**Chemical Engineering Department**

**King Saud University**

**CHE 414: Process Control**

**COURSE OUTLINE**

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| 1. Introduction   Control system examples  Control system elements  Reasons for control  What does control engineer  Control implementation | 3. SISO Linear systems Analysis  First order systems  Second order systems  Higher order systems  Transfer function and Block diagram |
| 1. SISO Linear system tools   Basic Modeling  Linearization  Laplace Transform  Solution of linear ODEs using Laplace Transform | 1. PID controllers   Single loop feedback block diagram  Closed-loop transfer function  PID control algorithm  Closed-Loop analysis  Stability analysis  Tuning methods |
| 1. Piping and Instrumentation Diagram   Basic symbols and tools used in P&ID  Drawing control loops  Control loop selections for a process unit  Understanding 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 |
| 1. Able to apply the skills build in previous courses to develop dynamic models for simple chemical systems. |
| 1. Able to examine and analyze the dynamics of simple chemical systems by solving the dynamic model analytically and numerically. |
| 1. Understand the elements of the process control structure and to be able to choose the suitable elements of this structure. |
| 1. Able to design classical PID controller for single-input single-output systems. |
| 1. Able to analyze the performance and stability of the controlled systems. |
| 1. Aware of the role of computer software to design control systems and recent developments in the field. |
| 1. Able to develop a P&ID for an entire Process |
| 1. Understand process dynamics and basic control analysis via lab experiments |
| 1. Able to write and make professional presentation of course lab reports |

**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>