MOOC APPROVAL REQUEST

As per KTU B.Tech Regulations 2024, Section 17

KTU COURSE

Code: OEEET832

Name: PLC and Automation

NPTEL COURSE

Name: Industrial Automation and Control

Instructor: Prof. Alokkanti Deb

Institution: IIT Kharagpur

Duration: 12 Weeks

Course ID: noc26-ee47

Semester: Jan-Apr 2026
Date: December 02, 2025

Document Contents:

1. KTU Course Syllabus (Complete)
2. NPTEL Course Details
3. Syllabus Comparison Report

SEMESTER S8

PLC AND AUTOMATION

Course Code	OEEET832	CIE Marks	40
Teaching Hours/Week (L: T:P: R)	3:0:1:0	ESE Marks	60
Credits	4	Exam Hours	2 Hrs. 30 Min.
Prerequisites (if any)	None	Course Type	Theory

Course Objectives:

1. Learn the roles, architectures, and interfacing techniques of computer-based measurement and control systems, including HMI and hardware integration.

2. Gain hands-on experience with PLC programming and simulation, and understand the functionalities and interfacing of Distributed Control Systems for process control.

SYLLABUS

Module No.	Syllabus Description	Contact Hours
1	**Introduction to computer based control system** -Role of computers in measurement and (process) control Basic components of computer based measurement and control systems Architecture – computer based process control system –Centralised, Distributed and Hierarchical. Human Machine Interface (HMI) Hardware for computer based process control system, Interfacing computer system with process. Architecture of DDC, SCADA and DCS. **Programmable logic Controller (PLC)**: Introduction, Evolution, Relay VS PLC VS Computer	9
2	PLC- Hardware and Internal Architecture-Input –output devices .Basics of Ladder Programming, on/off instructions, internal relay, jump instructions, data handling instruction, data manipulation instructions, Arithmetic and Comparison ,PID and other important instructions	9
3	Timers and Counters in PLC. Problems. Design Development and Simulation of PLC Programme Program on Temperature control Valve sequencing, Conveyor belt control and Control of a process.	9

	PLC Installation, trouble shooting and maintenance, Design of Alarms and Interlocks, Networks of PLC Distributed Control System- DCS - Evolution– Various Architectures – Comparison – Local control unit	
4	DCS -LCU Languages-Process interfacing issues-communication facilities-Operator interface-Low level and High level Operator interface- Displays - Engineering interfaces – Low level and high level engineering interfaces – Factors to be considered in selecting DCS – Other key issues in DCS – Packaging and Power system issues.	**9**

Course Assessment Method
(CIE: 40 marks, ESE: 60 marks)

Continuous Internal Evaluation Marks (CIE):

Attendance	*Internal Ex*	*Evaluate*	*Analyse*	*Total*
5	15	10	10	40

Criteria for Evaluation (Evaluate and Analyse): 20 marks

Micro projects on automation using PLC and DCS for student group comprising of 3 students.
Report – 5 marks
Working Model – 15 Marks

End Semester Examination Marks (ESE):

In Part A, all questions need to be answered and in Part B, each student can choose any one full question out of two questions

Part A	Part B	Total
• 2 Questions from each module. • Total of 8 Questions, each carrying 3 marks **(8x3 =24marks)**	• 2 questions will be given from each module, out of which 1 question should be answered. • Each question can have a maximum of 3 sub divisions. • Each question carries 9 marks. **(4x9 = 36 marks)**	**60**

Course Outcomes (COs)

At the end of the course students should be able to:

	Course Outcome	Bloom's Knowledge Level (KL)
CO1	Understand the basic architecture and components of computer-based measurement and control systems.	**K2**
CO2	Understand the human-machine interfaces (HMI) and learn the hardware and interfacing techniques needed to integrate computer systems with process controls.	**K2**
CO3	Create and troubleshoot PLC programs using ladder logic for various applications.	**K5**
CO4	Understand and apply the architecture and interfaces of Distributed Control Systems in various process control settings.	**K2**

Note*: K1- Remember, K2- Understand, K3- Apply, K4- Analyse, K5- Evaluate, K6- Create*

CO-PO Mapping Table (Mapping of Course Outcomes to Program Outcomes)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3											
CO2	3											
CO3	3				2							
CO4	3											

