



University of Kerala

Discipline	CHEMISTRY				
Course Code	UK3DSECHE203				
Course Title	INDUSTRIAL CHEMISTRY-I				
Type of Course	DSE				
Semester	3				
Academic Level	200 - 299				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	4	4 hours	-		4
Pre-requisites	1. Fundamental concepts of chemistry. 2. Terminology associated with Industrial chemistry				
Course Summary	This course aims to equip students with a comprehensive understanding of various aspects of the chemical industry, including manufacturing processes, industrial applications, safety measures, and the principles of green chemistry, preparing them for careers in the chemical industry with a focus on sustainability and safety.				

Detailed Syllabus:

Module	Unit	Content	Hrs
		INDUSTRIAL CHEMISTRY I	60
I		INTRODUCTION TO INDUSTRIAL CHEMISTRY	9
	1	Overview of Chemical Industry- Chemical sectors operating in India (Major sectors)	2
	2	Unit process, unit operations, flow diagrams, energy balance and material balance (basic concepts only)	3
	3	Chemical Industries in Kerala: Location, Raw materials, Chemistry involved in preparation, and uses- TiO ₂ , Cement, Urea, Ammonium Phosphate and superphosphate of lime.	4
II		INORGANIC CHEMICALS AND INDUSTRIAL GASES	9
	4	Historical Importance and industrial relevance of Haber's Process for the manufacture of NH ₃ .	2
	5	Manufacture, Properties and uses of 1) Sulfuric acid, 2) Nitric acid	2
	6	Manufacture, properties and uses of Industrial Gases: 1) Nitrogen 2) Oxygen 3) Carbon dioxide.	3
	7	Manufacture, properties and uses of Lime stone derivative: Lime, Sodium carbonate	2
III		INDUSTRIAL ASPECTS OF ORGANIC CHEMISTRY	9
	8	Primary raw materials for organic compounds- Petroleum and	2



	natural gas, Petroleum -origin of petroleum – mining of petroleum’-refining processes, Fractionation of crude oil	
9	Cracking: Thermal and catalytic Processes Reforming: Thermal and catalytic reforming Hydroforming: Conversion of hydrocarbons	3
10	Coal Chemistry -Types, structure, and properties of coal	2
11	Coking and gasification processes, distillation of coal- chemicals derived from them.	2
IV	INDUSTRIAL HAZARDS, SAFETY MEASURES AND GREEN CHEMISTRY	18
12	Industrial hazards: Definition, Safety signs and colours used in industries	2
13	Types of hazards: Mechanical hazard, Chemical hazard (Types) Fire Hazard, Dust hazard, Electrical hazard - Causes and preventive measures	4
14	Introduction to Green Chemistry, Pollution prevention act of 1990, emergence of green chemistry, need for Green Chemistry	2
15	Twelve principles of green chemistry	1
16	Atom economy, safer solvents and auxiliaries, ionic liquids-super critical fluids CO ₂ and H ₂ O, advantages of SCF	4
17	Catalysis and green chemistry- bio catalysis	2
18	Alternative sources of energy: Use of microwaves and ultrasonic energy, Renewable resources – biomass, solar energy, hydropower, geothermal energy and tidal energy	3
V	OPEN ENDED MODULE: Learning through problem solving, seminars, field trips, open discussions, assignment discussions, quizzes, open book exam etc.	15
	<ol style="list-style-type: none"> 1. Properties and applications of industrial gases and inorganic chemicals. 2. Specific unit processes and unit operations used in chemical industries, highlighting their principles, applications, and advancements. 3. Development of strategies to mitigate environmental impact and promote sustainability in chemical manufacturing. 4. Identification and resolution of safety hazards in chemical plants and laboratories. 5. Implementation of green chemistry principles to reduce the use of hazardous substances and energy consumption. 6. Role of renewable energy sources in powering chemical manufacturing processes. 7. Advancements in catalysis and its applications in green chemistry. 8. Innovative techniques for biomass conversion and utilization in the chemical industry. 9. Role of renewable energy sources in powering chemical manufacturing processes. 10. Chemistry and technology of petroleum refining and coal chemistry. 	



