**Chemical Engineering Department**

**King Saud University**

**CHE 414: Process Control**

**COURSE OUTLINE**

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| 1. Introduction

Control system examplesControl system elementsReasons for controlWhat does control engineerControl implementation | 3. SISO Linear systems Analysis First order systems Second order systemsHigher order systemsTransfer function and Block diagram |
| 1. SISO Linear system tools

Basic ModelingLinearizationLaplace TransformSolution of linear ODEs using Laplace Transform | 1. PID controllers

 Single loop feedback block diagram Closed-loop transfer function PID control algorithmClosed-Loop analysis Stability analysis Tuning methods |
| 1. Piping and Instrumentation Diagram

Basic symbols and tools used in P&IDDrawing control loopsControl loop selections for a process unitUnderstanding P&ID for a complete flow sheet |

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| **Course learning Objectives** |
| 1. Understand the importance of process control in chemical engineering industries, method of applications, and its major components
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| 1. Able to apply the skills build in previous courses to develop dynamic models for simple chemical systems.
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| 1. Able to examine and analyze the dynamics of simple chemical systems by solving the dynamic model analytically and numerically.
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| 1. Understand the elements of the process control structure and to be able to choose the suitable elements of this structure.
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| 1. Able to design classical PID controller for single-input single-output systems.
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| 1. Able to analyze the performance and stability of the controlled systems.
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| 1. Aware of the role of computer software to design control systems and recent developments in the field.
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| 1. Able to develop a P&ID for an entire Process
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| 1. Understand process dynamics and basic control analysis via lab experiments
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| 1. Able to write and make professional presentation of course lab reports
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**Grading Policy**

Homework assignments 10%

Quizzes and attendance 10%

Midterm Exam 1 15% 11-6-2017 at 6:00pm

Lab report & presentation 10% 12-25-2017 at 6:00pm

Midterm Exam 2 15% 12-11-2017 at 6:00pm

Final Exam 40%

**General guidelines about grading:**

1. All absence is considered whether with or without excuse
2. All absence in lecture and tutorial will be accounted for
3. Missed quizzes cannot be compensated
4. Quizzes may include group assignments
5. The final homework grade will be penalized by the absence rate in the tutorial sessions
6. The homework grade is dived equally to homework submission and evaluation of student performance during the tutorial session

**References:**

1. Stephanopoulos, G., *Chemical Process Control: An Introduction to Theory and Practice*, Prentice Hall, 1984.
2. Marlin, T., *Process Control: Designing Processes and control systems for dynamic Performance*, McGraw Hill, New York, 1995.
3. Luyben, W., *Process Modeling, Simulation and Control for Chemical Engineers*, McGraw Hill, New York, 1990.
4. Smith, C. and Corripio, A., *Principles and Practice of Automatic Process Control*, Wiley & sons, New York, 1997.
5. Seborg, D., Edgar, T., and Mellichamp, D., *Process Dynamics and Control*, Wiley & sons, New York, 1989.

**Course Web Page:**

<http://faculty.ksu.edu.sa/Emad.Ali/Pages/currentcourse323.aspx>

<http://faculty.ksu.edu.sa/Emad.Ali/Pages/coursestaught.aspx>