

SEMESTER <i>Seventh</i>	DEPARTMENT <i>Control Engineering</i>	COURSE TITLE <i>Programmable Logic Controller</i>
COURSE CODE <i>EC707</i>	HOURS: 3 UNITS: 3	COURSE SPECIFICATIONS <i>Theoretical Content</i>

1. Concepts' Revision:

- Revision of Logic Gates.
- Revision of the Concept of Closed Loop and Open Loop Control.

2. PLC Overview:

- Introduction (Comparison of PLC and Relays).
- PLC Parts, PLC Modules and Cards.
- PLC Memory Types.
- PLC Selection Criteria.

3. PLC Hardware:

- PLC Internal Hardware Architecture.
- Internal Architecture of Input and Output modules/parts.
- Digital and Analog Sensors/ Actuators.
- Source and Sink Concept.
- Signal and Data Conditioning.
- PLC Memory Addressing.
- PLC Wiring.

4. PLC Software:

- Overview on Programming Methods' Types:
 - Structured Text Language (STL).
 - Function Block Diagram (FBD).
 - Ladder Diagram (LD)
- Programming Basics of Ladder Diagram.
- Logic Inputs & Outputs in LD.
 - Start and Stop Circuit (Latching Circuit).
 - Implementing Logic Functions such as: AND Gate, OR Gate, and XOR Gate.

- Implementing Boolean's Functions in Ladder Diagram.
- Rising Edge and Falling Edge Circuit.
- On-Delay Timer / Off-Delay Timer Instructions in LD.
- Up/Down Counter Instructions in LD.
- Data Transfer Instructions in LD.
- Arithmetic Instructions in LD.
 - Add, Subtract, Multiply, and Divide Instructions and their effect on Flag registers.
- Special Purpose Flags like: Zero Flag, First Cycle Scan Flag, Always-ON-Flag, Always-off-Flag, and etc...
- Data Comparison Instructions in LD and their effects on Flags.
- Shift and Rotate Instructions in LD and their effects on Flags.
- Subroutine Instructions in LD.
- Types of Contactors.

5. Applications (Such as :)

- Traffic Light Control.
- Tank Level Control.
- Conveyer Built Control.
- Starting of 3- phase motor.
- Star Delta Starter.
- Mixer for Liquids Control.

References:

1. *Programmable Logic Controllers*, W. Bolton, 4th ed. 2006.
2. *Programmable Logical Controller*, J. W. Wabb, 1994.
3. *Programmable Logic Controller*, C. Simpson, 1993.
4. *PLC and their applications*, A. Crispin, 1990.