Maulana Abul Kalam Azad University of Technology, West Bengal

(Formerly West Bengal University of Technology)

Syllabus for B. Tech in Applied Electronics and Instrumentation Engineering (AEIE)

(Applicable from the academic session 2018-2019)

Course Code: PC - EI 601	**Category: Professional Core Course**
Course Name: Process Control	**Semester: Sixth**
L-T-P: 3-0-0	**Credit: 3**
Total Lectures: 44	
Pre-Requisite: Control System	

Objectives:

1. To study the operation of different types of industrial processes.
2. To study the different control strategies used in industrial applications.

Course Content:

Module No.	Description of Topic	Contact Hrs.
1	General review of process, Process control & automation, Servo and regulatory control, Basic process control loop block diagram. Characteristic parameter of a process: Process quality, Process potential, Process resistance, Process capacitance, Process lag, Self regulation.	8
2	Different control modes: On-off control, Multistep , Time proportional, Proportional, Offset-why it appears and how it is eliminated-mathematical analysis, Proportional-integral, Proportional -derivative, Proportional-integral-derivative, integral windup, bump less transfer, Inverse derivative control, controller selection guideline. Effect of disturbances and variation in set point in process control.	8
3	Tuning of controllers: Controller performance indices, Concept of good control, close loop and open loop tuning methods, comparison of tuning methods. Electronic P, PI, PD, PID controller design Pneumatic Controllers - brief analysis	8
4	Different control strategies - schemes, brief analysis and uses (i) Feedforward control (ii) Cascade control (iii) Ratio control (iv) Override control (v) Adaptive control (Programmed or scheduled and self adaptive control) (vi) Continuous control and Batch control.	6
5	Final control elements: Classification. Actuators: self-operated, pneumatic, electro-pneumatic, and stepper motor operated actuators. Valve positioner. Classification of control valves, performance and application of different control valves, valve type and construction, Single & Double Seated Valves, valve sizing, valve characteristics, Cavitation, Flashing, valve	8

	selection guidelines. Control Valve Accessories – Air Filter Regulator, I/P Converter.	
6	Programmable Logic Controller: Block diagram, Classification, Basic Architecture and Functions; Input-Output Modules. PLC Programming: PLC function block timers, function block counters, arithmetic function blocks, real time LADDER diagram; programming examples for maintenance and control. DCS: Computer based control, History and overviewof DCS, Concept of centralized and distributed control systems, system architecture, brief view on operator station, engineering station, field control station.	6

Course Outcome:

On successful completion of the course, students will be able to:

1. Construct the block diagram of feedback control loop and demonstrate its various components.
2. Analyze the different process characteristics with suitable examples.
3. Classify different types of controllers according to their feature and use.
4. Apply the concept of controller tuning in practical processes.
5. Illustrate the construction and use of different types of control valves.
6. Differentiate between different control schemes such as feedforward control, cascade control, ratio control, etc.
7. Construct LADDER program to operate batch processes.

Learning Resources

Text books:

1. Process Control-Principles and application, S. Bhanot, Oxford University press.
2. Principle of Process control, D. Patranabis, TMH.
3. Automatic Process Control, D.P. Eckman, John Wiley.
4. Instrumentation and Process Control, D.C. Sikdar, Khanna Publishing House.

Reference books:

1. Process control, P. Harriott, McGraw Hill.
2. Chemical process control, G. Stephanpoulos, PHI.
3. Process control instrumentation technology, C.D. Johnson, PHI
4. Process Control, S.K. Singh, PHI.
5. Instrument Engineers Handbook, B.G. Liptak, Chilton Book Co. Philadelphia
6. Elements of Chemical Process Technology, O.P. Gupta, Khanna Publishing House