E.M.G. YADAVA WOMEN'S COLLEGE, MADURAI – 625 014.

(*An Autonomous Institution – Affiliated to Madurai Kamaraj University*)

Re-accredited (**3rd Cycle**) with Grade **A+** & **CGPA 3.51** by NAAC

DEPARTMENT OF CHEMISTRY

TANSCHE - **CBC**S With OBE

BACHELOR OF SCIENCE

PROGRAMME CODE - K

COURSE STRUCTURE

(w.e.f. 2023 – 2024 Batch onwards)

Annexure-16

E.M.G. YADAVA WOMEN'S COLLEGE, MADURAI -14.

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TANSCHE - CBCS with OBE

DEPARTMENT OF CHEMISTRY – UG

(w.e.f. 2023– 2024 Batch onwards)

Vision

To build the vibrant and knowledgeable students community for careers in academia, industry, entrepreneur and government sectors through innovative teaching.

Mission

- To encourage students to face IIT-JAM, Entrance examinations for enroll M.Sc programme and other competitive examinations.
- To equip students become a successful women entrepreneur to run small scale industries like toiletry products and cosmetics.
- To impart quality chemical science education to enable the students to become an independent, competitive and professional graduates.

Programme Educational Objectives (PEO's): B.Sc. Chemistry

Sl. No.	Programme Educational Objectives
PEO1	To pursue further studies and able to work in various industries, research laboratories, schools and public sectors.
PEO2	To develop inter-social relationship and interpersonal skills in order to attain leadership qualities
PEO3	Apply knowledge and understanding of Chemistry to identify problems and solutions in daily life
PEO4	To possess skills of keen observation and drawing logical inferences from the practical experiments.
PEO5	Appear as a successful women entrepreneur to run small scale industries

Annexure-16

Programme Outcomes for Science Graduates

On completion of B.Sc., Programmes students will be able to

SI.No.	Programme Outcomes
PO1	Develop necessary foundation in fundamentals, aptitude, applications of sciences and other related subjects. Able to clear competitive examinations, appear with confidence and possess basic skills on the related subjects. Secure jobs in employment in Government / Private / Industry and entrepreneurship.
PO2	Receive basic experimental skills in the observation and study of nature, biological techniques, scientific research and demonstrate proficiency in critical analysis or creativity and provide scientific solutions to the problems of the society.
PO3	Enhance the digital knowledge of statistics and to understand its application in interpreting the obtained data.
PO4	Obtain knowledge with emerging trends in their disciplinary and inter-disciplinary areas. Usage of modern tools and software can also be put to use.
PO5	Lead lifelong learning & contribute sustainability to environment, equip students enough to take up higher studies up to research in various disciplines to become professionals.
PO6	Imbibe democratic, ethical, moral, social & spiritual values in the minds of the learners to become responsible citizens and build a healthy nation.

Annexure-16

Programme Specific Outcome (PSOs)

PSO	After completion of B.Sc Chemistry, the students will be able to	PO Addressed
PSO-1	**Disciplinary Knowledge:** Understand the fundamental principles, concepts, and theories related to physics and computer science. Also, exhibit proficiency in performing experiments in the laboratory.	PO1
PSO-2	**Critical Thinking:** Analyze complex problems, evaluate information, synthesize information, apply theoretical concepts to practical situations, identify assumptions and biases, make informed decisions and communicate effectively	PO2
PSO-3	**Problem Solving:** Employ theoretical concepts and critical reasoning ability with physical, mathematical and technical skills to solve problems, acquire data, analyze their physical significance and explore new design possibilities.	PO2 & PO3
PSO-4	**Research related skills:** Formulate research questions, conduct literature reviews, design and execute research studies, communicate research findings and collaborate in research projects.	PO3 & PO4
PSO-5	**Self-directed & Lifelong Learning:** Set learning goals, manage their own learning, reflect on their learning, adapt to new contexts, seek out new knowledge, collaborate with others and to continuously improve their skills and knowledge, through ongoing learning and professional development, and contribute to the growth and development of their field.	PO5 & PO6

Qualification for Admission

Candidates should have passed the Higher Secondary Examination, Mathematics, Physics, Chemistry, Biology / Physics, Chemistry, Botany, Zoology as one of the stream, conducted by the Board of Higher Education, Government of Tamilnadu, CBSC & ICSE or any other examination approved by Madurai Kamaraj University as equivalent.

Annexure-16

Duration of the Course

The students shall undergo this prescribed course of study for the period of three academic years under TANSCHE - Choice Based Credit System (CBCS) semester pattern with Outcome Based Education (OBE).

Medium of Instruction: English

System: Choice Based Credit System with Outcome Based Education Model

Nature of the Course

Courses are classified according to the following nature

1. Knowledge and skill oriented 2. Employability oriented 3. Entrepreneurship oriented

Outcome Based Education (OBE) & Assessment

Students understanding must be built on and assessed for wide range of learning activities, which includes different approaches and are classified along several basis, such as

1. **Based on purpose:**
   - Continuous Assessment (internal tests, Assignment, seminar, quiz, Documentation, Case lets,ICT based Assignment, Mini projects administered during the learning process)
   - External Assessment (Evaluation of students' learning at the end of instructional unit)
2. **Based on Domain Knowledge: (for UG Up to K4 levels)**
   Assessment through K1, K2, K3 & K4

Annexure-16

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TANSCHE – CBCS with OBE

(w.e.f. 2023-2024 batch onwards)

(PART I / PART II / PART III)

Internal (Formative) : 25 marks
External (Summative) : 75 marks
Total :100 marks

Formative Test (CIA-Continuous Internal Assessment) : 25 Marks

Components	Marks
Test (Average of two tests) (Conducted for 100 marks and converted into 10 marks)	**10**
Assignment	**5**
Seminar	**5**
Quiz/ Documentation/ Case lets/ ICT based Assignment/ Mini Projects	**5**
Total	**25**

- ✓ **Centralized system** of Internal Assessment Tests
- ✓ There will be **Two Internal Assessment** Tests
- ✓ Duration of Internal assessment test will be **2 hours for Test I & II**
- ✓ Students shall write **retest** with the approval of HOD on genuine grounds if they are absent.

Question Paper Pattern for Continuous Internal Assessment –Test I and II

Section	Marks
A- Multiple Choice Question (7x1mark)	7
B- Short Answer (4x2marks)	8
C- Either Or Type (3/6x5marks)	15
D- Open Choice Type (2/3x 10marks)	20
Total	50

Conducted for 100 marks and converted into 10 marks.

Question Paper Pattern for Summative Examination

Section	Marks
A-Multiple choice Questions without Choice (10x1 mark)	10
B-Short Answer without choice (5x2marks)	10
C-Either Or type (5/10x5marks)	25
D-Open Choice type (3/5x10 marks)	30
Total	75

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In respect of Summative Examinations passing minimum is **36% for UG.**

Latest amendments and revision as per **UGC** and **TANSCHE** norms is taken into consideration in curriculum preparation.

BLUE PRINT FOR INTERNAL ASSESSMENT – I

Articulation Mapping – K Levels with Course Learning Outcomes (CLOs)

Sl. No	CLOs	K- Level	Section A		Section B		Section C	Section D	Total
			MCQs (No Choice)		Short Answers (No Choice)		(Either or Type)	(Open choice)	
			No. of Questions	K-Level	No. of Questions	K-Level			
1	CLO 1	Upto K3	3	(K1/ K2)	3	(K1/ K2)	2 (K2) / 2 (K3) / 2 (K4) (Each set of questions must be in same level)	2 (K3) & 1 (K4)	
2	CLO 2	Upto K3	2	(K1/ K2)					
3	CLO 3	Upto K4	2	(K1/ K2)	1	(K1/ K2)			
No. of Questions to be asked			7		4		6	3	20
No. of Questions to be answered			7		4		3	2	16
Marks for each question			1		2		5	10	-
Total Marks for each section			7		8		15	20	50

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BLUE PRINT FOR INTERNAL ASSESSMENT – II

Articulation Mapping – K Levels with Course Learning Outcomes (CLOs)

Sl. No	CLOs	K- Level	Section A		Section B		Section C	Section D	Total
			MCQs (No Choice)		Short Answers (No Choice)		(Either or Type)	(Open choice)	
			No. of Questions	K-Level	No. of Questions	K-Level			
1	CLO 3	Upto K4	2	(K1/ K2)	1	(K1/ K2)	2 (K2) / 2 (K3) / 2 (K4) (Each set of questions must be in same level)	2 (K3) & 1 (K4)	
2	CLO 4	Upto K3	2	(K1/ K2)	3	(K1/ K2)			
3	CLO 5	Upto K4	3	(K1/ K2)					
No. of Questions to be asked			7		4		6	3	20
No. of Questions to be answered			7		4		3	2	16
Marks for each question			1		2		5	10	-
Total Marks for each section			7		8		15	20	50

Distribution of Marks with K-Levels CIA I and CIA II

CIA	K Levels	Section -A MCQ (No choice)	Section -B Short Answer (No choice)	Section -C (Either or Type)	Section –D (Open choice)	Total Marks	% of Marks
I & II	K1	4	4	-	-	8	10
	K2	3	4	10	-	17	23
	K3	-	-	10	20	30	40
	K4	-		10	10	20	27
	Marks	**7**	**8**	**30**	**30**	**75**	**100**

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Articulation Mapping - K Levels with Course Learning Outcomes (CLOs) for External Assessment

Sl. No	CLOs	K-Level	Section A		Section B		Section C (Either/or Type)	Section D (open choice)	Total
			MCQs (No choice)		Short Answers (No choice)				
			No. of Questions	K-Level	No. of Questions	K-Level			
1	CLO 1	Upto K3	2	K1/K2	1	K1/K2	2 (K3& K3)	1(K2)	
2	CLO 2	Upto K3	2	K1/K2	1	K1/K2	2(K2& K2)	1(K3)	
3	CLO 3	Upto K4	2	K1/K2	1	K1/K2	2 (K4&K4)	1(K4)	
4	CLO 4	Upto K 3	2	K1/K2	1	K1/K2	2 (K3& K3)	1(K3)	
5	CLO 5	Upto K 4	2	K1/K2	1	K1/K2	2 (K4& K4)	1(K4)	
No. of Questions to be asked			10		5		10	5	30
No. of Questions to be answered			10		5		5	3	23
Marks for each question			1		2		5	10	
Total Marks for each section			10		10		25	30	75

Distribution of Section-wise Marks with K Levels for External Assessment

K Levels	Section A (MCQ'S) (No choice)	Section B (Short Answer) (No choice)	Section C (Either or Type)	Section D (Open Choice)	Total Marks	% of Marks
K1	9	6	-	--	**15**	13
K2	1	4	10	10	**25**	21
K3	-	-	20	20	**40**	33
K4	-	-	20	20	**40**	33
Total Marks	10	10	50	50	**120**	100

K1- Remembering and recalling facts with specific answers

K2- Basic understanding of facts and stating main ideas with general answers

K3- Application oriented- Solving Problems, Justifying the statement and deriving inferences

K4- Examining, analyzing, presentation and make inferences with evidences

Annexure-16

EVALUATION (THEORY)

(PART IV - SEC / DSEC)

Internal (Formative) : 25 marks

External (Summative) : 75 marks

Total : 100 marks

Formative Test (CIA-Continuous Internal Assessment) : 25 Marks

Components	Marks
Test (Average of two tests) (Conducted for 60 marks and converted into 20 marks)	**20**
Assignment / Seminar/ Quiz/ Documentation (from Unit 5)	**5**
Total	**25**

- ✓ There will be two Internal Assessment Test
- ✓ Duration of Internal assessment test will be 1 hour for Test

Students shall write retest with the approval of HOD on genuine grounds if they are absent.

Question Paper Pattern for Continuous Internal Assessment Test I & II

Section	Marks
Multiple Choice Question (4x1mark)	4
Short Answer (3x2marks)	6
Either Or type (2/4 x5marks)	10
Open choice type (1/2 x10marks)	10
Total	30

Conducted for 60 marks and converted into 20 marks

Question Paper Pattern for External Examination

Section	Marks
Multiple Choice Question (10x1mark)	10
B- Short Answer (5x2marks)	10
C- Either Or type (5/5 x5marks)	25
Open choice type (3/5 x10marks)	30
Total	75

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BLUE PRINT FOR INTERNAL ASSESSMENT –I
Articulation Mapping - K Levels with Course Learning Outcomes (CLOs)

Sl. No	CLOs	K- Level	Section A		Section B		Section C	Section D	Total
			MCQs (No Choice)		Short Answers (No Choice)		(Either or Type)	(Open choice)	
			No. of Questions	K-Level	No. of Questions	K-Level			
1	CLO 1	Upto K3	2	K1	3	K1	1 (K2) / 1 (K3) (Each set of questions must be in same level)	1 (K2) & 1 (K3)	
2	CLO 2	Upto K3	2						
No. of Questions to be asked			4		3		4	2	13
No. of Questions to be answered			4		3		2	1	10
Marks for each question			1		2		5	10	-
Total Marks for each section			4		6		10	10	30

BLUE PRINT FOR INTERNAL ASSESSMENT –II
Articulation Mapping - K Levels with Course Learning Outcomes (CLOs)

Sl. No	CLOs	K- Level	Section A		Section B		Section C	Section D	Total
			MCQs (No Choice)		Short Answers (No Choice)		(Either or Type)	(Open choice)	
			No. of Questions	K-Level	No. of Questions	K-Level			
1	CLO 3	Upto K3	2	K1	3	K1	1 (K2) / 1 (K3) (Each set of questions must be in same level)	1 (K2) & 1 (K3)	
2	CLO 4	Upto K3	2						
No. of Questions to be asked			4		3		4	2	13
No. of Questions to be answered			4		3		2	1	10
Marks for each question			1		2		5	10	-
Total Marks for each section			4		6		10	10	30

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Distribution of Marks with K Levels – CIA I & II

