HAJEE KARUTHA ROWTHER HOWDIA COLLEGE

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

Uthamapalayam, Theni District. Pin Code: 625 533.

DEPARTMENT OF ZOOLOGY

BACHELOR OF SCIENCE – ZOOLOGY

SYLLABUS

Choice Based Credit System – CBCS

(As per TANSCHE/MKU Guidelines)

with

Outcome Based Education (OBE)

(Academic Year 2020 -2021 onwards)

HAJEE KARUTHA ROWTHER HOWDIA COLLEGE

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

Uthamapalayam, Theni District. Pin Code: 625 533.

Name of the Programme: B.Sc. Zoology

Choice Based Credit System (CBCS)
(As per TANSCHE/MKU Guidelines)

with
Outcome Based Education (OBE)

(with effect from the Academic Year 2020 – 2021)

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.

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	Keen sense of civility, professional ethics, receptivity and moral righteousness
PEO5	Commitment to address social and environmental threats and to act as responsible service-minded, duty-bound global citizens

Department Vision and Mission

Vision

We aim to attain excellence through high-quality education and research pertaining to local, regional and national requirements, and through collaboration with various researchers and educators across Tamil Nadu and India We look forward to indoctrinate the highest morals of life, respect for Mother Nature and concern for ethical values among students for establishing the sustainable environment.

Mission

- To instigate an awareness of the need to explore, identify and conserve biodiversity. To create an attractive and enthusiastic department where students want to come and study.
- To train students in zoological sciences and to equip them to apply themselves in activities requiring zoological expertise (Certificate course). Ultimately, our mission is to make our students self-employable.
- Our Undergraduate level training aims to provide a clear understanding of the wholeanimal Kingdom, its systematics, development, physiology, evolution and conservation. At undergraduate level, we strive to maintain a high level of scientific excellence in achieving hands on experience on various techniques.
- To involve the department in community-based and outreach activities, whenever and wherever possible affordable quality education to weaker part of the society
- To elevate the post graduate department of Zoology as the class academic and research centre of Madurai Kamaraj University.

Programme Outcomes (PO)

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

PO1	Students gain knowledge and skill in the fundamentals of animal sciences in zoology and that of plant sciences in botany, also understands the complex interactions among various living organisms.
PO2	Analyse complex interactions among the various animals of different phyla, their distribution and their relationship with the environment
PO3	Apply the knowledge of internal structure of cell, its functions in control of various metabolic functions of organisms & complex evolutionary processes and behaviour of animals
PO4	Correlates the environmental conservation processes of Plants & physiological processes of animals organ systems.
PO5	Gain knowledge of Agro based Small Scale industries like sericulture, fish farming, butterfly farming, Agro forestry practises and vermicompost preparation.

Programme Specific Outcomes (PSO)

A graduate of B.Sc. Zoology after three years will

PSO1	Identify the major groups of organisms with an emphasis on animals and be able to classify them within a phylogenetic framework. Students will be able to compare and contrast the characteristics of animals that differentiate them from other forms of life.
PSO2	Understand the basic concepts in cell and its components which are used to generate and utilize energy besides the development of various animals.
PSO3	Competence in distinguishing the anatomy of various animals and understand the physiological process.
PSO4	Explicate the ecological interconnectedness of life on earth by tracing energy and nutrient flows through the environment.
PSO5	Ability to apply fundamental statistical tools and physical principles(chemistry) to the analysis of relevant biological situations.

Programme Scheme

Eligibility

A pass in +2 examination conducted by the Board of Higher Secondary Education, Government of Tamil Nadu with Mathematics as one of the subject OR any other examination accepted by the Syndicate as equivalent.

For Programme Completion

A Candidate shall complete:

- Part I - Language papers – Tamil/Arabic/Malayalam in semesters I, II, III and IV respectively
- Part II - Language papers - English in semesters I, II, III, IV respectively
- Part III - Core papers in semesters I, II, III, IV, V and VI respectively
- Part III - Allied papers in semesters I, II, III, and IV respectively
- Part III - Elective papers in semesters V and VI respectively
- Part IV - Non- Major Elective papers in semesters I and II respectively
- Part IV - Skill based Subject papers in semesters III, IV, V and VI respectively
- Part IV - Value Education paper in semester I
- Part IV - Environmental Studies paper in semester II
- 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 (10 X 1 = 10 Marks)
Answer ALL questions.

- Questions 1 - 10
- Two questions from each unit
- Multiple choice questions and each question carries Four choices

Section – B (5 X 7 = 35 Marks)
Answer ALL questions choosing either A or B.

- Questions 11 - 15
- Two questions from each unit (either…. or…. type)
- Descriptive Type

Section – C (3 X 10 = 30 Marks)
Answer any THREE out of five questions.

- Questions 16 - 20
- One question from each unit
- Descriptive Type

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)
- Descriptive Type

Section – B (3 X 15 = 45 Marks)
Answer any THREE out of five questions.

- Questions 6 – 10
- One question from each unit
- Descriptive Type

Part V (Extension 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

Total – 100 marks

Passing minimum is **40%**

Weightage

Weightage for Bloom's Taxonomy	Percentage	Marks	
		CIAE	TEE
Knowledge (Remembering) – K1	40	10	30
Understanding – K2	40	10	30
Applying – K3	20	5	15
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	Total
Knowledge(K1)	2 (2)	1 (a or b) (3)	1 (5)	**25 marks**
Understanding(K2)	2 (2)	1 (a or b) (3)	1 (5)	
Apply(K3)	**Assignment (5)**			

Distribution of questions and marks for Term End Examinations

Bloom's Taxonomy	Section A	Section B	Section C	Total
Knowledge(K1)	2 (2)	4 (a or b) (28)	-------	**Total 75 Marks**
Understanding(K2)	3 (3)	1 (a or b) (7)	2 out of 3 (20)	
Apply(K3)	5 (5)	-------	1 out of 2 (10)	

Note: Figures in parenthesis are Marks

Credits Distribution

Part	Course Category	Courses	Credits	Total Marks
I	Tamil/ Arabic/ Malayalam	4	12	400
II	English	4	12	400
III	Core, Elective & Allied	25	98	2500
IV	Non- Major Elective	2	4	200
	Skill based Subject	4	8	400
	Value Education	1	2	100
	Environmental Studies	1	2	100
V	Extension Activities	1	2	100
		42	**140**	**4200**

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	20UTAL11/ 20UARL11/ 20UMLL11	Tamil / Arabic / Malayalam	6	25	75	100	3
Part - II							
English - I	20UENL11	English for Enrichment - I	6	25	75	100	3
Part – III (OBE)							
Core – I	20UZYC11	Invertebrata	5	25	75	100	5
Core – III	20UZYC2P	Invertebrata & Chordata	3	-	-	-	-
Allied – I	20UCHA11	Organic, inorganic & Physical Chemistry - I	4	25	75	100	3
Allied – III	20UCHA2P	Volumetric Analysis	2	-	-	-	-
Part - IV							
NME – I	20UZYN11	Lifestyle Related Ailments	2	25	75	100	2
VED	20UVED11	Value Education	2	25	75	100	2
		Total	**30**			**600**	**18**
Semester – II							
Part - I							
Language - II	20UTAL21/ 20UARL21/ 20UMLL21	Tamil / Arabic / Malayalam	6	25	75	100	3
Part - II							
English - II	20UENL21	English for Enrichment - II	6	25	75	100	3
Part – III (OBE)							
Core – II	20UZYC21	Chordata	5	25	75	100	5
Core – III	20UZYC2P	Invertebrata & Chordata	3	40	60	100	3
Allied – II	20UCHA21	Organic, inorganic & Physical Chemistry - II	4	25	75	100	3
Allied – III	20UCHA2P	Volumetric Analysis	2	40	60	100	2
Part - IV							
NME – II	20UZYN21	Ornamental Fish Culture	2	25	75	100	2
EVS	20UEVS21	Environmental Studies	2	25	75	100	2
		Total	**30**			**800**	**23**

Course Category	Course Code	Course Title	Hrs	CIAE	TEE	Max. Marks	Credits
Semester - III							
Part - I							
Language- III	20UTAL31/ 20UARL31/ 20UMLL31	Tamil / Arabic / Malayalam	6	25	75	100	3
Part - II							
English - III	20UENL31	English for Enlightenment – I	6	25	75	100	3
Part – III (OBE)							
Core – IV	2OUZYC31	Cell Biology	5	25	75	100	4
Core – V	20UZYC32	Molecular Biology	4	25	75	100	4
Core – VIII	20UZYC4P	Cell Biology, Molecular Biology, Embryology & Microbiology	3	-	-	-	-
Allied - IV	20UBYA11	Thallophyta, Bryophyta, Pteridophyta, Gymnospermae, Physiology & Plant ecology	4	25	75	100	3
Allied - VI	20UBYA2P	Allied Practical – II Botany	2	-	-	-	-
		Total	**30**			**500**	**17**
Semester – IV							
Part - I							
Language - IV	20UTAL41/ 20UARL41/ 20UMLL41	Tamil / Arabic / Malayalam	6	25	75	100	3
Part - II							
English - IV	20UENL41	English for Enlightenment - II	6	25	75	100	3
Part – III (OBE)							
Core – VI	20UZYC41	Embryology	5	25	75	100	4
Core - VII	20UZYC42	Microbiology	4	25	75	100	4
Core - VIII	20UZYC4P	Cell Biology, Molecular Biology, Embryology & Microbiology	3	40	60	100	4
Allied - V	20UPHA21	Taxonomy of Angiosperms, Cell biology, Anatomy & embryology of angiosperms & Biotechnology	4	25	75	100	3
Allied - VI	20UBYA2P	Allied Practical – II Botany	2	40	60	100	2
Part - V							
EA		Extension Activities**	--	100	--	100	2
		Total	**30**			**800**	**25**

Part – V
Extension Activities**

S. No.	Course Code	Course Title	Max. Marks	Credits
1.	20UNCC41	National Cadet Corps (Army)	100	2
2.	20UNCC42	National Cadet Corps (Navy)	100	2
3.	20UNSS41	National Service Scheme	100	2
4.	20UPED41	Physical Education	100	2
5.	20UYRC41	Youth Red Cross	100	2
6.	20URRC41	Red Ribbon Club	100	2
7.	20UHRC41	Human Rights Club	100	2
8.	20UCOC41	Consumer Club	100	2
9.	20UYOC41	Yoga Club	100	2
10.	20UHFC41	Health and Fitness Club	100	2
11.	20UECC41	Eco Club	100	2
12.	20ULIC41	Library & Information Science Club	100	2
13.	20USCC41	Science Communication Club	100	2
14.	20UFAC41	Fine Arts Club	100	2

Course Category	Course Code	Course Title	Hrs	CIAE	TEE	Max. Marks	Credits
Semester - V							
Part – III (OBE)							
Core - IX	20UZYC51	Ecology	4	25	75	100	4
Core - X	20UZYC52	Evolution	5	25	75	100	5
Core – XI	20UZYC53	Genetics & Biostatistics	5	25	75	100	5
Core – XV	20UZYC6P	Biochemistry & Ecology	3	-	-	-	-
Core – XVI	20UZYC6Q	Genetics, Biostatistics, Immunology and Aquaculture	2	-	-	-	-
Core – XVII	20UZYC6R	Physiology, Biotechnology & Evolution.	2	-	-	-	-
Elective - I	20UZYE51	Vermitechnology	5	25	75	100	3
	20UZYE52	Ayush					
	20UZYE53	Aquaculture					
Part - IV							
SBS - I	20UZYS51	Immunology	2	25	75	100	2
SBS – II	20UZYS52	Zoology for Competitive Examinations Paper – I (Objective Type Questions)	2	25	75	100	2
		Total	**30**			**600**	**21**
Semester - VI							
Part – III (OBE)							
Core –XII	20UZYC61	Biotechnology	5	25	75	100	5
Core – XIII	20UZYC62	Animal Physiology	5	25	75	100	5
Core - XIV	20UZYC63	Economic Entomology & Sericulture Technology	4	25	75	100	4
Core – XV	20UZYC6P	Biochemistry & Ecology Practical	3	40	60	100	5
Core - XVI	20UZYC6Q	Genetics, Biostatistics, Immunology & Aquaculture	3	40	60	100	5
Core – XVII	20UZYC6R	Physiology, Biotechnology & Evolution	3	40	60	100	5
Elective - II	20UZYE61	Computer Application & Information Technology	3	25	75	100	3
	20UZYE62	Commercial Zoology					
	20UZYE63	Biochemistry					
Part - IV							
SBS – III	20UZYS61	Poultry Science	2	25	75	100	2
SBS - IV	20UZYS62	Zoology for Competitive Examinations Paper – II (Objective Type Questions)	2	25	75	100	2
		Total	**30**			**900**	**36**
		Grand Total	**180**			**4200**	**140**

Course Code	Course Title	Category	Total Hours	Credits
20UZYC11	Invertebrata	Core – I	75	5

Nature of Course	
Knowledge Oriented	✓
Skill Oriented	✓
Employability Oriented	
Entrepreneurship Oriented	

Course Relevance	
Local	
Regional	
National	
Global	✓

Preamble

Enable the students to acquire knowledge on general characteristics, classification and detailed study on various organs and organ systems of the invertebrate animal group.

Course Outcomes (CO)

On the successful completion of the course the students will be able to

No.	Course Outcome	Knowledge Level
CO1	Relate general characteristic features, morphology and classification of Invertebrates (Protozoa –Echinoderms)	**K1**
CO2	Explain the lifecycle and adaptation of Protozoan and Porifera	**K1, K2**
CO3	Outline the lifecycle and adaptation of Coelenterates and Helminthes	**K1, K2**
CO4	Illustrate the lifecycle and adaptation of Annelida & Arthropoda	**K1, K2**
CO5	Identify the lifecycle and adaptation of Mollusca & Echinodermata	**K1, K2, K3**

K1-Knowledge K2-Understand K3-Apply

Mapping of CO with 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**

1-Low 2-Medium 3-Strong

Mapping of CO with 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**

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

Syllabus

UNIT I 15 Hours

Taxonomy: Definition- Principles of classification - Symmetry and Coelom -Units of classification - Binomial nomenclature, Outline classification of Animal kingdom up to class level with example. Flow chart only.

UNIT II 15 Hours

Protozoa: General characters up to class level; *Paramecium* – (Type study) General organization, Cyclosis, Contractile vacuole and conjugation only. Structure, pathology, prevention and control measures of *Plasmodium vivax* and *Entamoeba histolytica.*

Porifera: General characters up to class level-*Olynthus* – (Type study) General organization, histology, Spicules, Reproduction and Development only. Canal system in sponges.

UNIT III 15 Hours

Coelenterata: General characters up to class level *Obelia* – (Type study) Structure of *Obelia* colony, Medusa & Nemeatocyst, Reproduction and development (Metagenesis) Polymorphism in Coelenterata.

Helminthes: General characters up to class level *Fasciola hepatica* (Liver Fluke) - Type study. External characters, Digestive system, Excretion, Reproduction and Development (Life cycle) Structure, pathology, prevention and control measures of *Ascaris* and *Wucheraria.*

UNIT IV 15 Hours

Annelida: General characters up to class level-Earth worm – Type study-External morphology, Setae, Nephridia, Nervous system and Reproductive system only. Metamerism in Annelids.

Arthropoda: General characters up to class level-Cockroach- Morphology, Mouthparts, Digestive system, Nervous system, Reproductive system & Life cycle. Affinities of Peripatus.

UNIT V 15 Hours

Mollusca: General characters up to class level- *Pila globosa* – Type study- External morphology, Digestive system, Respiratory system, Osphridium only-Cephalopods as advanced molluscs.

Echinodermata: General characters up to class level-Star fish. Type study- External Morphology, Pedicellaria, Water vascular system only-Larval forms of Echinoderms.

Text Books

Jordan, E.I. and Verma, P.S. – ***Invertebrate Zoology***, Chand & Co Limited, New Delhi. 2014.

Reference Books

Barnes, R.D. ***Invertebrate Zoology***, Holf Saunders International edition, 4th edition 2006.

Ekambaranatha Ayyar and Ananthakrishnan, T.N**.** ***A manual of Zoology, volume I, Invertebrate*****,** Viswanathan (Printers and Publishers) Pvt. Ltd., Chennai. 2005.

Kotpal, R.L. ***Modern Text Book of Zoology, Invertebrates (Animal diversity – I),*** Rastogi Publications, Meerut, 2012.

Pechenik, Jan A, ***Biology of the Invertebrates***, Tata Mcgraw – Hill Pub. Company Ltd., New Delhi, 2014

Vasantika Kashyap, ***Life of Invertebrates*****,** Second Revised Edition, Vikas Pub. House Pvt. Ltd., New Delhi.2013

Pedagogy

Chalk & Talk & E-Resources

Teaching aids

Black Board, LCD Projector

Course Contents and Lecture Schedule

Module No.	Topic	No. of Lectures	Content Delivery Methods
UNIT - I			
1.1	Taxonomy –Definition	2	Chalk & Talk
1.2	Principles of classification up to class level	3	Chalk & Talk
1.3	Symmetry and coelom	2	Chalk & Talk
1.4	Units of classification	2	Chalk & Talk

1.5	Binomial nomenclature	2	Chalk & Talk
1.6	Outline classification of animal kingdom-flow charts	4	Chalk & Talk
UNIT - II			
2.1	General characters of Protozoa up to class level	1	PPT
2.2	Paramecium- General organization-cyclosis, contractile vacuole, conjugation	3	Chalk & Talk
2.3	Structure, Pathology, Prevention control of *Plasmodium vivax*	3	PPT
2.4	Structure, Pathology, Prevention & control of *Entamoeba histolytica*	2	Chalk & Talk
2.5	General characters of Porifera up to class level	2	Chalk & Talk
2.6	Olynthus-general organization-histology-spicules-reproduction and development.	2	Chalk & Talk
2.7	Canal system in sponges	2	Chalk & Talk,
UNIT - III			
3.1	General characters of the phylum Coelenterate up to class level	3	PPT
3.2	Type study of Obelia	2	PPT
3.3	Polymorphism in hydrozoa	2	PPT
3.4	General characters of the phylum helminthes up to class level	2	PPT
3.5	Type study- *Fasciola hepatica*	3	PPT
3.6	Structure, Pathology, Prevention & control of *Ascaris* & *Wuchereria*	3	Chalk & Talk
UNIT - IV			
4.1	General characters of the Annelida up to class level	3	Chalk & Talk
4.2	Type study of Earth worm	3	Chalk & Talk
4.3	Metamerism	3	Chalk & Talk
4.4	General characters of the Arthropoda upto class level	2	Chalk & Talk
4.5	Type study of cockroach	2	Chalk & Talk
4.6	Peripatus	2	Chalk & Talk

UNIT - V			
5.1	General characters of the phylum Mollusca up to class level	3	Chalk & Talk
5.2	Type study of Pila globosa	2	Chalk & Talk
5.3	Cephalopods as an advanced mollusks	2	Chalk & Talk
5.4	General characters of the phylum Echinodermata up to class level	3	Chalk & Talk
5.5	Type study of Star fish	2	Chalk & Talk Specimens
5.6	Water vascular system and larval forms of echinoderms	3	Chalk & Talk Specimens
	Total	**75**	

Course Designer
Dr. K. Arifa Banu
Assistant Professor of Zoology

Course Code	Course Title	Category	Total Hours	Credits
20UCHA11	Organic, Inorganic and Physical Chemistry - I	Allied-I	60	3

Nature of Course	
Knowledge Oriented	✓
Skill Oriented	
Employability Oriented	✓
Entrepreneurship Oriented	

Course Relevance	
Local	
Regional	
National	
Global	✓

Preamble

To recognize the properties of hydrogen, oxides, water, colloids carbohydrates, stereoisomerism, amino acids, proteins and dyes.

Course Outcomes (CO)

On the successful completion of the course the students will be able to

No.	Course Outcome	Knowledge Level
CO1	List the preparation and properties of hydrides, oxides, hardness of water and its implications.	K1
CO2	Classify the colloidal states of matter and its applications	K1, K2
CO3	Demonstrate the reactions of glucose, fructose and sucrose and relate their uses	K1, K2
CO4	Explain the concept of enantiomers, diastereoisomers and geometrical isomers	K1, K2
CO5	Identify the properties, classification and functions of proteins and dyes	K1, K2, K3

K1-Knowledge K2-Understand K3-Apply

Mapping of CO with PO

	PO1	PO2	PO3	PO4	PO5
CO1	3	2	2	3	2
CO2	3	3	2	2	2
CO3	3	2	2	3	2
CO4	3	2	2	3	2
CO5	3	3	2	2	2

1-Low 2-Medium 3-Strong

Mapping of CO with PSO

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

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

Syllabus

UNIT I 12 Hours

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 – estimation by EDTA method (outline only) - Units of hardness of water.

UNIT II 12 Hours

Colloids: Colloidal states of matter – various types – classification - Sols – 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.

UNIT III 12 Hours

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 – distinction between sucrose, glucose and fructose - Polysaccharides: Starch and cellulose (Structure only) – cellulose derivatives.

UNIT IV 12 Hours

Stereoisomerism – chiral center – optical activity of compounds containing one or two chiral centers (lactic and tartaric acid) – R-S notation – enantiomers – diastereoisomers – racemization – resolution - Geometrical isomerism of maleic and fumaric acids - E-Z notation of geometrical isomers.

UNIT V 12 Hours

Amino acids and proteins: Classification – 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.

Reference Book

B. S. Bahl & Arun Bahl, ***Advanced Organic Chemistry***, S. Chand & Company, New Delhi, 2009.

B.R. Puri and L.R. Sharma and Madan S. Pathania, ***Principles of Physical Chemistry***, Vishal Publishing Co., Jalandhar, 2005.

