(Bachelor of Science)(Undergraduate)
B. Sc. (UG) Semester -IV

Course Code	**US04CCHE51**	Title of the Course	**Organic Chemistry**
Total Credits of the Course	4	Hours per Week	4

Course Objectives:	To make students familiar with: 1. Organic chemistry as a subject 2. Application of organic chemistry in development of chemical science as subject. 3. Basic concepts related to stereochemistry, carbohydrates, ultraviolet spectroscopy and acid- base properties.

Course Content		
Unit	Description	Weightage* (%)
1.	**STEREOCHEMISTRY** Stereochemistry and stereoisomerism, Optical activity, Specific rotation, Production of Enantiomerism, Chirality, the chiral centre, enantiomers, Configuration, Specification of configuration: R and S, Sequence rules, Diastereomers, Meso structures, Specification of configuration : More than one chiral center, Generation of a chiral center, Synthesis and optical activity, Reaction of chiral molecules: Bond-breaking, Reaction of chiral molecules: Generation of second chiral center, Reaction of chiral molecules. Free rotation about C-C single bond. Conformation. Torsional strain Conformation of n-butane Vander Waals repulsion, Factors affecting stability of conformation, Conformation of cycloalkanes, Equatorial and axial bond in cyclohexane.	**25%**
2.	**ULTRAVIOLET SPECTROSCOPY** Origin of UV Spectra, Principle, Electronic transition (σ-σ*, n-σ*, π-π* and n-π*), relative positions of λ_{max} considering conjugative effect, steric effect, solvent effect, red shift (bathochromic shift), blue shift (hypsochromic shift), hyperchromic effect, hypochromic effect (typical examples). Aromatic and Polynuclear aromatic hydrocarbons. Problems of Dienes and enones using Woodward-Fieser rules. Problems of aromatic ketones, aldehydes and esters using empirical rules.	**25%**
3.	**CARBOHYDRATES**	

	Introduction, classification of carbohydrates, osazone formation, epimerization, step up (Killani Fisher Synthesis) and step down (Ruff Degradation) reactions of monosaccharides, simple structures of glucose and fructose, Fischer's proof of configuration of D-glucose, Cyclic structure of D (+) Glucose. Disaccharides: structure of (+) cellobiose.	**25%**
4.	**CHEMICAL REACTIVITY AND MOLECULAR STRUCTURE: (ACID- BASE PROPERTIES)** Acid-Bases, scale of acidity-basicity, Resonance effect, drawing of structures and the condition for resonance, Effect of change of hybridization on acidity and basicity, Inductive and electronic effects, steric effect and hydrogen bonding, Lewis acid and bases, Keto – enol tautomerism. Difference between resonance and tautomerism.	**25%**

Teaching-Learning Methodology	Conventional method (classroom blackboard teaching), ICT. Courses for B. Sc. Chemistry programme are delivered through classroom, laboratory work in a challenging, engaging, and inclusive manner that accommodates a variety of learning styles and tools (PowerPoint presentations, audio visual resources, e-resources, seminars, workshops, models).

Evaluation Pattern		
Sr. No.	Details of the Evaluation	Weightage
1.	Internal Written / Practical Examination (As per CBCS R.6.8.3)	15%
2.	Internal Continuous Assessment in the form of Practical, Viva-voce, Quizzes, Seminars, Assignments, Attendance (As per CBCS R.6.8.3)	15%
3.	University Examination	70%

Course Outcomes: Having completed this course, the learner will be able to	
1.	Learn about basic concepts of stereochemistry, ultraviolet spectroscopy, carbohydrates, chemical reactivity and molecular structure.
2.	Apply this knowledge in further studies of third year B.Sc. chemistry course.

Suggested References:	
Sr. No.	References
1.	A text book of organic chemistry by Arun Bahl and B. S. Bahl, 16th Ed.
2.	Organic chemistry by Morrison and Boyd, 6th Ed.
3.	Organic reaction mechanism by R. K. Bansal, 3rd Ed.
4.	Organic chemistry by S. M. Mukherji, S. P. Singh and R. P. Kapoor. Vol. II.

On-line resources to be used if available as reference material
On-line Resources: Google books, INFLIBNET, Google Web

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(Bachelor of Science)(Undergraduate)
B. Sc. (UG) Semester -IV

Course Code	**US04CCHE52**	Title of the Course	**ANALYTICAL CHEMISTRY**
Total Credits of the Course	4	Hours per Week	4

Course Objectives:	To make students familiar with: 1. Analytical chemistry as a subject. 2. Applications of analytical chemistry. 3. Basic concepts related to different kinds of analysis.

