Birla Institute of Technology & Science, Pilani
Hyderabad Campus

FIRST SEMESTER 2022-2023

Course Handout Part II

29/08/2022

In addition to part-I (General Handout for all courses appended to the timetable), this portion gives further specific details regarding the course.

Course No. : **CHE F 311**
Course Title : **Kinetics and Reactor Design**
Instructor-in-Charge : **Dr. Srikanta Dinda**
Instructor : **Dr. Debirupa Mitra**

Scope and Objective of the Course:

This course is an introduction to the chemical reaction kinetics, design, and performance of various types of chemical reactors for chemically reacting systems that yield industrially important products. The emphasis in this course will be to understand the fundamentals of the kinetics of homogeneous reactions, design and analysis of ideal reactors; and non-ideal flow.

Learning outcomes:
After studying this course, students will be able to

- Have the knowledge on what kind of reactor is suitable/best choice for what situation.
- Students will be able to analyze the kinetic related data to find the size of a reactor for a specific reaction

Textbooks:

1. Scott Fogler, H. Scott "Elements of Chemical Reaction Engineering", Pearson Edu, 4th Ed, 2006.
2. Octave Levenspiel, Chemical Reaction Engineering. 3rd Ed

Reference books

1. Fromment G.F. and Bischoff K.B., Chemical Reactor Analysis and Design, John Wiley 1994.
2. Schmidt Lanny D., "The Engineering of Chemical Reactions", Oxford University Press, 2nd Ed., 2005.

Course Plan:

Lecture No.	Learning objectives	Topics to be covered	Chapter in the Text Book
L1-L3	Introduction	Scope and objectives of the course, methodology, concept of mole balances	TB -1 Chapter-1
L4-L8	Rate Laws and Stoichiometry	Basic Definitions, Stoichiometry, Batch Systems, Flow Systems	TB -1 Chapter-3
L9-L12	Conversion and Reactor Sizing	Different types of reactors, Reactors in Series, Spacetime & Space Velocity	TB -1 Chapter-2 TB -2 Chapter-1
L13-L16	Isothermal Reactor	Design of Isothermal Reactors, e.g., Design	TB -1 Chaper-4

	Design	of CSTR and PFR, recycle reactor, Pressure Drop in Reactors	
L17-L22	Collection Analysis of Data Regression	Batch reactor Data: Differential, Integral Methods, autocatalytic reaction, enzyme catalysis	TB -1 Chaper-5 TB -1 Chaper-7
L23-L28	Multiple reactions	Complex reactions, Concepts of yield, selectivity, Maximizing products in parallel, and series reactions,	TB -1 Chapter-6
L29-32	Heterogeneous reaction	Steps involve heterogeneous reactions, derivation of kinetic rate,	TB -1 Chapter-8 & 9
L33-L37	Solid catalyzed reactions	Gas-solid catalytic reaction, Pore diffusion factors, Catalyst deactivation	TB -1 Chapter-10 11 & 12
L38-L42	Basics of non-ideal reactor	Concept of RTD, and Non-ideal reactor	TB -1 Chapter-13

Evaluation Scheme:

Component	Duration	Weightage (%)	Date & Time	Nature of Component
Mid-Sem	1.5 hr.	30 %	31/10 1.30 - 3.00PM	20% CB & 10% OB
Assignments/class test (min. 2)		10 %	to be announced in the class	OB
Quizzes (min. 4)		20 %	to be announced in the class	CB
Comprehensive	3 hr.	40 %	19/12 FN	20% CB & 20% OB

Closed Book Test: No reference material of any kind will be permitted inside the exam hall.

Open Book Exam: Use of any printed/written reference material (books and notebooks) will be permitted inside the exam hall. Computers/mobile of any kind will not be allowed inside the exam hall.

Chamber Consultation Hour: To be announced in the class.

Notices: All notices concerning this course will be displayed on the Notice Board of Chemical Engineering or CMS

Make-up Policy: Make-up for the mid-test and comprehensive may be granted only with prior permission and valid justification from the Instructor-in-charge. No makeup for the quizzes/class tests will be granted.

- **Academic Honesty and Integrity Policy: Academic honesty and integrity are to be maintained by all the students throughout the semester and no type of academic dishonesty is acceptable.**

INSTRUCTOR-IN-CHARGE
Dr. Srikanta Dinda