School of Chemistry
Faculty of Science
University of the Punjab, Lahore
Course Outline

BS Chemistry Semester-II					
Programme	**BS Chemistry**	**Course Code**	**Chem-131**	**Credit Hours**	**2**
Course Title	**Basic Organic Chemistry**			**Course Type**	**Major**

Course Introduction

The course is designed to provide an adequate knowledge about basic concepts in organic chemistry including chemistry of different functional groups. Here is a brief description of course outlines:

Basic concepts in Organic Chemistry

Localized and Delocalized bonding, conjugation and hyperconjugation; applications, resonance, resonance energy,rules of resonance, resonance hybrid, factor effecting the resonance, inductive effect and applications, steric effect and its applications, hydrogen bonding and its effect on various properties of organic compounds, Aromaticity, criteria for aromaticity and phenomena of tautomerisam.

Chemistry of Functional Groups

Chemistry of Hydrocarbons: Saturated, Unsaturated and aromatic hydrocarbons with emphasis on their synthesis and properties.Chemistry of Functional Groups: alcohol, Ether and amino groups, Preparation and properties of alcohols, Phenols, Ethers, Amines with focus on reaction mechanism and applications, Carbonyl compounds, Preparations and reaction mechanism of aldehydes and ketones and their applications, Preparation and reactions of carboxylic acids and their derivatives including esters, Amides, Acid halides and acid anhydrides.

Learning Outcomes

On the completion of the course, the students will:

1. The students are expected to get familiarized with the basic concepts of organic chemistry.
2. They will learn about the fundamentals different functional groups.
3. Students will be able to understand the concept of reactivity and stability of organic molecules.

Course Content		Assignments/Readings
Week 1	Basic Concepts in Organic Chemistry Localized bonding	Summarize previous knowledge of bonding in own words
	Delocalized bonding	Write differences between localized and delocalized bonding.
Week 2	Conjugation and hyper-conjugation	Practice problems
	Applications	Literature survey
Week 3	Resonance and resonance energy	
	Rules of resonance	Summarize rules of resonance and give two examples each.
Week 4	Resonance hybrid	Practice problems

	Factors effecting the resonance	Literature survey
Week 5	Inductive effects and applications	Literature survey
	Steric effect and its application	
Week 6	Hydrogen bonding and its effect on various properties of organic compounds	Literature survey
	Aromaticity	Enlist reasons of aromaticity.
Week 7	Criteria for aromaticity	write structures of aromatic, anti-aromatic and non-aromatic compounds
	Phenomena of tautomerism	
Week 8	**Mid-Term Week**	
Week 9	Chemistry of Functional Groups Chemistry of Hydrocarbons: Saturated hydrocarbons with emphasis on their synthesis and properties	Literature survey
	Unsaturated hydrocarbons with emphasis on their synthesis and properties	
Week 10	Aromatic hydrocarbons with emphasis on their synthesis and properties	Practice problems
	Chemistry of Functional Groups: Alcohol, ether and amino groups	
Week 11	Preparation and properties of alcohols, Phenols with focus on reaction mechanism and applications	Practice problems
	Preparation and properties of ethers and amines with focus on reaction mechanism and applications	
Week 12	Carbonyl compounds Preparations and reaction mechanism of aldehydes	Practice problems
	Preparations and reaction mechanism of ketones	Practice problems
Week 13	Applications of carbonyl compounds	
	Preparation and reactions of carboxylic acids	Practice problems
Week 14	Preparation and reactions of carboxylic acids derivatives Esters	Compare reactivity of acids with carbonyl compounds and alcohols.
	Amides	
Week 15	Acid Halides	
	Acid Anhydride	
Week 16	**Final-Term Week**	

Textbooks and Reading Material

1.L.G. Wade, Organic Chemistry,8th Ed.,Pearson,2012.
2.T.W.Graham solomons and Graig B.Fryhle,Organic chemistry,10th Ed.,John wiley and sons,2011.
3.J.G.Smith,Organic chemistry,3rd Ed,McGraw Hill companies,2012.
4.C.K. Ingold, "Structure and mechanism in organic chemsitry", C.B.S.
5.Morison and Boyd, "Organic Chemistry", 6th Edition, Prentice Hall.
6.Brown and Foote,Organic chemistry,6th.,Pearsons Publishers 2011.
7.Alder, Baker, Brown, "Mechanism in Organic Chemistry", Wiley Publishers.
8.Atkins Carey, "Organic Chemistry", A Brief Course, 2nd Edition.

Teaching Learning Strategies

1. Lectures
2. Group Discussion
3. Laboratory work/Numerical problem sets
4. Seminar/ Workshop

Assignments: Types and Number with Calendar

1. Practice questions from the exercises from the recommended textbook.
2. Literature review based assignment relevant to the course will also be given during the course

Assessment

Sr. No.	Elements	Weightage	Details
1	Midterm Assessment	35%	Written Assessment at the mid-point of the semester.
2	Formative Assessment	25%	Continuous assessment includes: Classroom participation, assignments, presentations, viva voce, attitude and behavior, hands-on-activities, short tests, projects, practical, reflections, readings, quizzes etc.
3	Final Assessment	40%	Written Examination at the end of the semester. It is mostly in the form of a test, but owing to the nature of the course the teacher may assess their students based on term paper, research proposal development, field work and report writing etc.