References

1. Riegel's handbook of Industrial Chemistry, J.A.Kent, CBS Publishers, New Delhi
2. B. K. Sharma, Industrial Chemistry, Part 1 & 2, GOEL Publishing House (2000).
3. Engineering Chemistry, P.C.Jain, M.Jain Dhanpat Rai & Sons, Delhi
4. Survey of Industrial Chemistry, Third Edition, Philip J. Chenier Publications, New Delhi
5. Engineering Chemistry, B.K.Sharma, Goel Publishing House, Meerut
6. S.K.Agarwala and Keemital Advanced Inorganic Chemistry
7. Puri, Sharma and Kalia. Principles of Inorganic Chemistry
8. P.L. Soni, Text book of Inorganic Chemistry
9. Industrial Chemistry, O. P. Vermani, A. K. Narula, Galgotia Publications Pvt. Ltd., New Delhi.
10. Industrial Safety Management, 3rd Edition, Deshmukh. L.M., Tata McGraw Hill, New Delhi, 2008
11. Chemical Hazards and Safety, 2nd Edition, Shrikant Dawande, Khanna Publishers, 2012
12. Industries in Kerala, K.R.Rajan.
13. Green Chemistry; Theory and Practice, Anastas. P.T, Warner, J.C., Oxford University Press, Oxford, U.K, 1998.
14. Green Chemistry Environment Friendly Alternatives, Rashmi Sanghi and M.M Srivasthava, Narosa Publishing House, 2006

Course Outcomes

No.	Upon completion of the course the graduate will be able to	Cognitive Level	PSO addressed
CO-1	Analyze raw materials, processes, and industrial sectors in India, focusing on Kerala's chemical industries.	An	1,3,5
CO-2	Understand the production, properties and uses, of industrial gases and inorganic chemicals.	An	1,2
CO-3	Explain petroleum and coal processing methods and identify resulting chemical products.	E	1,2
CO-4	Implement safety measures to manage industrial hazards effectively and evaluate industrial processes using green chemistry principles to propose sustainable and environmentally friendly alternatives.	C	1,3,5
CO-5	Critically analyze and apply principles of industrial chemistry to enhance efficiency, safety, and sustainability in chemical manufacturing.	C	1,3,5

R-Remember, U-Understand, Ap-Apply, An-Analyse, E-Evaluate, C-Create

Name of the Course: INDUSTRIAL CHEMISTRY-I



Credits: 4:0:0 (Lecture:Tutorial:Practical)

CO No.	CO	PO/PSO	Cognitive Level	Knowledge Category	Lecture (L)/ Tutorial (T)	Practical (P)
1	CO-1	PSO - 1,3,5 PO - 1, 2	An	C	L	
2	CO-2	PSO - 1,2 PO - 1, 2	An	C	L	
3	CO-3	PSO - 1,2 PO - 1, 2	E	C	L	
4	CO-4	PSO - 1,3,5 PO - 1, 2	C	P,C	L	
5	CO-5	PSO - 1,3,5 PO - 1	C	P,C	T	

F-Factual, C- Conceptual, P-Procedural, M-Metacognitive

Mapping of COs with PSOs and POs:

	PS O1	PSO 2	PSO 3	PSO 4	PSO 5	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO-1	3	-	3	-	2	3	3	-	-	-	-	-	-
CO-2	3	2	-	-	-	3	3	-	-	-	-	-	-
CO-3	3	3	-	-	-	3	3	-	-	-	-	-	-
CO-4	2	-	3	-	2	3	3	-	-	-	-	-	-
CO-5	3	-	2	-	2	2	-	-	-	-	-	-	-

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Quiz/ Discussion / Seminar
- Midterm Exam
- Programming Assignments
- Final Exam



Mapping of COs to Assessment Rubrics:

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO-1	✓	✓		✓
CO-2	✓			✓
CO-3	✓			✓
CO-4	✓	✓		✓
CO-5		✓	✓	

