Department of Science Education
Institute of Education & Research
University of the Punjab, Lahore

Course Outline

Programme	BS Science Education (1-8)	**Course Code**	SE-308L	**Credit Hours**	1
Course Title	**Chemistry Lab-III (Organic Chemistry Lab)**				

Course Introduction

1) **This course provides students with a comprehensive understanding of the fundamental principles and applications of organic Chemistry. It aims to develop their analytical and problem-solving skills by exploring topics such as Compound Analysis, aliphatic, aromatic, and heterocyclic compounds and their chemical behavior. The course also aims to strengthen analytical thinking skills essential for advanced studies in chemistry and related disciplines.**

Learning Outcomes

On the completion of the course, the students will:

1. Prepare and standardize solutions for laboratory experiments.
2. Investigate reaction kinetics and interpret experimental data.
3. Apply principles for Compound Analysis.
4. Determine physical properties like Basic Experimental techniques used in organic chemistry and Estimations (volumetric).

	Course Content	Assignments/Readings
Week 1	**Orientation** Laboratory safety protocols, chemical handling, Experimentation protocols	
Week 2	**Compound Analysis** Identification of organic compounds containing only one functional group with special emphasis on compounds containing following functional groups. -COOH, -OH, C=O, $-NH_2$, and $-CONH_2$	**Reading:** K.M.Ibne Raza, M.A. Rehman, Abdur Rehman, "Organic Chemistry", The Carvan Book House, Lahore.
Week 3	**Basic Experimental techniques used in organic chemistry: introduction and demonstration**	**Readings:** B.S. Furniss, "Vogel's T.B of Practical Organic Chemistry", Addison Wesley Longman, Inc. 1989.
Week 4	**Basic Experimental techniques used in organic chemistry** Filtration	**Readings:** B.S. Furniss, "Vogel's T.B of Practical Organic Chemistry", Addison Wesley Longman, Inc. 1989.

Week 5	**Basic Experimental techniques used in organic chemistry** Simple and fractional distillation	**Reading** R.L. Shriner, R.C Fuson, D.V. Curtin and T.C Morrill "The systematic identification of organic compounds, 6th ed. John Willey & sons, 1979.
Week 6	**Basic Experimental techniques used in organic chemistry** Solvent extraction	
Week 7	**Basic Experimental techniques used in organic chemistry** Sublimation	**Reading** Frederick George Mann and Saunder, "Practical Organic Chemistry", The English Language Book Society, 1960.
Week 8	**Basic Experimental techniques used in organic chemistry** Re-crystallization	
Week 9	Midterm Exam	
Week 10	**Basic Experimental techniques used in organic chemistry** Column Chromatography	**Reading** Daniel R. Palleras, "Experimental Organic Chemistry , John Willey & Sons" Inc., 2000.
Week 11	**Estimations (volumetric): introduction and demonstration**	
Week 12	**Estimations (volumetric):** Determination of molecular weight of a carboxylic acid	**Readings:** James A. Moore, "Experimental methods in Organic Chemistry", Holt-Saunders Int., 1983.
Week 13	**Estimations (volumetric):** Estimation of amide group and glucose.	**Readings:** James A. Moore, "Experimental methods in Organic Chemistry", Holt-Saunders Int., 1983
Week 14	Quiz	
Week 15	Revision	
Week 16	Quiz	

Textbooks and Reading Material

Textbooks.

1. K.M.Ibne Raza, M.A. Rehman, Abdur Rehman, "Organic Chemistry", The Carvan Book House, Lahore.
2. B.S. Furniss, "Vogel's T.B of Practical Organic Chemistry", Addison Wesley Longman, Inc. 1989.
3. Frederick George Mann and Saunder, "Practical Organic Chemistry", The English Language Book Society, 1960.
4. Daniel R. Palleras, "Experimental Organic Chemistry , John Willey & Sons" Inc., 2000.
5. James A. Moore, "Experimental methods in Organic Chemistry", Holt-Saunders Int., 1983.
6. R.L. Shriner, R.C Fuson, D.V. Curtin and T.C Morrill "The systematic identification of organic compounds, 6th ed. John Willey & sons, 1979.

1. Suggested Readings (Students can explore by themselves)
    1.1. Books
    1.2. Journal Articles/ Reports

Note:

2. It is preferable to use latest available editions of books. Mention the publisher & year of publication.
3. The References/ bibliography may be in accordance with the typing manual of the concerned faculty/subject. Preferably follow APA 7th Edition publication manual.

