University of Kerala

Discipline	CHEMISTRY				
Course Code	**UK3DSCCHE206**				
Course Title	**GENERAL CHEMISTRY III**				
Type of Course	**DSC**				
Semester	3				
Academic Level	200 - 299				
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 & second semester DSCs (chemistry) offered by UoK (preferable)				
Course Summary	The course delves into the chemistry behind drugs, food additives, energy production and storage, fertilizers, explosives, and polymers. Through theoretical exploration and practical experiments, students will gain a comprehensive understanding of the synthesis, properties, and applications of these substances, contributing to fields such as medicine, agriculture, energy, and materials science. The course emphasizes the interdisciplinary nature of chemistry and its significance in addressing societal needs and challenges related to health, food safety, energy, and environmental sustainability.				

Detailed Syllabus:

Module	Unit	Content GENERAL CHEMISTRY III	Hrs 75
I	**CHEMISTRY OF DRUGS & FOOD ADDITIVES**		**18**
	1	Classification of drugs- analgesic, antipyretic, antibiotic, hypnotics, sulpha drugs, antacids, antimalarials with examples – Mode of action of sulpha drugs	6
	2	Structure of aspirin, sulphaguanidine, Paracetamol Drugs of plant origin-anticancer compounds from plants (elementary idea only)	3
	3	Food additives – definition. Preservatives (examples), Food colours - permitted and non-permitted (examples), Toxicology. Flavours - natural and synthetic (examples)	3
	4	Artificial sweeteners (examples), Emulsifying agents (examples), Antioxidants (examples), Leavening agents (examples) and Flavour enhancers (examples). Importance of food additives.	3

	5	Soft drinks - formulation and health effects. Health drinks. Fast foods and junk foods and their health effects. Food adulteration (with examples). Food laws and standards. Food Safety and Standards Act, 2006.	3
II	**CHEMISTRY FOR ENERGY PRODUCTION & STORAGE**		**9**
	6	Primary and secondary batteries, battery components and their role	2
	7	Characteristics of Battery. Working of following batteries: Pb acid, Li-Battery, Solid state electrolyte battery.	4
	8	Fuel cells, Solar cell and polymer cell.	3
III	**FERTILIZERS & EXPLOSIVES**		**9**
	9	Different types of fertilizers. Manufacture of the following fertilizers: Urea, ammonium nitrate, calcium ammonium nitrate, ammonium phosphates; polyphosphate, superphosphate, compound and mixed fertilizers, potassium chloride, potassium sulphate.	6
	10	Origin of explosive properties in organic compounds, preparation and explosive properties of lead azide, PETN, cyclonite (RDX). Introduction to rocket propellants.	3
IV	**POLYMERS**		**9**
	11	Introduction. Classification of polymers: Natural, synthetic; linear, cross-linked and network; plastics, elastomers, fibres; homopolymers and copolymers. Polymerization reactions.	3
	12	Typical examples: Polyethylene, polypropylene, PVC, phenol-formaldehyde and melamine formaldehyde resins, polyamides (nylons) and polyesters.	4
	13	Natural rubber: structure, latex processing methods, vulcanization and uses.	
	14	Synthetic rubbers: SBR, nitrile rubber and neoprene. Biodegradability of polymers, environmental hazards. Recycling of plastics.	2
V	**PRACTICALS**		**30**
	15	**Section A:** **I. REACTIONS OF THE FOLLOWING CATIONS:** Hg^{+}, Pb^{2+}, Ag^{+}, $Hg^{2+,}$ Bi^{3+}, Cd^{2+}, As^{3+}, Sb^{3+}, Sn^{2+}, Sn^{4+}, Fe^{3+}, Al^{3+}, Cr^{3+}, Mn^{2+}, Zn^{2+}, Ni^{2+}, Cd^{2+}, Ba^{2+}, Ca^{2+}, Sr^{2+}, Mg^{2+} and NH_4^{+}. **II. SYSTEMATIC ANALYSIS OF TWO CATIONS IN A MIXTURE** The cations must be provided in solutions. A student must analyze **at least 5 mixtures** containing two cations each. **OR** **Section A: Organic Qualitative Analysis (Any 5 compounds with different functional groups are compulsory)** Systematic analysis with a view to identify the organic compound (aromatic – aliphatic, saturated – unsaturated, detection of elements and detection of functional groups) – polynuclear hydrocarbons, alcohols, phenols, halogen compounds, nitro compounds, amino compounds, aldehydes, ketones, carboxylic acids, amides, urea, thiourea and esters. Only monofunctional compounds are to be given.	15

