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.

PG DEPARTMENT OF CHEMISTRY

BACHELOR OF SCIENCE - 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

Generate knowledgeable Chemists and scientists to enhance services to the society.

Mission

- Enable the students to excel in the subject, research and services.
- Elevate students to international standards.
- Encourage the students to take up competitive examinations.

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

PEO1	Comprehensive knowledge and expertise, employability, the acumen of creative and critical thinking, the spirit of enquiry and professional attitude required for a successful career.
PEO2	Accountability, linguistic competence and communication skills in the work environment and beyond.
PEO3	Perseverance, effective collaboration, team spirit, leadership and problem solving skills.
PEO4	Their keen sense of civility, professional ethics, receptivity and moral righteousness.
PEO5	The commitment to address social and environmental threats and as responsible service-minded, duty-bound global citizens.

Programme Outcomes (PO)

On completion (after three years) of B.Sc. Chemistry Programme, a graduate will

PO1	Recall the knowledge of organic, inorganic, physical, thermodynamics, nuclear chemistry, polymers, photochemistry, nanostructured materials, drugs, catalysis, colloids, electrochemistry, cheminformatics and chemotherapy.
PO2	Explain the experiments in the area of physical chemistry experiments, preparation, estimation and analysis of organic and inorganic compounds.
PO3	Develop critical thinking, analytical reasoning, problem-solving techniques and innovative method to design and perform experiments.
PO4	Create an awareness of the impact of chemistry in various disciplines like biological, biodiversity, pollution, disaster management, environment, forensic, analytical and pharmaceutical fields. Use communication skills with comprehensive subject knowledge for competitive examinations.
PO5	Pursue post graduate program in higher educational institutions and also to get suitable employment opportunities in industries and academic institutions

Programme Specific Outcomes (PSO)

The graduates are

PSO1	Expertise in Chemistry: Will be able to nurture the needs of industries/laboratories related to chemistry including pharmaceutical/analytical chemistry
PSO2	Professional Growth: Will be able to demonstrate information literacy skills for acquiring knowledge of chemistry, as a chemist/researcher and also as a life-long learner
PSO3	Analytical Skills: Will be able to communicate effectively the scientific information and research results in written and oral formats, to both professional scientists and to the public
PSO4	Research Skills: Will be able to do research
PSO5	Employability and Leadership: Students will be equipped with the life-long learning process for self-sustainability, employability and leadership roles in our dynamic society.

Programme Scheme

Eligibility

A Pass in +2 examination conducted by Board of Higher Secondary Education, Government of Tamilnadu or equivalent with chemistry as one of the subject.

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., 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	26UCHCC11	General Chemistry - I	5	25	75	100	5
Core – II (Lab)	26UCHCC1P	Volumetric Quantitative Analysis	3	40	60	100	3
Generic Elective - I	26UBYGE11/ 26UZYGE11	Allied Botany – I / Animal Diversity	4	25	75	100	3
Generic Elective – II (Lab)	26UBYGE2P/ 26UZYGE2P	Allied Botany Practical / Allied Zoology Lab	2	-	-	-	-
Part – IV							
Foundation Course (SEC)(MCQ)	26UCHFN11	Basic Laboratory Practices	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	26UCHCC21	General Chemistry - II	5	25	75	100	5
Core – IV (Lab)	26UCHCC2P	Volumetric Quantitative Estimation	3	40	60	100	3
Core – V	26UCHCC22	Organic Chemistry - I	4	25	75	100	4
Generic Elective - II	26UBYGE21/ 26UZYGE21	Allied Botany – II / Animal Organization	4	25	75	100	3
Generic Elective – II (Lab)	26UBYGE2P/ 26UZYGE2P	Allied Botany Practical / Allied Zoology Lab	2	40	60	100	2
TOTAL			**30**				**23**

Course Code	Course Title	Category	Hours	Credits	Marks		
					CIAE	TEE	Total
26UCHCC11	**GENERAL CHEMISTRY - I**	**Core-I**	**5**	**5**	**25**	**75**	**100**

Course Objectives

To delineate introduction to organic chemistry, composition of organic compounds, colloidal states of matter and electrical & magnetic properties of matter, atomic structure and wave mechanics.

UNIT	Contents	No. of Hours
I	**Atomic structure and introduction to wave mechanics:** Rutherford's atomic model – The Bohr theory of hydrogen atom – the spectrum of hydrogen atom – The Sommerfeld extension of the Bohr theory - Davisson Germer experiment. Quantum theory of radiation – Einstein photoelectric equation – particle and wave character of electron – de Broglie equation – Heisenberg's uncertainty principle – quantum numbers– Pauli exclusion principle – Hund's rule of maximum spin multiplicity – Aufbau principle – Electronic configuration and Shapes of s, p & d orbitals.	15
II	**Colloids:** Classification of Colloids – Lyophobic and lyophilic sols – origin of charge and stability of colloids - coagulation and Schulze-Hardy rule – protective action – gold number, zeta potential and Stern double layer (qualitative idea) – optical properties – Tyndall effect. Mechanical properties – Brownian motion, electrokinetic phenomena (electrophoresis and electro-osmosis). Emulsions – types of emulsion – emulsifier with an example – Gels - Classification – applications of colloids.	15
III	**Electrochemical properties:** Dipole moment -electrical polarization of dielectrics and polarizability – determination of dipole moment-Clausius-Mosotti equation & Debye equation - Applications of dipole moment studies - estimation of ionic character, calculation of bond moments, distinguishing geometrical isomers and o-, m-, p- isomers. **Magnetic properties:** Magnetic permeability, specific susceptibility, magnetogyric ratio, atomic and molar susceptibilities – dia-, para- and ferromagnetism – measurement of susceptibility by Gouy's method.	15
IV	**Basics of Organic Chemistry:** Classification of organic compounds – various functional groups – alcohol, amines, acids, esters, aldehydes and ketones. Homologous series -IUPAC nomenclature taking examples from aliphatic and aromatic compounds involving the functional groups (alcohols, amines, acids, esters, aldehydes and ketones). General methods of preparation, properties and uses of methane, ethane, ethylene, propene and acetylene.	15

V	**Detection and Estimation of Elements:** Detection of nitrogen (Lassaigne's test), sulphur (sodium test) and halogens (sodium test), estimation of nitrogen (Kjeldahl method), sulphur, (Carius method), carbon and halogens (Carius method) in organic compounds. Composition of organic compounds– empirical formula – molecular formula – structural formula – simple calculations of organic compounds – acids, ketones and halogen compounds.	15
	Total	**75**

Course Outcomes		**Knowledge Level**
CO	**On completion of this course, students will**	
1	Inspect the atomic structure and concepts of wave mechanics.	K1, K2, K3, K4
2	Clarify the preparation, properties and applications of colloids.	K1, K2, K3, K4
3	Categorize the electrical and magnetic properties of matter.	K1, K2
4	Illustrate IUPAC nomenclature, classification of organic compounds and explain the uses of methane, ethane, ethylene, propene and acetylene.	K1, K2, K3
5	Demonstrate the detection and estimation of nitrogen, sulphur, carbon and halogens in organic compounds.	K1, K2, K3, K4

K1-Knowledge K2-Understand K3-Apply K4-Analyze

Text books

1. B. S. Bahl & Arun Bahl, ***Advanced Organic Chemistry***, S. Chand & Company, New Delhi, 2019.
2. B.R. Puri and L.R. Sharma and Madan S. Pathania, ***Principles of Physical Chemistry***, Vishal Publishing Co., Jalandhar, 2020.
3. R. D. Madan, ***Modern Inorganic Chemistry***, S. Chand & Company Ltd., Reprint 2014, 3rd Edition.

Reference Books

1. P. L. Soni, O. P. Dharmarha and U. N. Dash, ***Textbook of Physical Chemistry***, Sulthan & Sons publication, 2023, 24th revised Edition.
2. P.L. Soni, Text book of ***Inorganic Chemistry***, Sultan Chand & Sons, 2000, 20th Edition.