CIA	K Levels	Section A MCQ	Section B (Short Answers)	Section C (Either Or Type)	Section D (Open Choice)	Total Marks	% of Marks
I & II	K1	4	6	-	-	10	20
	K2	-	-	10	10	20	40
	K3	-	-	10	10	20	40
	Marks	**4**	**6**	**20**	**20**	**50**	**100**

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Articulation Mapping - K Levels with Course Learning Outcomes (CLOs) for External Assessment

Sl. No	CLOs	K-Level	Section A		Section B		Section C (Either or Type)	Section D (Open Choice)	Total
			MCQs		Short Answers				
			No. of Questions	K-Level	No. of Questions	K-Level			
1	CLO 1	Upto K3	2	K1	1	K1	6(K2) & 4(K3) (Each set of questions must be in same level)	2(K2) & 3(K3)	
2	CLO 2	Upto K3	2		1				
3	CLO 3	Upto K3	2		1				
4	CLO 4	Upto K 3	2		1				
5	CLO 5	Upto K 3	2		1				
No. of Questions to be asked			10		5		10	5	30
No. of Questions to be answered			10		5		5	3	23
Marks for each question			1		2		5	10	
Total Marks for each section			10		10		25	30	75

Distribution of Section-wise Marks with K Levels for External Assessment

K Levels	Section A (MCQ's)	Section B (Short Answer)	Section C (Either or Type)	Section D (Open Choice)	Total Marks	% of Marks
K1	10	10	-	--	**20**	16
K2	-	-	30	20	**50**	42
K3	-	-	20	30	**50**	42
Total Marks	10	10	50	50	**120**	100

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TANSCHE-CBCS with OBE

DEPARTMENT OF CHEMISTRY–UG

COURSE STRUCTURE

(w.e.f. 2023 – 2024 Batch onwards)

Semester	Part	Course Code	Course Title	Teaching hrs (per week)	Duration of Exam (hrs.)	Marks Allotted			Credits
						CIA	SE	Total	
I	I	23OU1TA1	**Part I:** Tamil	6	3	25	75	100	3
	II	23OU2EN1	**Part II:** General English -I	6	3	25	75	100	3
	III	23OUCH11	**Core Course1**: General Chemistry-I	5	3	25	75	100	5
		23OUCH1P	**Core Course 2:** Quantitative Inorganic Estimation (titrimetry) and Inorganic Preparations	3	6	40	60	100	3
		23OUCHGEMA1	**GEC 1:** Allied Mathematics –I	6	3	25	75	100	5
	IV	23OUCHSECN1	**SEC 1 (NME) :** Food Chemistry	2	3	25	75	100	2
		23OUCHFC1	**FC** : Role of Chemistry in Daily Life	2	3	25	75	100	2
II	I	23OU1TA2	**Part I:** Tamil	6	3	25	75	100	3
	II	23OU2EN2	**Part II:** General English - II	6	3	25	75	100	3
	III	23OUCH21	**Core Course3**: General Chemistry-II	5	3	25	75	100	5
		23OUCH2P	**Core Course4**: Qualitative Organic Analysis and Preparation of Organic Compounds	3	6	40	60	100	3
		23OUCHGEMA2	**GEC 2:** Allied Mathematics –II	6	3	25	75	100	5
	IV	23OUCHSECN2	**SEC 2 (NME) :** Dairy Chemistry	2	3	25	75	100	2
		23OUCHSEC3	**DSEC:** Cosmetics and personal grooming	2	3	25	75	100	2
			Total						46

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TANSCHE - CBCS with OBE

DEPARTMENT OF CHEMISTRY-UG

Generic Elective Course (For B.Sc., N&D)

COURSE STRUCTURE

(w.e.f. 2023 – 2024 Batch onwards)

Semester	Course Code	Title of the Course	Teaching hrs. (Per week)	Duration of Exam (hrs.)	Marks allotted			Credits
					CIA	SE	Total	
I	23OUNDGECH1	**GEC1:** Chemistry for Biological Sciences-I	4	3	25	75	100	3
	23OUNDGECH1P	**GEC2:** Chemistry Practical for Biological Sciences-I	2	3	40	60	100	2
II	23OUNDGECH2	**GEC 3**: Chemistry for Biological Sciences-II	4	3	25	75	100	3
	23OUNDGECH2P	**GEC4 :** Chemistry Practical for Biological Sciences-II	2	3	40	60	100	2

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Department of Chemistry						Class: I B.Sc		
Sem	**Category**	**Course Code**	**Course Title**	**Credits**	**Contact Hours / Week**	**CIA**	**SE**	**Total**
I	Core Course 1	**23OUCH11**	General Chemistry -I	5	5	25	75	100

Nature of the Course		
Knowledge and Skill Oriented	Employability Oriented	Entrepreneurship oriented
✓		

Course Objectives:

1. To gain knowledge about various atomic models and atomic structure
2. To understand about the wave particle duality of matter
3. To compare ionic bond and covalent bond.
4. To acquire knowledge about nature of chemical bonding,
5. To outline the fundamental concepts of organic chemistry

Course Content:

Unit –I Atomic structure and Periodic trends : History of atom (J.J.Thomson, Rutherford); Moseley's Experiment and Atomic number, Atomic Spectra; Black-Body Radiation and Planck's quantum theory Bohr's model of atom;The Franck-Hertz Experiment; Interpretation of Hspectrum; Photoelectric effect, Compton effect; Dual nature of Matter- DeBroglie wavelength-Davisson and Germer experiment Heisenberg's Uncertainty Principle; Electronic Configuration of Atoms and ions- Hund's rule, Pauli'exclusion principle and Aufbau principle; Numerical problems involving the core concepts.

Unit –II Introduction to Quantum Mechanics: Classical mechanics, Wave mechanical model of atom, distinction between a Bohr orbit and orbital; Postulates of quantum mechanics; probability interpretation of wavefunctions, Formulation of Schrodinger wave equation - Probability and electron density-visualizing the orbitals -Probability density and significance of Ψ and Ψ^2. **Modern Periodic Table:** Cause operiodicity; Features of the periodic table; classification of elements Periodic trends for atomic size- Atomic radii, Ionic, crystal and Covalent radii; ionization energy, electron affinity, electronegativity-electronegativity scales, applications of electronegativity. Problems involving the core concepts**.**

Unit –III Structure and Bonding - I : Ionic bond - Lewis dot structure of ionic compounds; properties of ionic compounds; Energy involved in ionic compounds; Born Haber cycle – lattice energies, Madelung constant; relative effect of lattice energy and solvation energy; Ion polarisation – polarising power and polarizability; Fajans' rules - effects of polarisation on properties of compounds; problems involving the core concepts.

Covalent bond - Shapes of orbitals, overlap of orbitals – σ and Π bonds; directed valency hybridization; VSEPR theory - shapes of molecules of the type AB_2, AB_3, AB_4, AB_5, AB_6 and AB_7 Partial ionic character of covalent bond-dipole moment, application to molecules of the type A_2, AB, AB_2, AB_3, AB_4; percentage ionic character- numerical problems based on calculation of percentage ionic character.

Unit –IV Structure and Bonding - II : VB theory – application to hydrogen molecule; concept of resonance - resonance structures of some inorganic species – CO_2, NO_2, $CO_3^{2-,}$ NO_3^- ; limitations of VBT; MO theory - bonding, antibonding and nonbonding orbitals, bond order; MO diagrams of H_2, C_2, O_2, O_2^+, O^{2-}, $O_2^{2-}N_2$, NO, HF, CO; magnetic characteristics, comparison of VB and MO theories. Coordinate bond: Definition, Formation of BF_3, NH_3, NH_4^+, H_3O^+ properties Metallic bond-electron sea model, VB model; Band theory-mechanism of conduction in solids; conductors, insulator, semiconductor – types, applications of semiconductors**.** Weak Chemical Forces - Vander Waals forces, ion-dipole forces, dipole-dipole interactions, induced dipole interactions, Instantaneous dipole-induced dipole interactions. Repulsive forces; Hydrogen bonding – Types, special properties of water, ice, stability of DNA; Effects of chemical force, melting and boiling points.

Unit –V Basic concepts in Organic Chemistry and Electronic Effects: Types of bond cleavage – heterolytic and homolytic; arrow pushing in organic reactions; reagents and substrates; types of reagents - electrophiles, nucleophiles, free radicals; reaction intermediates – carbanions, carbocations, carbenes, arynes and nitrynes. Inductive effect - reactivity of alkyl halides, acidity of halo acids, basicity of amines; inductomeric and electromeric effects.

Resonance – resonance energy, conditions for resonance - acidity of phenols, basicity of aromatic amines, stability of carbonium ions, carbanions and free radicals, reactivity of vinyl chloride, dipole moment of vinyl chloride and nitrobenzene, bond lengths; steric inhibition to resonance. Hyperconjugation - stability of alkenes, bond length, orienting effect of methyl group,

dipole moment of aldehydes and nitromethane. Types of organic reactions- addition, substitution, elimination and rearrangements

Books for study:

1. Madan, R. D. and Sathya Prakash, "*Modern Inorganic Chemistry"*, (2003),2nded, S. Chand and Company: New Delhi.
2. Rao, C.N. R. (2000), "*General Chemistry"*, Macmillan Publication: New Delhi.
3. Puri, B. R. and Sharma, L. R. (2002), "*Principles of Physical Chemistry*", 38thed., Vishal Publishing Company: Jalandhar.
4. Bruce, P. Y. and Prasad.K. J. R. (2008), "*Essential Organic Chemistry"*, Pearson Education: New Delhi.
5. Dash UN, Dharmarha OP, Soni P.L. (2016), "*Textbook of Physical Chemistry"*, Sultan Chand & Sons: New Delhi.

Books for Reference:

1. Maron, S. H. and Prutton C. P. (1972), "*Principles of Physical Chemistry"*,4th ed.; The Macmillan Company: Newyork.
2. Lee, J. D. Concise (1991), *"Inorganic Chemistry"*, 4th ed.; ELBS William Heinemann: London.
3. Gurudeep Raj, (2001), "*Advanced Inorganic Chemistry"*, 26thed, Goel Publishing House, Meerut.
4. Atkins, P.W. & Paula, J. (2014), "*Physical Chemistry"*, 10th ed.; Oxford University Press, New York.
5. Huheey, J. E. (1993), "*Inorganic Chemistry Principles of Structure and Reactivity"*, 4th ed; Addison, Wesley Publishing Company: India,

Web resources/E-books:

1. https://onlinecourses.nptel.ac.in
2. http://www.mikeblaber.org/oldwine/chm1045/notes_m.html
3. http://www.ias.ac.in/initiat/sci_ed/resources/chemistry/Inorganic.html
4. https://swayam.gov.in/course/64-atomic-structure-and-chemical-bonding
5. https://www.chemtube3d.com/

Pedagogy:

Chalk and Talk method, Power point Presentations, Seminar, Group Discussion, Quiz, You tube Links, Open book test and Virtual Labs.

Rationale for nature of Course:

Knowledge and Skill:

This course will enable the students to acquired knowledge about the Atomic structure and Periodic trends, Quantum mechanics and Modern Periodic Table, Structure and bonding –I&II and Basic concepts in Organic Chemistry and Electronic effects.

Activities to be given:

1. Power point presentation on the concept of VB theory and MO diagram.
2. To construct the structure and bonding of organic and inorganic molecules using atomic model set.

COURSE LEARNING OUTCOMES (CLO's):

CLOs	Course Learning Outcomes Statements	Knowledge According to Bloom's Taxonomy (Upto K level)
CLO1	Explain the atomic structure, wave particle duality of matter, periodic properties bonding, and properties of compounds.	K1 to K3
CLO2	Classify the elements in the periodic table, types of bonds, reaction intermediates electronic effects in organic compounds, types of reagents.	K1 to K3
CLO3	Apply the theories of atomic structure, bonding, to calculate energy of a spectral transition, Δx, Δp electronegativity, percentage ionic character and bond order.	K1 to K4
CLO4	Evaluate the relationship existing between electronic configuration, bonding, geometry of molecules and reactions; structure reactivity and electronic effects	K1 to K3
CLO5	Construct MO diagrams, predict trends in periodic properties, assess the properties of elements, and explain hybridization in molecules, nature of H – bonding and organic reaction mechanisms.	K1 to K4

K1- Remembering and recalling facts with specific answers
K2- Basic understanding of facts and stating main ideas with general answers
K3- Application oriented- Solving Problems
K4- Examining, analyzing, presentation and make inferences with evidences

Annexure-16

Mapping of Course Learning Outcomes (CLO's) with Programme Outcomes (PO's)

CLO's	PO1	PO2	PO3	PO4	PO5	PO6
CLO1	3	2	2	2	3	2
CLO2	3	2	2	1	3	2
CLO3	3	2	2	1	3	2
CLO4	3	2	1	3	3	2
CLO5	3	2	1	2	2	3

1-Basic Level 2- Intermediate Level 3- Advanced Level

LESSON PLAN: TOTAL HOURS (75Hrs)

