



# HAJEE KARUTHA ROWTHER HOWDIA COLLEGE

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

Re-Accredited with A++ Grade by NAAC (3<sup>rd</sup> Cycle)

Uthamapalayam - 625 533.

## DEPARTMENT OF ZOOLOGY

MASTER OF SCIENCE - ZOOLOGY

SYLLABUS

Choice Based Credit System – CBCS

With

Outcome Based Education (OBE)

(Academic Year 2026 - 2027 onwards)

# **HAJEE KARUTHA ROWTHER HOWDIA COLLEGE**

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## **College Vision and Mission**

### **Vision**

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

### **Mission**

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

The Vision beckons ..... the Mission continues forever.

# **HAJEE KARUTHA ROWTHER HOWDIA COLLEGE**

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## **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 Postgraduate level training aims to provide a clear understanding of the whole animal kingdom, it's systematics, development, physiology, evolution and conservation. At postgraduate level, we strive to maintain a high level of scientific excellence in achieving hands on experience on various techniques (via internship programmes) along with budding research activities (project work)
- To constantly improve the quality of our teaching and promoting research
- To involve the department in community-based and outreach activities, whenever and wherever possible Affordable quality education to weaker part of the society.
- And to elevate the post graduate department of Zoology as the class academic and research Centre of Madurai Kamaraj University.

### 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

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

### Programme Outcomes (PO)

On the successful completion of M. Sc., Zoology programme, the students will be able to

<b>PO1</b>	Students gain knowledge and skill in the fundamentals of animal sciences, understands the complex interactions among various living organisms.
<b>PO2</b>	Analyse complex interactions among the various animals of different phyla, their distribution and their relationship with the environment.
<b>PO3</b>	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.
<b>PO4</b>	Correlates the environmental conservation processes & physiological processes of animals and relationship of organ systems.
<b>PO5</b>	Gain knowledge of Agro based Small Scale industries like sericulture, fish farming, butterfly farming and vermicompost preparation.

### Program Specific Outcomes (PSO)

A graduate of M. Sc. Zoology after two years will

<b>PSO1</b>	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.
<b>PSO2</b>	Understand the basic concepts in cell and its components which are used to generate and utilize energy besides the development of various animals.
<b>PSO3</b>	Competence in distinguishing the anatomy of various animals and understand the physiological process.
<b>PSO4</b>	Explicate the ecological interconnectedness of life on earth by tracing energy and nutrient flows through the environment.
<b>PSO5</b>	Ability to apply fundamental statistical tools and physical principles (Physics, Chemistry) to the analysis of relevant biological situations.

## Programme Scheme

### Eligibility

A candidate who has passed B.Sc., Zoology as major subject with Chemistry / Botany as one allied.

### For Programme Completion

A Candidate shall complete:

- Part III - Core papers in semesters I, II, III and IV respectively
- Part III - Generic Elective papers in semesters I and II respectively
- Part III - Discipline Elective Papers in semesters III and IV respectively
- Part IV - Skill Enhancement Course (NME) Paper in Semester III respectively
- Part IV - Summer Internship/Industrial Training Paper in semester III respectively
- Part IV - Skill Enhancement Course (Professional Competency Skill) Paper in Semester IV respectively
- 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 III and Part IV (Non- Major Elective & Skill based Subject)

#### Section - A (10 X 2 = 20 Marks)

Answer ALL questions.

- Questions 1 - 10
- One question from each unit
- Short answer questions

#### Section - B (5 X 5 = 25 Marks)

Answer ALL questions (Choose either a or b).

- Questions 11 - 15
- One question from each unit
- Paragraph

#### Section - C (3 X 10 = 30 Marks)

Answer any THREE out of five questions.

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

### Part V (Extension Activities)

- Internal Evaluation only

### Passing Marks

Minimum 34 for External Exam

Eligibility for the degree – passing minimum is 50%

### Practical Examination

Internal	- 40 marks
External	- 60 marks (minimum 27 marks)
Total	- 100 marks

Passing minimum is 50%

**Weightage**

Weightage for Bloom's Taxonomy	Percentage	Marks	
		CIAE	TEE
Knowledge (Remembering) – K1	8	2	6
Understanding – K2	9	2	7
Applying – K3	12	3	9
Analyzing – K4	12	3	9
Evaluate – K5	40	10	30
Create – K6	19	5(Seminar)	14
<b>Gross Total</b>	<b>100</b>	<b>25</b>	<b>75</b>

**Assessment**

**Distribution of questions and marks for Continuous Internal Assessment Examinations**

Bloom's Taxonomy	Section A	Section B	Section C	Total
Knowledge(K1)	1(2)	-	-	<b>Total 25 marks</b>
Understanding(K2)	1(2)	-	-	
Apply(K3)	-	1(3)	-	
Analyzing (K4)	-	1(3)	-	
Evaluate (K5)	-	-	2(10)	
Create (K6)	<b>Seminar (5)</b>			

