Gyanmanjari Innovative University

Course Syllabus
Gyanmanjari Science College
Semester-2(M.SC.IC.)

Subject: Chemical Process Industry-MSCIN12507

Type of course: Major

Prerequisite: Students should have a basic knowledge of Industrial methods. A deep understanding of mass and energy balances, fluid mechanics, thermodynamics, and process control is essential. This forms the backbone for designing and operating chemical processes.

Rationale: To understand the development of new chemical processes that reduce waste, energy consumption, and harmful by-products is a major area of research and application in the industry.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks					Total Marks
				Theory Marks		Practical Marks		CA	
CI	T	P	C	ESE	MSE	V	P	ALA	
4	0	0	4	60	30	10	00	50	150

Legends: CI-Class Room Instructions; T – Tutorial; P - Practical; C – Credit; ESE - End Semester Examination; MSE- Mid Semester Examination; V – Viva; CA - Continuous Assessment; ALA- Active Learning Activities.

Course Content:

Unit No.	Course content	Hrs	% Weightage
1	**Marine and fine chemicals** Introduction, magnesium chloride, magnesium sulphate, magnesium hydroxide, magnesium trisilicate, magnesium carbonate, bromine, potassium chloride from seawater or brine, manufacture of precipitated silica, sodium stearate, magnesium stearate, zinc stearate, etc.	15	25
2	**Food industry** Food, fragrances, flavors and food additives. Manufacture of cane sugar. Preparation of saccharin, sucaryl sodium (Sodium cyclamate), Dulcin (Phenethylurea). **Fermentation** Manufacture of Industrial alcohol, absolute alcohol, Butanol, Acetone, Acetic acid, and Citric acid.	15	25
3	**Explosives and Propellants** Types of explosive, Characteristic of explosive, Industrial production of explosives. (Nitro, Nitramine, Nitramide, RDX, HMX). **Surface coating industries** Theory of corrosion and erosion, Corrosion reactions, Factor affecting corrosion rates, Protection against Corrosion.	15	25
4.	**Fertilizer industries** Introduction, classification, merits and demerits of chemical fertilizers (N.P.K), manufacture of urea, ammonium sulphate, ammonium phosphate (D.A.P), double and triple super phosphate, potassium chloride, agro chemicals (insecticides and pesticides), herbicides, fungicides, plant nutrients and regulators	15	25
	Total	60	100

Continuous Assessment:

Sr. No	Active Learning Activities	Marks
1.	**Lab-based compound synthesis and identification** Faculty will assign students to create a supersaturated solution of a substance like sugar (to make rock candy) or salt. Then they suspend a string or stick in the solution and observe crystal formation over several days. Student will make a report and upload it to the GMIU Web portal.	10
2.	**Propellants** Faculty will assign students to different types of explosives to research (e.g., nitro compounds, nitrine, RDX, HMX). Each group will study:The chemical structure of their assigned explosive.How it behaves under different conditions (e.g., pressure, temperature).How it is produced industrially, including the raw materials and the steps involved. Upload the details to the GMIU Web portal.	10
3.	**Explosive Characteristics** Students need to write a report on the synthesis, characteristics, and safe handling of explosives, along with a safety protocol for an industrial plant. Upload the details to the GMIU Web portal.	10
4.	**Fermentation Simulation:** Using simulation software (like Simulink or other bioprocess simulation tools), students will model the fermentation process for producing industrial alcohol (e.g., ethanol). They will adjust variables like temperature, pH, and sugar concentration to optimize yields. Each group will submit a report comparing the outcomes of their different simulation runs, discussing the factors that impact fermentation efficiency. Upload it on the GMIU Web portal.	10
5.	**Project on Precipitated Silica Production** Faculty will instruct students, and they will develop a detailed process flowchart for producing precipitated silica, incorporating both chemistry and engineering. Student must prepare the flowchart and submit it on the GMIU Web portal.	10
Total		**50**

Suggested Specification table with Marks (Theory):60

Distribution of Theory Marks (Revised Bloom's Taxonomy)						
Level	Remembrance (R)	Understanding (U)	Application (A)	Analyze (N)	Evaluate (E)	Create (C)
Weightage	20%	30%	30%	20%	00	00

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Course Outcome:

After learning the course the students should be able to:	
CO1	Know the fundamentals of marine and fine chemicals.
CO2	Comprehend the role of food additives, preservatives in food quality and shelf life.
CO3	Analyze and apply fermentation processes for the production of industrial chemicals.
CO4	Evaluate the industrial production methods for explosives and propellants.

Instructional Method:

The course delivery method will depend upon the requirement of content and need of students. The teacher in addition to conventional teaching method by black board, may also use any of tools such as demonstration, role play, Quiz, brainstorming, MOOCs etc.

From the content 10% topics are suggested for flipped mode instruction.

Students will use supplementary resources such as online videos, NPTEL/SWAYAM videos, e-courses, Virtual Laboratory.

The internal evaluation will be done on the basis of Active Learning Assignment.

Practical/Viva examination will be conducted at the end of semester for evaluation of performance of students in laboratory.

Reference Books:

[1]Shrev's Chamical Process Industries,-R. Norris Shreve, J.A.Brink,Jr.; McGraw-Hill Kgakusha

[2] Industrial Chemistry,-Dr B.K.Sharma; Goel Publication house.

[3] Roger's Industrial Chemistry,-C.C,Furnas; D.Van Nostrand compony,Inc.

[4] Industrial Chemistry,-William Thornton; John Wiley & Sons.

[5] Unit processes in organic synthesis by P. H. Groggins.