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

Course Syllabus: Combustion Kinetics - ME 342

Division	Physical Science and Engineering Division
Course Number	ME 342
Course Title	Combustion Kinetics
Academic Semester	Fall
Academic Year	2019/2020
Semester Start Date	08/25/2019
Semester End Date	12/10/2019
Class Schedule (Days & Time)	10:30 AM - 12:00 PM | Mon Wed

Instructor(s)

Name	Email	Phone	Office Location	Office Hours
Aamir Farooq	Aamir.Farooq@kaust.edu.sa	+966128082704	4217, 5, Al-Kindi (bldg. 5)	Monday and Wednesday: 1 - 2 pm.

Teaching Assistant(s)

Name	Email

Course Information

Comprehensive Course Description	Combustion, atmospheric chemistry, plasmas, chemical and materials processing, rocket nozzles and gaseous lasers are all complex processes involving many chemical species and a myriad of chemical transformations. The focus of this class will be on chemically reacting gases, with an emphasis on what occurs at the molecular level. Concepts from this course serve as the background for students to understand the models commonly employed to describe the chemical processes listed above. We will begin with an introduction to reaction rate theory, including collision and transition state theories and the theory of unimolecular reactions. The second part of the class will focus on applications in reaction kinetics, including atmospheric chemistry, chain reactions, and photochemistry. We will include relevant software to get hands-on experience with kinetic rate calculations.
Course Description from Program Guide	
Goals and Objectives	-Understand theoretical methods of elementary rate constant caclulation -Transition state theory concepts and applications -Unimolecular reactions -Applications of elementary reactions to complex problems -Basic understanding of the experimental techniques used for rate measurements
Required Knowledge	Thermodynamics
Reference Texts	*Reaction Kinetics* by M.J. Pilling and P.W. Seakins (Oxford Science Publications)
Method of evaluation	**25.00**% - Midterm exam **20.00**% - Homework /Assignments **35.00**% - Final exam **15.00**% - Course Project(s) **5.00**% - Active participation

Nature of the assignments	A homework will be assigned almost every other week. The students should read the book chapeters in advance of the lecture. The class project will be carried out in small groups.
Course Policies	Late submission of homework will be penalized with 10% deduction per late day.
Additional Information	

Tentative Course Schedule
(Time, topic/emphasis & resources)

Week	Lectures	Topic
1	Mon 08/26/2019	Course introduction
1	Wed 08/28/2019	Basic vocabulary and definitions
2	Mon 09/02/2019	Experimental techniques for kinetic measurements
2	Wed 09/04/2019	Experimental techniques for kinetic measurements
3	Mon 09/09/2019	Collision Theory
3	Wed 09/11/2019	Collision Theory
4	Mon 09/16/2019	Transition state theory
4	Wed 09/18/2019	Transition state theory
5	Mon 09/23/2019	Saudi National Day
5	Wed 09/25/2019	Applications of TST
6	Mon 09/30/2019	Applications of TST
6	Wed 10/02/2019	Unimolecular reactions
7	Mon 10/07/2019	Unimolecular reactions
7	Wed 10/09/2019	RRK and RRKM calculations
8	Mon 10/14/2019	Software calculations of TST and RRKM
8	Wed 10/16/2019	Straight-chain reaction mechanisms
9	Mon 10/21/2019	Mechanisms for explosion
9	Wed 10/23/2019	Mechanisms for explosion
10	Mon 10/28/2019	Mid-semester break
10	Wed 10/30/2019	**Midterm Exam**
11	Mon 11/04/2019	Atmospheric chemistry
11	Wed 11/06/2019	Atmospheric chemistry
12	Mon 11/11/2019	Combustion mechanisms
12	Wed 11/13/2019	High-temperature reaction classes
13	Mon 11/18/2019	Low-temperature reaction classes
13	Wed 11/20/2019	Low-temperature reaction classes
14	Mon 11/25/2019	Photochemistry
14	Wed 11/27/2019	Vibrational energy transfer
15	Mon 12/02/2019	Heterogenous reactions
15	Wed 12/04/2019	Heterogenous reactions
16	Mon 12/09/2019	Exams

Note

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