



HAJEE KARUTHA ROWTHER HOWDIA COLLEGE

(An Autonomous Institution Affiliated to Madurai Kamaraj University, Madurai.)

Re-Accredited with A++ Grade by NAAC (3rd Cycle)

Uthamapalayam - 625 533.

DEPARTMENT OF BIO CHEMISTRY

BACHELOR OF SCIENCE – BIO CHEMISTRY

SYLLABUS

Choice Based Credit System – CBCS

With

Outcome Based Education (OBE)

(Academic Year 2026 - 2027 onwards)

HAJEE KARUTHA ROWTHER HOWDIA COLLEGE

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College Vision and Mission

Vision

Our vision is to provide the best type of higher education to all, especially to students hailing from minority Muslim community, rural agricultural families and other deprived, under privileged sections of the society, inculcating the sense of social responsibility in them. Our college is committed to produce talented, duty-bound citizens to take up the challenges of the changing times.

Mission

Our mission is to impart and inculcate social values, spirit of service and religious tolerance as envisioned by our beloved Founder President Hajee Karutha Rowther.

The Vision beckons the Mission continues forever.

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Department Vision and Mission

Vision

The department of biochemistry discerns to provide quality students trained in the contemporary biochemical tools and technology and to achieve academic excellence in biochemistry. Imparting in depth knowledge to the students, facilitating research activities and cater the ever changing industrial demand and societal needs.

Mission

Strive and achieve a quality education that help the students to enhance problem solving skills to be successful in their professionalizes and to prepare students a lifelong learner offering solid theoretical and practical foundation in various discipline of the biochemistry. Also educate them about their professional and ethical responsibilities that benefit the society at large.

Programme Educational Objectives (PEO)

Our graduates will be progressive, efficient, value based, academically excellent, creative, collaborative, empowered and globally competent literates with the skills required for societal change.

They will demonstrate

PE01	Comprehensive knowledge and expertise, employability, the acumen of creative and critical thinking, the spirit of enquiry and professional attitude required for a successful career
PE02	Accountability, linguistic competence and communication skills in the work environment and beyond
PE03	Perseverance, effective collaboration, team spirit, leadership and problem solving skills
PE04	Keen sense of civility, professional ethics, receptivity and moral righteousness
PE05	Commitment to address social and environmental threats and to act as responsible service-minded, duty-bound global citizens

Programme Outcomes (PO)

On completion (after three years) of B.Sc. Biochemistry programme, the students are able to

PO1	Knowledge on the basic concept of Bio organic molecule, structure and functions enable to become excellent in Biochemistry.
PO2	Understand fundamental concepts of enzymes and its characteristics, Anabolic and Catabolic functions of the Biomolecules.
PO3	Acquiring the knowledge on techniques and biology module in biotechnology, bioinformatics, biostatistics, immunology, lab technology and microbiology.
PO4	Use the skill in analyzing the bioorganic compounds qualitatively and quantitatively that includes biochemical, microbiological, immunological and molecular biology techniques.
PO5	Enhance entrepreneurial skills to be self-employable.

Programme Specific Outcomes (PSO):

A graduate of B. Sc. Biochemistry Programme after 3 years will

PSO1	Graduates will be able to be successful biochemist in medical & food industries
PSO2	Graduates will be pursuing the higher studies in various fields of biochemistry
PSO3	Graduates able to integrate knowledge in classical laboratory technique & to use modern instrumentation and able to work a team member.
PSO4	Graduates be able to communicate (written & oral) scientific information to biochemist & non- biochemist
PSO5	Graduates will be knowledgeable in ethical practices in science.

Programme Scheme

Eligibility

A Pass in +2 examination conducted by Board of Higher Secondary Education, Government of Tamilnadu or equivalent with Biology/ Botany and Zoology as one of the subjects.

For Programme Completion

A Candidate shall complete:

- Part I - Language Courses – Tamil/Arabic/Malayalam in semesters I, II, III and IV respectively
- Part II - Language Courses - English in semesters I, II, III, IV respectively
- Part III - Core Courses in semesters I, II, III, IV, V and VI respectively
- Part III - Generic Elective Courses in semesters I, II, III and IV respectively
- Part III - Discipline Elective Courses in semesters IV, V and VI respectively
- Part IV - Foundation Course (Skill Enhancement Course) in Semester I
- Part IV - Entrepreneurial Skills (Skill Enhancement Course) Course in Semester III
- Part IV - Professional Competency Skill (Skill Enhancement Course) Course in Semester V
- Part IV – Non Major Elective (Skill Enhancement Course) Courses in Semesters V and VI respectively
- Part IV - Environmental Studies Course in semester I
- Part IV - Value Education Course in semester III
- Part IV - Summer Internship/Industrial Training Course in semester V
- Part V - Extension activity in semester IV

Scheme of Examinations under Choice Based Credit System

Term End Examinations (TEE)	- 75 Marks
Continuous Internal Assessment Examinations (CIAE)	- 25 Marks
Total	- 100 Marks

Pattern of Continuous Internal Assessment Examinations (CIAE)

Average of Two Internal Tests (each 20 marks)	- 20 Marks
Assignment	- 05 Marks
Total	- 25 Marks

Pattern of Term End Examinations

(Max. Marks: 75 / Time: 3 Hours)

External Examinations Question Paper Pattern for Part I & III and Part IV (Non- Major Elective & Skill based Subject)

Section - A (5 X 1 = 5 Marks)

Answer ALL questions.

- Questions 1 - 5
- One question from each unit
- Multiple choice questions and each question carries Four choices

Section - B (5 X 2 = 10 Marks)

Answer ALL questions.

- Questions 6 - 10
- One question from each unit
- Short Answer (Definition)

Section - C (5 X 6 = 30 Marks)

Answer any ALL questions (Choose either a or b).

- Questions 11 - 15

- One question from each unit
- Paragraph

Section - D (3 X 10 = 30 Marks)

Answer any THREE out of five questions.

- Questions 16 - 20
- One question from each unit
- Essay type

**External Examinations Question Paper Pattern for Part IV-
 Foundation Course**

- MCQ Pattern (1 X 75 = 75 Marks)

**External Examinations Question Paper Pattern for Part IV-
 Environmental Studies and Value Education**

Section - A: (5 X 6 = 30 Marks)

Answer ALL questions choosing either A or B.

- Questions 1 - 5
- Two questions from each unit (either.... or.... type)
- Paragraph

Section - B (3 X 15 = 45 Marks)

Answer any THREE out of five questions.

- Questions 6 - 10
- One question from each unit
- Essay type

Part V (Extension Activities) - 13 Activities

- Internal Evaluation

Passing Marks

Minimum 27 for External Exam

Eligibility for the degree – passing minimum is **40%**

Practical Examination

Internal – 40 marks

External – 60 marks (minimum 24 marks)

Total – 100 marks

Passing minimum is **40%**

Weightage

Weightage for Bloom's Taxonomy	Percentage	Marks	
		CIAE	TEE
Knowledge (Remembering) - K1	15	4	11
Understanding - K2	20	5	15
Applying - K3	25	6	19
Analyzing - K4	40	10	30
Gross Total	100	25	75

Assessment

Distribution of questions and marks for Continuous Internal Assessment Examinations

Bloom's Taxonomy	Section A	Section B	Section C	Section D	Total
Knowledge(K1)	2(2)	2(2)	-	-	25 marks
Understanding(K2)	Assignment (5)				
Apply(K3)	-	-	2(6)	-	
Analyzing (K4)	-	2(2)	-	1(8)	

Distribution of questions and marks for Term End Examinations.

