Industrial Automation & Control

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Gyan Ranjan Biswal received his B.E. in Electronics Engineering from the Pt. Ravishankar Shukla University, India in 1999 and M. Tech. (Honors) in Instrumentation & Control Engineering from the Chhattisgarh Swami Vivekananda Technical University, India in 2009 followed by Ph.D. in Electrical Engineering, specialized in the area of Power System Instrumentation (Power Generation Automation) from the Indian Institute of Technology Roorkee, India in 2013.

He is expertise in Design and Development of cooling systems for large size electrical generators, and the C&I of process industries. He has been in academia for about twelve years. Presently, he is with VSS University of Technology, Burla, India at the capacity of Head and Associate Professor, EEE from Dec. 2016. He has more than 75 publications in various Journals and Conferences of Internationally repute to his credit. He also holds a patent as well, and filed two more. He also adapted one international edition book published by Pearson India. He received research grants of more than US$95,000 (INR 60 lakhs). He has been supervised 09 Masters' theses, and registered 04 PhD theses. He has also been recognized with many national and international awards. He has been awarded with CICS award under the head of Indian National Science Academy for travel support to USA, MHRD Fellowship by Govt. of India, and Gopabandhu Das Scholarship in his career. His major areas of interests are Power System Instrumentation, Industrial Automation, Robust and Intelligent Control, the Smart Sensors, IoT enabled Smart Sensors, the Smart Grid, Fuel Cell lead Sustainable Sources of Energy, and System Reliability.

Dr. Biswal is a Fellow IE (India), Senior Member of IEEE, USA, and Life Member of ISTE, India. He is actively involved in review panels of different societies of international repute viz. IEEE, IFAC, and the ISA. Currently, he is also actively involved as a Member of IEEE–SA (Standards Association) working groups; IEEE P1876 WG, IEEE P21451-001 WG, and IEEE P1415. He has also been invited for delivering guest lectures at World Congress on Sustainable Technologies (WCST) Conf. 2012, London, UK, INDICON 2015, New Delhi, India, National Power Training Institute (NPTI), Nangal, India, and G.B. Pant Engineering College, Pauri, Gharwal, India, Surendra Sai University of Technology (formerly UCE), Burla, and as a guest expert in 2016 IEEE PES General Meeting Boston, MA, USA.

Syllabus

Industrial Automation & Control

MODULE-I (7 HOURS)

Introduction to process dynamics, its type and classifications. Control actions and controller tuning: Basic control actions-on/off, P, P+I, P+I+D, floating control, pneumatic and electronic controllers, controller tuning.

MODULE-II (7 HOURS)

Introduction to PLC, PAC, DCS and SCADA. IEDs, RTUs, HMI, Smart Sensors and Actuators. Communication Networks for PLC. The Instrument Lists of PLC and HMI. System Architecture, Programming languages of PLC, Relay logic and Ladder logic, Ladder Diagram Elements.

MODULE-III (9 HOURS)

Computer controlled processes: PLC based control of different types of processes such as liquid level system and flow control, open-and-closed chamber pressure control, temperature control, different types of heat exchangers.

MODULE-IV (9 HOURS)

Physical Ladder Diagram and Programmable Ladder Diagram. Case Studies: frost free refrigerator / freezer system; composite discrete / continuous control; conveyor system; oven system; elevator system; uniformly heated liquid control system, and hydro-phonic system.

MODULE-V (7 HOURS)

Advances in Automation: Programmable Automation Controllers. NI my-DAQ, my-RIO, c-RIO, and ELVIS. IEEE 802.11 / 15 Standards, IEEE 1451.5 Std. Role of Internet of Things and Cyber Physical System in Industry Automation, MQTT protocol.

Text and Reference Books

Recommended Text Books:

1. Peter D. Harriot, “Process Control”, Tata McGraw-Hill, New Delhi, 2009.
2. Liptak, H. “Process Control: Instruments Engineer’s Handbook”, Butterwirth Heinemann, 1995.
3. Curtis D. Johnson, “Process Control and Industrial Technology”, Pearson India, 8th ed., 2012.

Reference Books:

* Norman A Anderson, “Instrumentation for Process Measurement and Control”, CRC Press, 2018.
* B. Wayne Bequette, “Process Control – Modeling, Design, and Simulation”, Pearson India, 2015.
* John W. Webbs, “Programmable Logic Controllers – Principals and Applications”, fifth Edition, Pearson India /PHI (Old edition), 2012.

Other Important References

Reference Sites:	
1.	NPTEL, The National Programme on Technology Enhanced Learning (NPTEL): https://nptel.ac.in/
2.	MIT OpenCourseWare : https://ocw.mit.edu/index.htm

Course Outcomes

Upon successful completion of this course, you (students) will be able to

CO1	Understand the basic principles and importance of process control applications using automation.
CO2	Enlist the required instrumentation, knowledge of the P&ID, the Instrumentation Lists, and final elements to ensure that well-tuned control is achieved.
CO3	Demonstrate the student's ability to pursue a career in electrical engineering, control systems, automation platforms through a diverse range of theoretical skills and practical experience of real time applications.
CO4	Plan, design, install, operate, control and maintain different process and automated applications using PLCs/PACs. Further, PLC / PAC algorithm using Ladder Logic Diagram or equivalent languages while handling a plant process.
CO5	Implement an automation platform such as PACs and IoT while handling a plant process.

Introduction

Cluster	Component	% out of 100
1.	Quiz 1-4 (Teacher's / internal (tutorial / case studies) assessment)	**02+03+03+02=10**
2.	Assignment and Attendance	**05+05=10**
3.	Mid-Sem Exam	**30**
4.	End-Sem Exam	**50**
	Total	**100**

Note: * Exams can be of subjective and/or objective type.

Introduction

What do you mean by Industrial Automation & Control ???

Thank you