




**Ahmedabad
University**



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Course	CHE100 The World of Chemical and Environmental Engineering	Semester	Monsoon Semester 2024	
Faculty Name(s)	Snigdha Khuntia	Contact	snigdha.khuntia@ahduni.edu.in	
School	SEAS	Credits	1.5	
GER Category:	Humanities and Languages	Teaching Pedagogy Enable:NO	P/NP Course: Can not be taken as P/NP	
Schedule	Section 1	02:30 pm to 04:00 pm	Fri	01-08-24 to 26-11-24
		04:00 pm to 05:30 pm	Fri	01-08-24 to 26-11-24
Prerequisite	Not Applicable			
Antirequisite	Not Applicable			
Corequisite	Not Applicable			
Course Description	<p>This course serves as an introduction to the interdisciplinary fields of Chemical and Environmental Engineering, providing students with a fundamental understanding of key principles, processes, and practical applications in chemical and environmental engineering. Course activities include: Understanding chemical engineering models, drawings and process flow diagrams, water/effluent treatment systems, from a variety of process industries covering petrochemical, paper and pulp, textile, fertilizer, and pharmaceutical industries, and many others. A historical perspective will also be provided. The course integrates concepts from chemistry, biology and engineering principles associated with various industries.</p>			

Course Objectives	<p>The educational objectives of the course are to:</p> <ul style="list-style-type: none"> • Gain an overview of various industries in the broad realm of “chemical engineering, and “environmental engineering” • Learn methods of analysis of complex chemical systems • Gain exposure to terms and terminologies typical to chemical industries • Gain an overview of the chemical sector • Understand fundamentals related to conversion of raw material to end product • Connect industrial processes with courses of the curriculum • Develop an awareness of environmental issues, particularly in chemical sector, and challenges to reduce adverse impact • Introduce students to standards, regulations and sustainability.
Learning Outcomes	<p>After completing this course, a student should be able to,</p> <ul style="list-style-type: none"> • Gain overview of chemical industry, and identify type of industry and its salient hardware • Appreciate the construction features and processes occurring in unit operations • Make schematic diagram of the plant and identify material transformations and equipment involved therein • Appreciate safety and environmental aspects of chemical plants • Identify environmental impact of specific chemical industries and their control • Understand techniques of waste and effluent treatment • Link plant processes with curriculum structure and courses
Pedagogy	<p>Hands-on laboratory exercises and experiments to introduce concepts on chemical preparation and analysis, carbon analysis, fuel analysis and water and air quality assessments, solid waste management. Impart knowledge on how to collect, analyse, and interpret experimental data. Model making and reading process sheets</p>
Expectation From Students	<ul style="list-style-type: none"> • Students must adhere to the laboratory safety instructions and protocols. • They should follow the study materials and come prepared for each session. • Prior to the industry visit they must learn about the Industry profile. • Laboratory notes and journals must be followed and submitted on time. • Any misconduct shall not be entertained in the lab. • Students must learn to work in a team during their experiments and projects.