Bloom's Taxonomy	Section A	Section B	Section C	Section D	Total
Knowledge(K1)	1(1)	2(4)	1(6)	-	Total 75 Marks
Understanding(K2)	1(1)	1(2)	2(12)	-	
Apply(K3)	3(3)	2(4)	2(12)	-	
Analyzing (K4)	-	-	-	3(30)	

Note: Figures in parenthesis are Marks

Credits Distribution

S. No	Part	Category	No of Courses	No of Credits
1	Part - I	Language	4	12
2	Part - II	English	4	12
3	Part - III	Core (Theory / Practical / Project)	17	69
		Discipline Elective (Theory / Practical)	4	14
		Generic Elective (Theory / Practical *)	6	16
4	Part - IV (AEC)	Foundation Course	1	2
		EVS	1	2
		Value Education	1	2
		NME	2	4
5	Part - IV (SEC)	Entrepreneurial Skills	1	2
		Professional Competency	1	2
		Internship	1	2
6	Part - V	Extension Activity	1	1
Total			44	140

* Generic Elective Practical Examinations should be Conducted only in Even Semester

B.Sc., BIO CHEMISTRY
Details of Course Category, Code, Credits & Title

Course Category	Course Code	Course Title	Hrs	CIAE	TEE	Max. Marks	Credits
Semester - I							
Part - I							
Language - I	26UTALL11	பொதுத்தமிழ் - I	6	25	75	100	3
	26UARLL11	Introduction to Arabic Language - I					
	26UMMLL11	History of Malayalam Literature					
Part - II							
English - I	26UENLL11	General English - I	6	25	75	100	3
Part - III							
Core - I	26UBCCC11	Biomolecules	5	25	75	100	5
Core - II (Lab)	26UBCCC1P	Qualitative Analysis of Biomolecules	3	40	60	100	3
Generic Elective - I	26UCHGE11	Ancillary Chemistry - I	4	25	75	100	3
Generic Elective - II (Lab)	26UCHGE2P	Volumetric Analysis Ancillary Chemistry Lab	2	-	-	-	-
Part - IV							
Foundation Course (SEC)(MCQ)	26UBCFN11	Basics Concepts in Biochemistry	2	25	75	100	2
EVS	26UGEVS11	Environmental Studies	2	25	75	100	2
TOTAL			30				21

Course Category	Course Code	Course Title	Hrs	CIAE	TEE	Max. Marks	Credits
Semester - II							
Part - I							
Language - II	26UTALL21	பொதுத்தமிழ் - II	6	25	75	100	3
	26UARLL21	Introduction to Arabic Language - II					
	26UMMLL21	Prose, Composition & Translation					
Part - II							
English - II	26UENLL21	General English - II	6	25	75	100	3
Part - III							
Core - III	26UBCCC21	Cell Biology	5	25	75	100	5
Core - IV (Lab)	26UBCCC2P	Cell Biology Lab	3	40	60	100	3
Core - V	26UBCCC22	Human Physiology	4	25	75	100	4
Generic Elective - II	26UCHGE21	Ancillary Chemistry - II	4	25	75	100	3
Generic Elective - II (Lab)	26UCHGE2P	Volumetric Analysis Ancillary Chemistry Lab	2	40	60	100	2
TOTAL			30				23

Course Code	Course Title	Category	Hours	Credits	Marks		
					CIAE	TEE	Total
26UBCCC11	BIOMOLECULES	Core-I	5	5	25	75	100

Course Objectives		
To enable the students, acquire knowledge on occurrence, structure, physical and chemical properties, classification and biological role of biomolecules		
UNIT	Contents	No. of Hours
I	Carbohydrates: Classification and biological significance, physical properties - stereo isomerism, optical isomerism, anomers, epimers and muta rotation. Monosaccharides: Occurrence, linear and cyclic structure, Reactions of monosaccharides due to the presence of hydroxyl, aldehyde and keto groups. Disaccharides: Structure and properties of reducing disaccharides (lactose and mannose), non-reducing disaccharide(sucrose). Polysaccharides: Homo poly saccharides - Occurrence, structure and biological significance of starch, glycogen and cellulose. Hetero poly saccharides - Structure and biological significance. Muco poly saccharides - hyaluronic acid, chondroitin sulphate and heparin. (structural elucidation not needed).	15
II	Proteins: Amino acids – types of Classification - essential and non-essential, structure and property of amino acid. Protein: Properties of proteins - Ampholytes, iso-electric point, salting in and salting out, denaturation and renaturation, UV absorption. Levels of Organization of protein structure- Primary structure, Formation and characteristics of peptide bond, phi and psi angle, Secondary structure- α helix (egg albumin), β -pleated sheath (keratin), triple helix (collagen). Tertiary structure – reference to myoglobin. Quaternary structure with reference to haemoglobin.	15
III	Lipids: Bloor's classification, chemical nature and biological functions. Fatty acids: classification, nomenclature, structure and properties of fatty acids. Simple and mixed triglycerides: structure and general properties, Characterization of fats- iodine value, saponification value, acid number, acetyl number, polensky number, Reichert –Meissl number along with their significance. Compound Lipids-Structure and functions of phospholipids and glycolipids. Derived lipids-Structure and functions of cholesterol, bile acids and bile salts.	15
IV	Nucleic acids: Structure of purine and pyrimidine bases, nucleosides and nucleotides and their biological importance. Types of DNA: A, B, C, Z DNA, structure and biological significance, super helicity. Types of RNA: mRNA, tRNA, rRNA, hnRNA, snRNA, Secondary and tertiary structure of tRNA. Properties of DNA-Hypochromic and hyper chromic effect, melting temperature, viscosity. Denaturation and annealing.	15

V	Vitamins: Definition, Classification - Fat soluble vitamins – Sources, Structure and physiological functions - Water soluble vitamins – Sources, Structures and physiological functions Minerals: Mineral requirement, essential macro minerals and essential micro minerals, Sources and functions	15
Total		75
Course Outcomes		Knowledge Level
CO	On completion of this course, students will	
1	List the general classification and basic structural organization of biomolecules	K1, K2,K3
2	Represent the comparison of physical and chemical properties of biomolecules	K1, K2,K3
3	Manipulate the importance of various biomolecules in life process of all living organism	K1, K2,K3
4	Represent the comparison of physical and chemical properties of biomolecules.	K1, K2,K3,K4
5	Able to explain the cause of disease due to vitamin deficiency.	K1, K2,K3,K4
K1-Knowledge, K2-Understand, K3-Apply, K4- Analyze		
Textbooks		
1.	L.Veerakumari, <i>Biochemistry</i> , MJP Publisher.com, Chennai, 2005, 1 st Edition.	
2.	Ambika Shanmugam, <i>Fundamentals of Biochemistry</i> , Published by the author, Chennai, 2004, 7 th Edition.	
3	U.Sathyannarayana, <i>Essentials of Biochemistry</i> , Books and Allied Pvt. Ltd, Kolkata, first Publication 2002, Reprint 2003.	
Reference Books		
1.	Lehninger, <i>Biochemistry</i> , Kalyani Publisher, New Delhi, 2016, 2 nd Edition.	
2.	Mohan P Arora, <i>Biomolecules</i> , Himalaya Publishing, Chennai, 2009, 1 st Edition.	
e-Resources		
1.	https://www.bing.com/Biomolecules	
2.	https://www.britannica.com/science/biomolecules	

Mapping with Programme Outcomes:

