Course Type	Course Code	Name of the Course	L	T	P	Credits
DC	**NCHC514**	**Reaction Engineering**	3	1	0	4

Course Objectives

- To learn about reaction kinetics of chemical and biochemical reactions and to introduce ideal reactors and their design concepts.

Learning Outcomes

- Ability to analyse reaction systems
- Designing kinetic experiments involving chemical and biochemical reactions and interpreting data
- Design of industrial scale reactor on the basis of kinetic data obtained at lab scale

Unit No.	Topics to be Covered	Class Hours	Learning Outcome
1	**Kinetics of chemical and biochemical reactions**: Kinetics of homogeneous reactions: single and multiple, elementary and non-elementary reactions, rate equations; kinetic theories and models; Kinetics of enzymatic and biochemical reactions; determination of kinetic parameters from experimental data; Effect of temperature and pressure on rate equations.	**9 L + 3 T**	Understanding the concepts of reaction rate. Developing reliable rate expressions for chemical and biochemical reactions. Testing of kinetic models
2	**Reactor Types and Performance**: Types of reactors-ideal and non-ideal, and mole balance for ideal reactors; operation and performance of batch and continuous reactors, Interpretation of batch reactor data under constant volume and variable volume conditions.	**9 L + 3 T**	Learning the concepts of differential and integral methods of analysis and their application to interpret the given batch reactor data
3	**Design of Reactors**: Design of single homogeneous ideal reactors; comparison of volume of single reactors; Simple methods for calculating optimum reactor size.	**9 L + 3 T**	Developing performance equations for ideal reactors and their application to design and analyze ideal reactor systems.
4	**Combination of Reactors**: Plug flow reactors in series and / or parallel. CSTRs in series. Reactors of different types in series and their performance.	**8 L + 2 T**	Analyzing the performance of reactors in combination and suggesting the best arrangement of reactors for a given product requirement.
5	**Multiple reactions**: Parallel reactions in CSTRs and PFRs, product distribution, fractional yields. Series reactions in ideal reactors.	**7 L + 3 T**	Analyzing product distribution in multiple reactions and suggesting the best reactor schemes for maximum yield.
	Total	**56**	

Textbooks:

1. Levenspiel, O. (2006). Chemical Reaction Engineering, 3 rd Ed., Wiley.
2. Fogler, H. S. (2008). Elements of Chemical Reaction Engineering, 4 th Ed., Prentice Hall.

Reference Books:

1. Smith, J. M. (2013). Chemical Engineering Kinetics, 3 rd Ed., McGraw–Hill.