

**ChE 489: Process Dynamics and Control
Spring 2018**

Instructor: Dr. Ezinwa Elele
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Time & Place of Class: Monday 10:45 am – 12:55 pm, KUPF 107
Wednesday 10:00 am – 12:10 pm, KUPF 107
Office hours: Thursday 1:00 p.m. – 2:00 p.m. or individual appointment

Course Prerequisites: ChE 349; ChE 365

Textbook: Process Dynamics and Control (3rd Edition) by Seborg, Edgar, Mellichamp and Doyle, John Wiley & Sons, Inc.

Course Overview: This course is an introduction to chemical process dynamics and control. Topics include analysis of the dynamics of open-loop systems, the design of control systems, and the dynamics of closed-loop systems. Control techniques and methodologies, used by practicing chemical engineers, are emphasized.

Course outcomes:

Outcome 1: Students will be able to model chemical engineering processes and analyze/predict their dynamics both for open- (no control) and closed-loop (with control) cases.

Outcome 2: Students will be able to select the most appropriate input to manipulate, and to tune controllers to meet/achieve specified process objectives (for feedback control strategies).

Outcome 3: Students will be able to work effectively in problem-solving teams and assess the performance of their team-mates and themselves on the group efforts.

Grading schemes:

Homework (individual activity)	12%
Project	15%
Exam 1	20%
Exam 2	20%
Final Exam	25%
In-class group activities	8%

A final course grade will be assigned on the following basis:

90-100	A
85-89.9	B+
80-84.9	B
75-79.9	C+
70-74.9	C
60-69.9	D
<60	F

Schedule

Week	Date	Topics	Chapter/Section
Week 1	Wed: 01/17	Introduction	1.1, 1.2
Week 2	Mon: 01/22 Wed: 01/24	Introduction to process dynamics and control	1.1, 1.2 , 1.3, 1.4, 1.5 and 1.6
Week 3	Mon: 01/29 Wed: 01/31	Theoretical models of chemical processes	2.1, 2.2, 2.3, 2.4 and 2.5
Week 4	Mon: 02/05 Wed: 02/07	Laplace transforms	3.1, 3.2, 3.3, 3.4 and 3.5
Week 5	Mon: 02/12 Wed: 02/14	Transfer function models	4.1, 4.2 and 4.3
Week 6	Mon: 02/19 Wed: 02/21	Transfer function models (cont.) Exam 1	4.1, 4.2 and 4.3
Week 7	Mon: 02/26 Wed: 02/28	Dynamic behaviors of first order processes	5.1, 5.2 and 5.3
Week 8	Mon: 03/05 Wed: 03/07	Dynamic behaviors of second order processes	5.4
Week 9	Mon: 03/12 Wed: 03/14	Dynamic response characteristics of more complicated processes	6.1, 6.2, 6.3, 6.4, 6.5 and 6.6
Week 10	Mon: 03/19 Wed: 03/21	Feedback controllers and control system instrumentation Exam 2	8 and 9
Week 11	Mon: 03/26 Wed: 03/28	Spring Recess	
Week 11	Mon: 04/02 Wed: 04/04	Dynamic behavior of closed-loop systems (Project assigned)	11.1, 11.2, 11.3
Week 12	Mon: 04/09 Wed: 04/11	Dynamic behavior of closed-loop systems	11.1, 11.2, 11.3
Week 13	Mon: 04/16 Wed: 04/18	Stability of closed-loop control	11.4, 11.5
Week 14	Mon: 04/23 Wed: 04/25	PID controller design and tuning (Project due)	12.1, 12.2, 12.3
Week 15	Mon: 04/30	Feedforward and ratio control	15
		Final Exam: TBA	

The NJIT Honor Code and standards of *academic integrity* will be enforced in this course. Any violation will be brought to the immediate attention of the Dean of Students.