UNIT	DESCRIPTION	HOURS	MODE
I	**Atomic structure and Periodic trends :** History of atom (J.J.Thomson, Rutherford); Moseley's Experiment and Atomic number, Atomic Spectra; Black-Body Radiation and Planck's quantum theory Bohr's model of atom;The Franck-Hertz Experiment; Interpretation of Hspectrum; Photoelectric effect, Compton effect; Dual nature of Matter- DeBroglie wavelength-Davisson and Germer experiment Heisenberg's Uncertainty Principle; Electronic Configuration of Atoms and ions- Hund's rule, Pauli'exclusion principle and Aufbau principle; Numerical problems involving the core concepts.	**12**	Chalk and Talk, PPT, and quiz
II	**Introduction to Quantum mechanics :** Classical mechanics, Wave mechanical model of atom, distinction between a Bohr orbit and orbital; Postulates of quantum mechanics; probability interpretation of wavefunctions, Formulation of Schrodinger wave equation - Probability and electron density-visualizing the orbitals -Probability density and significance of Ψ and Ψ^2. **Modern Periodic Table:** Cause operiodicity; Features of the periodic table; classification of elements Periodic trends for atomic size-Atomic radii, Ionic, crystal and Covalent radii; ionization energy, electron affinity, electronegativity-electronegativity scales, applications of electronegativity. Problems involving the core concepts**.**	**18**	Chalk and Talk, PPT, quiz and You tube Links
III	**Structure and bonding - I :** Ionic bond - Lewis dot structure of ionic compounds; properties of ionic compounds; Energy involved in ionic compounds; Born Haber cycle – lattice energies, Madelung constant; relative effect of lattice energy and solvation energy; Ion polarisation – polarising power and polarizability; Fajans' rules - effects of polarisation on properties of compounds;	**15**	Chalk and Talk, PPT, quiz, seminar and Virtual Labs

	problems involving the core concepts. Covalent bond - Shapes of orbitals, overlap of orbitals – σ and Π bonds; directed valency hybridization; VSEPR theory - shapes of molecules of the type AB_2, AB_3, AB_4, AB_5, AB_6 and AB_7 Partial ionic character of covalent bond-dipole moment, application to molecules of the type A_2, AB, AB_2, AB_3, AB_4; percentage ionic character-numerical problems based on calculation of percentage ionic character.		
IV	VB theory – application to hydrogen molecule; concept of resonance - resonance structures of some inorganic species – CO_2, NO_2, CO_3^{2-}, NO_3^- ; limitations of VBT; MO theory - bonding, antibonding and nonbonding orbitals, bond order; MO diagrams of H_2, C_2, O_2, O_2^+, O^{2-}, $O_2^{2-}N_2$, NO, HF, CO; magnetic characteristics, comparison of VB and MO theories. Coordinate bond: Definition, Formation of BF_3, NH_3, NH_4^+, H_3O^+ properties Metallic bond-electron sea model, VB model; Band theory-mechanism of conduction in solids; conductors, insulator, semiconductor – types, applications of semiconductors**.** Weak Chemical Forces - Vander Waals forces, ion-dipole forces, dipole-dipole interactions, induced dipole interactions, Instantaneous dipole-induced dipole interactions. Repulsive forces; Hydrogen bonding – Types, special properties of water, ice, stability of DNA; Effects of chemical force, melting and boiling points.	**15**	Chalk and Talk, PPT, quiz and group discussion
V	Types of bond cleavage – heterolytic and homolytic; arrow pushing in organic reactions; reagents and substrates; types of reagents - electrophiles, nucleophiles, free radicals; reaction intermediates – carbanions, carbocations, carbenes, arynes and nitrynes. Inductive effect - reactivity of alkyl halides, acidity of halo acids, basicity of amines; inductomeric and electromeric effects. Resonance – resonance energy, conditions for resonance - acidity of phenols, basicity of aromatic amines, stability of carbonium ions, carbanions and free radicals, reactivity of vinyl chloride, dipole moment of vinyl chloride and nitrobenzene, bond lengths; steric inhibition to resonance. Hyperconjugation - stability of alkenes, bond length, orienting effect of methyl group, dipole moment of aldehydes and nitromethane. Types of organic reactions- addition, substitution, elimination and rearrangements	**15**	Chalk and Talk, PPT, quiz, Open book test
	Total Hours	**75**	

Course Designers: Ms.K.Punitha
Ms.J.Ilakkiyapavithra

Annexure-16

Department of Chemistry						Class: I B.Sc		
Sem	**Category**	**Course Code**	**Course Title**	**Credits**	**Contact Hours / Week**	**CIA**	**SE**	**Total**
I	Core Course 2	**23OUCH1P**	Quantitative Inorganic Estimation (titrimetry) and Inorganic Preparations	3	3	40	60	100

Course Objectives:

1. To gain knowledge on laboratory safety methods.
2. To acquire knowledge on handling glasswares.
3. To provide knowledge about Quantitative estimation
4. To provide knowledge about preparation of inorganic compounds

Course Content:

Unit – I Chemical Laboratory Safety in Academic Institutions

Introduction - importance of safety education for students, common laboratory hazards, assessment and minimization of the risk of the hazards, prepare for emergencies from uncontrolled hazards; concept of MSDS; importance and care of PPE; proper use and operation of chemical hoods and ventilation system; fire extinguishers-types and uses of fire extinguishers, demonstration of operation; chemical waste and safe disposal.

Common Apparatus Used in Quantitative Estimation (Volumetric) Description and use of burette, pipette, standard flask, measuring cylinder, conical flask, beaker, funnel, dropper, clamp, stand, wash bottle, watch glass, wire gauge and tripod stand. Principle of Quantitative Estimation (Volumetric) Equivalent weight of an acid, base, salt, reducing agent, oxidizing agent; concept of mole, molality, molarity, normality; primary and secondary standards, preparation of standard solutions; theories of acid-base, redox, complexometric, iodimetric and iodometric titrations; indicators – types, theory of acid–base, redox, metal ion and adsorption indicators, choice of indicators.

Unit – II Quantitative Estimation(Volumetric)

Preparation of standard solution, dilution from stock solution

Permanganometry

Estimation of sodium oxalate using standard ferrous ammonium sulphate

Dichrometry

Estimation of ferric alum using standard dichromate (external indicator) Estimation of ferric alum using standard dichromate (internal indicator)

Iodometry

Estimation of copper in copper sulphate using standard dichromate

Argentimetry

Estimation of chloride in barium chloride using standard sodium chloride/ Estimation of chloride in sodium chloride (Volhard's method)

Unit - III Complexometry

Estimation of hardness of water using EDTA

Estimation of iron in iron tablets Estimation of ascorbic acid.

Preparation of Inorganic compounds- Potash alum

Tetraammine copper (II) sulphate

Hexamminecobalt (III) chloride

Mohr's Salt

Books for study:

1. Venkateswaran, V.; Veeraswamy, R.; Kulandivelu, A.R. (1997), "Basic *Principles of Practical Chemistry"*, 2nd ed.; Sultan Chand &Sons: New Delhi.
2. Nad, A. K.; Mahapatra, B.; Ghoshal, A. (2007), "*An advanced course in Practical Chemistry"*, 3rd ed.; New Central Book Agency: Kolkata.

Books for Reference:

1.Mendham, J.; Denney, R. C.; Barnes, J. D.; Thomas, M.; Sivasankar, B.; Vogel's (2000), *"Textbook of Quantitative Chemical Analysis"*, 6th ed.; Pearson Education Ltd: New Delhi.

Web Resource/E-Books:

1. http://www.federica.unina.it/agraria/analytical-chemistry/volumetricanalysis
2. https://chemdictionary.org/titration-indicator/

Pedagogy: Chalk and Talk method, Power Point Presentations, Seminar, Group Discussion

Annexure-16

LESSON PLAN: TOTAL HOURS (45 Hrs)

UNIT	DESCRIPTION	HOURS	MODE
1	Instructions	1	Chalk and Talk
2	**Unit – I** Chemical Laboratory Safety in Academic Institutions Introduction - importance of safety education for students, common laboratory hazards, assessment and minimization of the risk of the hazards, prepare for emergencies from uncontrolled hazards; concept of MSDS; importance and care of PPE; proper use and operation of chemical hoods and ventilation system; fire extinguishers-types and uses of fire extinguishers, demonstration of operation; chemical waste and safe disposal. Common Apparatus Used in Quantitative Estimation (Volumetric) Description and use of burette, pipette, standard flask, measuring cylinder, conical flask, beaker, funnel, dropper, clamp, stand, wash bottle, watch glass, wire gauge and tripod stand. Principle of Quantitative Estimation (Volumetric) Equivalent weight of an acid, base, salt, reducing agent, oxidizing agent; concept of mole, molality, molarity, normality; primary and secondary standards, preparation of standard solutions; theories of acid-base, redox, complexometric, iodimetric and iodometric titrations; indicators – types, theory of acid–base, redox, metal ion and adsorption indicators, choice of indicators.	3	Chalk and Talk, PPT, Seminar
3	**Unit – II** Quantitative Estimation (Volumetric) Preparation of standard solution, dilution from stock solution	2	Chalk and Talk, Demonstration
4	Permanganometry: Estimation of sodium oxalate using standard ferrous ammonium sulphate.	3	Chalk and Talk, data interpretation
5	Dichrometry: Estimation of ferric alum using standard dichromate	3	Chalk and Talk, data interpretation
6	Iodometry :Estimation of copper in copper sulphate using standard dichromate	3	Chalk and Talk, data interpretation
7	Argentimetry :Estimation of chloride in barium chloride using standard sodium chloride	3	Chalk and Talk, data interpretation
8	Estimation of hardness of water using EDTA	3	Chalk and Talk, data interpretation
9	Estimation of iron in iron tablets Estimation of ascorbic acid.	3	Chalk and Talk, data interpretation, discussion
10	Preparation of inorganic compounds-Potash alum	3	Chalk and Talk, Discussion, Procedure with illustration
11	Tetraammine copper (II) sulphate	3	Chalk and Talk, Discussion, Procedure with illustration

12	Hexamminecobalt (III) chloride	3	Chalk and Talk, Discussion, Procedure with illustration
13	Mohr's Salt	3	Chalk and Talk, Discussion, Procedure with illustration
14	Revision	3	
15	Model	6	
	Total	45	

Course Designers: 1. Dr.(Mrs).S.Manimekalai
2. Ms.K.Punitha

EVALUATION (PRACTICAL)

Internal (Formative) : 40 marks

External (Summative) : 60 marks

Total : 100 marks

Question Paper Pattern for Internal Practical Examination: 40 Marks

S.No	Components	Marks
1.	Experiment- quantitative estimation and inorganic preparations	10
2	Procedure for quantitative estimation and inorganic preparations	10
3.	Model Exam	10
4.	Viva	5
5.	Observation Book	5
	Total	**40**

Question Paper Pattern for External Practical Examination (Major): 60 Marks

S.No	Components	Marks
1.	Experiment-Quantitative Inorganic Estimation (titrimetry)	20
2	Inorganic preparations	15
3	Procedure for quantitative estimation and inorganic preparation	10
4	Viva	5
5.	Record Book	10
	Total	**60**

Annexure-16

Distribution of marks for External

Quantitative Inorganic Estimation (titrimetry)

Estimation (20 marks)

Error <2% - 20 marks

Error 2-3% -15 marks

Error 3-4% -10 marks

Error >4% -5 marks

In respect of external examinations passing minimum is **35% for Under Graduate** Courses and in total, **aggregate of 40%.**

Latest amendments and revisions as per **UGC** and **TANSCHE** norm is taken into consideration to suit the changing trends in the curriculum.

Annexure-16

Department of Chemistry						Class: I B.Sc		
Sem	**Category**	**Course Code**	**Course Title**	**Credits**	**Contact Hours / Week**	**CIA**	**SE**	**Total**
I	Skill Enhancement Course 1 (NME)	**23OUCHSECN1**	Food Chemistry	2	2	25	75	100

Nature of the Course		
Knowledge and Skill Oriented	Employability Oriented	Entrepreneurship oriented
✔	✓	

Course Objectives:

1. To learn about food and water.
2. To understand modern foods and beverages.
3. To acquire knowledge about food additives.
4. To study the food nutrition and balanced diet.
5. To gain knowledge about food adulteration and hygiene.

Course Content:

Unit –I Food Adulteration : Sources of food, types, advantages and disadvantages. Food adulteration - contamination of wheat, rice, milk, butter etc. with clay stones, water and toxic chemicals -Common adulterants, Ghee adulterants and their detection. Detection of adulterated foods by simple analytical techniques.

Unit –II Food Poison : Food poisons - natural poisons (alkaloids - nephrotoxin) - pesticides, (DDT, BHC, Malathion) -Chemical poisons - First aid for poison consumed victims.

Unit –III Food Additives : Food additives -artificial sweeteners – Saccharin - Cyclomate a n d Aspartate Food flavours -esters, aldehydes and heterocyclic compounds – Food colours – Emulsifying agents – preservatives -leavening agents. Baking powder – yeast – tastemakers – MSG - vinegar.

Unit –IV Beverages : Beverages-softdrinks-soda-fruitjuices-alcoholicbeverages-examples. Carbonation-addictionto alcohol– diseases ofliver andsocial problems.

Unit –V Edible Oils : Fats and oils - Sources of oils - production of refined vegetable oils- preservation. Saturated and unsaturated fats - iodine value - role of MUFA and PUFA in preventing heartdiseases-determination of iodine value, RM value, saponification values and their significance

Books for study:

1. Chopra H. K.,. Panesar, Narosa P. S (2010), "*Food chemistry*",publishing house,
2. Jayashree Ghosh, (2006), "*Fundamental Concepts of Applied Chemistry"*, S. Chand & Co.Publishers, second edition, .
3. Rakesh Sharma L. (2022), *" Food Chemistry"*, Evincepub publishing,
4. Subbulakshmi, Shobha G., Udipi, Pdmini A, Ghugre, S (2021) "*Food processing and preservation*", New age international publishers, second edition,

Books for Reference:

1.. Belitz, Werner Grosch, H.-D, (2009) " *Food Chemistry*" Springer Science & Business Media, 4th Edition,
2. Swaminathan, M., (1979) "*Food Science and Experimental Foods*", Ganesh and Company,
3. Hasenhuettl, Gerard. L.; Hartel, Richard. W. (2008) "*Food Emulsifiers and their applications*" Springer New York 2nd ed.
4. John M. deMan, John W. Finley, W. Jefferey Hurst, Chang Yong Lee, (2018)"*Principles of food chemistry*", Springer, Fourth edition,

Web resources/E-books:

1. https://www.brainkart.com/article/Functions-of-food_33938/

2.https://www.wqpmag.com/water-disinfection/uv-disinfection/article/10958170/uv-ozone-a-match- made-in-heaven

3. https://krishijagran.com/health-lifestyle/different-types-of-mushrooms/

4. https://www.mdpi.com/2076-3921/10/8/1264/htm

Pedagogy:

Chalk and Talk method, Power point Presentations, Seminar, Group Discussion, Quiz.

Rationale for nature of Course:

Knowledge and Skill:

Students acquire knowledge on biological importance of food, water, soft drinks and familiarize in food nutritive values.

