6th Semester		Process Control and Instrumentation	L-T-P 3-0-0	3 CREDITS

Course Outcome:

- Identifying Process and it's Control parameters.
- Identifying various types of Controllers such as Continuous, Discontinuous, Electronic, Pneumatic and Hydraulic Controllers.
- Identifying characteristics of ON-OFF, Proportional, Derivative, Integral Control Modes.
- Implementation of Tuning Methods of PID Controller
- Study various actuators and their principle of operations.

Module I: **(14 Hours)**

Introduction to process control-Process definition, what is process-control Block diagram with examples [Ch-1, C. D Johnson]. Controller Principle-Introduction, Process characteristicsprocess equation, Process load, Process lag, self-regulation. Control system parameters-error, variable range, control parameter range, Control lag, Dead Time, Cycling, Controller modes, Discontinuous controller modes-two position mode, Multi position mode, Floating controlmode. Continuous control modes: P, I, D mode. Composite control modes: PI, PD, PID [Ch-9, C.D. Johnson]. Comparison of various controller principle. Controller tuning –process reaction curve (PRC). Ziegler Nichols tuning [Ch-4.9 and 4.10, S. Bhanot]

Module II: **(12Hours)**

Electronics Controller-Introduction, Electronics discontinuous controllers, electronic proportional controller, electronics Integral controller, electronic derivative controller, PI, PD, PID controller. [Ch-10, C. D. Johnson][Ch-6, S. Bhanot].Hydraulic and Pneumatic ControllersOnly PID design. [Ch-10, C. D. Johnson] [Ch-5, S. Bhanot]. Digital controller: Introduction, components and working of Direct Digital Control (DDC), benefits of DDC, Digital control realization. [Ch-7, S. Bhanot]

Module III: **(10 Hours)**

Final control element [Ch-4, K. Kant]: Introduction, Final control operation-signal conversion, Actuator-pneumatic actuation, hydraulic actuation, Electrical actuation. Control element-Control valve characteristics, control valve categories [Ch-4.6, K. Kant] [Ch-7, C. D. Johnson]

Books:

[1] Process Control Instrumentation Technology By-Curtis D.Johnson.PHI Publication.
[2] Process Control Principles and Applications By- SurekhaBhanot. Oxford Publication
[3] Computer based Industrial Control, 2nd ed. by K. Kant. PHI.

Digital Learning Resources:

CourseName: Process Control & Instrumentation
Course Link: https://nptel.ac.in/courses/103/103/103103037/
Course Instructor: Dr. Prabir Kumar Saha, IIT Guwahati