CO /PO	PO1	PO2	PO3	PO4	PO5
C01	3	2	3	3	3
C02	3	3	3	3	3
C03	3	3	3	3	3
C04	3	3	3	3	3
C05	3	3	3	3	3

Strong-3 Medium-2 Low-1

Level of Correlation between PSO's and CO's

CO /PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	2	3	3

Strong-3 Medium-2 Low-1

COURSE CONTENTS AND LECTURE SCHEDULE

Module No.	Topic	No. of Lectures
UNIT - I		
1.1	Classification and biological significance, physical properties - stereo isomerism, optical isomerism, anomers, epimers and muta rotation.	3
1.2	Monosaccharides: Occurrence, linear and cyclic structure, Reactions of monosaccharides due to the presence of hydroxyl, aldehyde and keto groups.	3
1.3	Disaccharides: Structure and properties of reducing disaccharides (lactose and mannose), non-reducing disaccharide(sucrose).	3
1.4	Polysaccharides: Homo poly saccharides - Occurrence, structure and biological significance of starch, glycogen and cellulose.	3
1.5	Hetero poly saccharides - Structure and biological significance. Muco poly saccharides - hyaluronic acid, chondroitin sulphate and heparin.	3
UNIT - II		
2.1	Amino acids – types of Classification - essential and non-essential, structure and property of amino acid.	3
2.2	Protein: Properties of proteins - Ampholytes, iso-electric point, salting in and salting out, denaturation and renaturation, UV absorption.	3
2.3	Primary structure, Formation and characteristics of peptide bond, phi and psi angle	3
2.4	Secondary structure- α helix (egg albumin), β - pleated sheath (keratin), triple helix (collagen).	3
2.5	Tertiary structure – reference to myoglobin. Quaternary structure with reference to haemoglobin.	3
UNIT - III		
3.1	Bloor's classification, chemical nature and biological functions. Fatty acids: classification, nomenclature, structure and properties of fatty acids.	3

3.2	Simple and mixed triglycerides: structure and general properties	3
3.3	Characterization of fats- iodine value, saponification value, acid number, acetyl number, polensky number, Reichert – Meissl number along with their significance.	3
3.4	Compound Lipids-Structure and functions of phospholipids and glycolipids.	3
3.5	Derived lipids-Structure and functions of cholesterol, bile acids and bile salts.	3
UNIT - IV		
4.1	Nucleic acids: Structure of purine and pyrimidine bases, nucleosides and nucleotides and their biological importance.	4
4.2	Types of DNA: A, B, C, Z DNA, structure and biological significance, super helicity.	4
4.3	Types of RNA: mRNA, tRNA, rRNA, hnRNA, snRNA, Secondary and tertiary structure of tRNA.	4
4.4	Properties of DNA-Hypochromic and hyper chromic effect, melting temperature, viscosity. Denaturation and annealing.	3
UNIT - V		
5.1	Vitamins: Definition, Classification.	3
5.2	Fat soluble vitamins – Sources, Structure and physiological functions.	3
5.3	Water soluble vitamins – Vitamins – Sources, Structures and physiological functions.	3
5.4	Minerals: Mineral requirement, essential macro minerals	3
5.5	Essential micro minerals, Sources and functions	3
Total		75

Course Designer

Name: R. Vanitha

Assistant Professor of Biochemistry

Course Code	Course Title	Category	Hours	Credits	Marks		
					CIAE	TEE	Total
26UBCCC1P	QUALITATIVE ANALYSIS OF BIOMOLECULES	Core - III	3	3	40	60	100

Course Objectives		
To enable the students, to gather knowledge about the biomolecules and determining the concentration of coloured compounds.		
UNIT	Contents	No. of Hours
I	Qualitative Analysis of Carbohydrates 1. Monosaccharides (Glucose, Fructose) 2. Disaccharides (Maltose, Sucrose, lactose) 3. Poly saccharides (Starch)	9
II	Qualitative Analysis of amino acids and proteins, lipids. 4. Amino acids – Arginine, Histidine, Tyrosine and Tryptophan. 5. Protein – Egg albumin 6. Lipids – Cholesterol	9
III	Titrimetric methods. 7. Determination of Saponification value of an edible oil. 8. Determination of Iodine number of an edible oil. 9. Determination of Acid number of an edible oil.	9
IV	10. Verification of Beer – Lambert’s law.	9
V	11. Determination of concentration of any coloured compounds.	9
Total		45
Course Outcomes		Knowledge Level
CO	On completion of this course, students will	
1	Define the particular compound present in the mixed solution.	K1, K2,K3,K4
2	Represent the carbohydrate, protein, Amino acids and lipids.	K1, K2,K3,K4
3	Knowledge gather Titrimetric methods.	K1, K2,K3
4	Experiment the techniques and model of colorimeter.	K1, K2,K3,K4
5	Understand the concentration of any coloured solution determine using calorimetry.	K1, K2,K3,K4
K1-Knowledge, K2-Understand, K3-Apply, K4- Analyze		
Textbooks		
1.	Jayaraman, <i>Laboratory Manual in Biochemistry</i> , Willey Eastern Limited Pune, 1981, 1st Edition.	
2.	Ranjana chawla, <i>Practical Clinical Biochemistry methods</i> . New Delhi, India, 2003, 3 rd Edition.	
3.	R.C.Gupta and S.Bhargava, <i>Practical Biochemistry</i> , CBS Publishers. New Delhi, India,1992, 2 nd Edition.	
Reference Books		
1.	Keith Wilson and John Walker, <i>Practical Biochemistry</i> .	

	Cambridge University Press, Melbourne 3166, Australia, 1995, 4 th Edition.
e-Resources	
1.	https://www.pdfdrive.com/instant-notes-analytical-chemistry-e912659.html 14
2.	https://www.pdfdrive.com/biochemistry-books.html

Mapping with Programme Outcomes:

CO / PO	P01	P02	P03	P04	P05
C01	3	2	3	3	3
C02	3	3	3	3	3
C03	3	3	3	3	3
C04	3	3	3	3	3
C05	3	3	3	3	3

Strong-3 Medium-2 Low-1

Level of Correlation between PSO's and CO's

CO / PSO	PS01	PS02	PS03	PS04	PS05
C01	3	3	3	3	3
C02	3	2	3	3	3
C03	3	3	3	3	3
C04	3	3	3	3	3
C05	3	3	3	3	3

Strong-3 Medium-2 Low-1

COURSE CONTENTS AND LAB SCHEDULE

Module No.	Topic	No. of Hours
UNIT - I		
1.1	Qualitative Analysis of Monosaccharides (Glucose, Fructose)	4
1.2	Qualitative Analysis of Disaccharides (Maltose, Sucrose, lactose)	4
1.3	Qualitative Analysis of Poly saccharides (Starch)	4
UNIT - II		
2.1	Qualitative Analysis of amino acids Arginine, Histidine, Tyrosine and Tryptophan	4
2.2	Qualitative Analysis of Protein Egg albumin	4
2.3	Qualitative Analysis of lipids Cholesterol	4
UNIT - III		
3.1	Determination of Saponification value of an edible oil.	4
3.2	Determination of Iodine number of an edible oil.	4
3.3	Determination of Acid number of an edible oil.	4

UNIT - IV		
4.1	Verification of Beer – Lambert’s law.	4
UNIT - V		
5.1	Determination of concentration of any coloured compounds.	5
Total		45

Course Designer

Name: R. Vanitha.

Assistant Professor of Biochemistry.

