SEMESTER-II

Mahatma Gandhi University
Kottayam

Programme	**BSc (Hons) CHEMISTRY**					
Course Name	**Fundamentals of Chemistry-2**					
Type of Course	**DSC A**					
Course Code	MG2DSCCHE100					
Course Level	**100-199**					
Course Summary	This course provides a basic understanding of the physical nature of matter, reactions in organic chemistry and the analytical tools for chemical investigations and identifications.					
Semester	II	Credits			4	Total Hours
Course Details	Learning Approach	Lecture	Tutorial	Practical	Others	
		3		1		75
Pre-requisites, if any						

COURSE OUTCOMES (CO)

CO No.	Expected Course Outcome	Learning Domains *	PO No
1	Make use of fundamental principles of analytical chemistry to solve quantitative titrimetric problems.	A	1,2
2	Classify various types of organic reactions based on their mechanisms.	U	1,2
3	Describe the fundamental principles governing the behaviour of different states of matter.	U	1,2
4	Compare and contrast the properties of solids, liquids, and gases.	An	1,2
5	Apply the basic principles of analytical chemistry in preparation of standard solutions, acid-base titrations and in the determination of viscosity and surface tension.	S	1,2,10

**Remember (K), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create (C), Skill (S), Interest (I) and Appreciation (Ap)*

COURSE CONTENT

Content for Classroom transaction (Units)

Module	Units	Course description	Hrs	CO No.
1	**Basic Concepts in Analytical Chemistry**			
	1.1	Molecular mass - mole concept. Oxidation and reduction (electron concept only)	2	1
	1.2	Titrimetric analysis - fundamental concepts-analyte, end point, indicators etc. Methods of expressing concentration: Weight percentage, molality, molarity, normality, mole fraction, ppm and ppb. Primary and secondary standards, quantitative dilution – problems	6	1
	1.3	Acid base concepts Arrhenius definition, Bronsted-Lowry definition and conjugate acid-base pairs, Lewis concept, ionization of acids and bases.	2	1
	1.4	Acid base titrations- strong acid -strong base, strong acid – weak base, weak acid – strong base weak acid – weak base - pH indicators (phenolphthalein and methyl orange), redox titrations	5	1
2	**Introduction to Organic Reactions**			
	2.1	Representation of organic molecules: projection formulae (Fischer, Sawhorse, Flying wedge and Newman)	3	2
	2.2	Types of reagents: electrophiles and nucleophiles	1	2
	2.3	Addition reactions: Markovnikov's addition, peroxide effect. Elimination reactions: E_1 and E_2 mechanism. Substitution reactions (SN_1, SN_2 reactions of alkyl halides only).	8	2
	2.4	Polymers- Basic concepts. Addition polymerisation (polyethylene, PVC)	3	2
3	**States of matter**			

	3.1	Matter and its different states (elementary idea only), intermolecular forces: dipole-dipole interaction, dipole-induced dipole interaction and induced dipole-induced dipole interaction, ion-dipole interaction, hydrogen bonding: intra and intermolecular hydrogen bonds- effect on physical properties.	4	3,4
	3.2	Gaseous state: - postulates of kinetic theory, ideal and real gas behaviour, compressibility factor deviation from ideal behaviour, van der Waals equation (no derivation)	4	3,4
	3.3	Liquid state: properties of liquids: vapour pressure, boiling point, surface tension, viscosity.	3	3, 4
	3.4	Solid state: types of solids: crystalline and amorphous solids: ionic solids: unit cell, crystal systems, Bravais lattices.	4	3,4
4	**Fundamentals of Chemistry-2 Practical**			
	1. Calibration of apparatus -Standard flask and preparation of standard molar solutions of any two primary standards-Oxalic acid, Mohr's Salt, Na_2CO_3. 2. Determination of pH of different water sources, common acids and bases using pH meter/pH strips 3. Acid base titration- acidimetry and alkalimetry: titration of strong acid vs. strong base, strong acid vs. weak base and weak acid vs. strong base. 4. Estimation of citric acid in citrus fruits. 5. Determination of viscosity of liquids using Ostwald viscometer. 6. Determination of surface tension of liquids using stalagmometer. 7. Identification of substances by physical properties such as colour, melting point, boiling point, solubility, density etc.		30	5
5	**Teacher Specific content**			

Teaching and Learning Approach	**Classroom procedure (mode of transaction)** Lecture sessions, interactive sessions including discussions, demonstrations, and experiments to engage students actively and visual aids like presentations, videos, and models to enhance understanding, encourage students to ask questions during

	or after the lectures, begin with safety instructions and guidelines for lab work. Allow students to conduct experiments under supervision (for lab work).
Assessment Types	**MODE OF ASSESSMENT** **C. Continuous Comprehensive Assessment (CCA)** **Theory (25 marks)** Assignments/MCQ/Viva/Involvement in classroom activitie **Practical (15 marks)** Lab involvement/report /Lab test
	D. Semester end examination **Theory (50 marks)- 1.5 hrs** i) MCQ 10 questions : 10 X 1 = 10 ii) Short answer 4 questions (out of 6): 4 X 3 =12 iii) Short essay 4 questions (out of 6): 4 X 7 = 28 **Practical (35 marks)-1 hr.** Lab report: 10 Viva: 10 Writing procedure: 15

References

1. D.A. Skoog, D.M. West, F.J. Holler and S.R. Crouch, *Fundamentals of Analytical Chemistry*, 8th Edn., Brooks/Cole, Thomson Learning, Inc., USA, 2004.

2. J. Mendham, R.C. Denney, J. D. Barnes and M. Thomas, *Vogel's Text Book of Quantitative Chemical Analysis*, 6th Edn., Pearson Education, Noida, 2013.

