MUTAH UNIVERSITY
Faculty of Engineering
Department of Chemical Engineering

Process Dynamics and Control

COURSE SYLLABUS

Course Code	Course Name	Credits	Contact Hours
0404541	**Process Dynamics and Control**	**3**	**48**

INSTRUCTOR/COORDINATOR	
Name	**Dr. Taha Alkhamis**
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TEXTBOOK

1. Process Systems Analysis and Control, Third edition, by Donald R. Coughanowr and Steven E. LeBlanc, McGraw-Hill, 2009.

Other Supplemental Materials

1. Chemical process control: An introduction to theory and practice by George Stephanopoulos, Prentice-Hall, 1984 or any later edition.
2. Process dynamics and control, by Soberg, Edger, Mellichamp, and Doyle, Third edition, John Wiley & Sons, 2011.

SPECIFIC COURSE INFORMATION

A. Brief Description of the Content of the Course (Catalog Description)

Process dynamics in time and Laplace domains, Input/output relationships and Transfer functions for first, second and higher order systems. Basic components of control systems and its dynamics, Design of single-loop feedback control systems, Stability analysis, Frequency response analysis.

B. Pre-requisites (P) or Co-requisites (C)

0404408 Computer Applications in Chemical Engineering **(P)**

C. Course Type (Required or Elective)

Required (Compulsory department course)

SPECIFIC GOALS

A. Specific Outcomes of Instruction

By the end of this course, the student should be able:

1. To use specific mathematical tools to handle process dynamics and control problems (Differential Equations, Laplace transforms, and Complex Variables) **(SLO 1).**
2. To understand the basic concepts of process dynamics and control: transfer function, first and second order systems, final control elements, block diagram, characteristic equation, and control design with frequency response **(SLO 1, SLO 2).**
3. To understand the impact of process control and stability on environment, product quality, and human life, with application of MATLAB® and SIMULINK on some applications **(SLOs 2, and 7)**

B. Student Outcomes Addressed by the Course

1	2	3	4	5	6	7				
✓	✓					✓				

BRIEF LIST OF TOPICS TO BE COVERED

List of Topics	No. of Weeks	Contact Hours
• **Introduction to process control**	**1**	**3**
• **Math revision: inversion by partial fractions, Laplace transforms, and solutions of ODEs + MATLAB applications**	**1**	**3**
• **Transfer function concept and Response of first order systems**	**1**	**3**
• **Physical examples of first order systems and response of first order systems in series**	**2**	**6**
• **Higher order systems (second order and transportation lag)** • **Mid-term exam**	**1**	**3**
• **Linear closed-loop systems (the control system), controllers and final control elements, development of a block diagram of chemical reactor control system**	**2**	**6**
• **Closed loop transfer function (feedback control), and transient response of simple control systems**	**1**	**3**
• **Stability: Routh test and root locus and introduction to frequency response**	**2**	**6**
• **Frequency response and control system design by frequency response**	**3**	**9**
• **Application to control design: control valves + Final Exam**	**2**	**6**
Total	**16**	**48**

METHODS OF ASSESSMENT			
No.	**Method of assessment**	**Week and Date**	**%**
1	**First Mid-term exam**	**8th week**	**30**
2	**Homework, Quizzes, Attendance, Possible MATLAB® small project**	**During the Semester**	**20**
4	**Final Examination**	**Final Week**	**50**
Total			**100**