Course Code	Course Title	Category	Hours	Credits	Marks		
					CIAE	TEE	Total
26UCHGE11	ALLIED CHEMISTRY - I	Generic Elective-I	4	3	25	75	100

Course Objectives		
To understand the properties of hydrogen, oxides, water, colloids and concept of carbohydrates, chemical bonding, amino acids, proteins and dyes.		
UNIT	Contents	No. of Hours
I	Hydrogen: Isotopes of hydrogen – preparation, properties and uses of heavy hydrogen. Hydrides – definition – classification – examples. Oxides – Definition – classification – examples. Water: Hardness of water – types of hardness – removal of hardness – industrial implications of hardness in water – Units of hardness of water.	12
II	Colloids: Colloidal states of matter – various types – classification - Sols – dialysis - electro dialysis – electro osmosis – electrophoresis – stability of colloids – protective action – Hardy Schulze law – gold number - Emulsion: Types of emulsions – emulsifier with examples - Gels: Classification, preparation - Applications of colloids.	12
III	Carbohydrates: Definition – classification – monosaccharides – properties and uses of glucose and fructose – Haworth structure (glucose only) – conversion of glucose to fructose and vice versa, mutarotation - Disaccharides: Sucrose (Structure only) – distinction between sucrose, glucose and fructose - Polysaccharides: Starch and cellulose (Structure only).	12
IV	Chemical Bonding: Orbitals – shapes of s and p orbitals – principle of hybridization – sp, sp ² and sp ³ hybridisation – methane, ethylene and acetylene – VSEPR theory - BeCl ₂ , BF ₃ , CH ₄ , PCl ₅ , SF ₆ , IF ₇ , H ₂ O and NH ₃ - M.O. theory: Formation of M.O.'s – bonding and antibonding and non – bonding. M.O.'s – M.O. diagram for H ₂ , He and F ₂ .	12
V	Amino acids and proteins: Classification – synthesis - Gabriel phthalimide – Strecker – Hell-Volhard-Zelinsky synthesis – properties of amino acids – action of heat, dipolar ion, iso-electric point, and Ruhemann's purple - polypeptides – proteins – classification and biological functions. Dyes: Definition – theory of colour and constitution – classification based on structure and applications – preparation of methyl orange – Bismark brown, malachite green – vat dye – indigo.	12
Total		60
Course Outcomes		Knowledge Level
CO	On completion of this course, students will	

1	Describe the preparation and properties of hydrides, oxides, hardness of water and its implications.	K1, K2
2	Classify the colloidal states of matter and its applications.	K1, K2, K3, K4
3	Demonstrate the reactions of glucose, fructose and sucrose and relate their uses.	K1, K2
4	Identify the concept of orbitals, hybridization, VSEPR and MO theories.	K1, K2, K3
5	Illustrate the properties, classification and functions of proteins and dyes.	K1, K2, K3, K4
K1-Knowledge		K2-Understand
K3-Apply		K4-Analyze
Text books		
1.	S.Vaithyanathan, <i>Text book of Ancillary Chemistry</i> ; Priya Publications, Karur, 2006.	
2.	V.Veeraiyan, <i>Text book of Ancillary Chemistry</i> ; High mount publishing house, Chennai, first edition, 2009.	
Reference Books		
1.	B. S. Bahl & Arun Bahl, <i>Advanced Organic Chemistry</i> , S. Chand & Company, New Delhi, 22 nd edition, 2022.	
2.	B.R. Puri and L.R. Sharma and Madan S. Pathania, <i>Principles of Physical Chemistry</i> , Vishal Publishing Co., Jalandhar, 50 th edition, 2025.	
3.	R.D. Madan, <i>Modern Inorganic Chemistry</i> , S. Chand, 2013.	
e-Resources		
1.	https://onlinecourses.nptel.ac.in/	
2.	https://swayam.gov.in/course/	

Mapping with Programme Outcomes:

CO /PO	PO1	PO2	PO3	PO4	PO5
C01	3	2	3	3	2
C02	3	3	2	2	3
C03	3	2	3	3	2
C04	3	2	2	3	3
C05	3	3	3	2	3
Strong-3		Medium-2		Low-1	

Level of Correlation between PSO's and CO's

CO /PSO	PSO1	PSO2	PSO3	PSO4	PSO5
C01	3	3	2	3	2
C02	3	3	3	2	3
C03	3	3	2	3	3
C04	3	2	3	3	2
C05	3	3	3	2	3
Strong-3		Medium-2		Low-1	

COURSE CONTENTS AND LECTURE SCHEDULE

Module No.	Topic	No. of Lectures
UNIT - I		
1.1	Isotopes of hydrogen – preparation, properties and uses of heavy hydrogen	2
1.2	Hydrides – definition – classification – examples	2
1.3	Oxides – Definition – classification – examples	2
1.4	Hardness of water – types of hardness - Removal of hardness - industrial implications of hardness in water - Units of hardness of water.	6
UNIT - II		
2.1	Colloidal states of matter – various types – classification	2
2.2	Sols – dialysis – electro osmosis – electrophoresis	2
2.3	Stability of colloids – protective action – Hardy Schulze law – gold number	2
2.4	Types of emulsions – emulsifier with examples	3
2.5	Classification, preparation - Applications of colloids	3
UNIT - III		
3.1	Carbohydrates: Definition – classification – monosaccharides – properties and uses of glucose and fructose	4
3.2	Haworth structure of glucose-mutarotation- Conversion of glucose to fructose and vice versa.	4
3.3	Sucrose – structure – distinction between sucrose, glucose and fructose	2
3.4	Polysaccharides: Starch and cellulose (Structure only).	2
UNIT - IV		
4.1	Chemical Bonding: Orbitals – shapes of s and p orbitals – principle of hybridization.	3
4.2	sp, sp ² and sp ³ hybridisation – methane, ethylene and acetylene.	3
4.3	VSEPR theory - BeCl ₂ , BF ₃ , CH ₄ , PCl ₅ , SF ₆ , IF ₇ , H ₂ O and NH ₃ .	3
4.4	M.O. theory: Formation of M.O's – bonding and antibonding and non – bonding. M.O.'s – M.O. diagram for H ₂ , He and F ₂ .	3
UNIT - V		
5.1	Amino acids and proteins: Classification – synthesis - Gabriel phthalimide – Strecker – Hell-Volhard-Zelinsky synthesis.	2
5.2	Properties of amino acids – action of heat, dipolar ion, iso-electric point, and Ruhemann's purple.	3
5.3	Polypeptides – proteins – classification and biological functions.	2
5.4	Dyes: Definition – theory of colour and constitution – classification based on structure and applications.	2
5.5	Preparation of methyl orange – Bismark brown, malachite green – vat dye – indigo.	3
Total		60

Course Designer

Name: Dr. M. Jannathul Firdhouse

Assistant Professor of Chemistry

Course Code	Course Title	Category	Hours	Credits	Marks		
					CIAE	TEE	Total
26UBCFN11	BASIC CONCEPTS IN BIOCHEMISTRY	Foundation Course (SEC)(MCQ)	2	2	25	75	100

Course Objectives		
To empower the knowledge and understanding the fundamentals of Biochemistry and Biological system.		
UNIT	Contents	No. of Hours
I	Solutions: Definition of solution – Types of solutions – Concentration of the solution – Mass percentage – Volume percentage – Mass by volume percentage – Part per million- Mole fraction – Normality – Molarity – Molality. (problem included).	6
II	Basics of Experimental Biochemistry: Accuracy and precision - Acids & Bases – pH and its measurement – Buffers – Preparation and characteristics of Buffer.	6
III	Evolution: Origin of life – Evidence for evolution – Evolution of organism – Human evolution - Darwin’s theory – Fundamentals of Cell, types – Prokaryotic and Eukaryotic – Cell Organelles	6
IV	Plant system: Plants- types of plants – Plant organ system – Plant tissue and its types – Introduction to Photosynthesis.	6
V	Human system: Human body organization – over view of human organ system – Tissues and its types – Different types of cells in human body – Introduction to metabolism.	6
Total		30
Course Outcomes		Knowledge Level
CO	On completion of this course, students will	
1	Aquaria knowledge to prepare and calculate the strength of solutions with different concentration.	K1, K2,K3
2	Understand the importance of pH and Buffer solution in chemical and biological reactions.	K1, K2, K3,K4
3	Discuss scientific hypothesis in origin and evolution of life on earth.	K1, K2, K3,K4
4	Differentiate the organ system of plant and its autotropic character.	K1, K2, K3
5	Enumerate the different human organ system and their role in metabolism.	K1, K2,K3,K4
K1-Knowledge, K2-Understand, K3-Apply, K4- Analyze		
Textbooks		
1.	NCERT text book, Chemistry , grade 11, 2022, New Delhi.	
2.	NCERT text book, Biology , grade 11, 2022, New Delhi.	