Employability Oriented: Take up employment in food testing lab

Activities to be given:

To find out the adulterants present in food stuff using different chemicals.

Annexure-16

COURSE LEARNING OUTCOMES (CLO's):

CLOs	Course Learning Outcomes Statements	Knowledge According to Bloom's Taxonomy (Upto K level)
CLO1	Learn about Food adulteration - contamination of Wheat, Rice, Milk, Butter.	K1 to K3
CLO2	Get an awareness about food poisons like natural poisons (alkaloids - nephrotoxin) pesticides, DDT, BHC, Malathion,	K1 to K3
CLO3	Get an exposure on food additives, artificial sweeteners, Saccharin, Cyclomate and Aspartate in the food industries.	K1 to K3
CLO4	Acquire knowledge on beverages, soft drinks, soda, fruit juices and alcoholic beverages examples.	K1 to K3
CLO5	Study about fats and oils - Sources of oils - production of refined vegetable oils - preservation. Saturated and unsaturated fats –MUFA and PUFA	K1 to K3

Mapping of Course Learning Outcomes (CLOs) with Programme Outcomes (POs)
(*SCIENCE*)

CLOs	PO1	PO2	PO3	PO4	PO5	PO6
CLO1	2	3	1	2	3	2
CLO2	3	3	2	3	3	2
CLO3	3	3	1	2	2	1
CLO4	3	2	2	1	1	2
CLO5	3	3	1	2	3	1

Mapping of Course Learning Outcomes (CLOs) with Programme Outcomes (POs)

(ARTS)

CLOs	PO1	PO2	PO3	PO4	PO5	PO6
CLO1	3	1	2	2	1	2
CLO2	2	1	1	1	1	2
CLO3	3	1	2	1	1	1
CLO4	3	1	3	2	1	2
CLO5	3	1	3	2	1	1

1-Basic Level 2- Intermediate Level 3- Advanced Level

Annexure-16

LESSON PLAN: TOTAL HOURS (30 Hrs)

UNIT	DESCRIPTION	HOURS	MODE
I	**Food Adulteration:** Sources of food, types, advantages and disadvantages. Food adulteration - contamination of wheat, rice, milk, butter etc. with clay stones, water and toxic chemicals -Common adulterants, Ghee adulterants and their detection. Detection of adulterated foods by simple analytical techniques.	**8**	Chalk and Talk, PPT, quiz,
II	**Food Poison** -Food poisons - natural poisons (alkaloids - nephrotoxin) - pesticides, (DDT,BHC, Malathion) - Chemical poisons - First aid for poison consumed victims.	**4**	Chalk and Talk, PPT, quiz,
III	**Food Additives**- Food additives -artificial sweeteners – Saccharin - Cyclomate a n d Aspartate Food flavours - esters, aldehydes and heterocyclic compounds – Food colours – Emulsifying agents – preservatives -leavening agents. Baking powder – yeast – tastemakers – MSG - vinegar.	**7**	Chalk and Talk, PPT, quiz,group discussion
IV	**Beverages** Beverages-softdrinks-soda-fruitjuices-alcoholicbeverages-examples. Carbonation-addictionto alcohol– diseases ofliver andsocial problems.	**4**	Chalk and Talk, PPT, quiz,
V	**Edible Oils**:Fats and oils - Sources of oils - production of refined vegetable oils - preservation.Saturated and unsaturated fats - iodine value - role of MUFA and PUFA in preventing heartdiseases-determination of iodine value,RM value,saponification values and their significance	**7**	Chalk and Talk, PPT, quiz, Seminar, Assignment
	Total	**30**	

Course Designers: 1. Dr.(Mrs).S.Manimekalai

2. Ms.K.Punitha

Annexure-16

Department of Chemistry						Class: I B.Sc		
Sem	**Category**	**Course Code**	**Course Title**	**Credits**	**Contact Hours / Week**	**CIA**	**SE**	**Total**
I	Foundation Course	**23OUCHFC1**	Role of Chemistry in Daily Life	2	2	25	75	100

Nature of the Course		
Knowledge and Skill Oriented	Employability Oriented	Entrepreneurship oriented
✔		

Course Objectives:

1.To gain knowledge about importance of Chemistry in everyday life

2.To acquire knowledge about chemistry of building materials and food

3.To understand about Nutrition and cosmetics.

4.To outline the application of Fertilizers and Fuels.

5.To compare the chemistry of Drugs and pharmaceuticals

Course Content :

Unit –I General survey of chemicals used in everyday life. Air - components and their importance; photosynthetic reaction, air pollution, green - house effect and the impact on our life style. Water - Sources of water, qualities of potable water, soft and hard water, methods of removal of hardness-water pollution.

Unit –II Building materials - cement, ceramics, glass and refractories - definition, composition and application only. Plastics - polythene, PVC, bakelite, polyesters, melamine-formaldehyde resins -preparation and uses only.

Unit –III Food and Nutrition - Carbohydrates, Proteins, Fats - definition and their importance as food constituents – balanced diet – Calories minerals and vitamins (sources and their physiological importance). Cosmetics – tooth paste, face powder, soaps and detergents, shampoos, nail polish, perfumes - general formulation and preparations - possible hazards of cosmetic use.

Unit –IV Chemicals in food production – fertilizers - need, natural sources; urea, NPK fertilizers and super phosphate. Fuel – classification - solid, liquid and gaseous; nuclear fuel examples and uses.

Unit –V Pharmaceutical drugs - analgesics and antipyretics - paracetamol and aspirin. Colour chemicals - pigments and dyes - examples and applications.

Explosives - classification and examples

Books for study:

1. Chopra H. K, (2010), "*Food chemistry",* Panesar, Narosa publishing house.
2. Jayashree Ghosh, S (2012) " *A textbook of pharmaceutical chemistry*", Chand publishing.
3. S. Vaithyanathan (2006), "*Text book of Ancillary Chemistry"*; Priya Publications, Karur.
4. Sharma, B. K, (2014), "*Industrial Chemistry*", GOEL publishing house, Meerut, Sixteen edition.
5. Kelly M. Elkins,(2019), "*Introduction to forensic chemistry"* CRC Press Taylor & Francis Group.
6. Jayashree Ghosh, (2006), "*Fundamental Concepts of Applied Chemistry*", S.Chand & Co.Publishers, second edition,

Books for Reference:

1. Randolph. Norris Shreve, (1977), "*Chemical Process Industries"*, McGraw-Hill, Texas, Fourth edition.
2. Poucher W.A,Joseph A.Brink,Jr. (2000), "*Perfumes,Cosmetics and Soaps*", Springer.
3. De .A.K, (1990), "*EnvironmentalChemistry"*, New Age International Publications.

Web resources/E-books:

1. https://kids.britannica.com/students/article/food-and-nutrition/274373
2. https://en.wikipedia.org/wiki/Building_material
3. https;//www.geeksforgeeks.org/posts-new?cid=82536bdb-84e6-4661-87c3-e77c3ac04ede

Pedagogy:

Chalk and Talk method, Power point Presentations, Seminar, Group Discussion, and Quiz

Rationale for nature of Course:

Knowledge and Skill: This course will enable the students to find different types of raw materials used in cosmetics, Soap and detergent. Gain knowledge of fundamentals in chemistry, Understand the knowledge about varies types of vitamins present in our body

Activities to be given:

1. To find out the types of vitamins present in varies food and make a chart
2. List out the ingredients present in commercial soap.

LESSON PLAN: TOTAL HOURS (30Hrs)

UNIT	DESCRIPTION	HOURS	MODE
I	General survey of chemicals used in everyday life. Air - components and their importance; photosynthetic reaction, air pollution, green - house effect and the impact on our life style. Water - Sources of water, qualities of potable water, soft and hard water, methods of removal of hardness-water pollution.	**7**	Chalk and Talk, PPT, quiz.
II	Building materials - cement, ceramics, glass and refractories - definition, composition and application only. Plastics - polythene, PVC, bakelite, polyesters, melamine-formaldehyde resins -preparation and uses only.	**5**	Chalk and Talk, PPT, quiz,
III	Food and Nutrition - Carbohydrates, Proteins, Fats - definition and their importance as food constituents – balanced diet – Calories minerals and vitamins (sources and their physiological importance). Cosmetics – tooth paste, face powder, soaps and detergents, shampoos, nail polish, perfumes - general formulation and preparations - possible hazards of cosmetic use.	**7**	Chalk and Talk, PPT, quiz, seminar
IV	Chemicals in food production – fertilizers - need, natural sources; urea, NPK fertilizers and super phosphate. Fuel – classification - solid, liquid and gaseous; nuclear fuel examples and uses.	**4**	Chalk and Talk, PPT, quiz, group Discussion
V	Pharmaceutical drugs - analgesics and antipyretics - paracetamol and aspirin. Colour chemicals - pigments and dyes - examples and applications. Explosives - classification and examples.	**7**	Chalk and Talk, PPT, quiz
	Total	**30**	

Course Designers: 1.Mrs.V.Gokilaa

2. Ms. J.Ilakkiyapavithra

Annexure-16

Department of Chemistry						Class: I B.Sc		
Sem	**Category**	**Course Code**	**Course Title**	**Credits**	**Contact Hours / Week**	**CIA**	**SE**	**Total**
II	Core Course 3	**23OUCH21**	General Chemistry-II	5	5	25	75	100

Nature of the Course		
Knowledge and Skill Oriented	Employability Oriented	Entrepreneurship oriented
✔		

Course Objectives:

1. To understand about chemistry of acids, bases and ionic equilibrium.
2. To illustrate and examine the properties of s and p-block elements.
3. To acquire knowledge about chemistry of hydrocarbons.
4. To learn about applications of acids and bases.
5. To discuss compounds of main block elements and hydrocarbons

Course Content:

Unit – I Acids, bases and Ionic equilibria : Concepts of Acids and Bases - Arrhenius concept, Bronsted-Lowry concept, Lewis concept; Relative strengths of acids, bases and dissociation constant; dissociation of poly basic acids, ionic product of water, pH scale, pH of solutions; Degree of dissociation, common ion effect, factors affecting degree of dissociation; acid base indicators, theory of acid base indicators – action of phenolphthalein and methyl orange, titration curves - use of acid base indicators;

Buffer solutions – types, mechanism of buffer action in acid and basic buffer, Henderson-Hasselbalch equation; Salt hydrolysis - salts of weak acids and strong bases, weak bases and strong acids, weak acids and weak bases - hydrolysis constant, degree of hydrolysis and relation between hydrolysis constant and degree of hydrolysis; Solubility product - determination and applications; numerical problems involving the core concepts.

Unit – II Chemistry of s - Block Elements : Hydrogen: Position of hydrogen in the periodic table. Alkali metals: Comparative study of the elements with respect to oxides, hydroxides,

halides, carbonates and bicarbonates. Diagonal relationship of Li with Mg. Preparation, properties and uses of NaOH, Na_2CO_3, KBr, $KClO_3$ alkaline earth metals. Anomalous behaviour of Be. **Chemistry of p- Block Elements (Group 13 & 14)** preparation and structure of diborane and borazine. Chemistry of borax. Extraction of Al and its uses. Alloys of Al. comparison of carbon with silicon. Carbon-di-sulphide – Preparation, properties, structure and uses. Percarbonates, per monocarbonates and per dicarbonates.

Unit – III Chemistry of p- Block Elements (Group 15-18): General characteristics of elements of Group 15; chemistry of $H_2N\text{-}NH_2$, NH_2OH, NH_3 and HNO_3. Chemistry of PH_3, PCl_3, PCl_5, $POCl_3$, P_2O_5 and oxy acids of phosphorous (H_3PO_3 and H_3PO_4). General properties of elements of group16 - Structure and allotropy of elements - chemistry of ozone - Classification and properties of oxides - oxides of sulphur and selenium – Oxy acids of sulphur (Caro's and Marshall's acids).**Chemistry of Halogens**: General characteristics of halogen with reference to electro-negativity, electron affinity, oxidation states and oxidizing power. Peculiarities of fluorine. Halogen acids (HF, HCl, HBr and HI), oxides and oxy acids ($HClO_4$). Inter-halogen compounds (ICl, ClF_3, BrF_5 and IF_7), pseudo halogens [$(CN)_2$ and $(SCN)_2$] and basic nature of Iodine. Noble gases: Position in the periodic table. Preparation, properties and structure of XeF_2, XeF_4, XeF_6 and $XeOF_4$; uses of noble gases - clathrate compounds.

Unit – IV Hydrocarbon Chemistry-I : Petroproducts: Fractional distillation of petroleum; cracking, isomerisation, alkylation, reforming and uses Alkenes-Nomenclature, general methods of preparation – Mechanism of elimination reactions – E_1 and E_2 mechanism - factors influencing – stereochemistry – orientation – Hofmann and Saytzeff rules. Reactions of alkenes – addition reactions – mechanisms – Markownikoff's rule, Kharasch effect, oxidation reactions – hydroxylation, oxidative degradation, epoxidation, ozonolysis; polymerization.**Alkadienes :** Nomenclature - classification – isolated, conjugated and cumulated dienes; stability of conjugated dienes; mechanism of electrophilic addition to conjugated dienes - 1, 2 and 1, 4 additions; free radical addition to conjugated dienes– Diels–Alder reactions – polymerisation – polybutadiene, polyisoprene (natural rubber), vulcanisation, polychloroprene..**Alkynes:** Nomenclature; general methods of preparation, properties and reactions; acidic nature of terminal alkynes and acetylene, polymerisation and isomerisation.**Cycloalkanes:** Nomenclature, Relative stability of cycloalkanes, Bayer's strain theory and its limitations. Conformational

analysis of cyclohexane, mono and di substituted cyclohexanes. Geometrical isomerism in cyclohexanes.