R.D. Madan, ***Modern Inorganic Chemistry***, S. Chand, 2013, revised edition,

Pedagogy

Chalk & Talk, E-Resources, Group Discussion

Teaching aids

Black Board, LCD Projector

Course Contents and Lecture Schedule

Module No.	Topic	No. of Lectures	Content Delivery Methods
	UNIT - I		
1.1	Isotopes of hydrogen – preparation, properties and uses of heavy hydrogen	2	Chalk & Talk
1.2	Hydrides – definition – classification – examples	2	E-Resources
1.3	Oxides – Definition – classification – examples	2	E-Resources
1.4	Hardness of water – types of hardness	2	Chalk & Talk
1.5	Removal of hardness - industrial implications of hardness in water	2	E-Resources
1.6	Estimation by EDTA method - Units of hardness of water.	2	E-Resources

UNIT - II			
2.1	Colloidal states of matter – various types – classification	2	E-Resources
2.2	Sols – dialysis – electro osmosis – electrophoresis	2	Chalk & Talk
2.3	Stability of colloids – protective action – Hardy Schulze law – gold number	2	E-Resources
2.4	Types of emulsions – emulsifier with examples	3	E-Resources
2.5	Classification, preparation - Applications of colloids	3	E-Resources
UNIT - III			
3.1	Carbohydrates: Definition – classification – monosaccharides – properties and uses of glucose and fructose	4	E-Resources
3.2	Haworth structure of glucose mutarotation	2	E-Resources
3.3	Conversion of glucose to fructose and vice versa,	2	Chalk & Talk
3.4	Sucrose – structure – distinction between sucrose, glucose and fructose	2	E-Resources
3.5	Starch and cellulose – cellulose derivatives	2	Chalk & Talk
UNIT - IV			
4.1	Stereoisomerism – chiral center – optical activity of compounds containing one or two chiral centers (lactic and tartaric acid)	4	E-Resources
4.2	R-S notation – enantiomers – diastereoisomers – racemization – resolution	4	Chalk & Talk
4.3	Geometrical isomerism of maleic and fumaric acids	2	Chalk & Talk
4.4	E-Z notation of geometrical isomers	2	E-Resources

UNIT - V			
5.1	Amino acids and proteins: Classification – synthesis	2	E-Resources
5.2	Properties of amino acids – action of heat, dipolar ion, iso-electric point, and Ruhemann's purple	3	Chalk & Talk
5.3	Polypeptides – proteins – classification and biological functions	2	E-Resources
5.4	Dyes: Definition – theory of colour and constitution – classification based on structure and applications	2	E-Resources
5.5	Preparation of methyl orange – Bismark brown, malachite green – vat dye – indigo	3	Chalk & Talk
	Total	**60**	

Course Designer
Dr. S. Sivakumar
Assistant Professor of Chemistry

Course Code	Course Title	Category	Total Hours	Credits
20UZYC21	Chordata	Core–II	75	5

Nature of Course	
Knowledge Oriented	✓
Skill Oriented	✓
Employability Oriented	
Entrepreneurship Oriented	

Course Relevance	
Local	
Regional	
National	
Global	✓

Preamble

To enable the students acquire knowledge on general features, classification and evolution of chordates and study of organs and organ systems to understand their functional aspects

Course Outcomes (CO)

On the successful completion of the course the students will be able to

No.	Course Outcome	Knowledge Level
CO1	Learn the general characteristics, classification with common examples of chordates, Prochordates specialized characters and peculiar development	**K1, K2**
CO2	Understand the comparative external features of various vertebrates	**K1, K2**
CO3	Knowledge on morphological and anatomical features of vertebrates	**K1, K2, K3**
CO4	Acquire knowledge on organs of communicative and sensory systems of vertebrates	**K1, K2, K3**
CO5	Understand the structural organization of skeletal system in vertebrates	**K1, K2, K3**

K1-Knowledge K2-Understand K3-Apply

Mapping of CO with PO

	PO1	PO2	PO3	PO4	PO5
CO1	**3**	**1**	**2**	**3**	**1**
CO2	**2**	**2**	**1**	**3**	**1**
CO3	**3**	**1**	**2**	**1**	**1**
CO4	**2**	**3**	**1**	**2**	**1**
CO5	**3**	**2**	**1**	**2**	**2**

1-Low 2-Medium 3-Strong

Mapping of CO with PSO

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	**3**	**1**	**2**	**3**	**1**
CO2	**2**	**2**	**1**	**3**	**1**
CO3	**3**	**1**	**2**	**1**	**1**
CO4	**2**	**3**	**1**	**2**	**1**
CO5	**3**	**2**	**1**	**2**	**2**

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

Syllabus

UNIT I 15 Hours

Prochordates: Chordate characteristics, Outline classification up to class level with examples. Type study: *Amphioxus* External morphology, feeding and digestion. General topics: Retrogressive metamorphosis in *Ascidian*, Affinities of *Balanoglossus*.

UNIT II 15 Hours

Pisces & Amphibia: Classification of Fishes & Amphibians upto class level with examples. Type study: Shark - External morphology, feeding and digestion. Type study: Frog - External morphology. General topics: Migration of Fishes- Parental care in Amphibia

UNIT III 15 Hours

Reptiles: Classification of Reptiles upto class level with examples. **Type study:** Calotes- External morphology, Circulatory system only. **General topics:** Poisonous and non-poisonous snakes – Identification and Biting mechanism. Origin -dominance and decline of Mesozoic reptiles-Temporal Fossae & Arcades

UNIT IV 15 Hours

Aves: Classification of Aves upto orders level with examples. **Type study: Pigeon –** External morphology, Respiratory system, Pectoral and Pelvic girdles only. **General topics:** Flight adaptations in birds- Archraeopteryx and its Evolutionary importance

UNIT V 15 Hours

Mammals: Classification of Mammals upto orders level with examples. **Type study: Rabbit -** . External morphology, Digestive system, Nervous system and Urinogenital system only. **General topics:** Dentition in mammals-Adaptation of aquatic mammals.

Text Books

Ekambaranatha Ayyar, M. and Ananthakrishnan, T.N. ***A Manual of Zoology Part II (Chordata)*** S. Viswanathan (Printers and Publishers) Pvt. Ltd., Chennai. 2013.

Reference Books

Gupta R.C and Girish Chopra, ***Comparative Anatomy of Chordates*** – R.Chand& Co, New Delhi.2003.

Harvey Pough F., Heifer, J.B. and McFarland, W.N. ***Vertebrate life*****,** Macmillan Pub. Co. New York.1985.

Jordan E.L, ***Chordate zoology*** – S. Chand & Co, Chennai. 2013.

Kotpal, R.L. ***Modern Text Book of Zoology Vertebrates***, Second Edition, Rastogi Publications, Meerut. 2014.

Pedagogy

Chalk & Talk & E-Resources

Teaching aids

Black Board, LCD Projector & Bio-Visual charts

Course Contents and Lecture Schedule

Module No.	Topic	No. of Lectures	Content Delivery Methods
UNIT - I			
1.1	Chordata characteristics, Outline classification upto class level with examples.	3	Chalk & Talk
1.2	**Type study:** *Amphioxus* - External morphology,	3	Chalk & Talk
1.3	Feeding and digestion.	3	Chalk & Talk
1.4	**General topics:** Retrogressive metamorphosis in *Ascidian*,	3	Chalk & Talk
1.5	Affinities of *Balanoglossus*.	3	Chalk & Talk
UNIT - II			
2.1	Classification of Fishes & Amphibians upto class level with examples.	3	Chalk & Talk
2.2	**Type study:** Shark - External morphology,	3	PPT
2.3	Feeding and digestion.	3	Chalk & Talk
2.4	**Type study:** Frog - External morphology.	3	Chalk & Talk

2.5	**General topics:** Migration of Fishes- Parental care in Amphibia.	3	Chalk & Talk
UNIT - III			
3.1	Classification of Reptiles upto class level with examples	3	Chalk & Talk
3.2	Type study: Calotes- External morphology,	3	Chalk & Talk
3.3	Circulatory system only.	3	Chalk & Talk
3.4	General topics: Poisonous and non-poisonous snakes, Identification and Biting mechanism.	3	Chalk & Talk
3.5	Origin -dominance and decline of Mesozoic reptiles-Temporal Fossae & Arcades	3	Chalk & Talk
UNIT - IV			
4.1	Classification of Aves upto orders level with examples.	3	Chalk & Talk
4.2	Type study: Pigeon – External morphology,	2	Chalk & Talk
4.3	Respiratory system,	2	Chalk & Talk
4.4	Pectoral and Pelvic girdles only.	3	PPT
4.5	General topics: Flight adaptations in birds	3	Chalk & Talk
4.6	Archraeopteryx and its Evolutionary importance.	2	Chalk & Talk
UNIT - V			
5.1	Classification of Mammals up to orders level with examples.	2	Chalk & Talk
5.2	**Type study: Rabbit -** External morphology,	3	Chalk & Talk
5.3	Digestive system,	2	Chalk & Talk
5.4	Nervous system	2	Chalk & Talk
5.5	Urinogenital system only	2	Chalk & Talk
5.6	**General topics:** Dentition in mammals	2	Chalk & Talk
5.7	Adaptation of aquatic mammals.	2	Chalk & Talk
	Total	**75**	

Course Designer
Dr. K. Arifa Banu
Assistant Professor of Zoology

Course Code	Course Title	Category	Total Hours	Credits
20UZYC2P	Invertebrata & Chordata	Core–III	90	3

Nature of Course	
Knowledge Oriented	✓
Skill Oriented	
Employability Oriented	
Entrepreneurship Oriented	

Course Relevance	
Local	
Regional	
National	
Global	✓

Preamble

Visualize, analyze and observe the various types of organisms in invertebrate and chordate, their organ systems, adaptations, their diversity and behavioral patterns.

Course Outcomes (CO)

On the successful completion of the course the students will be able to

No.	Course Outcome	Knowledge Level
CO1	Develop the knowledge on the visceral organs in the representative animals in the selected organ systems.	**K1,K2, K3**
CO2	Demonstrate the mounting techniques in the representative animals in the selected organ systems.	**K1,K2, K3**
CO3	Define the microscopic organisms to explain their survival skills.	**K1,K2,K3**
CO4	Classify the specific characters, identifying structures in the preserved, stuffed and dried animals.	**K1,K2,K3**
CO5	Explain the biodiversity, habitat, environment through the field visit.	**K1,K2**

K1-Knowledge K2-Understand K3-Apply

Mapping of CO with PO

	PO1	PO2	PO3	PO4	PO5
CO1	**3**	**3**	**1**	**2**	**2**
CO2	**3**	**2**	**3**	**1**	**3**
CO3	**3**	**3**	**1**	**3**	**3**
CO4	**3**	**2**	**3**	**3**	**3**
CO5	**3**	**3**	**3**	**2**	**2**

1-Low 2-Medium 3-Strong

Mapping of CO with PSO

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	1	2	2
CO2	3	2	3	1	3
CO3	3	3	1	3	3
CO4	3	2	3	3	3
CO5	3	3	3	2	2

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

Syllabus

UNIT I 18 Hours

Invertebrates: Demonstration: Cockroach Dissection -Digestive, Nervous systems & Reproductive system- Mounting:- Mouth parts and Salivary gland. Earthworm-Dissection- Digestive, Nervous systems & Reproductive system. Mounting - Body setae and Penial setae. House fly- Mounting – Mouthparts

UNIT II 18 Hours

Chart/Models: Pila - Digestive system and Nervous system .Freshwater mussel -Digestive system. **Spotters**- Protozoa - Amoeba, Plasmodium, Paramecium Entire and conjugation. Porifera, Gemmules and Spicules. Coelenterata - Obelia Colony, Medusa, Physalia, Any One Coral, Sea Anemone. Helminthes- Liverfluke-Entire, Taenia (Entire and Scolex).

UNIT III 18 Hours

Spotters: Nematoda- Ascaris Male and Female. Annelida -Nereis, Leech . Arthropoda - Zoea, Nauplius-Millipede and Centipede, Mollusca- Chiton, Sepia, Nautilus, Octopus. Echinodermata- Starfish, Sea Urchin , Sea Cucumber. D. Field Visit Observation and identification of insect pests of agricultural crops. Visit Vermifarm and observation of Earthworm species- Visit to Apiary.

UNIT IV 18 Hours

Chordates: Dissection and mounting : Fish – Dissection and observation of visceral organs Shark- Mounting of Placoid Scales .Chart/Models- Frog - Arterial system and Venous system, brain and spinal nerves. Spotters- Amphioxus, Balanoglossus, Acidian, Petromyzon ,Narcine, Anabas, Echines, Hippocampus, Eel, Rhacophorus and Alytes , Krait, Cobra, Viper, Typhlops, Enhydrina, Draco and Chameleon.

UNIT V 18 Hours

Spotters: Osteology of Rabbit – Skull, Typical Vertebra, Pectoral and pelvic girdle– Fore limb and Hind limb. Field visit- Rameshwaram, Kurusadai Island & Mandapam- Biodiversity study of marine animals.

Text Books

Kapoor, ***Practical Zoology***, Silver Line Publications, Allahabad, Uttrapradesh , 2014.

Reference Books

Pechenik, Jan A – ***Biology of the Invertebrates***, Tata Mcgraw – Hill Pub. Company Ltd., New Delhi, 2014.

Vasantika Kashyap- ***Life of Invertebrates***, Second Revised Edition, Vikas Pub. House Pvt. Ltd., New Delhi, 2013.

Kotpal, R.L -Modern ***Text Book of Zoology, Invertebrates (Animal diversity – I),*** Rastogi Publications, Meerut, 2012.

Barnes, R.D- ***Invertebrate Zoology,*** IV Edition, Holf Saunders International edition, 2006,.

Ekambaranatha Ayyar and Ananthakrishnan, T.N-***A manual of Zoology,*** volume I, Invertebrate, Viswanathan (Printers and Publishers) Pvt. Ltd., ChennaiKotpal, R.L, Vertebrates, Rastogi Publications, 2011.

Gupta R.C and Girish Chopra- ***Comparative Anatomy of Chordates*** – R.Chand & Co,New Delhi, 2003.

Newmann, ***The Phylum chordata, Biology of vertebrates and their skin***, Satish Book Enterprises, Agra, 1981.

Pedagogy

E-Resources, Chalk and talk, Charts and models, Group Discussion, Preserved animals and slides.

Teaching aids

LCD Projector, White Board, Microscope – Dissection, Compound.

Course Contents and Lecture Schedule

Module No.	Topic	No. of Lectures	Content Delivery Methods
UNIT - I			
1.1	A. Demonstration : Cockroach Dissection - Digestive, Nervous systems & Reproductive system- Mounting:- Mouth parts and Salivary gland.	6	Chalk & Talk Dissection Tools
1.2	Earthworm-Dissection- Digestive, Nervous systems & Reproductive system. Mounting - Body setae and Penial setae	6	Chalk & Talk Dissection Tools
1.3	House fly- Mounting –Mouthparts.	6	Chalk & Talk Dissection Tools
UNIT - II			
2.1	B. Chart/Models : Pila- Digestive system and Nervous system .Freshwater mussel - Digestive system.	6	E-Resources
2.2	C. Spotters- Protozoa - Amoeba, Plasmodium, Paramecium Entire and conjugation. Porifera Gemmules and Spicules.	6	Discussion
2.3	Coelenterata - Obelia Colony, Medusa, Physalia, Any One Coral, Sea Anemone. Helminthes- Liverfluke-Entire, Taenia (Entire and Scolex).	6	Discussion
UNIT - III			
3.1	Nematoda- Ascaris Male and Female. Annelida -Nereis, Leech . Arthropoda - Zoea, Nauplius-Millipede and Centipede.	6	Discussion
3.2	Mollusca- Chiton, Sepia, Nautilus, Octopus. Echinodermata- Starfish, Sea Urchin, Sea Cucumber.	6	Discussion
3.3	D. Field Visit Observation and identification of insect pests of agricultural crops. Visit Vermifarm and observation of Earthworm species- Visit to Apiary.	6	Chalk & Talk Discussion

UNIT - IV			
4.1	Chordates: A. Dissection and mounting : Fish – Dissection and observation of visceral organs Shark- Mounting of Placoid Scales	6	Chalk & Talk Dissection Tools
4.2	B. Chart/Models: Frog - Arterial system and Venous system, brain and spinal nerves.	6	E-Resources
4.3	C. Spotters: Amphioxus,Balanoglossus, Acidian, Petromyzon ,Narcine, Anabas, Echines, Hippocampus, Eel, Rhacophorus and Alytes , Krait, Cobra, Viper, Typhlops, Enhydrina, Draco and Chameleon	6	Discussion
UNIT - V			
5.1	C. Spotters: Osteology of Rabbit	6	Discussion
5.2	Skull, Typical Vertebra, Pectoral girdle of rabbit.	6	E- Resources
5.3	Pelvic girdle – Fore limb and Hind limb	6	Chalk & Talk
	Total	**90**	

Course Designer
Dr. M. Mohamed Meeran
Head & Assistant Professor of Zoology

Course Code	Course Title	Category	Total Hours	Credits
20UCHA21	Organic, Inorganic and Physical Chemistry - II	Allied-II	60	3

Nature of Course	
Knowledge Oriented	✓
Skill Oriented	✓
Employability Oriented	✓
Entrepreneurship Oriented	

Course Relevance	
Local	
Regional	
National	
Global	✓

Preamble

To identify the concept of photochemistry, coordination compounds, chromatographic technique, chemotherapy and thermodynamic concepts.

Course Outcomes (CO)

On the successful completion of the course the students will be able to

No.	Course Outcome	Knowledge Level
CO1	Describe the physical concepts of photochemistry	**K1**
CO2	Explain the basic terms, isomerism and theories involved in coordination compound	**K1, K2**
CO3	Apply the column, thin layer and paper chromatographic techniques to separate and identify the components present in a mixture	**K1,K2, K3**
CO4	classify the chemotherapy drugs such as sulpha, antimalarials, antibiotics and arsenical drugs	**K1, K2**
CO5	Identify the concepts of thermodynamics and its significance	**K1, K2, K3**

K1-Knowledge K2-Understand K3-Apply

Mapping of CO with PO

	PO1	PO2	PO3	PO4	PO5
CO1	**3**	**2**	**2**	**3**	**2**
CO2	**3**	**3**	**2**	**2**	**2**
CO3	**3**	**2**	**2**	**3**	**2**
CO4	**3**	**2**	**2**	**3**	**2**
CO5	**3**	**3**	**2**	**2**	**2**

1-Low 2-Medium 3-Strong

Mapping of CO with PSO

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	**3**	**2**	**2**	**3**	**2**
CO2	**3**	**3**	**2**	**2**	**2**
CO3	**3**	**2**	**2**	**3**	**2**
CO4	**3**	**2**	**2**	**3**	**2**
CO5	**3**	**3**	**2**	**2**	**2**

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

Syllabus

UNIT I 13 Hours

Photochemistry**:** Comparison of thermal and photochemical reactions – definition of photochemical reactions – laws of photochemistry – Grotthus-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 – chemiluminescence – bioluminescence – applications of photochemistry.

UNIT II 10 Hours

Coordination compounds: Definition – nomenclature – definition of various terms involved in coordination chemistry – classification of ligands-Werner's theory, EAN rule – VB theory – Nickel carbonyl – chelates.

UNIT III 10 Hours

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.

UNIT IV 15 Hours

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.

UNIT V 12 Hours

Definition of thermodynamic terms-system and surrounding – isolated, closed and open systems -intensive and extensive properties**-** Thermodynamic processes – reversible and irreversible, isothermal and adiabatic – state and path functions - Second law of thermodynamics - need for second law–Concept of entropy – physical significance of entropy -Gibbs free energy and its significance.

Reference Book

B. S. Bahl & Arun Bahl, ***Advanced Organic Chemistry***, S. Chand & Company, New Delhi, 2009.

B.R. Puri and L.R. Sharma and Madan S. Pathania, ***Principles of Physical Chemistry***, Vishal Publishing Co., Jalandhar, 2005.

R.D. Madan, ***Modern Inorganic Chemistry***, S. Chand, 2013, revised edition,

J. Ghosh, ***Fundamental concepts of Applied Chemistry***, S. Chand & Co. Publishing.

Pedagogy

Chalk & Talk, E-Resources, Group Discussion

Teaching aids

Black Board, LCD Projector

Course Contents and Lecture Schedule

Module No.	Topic	No. of Lectures	Content Delivery Methods
	UNIT - I		
1.1	Comparison of thermal and photochemical reactions – definition of photochemical reactions	2	Chalk & Talk
1.2	Laws of photochemistry – Grotthus-Draper law – Einstein law	2	E-Resources
1.3	Quantum efficiency – reasons for low and high quantum yield with examples	3	E-Resources
1.4	Consequence of light absorption by atoms and molecules – Jablonski diagram – fluorescence – phosphorescence	3	Chalk & Talk
1.5	Photosensitization – chemiluminescence – bioluminescence – applications of photochemistry	3	E-Resources
	UNIT - II		
2.1	Coordination compounds: nomenclature – definition of various terms involved in coordination chemistry	3	E-Resources
2.2	Classification of ligands-Werner's theory, EAN rule	3	Chalk & Talk
2.3	Valence Bond theory – Nickel carbonyl – chelates	4	E-Resources

UNIT - III			
3.1	Chromatographic technique: Principle – classification -adsorption and partition Chromatography	3	E-Resources
3.2	Thin layer chromatography – column chromatography (adsorption) – paper Chromatography	3	E-Resources
3.3	Gas-solid and gas-liquid chromatography- applications of each type- ion exchange chromatography	4	Chalk & Talk
UNIT - IV			
4.1	Sulpha drugs – sulphadiazine – sulphanilamide –preparation and applications	4	E-Resources
4.2	Antimalarials: chloroquine and plasmoquine –preparation and applications	3	Chalk & Talk
4.3	Arsenical drugs: Salvarasan – 606 and neosalvarasan-preparation and applications	3	Chalk & Talk
4.4	Antibiotics: Definition – classification – penicillin - amoxicillin – ampicillin – tetracyclin– streptomycin – mode of application – uses only	5	E-Resources
UNIT - V			
5.1	Definition of thermodynamic terms- system and surrounding – isolated, closed and open systems -intensive and extensive properties	4	E-Resources
5.2	Thermodynamic processes – reversible and irreversible, isothermal and adiabatic – state and path functions	4	Chalk & Talk
5.3	Second law of thermodynamics - need for second law–Concept of entropy – physical significance of entropy -Gibbs free energy and its significance	4	E-Resources
	Total	**60**	

Course Designer

Dr. M. Jannathul Firdhouse

Assistant Professor of Chemistry

Course Code	Course Title	Category	Total Hours	Credits
20UCHA2P	Volumetric Analysis	Allied-III	60	2

Nature of Course	
Knowledge Oriented	✓
Skill Oriented	✓
Employability Oriented	✓
Entrepreneurship Oriented	

Course Relevance	
Local	
Regional	
National	
Global	✓

Preamble

To enable the students to acquire the quantitative skills in volumetric analysis and to calibrate burette, pipette and standard flask.

Course Outcomes (CO)

On the successful completion of the course the students will be able to

No.	Course Outcome	Knowledge Level
CO1	Build basic quantitative skills in volumetric analysis with the use of burette, pipettes and standard flasks	**K1,K2, K3**
CO2	Apply acidimetric and alkalimetric method for the quantitative volumetric estimation of acids and bases	**K1,K2, K3**
CO3	Estimate the amount of inorganic compounds permanganometrically	**K1,K2, K3**
CO4	Demonstrate the quantitative estimation of Potassium dichromate iodometrically	**K1, K2**
CO5	Plan the laboratory hygiene and safety	**K1, K2, K3**

K1-Knowledge K2-Understand K3-Apply

Mapping of CO with PO

	PO1	PO2	PO3	PO4	PO5
CO1	**1**	**3**	**3**	**1**	**2**
CO2	**1**	**3**	**3**	**1**	**2**
CO3	**1**	**3**	**3**	**2**	**2**
CO4	**1**	**3**	**3**	**2**	**2**
CO5	**1**	**3**	**3**	**2**	**2**

1-Low 2-Medium 3-Strong

Mapping of CO with PSO

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	2	3	3	2	1
CO2	2	3	3	1	1
CO3	2	2	3	1	1
CO4	2	2	3	1	1
CO5	2	1	1	1	1

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

Syllabus

A double titration involving making up of the solution to be estimated or single titration involving making up of the solution to be estimated and the preparation of a primary standard.

I. Acidimetry and Alkalimetry

1. Titrations between a strong acid and strong base.
2. Titrations between a strong acid and weak base.
3. Titrations between a weak acid and strong base.

II. Permanganimetry

1. Titrations between potassium permanganate and oxalic acid, ferrous ammonium sulphate (Mohr's salt)

III. Iodometry (Demonstration Only)

1. Titrations of sodium thiosulphate with potassium permanganate and potassium dichromate.

Reference Book

Sundaram, Krishnan, Raghavan, ***Practical Chemistry (Part II),*** S. Viswanathan Co. Pvt., 1996.

B.S. Furniss, A.J. Hannaford, P.W. G. Smith, A.R. Tatchell, ***Vogel's Text Book of Practical Organic Chemistry***. 5th Edn., Pearson Education, 2005.