Reference Books	
1.	Robert M. Delvin, <i>Plant Physiology</i> , MED TECH Publishers, Kolkata, Bangalore, 2017, 1 st Edition.
2.	Albert L. Lehninger, <i>Principles of Biochemistry</i> , Kalyani Publication, New Delhi, 2006, 2 nd Edition.

Mapping with Programme Outcomes:

CO /PO	PO1	PO2	PO3	PO4	PO5
C01	3	1	3	3	3
C02	3	1	3	3	3
C03	3	1	2	2	2
C04	3	1	2	2	2
C05	3	1	2	2	2

Strong-3 Medium-2 Low-1

Level of Correlation between PSO's and CO's

CO /PSO	PSO1	PSO2	PSO3	PSO4	PSO5
C01	3	3	3	2	2
C02	3	3	3	2	2
C03	2	2	2	2	2
C04	2	2	2	2	2
C05	2	2	2	2	2

Strong-3 Medium-2 Low-1

COURSE CONTENTS AND LECTURE SCHEDULE

Module No.	Topic	No. of Lectures
UNIT - I		
1.1	Definition of solution, Types of solutions and Concentration of the solution	2
1.2	Mass percentage, Volume percentage and Mass by volume percentage	1
1.3	Part per million and Mole fraction	1
1.4	Normality, Molarity and Molality.	2
UNIT - II		
2.1	Accuracy and precision	1
2.2	Acids & Bases pH and its measurement	2
2.3	Buffer, Preparation and characteristics of Buffer.	3
UNIT - III		
3.1	Origin of life – Evidence for evolution	2
3.2	Evolution of organism, Human evolution and Darwin's theory	2

3.3	Fundamentals of Cell, types – Prokaryotic and Eukaryotic – Cell Organelles	2
UNIT - IV		
4.1	Plants- types of plants – Plant organ system.	2
4.2	Plant tissue and its types.	2
4.3	Introduction to Photosynthesis.	2
UNIT - V		
5.1	Human body organization – over view of human organ system	2
5.2	Tissues and its types – Different types of cells in human body.	2
5.3	Introduction to metabolism.	2
Total		30

Course Designer

Name: Dr. A. Khadira Sereen

Assistant Professor of Biochemistry

Course Code	Course Title	Category	Hours	Credits	Marks		
					CIAE	TEE	Total
26UBCCC21	CELL BIOLOGY	Core -III	5	5	25	75	100

Course Objectives		
To give enable Knowledge about organelles, architecture and biological role of cell.		
UNIT	Contents	No. of Hours
I	Architecture of cells- Introduction, Structural organization of prokaryotic and eukaryotic cells. Differences of Plant and animal cells. The ultrastructure of mitochondria, Chloroplast, Ribosomes, RER, SER, Golgi apparatus, Vacuoles, lysosome, peroxisome and their functions.	15
II	Organization of genome in prokaryotic and eukaryotic: Structure and functions of Nucleus. Chromosomes structure and Special types of chromosomes (lamp brush chromosomes, polytene chromosomes). Organization of chromatin – histones, nucleosome.	15
III	Bio membranes- Structural model and basic functions- transport across cell membranes- uniport, symport and antiport. Passive and active transport. Cytoskeleton: Microfilaments, Microtubules, intermediary bodies, flagella and cilia.	15
IV	Extracellular matrix – Collagen, laminin, fibronectin and proteoglycans- structure and biological role. Structure and role of cadherin, selectins, integrin. Cell communication: Cell-cell interactions- Types-gap junctions, tight junctions and Desmosomes – Cell signaling - endocrine, paracrine, autocrine, intracrine and neuroendocrine and receptors.	15
V	Cell cycle- Definition and Phases of Cell cycle, Cell division- Mitosis and Meiosis and its significance. Cancer cells- definition, types and characteristics of cancer cells.	15
Total		75
Course Outcomes		Knowledge Level
CO	On completion of this course, students will able to	
1	Explain the structure and functions of basic components of prokaryotic and eukaryotic cells, especially the organelles.	K1,K2,K3,K4
2	Familiarize the cytoskeleton and chromatin & chromosomes structure.	K1,K2,K3
3	Illustrate the structure, composition and functions of cell membrane related to membrane transport	K1,K2,K3,K4
4	Relate the structure and biological role of extra cellular matrix in cellular interactions.	K1,K2,K3

5	Elaborate the phases of cell cycle and cell division-mitosis and meiosis and characteristics of cancer cells.	K1,K2,K3,K4
K1-Knowledge, K2-Understand, K3-Apply, K4- Analyze		
Textbooks		
1.	Arumugam.N, <i>Cell biology</i> , Saras publication(10ed, paperback), 2019	
2.	Dr. Ajoy Paul, <i>Cell and molecular biology</i> , Books & Allied Publishers (4 th edition), 2015	
3	Devasena.T. <i>Cell Biology</i> .Oxford University Press India-ISBN:9780198075516, 0198075510, 2012	
4	Bruce Alberts and Dennis Bray. 2013, <i>Essential Cell Biology</i> . (4 th ed). Garland Science.	
Reference Books		
1.	S.C.R. <i>CellBiology</i> . New age Publishers -ISBN-10: 8122416888/ISBN-13: 978-8122416886, 2008	
2.	Cooper,G.A. <i>The Cell: A Molecular Approach</i> . Sinaue rAssociates, Inc -ISBN10: 0878931066 / ISBN 13: 9780878931064, 2013	
3	E.M.F.,D.R, <i>Cell and Molecular Biology</i> . Lippin cott Williams & Wilkins Phila delphia - ISBN: 0781734932 9780781734936, 2006	
4	LodishH.A ,Berk C.A, Kaiser M, Krieger M.P, Scott A, Bretscher H, Ploegh and Matsudaira. 2007. <i>Molecular Cell Biology</i> , 6th Edition, WH. Freeman Publishers, New York, USA.	
e-Resources		
1.	https://www.medicalnewstoday.com/article/320878.php	
2.	https://biologydictionary.net /cell	

Mapping with Programme Outcomes:

CO /PO	PO1	PO2	PO3	PO4	PO5
C01	3	3	2	3	2
C02	3	3	3	3	3
C03	3	3	2	1	3
C04	3	3	2	3	1
C05	3	3	3	3	3

Strong-3 Medium-2 Low-1

Level of Correlation between PSO's and CO's

CO /PSO	PSO1	PSO2	PSO3	PSO4	PSO5
C01	3	3	3	2	3
C02	3	2	3	1	3
C03	3	2	3	3	3
C04	3	1	2	3	2
C05	3	3	3	3	3

Strong-3 Medium-2 Low-1

COURSE CONTENTS AND LECTURE SCHEDULE

Module No.	Topic	No. of Lectures
UNIT - I		
1.1	Cell- Introduction	1
1.2	Structural organization of prokaryotic	1
1.3	Structural organization of Eukaryotic	1
1.4	Differences of Plant and animal cells	2
1.5	Mitochondria, Chloroplast	3
1.6	Ribosome, RER, SER,	3
1.7	Golgi apparatus, peroxisome	2
1.8	Vacuoles, lysosome	2
UNIT - II		
2.1	Structure and functions of Nucleus	4
2.2	Chromosomes structure and Special types of chromosomes	4
2.3	Organization of chromatin – Histones	4
2.4	Nucleosome.	3
UNIT - III		
3.1	Bio membranes- Structural model and basic functions	3
3.2	Transport across cell membranes- uniport, symport and antiport.	3
3.3	Transport: Active and Passive	3
3.4	Cytoskeleton: Microfilaments, Microtubules	3
3.5	Intermediatory bodies, flagella and cilia	3
UNIT - IV		
4.1	Extracellular matrix – Collagen, laminin.	3
4.2	Fibronectin and proteoglycans	3
4.3	Structure and role of cadherin, selectins, integrins	3
4.4	Cell-cell interactions- Types-gap junctions, Tight junctions and Desmosomes	3
4.5	Cell signaling and receptors	3
UNIT - V		
5.1	Cell cycle- Definition and Phases of Cell cycle	4
5.2	Cell division- Mitosis and its significant	4
5.3	Meiosis and its significance	4
5.3	Definition, types and characteristics of cancer cells.	3
Total		75

Course Designer

Name: A. Suriya

Assistant Professor of Biochemistry.

