Gyanmanjari Innovative University

Course Syllabus
Gyanmanjari Science College
Semester-5 (B.Sc)

Subject: Advanced Organic Chemistry-BSCCM15314

Type of course: Major

Prerequisite: Basic understanding about the structure and theory of Organic Chemistry.

Rationale: This course covers advanced organic chemistry, provides in-depth and expanded knowledge as well as experimental skills in organic chemistry with a focus on synthetic aspects of complex organic compounds.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks					Total Marks
				SEE		CCE			
CI	T	P	C	Theory	Practical	MSE	LWA/V	ALA	
3	0	2	4	75	25	30	20	50	200

Legends: CI-Class Room Instructions; T – Tutorial; P - Practical; C – Credit; SEE - Semester End Evaluation; MSE- Mid Semester Examination; LWA - Lab Work Assessment; V – Viva voce; CCE-Continuous and Comprehensive Evaluation; ALA- Active Learning Activities.

3 Credits * 25 Marks = 75 Marks (each credit carries 25 Marks) Theory
1 Credits * 25 Marks = 25 Marks (each credit carries 25 Marks) Practical
SEE 100 Marks will be converted in to 50 Marks
CCE 100 Marks will be converted in to 50 Marks
It is compulsory to pass in each individual component.

GYANMANJARI INNOVATIVE UNIVERSITY BHAVNAGAR

Course Content:

Unit No	Course Content	Hrs	% Weightage
1	**Basics of Acidity, basicity, and pKa of organic chemistry** Organic compounds are more soluble in water as ions, Charged compounds can be separated by acid–base extraction, Acids, bases, and pKa, Acidity, An isolated proton is extremely reactiveformation of H3O+ in water, The pH scale and pKa, Every acid has a conjugate base, Water can behave as an acid or as a base, The ionization of water, The definition of pKa,A graphical description of the pKa of acids and bases, An acid's pKa depends on the stability of its conjugate base, Acid and conjugate base strength, The choice of solvent limits the pKa range we can use, Constructing a pKa scale, The negative charge on an electronegative element stabilizes the conjugate base, Weak A–H bonds make stronger acids, Nitrogen compounds as acids and bases, The 'pKas' of bases, Carbon acids.	16	35%
2	**Delocalization and conjugation:** Introduction, The structure of ethene (ethylene, CH2=CH2), Molecules with more than one C=C double bond, Benzene has three strongly interacting double bonds, Multiple double bonds not in a ring, Conjugation, The conjugation of two π bonds, The molecular orbitals of butadiene, 1.Inductive effect:Inductive effects are of two types:(i) -I effect:(ii) +I effect:, Applications of Inductive effect:, (i) Acidic strength:(ii) Basic strength:(iii) Stability of carbonations:(iv) Stability of carbanion:(v) Stability of carbon free radical:(vi) Dipole moment: 2. Resonance Effect:Resonance energy:Conditions for resonance, Rules for writing resonating structure:, Rules for stability of resonating structure, 3. Mesomeric effect:Types of Mesomeric effect:(i) + m effect (ii) -m effect, Relative order of -m group: 4. Hyperconjugation :Applications of Hyperconjugation effect: 5. Electromeric effects:+E effect: -E effect:	16	35%
3	**Chemoselectivity and protecting group:** Reducing agents,Reduction carbonyl group,Hydrogen as a reducing agent, getting rid of functional group, Dissolving metal reductions,Selectivity on oxidation reaction, competing reactivity, A survey of protecting group.	07	15%

4	**Application of catalyst in organic chemisry :** Specifi c acid catalysis, Specifi c base catalysis, General base catalysis,General acid catalysis, The detection of intermediates , Trapping reactions, A collection of reactions linked by a common intermediate,	06	15%

Continuous Assessment:

Sr. No	Active Learning Activities	Marks
1	**Molecular Modeling:** Faculty will assign reaction and student will visualize the interaction of a catalyst with the reactants during different steps of a catalytic cycle than analyze it and will put forward their opinions in the form of report approx 100 words. Upload it on GMIU web portal.	10
2	**Retrosynthesis Challenges**: Faculty will assign a target molecule, work backward in groups to identify potential starting materials and key reactions and student will upload it on GMIU web portal.	10
3	**ConjugationReport:** Faculty will assign topics for Conjugation report and student will upload it on GMIU web portal.	10
4	**Reflect on the Activity:** Faculty will assign the activity, discuss what was learned and how it connects to broader concepts in regular life and student will upload it on GMIU web portal.	10
5	**Attendance**	10
Total		50

List of Practical:

Sr. No	Descriptions	Unit No	Hrs
1	**Organic Spotting**: Mixture of organic compound (Minimum 10 compounds) having mono and bi-functional organic groups with conformation and derivatives.	All	30
		Total	30

Suggested Specification table with Marks (Theory):75

Distribution of Theory Marks **(Revised Bloom's Taxonomy)**						
Level	Remembrance (R)	Understanding (U)	Application (A)	Analyze (N)	Evaluate (E)	Create (C)
Weightage	30%	30%	30%	10%	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	Predict the position of equilibrium in acid-base reactions using pKa values
CO2	Explain the enhanced stability of molecules and ions resulting from electron delocalization and conjugation
CO3	Analyze molecules with multiple functional groups and design reaction sequences
CO4	Design and execute organic reactions with improved rates and under milder conditions

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] Organic Chemistry by Morrison and Boyd, Pearson Publication.

[2] Organic Chemistry Volume-1 [6th Edition] By I.L. Finar.

[3] Organic Chemistry by Bahl&Bahl, S. Chand Publication.

[4] Advanced Organic Chemistry by Bahl&Bahl, S. Chand Publication.

[5] Organic Chemistry - Clayden - 2nd/Ed. - 2023-24. by Jonathan Clayden.