Unit – V Hydrocarbon Chemistry – II: Benzene: Source, structure of benzene, stability of benzene ring, molecular orbital picture of benzene, aromaticity, Huckel's (4n+2) rule and its applications. Electrophilic substitution reactions - General mechanism of aromatic electrophilic substitution - nitration, sulphonation, halogenation, Friedel-Craft's alkylation and acylation. Mono substituted and disubstituted benzene - Effect of substituent – orientation and reactivity. **Polynuclear Aromatic hydrocarbons:** Naphthalene – nomenclature, Haworth synthesis; physical properties, reactions – electrophilic substitution reaction, nitration, sulphonation, halogenation, Friedel – Crafts acylation & alkylation, preferential substitution at □ - position – reduction, oxidation – uses.Anthracene – synthesis by Elbs reaction, Diels – Alder reaction and Haworth synthesis; physical properties; reactions - Diels-Alder reaction, preferential substitution at C-9 and C-10; uses.

Books for study:

1. Madan R D, Sathya Prakash, (2003), "*Modern Inorganic Chemistry"*, 2nded, S.Chand and Company, New Delhi.
2. Sathya Prakash, Tuli G D,Basu S K and Madan R D, (2003), "*Advanced Inorganic Chemistry",* 17th ed., S.Chand and Company, New Delhi.
3. Bahl B S, Arul Bhal, (2003), "*Advanced Organic Chemistry"*, 3rd ed., S.Chand and Company, New Delhi.
4. Tewari K S, Mehrothra S N and Vishnoi N K, (1998), "*Text book of Organic Chemistry"*, 2nd ed., Vikas Publishing House, New Delhi.
5. Puri B R, Sharma L R, (2002), "*Principles of Physical Chemistry"*, 38th ed., Vishal Publishing Company, Jalandhar.

Books for Reference:

1. Maron S H and Prutton C P, (1972), "*Principles of Physical Chemistry"*, 4th ed., The Macmillan Company, Newyork.
2. Barrow G M, (1992), "*Physical Chemistry"*, 5th ed., Tata McGraw Hill, New Delhi.
   Lee J D, (1991), Concise Inorganic Chemistry, 4thed., ELBS William Heinemann, London.
3. Huheey J E, (1993), "*Inorganic Chemistry: Principles of Structure and Reactivity"*, 4th ed., Addison Wesley Publishing Company, India.

4. Gurudeep Raj, (2001), "*Advanced Inorganic Chemistry Vol – I"*, 26th ed., Goel Publishing House, Meerut.
5. Agarwal O P, (1995), "*Reactions and Reagents in Organic Chemistry"*, 8thed., Goel Publishing House,Meerut.

Web resources/E-books:

1.https://onlinecourses.nptel.ac.in

2.http://cactus.dixie.edu/smblack/chem1010/lecture_notes/4B.html

3.http://www.auburn.edu/~deruija/pdareson.

4.https://swayam.gov.in/course/64MOOC components

5.http://nptel.ac.in/courses/104101090/

6.http://nptel.ac.in/courses/104101090/

Pedagogy: Chalk and Talk method, Power point Presentations, Seminar, Group Discussion, Quiz.

Rationale for nature of Course:

Knowledge and Skill: This course to study and understand the p-block elements. To study the students may apply their skills and knowledge to acids bases and ionic equilibria. To acquire knowledge on hydrocarbon compounds.

Activities to be given:

1. To frame the structure of alkane, alkene and alkyne using atomic model set
2. To find out the pH of the acid and base solutions

COURSE LEARNING OUTCOMES (CLO's):

CLOs	Course Learning Outcomes Statements	Knowledge According to Bloom's Taxonomy (Upto K level)
CLO1	Understand the basic concept of acids, bases and ionic equilibria; periodic properties of s and p block elements, preparation and properties of aliphatic and aromatic hydrocarbons.	K1 to K3
CLO2	Discuss the periodic properties of S and P – block elements,reaction of aliphatic and aromatic hydrocarbons and strength of acids.	K1 to K3
CLO3	Classify hydrocarbons, types of reactions, acids and bases, examine the properties S and P-block elements, reaction mechanisms of aliphatic and	K1 to K4

	aromatic hydrocarbons	
CLO4	Explain theories of acids, bases and indicators, buffer action and important compounds of S-block elements.	K1 to K3
CLO5	Asses the application of hard and soft acids indicators,buffers,compounds of s and p-block elements and hydrocarbons.	K1 to K4

Mapping of Course Learning Outcomes (CLOs) with Programme Outcomes (POs)

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**
CLO1	3	2	2	2	3	2
CLO2	3	2	3	2	3	2
CLO3	3	3	1	2	3	2
CLO4	3	1	2	3	3	2
CLO5	3	2	1	2	2	3

1-Basic Level 2- Intermediate Level 3- Advanced Level

LESSON PLAN: TOTAL HOURS (75 Hrs)

UNIT	**DESCRIPTION**	**HOURS**	**MODE**
I	**Acids, bases and Ionic equilibria** Concepts of Acids and Bases - Arrhenius concept, Bronsted-Lowry concept, Lewis concept; Relative strengths of acids, bases and dissociation constant; dissociation of poly basic acids, ionic product of water, pH scale, pH of solutions; Degree of dissociation, common ion effect, factors affecting degree of dissociation; acid base indicators, theory of acid base indicators – action of phenolphthalein and methyl orange, titration curves - use of acid base indicators; Buffer solutions – types, mechanism of buffer action in acid and basic buffer, Henderson-Hasselbalch equation; Salt hydrolysis - salts of weak acids and strong bases, weak bases and strong acids, weak acids and weak bases - hydrolysis constant, degree of hydrolysis and relation	17	Chalk and Talk, PPT, quiz,

	between hydrolysis constant and degree of hydrolysis; Solubility product - determination and applications; numerical problems involving the core concepts.		
II	**Chemistry of s - Block Elements** Hydrogen: Position of hydrogen in the periodic table. Alkali metals: Comparative study of the elements with respect to oxides, hydroxides, halides, carbonates and bicarbonates. Diagonal relationship of Li with Mg. Preparation, properties and uses of NaOH, Na_2CO_3, KBr, $KClO_3$ alkaline earth metals. Anomalous behaviour of Be.**Chemistry of p- Block Elements (Group 13 & 14)** preparation and structure of diborane and borazine. Chemistry of borax. Extraction of Al and its uses. Alloys of Al. comparison of carbon with silicon. Carbon-di-sulphide – Preparation, properties, structure and uses. Percarbonates, per monocarbonates and per dicarbonates.	12	Chalk and Talk, PPT, quiz, group discussion
III	**Chemistry of p- Block Elements (Group 15-18)** General characteristics of elementsof Group 15; chemistry of H_2N-NH_2, NH_2OH, HN_3 and HNO_3. Chemistry of PH_3, PCl_3, PCl_5, $POCl_3$, P_2O_5 and oxy acids of phosphorous (H_3PO_3 and H_3PO_4). General properties of elements of group16 - Structure and allotropy of elements - chemistry of ozone - Classification and properties of oxides - oxides of sulphur and selenium – Oxy acids of sulphur (Caro's and Marshall's acids). **Chemistry of Halogens**: General characteristics of halogen with reference to electro-negativity, electron affinity, oxidation states and oxidizing power. Peculiarities of fluorine. Halogen acids (HF, HCl, HBr and HI), oxides and oxy acids ($HClO_4$). Inter-halogen compounds (ICl, ClF_3, BrF_5 and IF_7), pseudo halogens [$(CN)_2$ and $(SCN)_2$] and basic nature of Iodine. Noble gases: Position in the periodic table. Preparation, properties and structure of XeF_2, XeF_4, XeF_6 and $XeOF_4$; uses of noble gases - clathrate compounds.	17	Chalk and Talk, PPT, quiz,
IV	**Hydrocarbon Chemistry-I** Petroproducts: Fractional distillation of petroleum;	14	Chalk and Talk, PPT, quiz,

	cracking, isomerisation, alkylation, reforming and uses.Alkenes-Nomenclature, general methods of preparation – Mechanism of elimination reactions – E_1 and E_2 mechanism - factors influencing – stereochemistry – orientation – Hofmann and Saytzeff rules. Reactions of alkenes – addition reactions – mechanisms – Markownikoff's rule, Kharasch effect, oxidation reactions – hydroxylation, oxidative degradation, epoxidation, ozonolysis; polymerization. **Alkadienes:** Nomenclature - classification – isolated, conjugated and cumulated dienes; stability of conjugated dienes; mechanism of electrophilic addition to conjugated dienes - 1, 2 and 1, 4 additions; free radical addition to conjugated dienes– Diels–Alder reactions – polymerisation – polybutadiene, polyisoprene (natural rubber), vulcanisation,polychloroprene. **Alkynes**Nomenclature; general methods of preparation, properties and reactions; acidic nature of terminal alkynes and acetylene, polymerisation and isomerisation. **Cycloalkanes:** Nomenclature, Relative stability of cycloalkanes, Bayer's strain theory and its limitations. Conformational analysis of cyclohexane, mono and di substituted cyclohexanes. Geometrical isomerism in cyclohexanes.		seminar
V	**Hydrocarbon Chemistry - II** Benzene: Source, structure of benzene, stability of benzene ring, molecular orbital picture of benzene, aromaticity, Huckel's (4n+2) rule and its applications. Electrophilic substitution reactions - General mechanism of aromatic electrophilic substitution - nitration, sulphonation, halogenation, Friedel-Craft's alkylation and acylation. Mono substituted and disubstituted benzene - Effect of substituent – orientation and reactivity. **Polynuclear Aromatic hydrocarbons:** Naphthalene – nomenclature, Haworth synthesis; physical properties,	15	Chalk and Talk, PPT, quiz Seminar,

	reactions – electrophilic substitution reaction, nitration, sulphonation, halogenation, Friedel – Crafts acylation & alkylation, preferential substitution at □ - position – reduction, oxidation – uses. Anthracene – synthesis by Elbs reaction, Diels – Alder reaction and Haworth synthesis; physical properties; reactions - Diels-Alder reaction, preferential substitution at C-9 and C-10; uses.		
	Total	**75**	

Course Designers: 1.Dr.(Mrs).S.Manimekalai

2. Mrs.V.Gokilaa

Annexure-16

Department of Chemistry						Class: I B.Sc		
Sem	**Category**	**Course Code**	**Course Title**	**Credits**	**Contact Hours / Week**	**CIA**	**SE**	**Total**
II	Core Course 4	**23OUCH2P**	Qualitative Organic Analysis and Preparation of Organic compounds	3	3	40	60	100

Course Objectives:

1. To gain knowledge about laboratory safety.
2. To understand knowledge about handling glass wares.
3. To acquire knowledge about analysis of organic compounds
4. To understand basic knowledge about preparation of organic compounds

Course Content:

Unit – I Safety rules, symbols and first-aid in chemistry laboratory Basic ideas about Bunsen burner, its operation and parts of the flame. Chemistry laboratory glassware –basis information and uses.

Unit – II Qualitative Organic Analysis

Preliminary examination, detection of special elements - nitrogen, sulphur and halogens

Aromatic and aliphatic nature, Test for saturation and unsaturation, identification Of functional groups using solubility tests .Confirmation of functional groups

- monocarboxylic acid, dicarboxylic acid
- monohydric phenol, polyhydric phenol
- aldehyde, ketone, ester
- carbohydrate (reducing and non-reducing sugars)
- primary, secondary, tertiary amine
- monoamide, diamide, thioamide
- anilide, nitro compound

Preparation of derivatives for functional groups

Unit –III Preparation of Organic Compounds

i. Nitration - picric acid from Phenol
ii. Halogenation - p-bromo acetanilide from acetanilide

iii. Oxidation - benzoic acid from Benzaldehyde

iv. Microwave assisted reactions in water:

v. Methyl benzoate to Benzoic acid

vi. Salicylic acid from Methyl Salicylate

vii. Rearrangement - Benzil to Benzilic Acid

viii. Hydrolysis of benzamide to Benzoic Acid

Separation and Purification Techniques (Not for Examination)

1.Purificationof organic compounds by crystallization (from water / alcohol) and distillation

2.Determination of melting and boiling points of organic compounds.

3.Steam distillation - Extraction of essential oil from citrus fruits/eucalyptus leaves.

4. Chromatography (any one) (Group experiment)

(i) Separation of amino acids by Paper Chromatography

(ii)Thin Layer Chromatography - mixture of sugars / plant pigments /Permaganate/dichromate

(iii) Column Chromatography - extraction of carotene, chlorophyll and xanthophyll from leaves / separation of anthracene - anthracene picrate.

5. Electrophoresis – Separation of amino acids and proteins.

(Demonstration)

6. Isolation of casein from milk/Determination of saponification value of oil or fat/Estimation acetic acid from commercial vinegar. (Any one Group experiment) (4,5& 6–not for ES)

Books for Reference:

1. Venkateswaran, V.; Veeraswamy, R.; Kulandaivelu, A.R. (2012), "*Basic Principles of Practical Chemistry*", 2nd ed.; Sultan Chand: New Delhi.
2. Manna, A.K. (2018), "*Practical Organic Chemistry"*, Books and Allied: India.
3. Gurtu, J. N; Kapoor, R. (1987), "*Advanced Experimental Chemistry (Organic)"*, Sultan Chand: New Delh.,
4. Furniss,B. S.; Hannaford, A. J.; Smith, P. W. G.; Tatchell, A.R. Vogel's (1989), "*Textbook of Practical Organic Chemistry"*, 5th ed.; Pearson: India,1989

Web resources/E-books:

1.https://www.vlab.co.in/broad-area-chemical-sciences

Pedagogy: Chalk and Talk method, Power point Presentations, Seminar, Group Discussion, Quiz.