Course Designer

Dr. M. Kamal Nasar
Associate Professor of Chemistry

Course Code	Course Title	Category	Total Hours	Credits
2OUZYC31	Cell Biology	Core–IV	75	4

Nature of Course	
Knowledge Oriented	✓
Skill Oriented	
Employability Oriented	
Entrepreneurship Oriented	

Course Relevance	
Local	
Regional	
National	
Global	✓

Preamble

Cell biology explains the fundamental concepts of cell organelles and its function**.**

Course Outcomes (CO)

On the successful completion of the course the students will be able to

No.	Course Outcome	Knowledge Level
CO1	Tell the fundamentals of cell structures and organelles	**K1**
CO2	Explain the role, structure and functions of plasma membrane	**K1, K2**
CO3	Identify various enzymes present inside the cell and calculate the amount of energy generated after cell respiration	**K1, K2, K3**
CO4	Summarize the role of nucleic acids, genetic code and protein synthesis	**K1, K2**
CO5	Collect knowledge on different phases of cell cycle and experiment with mitosis and meiosis	**K1, K2, K3**

K1-Knowledge K2-Understand K3-Apply

Mapping of CO with 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**

1-Low 2-Medium 3-Strong

Mapping of CO with 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**

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

Syllabus

UNIT I 15 Hours

Discovery of cell and Cell theory- Ultrastructure of plant-bacterial and animal cells; Staining- types of staining and Cyto-chemical staining methods; Centrifugation- Ultra centrifuge- Sedimentation co-efficient.

UNIT II 15 Hours

Plasma membrane: Ultra structure – Chemical composition - Functions - modifications of Plasma membrane; Endoplasmic reticulum: Morphology- Ultra structure- chemical composition- functions; Golgi complex: Ultra structure- chemical composition and functions.

UNIT III 15 Hours

Lysosomes: Ultra structure and polymorphism- chemical composition and functions: Peroxisomes - glyoxysomes. Mitochondria: Ultra structure- chemical composition-enzyme systems- functions-Oxidation- Respiratory chain (ETP)- Kreb's cycle- ATP Production and Biogenesis.

UNIT IV 15 Hours

Ribosomes: Ultra structure- types- chemical composition - functions. Nucleus and Nucleolus: Ultra structure and functions. Nucleic Acids: DNA- Ultra structure replication- transcription- RNA- Types- Genetic code and protein synthesis.

UNIT V 15 Hours

Chromosomes: Ultra structure of Chromosomes- Special types of Chromosomes and functions- Cell division- mitosis and meiosis- Microtubules in spindle assembly- Structure of kinetochore; Cancer biology - Carcinogenesis: Definition- types- causes- properties- treatment- Oncogenesis- Cell Signaling.

Text Books

Powar, C.B., ***Cell Biology***, Himalayan Publishing House, New Delhi, 2009.

Paul, A., ***Cell and Molecular Biology***, Books and Allied (P) Ltd, New Delhi, 2009.

Reference Books

De Roberties E.D.P and E.M.F. De Roberties, ***Cell and Molecular Biology*****,** B.I. Publications Pvt. Ltd., India, 2011, 8th edition.

Pedagogy

Chalk & Talk, E-Resources, Group Discussion

Teaching aids

Black Board, LCD Projector

Course Contents and Lecture Schedule

Module No.	Topic	No. of Lectures	Content Delivery Methods
UNIT - I			
1.1	Discovery of cell and cell theory	2	Chalk & Talk
1.2	Ultra structure of plant-bacterial and animal cells	3	E-Resources
1.3	Staining- types of staining and	4	Discussion
1.4	Cyto-chemical staining methods	2	Chalk & Talk
1.5	Centrifugation- Ultra centrifuge	2	E-Resources
1.6	Sedimentation co-efficient	2	Discussion
UNIT - II			
2.1	Plasma membrane: Ultra structure – Chemical compositions	3	Discussion
2.2	Functions - modifications of Plasma membrane;	3	E-Resources
2.3	Endoplasmic reticulum: Morphology- Ultra structure	2	E-Resources
2.4	Chemical composition- functions of ER	2	E-Resources
2.5	Golgi complex: Ultra structure	2	Chalk & Talk
2.6	Chemical composition of Golgi apparatus	1	E-Resources
2.7	Functions of Golgi apparatus	2	E-Resources

UNIT - III			
3.1	Lysosomes: Ultra structure and polymorphism	2	E-Resources
3.2	chemical composition and functions	2	Chalk & Talk
3.3	Peroxisomes - glyoxysomes	2	Discussion
3.4	Mitochondria: Ultra structure- chemical composition	3	E-Resources
3.5	Enzyme systems- functions-Oxidation-Respiratory chain (ETP)	3	Chalk & Talk
3.6	Kreb's cycle- ATP Production and Biogenesis	3	E-Resources
UNIT - IV			
4.1	Ribosomes: Ultra structure- types-chemical composition - functions.	5	E-Resources
4.2	Nucleus and Nucleolus: Ultra structure and functions.	4	E-Resources
4.3	Nucleic Acids: DNA –Ultra structure-replication-transcription- RNA-Types-Genetic code and protein synthesis.	6	E-Resources
UNIT - V			
5.1	Chromosomes: Ultra structure of Chromosomes- Special types of Chromosomes and functions	3	E-Resources
5.2	Cell division- mitosis and meiosis	6	PPT
5.3	Microtubules in spindle assembly-Structure of kinetochore	2	Discussion
5.4	Cancer biology - Carcinogenesis: Definition- types- causes- properties-treatment	2	Chalk & Talk
5.5	Oncogenesis- Cell Signaling.	2	E-Resources
	Total	**75**	

Course Designer
Ms. A. Syedali Fathima
Assistant Professor of Zoology

Course Code	Course Title	Category	Total Hours	Credits
20UZYC32	Molecular Biology	Core–V	60	4

Nature of Course	
Knowledge Oriented	✓
Skill Oriented	
Employability Oriented	
Entrepreneurship Oriented	

Course Relevance	
Local	
Regional	
National	
Global	✓

Preamble

The course illustrates the ideology of genetic material in all life forms and the essence of central dogma of protein synthesis.

Course Outcomes (CO)

On the successful completion of the course the students will be able to

No.	Course Outcome	Knowledge Level
CO1	Relate the history behind the identification of genetic material	**K1**
CO2	Construct the molecular basis of DNA replication and modes	**K3**
CO3	Explain the genome organization in prokaryotic and eukaryotic organisms	**K2**
CO4	Experiment with molecular mechanism behind the different stages of protein synthesis	**K3**
CO5	Evaluate the mechanism of gene regulation in prokaryotes and eukaryotes	**K3**

K1-Knowledge **K2-Understand** **K3-Apply**

Mapping of CO with 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**

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

Mapping of CO with 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**

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

Syllabus

UNIT I 12 Hours

The molecular nature of DNA and RNA: Introduction to gene structure and function – DNA double helix – Structure of RNA – Physical properties – Introduction to Genomics, Proteomics and Metabolomics – Human genome project.

UNIT II 12 Hours

DNA Replication in prokaryotes and eukaryotes, mechanism of DNA replication, Semi-conservative, bidirectional and semi-discontinuous replication, RNA priming, Replication of circular and linear ds-DNA, Replication of telomeres.

UNIT III 12 Hours

RNA polymerase and transcription Unit, mechanism of transcription in prokaryotes and eukaryotes, synthesis of rRNA and mRNA, transcription factors

UNIT IV 12 Hours

Genetic code - Deciphering of genetic code - Salient features of genetic code - 3D structure of tRNA – codon-anticodon interaction - Mechanism of protein synthesis in prokaryotes and eukaryotes – Inhibitors of protein synthesis – Post translational modification of proteins – Polyprotein.

UNIT V 12 Hours

Regulation of gene expression: i) Gene regulation in prokaryotes: Fine control of prokaryotic transcription - lac operon and trp operon - Regulatory RNA ii) Gene regulation in eukaryotes: GAL system in yeast - DNA binding proteins - Homeobox in gene regulation.

Text Books

Malacinski, G.M. Freifelder‟s ***Essentials of Molecular biology,*** Jones & Barlett learning, New Delhi, 2015,4th edn.

Channarayappa, ***Molecular Biology,*** University Press, Hyderabad. 2015.

Reference Books

Alberts, B., Johnson, A., Lewis, J., Raff, M., Robersts, K. and Walter, P. ***Molecular Biology of the Cell,*** Garland Publishing, Inc., 2014, III Edn

De Roberties E.D.P and E.M.F.De Roberties ***Cell and Molecular Biology.*** Lippincott Williams & Wilkins, Pheladelphia. 2011. VIII Edn.

Griffiths, A.J.F., Lewontin, R.C., Gelbart, W.M. and Miller, J.H. ***Modern Genetic Analysis.*** W.H. Freeman and Company, New York. 2012. IIEdn

Hardin J., Bertoni, G.P. and Lewis, J. Becker‟s ***World of the Cell*** Pearson Education Inc., New York 2011, VIII Edn.

Lodish, H. Berk, A., Zipursky, S.L., Matsudara, P., Baltimore, D. and Darnell, J. ***Molecular Cell Biology*****,** W.H.Freeman and Company, Newyork. 2000. IV Edn.

Watson, J.D., N.H.Hopkins, J.W.Roberts, J.A.Steitz and A.M.Weiner, ***Molecular Biology of the Gene,*** Pearson Education Inc., New York.2014. IV Edn.

Wolfe, L.S., ***Molecular and Cellular Biology****,* Wadsworth publishing company, California. 2016.

Pedagogy

Chalk & Talk, E-Resources, Group Discussion

Teaching aids

Black Board, LCD Projector

Course Contents and Lecture Schedule

Module No.	Topic	No. of Lectures	Content Delivery Methods
UNIT - I			
1.1	The molecular nature of DNA and RNA: Introduction to gene structure and function	3	Chalk & Talk
1.2	DNA double helix – Structure of RNA	2	E-Resources
1.3	Physical properties – Introduction to Genomics, Proteomics and Metabolomics	4	Discussion
1.4	Human genome project	3	Discussion
UNIT - II			
2.1	DNA Replication in prokaryotes and eukaryotes	2	Discussion
2.2	mechanism of DNA replication, Semi-conservative, bidirectional and semi-discontinuous replication	4	Chalk & Talk

2.3	RNA priming, Replication of circular and linear ds	3	E-Resources
2.4	DNA, Replication of telomeres.	3	Chalk & Talk
UNIT - III			
3.1	RNA polymerase and transcription Unit	4	E-Resources
3.2	Mechanism of transcription in prokaryotes and eukaryotes,	4	Chalk & Talk
3.3	Synthesis of rRNA and mRNA, transcription factors	4	Discussion
UNIT - IV			
4.1	Genetic code - Deciphering of genetic code - Salient features of genetic code	2	Discussion
4.2	3D structure of tRNA – codon-anticodon interaction	2	E-Resources
4.3	Mechanism of protein synthesis in prokaryotes and eukaryotes	4	Chalk & Talk
4.4	Inhibitors of protein synthesis	2	E-Resources
4.5	Post translational modification of proteins – Polyprotein	2	Chalk & Talk
UNIT - V			
5.1	Regulation of gene expression: Gene regulation in prokaryotes: Fine control of prokaryotic transcription	3	E-Resources
5.2	lac operon and trp operon - Regulatory RNA	2	Chalk & Talk
5.3	Gene regulation in eukaryotes: GAL system in yeast	3	Discussion
5.4	DNA binding proteins	1	E-Resources
5.5	Homeobox in gene regulation	3	Chalk & Talk
	Total	**60**	

Course Designer
Dr. P. Raja
Assistant Professor of Zoology

Course Code	Course Title	Category	Total Hours	Credits
20UBYA11	**Thallophyta, Bryophyta, Pteridophyta, Gymnospermae, Physiology & Plant ecology**	**Allied - IV**	**60**	**3**

Nature of Course	
Knowledge Oriented	✓
Skill Oriented	
Employability Oriented	
Entrepreneurship Oriented	

Course Relevance	
Local	
Regional	
National	
Global	✓

Preamble

To enable the students acquire knowledge on general characters, classification and life cycle of Thallophyta, Bryophyta, Pteridophyta, Gymnospermae and enable the students to understand the physiological process and ecological adaptations of plants

Course Outcomes (CO)

On the successful completion of the course the students will be able to

No.	Course Outcome	Knowledge Level
CO1	Illustrate the structure, life cycle of *Nostoc, Sargassum* and Economic importance of Algae.	**K1, K2,K3**
CO2	Explain the structure, life cycle of Fungi with the reference of *Saccharomyces*, *Agaricus* and Economic importance, listing the general features of Bacteria and its Economic importance.	**K1, K2, K3**
CO3	Compare and contrast the general structure and life cycle of *Funaria, Selaginella* and *Pinus*.	**K1, K2**
CO4	Discuss the physiological process and mechanism of Transpiration, Photosynthesis and Respiration.	**K1, K2**
CO5	Interpret the adaptation of Hydrophytes, Xerophytes and factors affecting the vegetations.	**K1, K2, K3**

K1-Knowledge **K2-Understand** **K3-Apply**

Mapping of CO with 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

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

Mapping of CO with 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

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

Syllabus

UNIT I 11 Hours

Thallophyta - General characters of algae. A study on the structure and life cycle of the following genera- *Nostoc* and *Sargassum* (need not study the development of sex organs). Economic importance of Algae.

UNIT II 12 Hours

Fungi - General characters. A study on the structure and life cycle of the following genera- *Saccharomyces and Agaricus*. Elementary knowledge of Bacteria. Economic importance of Fungi and Bacteria.

UNIT III 15 Hours

Bryophyta, Pteridophyta and Gymnospermae; A study on the structure and life cycle of the following genera- *Funaria, Selaginella* and *Pinus* (need not study the development of sex organs)

UNIT IV 12 Hours

Plant physiology; Transpiration- Types and Mechanism of stomata. Photosynthesis – Light reaction – Calvin cycle. Respiration – Glycolysis – Krebs cycle

UNIT V 10 Hours

Plant ecology; Factors affecting vegetation – Climatic factor, Morphological and Anatomical adaptations in Hydrophytes and Xerophytes.

Text Books

K.S.Bilgrami and L. C. Saha, ***Text book of Algae***, CBS Publishers, New Delhi 2015, Ist Edition.

B.P. Pandey, ***A Textbook of Botany: Angiosperms - Taxonomy, Anatomy, Embryology and Economic Botany***, S. Chand Limited, 2014**.**

Sohan Sharma, ***Advances in Mycology,*** Random Publications Publishers and Distributors, New Delhi*, 2012.*

O. P. Sharma, ***Algae*****,** Tata McGraw-Hill Education, New Delhi, 2011.

B. P. Pandey, ***Text book of Botany***, Vol. I & II. S. Chand & Co. New Delhi, 1986.

Ganguly, A. K. ***General Botany*** Vol. I (1971) and Vol. II. The new book stall, Calcutta, 1975.

Fuller, H. J. and Tippo, O. ***College Botany***, Henry Holt & Company. 1949

Reference Books

Vashishta, B. R. Sinha, A. K, ***Botany for Degree student – Fungi***, S. Chand & Co. New Delhi. 2010.

Panday.S.N., Misra. S.P and Trivethi P.S, ***A Text book of Botany***, Volume II , Vikas Publishing House Pvt. Ltd., Delhi, 2009.

Rao, K. N., Krishnamoorthy, K. V. and Rao, G. S. ***Ancillary Botany***, S. Visvanathan Pvt, Madras, 1979.

Pedagogy

Chalk & Talk, Group Discussion & E-Resources

Teaching aids

Black Board, Collected Plants specimens, Permanent Slides, Specimens, Charts & LCD projector

Course Contents and Lecture Schedule

Module No.	Topic	No. of Lectures	Content Delivery Methods
UNIT - I			
1.1	General character of Algae	2	Chalk & Talk
1.2	Structure of *Nostoc*	2	Permanent Slides
1.3	Reproduction of *Nostoc*	2	Discussion
1.4	Structure of *Sargassum*	2	Plants specimens
1.5	Reproduction of *Sargassum*	2	E-Resources
1.6	Economic importance of Algae	1	Discussion

UNIT - II			
2.1	General character of Fungi	1	Discussion
2.2	Structure of Yeast	1	Permanent Slides
2.3	Life cycle of Yeast	2	Chalk & Talk
2.4	Structure of *Agaricus*	2	E-Resources
2.5	Life cycle of *Agaricus*	2	E-Resources
2.6	Economic Importance of Fungi	1	Discussion
2.7	General features of Bacteria	2	E-Resources
2.8	Economic importance of Bacteria	1	Discussion
UNIT - III			
3.1	Structure of *Funaria*	3	Chalk & Talk
3.2	Life cycle of *Funaria*	2	E-Resources
3.3	Structure of *Selaginella*	3	Chalk & Talk
3.4	Life cycle of *Selaginella*	2	E-Resources
3.5	Structure of P*inus*	3	Plants specimens
3.6	Life cycle of *Pinus*	2	Discussion
UNIT - IV			
4.1	Transpiration	4	Chalk & Talk
4.2	Light reaction	2	E-Resources
4.3	Dark reaction	2	E-Resources
4.4	Glycolysis	2	Discussion
4.5	Krebs cycle	2	E-Resources
UNIT - V			
5.1	Factors affecting vegetation	4	Chalk & Talk
5.2	Adaptation in Hydrophytes	3	E-Resources
5.3	Adaptation in Xerophytes	3	Discussion
	Total	**60**	

Course Designer
Ms. A. M. Rashida Banu
Assistant Professor of Botany

Course Code	Course Title	Category	Total Hours	Credits
20UZYC41	Embryology	Core - VI	75	4

Nature of Course	
Knowledge Oriented	✓
Skill Oriented	
Employability Oriented	
Entrepreneurship Oriented	

Course Relevance	
Local	
Regional	
National	
Global	✓

Preamble

Provides an insight into the development of an organism starting from gametogenesis to organogenesis. The course highlights the concepts of regeneration, metamorphosis and assisted reproductive technology.

Course Outcomes (CO)

On the successful completion of the course the students will be able to

No.	Course Outcome	Knowledge Level
CO1	Define various embryonic stages of an organism.	**K1**
CO2	Explain the basis of organ differentiation and summarize the sequence of events in fertilization.	**K1, K2**
CO3	Determine the development of various organs from the germ layers.	**K1, K2, K3**
CO4	Extend their knowledge on post embryonic development such as metamorphosis, regeneration and ageing.	**K1, K2**
CO5	Apply the modern implications of developmental biology in terms of in-vitro fertilization, Illustrate the methods of assisted reproductive technology	**K1, K2, K3**

K1-Knowledge **K2-Understand** **K3-Apply**

Mapping of CO with 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**

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

Mapping of CO with 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

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

Syllabus

UNIT I 15 Hours

Introduction to developmental biology: Theories of origin of life: Preformation- Epigenesis- Germplasm. Law's: Von Baer's law- Biogenetic law- Phases of development: Gametogenesis- Mammalian Sperm- Structure and types- Spermatogenesis. Mammalian Ovum- Structure- types- Oogenesis.

UNIT II 15 Hours

Fertilization: Types & process of fertilization. Biochemical & Physiological events. Parthenogenesis: definition- types- cleavage- planes and laws. Fate map of frog: blastulation & gastrulation.

UNIT III 15 Hours

Organogenesis: Development of brain and heart in frog, Placentation in Mammals- Definition- types- classification on the basis of foetal membranes & villi – functions- Extra embryonic membranes in Chick

UNIT IV 15 Hours

Organiser: Process of induction, Amphibian metamorphosis- Definition, Ecological, Morphological & Physiological changes. Regeneration: Definition- types and regeneration of limb in Salamander.

UNIT V 15 Hours

Human reproduction: Puberty- Menopause- Menstrual cycle- Pregnancy- Parturition and Lactation. Birth Control: Contraception- its types. Infertility method to overcome: IUI-IVF-Test tube baby- Ethical issues.

Text Books

Verma. S. And Agarwal V.K., ***Chordate Embryology***, S. Chand & Co., New Delhi, 2000.

Balinsky, B.I., ***An Introduction to Embryology***, W.B. Saunders and Co., London, 1981.

Reference Books

Arora M.P., ***Embryology*****,** Himalaya Publishing House, New Delhi, 2009.

Pedagogy

Chalk & Talk, E-Resources, Group Discussion

Teaching aids

Black Board, LCD Projector

Course Contents and Lecture Schedule

Module No.	Topic	No. of Lectures	Content Delivery Methods
UNIT - I			
1.1	Theories of origin of life: Preformation- Epigenesis- Germplasm.	3	Chalk & Talk
1.2	Law's: Von Baer's law- Biogenetic law- Phases of development.	3	Discussion
1.3	Gametogenesis- Mammalian Sperm- Structure and types- Spermatogenesis.	5	E-Resources
1.4	Mammalian Ovum- Structure- types- Oogenesis.	4	E-Resources
UNIT - II			
2.1	Types & process of fertilization.	2	Discussion
2.2	Biochemical & Physiological events.	3	E-Resources
2.3	Parthenogenesis: definition- types- cleavage- planes and laws.	5	E-Resources
2.4	Fate map of frog: blastulation & gastrulation.	5	E-Resources
UNIT - III			
3.1	Development of brain and heart in frog	6	E-Resources
3.2	Placentation in Mammals- Definition- types	4	Chalk & Talk

3.3	Classification on the basis of foetal membranes & villi – functions	2	Discussion
3.4	Extra embryonic membranes in Chick	3	E-Resources
UNIT - IV			
4.1	Organizer: Process of induction	5	E-Resources
4.2	Amphibian metamorphosis- Definition, Ecological, Morphological & Physiological changes.	5	E-Resources
4.3	Regeneration: Definition- types and regeneration of limb in Salamander.	5	E-Resources
UNIT - V			
5.1	Puberty- Menopause	3	E-Resources
5.2	Menstrual cycle	6	PPT
5.3	Pregnancy- Parturition and Lactation.	2	Discussion
5.4	Birth Control: Contraception- its types.	2	Discussion
5.5	Infertility method to overcome: IUI-IVF-Test tube baby- Ethical issues.	2	E-Resources
	Total	**75**	

Course Designer
Ms. A. Syedali Fathima
Assistant Professor of Zoology

Course Code	Course Title	Category	Total Hours	Credits
20UZYC42	**Microbiology**	**Core–VII**	**60**	**4**

Nature of Course	
Knowledge Oriented	✓
Skill Oriented	
Employability Oriented	
Entrepreneurship Oriented	

Course Relevance	
Local	
Regional	
National	
Global	✓

Preamble

The course illustrates the basic concepts and history on the development of microbiology. The main focus of the course is on the various branches of microbiology. And, it explains the pathogenecity and significance of beneficial microbes and methods for the control of pathogenic microbes.

Course Outcomes (CO)

On the successful completion of the course the students will be able to

No.	Course Outcome	Knowledge Level
CO1	Define the fundamental concepts, history and development of microbiology and microbial classification.	**K1, K2**
CO2	Perceive the theoretical basis and demonstrate the practical skills in the use of tools, technologies and methods involve in handling and using of microbes.	**K1, K2, K3**
CO3	Emphasize the conceptual basis of enlisted pathogens of humans and perceive the diagnostic skills and treating methods	**K1, K2, K3**
CO4	Summarize the different spoilage mechanisms in foods; illustrate methods to control deterioration and spoilage. Recognize and describe the characteristics of spoilage microorganisms in foods and their control.	**K1, K2, K3**
CO5	Relate knowledge on available microbes for agricultural purpose and their practical application in agricultural field	**K1, K2, K3**

K1-Knowledge **K2-Understand** **K3-Apply**

Mapping of CO with 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

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

Mapping of CO with 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

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

Syllabus

UNIT I 12 Hours

Definition for Microbiology, History of Microbiology & its Scope. Classification of Microorganisms, Different morphological appearances of Bacteria. Structure of a typical prokaryotic bacterium (E.coli) and its cell components.Structure of a typical T4Bacteriophage and its Life cycle.

UNIT II 12 Hours

Media and its types.Preparation of Nutrient Agar Plates. Broth culture, Stab culture, Slant culture.Autoclave- sterilization.Aseptic transfer, Inoculation, Spread plate, Streak plate- types, pour plate, serial dilution.Gram staining technique, Bacterial growth curve.