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
CO1	3	2	2	2	3
CO2	3	3	2	2	3
CO3	3	3	3	3	3
CO4	3	3	2	2	3
CO5	3	2	3	2	2

Strong-3 **Medium-2** **Low-1**

Level of Correlation between PSO's and CO's

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

Strong-3 **Medium-2** **Low-1**

COURSE CONTENTS AND LECTURE SCHEDULE

Module No.	Topic	No. of Lectures
	UNIT - I	
1.1	Atomic structure and introduction to wave mechanics: Rutherford's atomic model – The Bohr theory of hydrogen atom – the spectrum of hydrogen atom.	3
1.2	The Sommerfeld extension of the Bohr theory - Davisson Germer experiment.	3
1.3	Quantum theory of radiation – Einstein photoelectric equation – particle and wave character of electron – de Broglie equation – Heisenberg's uncertainty principle – quantum numbers.	3
1.4	Pauli exclusion principle – Hund's rule of maximum spin multiplicity – Aufbau principle.	3
1.5	Electronic configuration and Shapes of s, p & d orbitals.	3
	UNIT - II	
2.1	Introduction to Organic Chemistry: Definition - Classification of organic compounds – various functional groups – alcohol, amines, acids, esters, aldehydes and ketones.	5
2.2	Homologous series - IUPAC nomenclature taking examples from aliphatic and aromatic compounds involving the functional groups (alcohols, amines, acids, esters, aldehydes and ketones).	5
2.3	General methods of preparation, properties and uses of methane, ethane, ethylene, propene and acetylene.	5

UNIT - III		
3.1	Detection of nitrogen (Lassaigne's test), sulphur (sodium test) and halogens (sodium test) in organic compounds.	4
3.2	Estimation of nitrogen (Kjeldahl method), sulphur, (Carius method), carbon and halogens (Carius method) in organic compounds.	4
3.3	Composition of organic compounds – empirical formula – molecular formula – structural formula.	4
3.4	simple calculations of organic compounds – acids, ketones and halogen compounds.	3
UNIT - IV		
4.1	Colloidal States of matter-various types - classification – Lyophobic and lyophilic sols – origin of charge and stability of colloids.	4
4.2	Coagulation and Schulze-Hardy rule – protective action – gold number, zeta potential and Stern double layer (qualitative idea).	5
4.3	Optical properties – Tyndall effect. Mechanical properties – Brownian motion, electrokinetic phenomena (electrophoresis and electro-osmosis).	3
4.4	Emulsions – types of emulsion – emulsifier with an example – Gels - Classification – applications of colloids.	3
UNIT - V		
5.1	Dipole moment -electrical polarization of dielectrics and polarisability. Determination of dipole moment- Clausius-Mosotti equation & Debye equation.	4
5.2	Applications of dipole moment studies - estimation of ionic character, calculation of bond moments, distinguishing geometrical isomers and o-, m-, p- isomers.	4
5.3	Magnetic permeability, specific susceptibility, magnetogyric ratio, atomic and molar susceptibilities.	4
5.4	Dia-, para- and ferromagnetism – measurement of susceptibility by Gouy's method.	3
Total		**75**

Course Designer

Name: Hajee. Dr. M. Kamal Nasar

Head & Associate Professor of Chemistry

Course Code	Course Title	Category	Hours	Credits	Marks		
					CIAE	TEE	Total
26UCHCC1P	**VOLUMETRIC QUANTITATIVE ANALYSIS**	**Core - II (Lab)**	**3**	**3**	**40**	**60**	**100**

Course Objectives

This course is designed to enable students to acquire quantitative skills in volumetric analysis viz., acid-base titration and permanganimetry.

UNIT	Contents	No. of Hours
I	**Common Apparatus Used in Quantitative Estimation (Titrimetric)** Essential uses of apparatus in estimation, standard titrimetric methods	9
II	**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; complexometric, iodimetric and iodometric titrations; indicators–types and adsorption indicators, choice of indicators.	9
III	A double titration involving preparation of primary standard solution and making up of the solution to be estimated. **Acidimetry and Alkalimetry** 1. Estimation of sodium carbonate. 2. Estimation of sodium hydroxide/potassium hydroxide. 3. Estimation of oxalic acid.	9
IV	**Permanganimetry** 1. Estimation of ferrous ion. 2. Estimation of oxalic acid. 3. Estimation of calcium (direct method).	9
V	**Argentimetry** 1. Estimation of chloride in barium chloride using standard sodium chloride/Estimation of chloride in sodium chloride (Volhard's method).	9
	Total	**45**

Course Outcomes		Knowledge Level
CO	**On completion of this course, students will**	
1	Examine the basic principles involved in volumetric analysis.	K1, K2, K3, K4
2	Compare the methodologies of different titrimetric analysis.	K1, K2, K3, K4
3	Calculate the concentrations of unknown solutions in different ways and develop the skill to estimate the amount of a substance present in a given solution.	K1, K2, K3
4	Determine the amount of chemical substance present in a given	K1, K2, K3

	solution by acidimetry, alkalimetry and permanganimetry.	
5	Demonstrate the quantitative estimation of analyte by precipitation titration.	K1, K2
K1-Knowledge	**K2-Understand** **K3-Apply**	**K4-Analyze**
Text books		
1.	Mendham, J. Denney, R.C.; Barnes, J.D.; Thomas, M.; Sivasankar, B.; ***Vogel's Textbook of Quantitative Chemical Analysis***, 6thed.; Pearson Education Ltd: New Delhi, 2009.	
2.	Venkateswaran, V. Veeraswamy, R.; Kulandaivelu, A.R. ***Basic Principles of Practical Chemistry***, 2nded.; Sultan Chand & Sons: New Delhi, 1997.	
Reference Books		
1.	Sundaram, Krishnan, Raghavan, ***Practical Chemistry (Part II)***, S. Viswanathan Co. Pvt., 2006.	
2.	Nad, A.K.; Mahapatra, B.; Ghoshal, A.; ***An advanced course in Practical Chemistry***, 3rded.; New Central Book Agency: Kolkata, 2012.	
e-Resources		
1.	http://www.federica.unina.it/agraria/analyticalchemistry/volumetric-analysis	
2.	https://chemdictionary.org/titration-indicator/	

Mapping with Programme Outcomes:

CO /PO	PO1	PO2	PO3	PO4	PO5
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	2	2	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
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	2	2	2	2	2

Strong-3 **Medium-2** **Low-1**

COURSE CONTENTS AND LAB SCHEDULE

Module No.	Topic	No. of Hours
UNIT - I		
1.1	Common Apparatus Used in Quantitative Estimation (Volumetric): Description and use of burette, pipette, standard flask, measuring cylinder, conical flask, beaker, funnel, dropper,	9

	clamp, stand, wash bottle, watch glass, wire gauge and tripod stand.	
UNIT - II		
2.1	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.	3
2.2	Theories of acid-base, redox, complexometric, iodimetric and iodometric titrations.	3
2.3	Indicators–types, theory of acid–base, redox, metal ion and adsorption indicators, choice of indicators.	3
UNIT - III		
3.1	A double titration involving preparation of primary standard solution and making up of the solution to be estimated. **Acidimetry and Alkalimetry**: 1. Estimation of sodium carbonate.	3
3.2	2. Estimation of sodium hydroxide/potassium hydroxide.	3
3.3	3. Estimation of oxalic acid.	3
UNIT - IV		
4.1	**Permanganimetry**: 1. Estimation of ferrous ion.	3
4.2	2. Estimation of oxalic acid.	3
4.3	3. Estimation of calcium (direct method).	3
UNIT - V		
5.1	**Argentimetry**: **(Demonstration only)** 1. Estimation of chloride in barium chloride using standard sodium chloride/Estimation of chloride in sodium chloride (Volhard's method).	9
Total		**45**

Course Designer
Name: Dr. N. M. Abdul Khader Jailani
Associate Professor of Chemistry

Course Code	Course Title	Category	Hours	Credits	Marks		
					CIAE	TEE	Total
26UBYGE11	**ALLIED BOTANY - I**	**Generic Elective - I**	**4**	**3**	**25**	**75**	**100**

Course Objectives

To study the structure and life cycle of primitive plants, to observe the ultrastructure of plant cell organelles and microbes, and demonstrates the basic concepts of Mendelism and techniques in Plant tissue culture.

UNIT	Contents	No. of Hours
I	**Algae:** General characters of algae - Structure, reproduction and life cycle of the following genera - *Anabaena* and *Sargassum* and economic importance of algae.	12
II	**Fungi, Bacteria and Virus:** General characters of fungi, structure, reproduction and life cycle of the following genera – *Penicillium* and *Agaricus* and economic importance of fungi. Bacteria-general characters, structure of *Escherichia coli* and economic importance of bacteria. Virus - general characters.	12
III	**Bryophytes, Pteridophytes and Gymnosperms:** General characters of Bryophytes, Structure and life cycle of *Funaria*. General characters of Pteridophytes, Structure and life cycle of *Lycopodium*. General characters of Gymnosperms, Structure and life Cycle of *Pinus*.	12
IV	**Cell Biology:** Plant cell structure/organization. Cell organelles-ultra structure and function of Chloroplast, and Mitochondria. Cell division-mitosis and meiosis.	12
V	**Genetics and Plant Biotechnology:** Mendelism - Law of dominance, Law of segregation, Law of independent assortment. Monohybrid and dihybrid cross. Plant Tissue culture - Callus culture, Somatic embryogenesis and Micropropagation.	12
	Total	60

