

LNCT University
Diploma EX, V Semester Syllabus

INDUSTRIAL ELECTRONICS (DEX-505)

COURSE OUTCOMES:

After Completing the course student should be able to:

CO-1	Explain characteristics and operation of power electronic devices and SCR protection methods.
CO-2	Analyse rectifier/converter types and apply them to industrial scenarios.
CO-3	Describe and apply inverter, chopper and cycloconverter principles in motor and heating control.
CO-4	Design control circuits using relays, timers and sensors for industrial automation.
CO-5	Develop and evaluate PLC-based automation systems using ladder logic.

UNIT I: POWER ELECTRONIC DEVICES

Introduction to power electronics and its role in industries, characteristics and working of diode (power type), SCR (silicon controlled rectifier) TRIAC and DIAC, power MOSFET and IGBT, triggering methods and protection of SCR, comparison of switching devices.

UNIT II: RECTIFIERS AND POWER CONVERTERS

Controlled and uncontrolled rectifiers (single-phase and three-phase), half-wave and full-wave rectifiers. Bridge rectifier and centre-tap rectifier, working of dc-dc converters (buck, boost, buck-boost). AC-DC converters using SCRS, industrial applications of rectifiers and converters.

UNIT III: INVERTERS, CHOPPERS, AND CYCLOCONVERTERS

Classification of inverters: voltage source and current source. single-phase and three-phase inverters (basic circuits and waveforms). choppers: working and classification (step-up, step-down). cycloconverter: working principle and types. Applications in speed control of ac/dc motors and heating control.

UNIT IV: INDUSTRIAL CONTROL CIRCUITS AND APPLICATIONS

Basic control circuits using relays and timers, motor control circuits: DOL starter, star-delta starter, reversing, braking. Industrial heating and welding using electronics, electronic control of fans, pumps, conveyors and lifts. use of sensors (temperature, proximity, speed) in industrial control.

UNIT V: PROGRAMMABLE LOGIC CONTROLLERS (PLCS)

Introduction to PLCs and their role in automation, architecture and working of a PLC, ladder logic basics and simple programming examples applications of PLC in industrial automation. advantages of PLC over traditional relay logic systems.

List of Suggestive Experiments: -

1. Study and plot the V-I characteristics of a power diode.
2. Study and plot the V-I characteristics of an SCR (with triggering circuit).
3. Study the characteristics of TRIAC and DIAC and their use in phase control.
4. Study and simulate a Buck-Boost converter and observe output waveform.
5. Study the switching characteristics of Power MOSFET and IGBT.
6. Introduction to PLC hardware and architecture (trainer kit or simulation).
7. Write and execute a basic ladder diagram (e.g., turning ON/OFF a lamp).
8. Develop ladder logic for DOL and star-delta starters using PLC.
9. Study of inverter and chopper circuits.
10. Demonstration of electronic speed control for motors.

Reference Books: -

1. Power Electronics, M. H. Rashid.
2. Industrial Electronics, J. S. Chitode.
3. Power Electronics, P. S. Bhimbra.
4. Industrial and Power Electronics, Harish C. Rai.
5. Programmable Logic Controllers, Frank D. Petruzella.