IV Year B.Tech. EEE I-Semester

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PROGRAMMABLE LOGIC CONTROLLERS AND THEIR APPLICATIONS
(Professional Elective – III)

Prerequisites: Microprocessors and Microcontrollers, Control systems

Course Objectives:

1. To understand the generic architecture and constituent components of a Programmable Logic Controller.
2. To develop a software program using modern engineering tools and technique for PLC.
3. To apply knowledge gained about PLCs to identify few real life industrial applications

Unit-I (~8 Lecture Hours): PLC Basics PLC system, I/O modules and interfacing CPU processor programming equipment programming formats, construction of PLC ladder diagrams, devices connected to I/O modules.

Unit-II (~10 Lecture Hours): PLC Programming input instructions, outputs, operational procedures, programming examples using contacts and coils. Drill-press operation. Digital logic gates programming in the Boolean algebra system, conversion examples Ladder diagrams for process control Ladder diagrams and sequence listings, ladder diagram construction, and flow chart for spray process system.

Unit-III (~10 Lecture Hours): PLC Registers: Characteristics of Registers module addressing holding registers input registers, output registers. PLC Functions Timer functions and industrial applications counters counter function industrial applications, Architecture functions, Number comparison functions, number conversion functions.

Unit-IV (~8 Lecture Hours): Data handling functions: SKIP, Master control Relay Jump Move FIFO, FAL, ONS, CLR and Sweep functions and their applications. Bit Pattern and changing a bit shift register, sequence functions and applications, controlling of two axes and three axis Robots with PLC, Matrix functions.

Unit-V (~8 Lecture Hours): Analog PLC operation: Analog modules and systems Analog signal processing multi bit data processing, analog output application examples, PID principles position indicator with PID control, PID modules, PID tuning, PID functions

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TEXT BOOKS:

1. John W Webb, Ronald A Reiss, "Programmable Logic Controllers – Principle and Applications", Fifth edition,: PHI, 2003
2. JR Hackworth, F.D Hackworth, "Programmable Logic Controllers – Programming Method and Applications", First edition,: Pearson, 2006.

REFERENCES:

1. L.A. Bryan and E.A. Bryan, "Programmable Controllers-Theory and applications", Second edition: An Industrial Text Company Publication.
2. Dag H. Hanssen, "Programmable Logic Controllers: A Practical Approach to IEC 61131-3 using CODESYS", First edition, John Wiley & Sons, Ltd, 2015.

Online resources:

https://nptel.ac.in/courses/108105063/pdf/L-19(SM)%20(IA&C)%20((EE)NPTEL).pdf

https://nptel.ac.in/courses/112102011/downloads/faq%20of%20module%204.pdf

http://ee.sharif.edu/~industrialcontrol/LADDER_LOGIC_Tutorial.pdf

http://jjackson.eng.ua.edu/courses/ece485/lectures/

Course Outcomes:

Upon the completion of the course the student will be able to

1. Develop and explain the working of PLC with the help of a block diagram.
2. Execute, debug and test the programs developed for digital and analog operations.
3. Apply the knowledge of timer/counters with PLCs
4. Reproduce block diagram representation on industrial applications using PLC.
5. Understanding to interface various devices to PLCs
6. Acquire the knowledge of analog devices and their interfacing with PLCs