UNIT III 12 Hours

Types of diseases (Air borne, water borne, Vector borne). Nosocomial infections. Bacterial disease – Tuberculosis &Gonorrhoea-, Disease diagnosis, mode of transmission, epidemiology, eradication methods.Viral disease – AIDS, Dengue -, Disease diagnosis, mode of transmission, epidemiology, eradication methods.

UNIT IV 12 Hours

Definition- Factors in food spoilage; Food spoilage and its biochemical changes. Food Poisoning; Food preservation- methods.

UNIT V 12 Hours

Nitrogen fixing organism- mechanism of N2 fixation in the root nodules of Leguminous plants; Blue Green Algae (BGA)/ Cyanobacteria- non symbiosis- Azospirillum, Azotobacter. Mycorrhizae – types.

Text Books

Dubey R.C. & Maheshwari, D.K. ***A text book of Microbiology,*** S. Chand & company Pvt. Ltd, New Delhi. 2009.

Prescott, Harley and Klein's, 2009. ***Microbiology,*** Tata McGraw Hill international. 2009, 7th edition,

Chakaraborty. P. ***A text book of Microbiology,*** New central book agency Ltd., Calcutta. 1995.

Reference Books

Adams. M.R. and Moses, M.D. ***Food Microbiology,*** New age Int. Ltd, 1995.

Willium C. Frazier, Dennis C., Westhoff, ***Food Microbiology,*** Mc Graw Hill New Delhi. 2017.

Pedagogy

Chalk & Talk, E-Resources, Group Discussion

Teaching aids

Black Board, LCD Projector

Course Contents and Lecture Schedule

Module No.	Topic	No. of Lectures	Content Delivery Methods
UNIT - I			
1.1	Definition for Microbiology, History of Microbiology & its Scope.	2	Chalk & Talk
1.2	Classification of Microorganisms, Different morphological appearances of Bacteria. .	3	E-Resources
1.3	Structure of a typical prokaryotic bacterium (E.coli) and its cell components.	3	Discussion
1.4	Structure of a typical T4Bacteriophage	2	Chalk & Talk
1.5	T4Bacteriophage and its Life cycle.	2	Discussion

UNIT - II			
2.1	Media and its types	2	Discussion
2.2	.Preparation of Nutrient Agar Plates. Broth culture, Stab culture, Slant culture.	2	Chalk & Talk
2.3	Autoclave- sterilization.	2	E-Resources
2.4	Aseptic transfer, inoculation, Spread plate, Streak plate- types, pour plate,	2	Discussion
2.5	Serial dilution.,.	1	Chalk & Talk
2.6	Gram staining technique	2	E-Resources
2.7	Bacterial growth curve	1	Chalk & Talk
UNIT - III			
3.1	Types of diseases (Air borne, water borne, Vector borne).	2	E-Resources
3.2	Nosocomial infections	2	Chalk & Talk
3.3	Bacterial disease – Tuberculosis &Gonorrhoea-, Disease diagnosis, mode of transmission, epidemiology, eradication methods.	4	Discussion
3.4	Viral disease – AIDS, Dengue -, Disease diagnosis, mode of transmission, epidemiology, eradication methods	4	Discussion
UNIT - IV			
4.1	Definition- Factors in food spoilage;	4	Discussion
4.2	Food spoilage and its biochemical changes.	3	E-Resources
4.3	Food Poisoning	2	Chalk & Talk
4.4	Food preservation- methods	3	Chalk & Talk
UNIT - V			
5.1	Nitrogen fixing organism	2	E-Resources
5.2	mechanism of N2 fixation in the root nodules of Leguminous plants;	3	Chalk & Talk
5.3	Blue Green Algae (BGA)/	2	Discussion
5.4	Cyanobacteria- non symbiosis- Azospirillum, Azotobacter.	3	Chalk & Talk
5.5	Mycorrhizae – types.	2	Discussion
Total		**60**	

Course Designer
Dr. K. Arifa Banu
Assistant Professor of Zoology

Course Code	Course Title	Category	Total Hours	Credits
20UZYC4P	Cell Biology, Molecular Biology, Embryology & Microbiology	Core–VIII	90	4

Nature of Course	
Knowledge Oriented	✓
Skill Oriented	
Employability Oriented	
Entrepreneurship Oriented	

Course Relevance	
Local	
Regional	
National	
Global	✓

Preamble

The course provides a basic understanding on the organization of different tissues and cells. It helps to visualize the different stages of cell division. Explain the development of organ and organ system using slides, spotters and models.

Course Outcomes (CO)

On the successful completion of the course the students will be able to

No.	Course Outcome	Knowledge Level
CO1	Visualize and learn about the laboratory instruments	K1, K2
CO2	Explain experiments to reveal cellular function and explain structural organization of various cells.	K1, K2
CO3	Summarize, distinguish the structural organization of different cellular organelles.	K1, K2
CO4	Explain structure and molecular functioning of biomolecules the nucleic acids	K1,K2,K3
CO5	Identify the different stages of development –model organism	K1,K2,K3

K1-Knowledge K2-Understand K3-Apply

Mapping of CO with PO

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

1-Low 2-Medium 3-Strong

Mapping of CO with PSO

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	**3**	**3**	**1**	**2**	**2**
CO2	**3**	**2**	**3**	**3**	**3**
CO3	**3**	**3**	**1**	**2**	**3**
CO4	**3**	**2**	**3**	**3**	**3**
CO5	**3**	**3**	**3**	**2**	**2**

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

Syllabus

UNIT I 18 Hours

Cell & Molecular Biology: Experiments: Microscopy: Handling of dissection microscope and Compound microscope-Reagent preparation and handling: percentage solution, molarity and normality, preparation of Buffers-Observation of Mitotic Stages in Onion Root tip -Squash Preparation

UNIT II 18 Hours

Cell & Molecular Biology: Experiments:Observation of Meiotic stages in Grasshopper testis - Squash Preparation -Observation of Polytene chromosome in *Chironomous* larva -Human Blood smear preparation-Preparation ofSquamous epithelium from buccal samples

UNIT III 18 Hours

Cell & Molecular Biology: Sportters (Biovisual chats / Models): Mitochondria –Golgi apparatus -Endoplasmic reticulum -Ribosome-Chromosomes– RBC and WBC-Structure of DNA, RNA -Protein synthesis (Model)

UNIT IV 18 Hours

Embryology Spotters(Permanent Slides / Specimens/ Bio visual chats): Observation of different stages Chick Blastoderm stages (24 hrs – 48 hrs – 72 hrs - 96hrs-Observation of Frog: a) Egg b) Sperm c) Cleavage cells d) Blastula e) Gastrula –Observation of Metamorphosis in frog - Observation of mammalian: a) Egg b) Sperm- Study of Oogenesis & Spermatogenesis and Spermiogenesis- Observation of Placenta –Sheep(Cotyledonary type)-Pig (Diffused type)

UNIT V 18 Hours

Microbiology Experiments: Lab Safety and Aseptic Techniques-Cleaning of glasswares and modes of sterilization-Preparation of culture media for microorganisms – Agar &Broth media-Pure culture technique- a) Serial dilution b) Streak plate c) Pour plate.

Text Books

Dr. Renu Gupta, ***Cell biology practical manual***, Prestige publication , ISBN-108193651219, Jan1 2018.

Chaitanya K.V, ***Cell and molecular biology a lab manual***, Printico Hall- India learning private limited, Jan 2013.

Wilson and Walkers, ***Principles and techniques of Biochemistry and Molecular biology***, Cambridge University press, Jan 2018, 8 Edition.

Reference Books

Mari- Beffa, ***Key experiment in practical Developmental biology manual***, Cambridge university press, 2005.

Laura R Keller, ***Experimental developmental biology A laboratory manual***, Academic press 1998, 1 Edition.

Pedagogy

Chalk & Talk, E-Resources, Group Discussion

Teaching aids

Black Board, LCD Projector, Lab Instruments, Charts, Microscopic slides

Course Contents and Lecture Schedule

Module No.	Topic	No. of Lectures	Content Delivery Methods
UNIT - I			
1.1	Microscopy: Handling of dissection microscope and Compound microscope	6	Lab Instruments
1.2	Reagent preparation and handling: percentage solution, molarity and normality, preparation of Buffers	6	Discussion
1.3	Observation of Mitotic Stages in Onion Root tip - Squash Preparation	6	Charts
UNIT - II			
2.1	Observation of Meiotic stages in Grasshopper testis - Squash Preparation	6	E-Resources
2.2	Observation of Polytene chromosome in *Chironomous* larva	3	Discussion
2.3	Human Blood smear preparation	3	Lab Instruments
2.4	Preparation of Squamous epithelium from buccal samples	6	Discussion

UNIT - III			
3.1	Mitochondria	2	Chalk & Talk
3.2	Golgi apparatus	2	Discussion
3.3	Endoplasmic reticulum	2	Charts
3.4	Ribosome	2	Chalk & Talk
3.5	Chromosomes	2	Chalk & Talk
3.6	RBC and WBC	2	Discussion
3.7	Structure of DNA, RNA	4	Charts
3.8	Protein synthesis (Model)	2	Chalk & Talk
UNIT - IV			
4.1	Observation of different stages Chick Blastoderm stages	6	Microscopic slides
4.2	Observation of Frog: a) Egg b) Sperm c) Cleavage cells d) Blastula e) Gastrula	3	E-Resources
4.3	Observation of Metamorphosis in frog - Observation of mammalian: a)Egg b) Sperm	3	Chalk & Talk
4.4	Study of Oogenesis & Spermatogenesis and Spermiogenesis	3	Discussion
4.5	Observation of Placenta – Sheep (Cotyledonary type)- Pig (Diffused type)	3	E-Resources
UNIT - V			
5.1	Lab Safety and Aseptic Techniques	3	Lab Instruments
5.2	Cleaning of glasswares and modes of sterilization	3	Discussion
5.3	Preparation of culture media for microorganisms	3	Lab Instruments
5.4	Agar &Broth media	3	Discussion
5.5	Pure culture technique- a) Serial dilution b) Streak plate c) Pour plate	6	Lab Instruments
	Total	**90**	

Course Designer
Ms. P. Vinnoli
Assistant Professor of Zoology

Course Code	Course Title	Category	Total Hours	Credits
20UBYA21	**Taxonomy of Angiosperms, Cell biology, Anatomy & embryology of angiosperms & Biotechnology**	**Allied - V**	**60**	**3**

Nature of Course	
Knowledge Oriented	
Skill Oriented	✓
Employability Oriented	
Entrepreneurship Oriented	

Course Relevance	
Local	
Regional	
National	
Global	✓

Preamble

To enable the students acquire knowledge on classification, economic importance, anatomy and embryology, plant cell organelles, genetics with medicinal uses of flowering plants and the area of plant tissue culture, Biodiesel and Biogas.

Course Outcomes (CO)

On the successful completion of the course the students will be able to

No.	Course Outcome	Knowledge Level
CO1	Outline the Classification of flowering plants with its Economic importance and medicinal uses of Medicinal plants	**K1, K2,K3**
CO2	Illustrate the Ultra structure of Plant cell and its organelles and solve Mendelian genetics	**K1, K2,K3**
CO3	Interpret the structure of Simple and Complex permanent tissues and compare the primary structure of Dicot plants with Monocot plants.	**K1, K2**
CO4	Explain the Structure of Anther, Male Gametophyte, Female Gametophyte and Dicot embryo and extend the knowledge on the Pollination, Fertilization and types of Ovules.	**K1, K2**
CO5	Build Plant Tissue Culture methods and production of Biodiesel and Biogas.	**K1, K2, K3**

K1-Knowledge **K2-Understand** **K3-Apply**

Mapping of CO with 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

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

Mapping of CO with 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

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

Syllabus

UNIT I 15 Hours

Taxonomy: Outline the Bentham and Hookers' system of classification. Study of the following families and its economic importance: Euphorbiaceae, Asclepiadaceae and Poaceae. Study the medicinal uses of the following plants- *Phyllanthus, Azadirachta* and *Ocimum*, Introduction to Botanical survey of India.

UNIT II 11 Hours

Cell Biology: Ultra structure of plant cell and brief outline of the following organelles: Cell wall, Nucleus, Chloroplast, Mitochondria. Genetics- Mendel's mono and dihybrid cross. Incomplete dominance in monohybrid.

UNIT III 13 Hours

Anatomy: Simple and permanent tissues: Parenchyma, collenchyma, sclerenchyma. Complex permanent tissues: Xylem and phloem. Primary structure of dicot stem, monocot stem, dicot root and monocot root. Structure of mesophytic dicot leaf only.

UNIT IV 11 Hours

Embryology: Structure of anther, Structure of male gametophyte. Types of ovule. Structure of female gametophyte (Polygonum type), Pollination and Fertilization. Structure and development of dicot embryo (Capsella type – *bursa pastoris*), Parthenogenesis.

UNIT V 10 Hours

Plant Biotechnology: Introduction to Plant Tissue Culture, Callus culture, Anther culture and Embryo culture. Sterilization methods. Production of Bio diesel (Jatropha) and Biogas (Cow dung).

Text Books

Sambamurthy, A. V. S. S & Subramanian, N.S, ***A Textbook of Modern Economic Botany***, I K International Publishing House, New Delhi, 2008.

Sambamurthy, A. V. S. S, ***Taxonomy of angiosperms***, I K International Publishing House, New Delhi, 2005.

Verma P.S. and Agarwal V.K, ***Genetics, Molecular Biology, Evolution & Ecology***, S. Chand Publishing, New Delhi, 2004.

B.P. Pandey, ***Taxonomy of Angiosperms*****,** S. Chand & Co., New Delhi, 2001.

Reference Books

Annie Roland, ***Taxonomy of angiosperms*****,** Saras Publication, Nagercoil, 2005.

Bhojwani, S. S. and Bhatnagar, S. P. ***The Embryology of Angiosperms***. Vikas Publishing House Pvt., Ltd., New Delhi, 1981.

Sambamurthy, A. V. S. S. ***Genetics***, Narosa Publishing House, New Delhi, 1999.

Pandey, B. P. ***Plant anatomy***, S. Chand & Co., New Delhi, 1978.

Davis, P.H. and Heywood, V.M, ***Principles of Angiosperm Taxonomy***, Oliver and Boyd Edinburgh. London, 1965.

Pedagogy

Chalk & Talk, E-Resources, Group Discussion

Teaching aids

Black Board, Collected Plants specimens, Permanent Slides, Specimens & LCD projector

Course Contents and Lecture Schedule

Module No.	Topic	No. of Lectures	Content Delivery Methods
	UNIT - I		
1.1	Introduction - Bentham and Hookers' system of classification	3	Chalk & Talk
1.2	Euphorbiaceae - Economic importance	3	Plants specimens
1.3	Asclepiadaceae - Economic importance	3	Discussion
1.4	Poaceae- Economic importance	3	Plants specimens
1.5	*Phyllanthus* – Medicinal uses	1	E-Resources

1.6	*Azadirachta* - – Medicinal uses	1	Discussion
1.7	*Ocimum* – Medicinal uses	1	Plants specimens
UNIT - II			
2.1	Ultra Structure of Plant Cell	2	Permanent Slides
2.2	Cell wall	2	Chalk & Talk
2.3	Nucleus	1	Permanent Slides
2.4	Chloroplast	1	E-Resources
2.5	Introduction to genetics	2	Plants specimens
2.6	Monohybrid Cross	1	E-Resources
2.7	Dihybrid Cross	1	Discussion
2.8	Incomplete Dominance in monohybrid	1	Discussion
UNIT - III			
3.1	Simple and Permanent tissues: Parenchyma, collenchyma, sclerenchyma.	3	Permanent Slides
3.2	Complex permanent tissues: Xylem and Phloem	4	Permanent Slides
3.3	Primary anatomical structure of dicot stem	1	Discussion,
3.4	Primary anatomical structure of dicot root and monocot root	2	E-Resources
3.5	Comparison of Primary anatomical structure of monocot stem with dicot stem	2	Permanent Slides
3.6	Primary anatomical structure of dicot leaf	1	E- Resources
UNIT - IV			
4.1	Introduction to embryology and Structure of anther	2	E-Resources
4.2	Structure of male gametophyte	2	Chalk & Talk
4.3	Types of ovule	1	Permanent Slides
4.4	Structure of female gametophyte	2	Discussion
4.5	Fertilization	1	E-Resources
4.6	Structure and development of dicot embryo	3	E-Resources

UNIT - V			
5.1	Introduction to Plant Biotechnology	1	Chalk & Talk
5.2	Introduction to Plant Tissue Culture	1	E -Resources
5.3	Callus culture, Anther Culture, Embryo Culture	3	Discussion
5.4	Sterilization methods	1	E -Resources
5.5	Bio diesel	1	E-Resources
5.6	Biogas	3	Discussion
	Total	**60**	

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

Course Code	Course Title	Category	Total Hours	Credits
20UBYA2P	Allied Botany Practical	Allied – VI	60	1

Nature of Course	
Knowledge Oriented	
Skill Oriented	✓
Employability Oriented	
Entrepreneurship Oriented	

Course Relevance	
Local	
Regional	
National	✓
Global	

Preamble

To enable the students acquire practical knowledge of Thallophyta, Bryophyta, Pteridophyta, Gymnospermae and demonstrate the Plant physiology setup and to identify Ecological adaptations of plants.

Course Outcomes (CO)

On the successful completion of the course the students will be able to

No.	Course Outcome	Knowledge Level
CO1	Observe the morphology and anatomy of Thallophyta, Bryophyta, Pteridophyta and Gymnospermae	**K1, K2, K3**
CO2	Define the floral characters of Angiosperm plants and find them with suitable locally available plants	**K1, K2, K3**
CO3	Compare anatomy of Dicot stem with Monocot stem	**K1, K2, K3**
CO4	Recall the structure of cell organelles, show how to solve Mendelian genetics and find the tools used in Plant tissue culture	**K1, K2**
CO5	Demonstrate the Physiology setup and identify Ecological adaptations of plants	**K1, K2**

K1-Knowledge K2-Understand K3-Apply

Mapping of CO with PO

	PO1	PO2	PO3	PO4	PO5
CO1	**3**	**3**	**1**	**3**	**3**
CO2	**3**	**3**	**1**	**3**	**3**
CO3	**2**	**3**	**2**	**2**	**3**
CO4	**3**	**2**	**2**	**3**	**2**
CO5	**3**	**3**	**2**	**3**	**3**

1-Low 2-Medium 3-Strong

Mapping of CO with PSO

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	**3**	**3**	**1**	**3**	**3**
CO2	**3**	**3**	**1**	**3**	**2**
CO3	**3**	**2**	**2**	**2**	**3**
CO4	**2**	**3**	**2**	**3**	**2**
CO5	**3**	**3**	**2**	**3**	**3**

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

Syllabus

UNIT I 14 Hours

Thallophyta - Study of morphology of the vegetative and reproductive organs. **Bryophyta-** Study of morphology of the vegetative and reproductive organs. **Pteridophyta-**Study of morphology and anatomy of the vegetative and reproductive organs. **Gymnospermae -** Study of morphology and anatomy of the vegetative and reproductive organs

UNIT II 20 Hours

Morphology and Taxonomy- To describe in technical terms plants belonging to any of the families prescribed in the syllabus and to identify the family. **Economic Importance -**To identify the genus, family and morphology of the parts used for the following plant specimens

Ricinus– Seeds
Phyllanthus embilica- Fruit
Calotropis- Leaf with Latex
Bambusa – Stem
Zea– Cereal Grain
Saccharum- Stem, Jaggery
Azadirachta– Leaf, Seeds, Oil
Manihot – Tuber
Phyllanthus niruri – Whole plant
Hemidesmus – Dried Root
Sorghum – Seed
Oryza– Husk and Hay
Cymbopogon- Aromatic Oil
Ocimum– Plant, Oil

UNIT III 10 Hours

Anatomy - Study the anatomical characters of Dicot and Monocot stem. **Embryology -** Observation of permanent slides of reproductive parts of Angiosperms.

UNIT IV 8 Hours

Cytology - Observation of Electron micrographs of sub-cellular structures.
Genetics - To Study the Monohybrid, Dihybrid and Incomplete dominance.
Biotechnology - To study the tools used in Plant Tissue Culture

UNIT V 8 Hours

Plant physiology - Describe simple experimental setup in plant physiology
Ecology - Study the Plant Adaptations among the various habitats.

Reference Books

Dr. Ashok Bendre, ***C.B.C.S.: B.Sc 1st Year PRACTICAL BOTANY***, Rastogi Publications, 2018.

Dr. Ashok Bendre, ***C.B.C.S.: B.Sc 2nd Year PRACTICAL BOTANY***, Rastogi Publications, 2018.

Pandey B.P, ***Modern Practical Botany - Vol. 1***. S. Chand Limited, 2011.

Pandey B.P, ***Modern Practical Botany - Vol. I1***. S. Chand Limited, 2011.

Pandey B.P, ***Modern Practical Botany - Vol. II1***. S. Chand Limited, 2011.

Pedagogy

Sectioning, Dissection, Demonstration and Chalk & talk.

Teaching Aids

Blackboard, Collected fresh plants samples, Specimens, Charts and Permanent Slides.

Course Contents and Lecture Schedule

Module No.	Topic	No. of Lectures	Content Delivery Methods
UNIT - I			
1.1	To prepare a temporary slide of *Nostoc*	2	Plants specimens
1.2	To prepare a temporary slide of S*argassum* Stem	2	Plants specimens
1.3	To prepare a temporary slide of *Saccharomyces*	2	Plants specimens
1.4	To prepare a temporary slide of *Agaricus* gills	2	Plants specimens
1.5	To observe a Permanent slide of *Funaria* capsule, *Selaginella* cone, stem	2	Permanent slide
1.6	To prepare a temporary slide of *Pinus* needle	2	Plants specimens
1.7	To prepare a temporary slide of *Selaginella* stem	2	Permanent slide
UNIT - II			
2.1	Morphology of leaf and phyllotaxy	2	Plants specimens
2.2	Inflorescence and its types	2	Plants specimens
2.3	Dissection and taxonomic description of plants	10	Plants specimens
2.4	Economic importance of plant specimens	4	Plants specimens
2.5	Study of medicinal plants	2	Plants specimens

UNIT - III			
3.1	T.S of dicot stem and monocot stem	4	Plants specimens, Permanent slide
3.2	To observe permanent slides of different types of cells	2	Permanent slide
3.3	T.S of Anther	2	Permanent slide
3.4	L.S of Ovule	2	Permanent slide
UNIT - IV			
4.1	Monohybrid cross	2	Demonstration
4.2	Dihybrid cross	2	Demonstration
4.3	Incomplete Dominance cross	2	Demonstration
4.4	Tools of Plant Tissue Culture	2	Demonstration
UNIT - V			
5.1	Ganong's Potometer experiment	2	Experiment Demonstration
5.2	Mohl's Half Leaf experiment	2	Experiment Demonstration
5.3	Morphological Adaptations in Xerophytes and Hydrophytes	4	Permanent slide
	Total	**60**	

Course Designer
Dr. A. Maajitha Begam,
Assistant Professor of Botany

Course Code	Course Title	Category	Total Hours	Credits
20UZYC51	Ecology	Core–IX	60	4

Nature of Course	
Knowledge Oriented	✓
Skill Oriented	
Employability Oriented	
Entrepreneurship Oriented	

Course Relevance	
Local	
Regional	
National	
Global	✓

Preamble

To enable the students acquire knowledge on ecological applications and understand how ecology is the study of relationships between organisms and their environment.