Annexure-16

LESSON PLAN: TOTAL HOURS (45 Hrs)

S.No	Description	Hrs	Mode
1	Unit – I Safety rules, symbols and first-aid in chemistry laboratory Basic ideas about Bunsen burner, its operation and parts of the flame. Chemistry laboratory glassware –basis information and uses.	2	Chalk and Talk, Demonstration
2	Detection of special elements, Aromatic and aliphatic nature, Test for saturation and unsaturation and identification of functional groups	2	Demonstration
3	Derivative preparation	2	Demonstration
4	Analysis of organic substance -I	3	Chalk and Talk, Discussion, Procedure with illustration
5	Analysis of organic substance -II	3	Chalk and Talk, Discussion, Procedure with illustration
6	Analysis of organic substance -III	3	Chalk and Talk, Discussion, Procedure with illustration
7	Analysis of organic substance –IV	3	Chalk and Talk, Discussion, Procedure with illustration
8	Analysis of organic substance -V	3	Chalk and Talk, Discussion, Procedure with illustration
9	Analysis of organic substance -VI	3	Chalk and Talk, Discussion, Procedure with illustration
10	Preparation of Organic Compounds: Nitration - picric acid from Phenol Halogenation - p-bromo acetanilide from acetanilide Oxidation - benzoic acid from Benzaldehyde	3	Chalk and Talk, Discussion, Procedure with illustration
11	Microwave assisted reactions in water: Methyl benzoate to Benzoic acid Salicylic acid from Methyl Salicylate Rearrangement - Benzil to Benzilic Acid Hydrolysis of benzamide to Benzoic Acid	3	Chalk and Talk, Discussion, Procedure with illustration
12	Separation and Purification Techniques (Not for Examination) 1.Purificationof organic compounds by	3	Chalk and Talk, Demonstration

	crystallization (from water / alcohol) and distillation		
13	2.Determination of melting and boiling points of organic compounds. 3,Steam distillation - Extraction of essential oil from citrus fruits/eucalyptus leaves. 4. Chromatography (any one) (Group experiment) (i) Separation of amino acids by Paper Chromatography (ii)Thin Layer Chromatography - mixture of sugars / plant pigments /Permaganate/dichromate (iii) Column Chromatography - extraction of carotene, chlorophyll and xanthophyll from leaves / separation of anthracene - anthracene picrate. 5.Electrophoresis – Separation of amino acids and proteins. (Demonstration) 6. Isolation of casein from milk/Determination of saponification value of oil or fat/Estimation of acetic acid from commercial vinegar. (Any one Group experiment) (4,5& 6–not for ESE)	4	Chalk and Talk, Demonstration
14	Revision	4	
15	Model	4	
	Total	45	

Course Designers: 1.Dr.(Mrs).S.Manimekalai

2. Ms.K.Punitha

Annexure-16

EVALUATION (PRACTICAL*)*

Internal (Formative) : 40 marks

External (Summative) : 60 marks

Total :100 marks

Question Paper Pattern for Internal Practical Examination: 40 Marks

S.No	**Components**	**Marks**
1.	Experiment-Organic Analysis and organic preparation	10
2	Procedure for organic analysis and organic preparations	10
3.	Model Exam	10
4.	Viva	5
5.	Observation Book	5
	Total	**40**

Question Paper Pattern for External Practical Examination (Major): 60 Marks

S.No	**Components**	**Marks**
1.	Experiment- Organic Analysis	20
2	Experiment- Organic preparations	10
2	Procedure for organic analysis and organic preparations	10
3.	Viva	10
4.	Record Book	10
	Total	**60**

In respect of external examinations passing minimum is **35% for Under Graduate** Courses and in total, **aggregate of 40%.**

Latest amendments and revisions as per **UGC** and **TANSCHE** norm is taken into consideration to suit the changing trends in the curriculum.

Annexure-16

Department of Chemistry						Class: I B.Sc		
Sem	**Category**	**Course Code**	**Course Title**	**Credits**	**Contact Hours / Week**	**CIA**	**SE**	**Total**
II	Skill Enhancement Course 2 (NME)	**23OUCHSECN2**	Dairy Chemistry	2	2	25	75	100

Nature of the Course		
Knowledge and Skill Oriented	Employability Oriented	Entrepreneurship oriented
✔	✓	

Course Objectives:

1. To understand chemistry of milk and milk products
2. To acquire knowledge about processing of milk
3. To gain knowledge about preservation and formation of milk products.
4. To learn about special milk
5. To outline the fermented and other milk products

Course Content:

Unit-1 Composition of Milk : Milk-definition-general composition of milk- constituents of milk – lipids, proteins, carbohydrates, vitamins and minerals - physical properties of milk - colour, odour, acidity, specific gravity, viscosity and conductivity -Factors affecting the composition of milk - adulterants, preservatives with neutralizer- examples and their detection- estimation of fat, acidity and total solids in milk.

Unit –II Processing of Milk: Microbiology of milk - destruction of micro - organisms in milk, physico – chemical changes taking place in milk due to processing - boiling, pasteurization – types of pasteurization -Bottle, Batch and HTST (High Temperature Short Time) – Vacuum pasteurization – Ultra High Temperature Pasteurization.

Unit – III Major Milk Products: Cream - definition - composition - chemistry of creaming process - gravitational and centrifugal methods of separation of cream - estimation of fat in cream. Butter - definition -composition - theory of churning – desi butter - salted butter, estimation of acidity and moisture content in butter. Ghee - major constituents - common

adulterants added to ghee and their detection - rancidity - definition - prevention - antioxidants and synergists - natural and synthetic.

Unit – IV Special Milk : Standardised milk - definition - merits - reconstituted milk - definition - flow diagram of manufacture - Homogenised milk - flavoured milk - vitaminised milk - toned milk -Incitation milk - Vegetable toned milk - humanized milk –

Condensed milk –definition,composition and nutric value.

Unit – V Fermented and other Milk Products : Fermented milk products – fermentation of milk - definition, conditions, cultured milk - definition of culture - example, conditions - cultured cream, butter milk - Bulgarious milk -acidophilous milk – Yoheer Indigeneous products- khoa and chhena definition - Ice cream -definition-percentage composition-types-ingredients-manufacture of ice–cream, stabilizers emulsifiersandtheirrole-milkpowder-definition-needformakingmilkpowderdryingprocess-types of drying.

Books for study:

1. Bagavathi Sunder K., (2006.) "*Applied Chemistry"*, MJP Publishers, first edition,
2. Rangappa K. S. and Acharya, K.T. *"Indian Dairy Products*", Asia Publishing House New Delhi,
3. . Mathur, M.P. Datta Roy, D. Dinakar, P (2008.) "*Text book of dairy chemistry*".Indian Council of Agricultural Research, 1st edition,
4. Saurav Singh, Daya Publishing house, (2013) "*A Text book of dairy chemistry",* 1 st edition,
5. Choudhary, P. L (2021.) "*Text book of dairy chemistry",* Bio-Green book publishers,

Books for Reference:

1. Robert Jenness and S. Patom, (2005) "*Principles of Dairy Chemistry",* S.Wiley, New York.
2. Sukumar De, (1980.)"*Outlines of Dairy Technology"*, Oxford University Press, New Delhi,
3. Fox P.F and. Mcsweeney P.L H, (2016)"*Dairy Chemistry and Biochemistry*", Springer, Second edition, .
4. Fox, P. F.,. Uniacke-Lowe T,. McSweeney, P.L.H. OMahony J.A, (2015) "*Dairy chemistry and biochemistry*",Springer, Second edition,

Web resources/E-books:

1.https://epgp.inflibnet.ac.in/epgpdata/uploads/epgp_content/S000444FN/P000546/M011695/ET/14627_9550040et.pdf

2.https://www.pfndai.org/Document/Association_News/dairy_processing/Dairy_Products_Processing-_Dr_Kanade.pdf

3. https://www.fao.org/3/i3396e/i3396e.pdf

4.. http://ecoursesonline.iasri.res.in/mod/page/view.php?id=6168
5.https://www.researchgate.net/publication/228662659_Fermented_Dairy_Products_Starter_Cultures_and_Potential_Nutritional_Benefits

Pedagogy: Chalk and Talk method, Power point Presentations, Seminar, Group Discussion, Quiz.

Rationale for nature of Course:

Knowledge and Skill: To gain knowledge on dairy chemistry

Employability Oriented: Students will get employment in Dairy units

Activities to be given: To find out the composition in various types of milk.

COURSE LEARNING OUTCOMES (CLO's):

CLOs	Course Learning Outcomes Statements	Knowledge According to Bloom's Taxonomy (Upto K level)
CLO1	Understand about general composition of milk – constituents and its physical properties.	K1 to K3
CLO2	Acquire knowledge about pasteurization of Milk and various types of pasteurization - Bottle, Batch and HTST Ultra High Temperature Pasteurization.	K1 to K3
CLO3	Learn about cream and butter their composition and how to estimate fat in cream and ghee.	K1 to K3
CLO4	Explain about Homogenized milk, flavoured milk, vitaminised milk and toned milk.	K1 to K3
CLO5	Have an idea about how to make milk powder and its drying process - types of drying .	K1 to K3

Mapping of Course Learning Outcomes (CLOs) with Programme Outcomes (POs)

*(*SCIENCE*)*

CLOs	PO1	PO2	PO3	PO4	PO5	PO6
CLO1	2	3	1	2	3	2
CLO2	3	3	2	3	3	2
CLO3	3	3	1	2	2	1
CLO4	3	2	2	1	1	2
CLO5	3	3	1	2	3	1

Annexure-16

Mapping of Course Learning Outcomes (CLOs) with Programme Outcomes (POs)

(ARTS)

CLOs	PO1	PO2	PO3	PO4	PO5	PO6
CLO1	3	1	2	2	1	2
CLO2	2	1	1	1	1	2
CLO3	3	1	2	1	1	1
CLO4	3	1	3	2	1	2
CLO5	3	1	3	2	1	1

1-Basic Level 2- Intermediate Level 3- Advanced Level

LESSON PLAN: TOTAL HOURS (30 Hrs)

UNIT	DESCRIPTION	HOURS	MODE
I	Composition of Milk Milk-definition-general composition of milk constituents of milk - lipids, proteins, carbohydrates, vitamins and minerals - physical properties of milk - colour, odour, acidity, specific gravity, viscosity and conductivity - Factors affecting the composition of milk - adulterants, preservatives with neutralizer- examples and their detection- estimation of fat, acidity and total solids in milk.	**8**	Chalk and Talk, PPT, quiz,
II	Processing of Milk Microbiology of milk - destruction of micro - organisms in milk, physico – chemical changes taking place in milk due to processing - boiling, pasteurization – types of pasteurization -Bottle, Batch and HTST (High Temperature Short Time) – Vacuum pasteurization – Ultra High Temperature Pasteurization.	**4**	Chalk and Talk, PPT, quiz,
III	Major Milk Products Cream - definition - composition - chemistry of creaming process - gravitational and centrifugal methods of separation of cream - estimation of fat in cream. Butter - definition -composition - theory of churning – desi butter - salted butter, estimation of acidity and moisture content in butter. Ghee - major constituents - common adulterants added to ghee and their detection - rancidity - definition - prevention - antioxidants and synergists - natural and synthetic.	**7**	Chalk and Talk, PPT, quiz, group discussion
	Special Milk	**4**	Chalk and Talk,

	Standardised milk - definition - merits - reconstituted milk - definition - flow diagram of manufacture - Homogenised milk - flavoured milk - vitaminised milk - toned milk - Incitation milk - Vegetable toned milk - humanized milk – Condensed milk –definition,composition and nutric value.		PPT, quiz,
IV	Fermented and other Milk Products Fermented milk products – fermentation of milk - definition, conditions, cultured milk - definition of culture - example, conditions - cultured cream, butter milk - Bulgarious milk -acidophilous milk – Yoheer Indigeneous products- khoa and chhena definition - Ice cream - definition-percentage composition-types-ingredients-manufacture of ice–cream, stabilizers emulsifiersandtheirrole-milkpowder-definition-needformakingmilkpowderdryingprocess-types of drying.	**7**	Chalk and Talk, PPT, quiz, Seminar,
	Total	**30**	

Course Designer: Ms.K.Punitha

Annexure-16

Department of Chemistry						Class: I B.Sc		
Sem	**Category**	**Course Code**	**Course Title**	**Credits**	**Contact Hours / Week**	**CIA**	**SE**	**Total**
II	Discipline Specific Elective course (DSEC)	**23OUCHSEC3**	Cosmetics and Personal Grooming	2	2	25	75	100

Nature of the Course		
Knowledge and Skill Oriented	Employability Oriented	Entrepreneurship oriented
✔		✓

Course Objectives:

1. To gain the knowledge about formulations of various types of cosmetics and their significance
2. To understand the knowledge about hair, skin and dental care
3. To acquire the knowledge about makeup preparations and personal grooming
4. To learn about perfumes classification
5. To provide knowledge about Beauty Treatments Facials

Course Content:

Unit – 1 Skin care: Nutrition of the skin, skin care and cleansing of the skin; face powder – ingredients; creams and lotions – cleansing, moisturizing all purpose, shaving and sunscreen (formulation only); Gels – formulation and advantages; astringent and skin tonics – key ingredients, skin lightness, depilatories.

Unit – 1I Hair care Shampoos – types – powder, cream, liquid, gel – ingredients; conditioner – types – ingredients Dental care - Tooth pastes – ingredients – mouth wash

Unit – 1II Make up Base – foundation – types – ingredients; lipstick, eyeliner, mascara, eye shadow, concealers, rouge

Unit – 1V Perfumes Classification - Natural – plant origin – parts of the plant used, chief constituents; animal origin – amber gries from whale, civetone from civet cat, musk from musk deer; synthetic – classification emphasizing characteristics – esters – alcohols – aldehydes – ketones

Unit – V Beauty treatments Facials - types – advantages – disadvantages; face masks – types; bleach - types – advantages– disadvantages; shaping the brows; eyelash tinting; perming – types;

hair colouring and dyeing ; permanent waving – hair straightening; wax – types – waxing; pedicure, manicure - advantages – disadvantages

Books for study:

1.Thankamma Jacob, (1997), "*Foods, drugs and cometics – A consumer guide*", Macmillan publication, London.

Books for Reference:

1. Wilkinson J .B. E and Moore R J, Harry's(1997), "*cosmeticology"*, 7th ed., Chemical Publishers, London.
2. George Howard, (1987) " *Principles and practiceof perfumes and cosmetics*",

Web resources/E-books:

1. http://www.khake.com/page75.html
2. Net.foxsm/list/284

Pedagogy: Chalk and Talk method, Power point Presentations, Seminar, Group Discussion, Quiz.

