- Final Exam

Mapping of COs to Assessment Rubrics:

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO 1	✓	✓		✓
CO 2	✓	✓		✓
CO 3	✓		✓	✓
CO 4	✓	✓		✓
CO 5	✓			✓

University of Kerala

Discipline	CHEMISTRY
Course Code	**UK1DSCCHE105**
Course Title	**GENERAL CHEMISTRY I**

Type of Course	**DSC**				
Semester	1				
Academic Level	100 – 199				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	4	3 hours	-	2 hours	5
Pre-requisites	1. Basic knowledge and interest in science				
Course Summary	This course covers the fundamentals of scientific methodology, the evolution of chemistry, the contributions of notable scientists, chemistry's role in everyday life, lab safety, analytical principles, and practical experiments focusing on volumetric analysis and laboratory safety. Through theoretical understanding and hands-on experiments, students will gain essential knowledge and skills for a deeper comprehension of chemistry and its applications in various fields.				

Detailed Syllabus:

Module	Unit	Content GENERAL CHEMISTRY I	Hrs 75
I	**METHODOLOGY OF CHEMISTRY**		**9**
	1	Definition of Science. Scientific methods - observation-posing a question - formulation of hypothesis- experiment – theory - law. Falsification of hypothesis - inductive and deductive reasoning- revision of scientific theories and laws.	3
	2	Evolution of Chemistry-ancient speculation on the nature of matter. Early form of chemistry - alchemy, origin of modern chemistry. Structure of chemical science: Scope, theory and experiment - branches of chemistry.	3
	3	Role of chemistry as a central science connecting physics, biology and other branches of science. Interdisciplinary areas involving chemistry: Nanotechnology and biotechnology.	3
II	**POPULAR SCIENTISTS IN CHEMICAL SCIENCE**		**9**
	4	Some popular scientists and their contributions to the evolution of chemistry - Antoine Lavoisier, Dmitri Mendeleev, Marie Curie, Robert Boyle, John Dalton, Linus Pauling, Joseph Priestley, Friedrich Wöhler, J.J. Thomson, Amedeo Avogadro	6
	5	Women scientists in chemical science - Rosalind Franklin, Alice Ball, Dorothy Hodgkin, Gertrude Elion	3
III	**CHEMISTRY IN EVERYDAY LIFE**		**9**
	6	Household materials – Major chemical ingredients (No structural formula and preparation needed), Match Box-Soap- detergent— cooking gas –tooth paste – shampoo hair - dye- nail polish- whitener-moth balls, house hold bleach	5
	7	Method of action and possible hazards/toxicity of explosive chemicals, propellants –fire crackers.	4
IV	**LAB SAFETY & ANALYTICAL PRINCIPLES**		**18**

	8	Lab safety measurements: Awareness of material safety data sheet (MSDS), safe storage and handling of hazardous chemicals, simple first aids; electric shocks, fire, cut by glass and inhalation of poisonous gas, Accidents due to acids and alkalies, burns due to phenol and bromine, disposal of waste chemicals, Personal protective Equipment (PPE)	6
	9	Atomic mass - Molecular mass - Mole concept – Molar volume - Oxidation and reduction – Equivalent mass. Methods of expressing concentration: Molality, molarity, normality, ppm, and mole fraction. Dilution formula, Theory of volumetric analysis – Acid-base, redox, and complexometric titrations: acid-base, redox, and complexometric indicators. Principles in the separation of cations in qualitative analysis - Applications of common ion effect and solubility product - Microanalysis and its advantages. Accuracy & Precision (mention only).	12
V	**PRACTICALS**		**30**
	10	1. **Laboratory Safety** - Importance of lab safety – Burns – Eye accidents – Cuts – Gas poisoning – Electric shocks –Treatment of fires – First Aid and Treatment of Fires- Precautions and preventive measures. 2. **Volumetric Analysis (Any 5 experiments (double titration))** • Preparation of standard solutions. • Neutralization Titrations (i) Strong acid – strong base (ii) Weak acid – strong base (iii) Strong acid – weak base • Redox Titrations Permanganometry: (i) Estimation of oxalic acid. (ii) Estimation of Fe^{2+}/$FeSO_4.7H_2O$/Mohr's salt. (**Make sure that for students opting chemistry as second minor, the experiments are not overlapping with first minor)**	15
	11	3. **Open-ended experiments (Any 3)** a. Determination of hardness of water. b. Iodimetry and Iodometry: Estimation of Iodine/copper/ chromium. c. Determination of acetic acid content in vinegar by titration with NaOH. d. Determination of alkali content in antacid tablets by titration with HCl. e. Determination of available chlorine in bleaching powder. **(Other related experiments suggested by the teacher may be conducted)**	15

References:

1. C.N.R. Rao, *University General Chemistry*, MacMillan India Ltd.
2. Shashi Chowla; *Engineering Chemistry*, Danpat Rai Publication.