Assessment/Evaluation	<ul style="list-style-type: none"> Other Components: <ul style="list-style-type: none"> Practical - 30% Report - 30% Class participation (Including attendance) - 10% Student Presentation 1 - 20% Project - 10%
Attendance Policy	As per Ahmedabad University Policy.
Project / Assignment Details	<p>Practical - 30% This will be evaluated based on their experiments and results obtained in each session. Regular viva and their preparation on the course material will be assessed.</p> <p>Report - 30% This component is to evaluate their language and writing skill to present the report.</p> <p>Class participation (Including attendance) - 10% This component is about the Laboratory behaviour and safety protocols which each student must follow.</p> <p>Student Presentation 1 - 20% This is based on their final expo and presentation at the end of the course</p> <p>Project - 10% This is the component of group project where students will be asked to prepare a model of an Industry after the completion of majority of the course. They shall produce a complete flow sheet, and the process details.</p>
Course Material	<p>Reference Book</p> <ul style="list-style-type: none"> Standard Methods for the Examination of Water and Wastewater, W. Rice, B. Baird, A.D Eaton, L. S. Clesceri, 24 Edition, APHA Press, ISBN: 0875532993, Year: 2023, Solid and Hazardous Waste Management, S. Bhatia, 1 Edition, Atlantic, ISBN: 8126908149, Year: 2021, Perry's Chemical Engineers' Handbook, R. Perry, D. Green, 7 Edition, McGraw-Hill Education, ISBN: 0070498415, Year: 1997, Handbook of solid waste management, G. Tchobanoglous, F. Kreith, 2 Edition, McGraw-Hill Education, ISBN: 0071356231, Year: 2002, <p>Text Book(s)</p> <ul style="list-style-type: none"> Unit Operations of Chemical Engineering, W.L McCabe, P. Harriott, J.C. Smith, 7 Edition, McGraw-Hill Education, ISBN: 9355321082, Year: 2022, Chemical Reaction Engineering, O. Levenspiel, 3 Edition, Wiley, ISBN: 9354244602, Year: 2021,
Additional Information	None

Session Plan

NO.	TOPIC TITLE	TOPIC & SUBTOPIC DETAILS	READINGS,CASES,ETC.	ACTIVITIES	IMPORTANT DATES
1	Introduction to the laboratory practice, Safety instructions, and process flow diagrams	Chemical Engineering models, drawings, process flow diagrams, Water and Sewage treatment plant overview	McCabe and Smith, Ch 1	Discussion, Fire hazard and other safety instructions	
2	Application of Fluid mechanics	Setting up IV set for glucose flow, make your own syphon for acid dispensation, making a water level device	McCabe and Smith, Ch 2	Model making, experiment, group participation	
3	Application of Heat Transfer	(Building a model for perfect adiabatic system; Performance of Leiden frost Phenomena)	McCabe and Smith, Ch 10	Model making, experiment, group participation	
4	Application of Mass transfer	Diffusion, adsorption and absorption in daily life	McCabe and Smith, Ch 17	Model making, experiment, group participation	
5	Application of Chemical Reaction Engineering	(Ozonation of Dye water to determine the half life, chemical kinetics, and activation energy)	Levenspiel, Ch 3 and 4	Model making, experiment, group participation	
6	Petroleum industries	Types of fuel, characterization such as flash point, fire point, pour point, and smoke point	Notes and study materials, by SK	Experiment and calculations	
7	Food Industries	Determination of Carbohydrate (Molisch's test), Fat and Protein test for packaged food	Notes and study materials, by SK	Experiment and calculations	
8	Complete RO process	Complete flow sheet of a RO system, membrane type and synthesis, and membrane module	McCabe and Smith, Ch 26	Model making, experiment, group participation	
9	Characterization of Water	Performing DO, BOD, COD, TOC, pH, and TDS tests	Rice et al., Standard Methods for the Examination of Water and Wastewater	Experiment and calculations	

10	Soil and Air	PM in Air, PM, SO _x , NO _x , and CO ₂ from vehicle emission, TOC and pH of Soil	Tchobanoglous, and Kreith, Chapter 13	Experiement and calculations	
11	emission from coal burning	determination of calorific value and emission of PM, SO _x , NO _x , and CO ₂	Tchobanoglous, and Kreith, Chapter 13	Experiement and calculations	
12	Chemicals and Drugs synthesis	Nylon, Styrene, Aspirin, Preparation and Analysis	Notes and study materials, by SK	Experiement and calculations	
13	Possible field visits	Understand the process flow and collect water/wastewater samples for assessment: • Arvind Mills and textile wastewater treatment plant, Santej) (OR) • Water treatment plant within the city (OR) • Sewage treatment plant within the city (OR) • Air pollution control facility in a power plant (OR) • Solid waste handling and disposal facility		Plant visit	
14	Review and Reflection				
15	Expo				