**Distribution of questions and marks for Term End Examinations**

Bloom's Taxonomy	Section A	Section B	Section C	Total
Knowledge(K1)	3(6)	-	-	<b>Total 75 Marks</b>
Understanding(K2)	1(2)	1(5)	-	
Apply(K3)	2(4)	1(5)	-	
Analyzing (K4)	2(4)	1(5)	-	
Evaluate (K5)	-	-	3(30)	
Create (K6)	2(4)	2(10)	-	

**Note: Figures in parenthesis are Marks**

**Credits Distribution**

S.No	Part	Category	No of Courses	No of Credits
1	Part - III	Core (Theory / Practical / Project)	15	72
		Discipline Elective (Theory / Practical)	2	6
		Generic Elective (Theory / Practical )	2	6
2	Part - IV	NME	1	2
		Professional Competency	1	2
		Internship	1	2
3	Part - V	Extension Activity	1	1
<b>Total</b>			<b>23</b>	<b>91</b>

**M.Sc., ZOOLOGY**

**Details of Course Category, Code, Credits & Title**

Course Category	Course Code	Course Title	Hrs	CIAE	TEE	Max. Marks	Credits
<b>Semester - I</b>							
<b>Part - III</b>							
Core - I	26PZYCC11	Biology of Invertebrates and Vertebrates	6	25	75	100	5
Core - II	26PZYCC12	Cell and Molecular Biology	6	25	75	100	5
Core - III	26PZYCC13	Genetics	6	25	75	100	5
Core - IV	26PZYCC1P	Lab - I	6	40	60	100	4
Generic Elective - I	26PZYGE11	Biostatistics and Bio Informatics	6	25	75	100	3
<b>TOTAL</b>			<b>30</b>				<b>22</b>

Course Category	Course Code	Course Title	Hrs	CIAE	TEE	Max. Marks	Credits
<b>Semester - II</b>							
<b>Part - III</b>							
Core - V	26PZYCC21	Animal Physiology	6	25	75	100	5
Core - VI	26PZYCC22	Biological Chemistry	6	25	75	100	5
Core - VII	26PZYCC23	Ecology and Bio Diversity	6	25	75	100	5
Core - VIII	26PZYCC2P	Lab - II	6	40	60	100	4
Generic Elective - II	26PZYGE21	Wildlife Conservation and Management	6	25	75	100	3
<b>TOTAL</b>			<b>30</b>				<b>22</b>

Course Code	Course Title	Category	Hours	Credits	Marks		
					CIAE	TEE	Total
26PZYCC11	BIOLOGY OF INVERTEBRATES AND VERTEBRATES	Core - I	6	5	25	75	100

### Course Objectives

Students are enabling to get the knowledge on taxonomy, comparative biology of various organisms and the role of fossils in identifying the time of origin of species.

UNIT	Contents	No. of Hours
I	<b>Principles of Taxonomy:</b> Outline Classification of Animal Kingdom - Levels of Organization: Grades of Animal architecture-Symmetry - Coelom. General characters and Classification of Phyla: Locomotion in Arthropods and Molluscs - Nutrition in Polychaetes, Molluscs and Echinoderms.	18
II	<b>Functional Anatomy of Invertebrates:</b> Respiration- Gills, Book lungs, Trachea in Arthropods and Molluscs. Circulation- Circulation in Arthropods and Molluscs. Respiration in Arthropods and Molluscs - Excretory organs in nephridia and malphigian tubules - Nervous system in Arthropods and Echinoderms	18
III	<b>Larval life of Invertebrates:</b> Larval forms, their existence, adaptation and transformation - Minor Phyla Classification - Mesozoa, Rotifera, Phoronida and Chaetognatha, pogonophora.	18
IV	<b>Organ Systems in Vertebrates:</b> Integumentary system in Vertebrates - Dermal and Epidermal derivatives of Vertebrates - Digestive system in Vertebrates - Stomach in Mammals - Circulatory system of Fishes and Mammals - Heart in Vertebrates.	18
V	<b>Organ Systems and Appendicular Skeleton of Vertebrates:</b> Respiration in Fishes - Pulmonary Respiration in Tetrapods - Types of Kidneys - Reproductive system in Vertebrates - Appendicular Skeleton in Vertebrates: Pectoral and Pelvic girdles of Vertebrates - Limbs of Vertebrates .	18
<b>Total</b>		<b>90</b>
Course Outcomes		Knowledge Level
CO	On completion of this course, students will	
1	Identify, distinguish and categorize the non-chordates From chordates.	K1,K2,K3,K4
2	Compare and explain organ systems of animals according To the hierarchy.	K1,K2,K3,K4,K5,K6
3	Compare the organization of alimentary canal and heart In different vertebrates.	K1,K2,K3,K4,K5,K6
4	Explain how animals belonging to different habitat will	

