Discipline	**CHEMISTRY**				
Course Code	**UK2DSCCHE106**				
Course Title	**GENERAL CHEMISTRY II**				
Type of Course	**DSC**				
Semester	2				
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. Higher secondary level science knowledge 2. First semester DSC (Chemistry) offered by UoK (preferable)				
Course Summary	This course provides an overview of nanoscience, green chemistry, biomolecules, environmental and fuel chemistry. Through understanding nano systems, green chemistry principles, biomolecule structures, environmental threats, and fuel sources, students will gain insights into the interdisciplinary nature of chemistry and its applications in addressing global challenges. Practical experiments complement theoretical learning, offering hands-on experience in chemical and environmental analysis.				

Detailed Syllabus:

Module	Unit	Content GENERAL CHEMISTRY II	Hrs 75
I	**INTRODUCTION TO NANO SCIENCE**		**9**
	1	Terminology. Scales of nano systems. Evolution of nanoscience- Historical aspects, preparations containing nano gold in traditional medicine. Lycurgus cup- Faraday's divided metal etc. Nano systems in nature.	3
	2	Different types of nanoparticles. Classification of nanomaterials based on dimension with examples for each 0D, 1D, and 2D. Carbon nanotubes, Types of Carbon nanotubes – SWCNT and MWCNT, fullerenes, graphene - (basic concept only, no classification required) Applications of nanomaterials.	6
II	**GREEN CHEMISTRY**		**9**
	3	Role of Chemical Industries in polluting the Environment. Limitations of conventional waste management and pollution prevention-birth of green chemistry.	2
	4	Introduction to the principles of green chemistry atom economy calculation (simple reactions), Production of Ibuprofen-less hazardous chemical syntheses, designing safer chemicals.	3
	5	Bhopal gas tragedy- new greener syntheses, safer solvents and auxiliaries' ionic liquids-super critical fluids CO_2 and H_2O and their advantages.	3
	6	Green chemistry practices in research, educational and commercial laboratories (Basic idea only).j	1

III	**CHEMISTRY OF BIOMOLECULES**		**9**
	7	Carbohydrates - Introduction - classification, structure, common examples and biological significance.	2
	8	Introduction to lipids - classification to fats, phospholipids, steroids, and waxes, properties and biological functions	2
	9	Amino acids – essential amino acids – peptide bond formations – proteins, introduction to primary, secondary, tertiary and quaternary structures, protein denaturation, enzymes.	3
	10	Introduction to nucleic acids: DNA and RNA structure, functions, and types	2
IV	**ENVIRONMENTAL CHEMISTRY, FUEL CHEMISTRY**		**18**
	11	Nature of environmental threats and role of chemistry. Greenhouse effect, ozone layer and its depletion.	4
	12	Water pollution: Various factors affecting purity of water, sewage water, industrial waste, agricultural pollution such as pesticides, fertilizers, detergents, treatment of industrial waste water using activated charcoal, synthetic resins, reverse osmosis, electrodialysis. -Dissolved oxygen-BOD, COD.	5
	13	Review of energy sources (renewable and non-renewable). Classification of fuels and their calorific value. Coal: Uses of coal (fuel and nonfuel) in various industries, its composition, carbonization of coal. Coal gas, producer gas and water gas — composition and uses. Uses of coal tar-based chemicals.	3
	14	Petroleum and Petrochemical Industry: Composition of crude petroleum, Refining and different types of petroleum products and their applications. Petroleum and non-petroleum fuels (LPG, CNG, LNG, bio-gas, fuels derived from biomass), fuel from waste, synthetic fuels (gaseous and liquids), clean fuels.	4
	15	Lubricants: Classification of lubricants, lubricating oils (conducting and non-conducting) Solid and semisolid lubricants, synthetic lubricants.	2
V	**PRACTICALS**		**30**
	16	**A. (Any 5 experiments)** 1. Determination of dissolved oxygen in water. 2. Determination of Chemical Oxygen Demand (COD) 3. Determination of Biological Oxygen Demand (BOD) 4. Percentage of available chlorine in bleaching powder. 5. Measurement of chloride, sulphate and salinity of water samples by simple titration method ($AgNO_3$ and potassium chromate). 6. Estimation of total alkalinity of water samples (CO_3^{2-}, HCO_3^-). 7. Measurement of dissolved CO_2. 8. Study of some of the common bio-indicators of pollution. 9. Estimation of SPM in air samples. 10. Preparation of borax/ boric acid.	15
	17	**B. Open-ended experiments (Any 3)** **(From the above list or other related experiments suggested by the teacher may be conducted)**	15