Course Outcomes		Knowledge Level
CO	**On completion of this course, students will**	
1	Increase the awareness and appreciation of human friendly algae and their economic importance.	K1,K2,K3,K4
2	Develop an understanding of microbes and fungi and	K1,K2,K3,K4

	appreciate their adaptive strategies	
3	Develop critical understanding on morphology, anatomy and reproduction of Bryophytes, Pteridophytes and Gymnosperms.	K1,K2,K3,K4
4	Compare the structure and function of cells and explain the development of cells.	K1,K2,K3,K4
5	Understand the core concepts and fundamentals of genetics and plant biotechnology.	K1,K2,K3,K4
K1-Knowledge, K2-Understand, K3-Apply, K4- Analyze		
Textbooks		
1.	Singh, V., Pande, P. CandJain, D.K.2021. ***A Text Book of Botany***. Rastogi Publications, Meerut.	
2.	Bhatnagar, S.P and Alok Moitra. 2020. ***Gymnosperms***, New Age International(P) Ltd., Publishers, Bengaluru	
3.	Sharma, O.P.2017. Bryophyta, MacMillan India Ltd. Delhi.	
4.	Lee, R.E. 2008. ***Phycology***, IV Edition, Cambridge University Press, New Delhi.	
5.	Rao, K., Krishnamurthy, K.V and Rao, G.S.1979. ***Ancillary Botany***, S. Viswanathan Pvt. Ltd., Madras.	
Reference Books		
1.	Parihar, N.S.2012. ***An introduction to Embryophyta*** – Pteridophytes - Surjeet Publications, Delhi.	
2.	Alexopoulos, C.J.2013. ***Introduction to Mycology***. WilleyEasternPvt.Ltd.	
3.	Vashishta, P.C.2014***. Botany for Degree Students Gymnosperms***. Chand & Company Ltd, Delhi.	
4.	Coulter, M.Jhon,2014. ***Morphology of Gymnosperms***. Surjeet Publications, Delhi.	
5.	Vashishta, P.C.2014. ***Botany for Degree Students Algae***. 2014. Chand & Company Ltd, Delhi.	
6.	Parihar,N.S.2013. ***An introduction to Embryophyta*** –Bryophytes-,Surjeet Publications, Delhi	
7.	PandeyB.P.1986, ***Text Book of Botany***(College Botany) Vol I & II, S. Chand and Co. New Delhi.	

Mapping with Programme Outcomes:

CO /PO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**
CO1	3	3	1	3	3
CO2	3	3	1	3	3
CO3	3	3	2	3	3
CO4	3	3	2	3	3
CO5	3	3	2	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	1	3	3
CO2	3	3	1	3	3
CO3	3	3	2	3	3
CO4	3	3	2	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	General character of Algae	3
1.2	Structure and Reproduction of *Anabaena*	3
1.3	Structure and Reproduction of *Sargassum*	3
1.4	Economic importance of Algae	3
	UNIT - II	
2.1	General characters and Economic importance of Fungi of Fungi	2
2.2	Structure, reproduction and life cycle of Penicillium	2
2.3	Structure, reproduction and life cycle of *Agaricus*	2
2.4	General characters and economic importance of Bacteria	3
2.5	General characters of Virus	2
2.6	Structure of *E.coli*	1
	UNIT - III	
3.1	General characters of Bryophytes	2
3.2	Structure and Life cycle of *Funaria*	2
3.3	General characters of Pteridophytes	2
3.4	Structure and Life cycle of *Lycopodium*	2
3.5	General characters of Gymnosperms	2
3.6	Structure and Life cycle of *Pinus*	2
	UNIT - IV	
4.1	Plant cell structure / organization	3
4.2	Ultra structure and functions of Chloroplast	2
4.3	Ultra structure and functions of Mitochondria	2
4.4	Cell division- Mitosis	2
4.5	Meiosis	3
	UNIT - V	
5.1	Introduction to Genetics-Mendel's Law	1
5.2	Monohybrid cross	1
5.3	Dihybrid cross	2

5.4	Plant tissue culture – Introduction	2
5.5	Invitro culture methods – Callus Culture	2
5.6	Somatic embryogenesis	2
5.7	Micropropagation	2
Total		**60**

Course Designer
Name: Mrs. A. M. Rashida Banu
Assistant Professor of Botany

Course Code	Course Title	Category	Hours	Credits	Marks		
					CIAE	TEE	Total
26UZYGE11	**ANIMAL DIVERSITY**	**Generic Elective-I**	**4**	**3**	**25**	**75**	**100**

Course Objectives		
To enable the students to acquire knowledge on general characteristics, classification of Invertebrates and chordates		
UNIT	**Contents**	**No. of Hours**
I	**Acoelomata:** Levels of organization – Outline classification up to phylum with examples- General characteristics – Protozoa – Type Study: *Amoeba Proteus*. - Life cycle of *Plasmodium vivax* - Protozoan diseases – Porifera - canal system in *Leucosolenia* sponge – Coelenterata - *Hydra* – Biology of coral reefs.	12
II	**Pseudocoelomata**-Platyhelminthes - General characters - classification –Type Study: Morphology of *Taeniasolium*–Life cycle of *Ascaris lumbrcoides* - Helminth parasites in man.	12
III	**Coelomata** - General characteristics - Arthropoda, Mollusca and Echinodermata– Type Study: Cockroach-Morphology of *Periplaneta americana* – Economic importance of insects – *Pila globosa* – Torsion – *Asterias rubens* –Water vascular system – larval forms.	12
IV	**Prochordata:** Pisces and Amphibia-Classification of Fishes& Amphibians upto class level with examples.Type Study: Shark – External morphology, feeding and digestion.Frog- External morphology.General topics:Migration of fishes – Parental care in Amphibia.	12
V	**Reptilia,** Aves and Mammals: General characters –Type Study: *Columba livia* - flight adaptations in birds - migration in birds-adaptive radiation of beak and feet – Identification of poisonous and nonpoisonous snakes –*Oryctolagus cuniculus* - Dentition in mammals - aquatic mammals.	12
	Total	**60**

Course Outcomes		**Programme Outcomes**
CO	**On completion of this course, students will**	
1	Acquire knowledge oncharacteristic features, morphology and to classify aceolomates.	K1
2	Idenfify and classify pseudocoelomates.	K1, K2
3	Study of economic importance and evolutionary significance of respective Phylum	K1, K2
4	Illustrate the features of Prochordates, Pisces and Amphibians.	K1, K2,K3,K4

5	Compare poisonous and non-poisonous snakes and to study the adaptive features in Aves and Mammals.	K1, K2,K3,K4

K1-Knowledge K2-Understand K3-Apply K4-Analyze

Textbooks	
1.	Chaki, KK, Kundu, G and Sarkar, S (2005) ***Introduction to General Zoology***. Vol-1, New Central Book Agency Pvt. Ltd., Kolkata, India. Jordan EL and Verma PS (2013) Chordate Zoology, S.Chand & Co Ltd., New Delhi.
2.	Ekambaranatha Iyer, E (2016) ***Manual of Zoology Vol. II***. Viswanathan (Printers & Publishers),Chennai.
Reference Books	
1.	Kotpal, R.L. ***Modern Text Book of Zoology, Invertebrates*** (Animal diversity – I),

Mapping with Programme Outcomes:

CO /PO	PO1	PO2	PO3	PO4	PO5
CO1	3	3	2	2	3
CO2	3	2	3	3	1
CO3	3	3	3	3	2
CO4	2	3	1	3	1
CO5	3	1	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	2	2	3
CO2	3	2	3	3	1
CO3	3	3	3	3	2
CO4	2	3	1	3	1
CO5	3	1	3	3	3

Strong-3 Medium-2 Low-1

COURSE CONTENTS AND LECTURE SCHEDULE

Module No.	Topic	No. of Lectures
	UNIT - I	
1.1	Acoelomata: Levels of organization – Outline classification up to phylum with examples	3
1.2	General characteristics – Protozoa - Type Study: *Amoeba Proteus*	2
1.3	Life cycle of *Plasmodium vivax* - Protozoan diseases – Porifera - canal system – Coelenterata - *Hydra*- biology of corals and coral reefs.	2
1.4	Porifera –Type Study:Canal system in *Leucosolenia*	2
1.5	*Coelenterata* - Type Study:Hydra - Biology of coral reefs.	3
	UNIT - II	

2.1	Pseudocoelomata: Platyhelminthes - General characters - classification	4
2.2	Type Study: Morphology of *Taeniasolium*–Life cycle of *Ascaris lumbricoides*	4
2.3	Helminth parasites in man.	4
UNIT - III		
3.1	Coelomata: General characteristics- Arthropoda, Mollusca and Echinodermata–Type Study: Cockroach- Morphology of *Periplaneta americana*	4
3.2	Economic importance of insects	4
3.3	*Pila globosa* – torsion – *Asterias rubens* –watervascular system – larval forms	4
UNIT - IV		
4.1	**Prochordata:***Pisces* and *Amphibia*-Classification of Fishes& Amphibians up to class level with examples.	3
4.2	Type study: Shark – External morphology, feeding and digestion.	3
4.3	Frog- *Rana Hexadactyla*-External morphology.	3
4.4	General topics: Migration of fishes – Parental care in *Amphibia*.	3
UNIT - V		
5.1	Reptiles, Aves and Mammals: General characters –	3
5.2	Type Study:*Columba livia* - Flight adaptations in birds - migration in birds-adaptive radiation of beak and feet	3
5.3	Identification of poisonous and nonpoisonous snakes	3
5.4	*Oryctolagus cuniculus* - Dentition in mammals - aquatic mammals	3
Total		**60**