Teaching Learning Strategies

1. Hands-On Laboratory Experiments
2. Demonstration-Based Learning
3. Problem-Solving Sessions
4. Collaborative Group Work

Assignments: Types and Number with Calendar

Updating Practical books

Two assignments taking before mid-term and remaining two will be the part of final term.

Programme	BS Science Education (1-8)	Course Code	SE-308AL	Credit Hours	1
Course Title	**PHYSICS LAB-III**				

Course Introduction

This lab course provides experimental understanding of heat and thermodynamics. Students perform practical work to verify thermal laws and develop skills in measurement, data analysis, and report writing.

Learning Outcomes

Upon successful completion of this lab course, students will be able to:

1. Perform experiments related to heat, thermodynamics, and thermal properties of matter using standard laboratory apparatus.
2. Measure physical quantities accurately and analyze experimental data with proper error estimation.
3. Verify fundamental thermal laws such as Stefan–Boltzmann law and thermoelectric effects experimentally.
4. Plot graphs, interpret results, and prepare systematic laboratory reports.
5. Demonstrate safe laboratory practices and proper handling of equipment.

Course Content		Assignments/Readings
Week 1	Introduction to laboratory work; Safety rules; Familiarization with instruments.	Lab orientation and notebook preparation.
Week 2	**Exp-1:** Determination of temperature coefficient of resistance of a given wire.	Completion of experiment write-up.
Week 3	**Exp-2:** Determination of Stefan's constant	Checking of practical notebooks.
Week 4	**Exp-3:** Calibration of thermocouple by potentiometer.	Graph plotting and calculations.
Week 5	**Exp-4:** Principle of thermocouple; Thermoelectric EMF and temperature diagram.	Submission of lab report.
Week 6	**Exp-5:** Verification of Stephen-Boltzmann's law of radiation.	Completion of pending write-ups.
Week 7	**Exp-6:** Determining the specific heat capacities of solids	Notebook checking.
Week 8	**Exp-7:** Study of thermal expansion of solids and liquids.	Error analysis practice.
Week 9	Viva voce and final practical examination	Lab report submission.
Week 10	**Exp-8:** Determination of thermal and electrical conductivity of metals	Graph checking and corrections.
Week 11	**Exp-9:** To determine thermal emf and plot temperature diagram	Completion of practical record.

Week 12	**Exp-10:** To determine the Thermal conductivity of good and bad conductors using Lee's apparatus	Notebook checking.
Week 13	**Exp-10:** To determine the Thermal conductivity of good and bad conductors using Searl's apparatus	Submission of complete practical file.
Week 14	**Exp-12:** Determination of "J" by Callender – Barnes method	Correction and improvement of record.
Week 15	Repeat/Improvement of experiments and completion of record.	Final checking of notebooks.
Week 16	Repeat/Improvement of experiments and completion of record.	Viva voce preparation.

Textbooks and Reading Material

Textbooks.

1. *Physics laboratory experiments by J. D. Wilson, Cengage Learning (2014).*
2. *General Physics Laboratory I Experiments by K. Clara Castoldi, Kendall Hunt, (2015).*
3. *Physics Lab Experiments by M. French, Mercury Learning & Information, (2016).*
4. *Experiments And Demonstrations In Physics: Bar-ilan Physics Laboratory by Kraftmakher Yaakov, World Scientific (2014).*

Suggested Readings

1. *Physics Lab Experiments by M. French*, *Mercury Learning & Information*, Journal Articles/ Reports

Teaching Learning Strategies

1. Brief pre-lab lecture explaining theory and procedure
2. Demonstration of apparatus and experimental techniques
3. Hands-on performance of experiments by students
4. Supervised data collection and error analysis
5. Maintenance of laboratory notebook/record
6. Post-lab discussion and result evaluation
7. Viva voce to assess conceptual understanding

Assignments: Types and Number with Calendar

Total Assignments: 3

1. **Assignment–1:** Lab Report Writing (Temperature Coefficient / Thermocouple Experiment) – **Week 5**
2. **Assignment–2:** Numerical Problems & Error Analysis (Stefan–Boltzmann Law / Specific Heat) – **Week 9**
3. **Assignment–3:** Complete Practical File Submission & Viva Preparation – **Week 14**
4. Submission of each assignment will be within one week of issuance and will contribute to sessional marks as per Institute policy.