University of Kerala

Discipline	CHEMISTRY				
Course Code	**UK5SECCHE300**				
Course Title	**ANALYTICAL SKILLS**				
Type of Course	**SEC**				
Semester	5				
Academic Level	300 - 399				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	3	2 hours	-	2 hours	4
Pre-requisites	1.Basic knowledge, interest and lab skills in chemistry				
Course Summary	The course covers different concentration terms, various parameters of water, water quality analysis, components of soil ad its analysis, detection of carbohydrate, estimation of sugar, common food adulterants and its detection.				

Detailed Syllabus:

Module	Unit	Content ANALYTICAL SKILLS	Hrs 60
I	**INTRODUCTION TO CONCENTRATION TERMS**		**6**
	1	Molality, molarity, normality,	2
	2	Mole fraction, mass percentage, ppm, ppb	2
	3	Simple numerical problems.	2
II	**WATER ANALYSIS**		**9**
	4	Composition- Hardness testing- Chromatographic analysis- pH – Salinity testing- Ionic composition – Minerals- Pollutants – DO, BOD, COD, EC, DTC	3
	5	Nutrient Parameters – Portability of Water, Heavy Metal Testing, Types of Heavy metals- Toxicity testing- Biological methods - Chemical Methods	3
	6	Microscopical methods- AAS- Spectrophotometer- CPES-Flame Photometer- Hydrocarbon testing (PAH).	3
III	**SOIL ANALYSIS**		**5**
	7	Definition of Soil, Soil Components: Air, Water, inorganic and organic solids. Formation of Soil, Physical Properties	1
	8	Types of Soils & Basic Concepts Properties of Soil (Chemical Properties and Biological Properties), Fertility of Soils, soil deficiency with respect to macro and micronutrient components,	2
	9	Brief study of micronutrient & macronutrient, sources & Importance, Remedial measures to overcome deficiencies.	2
IV	**SUGAR & FOOD ANALYSIS**		**10**

	10	Introduction to carbohydrate, classification, Method for glucose estimation - Enzymatic method, Chemical method	2
	11	Estimation of glucose in urine sample, Estimation of glucose in CSF sample, Normal values, GTT	2
	12	Introduction Food additives, Preservatives, antioxidants, artificial sweeteners, flavors, flavor enhancers, stabilizers.	2
	13	General Analytical methods for milk, milk constituents and milk products like ice cream, milk powder, butter, margarine, cheese including adulterants.	4
V	**PRACTICAL[Any 8 practical, minimum 4 from 1 to 6 and the remaining from open ended]**		**30**
	1.	Estimation of hardness of water	
	2.	Determination of pH of soil	
	3.	Determination of pH and electrical conductivity of soil	
	4.	Determination of organic carbon in soil	
	5.	Detection of carbohydrate – Benedict test, Molisches test, Iodine test.	
	6.	Detection of food adulterant in milk, honey, ghee, sugar and vegetables	
	OPEN ENDED		
	7.	Estimation of glucose	
	8.	Detection of heavy metals in water	
	9.	Detection of nutrients in soil	
	10.	Seminar presentations, group discussions, debates, quizzes, case studies, hands on training etc on the above modules -search for different concentration terms in scientific literature, product labels or everyday life to describe the amount of solute in a solution -concentration of a given solute in solution using different concentration terms – collection of water samples from different sources and analysing them for various parameters such as pH, dissolved oxygen, turbidity, conductivity, and specific ions – Analyse and compare with standard soil samples from different locations – discussions on current issues and controversies related to sugar and food analysis, sugar substitutes, food labelling regulations and public health initiatives etc. **(Or any other related activities introduced by the teacher)**	

References

1. De., *Environmental Chemistry*, 6th Edition, New Age International
2. *Environmental studies*; Dr. K. Mukkanti, S. Chand &Camp Ltd
3. B.A. Yagodin (Ed). *Agricultural Chemistry*, 2 Volumes, Mir Publishers (Moscow), 1976.
4. Swaminathan M. *Text Book on Food chemistry, Printing and Publishing CO., Ltd., Bangalore.* 1993.
5. Norman N. Potter, *Food science*, *CBS publishers and distributors, New Delhi.* 1994.
6. Ramakrishnan S., Prasannam K.G and Rajan R –*Principles. Text book of medical biochemistry. Orient Longman* Ltd. III ed. 2001.

Course Outcomes

No.	Upon completion of the course the graduate will be able to	Cognitive Level	PSO addressed
CO-1	Develop skills in preparing different concentration of solutions	Ap	PSO-1,2,3,4
CO-2	Analyse different components present in water	An	PSO-1,2,3,4
CO-3	Develop skills on analysing different types of soil	E	PSO-1,2,3,4
CO- 4	Analyse different types of carbohydrate	C	PSO-1,2,3,4
CO- 5	Develop an idea about different food adulterants and skills in handling it.	C	PSO-1,2,3,4

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

Name of the Course: ANALYTICAL SKILLS

Credits: 2:0:1 (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-1,2,3,4	Ap	F	L	-
2	CO-2	PO-1,2,3,8 PSO-1,2,3,4	An	C, P	L/T	-
3	CO-3	PO-1,6 PSO-1,2,3,4	E	F, C	L/T	-
4	CO- 4	PO-1,2,3,8 PSO-1,2,3,4	C	C, P	L	-
5	CO- 5	PO-1,6,8 PSO-1,2,3,4	C	C, P	L/T	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	2	3	3	2	-	1	-	-	-	-	3	-	-
CO 2	2	3	3	2	-	2	1	1	-	-	-	-	2

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