Course Content		
Unit	Description	Weightage* (%)
1.	**TITRIMETRIC METHODS IN ANALYSIS** Introduction, Definitions: Standard solutions, Equivalence Point, Indicators, End point, Titration General Aspects of: Primary standards, Desirable properties of standard solution. Volumetric calculations: Molarity, Normality, percentage concentration, parts per million. **Neutralization Titration** Standard solution and acid- base indicators. Titration curve for strong acid-strong base, Systematic equilibrium concentrations for SA-SB titration. Acid-Base indicators, color change range of an indicator, Indicator error. Determination of Acetic acid in vinegar. Determination of Alkalinity of soda ash.	**25%**
2.	**COMPLEXOMETRIC TITRATION** Introduction, terms involved in titration: complex, ligand, buffer solution, chelating agents, chelates, Some Chelating agents, Stability of complexes: stepwise formation constants. Complexometric titration curve. Equilibria involved in EDTA titration, Indicators for EDTA titrations. Hardness of water. Ca in Calcium Gluconate Sample. Numerical based on this titration.	**25%**
3.	**REDOX TITRATION** Introduction, Terms involved: oxidation, reduction. Single electrode potential, formal potential, Nernst Equation, Titration curve for Iron (II) and cerium (IV). Types of redox indicators and their selection. Structural chemistry of redox indicators. Numericals: Calculation based on emf of electrode/cell, end point calculations, equation constants.	**25%**

4.	**WATER POLLUTANTS ANALYSIS** Water pollution: Introduction. Classification of water pollutants, Sources of water pollution. Origin of waste water, Effect of water pollutants, Water analysis: colour, turbidity, total dissolved solids, conductivity, acidity,alkalinity, hardness, chlorides, sulphates, fluorides. Drinking water standards.	**25%**

Teaching-Learning Methodology	Conventional method (classroom blackboard teaching), ICT. Courses for B. Sc. Chemistry programme are delivered through classroom, laboratory work in a challenging, engaging, and inclusive manner that accommodates a variety of learning styles and tools (PowerPoint presentations, audio visual resources, e-resources, seminars, workshops, models).

Evaluation Pattern		
Sr. No.	Details of the Evaluation	Weightage
1.	Internal Written / Practical Examination (As per CBCS R.6.8.3)	15%
2.	Internal Continuous Assessment in the form of Practical, Viva-voce, Quizzes, Seminars, Assignments, Attendance (As per CBCS R.6.8.3)	15%
3.	University Examination	70%

Course Outcomes: Having completed this course, the learner will be able to	
1.	Learn about basic Titrimetric Methods in Analysis, Neutralization Titration, Complexometric and Redox Titration, Water Pollutants Analysis.
2.	Use this information in further studies of third year B.Sc. chemistry course.

Suggested References:	
Sr. No.	References
1.	Fundamentals of Analytical Chemistry, 7th Edition by skoog, west, Holler.

2.	Quantitative Analysis 6th Edition, R.A. Day, Jr., A.L. Underwood.
3.	Analytical Chemistry –Dr. Alka Gupta, Pragati Prakashan.

On-line resources to be used if available as reference material
On-line Resources: Google books, INFLIBNET, Google Web

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(Bachelor of Science)(Undergraduate)
B. Sc. (UG) Semester -IV

Course Code	**US04CCHE53**	Title of the Course	**Chemistry Practical**
Total Credits of the Course	4	Hours per Week	8

Course Objectives:	To make students familiar with: 1. Practical organic chemistry as a subject. 2. Practical aspects of gravimetric analysis. 3. Practical aspects of qualitative analysis of binary organic mixture.

Course Content	
Unit	Description
1.	**Practical-I: BINARY ORGANIC MIXTURE** [Solid + Solid] Only water insoluble (At least Ten) Separation and identification of binary organic mixture : Solid + Solid [A/B/P/N] Solid Acid : Benzoic Acid, Salicylic Acid And Cinnamic Acid Solid Phenol : (α-napthol, β-napthol) Solid Base : (o, m, and p-nitroaniline) Solid Neutral : p-dichlorbenzene, naphthalene, anthracene, benzamide, acetanilide, m-dinitrobenzene.
2.	**Practical-II : GRAVIMETRIC ANALYSIS (SINGLE)** (i) Ba as $BaSO_4$ (ii) Fe as Fe_2O_3 (iii) Al as Al_2O_3 (iv) Ni as $Ni(DMG)_2$ (v) $ZnCO_3$ as ZnO (vi) $BaCl_2.2H_2O$ as $BaCl_2$
	Viva

Teaching-Learning Methodology	Hands on training, Practical Courses for B. Sc. Chemistry programme are delivered through classroom, laboratory work in a challenging, engaging, and inclusive manner that accommodates a variety of learning styles and tools (PowerPoint presentations, audio visual resources, e-resources, seminars, workshops, models).

Evaluation Pattern

Sr. No.	Details of the Evaluation	Weightage
1.	Internal Written / Practical Examination (As per CBCS R.6.8.3)	--
2.	Internal Continuous Assessment in the form of Practical, Viva-voce, Quizzes, Seminars, Assignments, Attendance (As per CBCS R.6.8.3)	---
3.	University Examination	100%

Course Outcomes: Having completed this course, the learner will be able to	
1.	Learn about separation and identification of binary organic mixture. As well as Gravimetric analysis. Which will be beneficial them for higher study.
2.	Improve practical skills of students.

Suggested References:	
Sr. No.	References
1.	Vogel's Textbook of Quantitative Chemical Analysis, 5th Edition By G. H. Jeffery, J.Basset, J.Mendham, R.C.Denney.
2.	Practical Chemistry By O. P. Pandey, D. N. Bajpai & S.Giri
3.	An Advanced Course In Practical Chemistry By Ghoshal, Mahapatra & Nad
4.	Vogel's Textbook Of Qualitative organic Analysis By G. Svehla

On-line resources to be used if available as reference material
On-line Resources: Google books, INFLIBNET, Google Web

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