Course Outcomes (CO)

On the successful completion of the course the students will be able to

No.	Course Outcome	Knowledge Level
CO1	Define the functional Characteristics of Ecosystems and Ecological Cycles	**K1, K2**
CO2	Explain the Functional and Structural Features of Communities.	**K1, K2**
CO3	Describe the dyanamic populations, find the causes and control of pollutions and social issues.	**K1, K2**
CO4	Explain the conservation of biodiversity, List out the Endangered and Endemic species.	**K1, K2, K3**
CO5	Summarize the Types, causes an control of disasters and Explain the needs and methods of rain water harvesting.	**K1, K2, K3**

K1-Knowledge K2-Understand K3-Apply

Mapping of CO with PO

	PO1	PO2	PO3	PO4	PO5
CO1	**3**	**3**	**3**	**2**	**3**
CO2	**3**	**3**	**3**	**1**	**3**
CO3	**3**	**3**	**1**	**2**	**3**
CO4	**3**	**2**	**3**	**3**	**3**
CO5	**3**	**3**	**1**	**2**	**3**

1-Low 2-Medium 3-Strong

Mapping of CO with PSO

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	**3**	**3**	**3**	**2**	**3**
CO2	**3**	**3**	**3**	**1**	**3**
CO3	**3**	**3**	**1**	**2**	**3**
CO4	**3**	**2**	**3**	**3**	**3**
CO5	**3**	**3**	**1**	**2**	**3**

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

Syllabus

UNIT I 12 Hours

Biotic and Abiotic factors: Light-Light on land and in water- Biological effects of Light (effect on metabolism, reproduction-pigmentation-development-locomotion and movement-diurnal migration only). Temperature: Thermal stratification and biological effects (metabolism-reproduction- development- morphology and Cyclomorphosis only) - Ecosystem – Definition-components-food chain and its types-food web-ecological pyramid. Bio-geochemical cycles – Carbon-Phosphorous and Nitrogen cycle.

UNIT II 12 Hours

Habitat & Community Ecology: Fresh water: Types of ponds and pond fauna. Marine water: Characteristics stratification, plain muddy shore and deep sea adaptations. Estuaries: Fauna and their adaptations. Definition to Community, characteristics, diversity, Ecotone and edge effect and ecological niche, equivalence and ecological succession.

UNIT III 12 Hours

Population Ecology, Pollution& Social issues: Natality, mortality, age distribution, growth factors, fluctuation and equilibrium, dispersal and distribution, regulation of population-Animal relationship- Air and water pollutions- Climatic change, green house effect and global warning, acid rain, Ozone layer depletion, Bhopal episode, stone leprosy in Taj Mahal and minamata diseases.

UNIT IV 12 Hours

Human Ecology & Biodiversity and conservation: Emergence of man-Population growth-Our hungry planet -Green Revolution-Future of man-Biogeographical classification of India-Biodiversity: Biodiversity of Tamilnadu-Hot spot of Biodiversity-Endangered& Endemic species of India-IUCN-Red data book

UNIT V 12 Hours

Disaster management & Rainwater Harvesting: Introduction: Flood-Drought - Drought – Earthquake – Cyclone - land slide -Tsunami. Conservation of Ecosystem- Rainwater Harvesting - Needs and methods.

Text Books

Odum E.P, ***Fundamentals of Ecology***, Nataraj Publishers, Dehradun, 1996.

Stiling. P, ***Ecology – Theories and applications***, Prentice Hall of India Pvt. Ltd., New Delhi, 2004.

Reference Books

Briggs. D, Smithson. P, Addison. K and Atkinson. K, Fundamentals ***of Physical Environment***, Routledge, UK, 2017, II Edition

Chang. K, ***Geological Information system***, Tata McGraw Hill publishers, New Delhi, 2012.

Kumaraswamy. K, Alagappa Moses. A and Vasanthy. M, ***Environmental Studies***, Bharathidasan University Publication, Tiruchirappalli, 2001.

Cunningham W. P and Saigo B.W, ***Environmetal science***, Tata McGraw Hill publishing Co., New Delhi, 2019, V Edition,

Krishnamoorthy K.V, An ***Advanced Text Book of Biodiversity-principles and practice***, II reprint, Oxford & IBH Publishing Co. Pvt. Ltd. New Delhi, 2014.

Pedagogy

Chalk & Talk, E-Resources, Group Discussion

Teaching aids

Black Board, LCD Projector

Course Contents and Lecture Schedule

Module No.	Topic	No. of Lectures	Content Delivery Methods
	UNIT - I		
1.1	Light: Light on land and in water-Biological effects of Light (effect on metabolism, reproduction-pigmentation-development-locomotion and movement-diurnal migration only).	3	Chalk & Talk
1.2	Temperature: Thermal stratification and biological effects (metabolism reproduction- development- morphology and cyclomorphosis only)	3	E-Resources

1.3	Ecosystem – Definition-components-food chain and its types-food web-ecological pyramid	3	Discussion
1.4	Bio-geochemical cycles – carbon-phosphorous and nitrogen cycle.	3	E-Resources
UNIT - II			
2.1	Fresh water: Types of ponds and pond fauna. Marine water: Characteristics stratification, plain muddy shore and deep sea adaptations.	4	Discussion
2.2	Estuaries: Fauna and their adaptations.	4	Chalk & Talk
2.3	Definition to Community, characteristics, diversity, Ecotone and edge effect and ecological niche, equivalence and ecological succession.	4	E-Resources
UNIT - III			
3.1	Natality, mortality, age distribution, growth factors, fluctuation and equilibrium, dispersal and distribution, regulation of population	3	E-Resources
3.2	Animal relationship	3	Chalk & Talk
3.3	Air and water pollutions	3	Discussion
3.4	Climatic change, green house effect and global warning, acid rain, Ozone layer depletion, Bhopal episode, stone leprosy in Taj Mahal and minamata diseases.	3	E-Resources
UNIT - IV			
4.1	Emergence of man-Population growth - Our hungry planet	3	Discussion
4.2	Green Revolution-Future of man - Biogeographical classification of India - Biodiversity	3	E-Resources
4.3	Biodiversiry of Tamilnadu-Hot spot of Biodiversity	3	Chalk & Talk
4.4	Endangered& Endemic species of India - IUCN-Red data book	3	E-Resources

UNIT - V			
5.1	Introduction - Types, causes, damages, protective steps caused by flood - Drought	4	E-Resources
5.2	Earthquake – Cyclone - land slide - Tsunami	4	Chalk & Talk
5.3	Conservation of Ecosystem - Rainwater Harversting - Needs and methods	4	Discussion
	Total	**60**	

Course Designer
Ms. Athira Sukumaran
Assistant Professor of Zoology

Course Code	Course Title	Category	Total Hours	Credits
20UZYC52	Evolution	Core – X	75	5

Nature of Course	
Knowledge Oriented	✓
Skill Oriented	
Employability Oriented	
Entrepreneurship Oriented	

Course Relevance	
Local	
Regional	
National	
Global	✓

Preamble

To enable the students acquire knowledge on the relationship between natural selection and evolution, the interconnections among organisms and the environment humans have evolved and how our actions effect the evolution of other organisms.

Course Outcomes (CO)

On the successful completion of the course the students will be able to

No.	Course Outcome	Knowledge Level
CO1	Define the Charles Darwin and his contribution to the theory of evolution	**K1, K2**
CO2	Explain the Adaptive colouration and relationship between natural selection and evolution	**K1, K2**
CO3	Demonstrate the Elemental forces of Evolution and list out the types and causes of variation.	**K1, K2**
CO4	Classify the types of speciation and Isolation, Explain the important Indian fossils	**K1, K2, K3**
CO5	Identify the Extinct animals and Examine the evolution of man and horse	**K1, K2, K3**

K1-Knowledge K2-Understand K3-Apply

Mapping of CO with PO

	PO1	PO2	PO3	PO4	PO5
CO1	**3**	**3**	**3**	**2**	**3**
CO2	**3**	**3**	**3**	**1**	**3**
CO3	**3**	**3**	**1**	**2**	**3**
CO4	**3**	**2**	**3**	**3**	**3**
CO5	**3**	**3**	**1**	**2**	**3**

1-Low 2-Medium 3-Strong

Mapping of CO with PSO

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	2	3
CO2	3	3	3	1	3
CO3	3	3	1	2	3
CO4	3	2	3	3	3
CO5	3	3	1	2	3

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

Syllabus

UNIT I 15 Hours

Theories of Evolution: Theories of origin of life-Evidence: morphological-Embryological - Biochemical and paleontological evidence - Lamarckism and neo-Lamarckism. Darwin voyage to Galapagos island. Darwinism and Neo-Darwinism.

UNIT II 15 Hours

Adaptive Colouration& Natural Selection : Micro and Macroevolution-Adaptive colouration, Mimicry-Betasian and Mullerian types- Missing links-Living fossils-Natural selection- types-stabilizing selection, directional selection and disruptive selection.

UNIT III 15 Hours

Variation & Types of Ploidy: Elemental force of Evolution, variation-types, source of variation, polyploidy. Types, causes, orgin of polyploidy, characteristics, polyploidy as a means of species-Hardy Weinberg law and evolution, genetic drift-salient features, Bottle neck phenomenon.

UNIT IV 15 Hours

Speciation, Formation& Types of Fossils: Speciation-Types- mechanism-Isolation: Types- Significance of isolation in speciation-patterns of evolution-Fossils-Formation types, Dating of fossils-significance of fossils, Geographical time scale-important Indian fossils-Trilobite, Nautilus Ammonites, Belemnites-living fossils-peripatus, sphenodon.

UNIT V 15 Hours

Extinction & Evolution: Extinction-Extinct animals, Types, causes and significances of extinction-Adaptive radiation-causes of adaptive radiation, adaptive radiation in mammals & Darwin's finches-Evolution of man-Evolution of Horse

Text Book

Rastogi V.B, KedarNath and Ram Nath, Meerat, ***Organic Evolution***, 2003.

Reference Books

Mayr. E, ***Animal Species and Evolution***, Harvard university press, 1963.

Moody P and Ludhiana A***, An Introduction of Evolution***, English-Kalyani Publishers, 2002, III Edition.

Simpson, G. G, Romer A. S, ***Major features of Evolution***, Columbia University Press, 1957.

Dobzhansky, Ayala, stebbin and Valentine, ***Evolution***, W. H. Freeman and Company. 1977.

Pedagogy

Chalk & Talk, E-Resources, Group Discussion

Teaching aids

Black Board, LCD Projector

Course Contents and Lecture Schedule

Module No.	Topic	No. of Lectures	Content Delivery Methods
	UNIT - I		
1.1	Theories of origin of life-Evidence: morphological- Embryological-Biochemical and paleontological evidence	3	Chalk & Talk
1.2	Lamarckism and Neo-lamarckism	4	E-Resources
1.3	Voyage to Galapagos island	4	Discussion
1.4	Darwinism and Neo-Darwinism	4	E-Resources
	UNIT - II		
2.1	Micro and Macroevolution	4	Discussion
2.2	Adaptive colouration, Mimicry-Betasian and Mullerian types	3	Chalk & Talk
2.3	Missing links-Living fossils	4	E-Resources
2.4	Natural selection- types-stabilizing selection, directional selection and disruptive selection	4	E-Resources
	UNIT - III		
3.1	Elemental force of Evolution	3	E-Resources
3.2	Variation-types, source of variation	4	Chalk & Talk
3.3	Polyploidy. Types, causes, origin of polyploidy, characteristics, polyploidy as a means of species	5	Discussion

3.4	Hardy Weinberg law and evolution, genetic drift-salient features, Bottle neck phenomenon.	3	E-Resources
UNIT - IV			
4.1	Speciation-Types- mechanism	3	Discussion
4.2	Isolation: Types- Significance of isolation in speciation-patterns of evolution	4	E-Resources
4.3	Fossils-Formation types, Dating of fossils-significance of fossils, Geographical time scale	4	Chalk & Talk
4.4	Important Indian fossils-Trilobite, Nautilus Ammonites, Belemnites-living fossils-peripatus, sphenodon	4	E-Resources
UNIT - V			
5.1	Extinction-Extinct animals ,Types, causes and significances of extinction	5	E-Resources
5.2	Adaptive radiation-causes of adaptive radiation, adaptive radiation in mammals & Darwin's finches	5	Chalk & Talk
5.3	Evolution of man-Evolution of Horse	5	Discussion
	Total	**75**	

Course Designer
Ms. Athira Sukumaran
Assistant Professor of Zoology

Course Code	Course Title	Category	Total Hours	Credits
20UZYC53	Genetics and Biostatistics	Core – XI	75	5

Nature of Course	
Knowledge Oriented	✓
Skill Oriented	
Employability Oriented	
Entrepreneurship Oriented	

Course Relevance	
Local	
Regional	
National	
Global	✓

Preamble

This course encourages the students to understand the genetic principles and fundamentals of inheritance besides aiding to deal and analyze the biological data.

Course Outcomes (CO)

On the successful completion of the course the students will be able to

No.	Course Outcome	Knowledge Level
CO1	Tell how the traits are being inherited from the parent to off springs	**K1**
CO2	Explain the possible ways of unwanted variations occurring in the genetic makeup of organisms	**K1, K2**
CO3	Use the theoretical knowledge of sex determination and chromosomal aberrations in Genetic counseling for eugenics and euthenics.	**K1, K2, K3**
CO4	Construct/collect the biological data from the given population	**K1, K2, K3**
CO5	Applying of the relevant statistical method for biological data	**K1, K2, K3**

K1-Knowledge K2-Understand K3-Apply

Mapping of CO with 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**

1-Low 2-Medium 3-Strong

Mapping of CO with 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

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

Syllabus

UNIT I 15 Hours

Mendelian Principle: Mendel and his experiments and law of inheritance: Law of Segregation, Law of Independent Assortment, back cross and test cross. Gene interaction: Complementary genes: Flower colour in sweet peas. Supplementary genes: Coat colour in mice. Epistasis: Plumage colour in poultry. Multiple alleles: ABO Blood groups and Rh factor in Human beings. Multiple factors: Skin colour in human beings.

UNIT II 15 Hours

Mutation: Types of mutation- factors affecting mutation-Chromosomal aberration-Structural and numerical alterations of Chromosomes: Deletion, Duplication, Inversion, Translocation, Ploidy and their genetic implications; Linkage and crossing over.

UNIT III 15 Hours

Sex linkage & Inheritance**:** Sex linkage in Man-Sex determination-Environmental, Hormonal control of sex determinations. Pedigree analysis, symbols used in Pedigree analysis. Human chromosomes-Normal Human karyotyping - Inherited disorders – Allosomal and Autosomal types (Turner's syndrome, Down syndrome and Klinefelter's syndrome only) – Genetic counseling - Eugenics & Euthenics. Human Genome Project.

UNIT IV 15 Hours

Biostatistics: Collection of data - Primary and Secondary data-Classification and tabulation of data-Diagrammatic and graphic representations. Measures of central tendency – Calculation of Mean, median and mode – Individual, discrete and continuous series.

UNIT V 15 Hours

Calculation: Measures of dispersion – Calculation of Range, Standard deviation, Standard error, Variance. Correlation and Regression Analysis - Types of correlation using scattered diagrams (Theory alone). Chi square test and its significance, Student 'T' test. One way & Two way annova.

Text Books

Meyyan R. P. ***Genetics,*** Nagercoil. Saras Publications, 2019.9th edition.

Veer Bala Rastogi, ***Biostatistics,*** Medtech publications, New Delhi, 2015, 3rd Edition.

Verma, P. S. and Agarwal, V. K. ***Cell Biology, Genetics Molecular biology Evolution and Ecology***, S. Chand & Co ltd Publication. New Delhi, 2005, 1st edition

Reference Book

Gupta, P.K, ***Genetics***, Rastogi Publications, Meerut. 2006, 3rd edition.

Pedagogy

Chalk & Talk, E-Resources, Group Discussion

Teaching aids

Black Board, LCD Projector

Course Contents and Lecture Schedule

Module No.	Topic	No. of Lectures	Content Delivery Methods
UNIT - I			
1.1	Mendel and his experiments and law of inheritance: Law of Segregation, Law of Independent Assortment, back cross and test cross.	5	Chalk & Talk
1.2	Gene interaction: Complementary genes: Flower colour in sweet peas. Supplementary genes: Coat colour in mice. Epistasis: Plumage colour in poultry.	5	Chalk & Talk
1.3	Multiple alleles: ABO Blood groups and Rh factor in Human beings.	3	Chalk & Talk
1.4	Multiple factors: Skin colour in human beings.	2	Chalk & Talk
UNIT - II			
2.1	Types of mutation- factors affecting mutation	3	Chalk & Talk
2.2	Chromosomal aberration-Structural and numerical alterations of Chromosomes: Deletion, Duplication, Inversion, Translocation	4	Chalk & Talk
2.3	Ploidy and their genetic implications	4	Chalk & Talk

2.4	Linkage and crossing over	4	Chalk & Talk
UNIT - III			
3.1	Sex linkage in Man	2	Chalk & Talk
3.2	Sex determination- Environmental, Hormonal control of sex determinations.	3	Chalk & Talk
3.3	Pedigree analysis, symbols used in Pedigree analysis.	2	Chalk & Talk
3.4	Human chromosome - Normal Human karyotyping - Inherited disorders – Allosomal and Autosomal types (Turner's syndrome, Down syndrome and Klinefelter's syndrome only)	4	Chalk & Talk
3.5	Genetic counseling - Eugenics & Euthenics. Human Genome Project.	4	Chalk & Talk
UNIT - IV			
4.1	Collection of data - Primary and Secondary data	2	Chalk & Talk
4.2	Classification and tabulation of data - Diagrammatic and graphic representations.	3	PPT
4.3	Measures of central tendency – Mean – Individual, discrete and continuous series	4	PPT
4.4	Median – Individual, discrete and continuous series	3	Chalk & Talk
4.5	Mode– Individual, discrete and continuous series	3	Chalk & Talk
UNIT - V			
5.1	Range, Standard deviation, Standard error, Variance	4	Chalk & Talk
5.2	Correlation and Regression Analysis - Types of correlation using scattered diagrams (Theory alone)	4	PPT
5.3	Chi – square test –its significance	4	Chalk & Talk
5.4	Student " T " test	3	PPT
	Total	**75**	

Course Designer
Dr. K. Arifa Banu
Assistant Professor of Zoology

Course Code	Course Title	Category	Total Hours	Credits
20UZYE51	Vermitechnology	Elective - I	75	5

Nature of Course	
Knowledge Oriented	
Skill Oriented	
Employability Oriented	✓
Entrepreneurship Oriented	

Course Relevance	
Local	
Regional	✓
National	
Global	

Preamble

Vermiculture refers to the artificial rearing of earthworms for the production of vermicompost to benefit humans. The utility and variability of research work in this field could be great use to the agricultural community.

Course Outcomes (CO)

On the successful completion of the course the students will be able to

No.	Course Outcome	Knowledge Level
CO1	Define importance and historical perspectives of Vermiculture	K1
CO2	Identify, the management monitoring and harvest of Vermiculture	K1, K2, K3
CO3	Explain the importance of vermicomposting over natural Farm Yard Manure.	K1, K2
CO4	Summarize the economic importance of earthworm	K1, K2
CO5	Define the Antipyretic and Anti-inflammatory activity of earthworm	K1

K1-Knowledge K2-Understand K3-Apply

Mapping of CO with PO

	PO1	PO2	PO3	PO4	PO5
CO1	2	2	2	2	2
CO2	2	2	2	2	2
CO3	1	1	1	1	1
CO4	1	1	1	1	1
CO5	2	2	2	2	2

1-Low 2-Medium 3-Strong

Mapping of CO with 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**

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

Syllabus

UNIT I 15 Hours

Vermibiology – Introduction – Historical perspectives – Taxonomy – Systemic position – Ecological types of earthworms, commonly occurring Indian Earthworms – Exotic earthworms.

UNIT II 15 Hours

Introduction – State of Art of Vermiculture techniques (Laboratory and field) –Working model of typical vermiculture bed – Maintenance, monitoring and harvest – Vermiwash – Preparation and application – Vermibiotechnology for solid waste.

UNIT III 15 Hours

Vermicomposting – Introduction - Vermicomposting methods – Earthworm cast – its importance in soil amelioration – Physico – Chemical properties – Casts of different species – Green waste, animal waste composting – Evaluation of the best suited worm – Advantages of vermicompost over natural Farm Yard Manure.

UNIT IV 15 Hours

Economic importance of Earthworms- Earthworm as a source of food – Live feed – Vermimeal preparation method – Chemical composition of vermimeal.

UNIT V 15 Hours

Earthworm as a source of drugs – Pharmacologically active materials derived from worms – Antipyretic and Anti-inflammatory activity of earthworm

Text Books

Eawag. ***Manual on Farm Vermicomposting and Vermicultur,*** Published by Organic Agriculture centre of Canada, 2011.

Board Eiri, ***Hand book of Biofertilizers and Vermiculture***. Published by USDA, USA, 2013.

Reference Books

Edwards and Bohlen ***Biology and ecology of Earthworms***, Chapman and Hall, London. 2009.

Bhawalkar and Bhawalkar, BERI, Puner, ***Vermiculture Biotechnology***, JS Publishing House, NEW DELHI, 2010.

Sultan A. Ismail, Orient Longman***, Vermicology***, Oxford Press, London, 2013.

K. L. Lee ***Introduction of Earthworms***, Academic Press, London, 2015.

Pedagogy

Chalk & Talk, E-Resources, Group Discussion

Teaching aids

Black Board, LCD Projector

Course Contents and Lecture Schedule

Module No.	Topic	No. of Lectures	Content Delivery Methods
UNIT - I			
1.1	Vermibiology – Introduction	2	Chalk & Talk
1.2	Historical perspectives – Taxonomy	3	E-Resource
1.3	Systemic position – Ecological types of earthworms	2	Discussion
1.4	commonly occurring Indian Earthworms	3	Chalk & Talk
1.5	Exotic earthworms	2	E-Resource
1.6	Ecological types of earthworms	3	Discussion
UNIT - II			
2.1	Vermiculture– Introduction	2	Chalk & Talk
2.2	State of Art of Vermiculture techniques (Laboratory and field)	2	E-Resource
2.3	Working model of typical vermiculture bed.	2	Discussion
2.4	Maintenance, monitoring and harvest	3	Chalk & Talk
2.5	Vermiwash	2	E-Resource
2.6	Preparation and application	2	Discussion

2.7	Vermibiotechnology for solid waste management	2	Chalk & Talk
UNIT - III			
3.1	Introduction - Vermicomposting methods	3	Chalk & Talk
3.2	Earthworm cast – its importance in soil amelioration	2	E-Resource
3.3	Physico, Chemical properties – Casts of different species	3	Discussion
3.4	Casts of different species	2	Chalk & Talk
3.5	Green waste, animal waste composting	2	E-Resource
3.6	Evaluation of the best suited worm – Advantages of vermicompost over natural Farm Yard Manure.	3	Discussion
UNIT - IV			
4.1	Economic importance of Earthworms	4	Chalk & Talk
4.2	Earthworm as a source of food	2	E-Resource
4.3	Live feed	2	Discussion
4.4	Vermimeal preparation method	2	Chalk & Talk
4.5	Chemical composition of vermimeal	3	E-Resource
4.6	Maintenance, monitoring and harvest	2	Discussion
UNIT – V			
5.1	Earthworm as a source of drugs	4	Chalk & Talk
5.2	Pharmacologically active materials derived from worms	4	E-Resource
5.3	Antipyretic activity of earthworm	4	Discussion
5.4	Anti-inflammatory activity of earthworm	3	Discussion
	Total	**75**	

Course Designer
Dr. M. Mohiadeen Batcha
Assistant Professor of Zoology

Course Code	Course Title	Category	Total Hours	Credits
20UZYE52	Ayush	Elective - I	75	5

Nature of Course	
Knowledge Oriented	✓
Skill Oriented	
Employability Oriented	
Entrepreneurship Oriented	

Course Relevance	
Local	
Regional	✓
National	
Global	

Preamble

To enable the students acquire knowledge on ancient and holistic system of medicine like Ayurveda, Yoga, Unani, Siddha, Homeopathy, Naturopathy and understand the principle, theories, treatment and its benefits

Course Outcomes (CO)

On the successful completion of the course the students will be able to

No.	Course Outcome	Knowledge Level
CO1	Illustrate the objectives, principle, elements, treatments followed in Ayurveda System of Medicine and Practice	K1, K2,K3
CO2	Apply Yoga practice to improve Physical and Spiritual health and list out the yoga asanas, pranayama and yoga therapy	K1, K2, K3
CO3	Explain about the principle, elements, theory, diagnosis and therapautics used in Perso-Arabic traditional medicine system.	K1, K2,K3
CO4	List out the principle, diagnosis and treatment and drugs used in the Siddha system of medicine.	K1, K2,K3
CO5	Outline the principle, source, precautions and remedies used in Homoeopathy and Naturopathy system of medicine.	K1, K2, K3

K1-Knowledge K2-Understand K3-Apply

Mapping of CO with PO

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

1-Low 2-Medium 3-Strong

Mapping of CO with PSO

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	1
CO2	3	2	3	3	3
CO3	3	3	1	2	3
CO4	3	3	3	3	3
CO5	3	3	2	3	3

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

Syllabus

UNIT I 15 Hours

Ayurveda: Basics , Objective, Fundamental Principles, Panchamahabhootha, Prakruti, Elements of Tridoshas, Ayurveda for Common Disease Conditions.