Course Designer
Name: Dr. M. Mohamed Meeran
Associate Professor of Zoology

Course Code	Course Title	Category	Hours	Credits	Marks		
					CIAE	TEE	Total
26UCHFN11	**BASIC LABORATORY PRACTICES**	**Foundation Course (SEC)(MCQ)**	**2**	**2**	**25**	**75**	**100**

Course Objectives		
The course enables the students to gain knowledge about good lab practices, and acquire the skills in qualitative, quantitative and organic analysis.		
UNIT	**Contents**	**No. of Hours**
I	**Laboratory Safety & Concentration of Solutions:** Handling of concentrated acids, bases and hazardous chemicals, Carcinogenic chemicals, Safety precautions, fire hazards and first aid procedures for laboratory accidents - poisoning – universal antidote.	6
II	**Inorganic Qualitative Analysis:** Principles of semi micro methods – solubility product and common ion effect - Group separation of common cations –interfering and non-interfering anions – elimination of interfering anions – test for basic anions and cations - phosphate, nitrate, sulphate, carbonate, fluoride, oxalate, chloride, borate, lead, cadmium, copper, nickel, calcium, barium, ammonium (any one test for each).	6
III	**Basic Principles of Quantitative Analysis:** General principle- Primary and secondary standards, criteria for primary standards, preparation of standard solutions, standardization of solutions. Types of titrations -Requirements for titrimetric analysis- principles of different acid base titrations - Limitation of volumetric analysis, endpoint and equivalence point – Neutralisation-titration curve - indicators used in acid-base titrations- theory of indicators - phenolphthalein and methyl orange.	6
IV	**Basics of Organic Analysis:** Qualitative tests to identify organic functional groups – aliphatic and aromatic, test for unsaturation, phenols, aldehydes, ketones, esters, carbohydrates, amines, amides, carboxylic acids (any one test for each).	6
V	**Purification of Organic compounds:** Purification of solid organic compounds: Crystallization, fractional crystallization, sublimation. Purification of organic liquids: Simple distillation- fractional distillation, distillation under reduced pressure, steam distillation, liquid-liquid extraction.	6
	Total	**30**
Course Outcomes		**Knowledge Level**
CO	**On completion of this course, students will**	

1	Explain the safe handling, storage and disposal of hazardous chemicals used in laboratory practices.	K1, K2
2	Apply the principles of semi-micro analytical methods, including solubility product and common ion effect.	K1, K2, K3
3	Determine the principles of quantitative analysis, standardization of solutions and requirements of titrimetric analysis.	K1, K2, K3
4	Inspect organic functional groups through appropriate qualitative tests.	K1, K2, K3, K4
5	Illustrate various purification techniques for organic compounds.	K1, K2, K3, K4
K1-Knowledge	**K2-Understand** **K3-Apply**	**K4-Analyze**
Text books		
1.	R. Gopalan, P.S. Balasubramaniam and K. Rengarajan, ***Elements of Analytical Chemistry***, Sultan Chand Publishers, New Delhi. 2013.	
2.	V. V. Ramanujam, ***Inorganic Semi Micro Qualitative Analysis***, National Publishing Company, 1965.	
3.	N.S. Gnanapragasam, G. Ramamurthy, ***Organic Chemistry Lab Manual***, S. Viswanathan Printers & Publishers Pvt Ltd, Reprint 1996.	
Reference Books		
1.	Cooke Josiah Parson Jr., ***Laboratory Practice***, Biblio Life Publisher, 2009, 2nd Edition.	
2.	Brian S Furniss, Antony J Hannaford, Peter. W.G. Smith, Austin R. Tatchel, ***Vogel's Textbook of Practical Organic Chemistry***, Longman Scientific & Technical, 1989, 5th Edition.	
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
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	2	3
CO4	3	3	3	3	3
CO5	2	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	2	3	3	3	3
CO5	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	Handling of concentrated acids, bases and hazardous chemicals, Carcinogenic chemicals, Safety precautions, fire hazards.	2
1.2	first aid procedures for laboratory accidents - poisoning – universal antidote.	2
1.3	Concentration of Solutions: Normality, molarity, molality, weight percentage, volume percentage, dilution from stock solutions – Problems.	2
	UNIT - II	
2.1	Principles of semi micro methods – solubility product and common ion effect - Group separation of common cations –interfering and non-interfering anions – elimination of interfering anions.	2
2.2	Test for anions - phosphate, nitrate, sulphate, carbonate, fluoride, oxalate, chloride, borate (any one test for each).	2
2.3	Test for cations - lead, cadmium, copper, nickel, calcium, barium, ammonium (any one test for each).	2
	UNIT - III	
3.1	General principle- Primary and secondary standards, criteria for primary standards, preparation of standard solutions, standardization of solutions.	2
3.2	Types of titrations-Requirements for titrimetric analysis- principles of different acid-base titrations - Limitation of volumetric analysis, endpoint and equivalence point	2
3.3	Neutralisation - titration curve - indicators used in acid-base titrations- theory of indicators - phenolphthalein and methyl orange.	2
	UNIT - IV	
4.1	Qualitative tests to identify organic functional groups – aliphatic and aromatic, test for unsaturation, amides, carboxylic acids (any one test for each).	2
4.2	Qualitative tests to identify phenols, aldehydes, ketones, esters.	2
4.3	Qualitative tests to identify carbohydrates, amines, amides,	2

	carboxylic acids.	
UNIT - V		
5.1	Purification of solid organic compounds – crystallization, factional crystallization, sublimation.	3
5.2	Purification of organic liquids – simple distillation- fractional distillation, distillation under reduced pressure, steam distillation, liquid-liquid extraction.	3
Total		**30**

Course Designer

Name: Ms. A. Ismath Raihana

Assistant Professor of Chemistry

Course Code	Course Title	Category	Hours	Credits	Marks		
					CIAE	TEE	Total
26UCHCC21	**GENERAL CHEMISTRY - II**	**Core-III**	**5**	**5**	**25**	**75**	**100**

Course Objectives

To delineate the polar effects, alcohols, thioalcohols and thioethers, properties of gaseous state and periodic table.

UNIT	Contents	No. of Hours
I	**Polar effects:** Inductive effect, comparing acid strengths – Mesomeric effect (- CN, - CO). Resonance effect – conditions for resonance. Hyperconjugation, Baker – Nathan effect, hyper conjugative structures of toluene, ethyl benzene and iso-propyl benzene. Generation and stability of free radicals, carbonium ions and carbanions. Steric effect – examples and effect on reactivity. Comparison of Basic strength of RNH_2, R_2NH, R_3N and aniline.	15
II	**Alcohols**: Preparation by hydroboration, reduction of carbonyl compounds, acids and esters, by using Grignard reagents – Reaction with metals –Mechanism and reactivity towards HX, dehydration – rearrangement –Ascending and descending the alcohol series – estimation of number of hydroxyl groups. Ethers: Mechanism of Williamson's synthesis, mechanism of cleavage by HX - estimation of methoxy group by Zeisel method – Applications of crown ethers.	15
III	**Thioalcohols and thioethers**: Preparation and properties of sulphonal, and mustard gas. **Dicarboxylic acids** - Oxalic, Malonic, Glutaric, Adipic acid - Preparation with mechanism, properties and uses. **Unsaturated acid*:*** Acrylic acid and Crotonoic acid - Preparation, Properties and uses. **Hydroxy acids**: Tartaric acid, citric acid - Preparation and properties.	15
IV	**Gaseous state:** Kinetic theory of gases – Postulates – Boyle law, Charles law and Avogadro's law – Deviation of real gases from ideal behaviour - Boyle temperature – Explanation for deviations – Vander Waals gas equation of states – derivation. Maxwell Boltzmann distribution of molecular velocities (no derivation) – Graphical representation and its significance – effect of temperature on velocity distribution. Types of molecular velocities – Average, Most probable and Root Mean Square velocities – Collision diameter – collision number – collision frequency – mean free path.	15
V	**Periodic table and periodic properties:** Periodic law and arrangement of elements in the periodic table – classification of elements – periodic properties - Horizontal, vertical and diagonal relationship in the periodic table – atomic volume – atomic radius –	15

	ionic radius – electron affinity – ionization energy – electronegativity - Pauling and Mulliken scale –Allred and Rochows scale – factors affecting the magnitude of electronegativity – application of electronegativity- trends along the group and across the period.	
Total		**75**

