industrial applications **(BL4)**
3. design different circuits for power converters and electric drives **(BL5)**
4. Simulate and analyse various power converters and electric drives **(BL6)**

Unit	Contents	Teaching hours (Total 45)
Unit- I	**Introduction to power electronic converters** Overview of different types of power converters and their importance in industrial applications	01
Unit- II	**Choppers** Introduction, basic classification – step down, step up and step up/down, basic chopper operation, control strategies, chopper configuration, thyristor chopper circuits, Jones' chopper, Morgan's chopper, related problems	08
Unit- III	**Inverters** Introduction, classification of inverters, series inverters, parallel inverters, Single-phase half and full bridge inverters, Performance parameters of inverters, practical inverter circuits – McMurray inverter, McMurray-Bedford inverter, related problems	08
Unit- IV	**Cycloconverters** Introduction, basic principle of operation, single-phase to single-phase cycloconverter, three-phase half-wave cycloconverter.	04
Unit- V	**Introduction to electric drives** Introduction, basic principle of operation, classification of electric drives, different types of loads.	04
Unit- VI	**DC drives** Introduction, basic machine equations and characteristic curves, schemes for DC motor speed control, single-phase DC drives, three-phase DC drives, comparison of half-wave converter, semi-converter, full converter and dual converter drives, chopper drives.	10
Unit- VII	**AC drives** Introduction, basic principle of operation, speed torque characteristics, speed control of induction motor, stator voltage control, rotor resistance control, stator frequency control, v/f control, stator current control, slip power recovery scheme, Scherbius drive, Kramer drive.	10

Self Study:
The self-study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self study contents.

Laboratory Work:
This shall consist of at least 10 practicals based on the above syllabus.

Suggested Reading:

1. M. Rashid, Power Electronics, Pearson Education Publication
2. L. Umanand, Power Electronics, Wiley Publication
3. M. D. Singh and K. B. Khanchandani, Power Electronics, Tata-McGraw Hill Publication
4. P. S. Bimbhra, Power Electronics, Khanna Publication
5. Asghar M. S. Jamil, Power Electronics, Prentice Hall of India Publications

Suggested List of Experiments (not restricted to the following):
(Only for Information)

1.	To perform the SCR based series inverter	**(02 Hrs)**
2.	To perform the SCR based parallel inverter without feedback diodes	**(02 Hrs)**
3.	To perform the SCR based parallel inverter with feedback diodes	**(02 Hrs)**
4.	To perform the SCR based bridge inverter functions & observes its associated waveforms	**(02 Hrs)**
5.	To perform the SCR based bridge Mc-Murry Bedford half bridge inverter functions & observe its associated waveforms	**(02 Hrs)**
6.	To perform the SCR based cyclo-converter & observe associated waveforms	**(02 Hrs)**
7.	To perform the SCR based Jones' Chopper Function & also observe the associated waveforms	**(02 Hrs)**
8.	To control and regulate the speed of DC shunt motor in open loop mode	**(02 Hrs)**
9.	To control and regulate the speed of DC shunt motor in close loop mode	**(02 Hrs)**
10.	Study of Industrial AC Drive	**(02 Hrs)**
11.	Simulate the given dc drive and obtain necessary waveforms	**(02 Hrs)**
12.	Simulate Step-up, Step-down and step up/down choppers for various duty cycles	**(02 Hrs)**

L = Lecture, T = Tutorial, P = Practical, C = Credit

w.e.f. the academic year 2024 - 25 and onwards