UNIT II 15 Hours

Yoga**:** Introduction, General Guidelines for Yoga Practice, Yogasanas, Kapalbhati, Pranayama, Yoga Therapy, International Yoga Day.

UNIT III 15 Hours

Unani**:** Introduction, Principle and Elements of Unani, Theory of Unani Medicine, Diagnosis, Prevention of Disease, Therapeutics.

UNIT IV 15 Hours

Siddha**:** Overview of Siddha , Theory and Basic Principles, Diagnosis and Treatment, Stress Management in Siddha, Important Siddha Drugs and Its Uses.

UNIT V 15 Hours

Homoeopathy and Naturopathy: Introduction, Fundamental Principles, Homoeopathic Remedies, Sources and Active Ingredients, Precautions, World Homeopathy Day.Naturopathy: Introduction, Principal, Fundamental elements, Diagnosis and Therapeutics.

Text Books

T.G. Ramamurti Iyer. ***The Handbook of Indian Medicine or The Gems of Siddha Systems.*** 2005.

Sunil V. Joshi**,** ***Ayurvedha and Panchakarma***. 1997

Dr. V. B. Athavale, ***Basic Principles of Ayurveda***. 1980.

Stephen Cummings, MD and Dana Ullman, MPH. ***Everybody's Guide to Homeopathic Medicines.*** 1984

R Alagappan. ***Medicine for AYUSH Students (Ayurveda, Yoga & Naturopathy, Unani, Siddha and Homeopathic Students)****.* 2017

Kamakhya Kumar. ***Yoga Education*****.** 2012

Reference Books

Paul Joseph Thottam. ***Siddha Medicine Handbook of Traditional Remedies.*** Kindle Edition. 2012.

Fundamental Principles of Ayurveda by Vasant Ltd. 2001

Hakkim Ashar Qadeer and Jamil Ahmad. ***Unani – The science of Gracco-Arabic medicine.*** **1999**

Dr. Rajan Sankaran. ***The synergy in Homeopathy***. 1955

Pedagogy

Chalk & Talk, E-Resources, Group Discussion

Teaching aids

Black Board, LCD Projector

Course Contents and Lecture Schedule

Module No.	Topic	No. of Lectures	Content Delivery Methods
UNIT - I			
1.1	Ayurveda - Basics and Objectives	3	Chalk & Talk
1.2	Fundamental Principles	2	Chalk & Talk
1.3	Panchamahabhootha	3	Discussion
1.4	Prakruti	2	E-Resources
1.5	Elements of Tridoshas	3	E-Resources
1.6	Ayurvedha for Common Disease Conditions	2	E-Resources
UNIT - II			
2.1	Introduction	2	Chalk & Talk
2.2	General Guidelines for Yoga Practice	2	Discussion
2.3	Yogasanas	2	E-Resources
2.4	Kapalbhati	2	E-Resources
2.5	Pranayama	2	E-Resources
2.6	Yoga Therapy	2	E-Resources
2.7	International Yoga Day	3	Chalk & Talk

UNIT - III			
3.1	Introduction	2	Chalk & Talk
3.2	Principle and Elements of Unani	3	Discussion
3.3	Theory of Unani Medicines	2	Chalk & Talk
3.4	Diagnosis	3	Discussion
3.5	Prevention of Disease	2	E-Resources
3.6	Therapeutics	3	E-Resources
UNIT - IV			
4.1	Overview of Siddha	3	Discussion
4.2	Theory and Basic Principles	3	Chalk & Talk
4.3	Diagnosis and Treatment	3	E-Resources
4.4	Stress management in Siddha	3	Chalk & Talk
4.5	Important Siddha Drugs and Its Uses	3	E-Resources
UNIT - V			
5.1	Introduction	2	Chalk & Talk
5.2	Fundamental Principles	2	Chalk & Talk
5.3	Homoeopathic Remedies	2	E-Resources
5.4	Sources and Active Ingredients	1	E-Resources
5.5	Precautions	2	Discussion
5.6	World Homeopathy Day	1	Chalk & Talk
5.7	Naturopathy- Introduction and Principles	1	Chalk & Talk
5.8	Fundamental elements	2	Discussion
5.9	Diagnosis and Therapeutics	2	E-Resources
	Total	**75**	

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

Course Code	Course Title	Category	Total Hours	Credits
20UZYE53	Aquaculture	Elective - I	75	5

Nature of Course	
Knowledge Oriented	
Skill Oriented	
Employability Oriented	✓
Entrepreneurship Oriented	

Course Relevance	
Local	
Regional	
National	
Global	✓

Preamble

To enable the students to find out the aquatic living resources and develop skill to culture them for the benefit of mankind.

Course Outcomes (CO)

On the successful completion of the course the students will be able to

No.	Course Outcome	Knowledge Level
CO1	Outline the list of aquatic organisms that can be cultured	**K1, K2**
CO2	Explain the feeding biology of cultivable species in aquaculture	**K1, K2**
CO3	List out the culture methods and illustrate the methods of artificial spawning	**K1, K2**
CO4	Identify the value added products and Solve the issues of cultivable organisms being over exploited by making use of simple fish preservation techniques	**K1, K2, K3**
CO5	Identify, control and prevent the pathogens of fish culture	**K1, K2, K3**

K1-Knowledge K2-Understand K3-Apply

Mapping of CO with 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**

1-Low 2-Medium 3-Strong

Mapping of CO with 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**

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

Syllabus

UNIT I 15 Hours

Introduction to Aquaculture - Definition and Scope - Importance- Origins and growth of Aquaculture-Current status of aquaculture. Classification of Fisheries - List of Fishing gears and crafts in India.

UNIT II 15 Hours

Food and feeding habit of fishes. Live feed and Artificial feed. Energy sources- Brood stock and larval nutrition

UNIT III 15 Hours

Culture Methods of Fishes: Induced spawning of Indian Carps, Culture practices - Paddy cum fish culture; Monoculture; Composite fish culture; Sewage fed fisheries; Cage fish culture.

UNIT IV 15 Hours

Preservation & Processing technologies: Fish preservation and processing- Sun drying; Salt curing; Chilling; freezing; Canning of fishes. Value added products – fish meal and fish oil.

UNIT V 15 Hours

Disease Management: Pests; Predators; Diseases: Control of aquatic insects-predatory and weed fishes- Methods of weed control i.e., manual; chemical and biological methods. Fish diseases (White spot disease; Fungal gill rot disease; Erythroderma; Epizootic Ulcerative Syndrome).

Text Book

TVR Pillai and MN Kutty, ***Aquaculture: Principles and Practices***, Wiley Blackwell, USA, 2005.

Reference Books

Shukla and Upadhyay, ***Economic Zoology***, Rastogi publications, Meerut, 2015.

Arumugam, N, ***Aquaculture***, Saras publication, Nagercoil. 2019.

Pedagogy

Chalk & Talk, E-Resources, Group Discussion

Teaching aids

Black Board, LCD Projector

Course Contents and Lecture Schedule

Module No.	Topic	No. of Lectures	Content Delivery Methods
UNIT - I			
1.1	Aquaculture: Definition and Scope	2	Chalk & Talk
1.2	Importance of aquaculture	3	E-Resources
1.3	Origins and growth of aquaculture	2	E-Resources
1.4	Current status of aquaculture	2	Chalk & Talk
1.5	Classification of Fisheries	4	E-Resources
1.6	List of Fishing gears and crafts in India	2	Chalk & Talk
UNIT - II			
2.1	Food and feeding habit of fishes	3	PPT
2.2	Live feed	3	E-Resources
2.3	Artificial feed	3	E-Resources
2.4	Energy sources	3	Chalk & Talk
2.5	Brood stock and larval nutrition	3	E-Resources
UNIT - III			
3.1	Culture Methods of Fishes: Induced spawning of Indian Carps	3	E-Resources
3.2	Paddy cum fish culture	3	Chalk & Talk
3.3	Monoculture	2	Discussion
3.4	Composite fish culture	3	E-Resources
3.5	Sewage fed fisheries	2	E-Resources
3.6	Cage fish culture	2	Discussion

UNIT - IV			
4.1	Preservation & Processing technologies: Fish preservation and processing	3	Discussion
4.2	Sun drying	2	E-Resources
4.3	Salt curing	3	Chalk & Talk
4.4	Chilling, freezing	2	Discussion
4.5	Canning of fishes	3	Chalk & Talk
4.6	Value added products – fish meal, fish oil	2	Discussion
UNIT - V			
5.1	Disease Management: Pests, Predators, Diseases	4	E-Resources
5.2	Control of aquatic insects, and predatory and weed fishes	3	Chalk & Talk
5.3	Methods of weed control i.e., manual, chemical and biological methods	4	E-Resources
5.4	Fish diseases (White spot disease, Fungal gill rot disease, Erythroderma, Epizootic Ulcerative Syndrome)	4	E-Resources
	Total	**75**	

Course Designer
Dr. M. Mohiadeen Batcha
Assistant Professor of Zoology

Course Code	Course Title	Category	Total Hours	Credits
20UZYS51	Immunology	SBS-I	30	2

Nature of Course	
Knowledge Oriented	✓
Skill Oriented	
Employability Oriented	
Entrepreneurship Oriented	

Course Relevance	
Local	
Regional	
National	
Global	✓

Preamble

Immunology deals with cells and organs of immune system, antigen, antibody - structure & diversity and antigen-antibody interactions. Clinical aspects such as hypersensitivity reactions, autoimmunity, and disorders of immune response, transfusion, transplantation and tumour Immunology are also dealt.

Syllabus

UNIT I 6 Hours

Scope of Immunology: Introduction to Immunology - History of Immunology – Primary & secondary lymphoid Organs – Thymus - Bursa of Fabricius in birds - Paeyer's patches – Tonsils - Bone marrow & Spleen.

UNIT II 6 Hours

Types of Immunity: Innate Immunity - Acquired Immunity - Humoral Immunity - Cell Mediated Immunity. Antigens: Haptens – Epitopes - Paratope. Antibodies: Structure & functions of IgG.

UNIT III 6 Hours

Immune Response of Antigen & Antibody: Antigen- Antibody reactions: Immune complex- Avidity- Precipitation- agglutination.

UNIT IV 6 Hours

Types of Hypersensitivity: Hypersensitivity- types- Antibody dependent Hypersensitivity- Cytotoxic Hypersensitivity alone. Autoimmune Disease: Rheumatoid arthritis Haemolytic Anaemia- Myasthenia gravis.

UNIT V 6 Hours

Vaccination Types: Major Histocompatability Complexes (MHC)-Vaccines-Types- Inactivated & Attenuated - Immunization- Active & Passive. Immunization Schedule.

Text Book

Punt J, Stranford S, Jones P and Owen J Kuby ***Immunology,*** W.H. Freeman and Co., New York (2018) Eighth edn,

Reference Books

Coico R and Sunshine G ***Immunology***: A short course, Wiley Blackwell, New York. (2009) Sixth edn,

Delves PJ, Martin SJ, Burton DR and Roitt IM ***Essential Immunology,*** Blackwell Publishers Ltd, UK. (2006) **Eleventh edn**,

Khan FH ***The Elements of Immunology***, Pearson Education, New Delhi. (2009) First edn.

Pedagogy

Chalk & Talk, E-Resources, Group Discussion

Teaching aids

Black Board, LCD Projector

Course Contents and Lecture Schedule

Module No.	Topic	No. of Lectures	Content Delivery Methods
UNIT - I			
1.1	Introduction – Primary & secondary lymphoid Organs	**2**	Chalk & Talk
1.2	Thymus- Bursa of Fabricius in birds	**2**	E-Resources
1.3	Paeyer's patches- Tonsils	1	Discussion
1.4	Bone marrow & Spleen	1	E-Resources
UNIT - II			
2.1	Types of Immunity - Innate Immunity	1	Discussion
2.2	Acquired Immunity-Humoral Immunity	1	Chalk & Talk
2.3	Cell Mediated Immunity	1	E-Resources
2.4	Antigens: Haptens	1	E-Resources
2.5	Epitopes- Paratope	1	Discussion
2.6	Antibodies: Structure & functions of IgG	1	Chalk & Talk
UNIT - III			
3.1	Introduction - Antigen.	2	E-Resources
3.2	Antibody reactions.	1	Chalk & Talk

3.3	Immune complex.	1	Discussion
3.4	Avidity.	1	Chalk & Talk
3.5	Precipitation- agglutination.	1	Discussion
UNIT - IV			
4.1	Hypersensitivity- types.	2	Discussion
4.2	Antibody dependent Hypersensitivity.	1	E-Resources
4.3	Cytotoxic Hypersensitivity alone.	1	Chalk & Talk
4.4	Autoimmune Disease: Rheumatoidarthritis.	1	Discussion
4.5	Haemolytic Anaemia - Myasthenia gravis.	1	E-Resources
UNIT - V			
5.1	Major Histocompatibility complexes (MHC)	1	E-Resources
5.2	Introduction - Vaccines.	1	Chalk & Talk
5.3	Types of vaccines.	1	Discussion
5.4	Inactivate vaccines	1	Lecture video
5.5	Attenuated vaccines.	1	PPT
5.6	Immunization - Active & Passive, Immunization Schedule.	1	PDF
	Total	**30**	

Course Designer
Ms. P. Vinnoli
Assistant Professor of Zoology

Course Code	Course Title	Category	Total Hours	Credits
20UZYS52	Zoology for Competitive Examination Paper – I	SBS - II	30	2

Nature of Course	
Knowledge Oriented	
Skill Oriented	
Employability Oriented	✓
Entrepreneurship Oriented	

Course Relevance	
Local	
Regional	
National	✓
Global	

Preamble

To enable the students to Appear for competitive exams.

Syllabus

UNIT I 6 Hours

Non-Chordates and Vertebrates: Classification and relationship of various phyla up to subclasses: Acoelomate and Coelomate, Protostomes and Deuterostomes, Bilateria and Radiata; Status of Protista, Parazoa, Ony chophora and Hemichordata - Symmetry. Protozoa: Locomotion, nutrition, reproduction, sex; General features and life history of Paramaecium, Monocystis, Plasmodium and Leishmania. Porifera: Skeleton, canal system and reproduction. Cnidaria: Polymorphism, defensive structures and their mechanism; coral reefs and their formation. Platyhelminthes: Parasitic adaptation; general features and life history of Fasciola and Taenia and their pathogenic symptoms. Nemathelminthes, Annelida, Arthropoda, Mollusca, Echinodermata, Protochordata, Pisces, Amphibia, Reptilia, Aves, Mammalia.

UNIT II **6** Hours

Ecology: Biosphere, Concept of ecosystem, Population; characteristics, population dynamics, population stabilization. Biodiversity and diversity conservation of natural resources, Wildlife of India, Remote sensing for sustainable development, Environmental biodegradation, pollution and its impact on biosphere and its prevention.

UNIT III **6** Hours

Ethology: Behaviour- Sensory filtering, reponsiveness, sign stimuli, learning and memory, instinct, habituation, conditioning, imprinting. Orientation, navigation, homing, biological rhythms, biological clock, tidal, seasonal and circadian rhythms. Methods of studying animal behaviour including sexual conflict, selfishness, kinship and altruism.

UNIT IV 6 Hours

Economic Zoology: Apiculture, sericulture, lac culture, carp culture, pearl culture, prawn culture, vermiculture. Transgenic animals. Medical biotechnology, human genetic disease and genetic counselling, gene therapy. Forensic biotechnology.

UNIT V 6 Hours

Biostatistics and Instrumentation Methods: Designing of experiments; null hypothesis; correlation, regression, distribution and measure of central tendency, chi square, student-test, F-test (one-way & two-way F-test). Spectrophotometer, phase contrast and fluorescence microscopy, radioactive tracer, ultra centrifuge, gel electrophoresis, PCR, ELISA, FISH and chromosome painting. Electron microscopy (TEM, SEM).

Reference Books

Barnes, R.D (1987). ***Invertebrate Zoology***, W.B. Saunders, NewYork.

Groove, A.J,Newell, G.E. (1974). ***Animal Biology***–Indian Reprint, University Book Stall, New Delhi. 6.

Hyman, L.H (1942). ***The Invertebrate volumes***. McGraw-Hill.

Kotpal R.L,Agarwal S.K, R.P. Khetharpal (2002). ***Modern Text Book of Zoology***. Rastogi Publications, Meerut.

Mayr, E (1980). ***Principles of Systematic Zoology*** Tata McGraw Hill Publishing Co., New Delhi

Dr.N.Arumugam, V. Kumaresan, **Saras biology**

PD Sharma ***Ecology and Environment***

Pedagogy

Chalk & Talk, E-Resources, Group Discussion

Teaching aids

Black Board, LCD Projector

Course Contents and Lecture Schedule

Module No.	Topic	No. of Lectures	Content Delivery Methods
UNIT - I			
1.1	Classification and relationship of various phyla up to subclasses: Acoelomate and Coelomate, Protostomes and Deuterostomes, Bilateria and Radiata; Status of Protista, Parazoa, Onychophora and Hemichordata - Symmetry. Protozoa: Locomotion, nutrition, reproduction, sex; General features and life history of Paramaecium, Monocystis, Plasmodium and Leishmania. Porifera: Skeleton, canal system and reproduction. Cnidaria: Polymorphism, defensive structures and their mechanism; coral reefs and their formation.	**3**	Chalk & Talk
1.2	Platyhelminthes: Parasitic adaptation; general features and life history of Fasciola and Taenia and their pathogenic symptoms. Nemathelminthes, Annelida, Arthropoda, Mollusca, Echinodermata, Protochordata, Pisces, Amphibia, Reptilia, Aves, Mammalia.	**3**	Discussion
UNIT - II			
2.1	Biosphere, Concept of ecosystem, Population; characteristics, population dynamics, population stabilization. Biodiversity and diversity conservation of natural resources, Wildlife of India	3	Chalk & Talk
2.2	Remote sensing for sustainable development, Environmental biodegradation, pollution and its impact on biosphere and its prevention.	3	Chalk & Talk

UNIT - III			
3.1	Behaviour: Sensory filtering, reponsiveness, sign stimuli, learning and memory, instinct, habituation, conditioning, imprinting. Orientation, navigation, homing, biological rhythms, biological clock, tidal, seasonal and circadian rhythms.	4	Chalk & Talk
3.2	Methods of studying animal behaviour including sexual conflict, selfishness, kinship and altruism.	2	Chalk & Talk
UNIT - IV			
4.1	Apiculture, sericulture, lac culture, carp culture, pearl culture, prawn culture, vermiculture. Transgenic animals.	**3**	Discussion
4.2	Medical biotechnology, human genetic disease and genetic counselling, gene therapy. Forensic biotechnology.	**3**	Chalk &Talk
UNIT - V			
5.1	Designing of experiments; null hypothesis; correlation, regression, distribution and measure of central tendency, chi square, student-test, F-test (one-way & two-way F-test).	**3**	Chalk & Talk
5.2	Spectrophotometer, phase contrast and fluorescence microscopy, radioactive tracer, ultra centrifuge, gel electrophoresis, PCR, ELISA, FISH and chromosome painting. Electron microscopy (TEM, SEM).	**3**	Discussion
	Total	**30**	

Course Designer
Dr. Mr. P. Raja
Assistant Professor of Zoology

Course Code	Course Title	Category	Total Hours	Credits
20UZYC61	Biotechnology	Core – XII	60	4

Nature of Course	
Knowledge Oriented	✓
Skill Oriented	
Employability Oriented	
Entrepreneurship Oriented	

Course Relevance	
Local	
Regional	
National	
Global	✓

Preamble

This course provides theoretical bases to properties and techniques of adaptable DNA modifying enzymes, cloning strategies, vector types, host genotype specificities for selection and screening of recombinants and/or recombinant transformants. It illustrates the fundamental steps in gene cloning and its application in the field of industry and medicine.

Course Outcomes (CO)

On the successful completion of the course the students will be able to

No.	Course Outcome	Knowledge Level
CO1	Elaborate the various tools and techniques of genetic engineering.	**K1, K2**
CO2	Explain various molecular cloning methods involve in the commercial production of medicines and food.	**K1, K2**
CO3	Recognize the innovative techniques learnt in basic and applied fields of biological research.	**K1, K2**
CO4	Explain the principles underlying DNA amplification and gene cloning in plant cells.	**K1, K2, K3**
CO5	Determine the research methodologies employing genetic engineering techniques in environmental protection.	**K1, K2, K3**

K1-Knowledge K2-Understand K3-Apply

Mapping of CO with 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**

1-Low 2-Medium 3-Strong

Mapping of CO with 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

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

Syllabus

UNIT I 12 Hours

Conventional Vs Modern biotechnology: Conventional Vs Modern biotechnology; Multi-disciplinary tree Tools for Genetic engineering - Recombinant DNA (rDNA) Technology- Gene Cloning and its tools – Host, Vectors, Enzymes, Cosmids. Major Steps involved in cloning of Human insulin Gene.

UNIT II 12 Hours

Gene cloning strategies: Gene cloning strategies: Selection of desired DNA fragments, linkers and adapters, Transformation (heatshock, electroporation, microinjection) and transfection. Direct gene transfers through Ti plasmid. Screening of recombinants: colony hybridization, antibiotic based, blue white screening, Imuno based. Construction of genomic, cDNA libraries & Gene therapy

UNIT III 12 Hours

Animal Biotechnology: Cloning of Animals- methods and its uses; Application of transgenic Animals- rDNA Protein production - Interferon, Interleukin, Urokinase application in Fish & Sheep; rDNA vaccines (types only); Hybridoma Technology- Production and application of Monoclonal Antibodies MCA/ Mabs; Polymerase chain reaction (PCR), Blotting techniques- Southern& Northern blots; DNA finger printing and its uses.

UNIT IV 12 Hours

Plant Biotechnology: Plant cell and tissue culture (PTC), culture media, Types of plant tissue cultures (Callus, suspension, protoplast, anther & ovule cultures, somatic embryos and meristem cultures). Micropropagation and somatic embryogenesis. Applications of PTC: Massive plant production, virus free plants, Embryo rescue of endangered plants, Germplasm collection and seed conservation.

UNIT V 12 Hours

Environmental Biotechnology: Biodegradation – Definition- Xenobiotics- Biodegrading agents- treatment of toxic pollutants and its advantages. *Psedomonasputida*- Super Bug; Polymerase chain reaction (PCR), Blotting techniques- Southern& Northern blots; DNA finger printing and its uses. Rural biotechnology: Red, White, Blue & Green biotechnology.

Text Books

Dubey R. C, ***A text book of Biotechnology***, S. Chand & Company, New Delhi, 2009.