Course Outcomes		**Knowledge Level**
CO	**On completion of this course, students will**	
1	Examine the inductive effect, mesomeric effect, resonance effect, hyperconjugation effect, steric effect and reactive intermediates	K1, K2, K3, K4
2	Identify the preparation, properties and mechanism of alcohols and ethers.	K1, K2, K3
3	Simplify the preparation, properties and uses of Thioalcohols and Thioethers.	K1, K2, K3, K4
4	Explain the ideal and real gas concepts, molecular velocities, Maxwell-Boltzmann distribution and viscosity.	K1, K2
5	Illustrate the periodic properties and its variation over the periodic table.	K1, K2, K3, K4

K1-Knowledge K2-Understand K3-Apply K4-Analyze

Textbooks	
1.	P. L. Soni, O. P. Dharmarha and U. N. Dash, ***Textbook of Physical Chemistry***, Sulthan & Sons publication, 2023, 24th revised Edition.
2.	R. D. Madan, ***Modern Inorganic Chemistry***, S. Chand & Company Ltd., Reprint 2014, 3rd Edition.
3.	P.L. Soni, ***Text book of Inorganic Chemistry***, Sultan Chand & Sons, 2000, 20th Edition.
Reference Books	
1.	B. S. Bahl & Arun Bahl, ***Advanced Organic Chemistry***, S. Chand & Company, New Delhi, 2019.
2.	P. L. Soni & H. M. Chawla, ***Text book of Organic Chemistry***, Sulthan Chand & Sons, New Delhi, 2012, 29th Edition.
3.	B.R. Puri and L.R. Sharma and Madan S. Pathania, ***Principles of Physical Chemistry***, Vishal Publishing Co., Jalandhar, 2005.
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
CO1	3	2	3	3	2
CO2	2	3	2	3	2
CO3	3	3	2	3	2
CO4	3	3	2	3	2
CO5	3	2	2	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	2	3	2	3
CO2	3	2	2	3	2
CO3	3	3	2	3	2
CO4	3	2	2	2	2
CO5	3	2	2	3	3

Strong-3 **Medium-2** **Low-1**

COURSE CONTENTS AND LECTURE SCHEDULE

Module No.	Topic	No. of Lectures
	UNIT - I	
1.1	Polar effects: Inductive effect, comparing acid strengths – Mesomeric effect (- CN, - CO). Resonance effect – conditions for resonance.	4
1.2	Hyperconjugation, Baker – Nathan effect - Hyper conjugative structures of toluene, ethyl benzene and isopropyl benzene.	4
1.3	Generation and stability of free radicals, carbonium ions and carbanions.	4
1.4	Steric effect – examples and effect on reactivity. Basic strength of RNH_2, R_2NH, R_3N and aniline.	3
	UNIT - II	
2.1	Preparation by hydroboration, reduction of carbonyl compounds, acids and esters, by using Grignard reagents.	4
2.2	Reaction with metals –Mechanism and reactivity towards HX, dehydration – rearrangement –Ascending and descending the alcohol series.	5
2.3	Estimation of number of hydroxyl groups. Ethers: Mechanism of Williamson's synthesis, mechanism of cleavage by HX.	4
2.4	Estimation of methoxy group by Zeisel method – Applications of crown ethers.	2
	UNIT - III	

3.1	Thioalcohols and thioethers: Preparation and properties of sulphonal and mustard gas.	4
3.2	Dicarboxylic acids - Oxalic, Malonic, Glutaric, Adipic acid preparation with mechanism, properties and uses.	4
3.3	Unsaturated acid: Acrylic acid and Crotonoic acid - preparation, properties and uses.	4
3.4	Hydroxy acids - Tartaric acid, citric acid - preparation and properties.	3
UNIT - IV		
4.1	Kinetic theory of gases – Postulates – Boyle law, Charles law and Avogadro's law – Deviation of real gases from ideal behaviour - Boyle temperature – Explanation for deviations – Vander Waals gas equation of states – derivation.	6
4.2	Maxwell-Boltzmann distribution of molecular velocities (no derivation) – Graphical representation and its significance – effect of temperature on velocity distribution.	4
4.3	Types of molecular velocities – Average, Most probable and Root Mean Square velocities.	2
4.4	Collision diameter – collision number – collision frequency – mean free path.	3
UNIT - V		
5.1	Long form of the Periodic Table – classification of elements – periodic properties – atomic volume – atomic radius – ionic radius.	5
5.2	Electron affinity – ionization energy – electronegativity - Pauling and Mulliken scale - Allred and Rochows scale.	5
5.3	Factors affecting the magnitude of electronegativity – application of electronegativity- trends along the group and across the period.	5
Total		**75**

Course Designer
Name: Dr. K. Shahul Hameed
Assistant Professor of Chemistry

Course Code	Course Title	Category	Hours	Credits	Marks		
					CIAE	TEE	Total
26UCHCC2P	**VOLUMETRIC QUANTITATIVE ESTIMATION**	**Core - IV (Lab)**	**3**	**3**	**40**	**60**	**100**

Course Objectives

This course is designed to provide undergraduate students with a strong foundation in chemical laboratory safety and develops practical skills in quantitative chemical analysis through titrimetric methods such as iodometry, dichrometry, and complexometry.

UNIT	Contents	No. of Hours
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 material safety data sheet (MSDS); importance and care of personal protective equipment (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.	15
II	A double titration involving preparation of primary standard solution and making up of the solution to be estimated. **Iodometry** 1. Estimation of potassium dichromate. 2. Estimation of potassium permanganate. 3. Estimation of copper.	9
III	**Dichrometry** 1. Estimation of ferrous ion. 2. Estimation of ferric ion using internal indicator. 3. Estimation of ferric ion using external indicator.	9
IV	**Complexometry** 1. Estimation of hardness of water using EDTA.	6
V	**Applications of titrimetry in pharmaceuticals** 1. Estimation of iron (II) in iron tablets. 2. Estimation of ascorbic acid in vitamin C tablets.	6
	Total	**45**

Course Outcomes		Knowledge Level
CO	**On completion of this course, students will**	
1	Identify common laboratory hazards and apply appropriate chemical safety measures and waste disposal practices.	K1, K2, K3, K4
2	Apply iodometric methods to determine the concentration of selected analytes.	K1, K2, K3, K4
3	Analyze samples using dichrometric and complexometric titrations with suitable indicators.	K1, K2, K3, K4

4	Estimate iron and ascorbic acid in pharmaceutical samples.	K1, K2, K3, K4
5	Evaluate experimental results from chemical estimations and present findings systematically.	K1, K2, K3, K4
K1-Knowledge	**K2-Understand** **K3-Apply**	**K4-Analyze**
Text books		
1.	Mendham, J.; Denney, R.C.; Barnes, J.D.; Thomas, M.; Sivasankar, B.; ***Vogel's Textbook of Quantitative Chemical Analysis***, 6thed.; Pearson Education Ltd: New Delhi, 2009.	
2.	Venkateswaran, V.; Veeraswamy, R.; Kulandaivelu, A.R. ***Basic Principles of Practical Chemistry***, 2nded.; Sultan Chand & Sons: New Delhi, 1997.	
Reference Books		
1.	Sundaram, Krishnan, Raghavan, ***Practical Chemistry (Part II)***, S. Viswanathan Co. Pvt., 2006.	
2.	Nad, A.K.; Mahapatra, B.; Ghoshal, A.; ***An advanced course in Practical Chemistry***, 3rded.; New Central Book Agency: Kolkata, 2012.	
e-Resources		
1.	http://www.federica.unina.it/agraria/analyticalchemistry/volumetric-analysis	
2.	https://chemdictionary.org/titration-indicator/	

Mapping with Programme Outcomes:

CO /PO	PO1	PO2	PO3	PO4	PO5
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	2	2	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
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	2	2	2	2	2

Strong-3 **Medium-2** **Low-1**

COURSE CONTENTS AND LAB SCHEDULE

Module No.	Topic	No. of Hours
UNIT - I		

1.1	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;	5
1.2	Concept of Material Safety Data Sheet (MSDS); importance and care of Personal Protective Equipment (PPE).	4
1.3	Proper use and operation of chemical hoods and ventilation system; fire extinguishers–types and uses of fire extinguishers, demonstration of operation.	3
1.4	Chemical waste and safe disposal.	3
UNIT - II		
2.1	A double titration involving preparation of primary standard solution and making up of the solution to be estimated. **Iodometry**: 1. Estimation of potassium dichromate.	3
2.2	2. Estimation of potassium permanganate.	3
2.3	3. Estimation of copper.	3
UNIT - III		
3.1	**Dichrometry**: 1. Estimation of ferrous ion.	3
3.2	2. Estimation of ferric ion using internal indicator.	3
3.3	3. Estimation of ferric ion using external indicator.	3
UNIT - IV		
4.1	**Complexometry**: 1. Estimation of hardness of water using EDTA.	6
UNIT - V		
5.1	**Applications of titrimetry in pharmaceuticals:** 1. Estimation of iron (II) in iron tablets.	3
5.2	2. Estimation of ascorbic acid in vitamin C tablets.	3
Total		**45**