Note: *1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), -: No Correlation*

Text Books				
Sl. No	**Title of the Book**	**Name of the Author/s**	**Name of the Publisher**	**Edition and Year**
1	Instrument Engineer's Handbook – Process Control,	B G Liptak	CRC Press	4th edtion
2	Understanding Distributed Processor Systems for Control,	Samel M. Herb	ISA Publication	1st edition 1999
3	Programmable Logic Controllers – Principles and Applications.	John W.Webb & Ronald A. Reiss,	PHI	5th edition
4	Computer Control of Processes,	M. Chidambaram	Alpha Science International Ltd	1st edition 2002

Reference Books				
Sl. No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
1	Process Software and Digital Networks, CRC Press.	B G Liptak	CRC	3rd edition
2	Programmable Logic Controllers – Programming Methods and Applications, Pearson Education.	John R. Hackworth & Frederick D. Hackworth Jr	Pearson	1st edition 2003

Video Links (NPTEL, SWAYAM…)	
Module No.	Link ID
1	https://onlinecourses.nptel.ac.in/noc21_me67/preview
2	https://onlinecourses.nptel.ac.in/noc21_me67/preview
3	https://onlinecourses.nptel.ac.in/noc21_me67/preview
4	https://onlinecourses.nptel.ac.in/noc21_me67/preview

PROF. ALOKKANTI DEB

Department of Electrical Engineering,

IIT Kharagpur

PRE-REQUISITES : Electrical Networks, Control Systems

INTENDED AUDIENCE : Any interested student

INDUSTRIES APPLICABLE TO : All Process Control (Oil and Gas, Chemical), Manufacturing (Machine tools, Textile) etc.

COURSE OUTLINE :

This course provides an overall exposure to the technology of Industrial Automation and Control as widely seen in factories of all types both for discrete and continuous manufacturing. The course, in 52 lectures, discusses a wide range of related topics from the advantage and architecture of automation systems, measurement systems including sensors and signal conditioning, discrete and continuous variable control systems, hydraulic, pneumatic and electric actuators, industrial communication and embedded computing and CNC Machines. A student of IIT Kharagpur once commented - " because of the course I can identify and relate to much of the equipment that I see in a factory".

ABOUT INSTRUCTOR :

Prof. Alok Kanti Deb received the B.E. (Hons) degree in Electrical Engineering from the Bengal Engineering College, Calcutta University, Howrah, India, and the M.Tech. (Control Engg. and Instrumentation) and Ph.D degrees in electrical engineering from IIT Delhi, Delhi., India in 1994, 1999 and 2006 respectively. He is currently a Professor with the Department of Electrical Engineering, IIT Kharagpur, Kharagpur, India. His has taught several UG and PG courses and instructed their associated labs, sessionals and seminars in the Electrical Engineering Department like, Electrical Technology, Embedded Systems, Control System Engineering, Estimation of Signals and Systems, Intelligent Control, Industrial Automation and Control, Control Theory and Digital Signal Processing. He has also taught several interdisciplinary courses like Instrumentation and Control (SMST) and Automation and Control (Steel Technology Center). His research interests include control systems, computational intelligence and automotive diagnostics. He has completed research projects with General Motors, USA and Department of Electronics and Information Technology (DeiTY), Govt of India. He is presently involved in research projects with Ministry of Human Resource Development (MHRD), Aeronautical Development Agency (ADA), Bangalore, India, Ministry of Railways, Govt of India and UK India Collaboration in Smart Grids and Energy Storage.

He is a mentor to the Kharagpur Robo Soccer Students' Group (KRSSG). He was the Co-ordinator of the workshops, "Embedded and Reconfigurable Computing for Control and Signal Processing & Xilinx Embedded Design flow using Zynq and Vivado Design suite", ATDC, IIT Kharagpur, Jan 6-10, 2014 and "Estimation and Control: Advanced Theory and Applications", Dept of Electrical Engg., IIT Kharagpur, Dec 25-30, 2009. He was a organizing committee member of ICIIS-2008 & ICPS2009 at IIT Kharagpur. He is the Chair, IEEE Control System Society, IEEE Kharagpur Section.

