Lecture Plan

Name of the college: Government College of Arts, Science and Commerce, Sanquelim- Goa

Name of Faculty: Ms. Dipika Gosavi	**Subject:** Chemistry
Paper code: CHC-204	**Program:** T Y BSc
Division: A	
Academic year: 2025 - 2026	**Semester:** IV
Total Lectures: 15	

Course Objectives: : To provide foundational understanding of catalysis, adsorption, colloids, surfactants, and surface phenomena with empl mechanisms, industrial applications, stability, and environmental relevance.

Expected Course Outcome:

1. **Explain** catalysis, activation energy, and distinguish between homogeneous and heterogeneous catalytic systems with suitable examples.
2. **Analyze** catalyst activity, selectivity, stability, and describe mechanistic steps in heterogeneous catalysis and adsorption processes.
3. **Interpret** adsorption phenomena using Freundlich and Langmuir isotherms and relate them to applications such as wastewater purification.
4. **Explain** colloids, surfactants, colloidal types, electrical double layer, DLVO theory, and zeta potential governing colloidal stability.
5. **Apply** concepts of catalysis, adsorption, and colloid science to solve numerical or conceptual problems and evaluate industrial catalytic processes.

Student Learning Outcome:

1. Students will describe activation energy, catalytic pathways, and classify catalysts.
2. They will apply Freundlich and Langmuir isotherms to interpret adsorption and calculate catalytic or surface parameters.
3. They will compare homogeneous and heterogeneous catalysis and explain catalyst synthesis methods.
4. They will analyze major industrial catalytic processes and the role of metal, solid acid, solid base, and zeolite catalysts.
5. They will explain colloidal systems, DLVO theory, electrokinetic phenomena, surfactants, and their role in colloidal stability and surface-tension reduction.

	Month	Lecture From	Lecture To	No. of lectures allotted	Topic, Subtopic to be covered	Exercise/ Assignment	ICT Tools	Reference books	
	December	01/12/2025	07/12/2025	1	Introduction to Catalysis and Activation Energy	Assignment	Power point presentation/ Smart board.	Banwell, C.N. & McCash, E.M., Fundamentals of Molecular Spectroscopy, 4th edition, Tata McGraw Hill, New Delhi, 2006. 2. Donald A. McQuarrie, John D. Simon, Physical Chemistry: A Molecular Approach, Student Edition, Viva Books Pvt. Ltd., 2018, Mumbai, 1st edition	
	December	08/12/2025	14/12/2025	1	Homogeneous vs. Heterogeneous Catalysis with Examples	Assignment	Power point presentation/ Smart board.	Banwell, C.N. & McCash, E.M., Fundamentals of Molecular Spectroscopy, 4th edition, Tata McGraw Hill, New Delhi, 2006. 2. Donald A. McQuarrie, John D. Simon, Physical Chemistry: A Molecular Approach, Student Edition, Viva Books Pvt. Ltd., 2018, Mumbai, 1st edition	
	December	15/12/2025	18/12/2025	1	Catalytic Activity, Selectivity, and Stability	Assignment	Power point presentation/ Smart board.	Banwell, C.N. & McCash, E.M., Fundamentals of Molecular Spectroscopy, 4th edition, Tata McGraw Hill, New Delhi, 2006. 2. Donald A. McQuarrie, John D. Simon, Physical Chemistry: A Molecular Approach, Student Edition, Viva Books Pvt. Ltd., 2018, Mumbai, 1st edition	
	December	21/12/2025	23/12/2025	1	Mechanistic Steps in Heterogeneous Catalysis	Assignment	Power point presentation/ Smart board.	Banwell, C.N. & McCash, E.M., Fundamentals of Molecular Spectroscopy, 4th edition, Tata McGraw Hill, New Delhi, 2006. 2. Donald A. McQuarrie, John D. Simon, Physical Chemistry: A Molecular Approach, Student Edition, Viva Books Pvt. Ltd., 2018, Mumbai, 1st edition	
	January	03/01/2026	09/01/2026	1	Adsorption vs Absorption; Cause of Adsorption	Assignment	Power point presentation/ Smart board.	Banwell, C.N. & McCash, E.M., Fundamentals of Molecular Spectroscopy, 4th edition, Tata McGraw Hill, New Delhi, 2006. 2. Donald A. McQuarrie, John D. Simon, Physical Chemistry: A Molecular Approach,	