Course Code	Course Title	Category	Hours	Credits	Marks		
					CIAE	TEE	Total
26UBCCC2P	CELL BIOLOGY LAB	Core -IV (Lab)	3	3	40	60	100

Course Objectives		
To enable skill about microscopes, different staining techniques		
UNIT	Contents	No. of Hours
I	MICROSCOPY AND STAINING TECHNIQUES 1. Study the parts of Compound microscope 2. Preparation of Slides and Staining methods	9
II	1. Examination of prokaryotic cells (Bacterial cells) 2. Visualization of animal and plant cell by methylene blue.	9
III	1. Visualization of mitochondria by Janus green stain. 2. Visualization of Nuclear fractions by Acetocarmine stain	9
IV	GROUP EXPERIMENT 1. Identification of different stages of mitosis in onion root tip 2. Identification of different stages of meiosis in onion bud	9
V	SPOTTERS 2. a) Cells: Nerve, plant and Animal cell b) Organelles: Mitochondria, Chloroplast, Endoplasmic reticulum c) Mitosis stages-Prophase, Anaphase, Metaphase, Telophase.	9
Total		45
Course Outcomes		Knowledge Level
CO	On completion of this course, students will be able to	
1	Identify the parts of microscope.	K1,K2,K3
2	Preparation of Slides.	K1,K2,K3
3	Identify the stages of mitosis & meiosis.	K1,K2,K3,K4
4	Visualize nucleus and mitochondria by staining methods.	K1,K2,K3,K4
5	Identify the spotters of cells, organelles and stages of cell division.	K1,K2,K3,K4
K1-Knowledge, K2-Understand, K3-Apply, K4- Analyze		
Textbooks		
1.	Rickwood, D and J.R. Harris <i>cell Biology: Essential Techniques</i> , John wikey 1996.	
2.	Davis, J.M. <i>Basic Cell culture: A practical approach</i> , IRL 1994.	
3.	Ganesh M.K. and Shivashankara A.R. 2012. <i>Laboratory Manual for Practical Biochemistry</i> Jaypee publications, 2 nd Edition.	
Reference Books		

1.	Essential practical handbook of Cell biology ,Genetics and Microbiology -A Practical manual- Debarati Das Academic publishers, ISBN, 9789383420599, 1st Edition 2017.
2.	Cell biology Practical , Dr.Venugupta ISBN8193651219, Prestige publisher, 1 st Jan 2018.
3.	Cell and Molecular biology , DeRobertis, 8th edition, 1st June, 1987.
e-Resources	
1.	https://www.microscopemaster.com/organelles.html
2.	https://www.pdfdrive.com/biochemistry-books.htm

Mapping with Programme Outcomes:

CO / PO	PO1	PO2	PO3	PO4	PO5
C01	3	3	3	2	3
C02	3	2	3	3	3
C03	2	3	2	3	3
C04	3	3	2	3	2
C05	3	3	3	3	3

Strong-3 Medium-2 Low-1

Level of Correlation between PSO's and CO's

CO / PSO	PSO1	PSO2	PSO3	PSO4	PSO5
C01	3	3	2	2	3
C02	3	3	2	3	3
C03	3	3	3	3	3
C04	3	3	3	3	2
C05	3	3	3	2	3

Strong-3 Medium-2 Low-1

COURSE CONTENTS AND LAB SCHEDULE

Module No.	Topic	No. of Hours
UNIT-I		
1.1	Study the parts of Compound microscope.	5
1.2	Preparation of Slides.	4
UNIT-II		
2.1	Examination of prokaryotic.	5
2.2	Visualization of animal and plant cell by methylene blue.	4
UNIT-III		
3.1	Staining and visualization of mitochondria by Janus green stain.	4
3.2	Visualization of Nuclear fractions by Acetocarmine stain	5
UNIT-IV		
4.1	Identification of different stages of mitosis	5

	in onion root tip	
4.2	Identification of different stages of meiosis in onion bud	4
UNIT-V		
5.1	a) Cells: Nerve, plant and Animal cell	3
5.2	b) Organelles: Mitochondria, Chloroplast, Endoplasmic reticulum	3
5.3	c) Mitosis stages–Prophase, Anaphase, Metaphase, Telophase.	3
	TOTAL	45

Course Designer

Name: A. Suriya

Assistant Professor of Biochemistry.

Course Code	Course Title	Category	Hours	Credits	Marks		
					CIAE	TEE	Total
26UBCCC22	HUMAN PHYSIOLOGY	Core	4	4	25	75	100

Course Objectives		
To empower the knowledge and understanding the physiological functions of human.		
UNIT	Contents	No. of Hours
I	Organization of body fluid and Homeostasis – Body fluids – Intracellular, extracellular and interstitial fluid – Blood – Composition and function, mechanism of blood coagulation, role of vitamin K in coagulation, anticoagulant and fibrinolytic systems. CSF – Blood Brain Barrier - Homeostasis, control system and their components – significance of homeostasis imbalance.	12
II	Respiratory System – Overview of respiratory system, Types of respiration, Transport of respiratory gases, Exchange of respiratory gases in lungs and tissues – Chloride Shift & Bohr's effect, Lung surfactant. Circulatory System – Structure and functions of the Heart. Arterial and venous system, Cardiac cycle, heart sound, Blood pressure and Factors affecting blood pressure.	12
III	Brain Physiology – Nervous system – Types of brain cells and structure, synaptic transmission, reflex action, neurotransmission – Resting membrane and Action potential. Neurotransmitters – Neuromuscular junction. Muscular system- structure and types of muscles - skeletal, smooth and cardiac muscles, muscle proteins- types and functions, mechanism of muscle contraction.	12
IV	Digestive system – composition, functions of saliva, gastric pancreatic intestine and bile secretions, structure of digestive system, Digestion, absorption of carbohydrates, lipids, proteins. Excretory system – Structure of nephron, mechanism of urine formation, GFR – Concentration and acidification of Urine. Role of kidneys in the maintenance of acid base balance.	12
V	Reproductive system - Male reproductive system - spermatogenesis, capacitation and transport of sperm- blood test is barrier. Female reproductive system – Menstruation cycle – Fertilization. Endocrinology - Endocrine glands and their secretions. Hormones – Classification of hormones, transport of hormones in the circulation and their half -lives. Structure and functions of Insulin, thyroxine. Steroid hormones- Corticosteroids, Sex hormones – testosterone and estrogen.	12
Total		60
Course Outcomes		Knowledge Level
CO	On completion of this course, students will	