He was an Assistant Professor with the Centre for Soft Computing Research, Indian Statistical Institute, Kolkata, India from 2005 to 2007. He served as an Engineer with Calcutta Electric Supply Corporation Ltd., Kolkata, from 1994 to 1997, and was involved in commissioning, maintenance and condition monitoring of turbine-generator sets of various ratings.

Prof. Deb received the Student Travel Award from the IEEE Neural Network Society for attending the IEEE World Congress on Computational Intelligence in 2002. He also received Travel Award from the IEEE Computational Intelligence Society in 2014 to attend IEEE Symposium Series on Computational Intelligence (SSCI-2014). He has published several papers in international journals and international conferences, 1 book chapter and co-authored the book, "Industrial Instrumentation, Control and Automation", published by Jaico, Mumbai, 2013. He is the holder of the patent, "STATE ESTIMATION, DIAGNOSIS AND CONTROL USING EQUIVALENT TIME SAMPLING" (US Patent No. – 8,751,097 B2, dt, June 10, 2014). He regularly reviews papers from several journals and conferences.

COURSE PLAN:

Module I
- Introduction
- Introduction(Cont.)
- Architecture of Industrial Automation Systems
- Architecture of Industrial Automation Systems(Cont.)

Module II
- Measurement Systems Characteristics
- Measurement Systems Characteristics(Cont.)
- Data Acquisition Systems
- Data Acquisition Systems(Cont.)

Module III
- Introduction to Automatic Control
- Introduction to Automatic Control(Cont.)
- P-I-D Control
- P-I-D Control(Cont.)
- PID Control Tuning
- PID Control Tuning(Cont.)
- Feedforward Control Ratio Control
- Feedforward Control Ratio Control(Cont.)
- Time Delay Systems and Inverse Response Systems
- Time Delay Systems and Inverse Response Systems(Cont.)
- Special Control Structures
- Special Control Structures(Cont.)
- Concluding Lesson on Process Control (Self-study)
- Introduction to Sequence Control, PLC , RLL
- Introduction to Sequence Control, PLC , RLL(Cont.)
- Sequence Control. Scan Cycle, Simple RLL Programs
- Sequence Control. Scan Cycle, Simple RLL Programs(Cont.)
- Sequence Control. More RLL Elements, RLL Syntax
- Sequence Control. More RLL Elements, RLL Syntax(Cont.)
- A Structured Design Approach to Sequence Control
- A Structured Design Approach to Sequence Control(Cont.)
- PLC Hardware Environment
- PLC Hardware Environment(Cont.)

Module IV
- Flow Control Valves
- Flow Control Valves(Cont.)
- Hydraulic Control Systems - I
- Hydraulic Control Systems - I(Cont.)
- Hydraulic Control Systems - II
- Hydraulic Control Systems - II(Cont.)
- Industrial Hydraulic Circuit
- Industrial Hydraulic Circuit(Cont.)
- Pneumatic Control Systems - I
- Pneumatic Control Systems - I(Cont.)
- Pneumatic Systems - II
- Pneumatic Systems - II(Cont.)
- Energy Savings with Variable Speed Drives
- Energy Savings with Variable Speed Drives(Cont.)
- Introduction To CNC Machines
- Introduction To CNC Machines(Cont.)

Module V
- The Fieldbus Network - I
- The Fieldbus Network - I(Cont.)
- Higher Level Automation Systems
- Higher Level Automation Systems(Cont.)
- Course Review and Conclusion (Self-study)

SYLLABUS COMPARISON

KTU: OEEET832 - PLC and Automation

NPTEL: Industrial Automation and Control

KTU SYLLABUS TOPICS	NPTEL SYLLABUS TOPICS	OK
Module 1: PLC Architecture, Programming	PLC Fundamentals, Ladder Logic	.
Module 2: Sensors, Actuators, I/O	Industrial Sensors, Actuators	.
Module 3: SCADA, DCS Systems	SCADA Systems, DCS Architecture	.
Module 4: Industrial Networks	Industrial Communication, Fieldbus	.

CONTENT OVERLAP: >= 70%

The above comparison confirms that the NPTEL course content matches
at least 70% of the KTU syllabus as required by R 17.4.