References:

1. V. S. Muraleedharan and A. Subramania, *Nanoscience and nanotechnology*, Ane Books Pvt. Ltd. New Delhi, 2009.
2. T. Pradeep, *Nano: The Essentials*, McGraw-Hill education, New Delhi,2006.
3. Poole, C.P. & Owens, F.J. *Introduction to Nanotechnology* John Wiley & Sons, 2003.
4. Ahluwalia, V.K. & Kidwai, M.R. *New Trends in Green Chemistry*, Anamalaya Publishers (2005).
5. Anastas, P.T. & Warner, J.K.: *Green Chemistry - Theory and Practical*, Oxford University Press (1998).
6. Finar, I. L. *Organic Chemistry (Volume 2)*, Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).
7. Nelson, D. L. & Cox, M. M. *Lehninger's Principles of Biochemistry* 7th Ed., W. H.
8. Freeman. Girard, J.E, (2011), *Principles of Environmental Chemistry*, Jones & Bartlett India Pvt. Limited.
9. Sodhi, G.S. ((2013), *Fundamental Concepts of Environmental Chemistry*, Narosa
10. Jain, P.C. & Jain, M. *Engineering Chemistry*, Dhanpat Rai & Sons, Delhi.
11. Sharma, B.K. & Gaur, H. *Industrial Chemistry*, Goel Publishing House, Meerut (1996).
12. Maria C Suros, Environmental Sampling and Analysis, CRC press, Taylor & Francis, 1997.

Course Outcomes

No.	Upon completion of the course the graduate will be able to	Cognitive Level	PSO addressed
CO-1	Gain a basic understanding of nanoscience and nanomaterials.	An	PSO-5
CO-2	Equip with the basic knowledge to apply green chemistry principles for sustainable and environmentally responsible chemical practices.	An, E	PSO-4
CO-3	Understand the structures, functions, and significance of biomolecules, enabling to know fundamental aspects of biochemistry and molecular biology	An	PSO-1
CO-4	Possess the knowledge on various environmental threats and gain basic ideas to develop sustainable solutions for various environmental challenges. Gain a basic understanding of energy sources, fuels, and lubricants, to analyze, select, and utilize appropriate resources for various applications.	An, C	PSO-4
CO-5	Develop essential laboratory skills, analytical	Ap, An	PSO-2

	techniques, and an understanding of environmental monitoring methods		

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

Name of the Course: GENERAL CHEMISTRY II

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 PSO-5	An	C	L	
2	CO-2	PO-3 PSO-4	An, E	P	L	
3	CO-3	PO-2 PSO-1	An	C	L	
4	CO-4	PO-3 PSO-4	An, C	M	L	
5	CO-6	PO-6 PSO-2	Ap, An	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	-	-	-	-	3	3	-	-	-	-	-	-	-
CO 2	-	-	-	2	-	-	-	2	-	-	-	-	-
CO 3	2	-	-	-	-	-	-	2	-	-	-	-	-
CO 4	-	-	-	-	-	-	-	-	-	-	-	-	-
CO 5	-	-	-	2	-	-	-	2	-	-	-	-	-

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium

3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Quiz/ Discussion / Seminar
- Midterm Exam
- Programming Assignments
- 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	**UK2MDCCHE100**
Course Title	**CHEMISTRY IN EVERYDAY LIFE**