1	Distinguish the different body fluids and their role in maintaining the homeostasis.	K1, K2, K3, K4
2	Aid in understanding the physiology of respiratory and circulatory systems	K1, K2, K3, K4
3	Explain the structure and physiology of the nervous and muscular system	K1, K2, K3, K4
4	Explicate the functions of digestive and excretory system of the body.	K1, K2, K3, K4
5	Emphasize the importance of various endocrine glands and hormones secreted by them.	K1, K2, K3, K4
K1-Knowledge, K2-Understand, K3-Apply, K4- Analyze		
Textbooks		
1.	N. Muruges, <i>Basic Anatomy and Physiology</i> , Sathya Publishers, Madurai, 2004, 5 th Edition.	
2.	Dr. A.S. Moni, <i>Human Anatomy and Physiology</i> , Jal Publisher, Madurai 1992, 1 st Edition.	
Reference Books		
1.	Padma B Sanghani, <i>Human Anatomy and Physiology</i> , Tata McGraw-Hill Education Private Limited, New Delhi, 2012, 1 st Edition.	
2.	Blain N. Mzrieb, <i>Essentials of human Anatomy and Physiology</i> , Tara Act Printer Private Limited, Chennai, 2018, 10 th Edition.	
e-Resources		
1.	https://www.youtube.com/watch?v=6qnSsV2syUE .	
2.	https://slideplayer.com/slide/9431799	

Mapping with Programme Outcomes:

CO /PO	P01	P02	P03	P04	P05
C01	3	2	3	3	3
C02	3	2	3	2	2
C03	3	2	3	3	3
C04	3	3	3	2	3
C05	3	3	3	3	2

Strong-3 Medium-2 Low-1

Level of Correlation between PSO's and CO's

CO /PSO	PS01	PS02	PS03	PS04	PS05
C01	3	2	3	3	3
C02	3	2	3	2	2
C03	3	2	3	3	3
C04	3	3	3	2	3
C05	3	3	3	3	2

Strong-3 Medium-2 Low-1

COURSE CONTENTS AND LECTURE SCHEDULE

Module No.	Topic	No. of Lectures
UNIT - I		
1.1	Body fluids – Intracellular, extracellular and interstitial fluid.	2
1.2	Blood – Composition and function	2
1.3	Mechanism of blood coagulation, role of vitamin K in coagulation	2
1.4	Anticoagulant and fibrinolytic systems	2
1.5	CSF – Blood Brain Barrier	2
1.6	Homeostasis, control system and their components – significance of homeostasis imbalance.	2
UNIT - II		
2.1	Overview of respiratory system, Types of respiration	3
2.2	Overview of respiratory system, Types of respiration.	3
2.3	Chloride Shift & Bohr's effect, Lung surfactant.	2
2.4	Circulatory System – Structure and functions of the Heart. Arterial and venous system	2
2.5	Cardiac cycle, heart sound, Blood pressure and Factors affecting blood pressure.	2
UNIT - III		
3.1	Nervous system – Types of brain cells and structure	2
3.2	Synaptic transmission, reflex action, neurotransmission – Resting membrane and Action potential.	2
3.3	Neurotransmitters – Neuromuscular junction.	2
3.4	Muscular system- structure and types of muscles - skeletal, smooth and cardiac muscles.	2
3.5	Muscle proteins- types and functions	2
3.6	Mechanism of muscle contraction.	2
UNIT - IV		
4.1	Digestive system, composition, functions of saliva, gastric pancreatic intestine and bile secretions	2
4.2	Structure of digestive system	2
4.3	Digestion, absorption of carbohydrates, lipids, proteins.	2
4.4	Excretory system – Structure of nephron, mechanism of urine formation	2
4.5	GFR – Concentration and acidification of Urine.	2
4.6	Role of kidneys in the maintenance of acid base balance.	2
UNIT - V		
5.1	Male reproductive system - spermatogenesis, capacitation and transport of sperm- blood test is barrier.	2
5.2	Female reproductive system – Menstruation cycle	2

5.3	Fertilization	2
5.4	Endocrine glands and their secretions – Chemical signaling.	2
5.5	Hormones – Classification of hormones, transport of hormones in the circulation and their half -lives.	1
5.6	Structure and functions of Insulin, thyroxine.	1
5.7	Steroid hormones- Corticosteroids	1
5.8	Sex hormones – testosterone and estrogen.	1
Total		60

Course Designer

Name: Dr. A. Khadira Sreen

Assistant Professor of Biochemistry

Course Code	Course Title	Category	Hours	Credits	Marks		
					CIAE	TEE	Total
26UCHGE21	ALLIED CHEMISTRY - II	Generic Elective -II	4	3	25	75	100

Course Objectives		
To identify the concept of photochemistry, coordination compounds, chromatographic technique, chemotherapy and nuclear chemistry.		
UNIT	Contents	No. of Hours
I	Photochemistry: Comparison of thermal and photochemical reactions – definition of photochemical reactions – laws of photochemistry – Grothaus-Draper law – Einstein law – quantum efficiency – reasons for low and high quantum yield with examples – consequence of light absorption by atoms and molecules – Jablonski diagram – fluorescence – phosphorescence – photosensitization – mechanism – chemiluminescence – bioluminescence – applications of photochemistry.	12
II	Coordination compounds: Definition – nomenclature – definition of various terms involved in coordination chemistry – classification of ligands - Werner's theory, Valence Bond theory (VBT) - EAN rule – Nickel carbonyl – chelates.	12
III	Chromatographic technique: Principle – classification -adsorption and partition chromatography- thin layer chromatography – column chromatography (adsorption) – paper Chromatography – gas-solid and gas-liquid chromatography- applications of each type - ion exchange chromatography.	12
IV	Sulpha drugs: Sulphadiazine – Sulphanilamide – Preparation and applications. Antimalarials: Chloroquine and Plasmoquine. Arsenical drugs: Salvarasan – 606 and Neosalvarasan. Antibiotics: Definition – classification – Penicillin - Amoxicillin – Ampicillin – Tetracyclin- Streptomycin – mode of application – uses only.	12
V	Nuclear Chemistry: Composition of the nucleus – nuclear forces – mass defect – binding energy – nuclear stability – Soddy and Fajan's group displacement law – Nuclear fission: Overview – application of fission – principle of atom bomb - Nuclear fusion: Emission of energy – Stellar energy – hydrogen bomb - Applications of radioactive isotopes.	12
Total		60
Course Outcomes		Knowledge Level
CO	On completion of this course, students will	
1	Describe the physical concepts of photochemistry.	K1, K2

2	Explain the basic terms, isomerism and theories involved in coordination compound.	K1, K2
3	Apply the column, thin layer and paper chromatographic techniques to separate and identify the components present in a mixture.	K1, K2, K3
4	Classify the chemotherapy drugs such as sulpha, antimalarials, antibiotics and arsenical drugs.	K1, K2, K3, K4
5	Examine the concept of nuclear chemistry and its applications.	K1, K2, K3, K4
K1-Knowledge		K2-Understand
K3-Apply		K4-Analyze
Text books		
1.	P.L.Soni, Mohan Katyal, <i>Text book of Inorganic chemistry</i> ; Sultan Chand and Company, New Delhi, twentieth edition, 2007.	
2.	S.Vaithyanathan, <i>Text book of Ancillary Chemistry</i> ; Priya Publications, Karur, 2006.	
Reference Books		
1.	B. S. Bahl & Arun Bahl, <i>Advanced Organic Chemistry</i> , S. Chand & Company, New Delhi, 22 nd edition, 2022.	
2.	B.R. Puri and L.R. Sharma and Madan S. Pathania, <i>Principles of Physical Chemistry</i> , Vishal Publishing Co., Jalandhar, 50 th edition, 2025.	
3.	R.D. Madan, <i>Modern Inorganic Chemistry</i> , S. Chand Publishers, 2013.	
e-Resources		
1.	https://onlinecourses.nptel.ac.in/	
2.	https://swayam.gov.in/course/	

