



**Gyanmanjari**  
Innovative University

Course Syllabus  
Gyanmanjari Diploma Engineering College  
Semester-3(Diploma)

**Subject:** Fundamental Chemical Engineering- DETCH13202

**Type of course:** Major

**Prerequisite:** Basic knowledge of Science

**Rationale:** The unit conversions, material and energy balance are the essential parts in the practice of other subjects. Thus this course is a core course for chemical engineers and should be learned sincerely by students.

**Teaching and Examination Scheme:**

Teaching Scheme			Credits	Examination Marks					Total Marks
CI	T	P		C	Theory Marks		Practical Marks		
			ESE		MSE	V	P	ALA	
04	00	02	5	60	30	10	20	30	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:**

SR. NO	Course content	Hrs	% Weight age
1	<b>Molecular weight determination of organic compounds:</b> Concept of molecular weight, Molecular weight determination of volatile organic compound by Victor-Mayer's method including its apparatus experimental procedure and related calculations and sums. Molecular weight determination of carboxylic acids by silver salt method including its procedure, calculations and sums. Molecular weight determination of an organic base by Chloroplatinate method with its procedure, calculations and sums. Introduction of empirical formula and molecular formula with numericals.	15	25%



2	<p><b>Chapter – 2 Adsorption</b></p> <ul style="list-style-type: none"> <li>• Introduction of surface chemistry concept of adsorption.</li> <li>• Difference between adsorption and absorption. Characteristics of adsorption.</li> <li>• Types of adsorption, Physical &amp; Chemical adsorption.</li> <li>• Freundlich’s adsorption isotherm and its limitations.</li> <li>• Langmuir’s adsorption isotherm, Applications of adsorption.</li> </ul> <p><b>Chapter –3 Alicyclic compounds</b></p> <ul style="list-style-type: none"> <li>• Introduction.</li> <li>• General methods for the preparation of cycloalkane compounds.</li> <li>• General physical and chemical properties of cycloalkane compounds. Stability of cycloalkane compounds by Baeyer’s strain theory and strain less ring theory.</li> </ul>	15	25%
3	<p><b>Cement and Refractors:</b> Cement. constituting compounds in cement. Compositions and manufacturing of Portland cement. Setting and hardening of cement. Glass and its general properties. Manufacture of glass. variety of glasses and their application. Definition of refractories. Characteristics and Application of refractories. Classification of refractories: Acid. Basic and neutral refractories.</p>	15	25%
4.	<p><b>Chemistry of Water:</b> Introduction. Source of water. Hard water and soft water. Salts cause water hardness, Unit of hardness. and simple numerical on water hardness. Problems caused by the use of hard water in boilers and its prevention. Scale and sludge, Foaming and Priming, Caustic embrittlement, Corrosion. Water softening techniques: Soda-lime process, Zeolite process, Ion exchange process, Reverse Osmosis process. Treatment of Municipal drinking water Screening, Sedimentation, Coagulation, Filtration, Sterilization of water by chlorination, Break-point of Chlorination. Enlist Indian standard specifications of drinking water</p>	15	25%

**Continuous Assessment:**

Sr. No	Active Learning Activities	Marks
1.	<p><b>Lab experiment (Easy Exercise)</b> Faculty will give experiment name (Ex. Fire snake, Lemon Volcano, Cabbage Chemistry) and students will perform it and make a video and upload in to GMIU web Portal.</p>	10
2.	<p><b>Report writing</b> Faculty will give name of chemistry related report and students will prepare and upload it to Portal.</p>	10



3.	<b>Picture Analysis Survey</b> Faculty will assign picture and students will analyze it and will put forward their opinions in form of a report and will upload it to GMJU web Portal.	10
<b>Total</b>		30

### 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	25%	35%	20%	10%	10%	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	Learn the basic concepts of molecular weight determination.
CO2	Know about adsorption, theorem of adsorption.
CO3	Know about the constituting compounds in cement.
CO4	Apply the different treatment methods for purification of water.

### List of Practicals:

Sr. No	Descriptions	Unit No.	Hrs
1.	Titration between Strong Acid and Strong Base using Phenolphthalein as indicator	1	4
2.	Titration between Strong Acid and Weak Base using Methyl Orange as indicator	1	4
3.	Titration between $\text{KMnO}_4$ and $\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$	2	2
4.	Hardness of water by EDTA method	2	4
5.	Determination of pH of different solution	3	4
6.	Determine Chloride content in water	3	2
7.	Estimate alkalinity of given water sample using 0.01M sulphuric acid solution.	4	2



8.	Determine flash point and fire point of the given lubricating oil using Pensky Martens/Cleveland open cup apparatus/Able's flashpoint apparatus.	4	4
9.	Determine Total Dissolved Solid (TDS) and Total Suspended Solid (TSS) in a given sample of water.	4	4
			30

### 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] Basic Principles and Calculations in Chemical Engineering, Himmelblau David M., PHI Learning, New Delhi
- [2] Stoichiometry and Process Calculations, Narayanan K.V. and Lakshmikutty B.
- [3] Introduction to Process Calculations, K.A. Gavhane