

ChE 489: Process Dynamics and Control
Fall 2017

Instructor: Dr. Ezinwa Elele
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Office hours: Friday 11 a.m. – 12:00 p.m. or individual appointment

Time & Place of Class: Thursday 5:45 am – 9:35 pm GITC 1400

Course Prerequisites: ChE 349; ChE 365

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

Grading schemes:

Homework (individual activity)	7%
Project	10%
Exam 1	17%
Exam 2	17%
Exam 3	17%
Final Exam	25%
In-class group activities	7%

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.

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	Section
Week 1	Sept 7	Introduction to process dynamics and control	1.1, 1.2 , 1.3, 1.4, 1.5 and 1.6
Week 2	Sept 14	Theoretical models of chemical processes	2.1, 2.2, 2.3, 2.4 and 2.5
Week 3	Sept 21	Laplace transforms	3.1, 3.2, 3.3, 3.4 and 3.5
Week 4	Sept 28	Transfer function models	4.1, 4.2, 4.3 and 4.4
Week 5	Oct 5	<u>Exam 1</u> Dynamic behaviors of first order processes	5.1, 5.2 and 5.3
Week 6	Oct 12	Dynamic behaviors of second order processes	5.4
Week 7	Oct 19	Dynamic response characteristics of more complicated processes	6.1, 6.2, 6.3, 6.4, 6.5 and 6.6
Week 8	Oct 26	Development of empirical models from process data	7
Week 9	Nov 2	<u>Exam 2</u> Feedback controllers and control system instrumentation <i>(Project assigned)</i>	8 and 9
Week 10	Nov 9	Dynamic behavior of closed-loop systems	11
Week 11	Nov 21 (Thurs. class meet)	<u>Exam 3</u> Stability of closed-loop control	11.4
Week 11	Nov 23	Thanksgiving recess	No class
Week 12	Nov 30	PID controller design and tuning <i>(Project due)</i>	12
Week 13	Dec 7	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.