Mapping with Programme Outcomes:

CO / PO	P01	P02	P03	P04	P05
C01	3	3	2	3	3
C02	3	3	3	2	2
C03	3	2	2	3	3
C04	3	2	3	3	3
C05	3	3	3	3	2
Strong-3		Medium-2		Low-1	

Level of Correlation between PSO's and CO's

CO / PSO	PS01	PS02	PS03	PS04	PS05
C01	3	3	3	3	2
C02	3	3	3	2	3
C03	3	2	3	3	3
C04	3	3	2	3	3
C05	3	3	3	2	3
Strong-3		Medium-2		Low-1	

COURSE CONTENTS AND LECTURE SCHEDULE

Module No.	Topic	No. of Lectures
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UNIT - I		
1.1	Comparison of thermal and photochemical reactions - definition of photochemical reactions	2
1.2	Laws of photochemistry - Grotthus-Draper law - Einstein law	2
1.3	Quantum efficiency - reasons for low and high quantum yield with examples	2
1.4	Consequence of light absorption by atoms and molecules - Jablonski diagram - fluorescence - phosphorescence	3
1.5	Photosensitization - chemiluminescence - bioluminescence - applications of photochemistry	3
UNIT - II		
2.1	Coordination compounds: nomenclature - definition of various terms involved in coordination chemistry	4
2.2	Classification of ligands-Werner's theory, EAN rule	4
2.3	Valence Bond theory - Nickel carbonyl - chelates	4
UNIT - III		
3.1	Chromatographic technique: Principle - classification - adsorption and partition Chromatography	4
3.2	Thin layer chromatography - column chromatography (adsorption) - paper Chromatography	4
3.3	Gas-solid and gas-liquid chromatography- ion exchange chromatography- applications.	4
UNIT - IV		
4.1	Sulpha drugs - sulphadiazine - sulphanilamide -preparation and applications	3
4.2	Antimalarials: chloroquine and plasmoquine -preparation and applications	3
4.3	Arsenical drugs: Salvarasan - 606 and neosalvarasan-preparation and applications	3
4.4	Antibiotics: Definition - classification - penicillin - amoxicillin - ampicillin - tetracyclin- streptomycin - mode of application - uses only	3
UNIT - V		
5.1	Nuclear Chemistry: Composition of the nucleus - nuclear forces - mass defect - binding energy - nuclear stability - Soddy's group displacement law - illustration.	4
5.2	Nuclear fission: Definition - application of fission - principle of atom bomb - Nuclear fusion: Definition - emission of energy - Stellar energy - hydrogen bomb	4
5.3	Applications of radioactive isotopes.	4
Total		60

Course Designer

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Course Code	Course Title	Category	Hours	Credits	Marks		
					CIAE	TEE	Total
26UCHGE2P	VOLUMETRIC ANALYSIS FOR ALLIED CHEMISTRY LAB	Generic Elective -II (Lab)	2	2	40	60	100

Course Objectives		
To enable the students to acquire the quantitative skills in volumetric analysis and to calibrate burette, pipette and standard flask.		
UNIT	Contents	No. of Hours
I	The essential apparatus used in the volumetric analysis. Concepts of molecular weight, equivalent weight, normality and calculation. A double titration involving the making up of the given solution to be estimated and the preparation of a primary standard solution.	12
II	Laboratory hygiene and safety: Handling of concentrated acids, bases and hazardous chemicals, Carcinogenic chemicals, Safety precautions, fire hazards and first aid procedures for laboratory accidents - poisoning – universal antidote.	12
III	Acidimetry and Alkalimetry 1. Titration between a strong acid and strong base. 2. Titration between a strong acid and weak base. 3. Titration between a weak acid and strong base.	12
IV	Permanganometry 1. Titration between $KMnO_4$ and oxalic acid 2. Titration between $KMnO_4$ and ferrous sulphate 3. Titration between $KMnO_4$ and Mohr's salt (Ferrous ammonium sulphate)	12
V	Iodometry 1. Titration between sodium thiosulphate and potassium dichromate 2. Titration between sodium thiosulphate and copper sulphate	12
Total		60
Course Outcomes		Knowledge Level
CO	On completion of this course, students will	
1	Simplify basic quantitative skills in volumetric analysis with the use of burette, pipettes and standard flasks.	K1, K2, K3, K4
2	Inspect the laboratory hygiene and safety.	K1, K2, K3, K4
3	Apply acidimetric and alkalimetric method for the quantitative volumetric estimation of acids and bases.	K1, K2, K3
4	Estimate the amount of oxalic acid, ferrous sulphate and Mohr's salt permanganometrically.	K1, K2, K3

5	Analyze quantitatively the potassium dichromate and copper sulphate iodometrically.	K1, K2, K3, K4
K1-Knowledge		K2-Understand
K3-Apply		K4-Analyze
Text books		
1.	O. P. Pandey, D. N. Bajpai & S. Giri, <i>Practical Chemistry (For B.Sc.)</i> – S. Chand Publishing, 2010.	
2.	Sundaram, Krishnan, Raghavan, <i>Practical Chemistry (Part II)</i> , S. Viswanathan Co. Pvt., 1996.	
Reference Books		
1.	Basset, J. Mendham, R.C. Denney, <i>Vogel's Textbook of Quantitative Chemical Analysis, Longman Scientific & Technical</i> , New York, 1989, 5 th Edition.	
2.	V. Venkateswaran, R. Veeraswamy, A. R. Kulandaivelu, <i>Basic Principles of Practical Chemistry</i> , Sultan Chand & Sons, New Delhi, 2004, 2 nd Edition.	
e-Recourses		
1.	http://www.federica.unina.it/agraria/analyticalchemistry/volumetric-analysis	
2.	https://chemdictionary.org/titration-indicator/	

Mapping with Programme Outcomes:

CO / PO	P01	P02	P03	P04	P05
C01	3	3	3	3	3
C02	3	3	3	2	3
C03	3	3	3	3	3
C04	3	3	3	3	3
C05	3	3	3	3	2
Strong-3		Medium-2		Low-1	

Level of Correlation between PSO's and CO's

CO / PSO	PS01	PS02	PS03	PS04	PS05
C01	3	3	3	3	3
C02	3	3	3	3	3
C03	3	3	2	3	2
C04	3	3	3	3	3
C05	3	3	3	3	3
Strong-3		Medium-2		Low-1	

COURSE CONTENTS AND LECTURE SCHEDULE

Module No.	Topic	No. of Lectures
UNIT - I		
1.1	The essential apparatus used in the volumetric analysis.	4
1.2	Concepts of molecular weight, equivalent weight, normality and calculation.	4

1.3	A double titration involving the making up of the solution to be estimated and the preparation of a primary standard.	4
UNIT - II		
2.1	Handling of concentrated acids, bases and hazardous chemicals and Carcinogenic chemicals.	4
2.2	Safety precautions, fire hazards and first aid procedures for laboratory accidents	4
2.3	Poisoning – universal antidote.	4
UNIT - III		
3.1	Titrations between a strong acid versus strong base.	4
3.2	Titrations between a strong acid versus weak base.	4
3.3	Titrations between a weak acid versus strong base.	4
UNIT - IV		
4.1	Titration between KMnO_4 against oxalic acid	4
4.2	Titration between KMnO_4 against ferrous sulphate	4
4.3	Titration between KMnO_4 against Mohr's salt (Ferrous ammonium sulphate)	4
UNIT - V		
5.1	Titration between sodium thiosulphate versus potassium dichromate	6
5.2	Titration between sodium thiosulphate versus copper sulphate	6
Total		60

Course Designer

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