Satyanarayana U, ***Biotechnology***, Books and Allied (P) Ltd., Kolkata, 2010

Reference Books

Brown, T.A, ***Gene Cloning & DNA Analysis: An introduction***, Blackwell publishing, USA, 2006, V Edition.

Glick. R and Pasternak. J, ***Molecular Biotechnology***, Panima Publishers, New Delhi, 1994

Balasubramanian, D, C. F. A. Bryce, K. Dharmalingam, Y. Green, Kunthala Jeyaraman, ***Concepts in Biotechnology***, Universities (P) ltd, Hyderabad, 2004.

Chawla H. S, ***Introduction to Biotechnology***, Oxford & IBH Publishing Co. Pvt. Ltd, New Delhi, 2000.

Pedagogy

Chalk & Talk, E-Resources, Group Discussion

Teaching aids

Black Board, LCD Projector

Course Contents and Lecture Schedule

Module No.	Topic	No. of Lectures	Content Delivery Methods
UNIT - I			
1.1	Conventional Vs Modern biotechnology; Multi-disciplinary tree	2	Chalk & Talk
1.2	Tools for Genetic engineering	2	E-Resources
1.3	Recombinant DNA (rDNA) Technology	2	Discussion
1.4	Gene Cloning and its tools	2	Discussion
1.5	Host, Vectors, Enzymes, Cosmids.	2	E-Resources

1.6	Major Steps involved in cloning of Human insulin Gene.	2	Discussion
UNIT - II			
2.1	Gene cloning strategies: Selection of desired DNA fragments, linkers and adapters,	2	Discussion
2.2	Transformation (heatshock, electroporation, microinjection)	3	Chalk & Talk
2.3	transfection. Direct gene transfer through Ti plasmid.	2	E-Resources
2.4	Screening of recombinants: colony hybridization, antibiotic based, blue white screening, Imuno based.	3	E-Resources
2.5	Construction of genomic, cDNA libraries & Gene therapy	2	Discussion
UNIT - III			
3.1	Cloning of Animals- methods and its uses;	2	E-Resources
3.2	Application of transgenic Animals- in ; rDNA Protein production – Interferon, Interleukin, Urokinase application in Fish & Sheep; Transgenic Animals- Fish & Sheep,	2	Chalk & Talk
3.3	Transgenic Animals- Fish & Sheep. rDNA vaccines (types only)	3	Discussion
3.4	Hybridoma Technology- Production and application of Monoclonal Antibodies MCA/ Mabs;	2	E-Resources
3.5	Polymerase chain reaction (PCR), Blotting techniques- Southern& Northern blots;	1	Discussion
3.6	DNA finger printing and its uses	2	E-Resources
UNIT - IV			
4.1	Plant cell and tissue culture (PTC), culture media,	2	Discussion
4.2	Types of plant tissue cultures (Callus, suspension, meristem culture	3	E-Resources
4.3	Anther & ovule cultures	2	Chalk & Talk

4.4	Protoplast culture	2	E-Resources
4.5	Micropropagation and somatic embryogenesis.	2	Discussion
4.6	Applications of PTC	1	Discussion
UNIT - V			
5.1	Biodegradation – Definition- Xenobiotics-	3	E-Resources
5.2	Biodegrading agents- treatment of toxic pollutants and its advantages	3	Chalk & Talk
5.3	*Psedomonasputida*- Super Bug	2	Discussion
5.4	Rural biotechnology: Red, White, Blue & Green biotechnology.	4	E-Resources
	Total	**60**	

Course Designer
Ms. P. Vinnoli
Assistant Professor of Zoology

Course Code	Course Title	Category	Total Hours	Credits
20UZYC62	Animal Physiology	Core - XIII	75	5

Nature of Course	
Knowledge Oriented	✓
Skill Oriented	
Employability Oriented	
Entrepreneurship Oriented	

Course Relevance	
Local	
Regional	
National	
Global	✓

Preamble

To enable the students acquire knowledge on various physiological organ-systems and their importance in the integrative functions of the body.

Course Outcomes (CO)

On the successful completion of the course the students will be able to

No.	Course Outcome	Knowledge Level
CO1	Define the breakdown of nutrients into parts small enough for the body to absorb and use for energy, growth, and cell repair. Explain the energy releasing and supplying process in all living organisms	**K1, K2**
CO2	Explain the waste removal from the body and ensures the transportation of *oxygen* and nutrients to every cell in your body.	**K1, K2**
CO3	Describe the Structure and mechanism of various muscles, Define the fundamental unit of cells	**K1, K2**
CO4	Identify the sense organs and Sensory receptors	**K1, K2, K3**
CO5	Find out the Hormones which regulate the body's growth, metabolism, and sexual development and function	**K1, K2, K3**

K1-Knowledge **K2-Understand** **K3-Apply**

Mapping of CO with PO

	PO1	PO2	PO3	PO4	PO5
CO1	**3**	**3**	**3**	**2**	**3**
CO2	**3**	**3**	**3**	**1**	**3**
CO3	**3**	**3**	**1**	**2**	**3**
CO4	**3**	**2**	**3**	**3**	**3**
CO5	**3**	**3**	**1**	**2**	**3**

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

Mapping of CO with PSO

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	2	3
CO2	3	3	3	1	3
CO3	3	3	1	2	3
CO4	3	2	3	3	3
CO5	3	3	1	2	3

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

Syllabus

UNIT I 15 Hours

Mechanism of Digestion & Respiration - Digestion: Physicochemical process of digestion and absorption of Carbohydrate-Proteins and Lipids. Respiration: Kinds of respiration-Respiratory organs and mode of respiration found among animals-Role of mitochondria in respiration-respiratory pigments – transport of Oxygen and carbon dioxide – Respiratory Quotient – Mechanism of pulmonary respiration.

UNIT II 15 Hours

Mechanism of Excretion & Functions of Circulatory system - Excretion: Structure of nephron - Kidney- principle excretory organ- Formation of Urine. Circulation: Structure and composition of blood- Functions of the circulatory system- Mechanism of Heart beat- Pace makers- ECG- Blood pressure and Blood coagulation. Osmoregulation in crustaceans and teleost fish-Thermoregulation: Poikilotherms and Homeotherms.

UNIT III 15 Hours

Muscle Physiology & Nervous System - Muscle physiology: Ultra structure of muscle-Mechanism of muscle contraction and relaxation- Nerve physiology: Ultra structure of neuron – physiology of nerve coordination-Nerve impulse and conduction of nerve impulse-Reflex Action: definition of vision and hearing in man- Autonomic nerve system.

UNIT IV 15 Hours

Sense Organs & Receptors - Sense organs - Classification of sense organs-mechano receptors-primary sense cells: pressure, pain &touch receptors-Equilibrium receptors- thermo receptors-chemoreceptors- photo receptors Chronobiology: characteristics of Circadian rhythm – examples.

UNIT V 15 Hours

Endocrine System & Hormonal Functions - Endocrine & Neuro endocrine system in Crustaceans & Vertebrates- Hormonal function: Pituitary-Thyroid- Parathyroid-adrenal- Islets of Langerhans and testes and Ovary.

Text Book

P.S Verma, B.S. Tyagi, and V.K. Agarwal, ***Animal physiology***, S Chand & Co (October 31, 2001)

Reference Books

Philip H. Mitchel, ***A Text book of General Physiology***, Mc Graw Hill Publications, New York, 2013.

Hoar, S. William, ***General Comparative Physiology***, Prentice Hall of Indian Pvt Ltd, New Delhi.

Pedagogy

Chalk & Talk, E-Resources, Group Discussion

Teaching aids

Black Board, LCD Projector

Course Contents and Lecture Schedule

Module No.	Topic	No. of Lectures	Content Delivery Methods
UNIT - I			
1.1	Digestion: Physicochemical process of digestion and absorption of Carbohydrate-Proteins and Lipids	4	Chalk & Talk
1.2	Respiration: Kinds of respiration-Respiratory organs and mode of respiration found among animals	4	E-Resources
1.3	Role of mitochondria in respiration-respiratory pigments – transport of Oxygen and carbon dioxide	4	E-Resources
1.4	Respiratory Quotient – Mechanism of pulmonary respiration	3	Chalk & Talk
UNIT - II			
2.1	Excretion: Structure of nephron-Kidney-principle excretory organ- Formation of Urine	3	PPT
2.2	Circulation: Structure and composition of blood- Functions of the circulatory system	5	E-Resources
2.3	Mechanism of Heart beat- Pace makers-ECG- Blood pressure and Blood coagulation	4	E-Resources

2.4	Thermoregulation: Poikilotherms and Homeotherms	3	Chalk & Talk
UNIT - III			
3.1	Muscle physiology: Ultra structure of muscle-Mechanism of muscle contraction and relaxation	4	E-Resources
3.2	Nerve physiology: Ultra structure of neuron – physiology of nerve coordination	4	Chalk & Talk
3.3	Nerve impulse and conduction of nerve impulse-Reflex Action: definition of vision	4	Discussion
3.4	hearing in man- Autonomic nerve system	3	E-Resources
UNIT - IV			
4.1	Sense organ-Classification of sense organs	3	Discussion
4.2	Mechano receptors-primary sense cells: pressure, pain &touch receptors-Equilibrium receptors	4	E-Resources
4.3	thermo receptors-chemoreceptors- photo receptors	4	Chalk & Talk
4.4	Chronobiology: characteristics of Circadian rhythm – examples	4	Discussion
UNIT - V			
5.1	Endocrine & Neuro endocrine system in Crustaceans & Vertebrates	3	E-Resources
5.2	Hormonal function: Pituitary- Thyroid	5	Chalk & Talk
5.3	Parathyroid-adrenal- Islets of Langerhans	3	E-Resources
5.4	Testes and Ovary	4	E-Resources
	Total	**75**	

Course Designer
Dr. M. Ashiq Ur Rahman
Assistant Professor of Zoology

Course Code	Course Title	Category	Total Hours	Credits
20UZYC63	Entomology & Sericulture Technology	Core-XIV	60	4

Nature of Course	
Knowledge Oriented	✓
Skill Oriented	
Employability Oriented	
Entrepreneurship Oriented	

Course Relevance	
Local	
Regional	
National	
Global	✓

Preamble

This course promotes the students to understand the role of insects and the impact of its possession in the ecosystem.

Course Outcomes (CO)

On the successful completion of the course the students will be able to

No.	Course Outcome	Knowledge Level
CO1	Define the taxonomy and list the types of metamorphosis seen in insects.	**K1**
CO2	Explain the commercial aspects of beekeeping.	**K1, K2**
CO3	Classify the different types of silk and silkworm.	**K1, K2**
CO4	Construct the sericulture unit as a cottage industry.	**K1, K2, K3**
CO5	Identify the importance of household insect pests and vectors causing diseases.	**K1, K2, K3**

K1-Knowledge **K2-Understand** **K3-Apply**

Mapping of CO with 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**	**2**	**1**	**3**	**2**
CO5	**3**	**1**	**1**	**3**	**3**

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

Mapping of CO with 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**	**2**	**1**	**3**	**2**
CO5	**3**	**1**	**1**	**3**	**3**

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

Syllabus

UNIT I 12 Hours

Introductory Entomology: Introduction - Salient features of Insects - Dominance of insects among animals - Insect classification upto order level with examples (List only)- Economic classification of insects with examples (List only). Insect development and metamorphosis- Egg, larval and pupal types.

UNIT II 12 Hours

Beekeeping: Systematic position of honeybee, Kinds of honeybees, Habits and habitat, Population, Castes, Biology, production and uses.

UNIT III 12 Hours

Sericulture: Importance, Sericulture industry in India, Central Silk Board, Systematic position of *Bombyxmori*, Voltinism, Moriculture in general, Biology of silkworm.

UNIT IV 12 Hours

Sericulture Technology: Overview of Cocoon quality, cocoon sorting and marketing - Cocoon stifling, Boiling and Brushing - Silk Reeling - Silk processing - Uses of silk.

UNIT V 12 Hours

Medical Entomology: House hold insect pests and their control measures. Disease causing vectors – Housefly, mosquito, lice, Tsetse fly – Life cycle, disease transmitted and their control measures.

Text Books

NalinaSundari, M.S and Santhi, R ***Entomology,*** MJP Publishers, Chennai, (2006).
Ganga. G and Sulochana Chetty. J ***An introduction to sericulture***, IBH Publisher, New Delhi. (2014).

Reference Books

B.V David and Ananthakrishnan T.N***. General and Applied Entomology,*** Tata McGraw Hill Pub.Co., Ltd., New York, (2013).

Vasantharaj David. B, ***Elements of Economic Entomology***, Brillion publishing, New Delhi, (2017).

M. Johnson & M. Kesary ***Sericulture***, Saras Publication, Nagercoil, (2019).

Pedagogy

Chalk & Talk, E-Resources, Group Discussion

Teaching aids

Black Board, LCD Projector

Course Contents and Lecture Schedule

Module No.	Topic	No. of Lectures	Content Delivery Methods
UNIT - I			
1.1	Introduction - Salient features of Insects - Dominance of insects among animals	3	Chalk & Talk
1.2	Insect classification upto order level with examples (List only)-	3	Discussion
1.3	Economic classification of insects with examples (List only).	3	Chalk & Talk
1.4	Insect development and metamorphosis- Egg, larval and pupal types.	3	E-Resources
UNIT - II			
2.1	Beekeeping: Systematic position of honeybee	3	Chalk & Talk
2.2	Kinds of honeybees, Habits and habitat	3	Discussion
2.3	Population, Castes	3	Chalk & Talk
2.4	Biology, production and uses.	3	E-Resources
UNIT - III			
3.1	Sericulture: Importance, Sericulture industry in India,	3	Discussion

3.2	Central Silk Board	3	Chalk & Talk
3.3	Systematic position of *Bombyxmori*, Voltinism,	3	E-Resources
3.4	Moriculture in general, Biology of silkworm.	3	Discussion
UNIT - IV			
4.1	Sericulture Technology: Overview of Cocoon quality,	3	Discussion
4.2	cocoon sorting and marketing - Cocoon stifling,	3	Discussion
4.3	Boiling and Brushing -	3	Chalk & Talk
4.4	Silk Reeling - Silk processing - Uses of silk.	3	E-Resources
UNIT - V			
5.1	Medical Entomology: House hold insect pests and their control measures. Tsetse fly	3	Discussion
5.2	Disease causing vectors – Housefly	3	Chalk & Talk
5.3	mosquito, lice	3	E-Resources
5.4	Life cycle, disease transmitted and their control measures.	3	Discussion
	Total	**60**	

Course Designer
Ms. A. Syedali Fathima
Assistant Professor of Zoology

Course Code	Course Title	Category	Total Hours	Credits
20UZYC6P	Biochemistry & Ecology Practical	Core - XV	90	5

Nature of Course	
Knowledge Oriented	✓
Skill Oriented	
Employability Oriented	
Entrepreneurship Oriented	

Course Relevance	
Local	
Regional	
National	
Global	✓

Preamble

To enable the students acquire knowledge on different Biochemical techniques and safe practices in the laboratory, follow proper procedures and regulations for safe use and disposal of chemicals, Gain experience developing ecological hypotheses and designing observational and experimental studies in field and laboratory settings.

Course Outcomes (CO)

On the successful completion of the course the students will be able to

No.	Course Outcome	Knowledge Level
CO1	Demonstrate an understanding of fundamental biochemistry principles, including topics specific to chemistry and biochemistry.	**K1,K2**
CO2	Apply the amount of carbohydrate, lipids and proteins from given sample, Determine the importance of pH measurement, use of electrophoresis and centrifugation	**K1,K2,K3**
CO3	Calculate the amount of dissolved oxygen in water samples, Able to mount planktons.	**K1,K2,K3**
CO4	Describe the food chain and food web, Explain about the animal associations	**K1,K2**
CO5	Classify different types of adaptations among the animals	**K1,K2**

K1-Knowledge K2-Understand K3-Apply

Mapping of CO with PO

	PO1	PO2	PO3	PO4	PO5
CO1	**3**	**3**	**3**	**2**	**3**
CO2	**3**	**3**	**3**	**1**	**3**
CO3	**3**	**3**	**1**	**2**	**3**
CO4	**3**	**2**	**3**	**3**	**3**
CO5	**3**	**3**	**1**	**2**	**3**

1-Low 2-Medium 3-Strong

Mapping of CO with PSO

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	**3**	**3**	**3**	**2**	**3**
CO2	**3**	**3**	**3**	**1**	**3**
CO3	**3**	**3**	**1**	**2**	**3**
CO4	**3**	**2**	**3**	**3**	**3**
CO5	**3**	**3**	**1**	**2**	**3**

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

Syllabus

UNIT I 18 Hours

Quantitative analysis of Carbohydrate: Anthrone method, Quantitative analysis of Protein – Lowry et al.,-method.-Analysis for Sopanification number in lipid

UNIT II 18 Hours

Qualitative analysis of Urine: Sugar, albumin, bile salts, bile pigments and ketone bodies- Verification of Beer- Lambert's law-pH measurements of various samples using pH meter.

UNIT III 18 Hours

Separation of amino acids: Separation of amino acids by Paper Chromatography - Electrophoresis & Centrifuges- Demonstration. Estimation of Dissolved Oxygen in water samples

UNIT IV 18 Hours

Plankton mounting: Plankton mounting: Fresh water and marine planktons, Sampling of animal population by quadrate method and line transect method in terrestrial habitat. Examples illustrating animal association.

UNIT V 18 Hours

Study of food chain and food web: Study of food chain and food web in as pond Ecosystem. Measurement of water transparency using Secchi disc. Adaptations: a) Parasitic adaptations' – *Ascaris*, *Taeniasolium* and *Sacculina*, b) Flight adaptations – Birds and bat, c) Aquatic adaptations – (Model or proper cuttings), d) Burrowing adaptations – Rat/Pangolin.

Study Tour: To a minimum of three days exposing the students to various Ecological habitat, Farm Visit, Zoos, Botanical Gardens, Pollution Areas and submit a report.

Text Books

Shivaraja Shankaraym, ***Laboratory Manual for Practical Biochemistry***, Jaypee Brothers Medical Pulishers: 2013, Second Edition.

Reference Books

Damodaran Geetha. K. ***Practical Biochemistr,-*** Jaypee Brothers Medical Publishers: 2016, Second Edition.

R. S. Sengar, ***Laboratory Manual of Biochemstry*****,** Methods and Techniques, January 15, 2014, 1st Edition.

Course Designer

Ms. A. Syedali Fathima
Assistant Professor of Zoology

Course Code	Course Title	Category	Total Hours	Credits
20UZYC6Q	Genetics, Biostatistics, Immunology & Aquaculture	Core - XVI	90	5

Nature of Course	
Knowledge Oriented	✓
Skill Oriented	
Employability Oriented	
Entrepreneurship Oriented	

Course Relevance	
Local	
Regional	
National	
Global	✓

Preamble

To enable the students acquire knowledge on hands-on practical techniques that will supplement and enrich the lecture portion of the course, develop critical thinking skills, and develop competency and expertise in the application of statistical methods applied to biological data obtained in experimental techniques**.**

Course Outcomes (CO)

On the successful completion of the course the students will be able to

No.	Course Outcome	Knowledge Level
CO1	Demonstrate and understand the mendelian principles and various genetic inheritance.	**K1,K2**
CO2	Describe genetics at microbial level.	**K1,K2**
CO3	Apply statistical methods to solve simple problems	**K1,K2,K3**
CO4	Explain the structure of lymphoid organs and know about some diagnostic principles and tools	**K1,K2**
CO5	Collect about the characteristics of economically important fishes and its by products	**K1,K2,K3**

K1-Knowledge K2-Understand K3-Apply

Mapping of CO with 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**

1-Low 2-Medium 3-Strong

Mapping of CO with 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**

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

Syllabus

UNIT I 18 Hours

Simple Mendelian traits in man. Blood Grouping- A, B, AB, O & Rh. Study of Drosophila Culture and isolation of Virgin flies.

UNIT II 18 Hours

Mounting of Barr body. Pedigree Analysis-Charts Conjugation-Charts Transformation and Transduction-Charts

UNIT III 18 Hours

Calculation of Mean, Median, Mode, Standard deviation, Standard error & Variance using Neem leaves, Height & weight of class students. Study of Probability with two coin tossing experiment.

UNIT IV 18 Hours

Demonstration of lymphoid organs through dig frog software. Demonstration of ELISA. Demonstration Immuno electrophoresis. Studies on any 3 Autoimmuno Disease through You tube channel.

UNIT V 18 Hours

Studies of 3 Indian major carps by its external characters. Extraction of fish glue from locally available fish. Extraction of Isinglass from locally available fish.

Reference Books

H. Tamarin ***Principles of Genetics,*** Robert. Tata- McGraw Hill publications, 2005. 7th Edition.

G. S. Miglani, ***Advanced Genetics.*** Alpha Science International, Ltd. 2015.

W.W Daniel. ***Biostatistics: A foundation for analysis in the Health Sciences, Biostatistics,*** Publisher: John Wiley and Sons.

Course Designer

Ms. Athirasukumaran

Assistant Professor of Zoology

Course Code	Course Title	Category	Total Hours	Credits
20UZYC6R	Physiology, Biotechnology & Evolution	Core - XVII	90	5

Nature of Course	
Knowledge Oriented	✓
Skill Oriented	
Employability Oriented	
Entrepreneurship Oriented	

Course Relevance	
Local	
Regional	
National	
Global	✓

Preamble

To enable the students acquire knowledge on the body undergoes change throughout the life span related to cell and organ development ,understanding of the principles and practices of biotechnology and various contemporary observations of biological evolution.

Course Outcomes (CO)

On the successful completion of the course the students will be able to

No.	Course Outcome	Knowledge Level
CO1	Define amylase activity, Blood pressure measurements and list out different type of nitrogenous waste products produced by the animals	**K1**
CO2	Describe about Haemoglobinometer & Test the oxygen consumption in fish and haemoglobin by Haemoglobinometer.	**K1**
CO3	Explain PCR techniques and Southern blotting techniques and Enumeration of blood cells by haemocytometer.	**K1,K2**
CO4	Define the Evidences of evolution and races of organisms.	**K1**
CO5	Identify the animals showing adaptive colouration for their protections	**K1,K2,K3**

K1-Knowledge **K2-Understand** **K3-Apply**

Mapping of CO with PO

	PO1	PO2	PO3	PO4	PO5
CO1	**3**	**3**	**3**	**2**	**3**
CO2	**3**	**3**	**3**	**1**	**3**
CO3	**3**	**3**	**1**	**2**	**3**
CO4	**3**	**2**	**3**	**3**	**3**
CO5	**3**	**3**	**1**	**2**	**3**

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

Mapping of CO with PSO

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	**3**	**3**	**3**	**2**	**3**
CO2	**3**	**3**	**3**	**1**	**3**
CO3	**3**	**3**	**1**	**2**	**3**
CO4	**3**	**2**	**3**	**3**	**3**
CO5	**3**	**3**	**1**	**2**	**3**

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

Syllabus

UNIT I 18 Hours

Amylase activity: Amylase activity in human saliva in relation to pH and Temperature. Estimation of oxygen consumption in fish.

UNIT II 18 Hours

Enumeration of nitrogenous waste: products in fish tank water, bird excreta & mammalian urine for detection of ammonia, urea & uric acid. Blood pressure demonstration under normal condition and stress.

UNIT III 18 Hours

Estimation of haemoglobin: Estimation of haemoglobin by Haemoglobinometer. Enumeration of blood cells by haemocytometer. Demonstration of P. C. R technique.

UNIT IV 18 Hours

Homologous and Analogous organs: Blot (Demo through CD).

Homologous and Analogous organs. Vestigial organs.

UNIT V 18 Hours

Fossils**:** Fossils Examples of evolutionary importance – Peripatus and Limulus. Animals with adaptive colouration – Leaf insect, Stick insect and Chaemeleon. Variation in Finger prints.