		(Make sure that the practicals conducted for second minor students are different from that of first minor DSC)	
	16	**Section B: OPEN ENDED PRACTICALS (Any 3 experiments)** 1. Test for the presence of food additives in common food items by spot tests or chromatography techniques and known food additives as reference standards. 2. Measurement of the acidity of soft drinks by pH indicator strips or a pH meter. 3. Investigation of the antioxidant properties of different food items calorimetrically using a known antioxidant (e.g., vitamin C) as standard. 4. Detection of common adulterants in food products such as starch in milk, synthetic colors in spices, or urea in edible oils. 5. Construction of simple galvanic cell. 6. Measurement of pH of solutions prepared from different fertilizers. **(May be selected from the list or the teacher can add experiments)**	15

References:

1. D. Sriram and P. Yogeeswari, *Medicinal Chemistry* 2nd edn. Pearson, 2011.
2. G R Chatwal and Anand, *Synthetic Drug* Himalaya Publishing House, New Delhi.
3. G. R. Chatwal, *Organic Chemistry of Natural Products* Vol. I and II, Himalaya Publishing House, New Delhi.
4. B. Sreelakshmi, *Food Science,* New Age International, New Delhi.
5. J. A. Kent: Riegel's Handbook of Industrial Chemistry, CBS Publishers, New Delhi.
6. P. C. Jain & M. Jain: Engineering Chemistry, Dhanpat Rai & Sons, Delhi.
7. R. Gopalan, D. Venkappayya, S. Nagarajan: Engineering Chemistry, Vikas Publications, New Delhi.
8. B. K. Sharma: Engineering Chemistry, Goel Publishing House, Meerut.
9. R. M. Felder, R. W. Rousseau: *Elementary Principles of Chemical Processes*, Wiley Publishers, New Delhi.
10. S.L. Tisdale; W. L. Nelson and J. D. Beaton, *Soil Fertility and Fertilizers,* Macmillan Publishing Company, New York, 1990.
11. K. H. Buchel, *Chemistry of Pesticides,* John Wiley & Sons, New York, 1983.
12. V.R. Gowarikar, N.V. Viswanathan, J. Sreedhar, *Polymer Science*, 2nd edn., New Age International Pvt. Ltd., 2015.

Course Outcomes

No.	Upon completion of the course the graduate will be able to	Cognitive Level	PSO addressed
CO-1	Analyze the classification, structure, and mechanism of drugs	An	PSO-1,2

	and food additives, analyze their roles, sources, and health impacts, and interpret food safety regulations including the Food Safety and Standards Act, 2006, to develop an informed understanding of public health and chemical safety.		
CO-2	Analyze the construction, components, working principles, and performance characteristics of primary and secondary batteries, including fuel cells, solar cells, lithium-based and polymer cells, with emphasis on their electrochemical mechanisms and applications.	An	PSO-1,2,3,4
CO-3	Evaluate the chemical principles, manufacturing processes, and applications of major industrial fertilizers and explosives, including their structural basis, reactivity, and role in agricultural and defense technologies.	E	PSO-1,2,3,4
CO-4	Evaluate the classification, synthesis, structural characteristics, and applications of natural and synthetic polymers—including rubbers and resins—while evaluating their environmental impact, biodegradability, and strategies for sustainable management through recycling.	C	PSO-1,2,3,4
CO-5	Develop the ability to systematically identify inorganic and organic compounds through qualitative analysis, apply analytical techniques in open-ended experimental contexts related to real-world chemical and environmental problems, and interpret data to draw meaningful scientific conclusions.	C	PSO-1,2,3,4

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

Name of the Course: GENERAL CHEMISTRY III

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 PSO-1,2	An	F, C	L	-
2	CO-2	PO-1,6 PSO-1,2,3,4	An	F, C, P	L	-
3	CO-3	PO-1,6 PSO-1,2,3,4	E	C, P	L	-

4	CO-4	PO-1,6 PSO-1,2,3,4	C	C, P	L	-
5	CO-5	PO-1,6 PSO-1,2,3,4	C	C, P	L	-

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	2	-	-	-	1	-	-	-	-	2		
CO 2	2	3	3	1	-	1	-	-	-	-	2		
CO 3	2	3	3	1	-	1	-	-	-	-	2		
CO 4	2	3	3	1	-	1	-	-	-	-	2		
CO 5	1	2	3	2	-	1	-	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	✓	✓		✓