								Student Edition, Viva Books Pvt. Ltd., 2018, Mumbai, 1st edition	
	January	10/01/2026	16/01/2026	1	Striking and Sticking Probability in Surface Processes	worksheets	Power point presentation/ Smart board.	Banwell, C.N. & McCash, E.M., Fundamentals of Molecular Spectroscopy, 4th edition, Tata McGraw Hill, New Delhi, 2006. 2. Donald A. McQuarrie, John D. Simon, Physical Chemistry: A Molecular Approach, Student Edition, Viva Books Pvt. Ltd., 2018, Mumbai, 1st edition	
	January	17/01/2026	23/01/2026	1	Freundlich Adsorption Isotherm and Its Applications	worksheets	Power point presentation/ Smart board.	Banwell, C.N. & McCash, E.M., Fundamentals of Molecular Spectroscopy, 4th edition, Tata McGraw Hill, New Delhi, 2006. 2. Donald A. McQuarrie, John D. Simon, Physical Chemistry: A Molecular Approach, Student Edition, Viva Books Pvt. Ltd., 2018, Mumbai, 1st edition	
	January	24/01/2026	30/01/2026	1	Langmuir Adsorption Isotherm and Wastewater Purification	worksheets	Power point presentation/ Smart board.	Banwell, C.N. & McCash, E.M., Fundamentals of Molecular Spectroscopy, 4th edition, Tata McGraw Hill, New Delhi, 2006. 2. Donald A. McQuarrie, John D. Simon, Physical Chemistry: A Molecular Approach, Student Edition, Viva Books Pvt. Ltd., 2018, Mumbai, 1st edition	
	February	01/02/2026	07/02/2026	1	Types of Catalysts: Metal, Acid-Base, Zeolite	worksheets	Power point presentation/ Smart board.	Banwell, C.N. & McCash, E.M., Fundamentals of Molecular Spectroscopy, 4th edition, Tata McGraw Hill, New Delhi, 2006. 2. Donald A. McQuarrie, John D. Simon, Physical Chemistry: A Molecular Approach, Student Edition, Viva Books Pvt. Ltd., 2018, Mumbai, 1st edition	
	February	08/02/2026	14/02/2026	1	Precipitation and Combustion Methods of Catalyst Synthesis	worksheets	Power point presentation/ Smart board.	Banwell, C.N. & McCash, E.M., Fundamentals of Molecular Spectroscopy, 4th edition, Tata McGraw Hill, New Delhi, 2006. 2. Donald A. McQuarrie, John D. Simon, Physical Chemistry: A Molecular Approach, Student Edition, Viva Books Pvt. Ltd., 2018, Mumbai, 1st edition	

	February	15/02/2026	21/02/2026	1	Metal-Catalysed Reactions: Haber–Bosch Process	worksheets	Power point presentation/ Smart board.	Banwell, C.N. & McCash, E.M., Fundamentals of Molecular Spectroscopy, 4th edition, Tata McGraw Hill, New Delhi, 2006. 2. Donald A. McQuarrie, John D. Simon, Physical Chemistry: A Molecular Approach, Student Edition, Viva Books Pvt. Ltd., 2018, Mumbai, 1st edition	
	February	22/02/2026	28/02/2026	1	Solid Acid and Solid Base Catalysts: Alkylation, Dehydration, Amination, Xylenol Production	worksheets	Power point presentation/ Smart board.	Banwell, C.N. & McCash, E.M., Fundamentals of Molecular Spectroscopy, 4th edition, Tata McGraw Hill, New Delhi, 2006. 2. Donald A. McQuarrie, John D. Simon, Physical Chemistry: A Molecular Approach, Student Edition, Viva Books Pvt. Ltd., 2018, Mumbai, 1st edition	
	March	01/03/2026	07/03/2026	1	Introduction to Zeolites and Zeolite-Catalysed Reactions	worksheets	Power point presentation/ Smart board.	Banwell, C.N. & McCash, E.M., Fundamentals of Molecular Spectroscopy, 4th edition, Tata McGraw Hill, New Delhi, 2006. 2. Donald A. McQuarrie, John D. Simon, Physical Chemistry: A Molecular Approach, Student Edition, Viva Books Pvt. Ltd., 2018, Mumbai, 1st edition	
	March	08/03/2026	14/03/2026	1	Colloids: Classification, Electrical Double Layer	worksheets	Power point presentation/ Smart board.	Banwell, C.N. & McCash, E.M., Fundamentals of Molecular Spectroscopy, 4th edition, Tata McGraw Hill, New Delhi, 2006. 2. Donald A. McQuarrie, John D. Simon, Physical Chemistry: A Molecular Approach, Student Edition, Viva Books Pvt. Ltd., 2018, Mumbai, 1st edition	
	March	15/03/2026	21/03/2026	1	DLVO Theory, Surfactants, Zeta Potential, Electrokinetic Phenomena, Colloidal Stability	worksheets	Power point presentation/ Smart board.	Banwell, C.N. & McCash, E.M., Fundamentals of Molecular Spectroscopy, 4th edition, Tata McGraw Hill, New Delhi, 2006. 2. Donald A. McQuarrie, John D. Simon, Physical Chemistry: A Molecular Approach, Student Edition, Viva Books Pvt. Ltd., 2018, Mumbai, 1st edition	

Assessment Rubrics

Component	Max Marks

ISA 1	7.5
ISA 2	7.5
Practical	-
Project	-
Semester End Exam	45