3. B.K. Sharma; *Industrial Chemistry*. Goel Publishing House, Meerut, 2003.
4. Singh, K., *Chemistry in Daily Life;* Prentice Hall of India, New Delhi, 2008.
5. D.A. Skoog, D.M. West, F.J. Holler and S.R. Crouch, *Fundamentals of Analytical Chemistry*, 8th Edition, Brooks/Cole, Thomson Learning, Inc., USA, 2004.
6. 4. J. D. Lee, *Concise Inorganic Chemistry*, 5th edn., Blackwell Science, London, 2010.
7. B.R. Puri, L.R. Sharma and K.C. Kalia, *Principles of Inorganic Chemistry*, 31st Edition, Milestone Publishers and Distributors, New Delhi, 2013.
8. Satya Prakash, *Advanced Inorganic Chemistry*, Volume 1, 5th Edition, S. Chand and Sons, New Delhi, 2012.
9. J. Mendham, R.C. Denney, J. D. Barnes and M. Thomas, *Vogel's Text Book of Quantitative Chemical Analysis*, 6th Edition, Pearson Education, Noida, 2013.
10. R. Gopalan, *Inorganic Chemistry for Undergraduates*, Universities Press, Hyderabad, 2009.
11. *Vogels Textbook of Quantitative Chemical Analysis*, 6thEdn., Pearson Education Ltd.

Course Outcomes

No.	Upon completion of the course the graduate will be able to	Cognitive Level	PSO addressed
CO-1	Analyse the evolution and structure of chemical science, apply scientific methods and reasoning to revise theories, and evaluate the interdisciplinary role of chemistry in connecting and advancing fields such as physics, biology, nanotechnology, and biotechnology.	An	PSO – 3,4,5
CO-2	analyse the pioneering contributions of key scientists, including women scientists, in shaping the evolution of chemical science and critically evaluate their impact on the development of major chemical concepts and discoveries.	An	PSO –3,4
CO-3	Evaluate the chemical composition, functional roles, and potential health or environmental hazards of common household materials and explosive substances, including their methods of action and associated risks.	E	PSO –3,4
CO-4	Design and implement safe and effective laboratory practices by applying foundational chemical concepts such as mole calculations, solution concentration, volumetric analysis, and qualitative separation techniques, while ensuring proper handling of hazardous materials, first aid response, and adherence to safety protocols including PPE, MSDS, and	C	PSO – 1,2,3,4

	chemical waste disposal.		
CO-5	Design and perform standard volumetric and instrumental analytical experiments to prepare solutions, estimate analytes through acid-base, redox, and complexometric titrations, and apply suitable methods for quantitative chemical analysis with scientific reasoning.	C	PSO – 1,2,3,4,5

R-Remember, U-Understand, Ap-Apply, An-Analyse, E-Evaluate, C-Create

Name of the Course: GENERAL CHEMISTRY I

Credits: 3:0:1 (Lecture:Tutorial:Practical)

CO No.	CO	PO/ PSO	Cognitive Level	Knowledge Category	Lecture (L)/ Tutorial (T)	Practical (P)
1	CO-1	PO-1,6,8 PSO –3,4,5	An	M, F	L	-
2	CO-2	PO-1,6,8 PSO –3,4	An	F, C	L	-
3	CO-3	PO-1,5,6,8 PSO –3,4	E	M, F	L	-
4	CO-4	PO-1,8 PSO –1,2,3,4	C	F, C	L	-
5	CO-5	PO-1,2,6 PSO –1,2,3,4,5	C	P	-	P

F-Factual, C- Conceptual, P-Procedural, M-Metacognitive

Mapping of COs with PSOs and POs:

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO 1	-	-	1	1	1	1	-	-	-	-	1	-	2
CO 2	-	-	1	1	-	1	-	-	-	-	1	-	2
CO 3	-	-	1	1	-	1	-	-	-	1	1	-	2
CO 4	1	1	3	2	-	1	-	-	-	-		-	2
CO 5	2	2	3	3	2	2	-	-	-	-	2	-	-