Text Books

Verma, Ashish S./ Das Surajit & Singh Anchal-S ***Laboratory Manual for Biotechnology***- Chand Publishing, 2014.

Douglas Futuyma, ***Text Book of Evolution***, Sinauer Publication 15-Jul-2013.

Kendall Hunt, ***Introduction to Biotechnology Lab Manual***, Kendall Hunt Publishing Company, 9-Sep-2011.

Reference Books

Amrit K, ***Laboratory manual of animal physiology and biotechnology***, CBS Publishers & Distributors Pvt. Ltd, New Delhi,2006, First edn.

Durairaj G, ***Laboratory manual of Animal Physiology***, COSIP-ULP Publications, Department of Zoology, University of Madras, Chennai.

Thomas P. Colville, Joanna M. Bassert, Elsevier Health Sciences, ***Laboratory Manual for Clinical Anatomy and Physiology for Veterinary***, 13-Mar-2015.

Course Designer

Ms. A. Syedali Fathima

Assistant Professor of Zoology

Course Code	Course Title	Category	Total Hours	Credits
20UZYE61	**Computer Application & Information Technology**	**Elective - II**	**60**	**4**

Nature of Course	
Knowledge Oriented	
Skill Oriented	✓
Employability Oriented	
Entrepreneurship Oriented	

Course Relevance	
Local	
Regional	
National	
Global	✓

Preamble

Basic knowledge on software. Computers and Network

Course Outcomes (CO)

On the successful completion of the course the students will be able to

No.	Course Outcome	Knowledge Level
CO1	List out the Computer-Generation and classification of Computer.	**K1**
CO2	Explain the Network topologies.	**K1, K2**
CO3	Illustrate the MS-menu tool bar.	**K1, K2, K3**
CO4	Apply the knowledge of basic principles and concepts of computer	**K1, K2, K3**
CO5	Outline the network concepts.	**K1, K2**

K1-Knowledge K2-Understand K3-Apply

Mapping of CO with 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**

1-Low 2-Medium 3-Strong

Mapping of CO with 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**

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

Syllabus

UNIT I 12 Hours

Introduction to Computer – Block diagram-Characteristics of Computer-Generation and classification of Computer.

UNIT II 12 Hours

Computer and communication- Type – needs – Communication media – Network topologies.

UNIT III 12 Hours

MS word- File Operations- New- Open- Save- Print. Editing - Cut-Copy-Paste- Find -Replace Insert- Page numbers -Pictures.

UNIT IV 12 Hours

MS word- Format- Font- Bullet – Numbering- Paragraph –Background-Tools--Spelling – Grammar- Data-Sort.

UNIT V 12 Hours

Internet-Internet concept – Types of internet connection- Internet services – Browsing techniques – Websites – Email – Applications of Internet, Mobile Computing, Creation of Barr codes, Algorithm**.**

Text Book

Arumugam N. ***Biostatistics and Computer application,*** Saras publications, Kottar, Nagercoil, 2005.

Reference Books

Christine Solomon, ***Developing Application with MS: Office for Windows 95***– Microsoft Office Press.1 April 1995 2nd Edition.

Chanchal Mittal, ***Fundamentals of Information Technology***, Pragathi Prakasam Publications, Meerut. 2013. 9th Edition.

Rajaraman. V. ***Fundamentals of Computer***. Prentice Hall India Learning Private Limited; 2014. 6th Edition

Vasanthi Ramanathan, ***Computer application*** Meenakshi pathippagam Madurai – 20.

Pedagogy

Chalk & Talk, E-Resources, Group Discussion

Teaching aids

Black Board, LCD Projector

Course Contents and Lecture Schedule

Module No.	Topic	No. of Lectures	Content Delivery Methods
UNIT - I			
1.1	Introduction to Computer – Block diagram	4	Chalk & Talk
1.2	Characteristics of Computer-Generation	4	Chalk & Talk
1.3	Classification of Computer.	4	E-Resources
UNIT - II			
2.1	Computer and communication- Type – needs	4	Chalk &Talk
2.2	Communication media	4	Chalk & Talk
2.3	Network topologies	4	E-Resources
UNIT - III			
3.1	MS word- File Operations	4	PPT
3.2	New- Open- Save- Print.	4	PPT
3.3	Editing-Cut-Copy-Paste- Find –Replace Insert- Page numbers –Pictures	4	E-Resources
UNIT - IV			
4.1	MS word- Format- Font- Bullet – Numbering- Paragraph	4	PPT
4.2	Background- Tools--Spelling – Grammar	4	PPT
4.3	Data-Sort	4	PPT

UNIT - V			
5.1	Internet-Internet concept – Types of internet connection	4	Chalk & Talk
5.2	Internet services – Browsing techniques – Websites – Email – Applications of Internet.	4	PPT
5.3	Mobile Computing, Creation of Barr codes, Algorithm	4	PPT
	Total	**60**	

Course Designer
P. Vinnoli
Assistant Professor of Zoology

Course Code	Course Title	Category	Total Hours	Credits
20UZYE62	Commercial Zoology	Elective - II	60	4

Nature of Course	
Knowledge Oriented	
Skill Oriented	
Employability Oriented	✓
Entrepreneurship Oriented	

Course Relevance	
Local	
Regional	
National	✓
Global	

Preamble

To enable the students acquire knowledge on various areas of applied zoology and develop expertise in setting up a model unit for commercial purpose.

Course Outcomes (CO)

On the successful completion of the course the students will be able to

No.	Course Outcome	Knowledge Level
CO1	List the dairy breeds	**K1**
CO2	Write the commercial outcomes of lac insect and its culture	**K1, K2**
CO3	Explain pearl is being made inside the oyster	**K1, K2**
CO4	Find the live feed for different cultivable aquatic organisms	**K1, K2, K3**
CO5	Determine the management of pet birds and its importance	**K1, K2, K3**

K1-Knowledge K2-Understand K3-Apply

Mapping of CO with 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**	**2**	**3**	**3**	**3**

1-Low 2-Medium 3-Strong

Mapping of CO with 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**	**2**	**3**	**3**	**3**

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

Syllabus

UNIT I 12 Hours

Dairy Farming: Introduction to dairy farming –Milch breeds, Draught breeds, Dual purpose breeds and new cross breeds- Live stocks in India (Jersey, Buffaloes) - Goat- Murrah, Jamunapari -Management of Model dairy farm-Livestock disease (FMD, Udder).

UNIT II 12 Hours

Lac culture: Introduction - systemic position - distribution - biology; lifecycle - lac cultivation - composition and types of lac - lac products - Enemies of lac

UNIT III 12 Hours

Pearl Culture: Types and composition of Pearl- Biology of pearl oyster, Pearl formation, Culturing, rearing and harvesting of pearls.

UNIT IV 12 Hours

Live feed culture: Introduction - need for live feed - culture of Artemia - Daphnia - Brachionus - Cyclops – Tubifex.

UNIT V 12 Hours

Future Strategies for Livestock Development-Genetic Improvement for best breeds-Economic importance of Dairy, Leather, Wool, Fur and Pharmaceutical Industries in India.

Text Books

Sukla. G. S and Upadhyay, V. B, ***EconomicZoology***, Rsatogi Publications, Meerut, India, 2000, ISBN- 81-7133-137-8.

M.R.Gnaanamani, Modern aspects of ***commercial Poultry Keeping***, Giri Publications, Madurai, Tamilnadu,India.1996.

N. Arumugam, T. Murugan, J. Johnson Rajeshwar, ***Applied Zoology***, Saras Publication, Nagercoil.

Reference Books

G Suhasini, ***Applied Zoology***, Bio Green Publishers, New Delhi, 2017.

Parul Yadav, ***Applied and Economic Zoology***, KNRN publications, Meerut, 2017.

Jawaid Ahsan and Subhas Prasad Sinha, A ***Handbook on Economic Zoology***-ISBN-81-219-0876-0. S. Chand & Co., Ltd., New Delhi, 2000.

Banerjee, G. C, ***Poultry-III,*** Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi.1992Edition-ISBN-81-204-008-4.

Pedagogy

Chalk & Talk, E-Resources, Group Discussion

Teaching aids

Black Board, LCD Projector

Course Contents and Lecture Schedule

Module No.	Topic	No. of Lectures	Content Delivery Methods
UNIT - I			
1.1	Dairy Farming: Introduction to dairy farming	2	Chalk & Talk
1.2	Live stocks in India (Jersey, Buffaloes)	2	Chalk & Talk
1.3	Goat- Murrah,Jamunapari,	2	E-Resource
1.4	Management of Model dairy farm,	3	Discussion
1.5	Livestock disease (FMD, Udder)	3	E-Resource
UNIT - II			
2.1	Lac culture: Introduction - systemic position - distribution	3	E-Resource
2.2	Biology; lifecycle	3	Chalk & Talk
2.3	lac cultivation	2	Chalk & Talk,
2.4	composition and types of lac	1	Chalk & Talk
2.5	lac products	2	Chalk & Talk
2.6	Enemies of lac	1	Chalk & Talk
UNIT - III			
3.1	Types and composition of Pearl	3	Discussion
3.2	Pearl formation,	3	Chalk & Talk
3.3	Culturing,	3	Chalk & Talk

3.4	Rearing and harvesting of pearls.	3	E-Resource
UNIT - IV			
4.1	Live feed culture: Introduction	2	Discussion
4.2	Need for live feed	1	Chalk & Talk
4.3	Culture of Artemia	3	Chalk & Talk
4.4	Daphnia Culture	2	E-Resource
4.5	BrachionusCulture	2	Discussion
4.6	Cyclops and Tubifex Culture	2	Discussion
UNIT - V			
5.1	Future Strategies for Livestock Development	2	Chalk & Talk
5.2	Genetic Improvement for best breeds-	2	Chalk & Talk
5.3	Economic importance of Dairy Industries in India.	2	E-Resource
5.4	Economic importance of Leather Industries in India.	2	Discussion
5.5	Economic importance of Wool Industries in India.	2	E-Resource
5.6	Economic importance of Fur and Pharmaceutical Industries in India.	2	Chalk & Talk
	Total	**60**	

Course Designer
Dr. M. Ashiq Ur Rahman
Assistant Professor of Zoology

Course Code	Course Title	Category	Total Hours	Credits
20UZYE63	Biochemistry	Elective - II	60	4

Nature of Course	
Knowledge Oriented	✓
Skill Oriented	
Employability Oriented	
Entrepreneurship Oriented	

Course Relevance	
Local	
Regional	
National	
Global	✓

Preamble

The course elaborates on the chemical and physical properties of biomolecules like proteins, lipids carbohydrates and nucleic acids and it emphasis their structure, classification and functions. The course integrates important concepts from chemistry and biology.

Course Outcomes (CO)

On the successful completion of the course the students will be able to

No.	Course Outcome	Knowledge Level
CO1	Elaborate the chemical and physical properties solvent and buffers and their importance in biological systems.	**K1, K2**
CO2	Explain the properties and biological importance of biomolecule the carbohydrate	**K1, K2**
CO3	Apply the role of proteins in the animal system	**K1, K2, K3**
CO4	Determine how chemical concepts are related to biological processes related to enzymology and the role of lipids	**K1, K2, K3**
CO5	Demonstrate the structure and functions of nucleic acids and vitamins	**K1, K2**

K1-Knowledge K2-Understand K3-Apply

Mapping of CO with 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	**3**	**3**	**1**	**3**	**2**
CO5	**3**	**1**	**3**	**3**	**3**

1-Low 2-Medium 3-Strong

Mapping of CO with 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	**3**	**3**	**1**	**3**	**2**
CO5	**3**	**1**	**3**	**3**	**3**

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

Syllabus

UNIT I 12 Hours

Biomolecules: Biomolecules - Interaction and bonding. Water– Molecular structure and properties (Thermal, solvent, colligative) dissociation and ionization of water, pH and buffers (bicarbonate, phosphate and acetate); Henderson-Hasselbach equation. pKa.

UNIT II 12 Hours

Carbohydrates: Classification - Monosaccharides – glucose, fructose and galactose – structure and isomerism – biological importance. Disaccharides– Structure and biological importance of maltose, sucrose and lactose Polysaccharides: Homo Polysaccharides- Starch and Glycogen Hetero Polysaccharides: Structural characteristics and functions of peptidoglycan and agar.

UNIT III 12 Hours

Aminoacids: Structure and classification of amino acids based on Polarity - properties and chemical reactions-Zwitter ion – Isoelectric PI, Proteins – classification, primary, secondary – Ramachandran Plot, tertiary and quaternary structure.

UNIT IV 12 Hours

Lipids: Classification - Biological importance - Beta oxidation Enzymes: Classification and mechanism of action (lock and key and induced fit theories). Enzyme kinetics – Michael‟s Menden equation, Enzyme inhibition- competitive, non-competitive and allosteric.

UNIT V 12 Hours

Nucleic Acids: Nucleoproteins, nucleosides, Nucleotides, chemical structure of DNA, synthesis of nucleic acids- Salvage and De-novo pathways. Fat and water soluble vitamins – source, significance and deficiency.

Text Books

Jain, J.L, Nitin Jain and Sunjay Jain. ***Fundamentals of Biochemistry***, S. Chand and Company Ltd, New Delhi, 2010, Fifth Edition.

A.L. Lehninger, ***Principles of Biochemistry***, Worth Publishers, Inc. New York, 1982.

Satyanarayana, U. and Chakrapani, U. ***Biochemistry***, Books & Allied Pvt. Ltd., Kolkata, 2009.

Reference Books

Deb, A.C. ***Fundamentals of Biochemistry***, New Central Book Agency Pvt. Ltd., Kolkata, 2011, 10th Edition.

Victor W. Rodwell, David A. Bender, Kathleen M. Botham, Peter J. Kennelly, P. Anthony Weil, the McGraw-Hill Education ***Harpers Illustrated Biochemistry***, 30th Edition.

Rastogi, S.C. ***Biochemistry,*** Tata McGraw Hill Edition, New Delhi, 2010, 3rd Edition,

Stryer, L, ***Biochemistry,*** W.H. Freeman and Company, New York, 2000, Fourth edition.

Pedagogy

Chalk & Talk, E-Resources, Group Discussion

Teaching aids

Black Board, LCD Projector

Course Contents and Lecture Schedule

Module No.	Topic	No. of Lectures	Content Delivery Methods
UNIT - I			
1.1	Biomolecules - Interaction and bonding.	3	Chalk & Talk
1.2	Water – Molecular structure and properties (Thermal, solvent, colligative) dissociation and ionization of water,	3	E-Resources
1.3	pH and buffers (bicarbonate, phosphate and acetate).	3	Discussion
1.4	Henderson-Hasselbach equation. pKa.	3	Discussion
UNIT - II			
2.1	Carbohydrates: Classification - Monosaccharides – glucose, fructose and galactose	2	Chalk & Talk

2.2	structure and isomerism – biological importance	2	E-Resources
2.3	Disaccharides – Structure and biological importance of maltose, sucrose and lactose	2	Discussion
2.4	Polysaccharides: Homo Polysaccharides- Starch and Glycogen	3	Chalk & Talk
2.5	Hetero Polysaccharides: Structural characteristics and functions of peptidoglycan and agar	3	Discussion
UNIT - III			
3.1	Structure and classification of amino acids based on Polarity	4	Chalk & Talk
3.2	Zwitter ion – Isoelectric PI,	4	E-Resources
3.3	Proteins – classification, primary, secondary – Ramachandran Plot, tertiary and quaternary structure.	4	Discussion
UNIT - IV			
4.1	Lipids: Classification	2	Chalk & Talk
4.2	Biological importance - Beta oxidation	3	E-Resources
4.3	Enzymes: Classification and mechanism of action (lock and key and induced fit theories).	3	Discussion
4.4	Enzyme kinetics – Michael‟s Menden equation	2	Chalk & Talk
4.5	Enzyme inhibition- competitive, non-competitive and allosteric	2	Discussion
UNIT - V			
5.1	Nucleic acids: Nucleoproteins, nucleosides, Nucleotides,	2	Chalk & Talk
5.2	Chemical structure of DNA,	3	E-Resources
5.3	Synthesis of nucleic acids- Salvage and De-novo pathways.	3	Discussion
5.4	Fat soluble vitamins – source, significance and deficiency	2	Chalk & Talk
5.5	Water soluble vitamins – source, significance and deficiency	2	Discussion
	Total	**60**	

Course Designer
Ms. A. Syedali Fathima
Assistant Professor of Zoology

Course Code	Course Title	Category	Total Hours	Credits
20UZYS61	Poultry Science	SBS - III	30	2

Nature of Course	
Knowledge Oriented	
Skill Oriented	
Employability Oriented	✓
Entrepreneurship Oriented	

Course Relevance	
Local	
Regional	
National	✓
Global	

Preamble

To enable the students acquire knowledge on the status and perspective of Indian Poultry Industry and advantages of rearing poultry.

Syllabus

UNIT I 6 Hours

Poultry industry in India: scope and objectives- Choosing commercial layers and Broilers. Types of poultry housing – litter system, 1:3 system, cage rearing- Poultry equipments**.**

UNIT II 6 Hours

Practical aspects of Chick rearing - Management of layers - Management of Broilers. Marketing of poultry product-Poultry manure.

UNIT III 6 Hours

Lighting programmes-Summer and winter management-Debeaking.

UNIT IV 6 Hours

Non - Nutritive feed additives. Feed stuff for poultry. Feed formulation. Nutrition deficiency symptoms - Quality control.

UNIT V 6 Hours

Viral, Bacterial and Fungal diseases-Ranikhet, Fowl typhoid, Aspergillosis-Parasitic diseases Coccidiosis-Vaccination programme.

Text Book

Gnanamani, M.R, ***Modern aspects of commercial poultry keeping***, Giri Publication, Madurai, 2008, Ninth edition.

Reference Books

Naidu, P.M.N, ***Poultry keeping in India***, Indian council of Agricultural Research, New Delhi, 2010

Sreenivasaiah, P. V, ***Textbook of Poultry Science***, Write & Print Publications, New Delhi, 2015, 1st Edition.

Singh, R. A, ***Poultry Production***, Kalyani Publishers, New Delhi, 2011, 3rd Edition.

Pedagogy

Chalk & Talk, E-Resources, Group Discussion

Teaching aids

Black Board, LCD Projector

Course Contents and Lecture Schedule

Module No.	Topic	No. of Lectures	Content Delivery Methods
UNIT - I			
1.1	Poultry industry-Definition	1	Chalk & Talk
1.2	Poultry industry scope in India	1	E-Resources
1.3	Choosing commercial layer and Broiler birds	1	E-Resources
1.4	Types of poultry bird housing - litter system	1	Chalk & Talk
1.5	1:3 system, cage rearing	1	E-Resources
1.6	Poultry equipments	1	Chalk & Talk
UNIT - II			
2.1	Practical aspects of chick rearing	1	PPT
2.2	Management of layers	2	E-Resources
2.3	Management of Broilers	1	E-Resources
2.4	Marketing of poultry product	1	Chalk & Talk
2.5	Poultry manure	1	E-Resources
UNIT - III			
3.1	Lighting programmes	1	E-Resources
3.2	Summer management	2	Chalk & Talk
3.3	Winter management	2	Discussion
3.4	Debeaking	1	E-Resources
UNIT - IV			
4.1	Non - Nutritive feed additives	1	Discussion
4.2	Feed stuff for poultry	2	E-Resources
4.3	Feed formulation	1	Chalk & Talk
4.4	Nutrition deficiency symptoms	1	Discussion
4.5	Quality control	1	Chalk & Talk

UNIT - V			
5.1	Disease Management: Viral disease - Ranikhet disease	2	E-Resources
5.2	Bacterial - Fowl typhoid	1	Chalk & Talk
5.3	Fungal - Aspergillosis	1	E-Resources
5.4	Parasitic disease - Coccidiosis	1	E-Resources
5.5	Vaccination programme	1	E-Resources
	Total	**30**	

Course Designer
Dr. M. Mohiadeen Batcha
Assistant Professor of Zoology

Course Code	Course Title	Category	Total Hours	Credits
20UZYS62	Zoology for Competitive Examination Paper – II	SBS - IV	30	2

Nature of Course	
Knowledge Oriented	
Skill Oriented	
Employability Oriented	✓
Entrepreneurship Oriented	

Course Relevance	
Local	
Regional	
National	✓
Global	

Preamble

To enable the students to Appear for competitive exams.

Syllabus

UNIT I 6 Hours

TEACHING APTITUDE: Teaching: Nature, objectives, characteristics and basic requirements; Learner's characteristics; Factors affecting teaching; Methods of teaching; Teaching aids; Evaluation systems.

UNIT II 6 Hours

RESEARCH APTITUDE: Research: Meaning, characteristics and types; Steps of research, Methods of research; Research Ethics; Paper, article, workshop, seminar, conference and symposium. Thesis writing: its characteristics and format.

UNIT III 6 Hours

READING COMPREHENSION AND COMMUNICATION: A passage to be set with questions to be answered. Communication Nature, characteristics, types, barriers and effective classroom communication.

UNIT IV 6 Hours

REASONING: Number series; letter series; codes; Relationships; classification. Logical Reasoning-Understanding the structure of arguments; Evaluating and distinguishing deductive and inductive reasoning; Verbal analogies: Word analogy — Applied analogy; Verbal classification; Reasoning Logical Diagrams: Simple diagrammatic relationship, multi-diagrammatic relationship; Venn diagram; Analytical Reasoning.

UNIT V 6 Hours

DATA INTERPRETATION: Sources, acquisition and interpretation of data; Quantitative and qualitative data; Graphical representation and mapping of data.

Reference Books

GL Barrons, ***Thorpe's verbal reasoning, LSAT Materials*** Mc Graw Hills.
R S Agarwal, '***A modern approach to Logical reasoning'*** S.Chand.
R S Agarwal, '***Quantitative Aptitude'*** S Chand.
G. L BARRONS, ***Quantitative Aptitude***
Abhijit Guha***, Quantitative Aptitude*** - Mc Graw Hills

Pedagogy

Chalk & Talk, E-Resources, Group Discussion

Teaching aids

Black Board, LCD Projector

Course Contents and Lecture Schedule

Module No.	Topic	No. of Lectures	Content Delivery Methods
	UNIT - I		
1.1	Teaching: Nature, objectives, characteristics and basic requirements; Learner's characteristics.	3	Chalk & Talk
1.2	Factors affecting teaching; Methods of teaching; Teaching aids; Evaluation systems.	3	E-Resource
	UNIT - II		
2.1	Research: Meaning, characteristics and types; Steps of research, Methods of research;	3	Chalk & Talk
2.2	Research Ethics; Paper, article, workshop, seminar, conference and symposium. Thesis writing: its characteristics and format.	3	Chalk & Talk
	UNIT - III		
3.1	A passage to be set with questions to be answered.	2	Chalk & Talk
3.2	Communication Nature, characteristics, types, barriers and effective classroom communication.	4	Chalk & Talk

UNIT - IV			
4.1	Number series; letter series; codes; Relationships; classification. Logical Reasoning-Understanding the structure of arguments	2	Chalk & Talk
4.2	Evaluating and distinguishing deductive and inductive reasoning; Verbal analogies: Word analogy — Applied analogy; Verbal classification	2	Chalk & Talk
4.3	Reasoning Logical Diagrams: Simple diagrammatic relationship, multi-diagrammatic relationship; Venn diagram; Analytical Reasoning.	2	Chalk & Talk
UNIT - V			
5.1	Sources, acquisition and interpretation of data	2	Chalk & Talk
5.2	Quantitative and qualitative data	2	Chalk & Talk
5.3	Graphical representation and mapping of data.	2	Chalk & Talk
	Total	**30**	

Course Designer
Dr. M. Ashiq Ur Rahman
Assistant Professor of Zoology