Rationale for nature of Course:

Knowledge and Skill: To acquired knowledge on cosmetics and beauty treatments.

Entrepreneurship oriented:

This course will enable the students to develop their entrepreneurial skills that enable them to become a successful entrepreneur in the field of cosmetics**.**

Activities to be given: Prepare power point presentation about various cosmetics products and their composition

COURSE LEARNING OUTCOMES (CLO's):

CLOs	Course Learning Outcomes Statements	Knowledge According to Bloom's Taxonomy (Upto K level)
CLO1	Know about the composition of various cosmetic products	K1 to K3
CLO2	Understand chemical aspects and applications of hair care and dental care and skin care products	K1 to K3
CLO3	Understand chemical aspects and applications of perfumes and skin care products	K1 to K3
CLO4	Understand the methods of beauty treatments their advantages and disadvantage	K1 to K3
CLO5	Understand the hazards of cosmetic products.	K1 to K3

Annexure-16

Mapping of Course Learning Outcomes (CLOs) with Programme Outcomes (POs)

	PO1	PO2	PO3	PO4	PO5	PO6
CLO1	3	1	1	2	3	2
CLO2	3	1	1	1	3	2
CLO3	3	1	1	1	3	2
CLO4	3	1	2	3	3	2
CLO5	3	2	1	2	1	3

1-Basic Level 2- Intermediate Level 3- Advanced Level

LESSON PLAN: TOTAL HOURS (30 Hrs)

UNIT	DESCRIPTION	HOURS	MODE
I	Skin care -Nutrition of the skin, skin care and cleansing of the skin; face powder – ingredients; creams and lotions – cleansing, moisturizing all purpose, shaving and sunscreen (formulation only); Gels – formulation and advantages; astringent and skin tonics – key ingredients, skin lightness, depilatories.	**8**	Chalk and Talk, PPT, quiz,
II	Hair care Shampoos – types – powder, cream, liquid, gel – ingredients; conditioner – types – ingredients Dental care Tooth pastes – ingredients – mouth wash	**4**	Chalk and Talk, PPT, quiz,
III	Make up Base – foundation – types – ingredients; lipstick, eyeliner, mascara, eye shadow, concealers, rouge	**7**	Chalk and Talk, PPT, quiz, group discussion
IV	Perfumes Classification - Natural – plant origin – parts of the plant used, chief constituents; animal origin – amber gries from whale, civetone from civet cat, musk from musk deer; synthetic – classification emphasizing characteristics – esters – alcohols – aldehydes – ketones	**4**	Chalk and Talk, PPT, quiz,
V	Beauty treatments Facials - types – advantages – disadvantages; face masks – types; bleach - types – advantages– disadvantages; shaping the brows; eyelash tinting; perming – types; hair colouring and dyeing ; permanent waving – hair straightening; wax – types – waxing; pedicure, manicure - advantages – disadvantages	**7**	Chalk and Talk, PPT, quiz, Seminar,
	Total	**30**	

Course Designers: 1.Ms.K.Punitha

2. Dr.(Mrs) S.Manimekalai

Annexure-16

Department of Chemistry						Class: I B.Sc (N&D)		
Sem	**Category**	**Course Code**	**Course Title**	**Credits**	**Contact Hours / Week**	**CIA**	**SE**	**Total**
I	Generic Elective Course 1	23OUNDGECH1	Chemistry for Biological Sciences-I	3	4	25	75	100

Nature of the Course		
Knowledge and Skill Oriented	Employability Oriented	Entrepreneurship oriented
✓		

Course Objectives:

1. To gain knowledge about basics of atomic orbitals, chemical bonds, hybridization an fundamentals of organic chemistry and nuclear chemistry.
2. To understand about the nuclear chemistry and industrial chemistry.
3. To acquire knowledge about fundamental concept of organic chemistry.
4. To outline the importance of Drug and speciality chemicals.
5. To discuss the separation and purification techniques.

Course Content:

Unit-I Chemical Bonding and Nuclear Chemistry: Chemical Bonding: Molecular Orbital Theory-bonding, antibonding and non-bonding orbitals. M. O diagrams for Hydrogen, Helium, Nitrogen; discussion of bond order and magnetic properties.Nuclear Chemistry: Fundamental particles - Isotopes, Isobars, Isotones and Isomers-Difference between chemical reactions and nuclear reactions- group displacement law. Nuclear binding energy - mass defect - calculations. Nuclear fission and nuclear fusion - differences – Stellar energy. Applications of radioisotopes – carbon dating, rock dating and medicinal applications.

Unit-II Fuels: Fuel gases: Natural gas, water gas, semi water gas, carbureted water gas, producer gas, CNG, LPG and oil gas (manufacturing details not required).Silicones: Synthesis, properties and uses of silicones. Fertilizers: Urea, ammonium sulphate, potassium nitrate NPK fertilizer, superphosphate, triple superphosphate.

Unit III Fundamental Concepts in Organic Chemistry

Hybridization: Orbital overlap hybridization and geometry of CH_4, C_2H_4, C_2H_2 and C_6H_6. Polar effects: Inductive effect and consequences on Ka and K_b of organic acids and bases, electromeric, mesomeric, hyper conjugation and steric-examples and explanation. Reaction mechanisms: Types of reactions- aromaticity-aromatic electrophilic substitution; nitration, halogenation, Friedel-Craft's alkylation and acylation. Heterocyclic compounds: Preparation, properties of pyrrole and pyridine.

Unit IV Drugs and Speciality Chemicals

Definition, structure and uses: Antibiotics viz., Penicillin, Chloramphenicol and Streptomycin; Anaesthetics viz.,Chloroformand ether; Antipyretics viz., aspirin, paracetamol and ibuprofen; Artificial Sweeteners viz., saccharin, Aspartame and cyclamate; Organic Halogen compounds viz., Freon, Teflon.

Unit V Analytical Chemistry

Introduction qualitative and quantitative analysis. Principles of volumetric analysis. Separation and purification techniques: extraction, distillation and crystallization. Chromatography: principle and application of column, paper and thin layer chromatography.

Books for study:

1. Veeraiyan.V, (2009), "*Textbook of Ancillary Chemistry*", High mount publishing house, Chennai, first edition.
2. Vaithyanathan.S, (2006), "*Text book of Ancillary Chemistry*", PriyaPublications, Karur.
3. ArunBahl, Bahl. B.S, (2012) "*Advanced Organic Chemistry*", S.Chand and Company, New Delhi, twenty third edition.
4. Soni. P.L., Chawla. H.M, (2007) "*Text Book of Inorganic Chemistry*", Sultan Chand & sons, New Delhi, twenty ninth edition.

Books for Reference:

1. Soni. P.L., Mohan Katyal, (2007), "*Text book of Inorganic chemistry*", Sultan Chand and Company, New Delhi, twentieth edition,
2. Sharma. B.K,, (2014) "*Industrial Chemistry*", GOEL publishing house, Meerut, sixteenth edition,
3. Jayashree gosh, (2006) "*Fundamental Concepts of Applied Chemistry*", Sultan & Chand, Edition

Web resources/E-books:

1. http://www.khake.com/page75.html
2. Net.foxsm/list/284

Pedagogy: Chalk and Talk, PPT, Group Discussion , Seminar , Quiz, Spot test, Virtual labs.

Rationale for nature of Course:

Knowledge and Skill:

1. This course to study and understand the chemical concepts, principles and theories of nuclear chemistry and Aromaticity.
2. To develop the knowledge on applications of Fertilizer.
3. To gain the knowledge and skill to study the application of Antibiotics and Antipyretics in our daily life.
4. To acquired knowledge about the Separation of organic compounds.

Activities to be given:

1. To identify the applications of radioactive isotopes in various field.
2. To Writing the application of fertilizer and fuel gas.
3. Extraction process involved in metallurgical process using chart work method.
4. To writing the application of Antibiotics, Anesthesia and Antipyretics.

COURSE LEARNING OUTCOMES (CLO's):

CLOs	Course Learning Outcomes Statements	Knowledge According to Bloom's Taxonomy (Upto K level)
CLO1	State the theories of chemical bonding, nuclear reactions and its applications.	K1 to K3
CLO2	Evaluate the efficiencies and uses of various fuels and fertilizers.	K1 to K3
CLO3	Explain the type of hybridization, electronic effect and mechanism involved in theorganic reactions.	K1 to K4
CLO4	Demonstrate the structure and uses of antibiotics, anaesthetics, antipyretics andartificial sugars.	K1 to K3
CLO5	Analyse various methods to identify an appropriate method for the separation of chemical components	K1 to K4

Mapping of Course Learning Outcomes (CLOs) with Programme Outcomes (POs)

CLO's	PO1	PO2	PO3	PO4	PO5	PO6
CLO1	3	1	1	2	3	2
CLO2	3	1	1	1	3	2
CLO3	3	1	1	1	3	2
CLO4	3	1	2	3	3	2
CLO5	2	2	1	2	1	1

1-Basic Level 2- Intermediate Level 3- Advanced Level

LESSON PLAN: TOTAL HOURS (60 Hrs)

UNIT	DESCRIPTION	HOURS	MODE
1	**Chemical Bonding and Nuclear Chemistry** Chemical Bonding: Molecular Orbital Theory-bonding, antibonding and non-bonding orbitals. M.O diagrams for Hydrogen, Helium, Nitrogen; discussion of bond order and magnetic properties. Nuclear Chemistry: Fundamental particles - Isotopes, Isobars, Isotones and Isomers-Differences between chemical reactions and nuclear reactions- group displacement law. Nuclear binding energy - mass defect - calculations. Nuclear fission and nuclear fusion - differences – Stellar energy. Applications of radioisotopes – carbon dating, rock dating and medicinal applications.	**13**	Chalk and Talk, PPT, quiz,
2	Fuels: Fuel gases: Natural gas, water gas, semi water gas, carbureted water gas, producer gas, CNG, LPG and oil gas (manufacturing details not required). Silicones: Synthesis, properties and uses of silicones. Fertilizers: Urea, ammonium sulphate, potassium nitrate	**10**	Chalk and Talk, PPT, quiz,

	NPK fertilizer, superphosphate, triple superphosphate.		
3	**Fundamental Concepts in Organic Chemistry** Hybridization: Orbital overlap hybridization and geometry of CH_4, C_2H_4, C_2H_2 and C_6H_6. Polar effects: Inductive effect and consequences on K_a and K_b of organic acids and bases, electromeric, mesomeric, hyper conjugation and steric-examples and explanation. Reaction mechanisms: Types of reactions-aromaticity-aromatic electrophilic substitution; nitration, halogenation, Friedel-Craft's alkylation and acylation.Heterocyclic compounds: Preparation, properties of pyrrole and pyridine.	**12**	Chalk and Talk, PPT, quiz, group discussion
4	**Drugs and Speciality Chemicals** Definition, structure and uses: Antibiotics Chloramphenicol and Streptomycin; Anaesthetics viz.,Chloroform and ether; Antipyretics viz., aspirin, paracetamol and ibuprofen;Artificial Sweeteners viz., saccharin, Aspartame and cyclamate; Organic Halogen compounds viz., Freon, Teflon.	**10**	Chalk and Talk, PPT, quiz,
5	**Analytical Chemistry** Introduction qualitative and quantitative analysis. Principles ofvolumetric analysis. Separation and purification techniques: extraction, distillation and crystallization. Chromatography: principle and application of column, paper and thin layer chromatography.	**15**	Chalk and Talk, PPT, quiz, Seminar,
	Total	**60**	

Course designers: 1. Ms.K.Punitha

2. J. Ilakkiyapavithra

Annexure-16

Department of Chemistry						Class: I B.Sc (N&D)		
Sem	**Category**	**Course Code**	**Course Title**	**Credits**	**Contact Hours / Week**	**CIA**	**SE**	**Total**
I	Generic Elective Course-2	**23OUNDGECH1P**	Chemistry Practical for Biological Sciences- I	2	2	40	60	100

Nature of the Course		
Knowledge and Skill Oriented	Employability Oriented	Entrepreneurship oriented
✓		

II) Volumetric Analysis:

1. Estimation of sodium hydroxide using standard sodiumcarbonate.
2. Estimation of hydrochloric acid using standard oxalic acid.
3. Estimation of ferrous sulphate using standard Mohr's salt.
4. Estimation of oxalic acid using standard ferrous sulphate.
5. Estimation of potassium permanganate using standardsodium hydroxide.
6. Estimation of magnesium using EDTA.
7. Estimation of ferrous ion using diphenyl amine as indicator.

Books for References:

1. Venkateswaran.V, Veeraswamy.R, Kulandaivelu.A.R., (2012*),"Basic Principles of Practical Chemistry",* 2nd Edition, Sultan Chand & Sons, New Delhi
2. Mendham J., Denney R. C., Barnes J. D., Thomas M., Sivasankar B., (2000)"*Vogel's Textbook of Quantitative Chemical Analysis*," 6th edn, Pearson Education Ltd., New Delhi.
3. Mukhopadhyay R., Chatterjee P., (2007), "*Advanced Practical Chemistry*," 3rd Edition, Books and Allied Pvt., Kolkata.

