جامعة الملك عبدالله
للعلوم والتقنية
King Abdullah University of
Science and Technology

Course Syllabus: Reaction Engineering - CBE 203

Division	Physical Science and Engineering Division
Course Number	CBE 203
Course Title	Reaction Engineering
Academic Semester	Spring
Academic Year	2017/2018
Semester Start Date	01/28/2018
Semester End Date	05/24/2018
Class Schedule (Days & Time)	02:30 PM - 04:00 PM | Mon Thu

Instructor(s)

Name	Email	Phone	Office Location	Office Hours
Subram Maniam Sarathy	Mani.Sarathy@kaust.edu.sa	+966128084626	4222, 5, Al-Kindi (bldg. 5)	

Teaching Assistant(s)

Name	Email

Course Information

Comprehensive Course Description	Advanced reaction engineering applies the basic concepts of reaction rate, stoichiometry and equilibrium to the design and analysis of chemical and biological reacting systems. The course is designed for graduate students with interests in the design and optimization of process reaction vessels in the chemicals/petrochemicals, biological/food as well as materials/minerals processing industries. The following core concepts are covered: analysis of complex industrial reaction kinetics, effect of micromixing on reactive systems, computational chemistry, non-isothermal reactor design, nonlinear analysis in reaction systems, catalytic processes, multiphase (gas-liquid-solid) reactors for single and multiple reactions, strategies for reactor optimization and case studies in industrial process reactor design and operation.
Course Description from Program Guide	The objective of this course is to impart and to continue the rigorous study of reaction engineering. In this course, particular emphasis will be given to chemical kinetics and transport phenomena, review of elements of reaction kinetics, rate processes in heterogeneous reacting systems, design of fluid-fluid and fluid-solid reactors, scale-up and stability of chemical reactors and residence time analysis of heterogeneous chemical reactors.
Goals and Objectives	The objective of this course is to help the student master several advanced ideas in chemical reaction engineering, notably: -Complex chemical reaction mechanisms and kinetics. -Transport effects in multiphase reactive systems. -Advanced reactor design and stability, including consideration of the energy balance. -Computational tools for reaction engineering
Required Knowledge	Undergraduate level chemical reaction engineering, mass transfer, and thermodynamics.
Reference Texts	[1] H.S.A. FOGLER, Elements of Chemical Reaction Engineering, Prentice-Hall PTR, 2006. [2] O. Levenspiel, Chemical Reaction Engineering, John Wiley & Sons Inc, 1999. [3] C.G. Hill, An Introduction to Chemical Engineering Kinetics & Reactor Design, 1983.

Method of evaluation	**20.00**% - Homework /Assignments **60.00**% - Research Project **20.00**% - Midterm exam
Nature of the assignments	HOMEWORK: Evaluated based on assignments requiring the student to prepare a critical written review of a journal article and complete problem sets. MID TERM EXAM: Evaluated based on a two hour written exam assessing the analytical and technical capabilities of the student to solve sustainable engineering problems. RESEARCH PROJECT – Evaluated based on the following three components of the course research project: a written project proposal (10%), a written final project report (40%), and a final oral presentation (10%).
Course Policies	10% of the final course evaluation is based on class participation, for which a physical and intellectual presence is required. Late work will be penalized 10% for each 24 hours after the due date.
Additional Information	In accordance with the University policy and professional standards, the highest levels of academic integrity are expected in this class. The code of student conduct is strictly enforced. Academic dishonesty will result in reductions in grades and/or expulsions from this class and/or the University.

Tentative Course Schedule *(Time, topic/emphasis & resources)*		
Week	**Lectures**	**Topic**
1	Mon 01/29/2018	Introduction to the course and the importance of reaction engineering
1	Thu 02/01/2018	Introduction to the course and the importance of reaction engineering
2	Mon 02/05/2018	Stoichiometry, thermodynamics of reacting systems
2	Thu 02/08/2018	Stoichiometry, thermodynamics of reacting systems
3	Mon 02/12/2018	Kinetics of elementary reactions, ideal reactors
3	Thu 02/15/2018	Kinetics of elementary reactions, ideal reactors
4	Mon 02/19/2018	Reaction mechanism and kinetics
4	Thu 02/22/2018	Reaction mechanism and kinetics
5	Mon 02/26/2018	Complex reaction networks and complex systems
5	Thu 03/01/2018	Complex reaction networks and complex systems
6	Mon 03/05/2018	Computational chemistry part 1
6	Thu 03/08/2018	Computational chemistry part 1
7	Mon 03/12/2018	Computational chemistry part 2
7	Thu 03/15/2018	Computational chemistry part 2
8	Mon 03/19/2018	Midterm and intro to catalytic systems
8	Thu 03/22/2018	Midterm and intro to catalytic systems
9	Mon 03/26/2018	Catalytic systems
9	Thu 03/29/2018	Catalytic systems
10	Mon 04/02/2018	Biofuel reaction engineering
10	Thu 04/05/2018	Biofuel reaction engineering
11	Mon 04/09/2018	Spring Break Week
11	Thu 04/12/2018	Spring Break Week
12	Mon 04/16/2018	Mixing in reactors, external and internal transport
12	Thu 04/19/2018	Mixing in reactors, external and internal transport
13	Mon 04/23/2018	Advanced reactor design part 1
13	Thu 04/26/2018	Advanced reactor design part 1
14	Mon 04/30/2018	Advanced reactor design part 2
14	Thu 05/03/2018	Advanced reactor design part 2
15	Mon 05/07/2018	Non-ideal reactor design
15	Thu 05/10/2018	Non-ideal reactor design
16	Mon 05/14/2018	Final research project presentations
16	Thu 05/17/2018	Final research project presentations
17	Mon 05/21/2018	Exam week
17	Thu 05/24/2018	Exam week

Note

The instructor reserves the right to make changes to this syllabus as necessary.