Course Designer
Name: Dr. N.M. Abdul Khader Jailani
Associate Professor of Chemistry

Course Code	Course Title	Category	Hours	Credits	Marks		
					CIAE	TEE	Total
26UCHCC22	**ORGANIC CHEMISTRY - I**	**Core – V**	**4**	**4**	**25**	**75**	**100**

Course Objectives		
To acquire knowledge about types of organic reactions, aromatic compounds, Aromatic nitro compounds and mechanism of reactions.		
UNIT	**Contents**	**No. of Hours**
I	**Basic organic reactions:** Substitution – S_N1 and S_N2 mechanisms, addition- Markownikoff's rule and Anti – Markownikoff's rule, elimination- E1, E2 mechanisms, Hofmann's rule and Saytzeff rule - rearrangement and polymerisation reactions – examples.	12
II	**Aromatic Compounds - I**: Introduction – general characteristics of aromatic compounds – Aromaticity and Huckel's rule – Structure of benzene – Mechanism of aromatic electrophilic substitution – Halogenation (Chlorination), nitration, Sulphonation and Friedel – Crafts reactions – Mechanism of aromatic nucleophilic substitution: Unimolecular, bimolecular and benzyne mechanisms.	12
III	**Aromatic Compounds-II:** Homologous series of benzene- Preparation, Properties and uses of toluene, xylene and Mesitylene. Aromatic halogen compounds: Preparation, properties and uses of bromobenzene and benzyl bromide – reactivity of aryl halides, distinction between nuclear and side chain halogenated derivatives.	12
IV	**Aromatic Compounds - III:** Preparation and properties of nitrotoluenes and nitrobenzene. Aromatic amino compounds: Preparation by reduction of nitro compounds and from chlorobenzene – Effect of substituents on the basic character of aromatic amines – Comparison between aliphatic and aromatic amines. Preparation of sulphanilic acid, nitroanilines and phenylenediamines. Preparation and synthetic applications of benzene diazonium chloride.	12
V	**Aromatic Compounds–IV**: Aromatic aldehydes: Benzaldehyde – Mechanism of Cannizaro, Perkins, Claisen, Knoevenagel reaction and benzoin condensation - Preparation and Properties of Cinnamaldehyde & vanillin. Phenols: Acidity of phenols – effect of substituents on the acidity of phenol, mechanism of Reimer-Tiemann, Gattermann, Fries and Kolbe's reactions.	12
Total		**60**

Course Outcomes		**Knowledge Level**
CO	**On completion of this course, students will**	
1	Compile the reaction mechanism in relation to nucleophilic substitution, elimination, rearrangement and polymerization	K1, K2, K3

	reactions.	
2	Illustrate the concept, grasp the preparation, properties and applications of aromatic nitro and amino compounds.	K1, K2, K3, K4
3	Inspect the aromaticity of organic molecules and predict the reactivity and orientation of electrophiles and nucleophiles during the chemical reactions.	K1, K2, K3, K4
4	Simplify the preparation, properties and uses of aromatic hydrocarbons and aromatic halogen compounds.	K1, K2, K3, K4
5	Classify advanced organic name reactions and various factors influencing the acidity of phenols.	K1, K2, K3, K4
K1-Knowledge	**K2-Understand** **K3-Apply**	**K4-Analyze**
Textbooks		
1.	B. S. Bahl & Arun Bahl, ***Advanced Organic Chemistry***, S. Chand & Company, New Delhi, 2019.	
2.	P. L. Soni & H. M. Chawla, ***Text book of Organic Chemistry***, Sulthan Chand & Sons, New Delhi, 2012, 29th edition.	
Reference Books		
1.	I.L. Finar, ***Organic Chemistry, Volume I: The Fundamental Principles*****,** ELBS, Singapore, 1994, 6th Edition.	
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
CO1	3	3	3	3	3
CO2	3	3	2	3	3
CO3	3	3	2	2	3
CO4	3	3	1	2	3
CO5	3	3	2	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	2
CO3	3	3	3	3	2
CO4	2	3	1	1	1
CO5	3	3	2	2	2

Strong-3 **Medium-2** **Low-1**

COURSE CONTENTS AND LECTURE SCHEDULE

Module No.	Topic	No. of Lectures
UNIT - I		

1.1	**Basic organic reactions:** Substitution – S_N1 and S_N2 mechanisms, addition- Markownikoff's rule and Anti – Markownikoff's rule.	6
1.2	Elimination- E1, E2 mechanisms, Hofmann's rule and Saytzeff rule - Rearrangement and polymerisation reactions – examples.	6
UNIT - II		
2.1	Introduction – general characteristics of aromatic compounds – Aromaticity and Huckel's rule.	3
2.2	Structure of benzene – Mechanism of aromatic electrophilic substitution.	3
2.3	Halogenation (Chlorination), nitration, Sulphonation and Friedel – Crafts reactions.	3
2.4	Mechanism of aromatic nucleophilic substitution: Unimolecular, bimolecular and benzyne mechanisms.	3
UNIT - III		
3.1	Aromatic hydrocarbons: Preparation, Properties and uses of toluene, xylene and Mesitylene.	4
3.2	Aromatic halogen compounds: Preparation, properties and uses of bromobenzene and benzyl bromide	4
3.3	Reactivity of aryl halides, distinction between nuclear and side chain halogenated derivatives.	4
UNIT - IV		
4.1	Aromatic nitro compounds: Preparation and properties of nitrotoluenes and nitrobenzene.	3
4.2	Aromatic amino compounds: Preparation by reduction of nitro compounds and from chlorobenzene – Effect of substituents on the basic character of aromatic amines	4
4.3	Comparison between aliphatic and aromatic amines. Preparation of sulphanilic acid, nitroanilines and phenylenediamines.	3
4.4	Preparation and synthetic applications of benzene diazonium chloride.	2
UNIT - V		
5.1	Aromatic aldehydes: Benzaldehyde – Mechanism of Cannizaro, Perkins, Claisen, Knoevenagel reaction and benzoin condensation - Preparation & Properties of Cinnamaldehyde & vanillin.	6
5.2	Phenols: Acidity of phenols – effect of substituents on the acidity of phenol, mechanism of Reimer-Tiemann, Gattermann, Fries and Kolbe's reactions.	6
Total		**60**

Course Designer

Name: Dr. S. Sivakumar

Assistant Professor of Chemistry

Course Code	Course Title	Category	Hours	Credits	Marks		
					CIAE	TEE	Total
26UBYGE21	**ALLIED BOTANY - II**	**Generic Elective - II**	**4**	**3**	**25**	**75**	**100**

Course Objectives		
To be familiar with basic concepts of Plant systematics, learn the importance of plant structure and reproductive patterns, and know about the physiological process of plant metabolism.		
UNIT	**Contents**	**No. of Hours**
I	**MORPHOLOGY OF FLOWERING PLANTS:** Plant and its parts. Structure and function of root and stem. Phyllotaxy. Inflorescence - Racemose, Cymose. Terminology with reference to flower description.	12
II	**TAXONOMY:** Study of the range of characters and plants of economic importance in The following families: Caesalpiniaceae, Asclepiadaceae, Euphorbiaceae and Poaceae.	12
III	**ANATOMY** Tissue and tissue systems: Simple and complex tissues. Anatomy of monocot and dicot roots - anatomy of monocot and dicot stems - Anatomy of dicot and monocot leaves.	12
IV	**EMBRYOLOGY** Structure of mature anther and ovule - Types of ovules, structure of embryo sac, pollination –double fertilization, structure of dicotyledonous and monocotyledonous seeds.	12
V	**PLANTPHYSIOLOGY** Photosynthesis- light reaction- Calvin cycle; respiration-Glycolysis-Krebs cycle-electron transport system. Growth hormones- auxins and cytokinins and their applications.	12
	Total	**60**

Course Outcomes		**Knowledge Level**
CO	**On completion of this course, students will**	
1	Understand the fundamental concepts of plant systematics	K1,K2,K3,K4
2	Identify and distinguish the different plants with its families	K1,K2,K3,K4
3	Analyze the types of cells and difference of its pattern in plants	K1,K2,K3,K4
4	Analyze and recognize the reproductive structures and methods in plants	K1,K2,K3,K4
5	Classify aerobic and anaerobic respiration and understand the importance of photosynthesis	K1,K2,K3,K4,