Web resources/E-books:

1. **http://allcomputerprograms.blogspot.com/2011/09/estimation-of-ferrous-iron-redox.html**

2. https://byjus.com/chemistry/titration-of-oxalic-acid-with-kmno4/
3. https://byjus.com/chemistry/titration-of-hydrochloric-acid-against-standard-sodium-carbonate/
4. https://byjus.com/jee/hardness-of-water-types-and-removal/

Pedagogy: Chalk and Talk, Group Discussion, Data interpretation and Demonstration

LESSON PLAN: TOTAL HOURS (30 Hrs)

UNIT	DESCRIPTION	HOURS	MODE
1	Instructions	2	Chalk and Talk, Group discussion
2	Estimation of sodium hydroxide using standard sodiumcarbonate.	3	Discussion, Data interpretation
3	Estimation of hydrochloric acid using standard oxalic acid.	3	Discussion, Data interpretation
4	Estimation of ferrous sulphate using standard Mohr's salt	3	Demonstration, Data interpretation
5	Estimation of oxalic acid using standard ferrous sulphate.	3	Discussion, Data interpretation
6	Estimation of potassium permanganate using standardsodium hydroxide.	3	Demonstration, Data interpretation
7.	Estimation of magnesium using EDTA.	3	Discussion, Data interpretation
8	Estimation of ferrous ion using diphenyl amine as indicator.	3	Discussion, Data interpretation
9	Revision	4	
10	Model Exam	3	
	Total	30	

Course Designers: 1. Ms.K.Punitha

2. J. Ilakkiyapavithra

Annexure-16

EVALUATION (PRACTICAL*)*

Internal (Formative) : 40 marks

External (Summative) : 60 marks

Total :100 marks

Question Paper Pattern for Internal Practical Examination: 40 Marks

S.No	**Components**	**Marks**
1.	Experiment	10
2	Procedure	10
3.	Model Exam	10
4.	Viva	5
5.	Observation Book	5
	Total	**40**

Question Paper Pattern for External Practical Examination (Major): 60 Marks

S.No	**Components**	**Marks**
1.	Experiment	30
2	Procedure	10
3.	Viva	10
4.	Record Book	10
	Total	**60**

Distribution of marks for External

Estimation (30 marks)

Error <2% - 30 marks

Error 2-3% -25 marks

Error 3-4% -20 marks

Error >4% -10 marks

In respect of external examinations passing minimum is **35% for Under Graduate** Courses and in total, **aggregate of 40%.**

Latest amendments and revisions as per **UGC** and **TANSCHE** norm is taken into consideration to suit the changing trends in the curriculum.

Annexure-16

Department of Chemistry						Class: I B.Sc (N&D)		
Sem	**Category**	**Course Code**	**Course Title**	**Credits**	**Contact Hours / Week**	**CIA**	**SE**	**Total**
II	Generic Elective Course 3	23OUNDGECH2	Chemistry for Biological Sciences-II	3	4	25	75	100

Nature of the Course		
Knowledge and Skill Oriented	Employability Oriented	Entrepreneurship oriented
✓		

Course Objectives:

1.To study the nomenclature of coordination compounds.

2.To acquire the knowledge about carbohydrates.

3.To gain the knowledge about Amino Acids and Essential elements of biosystem.

4.To understand the concepts of electrochemistry

5.To provide fundamentals of photochemistry

Course Content:

Unit-1 Co-ordination Chemistry and Water Technology: Co-ordination Chemistry**:** Definition of terms - IUPAC Nomenclature- Werner'stheory - EAN rule - Pauling's theory – Postulates - Applications to $[Ni(CO)_4]$, $[Ni(CN)_4]^{2-}$,$[Co(CN)_6]^{3-}$ Chelation - Biological role of Hemoglobin and Chlorophyll (elementary idea) -Applications in qualitative and quantitative analysis.Water Technology: Hardness of water, determination of hardness of water using EDTA method, zeolite method-Purification techniques –BOD and COD

Unit-II Carbohydrates: Classification, preparation and properties of glucose and fructose. Discussion of open chain ring structures of glucose and fructose. Glucose-fructose interconversion. Preparation and properties of sucrose, starch and cellulose.

Unit-1II Amino Acids and Essential elements of biosystem: Classification - preparation and properties of alanine,preparation of dipeptides using Bergmann method - Proteins-

classification – structure - Colour reactions – Biological functions – nucleosides -nucleotides – RNA and DNA – structure. Essentials of trace metals in biological system-Na, Cu, K, Zn, Fe, Mg.

Unit-1V Electrochemistry: Galvanic cells - Standard hydrogen electrode - calomel electrode - standard electrode potentials -electrochemical series. Strong and weak electrolytes - ionic product of water -pH, pKa, pKb. Conductometric titrations - pH determination by colorimetric method – buffer solutions and its biological applications - electroplating - Nickel and chromeplating – Types of cells -fuel cells-corrosion and its prevention.

Unit-V Photochemistry: Grothus - Drapper's law and Stark-Einstein's law of photochemical equivalence, Quantum yield - Hydrogen -chloride reaction. Phosphorescence, fluorescence, chemiluminescence and photosensitization and photosynthesis (definition with examples).

Books for study :

1. Veeraiyan.V, (2009), "*Textbook of Ancillary Chemistry",* High mountpublishing house, Chennai, first edition.
2. Vaithyanathan.S, (2006), "*Text book of Ancillary Chemistry*", Priya Publications, Karur.
3. Arun Bahl, Bahl.B.S, (2012), "*Advanced Organic Chemistry*", S.Chand and Company, New Delhi, twenty third edition.
4. Soni.P.L, Chawla.H.M, (2007),"*Text Book of Organic Chemistry*", Sultan Chand & sons, New Delhi twenty ninth edition.

Books for Reference:

1. Arun Bahl, Bahl. B.S, (2012), "*Advanced Organic Chemistry*", S.Chandand Company, New Delhi, twenty third edition.
2. Soni.P.L, Chawla.H.M, (2007), *Text Book of Organic Chemistry*; Sultan Chand & sons, New Delhi,, twenty ninth edition.
3. Soni, P.L Mohan Katyal, (2007), "*Text book of Inorganic chemistry*", Sultan Chand and Company, New Delhi, twentieth edition.
4. Puri B.R, Sharma, L.R.Pathania, M.S (2018), "*Text book Physical Chemistry*", Vishal Publishing Co., New Delhi, forty seventhedition.
5. Sharma B.K, (2014), "*Industrial Chemistry",* GOEL publishing house Meerut, sixteenth edition,

Web resources/E-books:

1. https://cdn1.byjus.com/wp-content/uploads/2019/07/Tamil-Nadu-State-Board-Textbooks_Samacheer-Kalvi-Class-XII_Chemistry_Vol-1_Unit-5_English_Medium.pdf
2. https://www.sathyabama.ac.in/sites/default/files/course-material/2020-10/note_1456404597.pdf
3. https://soe.unipune.ac.in/studymaterial/swapnaGaikwadOnline/aminoacids-171113130407.pdf
4. https://chem.pg.edu.pl/documents/175289/4235721/Electrochemistry-supplement%20text.pdf
5. https://gcwgandhinagar.com/econtent/document/1587113971photochemistry.pdf

Pedagogy: Chalk and Talk method, Power point Presentations, Seminar, Group Discussion, Quiz.

Rationale for nature of Course:

Knowledge and Skill: This course will enable the students to acquired knowledge on Co-ordination Chemistry and Water Technology, Carbohydrates, Amino Acids and Essential elements of biosystem, electro chemistry and photochemistry**.**

Activities to be given:

1. Power point presentation on the topic of amino acids.
2. To find out the hardness of water by titration method

COURSE LEARNING OUTCOMES(CLO's):

CLOs	Course Learning Outcomes Statements	Knowledge According to Bloom's Taxonomy (Upto K level)
CLO1	Write the IUPAC name for complex, different theories to explain the bonding incoordination compounds and water technology.	K1 to K3
CLO2	Explain the preparation and property of carbohydrate	K1 to K3
CLO3	Enlighten the biological role of transition metals, amino acids and nucleic acids.	K1 to K4
CLO4	Apply/demonstrate the electrochemistry principles in corrosion, electroplating andfuel cells.	K1 to K3
CLO5	Outline the various type of photochemical process	K1 to K4

Mapping of Course Learning Outcomes (CLOs) with Programme Outcomes (POs)

CLO's	PO1	PO2	PO3	PO4	PO5	PO6
CLO1	3	1	1	2	3	2
CLO2	3	1	1	1	3	2
CLO3	3	1	1	1	3	2
CLO4	3	1	2	3	3	2
CLO5	3	1	2	2	3	2

1-Basic Level 2- Intermediate Level 3- Advanced Level

LESSON PLAN: TOTAL HOURS (60 Hrs)

UNIT	DESCRIPTION	HOURS	MODE
I	**Co-ordination Chemistry and Water Technology** Co-ordination Chemistry**:** Definition of terms - IUPAC Nomenclature- Werner'stheory - EAN rule - Pauling's theory – Postulates - Applications to [Ni(CO)4], $[Ni(CN)4]^{2-}$,$[Co(CN)6]^{3-}$ Chelation - Biological role of Hemoglobin and Chlorophyll (elementary idea) - Applications in qualitative and quantitative analysis.Water Technology: Hardness of water, determination of hardness of water using EDTA method, zeolite method- Purification techniques –BOD and COD.	**13**	Chalk and Talk, PPT, quiz,
II	**Carbohydrates** Classification, preparation and properties of glucose and fructose. Discussion of open chain ring structures of glucose and fructose. Glucose-fructose interconversion. Preparation and properties of sucrose, starch and cellulose.	**10**	Chalk and Talk, PPT, quiz,
III	**Amino Acids and Essential elements of biosystem** Classification - preparation and properties of alanine, preparation of dipeptides using Bergmann method - Proteins- classification – structure - Colour reactions – Biological functions – nucleosides -nucleotides – RNA	**12**	Chalk and Talk, PPT, quiz, group discussion

	and DNA – structure. Essentials of trace metals in biological system-Na, Cu, K, Zn, Fe, Mg.		
IV	**Electrochemistry** Galvanic cells - Standard hydrogen electrode - calomel electrode - standard electrode potentials - electrochemical series. Strong and weak electrolytes - ionic product of water -pH, pKa, pKb. Conductometric titrations - pH determination by colorimetric method – buffer solutions and its biological applications - electroplating - Nickel and chrome plating – Types of cells -fuel cells-corrosion and its prevention.	**10**	Chalk and Talk, PPT, quiz,
V	**Photochemistry** Grothus - Drapper's law and Stark-Einstein's law of photochemical equivalence, Quantum yield - Hydrogen -chloride reaction. Phosphorescence, fluorescence, chemiluminescence and photosensitization and photosynthesis(definition with examples).	**15**	Chalk and Talk, PPT, quiz, Seminar,
	Total	**60**	

Course Designers: 1. Ms.K.Punitha

2. Mrs.V.Gokilaa

Annexure-16

Department of Chemistry						Class: I B.Sc (N&D)		
Sem	**Category**	**Course Code**	**Course Title**	**Credits**	**Contact Hours / Week**	**CIA**	**SE**	**Total**
II	Generic Elective Course 4	**23OUNDGECH2P**	Chemistry Practical for Biological Sciences -II	2	2	40	60	100

Nature of the Course		
Knowledge and Skill Oriented	Employability Oriented	Entrepreneurship oriented
✓		

SYSTEMATIC ANALYSIS OF ORGANIC COMPOUNDS

The analysis must be carried out as follows:

1.Functional group tests [phenol, acids (mono & di) aromatic primary amine, amides (mono & di), aldehydeand glucose].
2.Detection of elements (N, S, Halogens).
3.To distinguish between aliphatic and aromaticcompounds
4.To distinguish – Saturated and unsaturated compounds

Books for References:

1. Venkateswaran.V, Veeraswamy.R, Kulandaivelu.A.R., (2012*),"Basic Principles of Practical Chemistry",* 2nd Edition, Sultan Chand & Sons, New Delhi.
2. Mendham.J, Denney.R. C., Barnes J. D., Thomas M., Sivasankar B., (2000)"*Vogel's Textbook of Quantitative Chemical Analysis*," 6th edn, Pearson Education Ltd., New Delhi.
3. Mukhopadhyay R., Chatterjee P., (2007) "*Advanced Practical Chemistry*," 3rd Edition, Books and Allied Pvt., Kolkata,

Web resources/E-books:

1. **http://allcomputerprograms.blogspot.com/2011/09/estimation-of-ferrous-iron-redox.html**

2. https://byjus.com/chemistry/titration-of-oxalic-acid-with-kmno4/
3. https://byjus.com/chemistry/titration-of-hydrochloric-acid-against-standard-sodium-carbonate/
4. https://byjus.com/jee/hardness-of-water-types-and-removal/

Pedagogy: Chalk and Talk, Group Discussion, Data interpretation and Demonstration

LESSON PLAN: TOTAL HOURS (30 Hrs)

S.No	Description	Hrs	Mode
1	Instructions	4	Chalk and Talk
2	Detection of special elements, Aromatic and aliphatic nature, Test for saturation and unsaturation	2	Demonstration
3	Identification of functional groups	2	Demonstration
4	Derivative preparation	2	Demonstration
5	Analysis of organic substance -I	2	Chalk and Talk, Discussion, Procedure with illustration
6	Analysis of organic substance -II	2	Chalk and Talk, Discussion, Procedure with illustration
7	Analysis of organic substance -III	2	Chalk and Talk, Discussion, Procedure with illustration
8	Analysis of organic substance –IV	2	Chalk and Talk, Discussion, Procedure with illustration
9	Analysis of organic substance -V	2	Chalk and Talk, Discussion, Procedure with illustration
10	Analysis of organic substance -VI	2	Chalk and Talk, Discussion, Procedure with illustration
11	Revision	4	
12	Model	4	
	Total	30	

Course Designers: 1. Ms.K.Punitha

2. J. Ilakkiyapavithra

Annexure-16

EVALUATION (PRACTICAL*)*

Internal (Formative) : 40 marks

External (Summative) : 60 marks

Total :100 marks

Question Paper Pattern for Internal Practical Examination: 40 Marks

S.No	**Components**	**Marks**
1.	Experiment-Organic Analysis	10
2	Procedure for organic analysis	10
3.	Model Exam	10
4.	Viva	5
5.	Observation Book	5
	Total	**40**

Question Paper Pattern for External Practical Examination (Major): 60 Marks

S.No	**Components**	**Marks**
1.	Experiment- Organic Analysis	30
2	Procedure for organic analysis	10
3.	Viva	10
4.	Record Book	10
	Total	**60**

In respect of external examinations passing minimum is **35% for Under Graduate** Courses and in total, **aggregate of 40%.**

Latest amendments and revisions as per **UGC** and **TANSCHE** norm is taken into consideration to suit the changing trends in the curriculum.