



Engineering Program

Specialization	Automatic control technology
Course Number	20310241
Course Title	Process Control Systems
Credit Hours	2
Theoretical Hours	2
Practical Hours	0



Brief Course Description:

- ❖ This subject covers the application of instrumentation in process industry introduced different quantities to be controlled like (pressure, temperature, level, flow), analog(electronics and pneumatics) and digital control device

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.
- Assemble and test simple automatic process control system.



Detailed Course Description:

Unit Number	Unit Name	Unit Content	Time Needed
1.	Introduction to process control	<ul style="list-style-type: none"> 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 function	<ul style="list-style-type: none"> Transfer functions of the proportional element, integral element differential element, first order element, and second order element 	
3.	Block Diagrams	<ul style="list-style-type: none"> 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	<ul style="list-style-type: none"> The characteristic equation of the closed-loop system. Introduction to systems stability. Algebraic criteria of stability. The frequency response and bode diagrams 	
5.	Automatic control modes and there characteristics	Two –position control, proportional control, proportional-plus-reset control, proportional-plus-Rate	

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		control, process reaction curves of P/PI/PID controllers	
6.	Multiply variable control	<ul style="list-style-type: none"> ▪ Cascade Control, Ratio Control, Feed ward control 	
7.	Pneumatic control mechanisms	<ul style="list-style-type: none"> ▪ Contents, function, signals, actions, 	
8.	Electronics control system	<ul style="list-style-type: none"> ▪ Transmitters, the principle of operation, signals, action, 	
9.	Final control elements	<ul style="list-style-type: none"> ▪ Types of control valve, choice of control valves, control valve bodies, control valve actuators, positioners and accessories, self-powered valve 	
10.	Controller Tuning	<ul style="list-style-type: none"> ▪ Open-loop transient response method. Ziegler-Nichols method. Frequency response method 	
11.	Schematic reading of processes by using ISA		
12.	Digital control system	A/D converter, D/A converter sampler data control system,	

Evaluation Strategies:

Exams		Percentage	Date
Exams	First Exam	20%	
	Second Exam	20%	
	Final Exam	50%	
Homework and Projects		10%	

Teaching Methodology:

- ❖ Lectures

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.

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Program Engineering

Specialization	Automatic Control Technology
Course Number	20310242
Course Title	Process Control Systems Lab
Credit Hours	1
Theoretical Hours	0
Practical Hours	3



Brief Course Description:

- ❖ Lap in support of the control loop system, experiments to true different controllers analog(electronics and pneumatics) and digital to control pressure, flow, level, temperature, using mat lab

Course Objectives:

- 1- To adjust and tuning the transmitters, controller, I/P ,P/I, control valve
- 2- To install the control system
- 3- Tuning the control system
- 4- Used mat lab to analyze stability and characteristic the control system



Detailed Course Description:

Unit Number	Unit Name	Unit Content	Time Needed
1.		▪ Adjustments and tuning the control components	
2.		▪ On /off control of level system	
3.		▪ (P) Control of flow	
4.		▪ (PI) and (PD) control of flow	
5.		▪ Proportional and proportional integral control of pressure	
6.		▪ (P) Control of temperature using analog controller	
7.		▪ Analog control system with PLC	
8.		▪ Installation pneumatic control system and calibration	
9.		▪ Assembly and disassembly control valves	
10.		▪ Mat lab	

Evaluation Strategies:

Exams		Percentage	Date
Exams	Reports Exam	30%	
	Midterm Exam	20%	
	Final Exam	50%	

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Teaching Methodology:

- ❖ Lab. work

Text Books & References:

1. Festo and Armfield referenc
2. Process Control and Transducers .
3. mat lab