K1-Knowledge, K2-Understand, K3-Apply, K4- Analyze	
Text books	
1.	Sharma, O.P.2017. ***Plant Taxonomy.(II Edition).***The McGraw Hill Companies
2.	Bhojwani, S.S. Bhatnagar, S. Pand Dantu, P.K.2015. ***The Embryology of Angiosperms*** (6th revised and enlarged edition). Vikas Publishing House, New Delhi
3.	Maheshwari, P.1963. ***Recent Advances in Embryology of Angiosperms***. Intl. Soc. Plant Morphologists, New Delhi
4.	V.K.Jain, 2022. ***Fundamentals of Plant Physiology***, S. Chand Publishing
5.	Pandey B.P, ***Plant Anatomy***, S Chand publication, 2001.
Reference Books	
1.	Lawrence. G.H.M.1985. ***An Introduction to Plant Taxonomy***, Central Book Depot, Allahabad.
2.	Bhojwani, S. Sand Bhatnagar, S.P.2000.***The Embryology of Angiosperms*** (4th Revised and enlarged edition).Vikas Publishing House, New Delhi
3.	Pandey,B.P.2012. ***Plant Anatomy***. SChandPublishing
4.	Rajni Gupta. 2012. ***Plant Taxonomy***: Past, Present and Future. Vedams (P) Ltd. New Delhi.
5.	Jain, V.K. 2006. ***Fundamentals of Plant Physiology***, S. Chand and Company Ltd., New Delhi
6.	Verma, S.K.2006. ***A Text book of Plant Physiology***, S.K. Chand & Co., New Delhi

Mapping with Programme Outcomes:

CO /PO	PO1	PO2	PO3	PO4	PO5
CO1	3	3	1	3	3
CO2	3	3	1	3	3
CO3	3	3	2	3	3
CO4	3	3	2	3	3
CO5	3	3	2	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	1	3	3
CO2	3	3	1	3	3
CO3	3	3	2	3	3
CO4	3	3	2	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	Plant parts	1
1.2	Structure and functions of Root	1
1.3	Structure and functions of stem	1
1.4	Phyllotaxy	2
1.5	Types of Inflorescence- Racemose and Cymose	3
1.6	Technical terms to describe a flower	4
	UNIT – II	
2.1	Distinguishing characters and economic importance of Caesalpiniaceae	3
2.2	Distinguishing characters and economic importance of Euphorbiaceae	3
2.3	Distinguishing characters and economic importance of Asclepiadaceae	3
2.4	Distinguishing characters and economic importance of Poaceae	3
	UNIT – III	
3.1	Simple and Permanent tissues: Parenchyma, collenchyma, sclerenchyma.	2
3.2	Complex permanent tissues: Xylem and Phloem	4
3.3	Primary anatomical structure of dicot root and monocot root	2
3.4	Comparison of Primary anatomical structure of monocot stem with dicot stem	2
3.5	Primary anatomical structure of dicot and monocot leaf	2
	UNIT – IV	
4.1	Structure of anther and ovule	2
4.2	Types of ovule	2
4.3	Structure of embryo sac	2
4.4	Pollination and double Fertilization	2
4.5	Structure of dicotyledonous and monocotyledonous seeds	2
	UNIT – V	
5.1	Photosynthesis	4
5.2	Glycolysis	2
5.3	Krebs cycle	2
5.4	Growth hormones – Auxin, Cytokinin, applications	4
	Total	**60**

Course Designer
Name: Dr. A. Maajitha Begam
Assistant Professor of Botany

Course Code	Course Title	Category	Hours	Credits	Marks		
					CIAE	TEE	Total
26UZYGE21	**ANIMAL ORGANIZATION**	**Generic Elective-II**	**4**	**3**	**25**	**75**	**100**

Course Objectives		
Enable the students to acquire knowledge on general characteristics, classification and detailed study on various organs and organ systems of the invertebrate animal group.		
UNIT	**Contents**	**No. of Hours**
I	a. Principles of Taxonomy: Binomial nomenclature – Animal Organization –Body types – Protozoa – Metazoa – types of coelom – types of symmetry. b. Outline classification of Invertebrates and the salient features of the Phyla with examples. c. Outline classification of Chordates upto classes giving examples	12
II	a. Feeding and digestion in Amoeba and Frog. b. Respiration in Cockroach c. Gills in Fish and Lungs in bird.	12
III	a. Circulatory system, Earthworm and Calotes. b. Locomotion in Amoeba c. Flight mechanism in Pigeon.	12
IV	a. Nervous system of Earthworm b. Sensory Organs : Human Eye, Ear. c. Human Gustatory receptors	12
V	a. Excretion in Earthworm b. Excretion in Man-Structure of kidney and urine formation. c. Reproductive system of Rabbit.	12
	Total	**60**

Course Outcomes		**Knowledge Level**
CO	**On completion of this course, students will**	
1	Recall that provides basic understanding of principles of animal taxonomy.	K1
2	Explain invertebrate and chordates organ systems.	K1, K2
3	Illustrate the adaptations invertebrate and chordate animals.	K1, K2
4	Experiment with nerve co-ordination on different animals sensory organs.	K1, K2,K3,K4
5	Analyze and classify invertebrate and chordates excretion systems.	K1, K2, K3,K4
K1-Knowledge	**K2-Understand** **K3-Apply**	**K4-Analyze**

Textbooks	
1.	Jordan E. L and Verma P. S, Chordate Zoology, S.Chand& Co Ltd., New Delhi.2013.
2.	Jordan E. L and P. S Verma, Invertebrate Zoology, S. Chand & Co Ltd., New Delhi, 2013.
Reference Books	
1.	Jordan &Verma, Chordate Zoology, S. Chand & Co Ltd. 2011.
2.	Kotpal R.L, Invertebrates, Rastogi Publications. 2011.

Mapping with Programme Outcomes:

CO /PO	PO1	PO2	PO3	PO4	PO5
CO1	3	3	1	2	3
CO2	3	1	3	3	1
CO3	3	3	3	3	2
CO4	2	3	1	3	2
CO5	3	1	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	1	2	3
CO2	3	1	3	3	1
CO3	3	3	3	3	2
CO4	2	3	1	3	2
CO5	3	1	3	3	3

Strong-3 Medium-2 Low-1

COURSE CONTENTS AND LECTURE SCHEDULE

Module No.	Topic	No. of Lectures
	UNIT - I	
1.1	Principles of Taxonomy	2
1.2	Binomial nomenclature, Animal Organization.	2
1.3	Body types – Protozoa – Metazoa	2
1.4	Types of coelom – types of symmetry	2
1.5	Outline classification of Invertebrates and the salient features of the Phyla with examples	2
1.6	Outline classification of Chordates upto classes giving examples.	2
	UNIT - II	
2.1	Feeding in amoeba	2
2.2	Digestion in *Amoeba*	2
2.3	Feeding in frog	2
2.4	Respiration in cockroach	3
2.5	Gills in Fish and lungs in birds	3

UNIT - III		
3.1	Circulatory system in Earthworm	3
3.2	Circulatory system in Calotes	3
3.3	Circulatory system comparison	3
3.4	Flight mechanism in pigeon	3
UNIT - IV		
4.1	Nervous system of earth worm.	2
4.2	Sensory organs	2
4.3	Human Eye	2
4.4	Human Ear	2
4.5	Human brain	2
4.6	Human Gustatory receptors	2
UNIT - V		
5.1	Excretion of Earth worm	3
5.2	Excretion in man	2
5.3	Structure of kidney	2
5.4	Formation and process of urine	2
5.5	Reproductive system of rabbit.	3
Total		**60**

Course Designer
Name: Dr. M. Mohamed Meeran
Associate Professor of Zoology

Course Code	Course Title	Category	Hours	Credits	Marks		
					CIAE	TEE	Total
26UBYGE2P	**ALLIED BOTANY PRACTICAL**	**Generic Elective - II**	**2**	**2**	**40**	**60**	**100**

Course Objectives

To enhance information on the identification of each taxonomical group by developing the skill-based detection of the morphology and microstructure of plants and to be familiar with the basic concepts and principles of plant systematic.

UNIT	Contents	No. of Hours
I	Make suitable micro preparation of the types prescribed in Algae, Fungi, Bryophytes, Pteridophytes and Gymnosperms.	12
II	Microphotographs of the cell organelles ultra structure and Simple genetic problems.	12
III	To dissect a flower, construct floral diagram and write floral formula.	12
IV	Demonstration experiments 1.Ganong's Light screen 2.Ganong's respiroscope Spotters-Algae, Fungi, Bryophytes, Pteridophytes, Gymnosperms and Angiosperm an atomy, Embryology, Cell biology and Biotechnology	12
V	To make suitable micro preparations of anatomy materials in the syllabus	12
	Total	**60**

Course Outcomes		Knowledge Level
CO	**On completion of this course, students will**	
1	To study the internal organization of algae and fungi.	K1,K2,K3,K4
2	Develop critical understanding on morphology, anatomy and reproduction of Bryophytes, Pteridophytes and Gymnosperms.	K1,K2,K3,K4
3	To study the classical taxonomy with reference to different parameters.	K1,K2,K3,K4
4	Understand the fundamental concepts of plant anatomy and embryology	K1,K2,K3,K4
5	To study the effect of various physical factors on photosynthesis.	K1,K2,K3,K4

K1-Knowledge, K2-Understand, K3-Apply, K4- Analyze

Textbooks

1.	Sharma, O.P.2017. Bryophyta, MacMillan India Ltd, New Delhi.
2.	Sharma, O.P.2012. Pteridophyta, Tata McGraw- Hills Ltd, New Delhi
3.	Subramaniam, N.S.1996. ***Laboratory Manual of Plant Taxonomy***. Vikas Publishing House Pvt. Ltd., New Delhi.

