Fall 2018

CHE 349 - Kinetics and Reactor Design

Robert Barat

MEMORANDUM

To: ChE 349 Class *From:* Prof. Robert Barat
Date: September 4, 2018 *Re:* Course Introduction (v.1)

Course Description: *ChE 349 Kinetics and Reactor Design (3-0-3).*

Derive and solve species and energy balances for single chemical reactors processing liquid and gaseous systems; chemical reactor process safety; multiple reaction applications; catalysis, including mechanisms, rates, reactor design.

Prerequisites: Chem 236, ChE 342, ChE 370, Math 222

Prerequisites by Topic: Physical Chemistry Thermodynamics (I, II)
Heat and Mass Transfer Differential equations

Class Meetings: Tuesdays 10 – 11:30 AM, Faculty Memorial Hall 408
Thursdays 4 – 5:20 PM – Kupfrian 202

Instructor Information:

Office Hours: TBA – I'm in every day except most Fridays – stop in, or email me.
Location: 380 Tiernan Hall -- Individual or group visits /appointments are OK.
Office phone: (973) 596-5605 Email (preferred contact): robert.b.barat@njit.edu

Text: *Essentials* of Chemical Reaction Engineering, H. S. Fogler, 2nd ed. -- Prentice Hall (2018). This book comes with a CD that includes the *Polymath* math solver package, as well as supplementary material.

Web-Based Resource: http://www.umich.edu/~essen/

Course Requirements: Term Quizzes* (3) .... 50% (2 before the drop date)
Group Project ……15%
Homework ……..... 15%
Final quiz*…….…... 20%
* All quizzes are "Open-Book" and "Open-Notes"

Grading Scale *(preliminary – subject to change):* Totals normalized to 100

A	B+	B	C+	C	D	F
90-100	84-89	78-83	72-77	66-71	60-65	< 60

Homework: Problem sets will be assigned, collected, graded by the TA, then returned to you. Solutions will be reviewed in class as time allows. All solutions posted on the Moodle site. If you have questions about HW grading, please contact the TA directly. All HW problems are original – none from the Fogler text.

Teaching Assistant: TBA

Group Project: Work in groups (you form). A Peer & Self Evaluation will be done at the conclusion of the project that will impact your grade; more details later.

Moodle Site: http://moodle.njit.edu --- Please check this site and your email often (at least once a day). Practice problems will be posted, as well as HW and quiz solutions, group projects, some in-class work, and useful memos.

Math Solver: You must have access to and know how to use a math solver software package. Examples include *Polymath, Maple, Matlab, Mathcad,* and *Mathematica.* It will be needed for the term project and some homeworks. *Polymath* is available on dep't PCs in 411 Tiernan, as is the license info for program download onto your PC. A solver is NOT needed on quizzes.

Course Topics:
Constant density (liquid) reactors – species balance
Variable density (gas) reactors – species balance
Simultaneous species and energy balances
Chemical reactor process safety
Multiple reaction systems
Catalysis – homogeneous and heterogeneous

Assigned Readings: The semester schedule (separate posting) lists recommended readings in the Fogler text. Ultimately, for quizzes and exams, you are responsible for the material *covered in class.*

Recommended Link: You should check out this link: www.essentialchemicalindustry.org
This is a treasure of information about our profession.

ABET Course Objectives:

1. To provide students with the basic knowledge of how to design chemical reactors.
2. To inform students with an awareness of chemical reactor process safety
3. To inspire students to approach reactor design with an ethical and environmental awareness through a research orientation.

ABET Criteria (Outcomes) Addressed in this Course:

Students who have successfully completed this course will have:

(a) an ability to apply knowledge of mathematics, science, and engineering.
(c) an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.
(e) an ability to identify, formulate, and solve engineering problems.
(h) the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context.
(j) an introduction to contemporary issues in chemical engineering.
(k) an ability to use the techniques, skills, and modern engineering tools necessary for chemical engineering practice.

NOTE: For ABET, I will be collecting sample HWs and quizzes after you review your grades on the work.