Associate Degree Program

Specialty	Industrial Control Technology
Course Number	020301241
Course Title	Process Control
Credit Hours	2
Theoretical Hours	2
Practical Hours	0

Brief Course Description:
Introduction to control systems and process control. Block-diagram representation of systems. Open loop and closed-loop systems. System performance indicators. Basic control principles: P, I and D controls. Modes of automated process control on- off, P, PI and PID setting controls, Realizing the different control modes using operational amplifiers, open-loop control using PLC and computers and reading schematics of processes by using ISA.

Course Objectives:
Upon the completion of the course, the student will be able to:
1. Identify the functions of the various components of the automatic process control system.
2. Recognize the open and closed Loop systems and their application in process control.
3. Carry out the necessary calculations to guarantee system stability and accepted system performance.
4. Realize PID modes of control using the necessary analogue electronic equipment.
5. Carry out controller tuning using the recommended methods.
6. Assemble and test simple automatic process control system.
7. Write simple programs to control processes using PLC.

Detailed Course Description:

Unit Number	Unit Name	Unit Content	Time Needed
1.	**Introduction to control systems and process control**	▪ Historical background. Application of process control in industry. Advantages of automatic process control. Main components of process control system. Block diagrams. Open-Loop and closed-Loop system. Classification of process control systems in accordance with the nature of power or the nature of control signals	
2.		▪ Transfer functions of the proportional element, integral element differential element, first order element, and second order element	
3.	**Block Diagrams**	▪ Transfer function of series dynamic elements, loops with negative and loops with positive feed backs. Simplification of block diagrams. Transfer function of open-loop and closed-loop systems	
4.	**Stability of automatic Process Control Systems**	▪ The characteristic equation of the closed-loop system. ▪ Introduction to systems stability. Algebraic criteria of stability. The frequency response and bode diagrams	
5.	**Analogue Controllers**	▪ Introduction and general features. Proportional control mode. (PI) control mode. (PID) control mode. Electronic controllers. Pneumatic	

		controllers	
6.	**Controller Tuning**	▪ Open-loop transient response method. Ziegler-Nichols method. Frequency response method	
7.	**Schematic reading of processes by using ISA**		

Text Books & References:

1. Process control instrumentation technology, Curtis D. Johnson,   Fifth edition Printice-Hall international, Inc.1997, USA.
2. Introduction to control system technology, Fourth edition. Robert N. bateson, 1993 U.S.A, Macmillan publishing company.

Associate Degree Program

Specialty	**Industrial Control Technology**
Course Number	**020301242**
Course Title	**Process Control Lab**
Credit Hours	**1**
Theoretical Hours	**0**
Practical Hours	**3**

Brief Course Description:

- ❖ Laboratory activates include the level, flow, temperature and pressure controls using Pneumatic and electrical control systems. The students shall do the necessary settings for the on-off; P, PI and PID controllers. Open-Loop controls are investigated using operational amplifiers. Conversion from P/I and I/P shall also be investigated.

Course Objectives:

The course objective is to give the students practical skills to investigate the properties of manual self-regulated, proportional, proportional integral, PD and PID in process control.

Detailed Course Description:

Unit Number	Unit Name	Unit Content	Time Needed
1.		▪ Investigation of the properties of manual and self-regulated processes	
2.		▪ Investigation of proportional element by software EWB	
3.		▪ Investigation of (D,I) element by software EWB	
4.		▪ Investigation of first order system by software EWB	
5.		▪ Proportional and proportional integral control of pressure	
6.		▪ (P) Control of flow	
7.		▪ (PI) and (PD) control of flow	
8.		▪ (P) Control of temperature using analog controller	
9.		▪ Program and control the liquid level by using PLC	
10.		▪ On-off process control system (level control)	

Text Books & References:
1. Soft ware EWB or multisim 2001, available for educational community.
2. Process Control and Transducers DL 2314.
3. Technovate. Automatic and process control technology experiments.