4.	Benjamin, A. Pierce. 2012. ***Genetics- A conceptual Approach***. W. H. Freeman and Company, New York, England.
5.	Noggle G. R and G.J. Fritz. 2002. ***Introductory Plant Physiology***. Prentice Hall of India, New Delhi
Reference Books	
1.	Strick berger, M.W.2005. ***Genetics*** (III Ed).Prentice Hall, New Delhi, India.
2.	Nancy Serediak and M. Huynh. 2011. Algae identification lab Guide. Accompanying manual to algae identification field guide, Ottawa Agriculture and Agri food Canada publisher.
3.	Mohammed Gufran Khan, Shite Gatew and Bedilu Bekele. 2012. Practical manual for Bryophytes and Pteridophytes. Lambert Academic Publishing.
4.	Aler Gingauz. 2001. ***Medicinal Chemistry***. Oxford University Press & Wiley Publications
5.	Steward, F.C. 2012. Plant Physiology Academic Press, US

Mapping with Programme Outcomes:

CO /PO	PO1	PO2	PO3	PO4	PO5
CO1	3	3	1	3	3
CO2	3	3	3	3	3
CO3	2	3	2	3	3
CO4	3	2	2	2	3
CO5	3	3	2	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	1	3	3
CO2	3	3	3	3	3
CO3	2	2	2	2	3
CO4	3	3	2	3	2
CO5	3	3	2	3	3

Strong-3 Medium-2 Low-1

COURSE CONTENTS AND LAB SCHEDULE

Module No.	Topic	No. of Hours
UNIT - I		
1.1	Micro Preparation of Algae	3
1.2	Micro Preparation of Fungi	2
1.3	Micro Preparation of Bryophytes	2
1.4	Micro Preparation of Pteridophytes	2

1.5	Micro Preparation of Gymnosperms	3
UNIT - II		
2.1	Ultra structure of Chloroplast	3
2.2	Ultra structure of Mitochondria	3
2.3	Experiment of Mono hybrid cross	3
2.4	Experiment of Di hybrid cross	3
UNIT - III		
3.1	Description and Dissection of flowers belongs to Caesalpiniaceae family	3
3.2	Description and Dissection of flowers belongs to Asclepiadaceae family	3
3.3	Description and Dissection of flowers belongs to Euphorbiaceae family	3
3.4	Description and Dissection of flowers belongs to Poaceae family	3
UNIT - IV		
4.1	Demonstration of Ganong's Light screen Experiment	2
4.2	Demonstration of Ganong's respire scope Experiment	2
4.3	Spotters - Algae, Fungi, Bryophytes, Pteridophytes, Gymnosperms.	4
4.4	Spotters - Embryology	2
4.5	Spotters - Biotechnology	2
UNIT - V		
5.1	Micro preparations of Dicot and Monocot Roots	4
5.2	Micro preparations of Dicot and Monocot Stems	4
5.3	Micro preparations of Dicot and Monocot Leaves	4
Total		**60**

Course Designer
Name: Dr. A. Maajitha Begam
Assistant Professor of Botany

Course Code	Course Title	Category	Hours	Credits	Marks		
					CIAE	TEE	Total
26UZYGE2P	**ALLIED ZOOLOGY LAB**	**Generic Elective-II**	**2**	**2**	**40**	**60**	**100**

Course Objectives

To enable the students to acquire knowledge on general features, classification of Invertebrates and Vertebrates and to acquire knowledge on the structure and functions of various organs and organ systems.

UNIT	Contents	No. of Hours
I	Anatomical observation –Anatomical observation and Comment on the following systems using CDROM animal alternatives/Models/Charts/Bio Visual aids and Transparency.	12
II	Anatomical observation -Earthworm: Nerve ring and nerve cord- Body setae. Prawn: Cephalic appendages-Thoracic appendages-Abdominal appendages.	12
III	Invertebrate Spotters - Protozoans: Amoeba Proteus –Paramecium caudatum - Euglenaviridis and Plasmodium vivax. Porifera: Simple sponge-Sponge Gemmule -Sponge Spicules. Coelenterata: Hydra-Obelia–colony, Obelia–Medusa-Jellyfish and seaanemone. Platyhelminthes: Tapeworm,Liverfluke,Redia and Cercaria. Nematodes:Ascaris and Wuchereria.	12
IV	Invertebrate Spotters - Annelids: Earthworm and Leech. Arthropods: Honeybee–Queen, Drone and workers, Silkworm–Moth, Larva and cocoon. Paddy pest: Tryphoryza and Leptocorisa, Coconutpest – Oryctes rhinoceros and Nephantis. Molluscans:Pila and Pearloyster. Echinodermata: Starfish–oralandaboralview.	12
V	Chordata - Amphioxus-Balanoglossus-SeaAscidians-Anyfiveediblefishes-Cobra-Kriat-ViperDryophis- Osteology:Rabbitskull-Atlas-Pectoral&Pelvicgirdles-Fore&Hindlimbs.	12
	Total	**60**

Course Outcomes		Knowledge Level
CO	**On completion of this course, students will**	
1	Acquire knowledge on structural organization and Skeletal system in Invertebrates and Chordates.	K1, K2,K3
2	Identify and classify Protozoa, Porifera and Coelenterata.	K1, K2
3	Assess the importance of phylum Arthropoda -Mollusca And Echinoderms.	K1, K2

4	Knowledge on morphological and anatomical features of edible fishes.	K1, K2,K3,K4
5	Studies on Architecture of skull, Girdles and Vertebrae in Chordates.	K1, K2,K3,K4
K1- K1-Knowledge K2-Understand K3-Apply K4-Analyze		
Textbooks		
1.	***A Textbook of Practical Zoology***- Invertebrate-S.S.Lal, Rastogi Publications.	
2.	***A Text Book of Vertebrate Practical Zoology***- V.Banerjee, Bharati Bhavan Publishers	
Reference Books		
1.	***Practical Zoology*** B.D.Sharma, Jai Prakash Nath & Co.,Meerut	

Mapping with Programme Outcomes:

CO /PO	PO1	PO2	PO3	PO4	PO5
CO1	3	3	1	3	3
CO2	3	3	1	3	3
CO3	3	3	2	3	3
CO4	3	3	2	3	3
CO5	3	3	2	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	1	3	3
CO2	3	3	1	3	3
CO3	3	3	2	3	3
CO4	3	3	2	3	3
CO5	3	3	2	3	3

Strong-3 Medium-2 Low-1

COURSE CONTENTS AND LAB SCHEDULE

Module No.	Topic	No. of Hours
UNIT - I		
1.1	**Anatomical observation –** Earthworm: Nerve ring and nerve cord- Body setae.	4
1.2	Prawn: Cephalic appendages-Thoracic appendages-	4
1.3	Abdominal appendages	4
UNIT - II		
2.1	Honeybee: Mouthparts and sting.	4
2.2	Frog: Arterial system	4
2.3	Frog:Venous system and Brain.	4
UNIT - III		

3.1	Protozoans: Amoeba Proteus –Paramecium caudatum-EuglenaviridisandPlasmodiumvivax.Porifera:Simplesponge-SpongeGemmule-SpongeSpicules..	4
3.2	Coelenterata: Hydra-Obelia–colony,Obelia–Medusa-Jellyfishandsea anemone	4
3.3	Platyhelminthes: Tapeworm,Liverfluke, Redia and Cercaria. Nematodes: Ascaris and Wuchereria	4
UNIT - IV		
4.1	Annelids: Earthworm and Leech. Arthropods: Honeybee–Queen, Drone and workers, Silkworm –Moth,Larva andcocoon,	4
4.2	Paddy pest: Tryphoryza and Leptocorisa, Coconutpest–Oryctes rhinoceros and Nephantis.	4
4.3	Molluscans: Pila and Pearloyster. Echinodermata: Starfish–Oral and Aboralview.	4
UNIT - V		
5.1	Chordata - Amphioxus-Balanoglossus-Sea Ascidians-Any five ediblefishes-.	4
5.2	Cobra-Kriat-Viper-Dryophis.	4
5.3	Osteology: Rabbitskull-Atlas-Pectoral &Pelvicgirdles-Fore&Hindlimbs	4
Total		**60**

Course Designer
Name: Dr. M. Mohamed Meeran
Associate Professor of Zoology