Gyanmanjari Innovative University

Course Syllabus
Gyanmanjari Institute of Technology
Semester-6 (B.Tech)

Subject: Chemical Process Technology-BETCH16320

Type of course: Major (Core)

Prerequisite: None

Rationale: The primary goal of this subject is to teach the fundamentals of chemical processes that occur in chemical and allied industries like pharmaceuticals, cement, etc. The subject imparts knowledge about the basic concepts for manufacturing various chemical compounds.

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	2	5	60	30	10	0	50	150

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

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Course Content:

Sr. No	Course content	Hrs	% Weightage
1	**Chemical processing and the work of chemical engineering:** Basic chemical data, unit operation and unit process, batch and continuous processing, process flow sheet, environment aspects, safety aspects etc. **Sulphur, Sulphuric acid industry:** Mining and manufacturing of Sulphur, synthesis of Sulphur dioxide, Manufacture of Sulphuric acid and its applications, manufacturing technologies & associated engineering problems	12	20
2	**Fertilizer industry:** manufacturing processes of Ammonia, Urea, Nitric acid, Phosphoric acid, their uses and applications, manufacturing of phosphate fertilizers, major engineering problems, NPK fertilizer. **Chlor-alkali and heavy inorganic industry:** Manufacturing of soda ash, Caustic Soda and Chlorine by membrane cell, mercury & diaphragm process.	12	20
3	**Sugar & Fermentation Industry:** Manufacturing of Sugar. Fermentation process, Industrial Alcohol, Absolute Alcohol, Beers, Wines and Liquors, Manufacturing of Butyl Alcohol & Citric acid by fermentation. **Cement & ceramic industry:** Cement & Its types, Limestone beneficiation, manufacturing of Portland cement, lime manufacture. Introduction to Ceramic Industry, basic raw materials and ceramic chemistry, manufacturing of Refractory bricks.	12	20
4	**Pulp and paper industry:** Pulp manufacturing by Kraft process, major engineering problems, chemical recovery, Manufacturing of Paper **Industrial gases and carbon:** Importance of cryogenics in gas production, production of gases like carbon dioxide, oxygen, nitrogen, hydrogen, introduction to rare gases of atm. like helium and acetylene.	12	20

5	**Dye & its intermediates, paints:** Classification of dyes according to its constitution and application, Introduction to Disperse, Reactive, Azo dyes, H-acid, Koch acid, Vinyl sulphone, Vat dyes. Introduction to Paints classification & its constituents, PVC of Paints. **Soap and detergent industry:** Introduction to soap and detergent, soap manufacturing process, methods of detergent manufacture, manufacture of glycerin.	12	20

Continuous Assessment:

Sr. No	Active Learning Activities	Marks
1	**Chemical Industries Details:** Student will identify various type of chemical Industries In detail and list out industries name along with their products and location. Upload pdf on the GMIU Web Portal.	10
2	**Poster Presentation:** Students will give a Poste presentation on the topic assigned by the faculty Upload it on the GMIU Portal.	10
3	**Technical Video-Based presentation.** Students will create and present a video on the manufacturing process of any one product and upload it on the GMIU Portal.	10
4	**Project** Students will prepare a project Guideline given by faculty and submit a report, on the GMIU Portal.	10
5	**Industrial Exposure.** Students will undergo 1 days of industrial exposure to observe Manufacturing process starting to end product preparation and prepare a report and upload it on the GMIU 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	Recognize the manufacturing of various inorganic and organic chemicals
CO2	Understand the process flow diagram and various process parameters
CO3	Identify and solve engineering problems during production
CO4	Comprehend the practical methods of production in a chemical plant
CO5	Build a bridge between theoretical and practical concepts applied in industry

List of Suggested Practical

Sr. No	Suggested Practical	Unit No	Hrs.
1	To determine saponification value of oil sample	1	2
2	To prepare detergent in the laboratory and to carry out its cost analysis	1	2
3	To determine the acid value of the given sample of oil.	2	2
4	To prepare hydrated lime from the given calcium carbonate powder	2	2
5	To prepare caustic soda by chemical method.	3	2
6	To synthesis aspirin from salicylic acid.	3	2
7	Preparation of phenyl azo – β – Naphthol from aniline	4	2
8	Preparation of disperse dye.	5	2
9	To prepare mordant yellow dye.	5	2
10	Preparation of fast green dye.	5	2
11	Preparation of nitro benzene from benzene.	3	2
12	To study Alcohol Fermentation by Saccharomyces cereviceae (Baker's Yeast).	2	4
13	Fermentative production of citric acid using the fungi Aspergillus niger.	2	4

Instructional Method:

The course delivery method will depend upon the requirement of content and the needs of students. The teacher, in addition to conventional teaching methods by black board, may also use any 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. 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 the laboratory.

Reference Books:

[1] "Shreve's Chemical Process Industry", George T. Austin, McGraw Hill Publication, 5th edition
[2] "DRYDENS outlines of chemical technology for the 21st century", M Gopala Rao & Marshal Sitting, pub East- West Press, 3rd edition.
[3] "Ulmanns Encyclopedia of Industrial Chemistry", Wiley
[4]" Encyclopedia of Chemical Technology", Kirk and Othmer, Wiley Interscience.
[5] "Unit processes in Organic synthesis", Groggins, P.H., Tata McGraw Hill Education Pvt Ltd.