3. *Vogels Textbook of Quantitative Chemical Analysis*, 6th Edn. Pearson Education Ltd, 2009.

4. R.T. Morrison, R.N Boyd and S.K Bhattacharjee, *Organic Chemistry*, 7th Edn., Dorling Kindersley Pvt. Ltd (Pearson Education), 2011.

5. T.W. Graham Solomon, C.B. Fryhle, S. A. Snyder, *Organic Chemistry*, John Wiley & Sons, 2014.

6. A. Bahl and B.S. Bahl, *Advanced Organic Chemistry*, S. Chand, 2010.

7. J.Clayden, N.Greeves, S. Warren, and P.Wothers, *Organic Chemistry*, Oxford University Press, 2004.

8. Puri, Sharma and Pathania, "*Principles of Physical Chemistry*", 47th Edn. Vishal Publishing Co, 2020.

9. P W Atkins, *Physical Chemistry*, 11th Edn. Oxford University Press, 2018.

10. K. L. Kapoor, *A Textbook of Physical chemistry* , Volume 1, Macmillan India Ltd, 2020.

11. J.B. Yadav, *Advanced Practical Physical Chemistry,* Krishna Prakashan, 2016.

12. K.K. Sharma, *An Introduction of Practical Chemistry,* Vikas Publishing House, New Delhi, 1984.

13. T. Brown, C. Murphy, H. LeMay, *Laboratory Experiments for Chemistry*, Pearson, 2018.

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Programme						
Course Name	**Dairy Chemistry**					
Type of Course	MDC					
Course Code	MG2MDCCHE100					
Course Level	**100-199**					
Course Summary	This course will enable students to understand various types of milk, processing methods and the production of various dairy products.					
Semester	II	Credits			3	Total Hours
Course Details	Learning Approach	Lecture	Tutorial	Practical	Others	
		2		1		60
Pre-requisites, if any						

COURSE OUTCOMES (CO)

CO No.	Expected Course Outcome	Learning Domains *	PO No
1	Evaluate the quality and nutritive value of milk by knowing the general chemical composition	E	1,2,3, 6,10
2	Describe the techniques of milk processing	U	1,2,3, 10
3	Compare different types of processed milk.	U	1,2,3,6, 10
4	Classify various types of milk products based on their composition and processing methods	An	1,,3,10
5	Demonstrate the preparation of various milk products	A	1,2,3,4,6 10,

Remember (K), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create (C), Skill (S), Interest (I) and Appreciation (Ap)

COURSE CONTENT

Content for Classroom transaction (Units)

Module	Units	Course description	Hrs	CO No.
1		**Composition and processing of Milk**		
	1.1	Milk- Definition, general composition of milk (cow, buffalo, goat and human) -water, protein, lactose and fat. Nutritive value of milk. Colostrum: significance, composition, difference between normal milk and colostrum.	6	1
	1.2	Physico-chemical properties of milk- color, odour, density, acidity, germicidal properties, viscosity. Adulteration of milk and detection. Preservatives and neutralizers.	5	1
	1.3	Quality assurance – FSSAI, PFA, AGMARK.	1	1
	1.4	Importance of milk processing- filtration, clarification, boiling, homogenization and pasteurization. Types of pasteurization- LTLT and HTST.	3	2
2		**Special milk and Milk products**		
	2.1	Standardised milk - definition – merits. Homogenised milk, flavoured milk, vitaminised milk, toned milk, incitation milk, vegetable toned milk, condensed milk - definition composition and nutritive value.	4	2
	2.2	Butter - definition - composition - theory of churning – desi butter, salted butter. Ghee - major constituents - common adulterants added to ghee and their detection - rancidity - definition – prevention. Cream- definition-composition-chemistry of creaming process.	6	2
	2.3	Fermented milk products - fermentation of milk - definition and conditions. Yogurt and Curd (introduction and methods of production). Khoa and chana -definition and preparation - sweets – peda, burfi, gulab jamun, rasogolla. Milk powder - definition	5	4
3		**Dairy Chemistry Practicals**		
	3.1	1. Demonstration of preparation of khoa based products- peda, milk cake	30	5

		2. Demonstration of preparation of chana based products- paneer 3. Determination of pH of milk 4. Determination of moisture content in paneer by lab oven method		
4	**Teacher Specific content**			

Teaching and Learning Approach	**Classroom procedure (mode of transaction)** Lecture sessions, interactive sessions including discussions, demonstrations, and experiments to engage students actively and visual aids like presentations, videos, and models to enhance understanding. Encourage students to ask questions during or after the lectures. Begin with safety instructions and guidelines for lab work. Allow students to conduct experiments under supervision (for lab work).
Assessment Types	**MODE OF ASSESSMENT** **A. Continuous Comprehensive Assessment (CCA)** **Theory (15 marks)** Assignments/MCQ/Viva **Practical(15 marks)** Lab involvement/report /Lab test
	B. Semester End examination **Theory (35 marks) -45 minutes** MCQ 35 questions : 35 X 1 = 35 **Practical (35 marks)- 1 hr.** I) Lab report: 10 II) Viva: 10 III) Writing procedure: 15

References

1. R. Jenness and S. Patom, *Principles of Dairy Chemistry*, Wiley, 2017.
2. K.S.Rangappa and K.T Acharya., *Indian Dairy Products*, Asia Publishing House, 1975.
3. F.P. Wong., *Fundamentals of Dairy Chemistry*, Springer, 2012.
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5. J. N. Warner, *Principles of Dairy Procesing*, Wiley, 1976.
6. Sukumar De, *Outlines of Dairy technology*, Oxford, 2001.
7. D. Richmond, *Laboratory Manual of Dairy Analysis*, Biotech Books, 2008.