BS Chemistry Semester-II					
Programme	**BS Chemistry**	**Course Code**	**Chem - 132**	**Credit Hour**	1
Course Title	**Organic Chemistry Lab**		**Course Type**	**Major**	

Course Introduction

The course is organized to provide an adequate knowledge about basic experimental techniques in organic chemistry including chemistry of different functional groups.
Here is a brief description of course outlines:
Organic lab safety and basic lab apparatus and equipment introduction
Basic Experimental techniques used in organic chemistry
Filtration
Simple and fractional distillation
Solvent extraction
Sublimation
Re-crystallization
Compound Analysis
Identification of functional groups in different organic compounds containing only one functional group with special emphasis on compounds containing following functional groups.
-COOH, -OH, C=O, -NH2, and –CONH2
Estimations (volumetric)
Determination of molecular weight of a carboxylic acid.

Learning Outcomes

On the completion of the course, the students will:

1. Learn about the basic purification techniques in organic chemistry
2. will be able to detect the functional groups in different organic compounds
3. will be able to understand the principles of basic lab safety

Course Content		Assignments/Readings
Week 1	Basic experimental techniques used in organic chemistry Filtration Separation of given mixture of glucose and sand by filtration	Enlist all separation techniques and merits and demerits of these technique
Week 2	Distillation Separation of given miscible mixture of water and ethanol by fractional distillation	
Week 3	Solvent Extraction Extraction of caffeine from tea or coffee	Search out different sub techniques used in solvent extraction.
Week 4	Sublimation Separate the mixture of benzoic acid and sand	
Week 5	Re-crystallization Purify the given impure sample of benzoic acid	
Week 6	Chromatography Separate the given mixture of benzoic acid and acetanilide by using thin layer chromatography	Enlist types of chromatography.
Week 7	Column Chromatography Basic concept of column chromatography and demonstration of experimental set-up	

	Separate the mixture of benzoic acid and methyl benzoate from an alumina column.	
Week 8	Mid Term Examinations	
Week 9	Compound Analysis Lecture on functional groups in organic chemistry, preliminary tests, solubility tests and group detection test Melting and boiling point determination	Write down chemistry of all reactions
Week 10	Carboxylic acid Identify the functional groups present in the given sample of oxalic acid	
Week 11	Phenol (water soluble) Identification of resorcinol by functional group detection tests	
Week 12	Phenol (water insoluble) Identification of ∝-naphthol by functional group detection tests	
Week 13	Carbonyl compounds(Aldehydes and ketones) Identify the given sample of glucose	
Week 14	Amide Group Identify the pure sample of urea	
Week 15	Estimations (volumetric) Determine the molecular weight of given carboxylic acid	Practice problems
Week 16	**Final Term Examinations**	

Textbooks and Reading Material

1. 1. K.N. Williamson and K.M. Masters, *Macroscale and Microscale Organic Experiments*, published by Cengage learning, 2011.
2. 2. Practical Organic Chemistry by F.G. Mann and B.C. Saunders, Longman, UK. 1978.
3. The Systematic Identification of Organic Compounds (8^{th} Ed.) by R.L. Shriner et al., Wiley, 2003.
4. Vogel's Textbook of Practical Organic Chemistry (5^{th} Ed.) by A.I. Vogel et al. Longman, UK, 1989.
5. Advanced Practical Organic Chemistry, by J. Leonard, B. Lygo, G. Procter, CRC. 1994.
6. Advanced Practical Organic Chemistry (2^{nd} Ed.) by N.K. Vishnoi, Vikas Publishing House Pvt. Ltd. India, 1996.
7. J.J. Li, C. Limberakis and D.A. Pflum, *Modern Organic Synthesis in Laboratory*, Oxford University Press, 2007.
8. J. Leonard, B. Lygo and G. Procter Nelson, *Advanced Practical Organic Chemistry*, Thomes Ltd. UK, 2001.

Teaching Learning Strategies

1. Quizes
2. Lectures
3. Assignments
4. Group Discussion

Assignments: Types and Number with Calendar
1. Lab activities and practical performance from week 1 to week 16. 2. Literature review based assignment relevant to the course will also be given during the course. 3. Maintain record of all Practicals in note book under the following headings: Theory, Procedure, Chemicals, Observations and Results, Precautions

Assessment

Sr. No.	Elements	Weightage	Details
1	Midterm Assessment	35%	Viva, Written and practical assessment at the mid-point of the semester.
2	Formative Assessment	25%	Continuous assessment includes: Classroom participation, assignments, viva voce, attitude and behavior, hands-on-activities, projects, practical, reflections, readings, quizzes etc.
3	Final Assessment	40%	Viva, Practical performance and written examination at the end of the semester.