	respire besides comparing the various system and influence of accessory glands in reproduction across Vertebrates.	K1,K2,K3,K4,K5,K6
5	Explain the less diverse minor phyla and estimate the time travel of organisms through time from the fossil deposits.	K1,K2,K3,K4,K5,K6
<b>K1-Knowledge K2-Understand K3-Apply K4- Analyse K5-Evaluate K6- Creating</b>		
<b>Textbooks</b>		
1.	Barnes, R.D. <i>Invertebrate Zoology</i> , IV Ed., Holt Saunders – International Edition.1982.	
2.	Barrington, E.J.W. <i>Invertebrate Structure and Function</i> , II Ed., ELBS and Nelson.1979.	
3.	Kent. G.C. <i>Comparative Anatomy of the Vertebrates</i> , McGraw Hill Book Co., Inc., New York.1976.	
<b>Reference Books</b>		
1.	Kotpal, R.L., Minor Phyla.,Rastogi Publication, Meerut. 2nd Edition, 2002.	
2.	Vasantika Kashyap., <i>Life of Invertebrates</i> , Vikas Publishing House Pvt. Ltd., New Delhi.1997.	
3.	Waterman, A.J., <i>Chordate Structure and Function</i> , The MacmillanCompany.1971.	
4.	E.Ayyar – Invertebrate Zoology,	
<b>e-Resources</b>		
1.	<a href="https://www.swayamprabha.gov.in/index.php/program/archive/9">https://www.swayamprabha.gov.in/index.php/program/archive/9</a>	
2.	<a href="https://ncert.nic.in/textbook.php">https://ncert.nic.in/textbook.php</a>	
3.	<a href="https://www.biodiversitylibrary.org">https://www.biodiversitylibrary.org</a>	
4.	<a href="https://www.britannica.com/animal/invertebrate">https://www.britannica.com/animal/invertebrate</a>	

### Mapping with Programme Outcomes:

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

**Strong-3      Medium-2      Low-1**

### Level of Correlation between PSO's and CO's

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

**Strong-3      Medium-2      Low-1**

**COURSE CONTENTS AND LECTURE SCHEDULE**

<b>Module No.</b>	<b>Topic</b>	<b>No. of Lectures</b>
<b>UNIT - I</b>		
1.1	<b>Principles of Taxonomy:</b> Outline Classification of Animal Kingdom - Levels of Organization: Grades of Animal architecture.	6
1.2	Symmetry - Coelom. General characters and Classification of Phyla: Locomotion in Arthropods and Molluscs.	6
1.3	Nutrition in Polychaetes, Molluscs and Echinoderms.	6
<b>UNIT - II</b>		
2.1	<b>Functional Anatomy of Invertebrates:</b> Respiration- Gills, Book lungs, Trachea in Arthropods and Molluscs.	6
2.2	Circulation- Circulation in Arthropods and Molluscs. Respiration in Arthropods and Molluscs.	6
2.3	Excretory organs in nephridia and malphigian tubules.	3
2.4	Nervous system in Arthropods and Echinoderms.	3
<b>UNIT - III</b>		
3.1	<b>Larval life of Invertebrates:</b> Larval forms, their existence.	6
3.2	Adaptation and transformation.	6
3.3	Minor Phyla Classification - Mesozoa, Rotifera.	3
3.4	Phoronida and Chaetognatha.	3
<b>UNIT - IV</b>		
4.1	<b>Organ Systems in Vertebrates:</b> Integument system in Vertebrates – Dermal and Epidermal derivatives of Vertebrates.	6
4.2	Digestive system in Vertebrates – Stomach in Mammals.	6
4.3	Circulatory system of Fishes and Mammals.	4
4.4	Heart in Vertebrates.	2
<b>UNIT - V</b>		
5.1	<b>Organ Systems and Appendicular Skeleton of Vertebrates:</b> Respiration in Fishes – Pulmonary Respiration in Tetrapods.	6
5.2	Types of Kidneys - Reproductive system in Vertebrates.	6
5.3	Appendicular Skeleton in Vertebrates: Pectoral and Pelvic girdles of Vertebrates – Limbs of Vertebrates.	6
<b>Total</b>		<b>90</b>

**Course Designer**

**Name: Mr. S. Basil Mohamed**

Assistant Professor of Zoology

Course Code	Course Title	Category	Hours	Credits	Marks		
					CIAE	TEE	Total
26PZYCC12	CELL AND MOLECULAR BIOLOGY	Core - II	6	5	25	75	100

Course Objectives		
In depth knowledge and understanding on principles involved in the cell culture techniques and also students are enthusiastic to know molecular techniques.		
UNIT	Contents	No. of Hours
I	<b>Cell membrane:</b> Structure of membrane models - lipid bilayer and membrane proteins Diffusion, osmosis, ion channels and active transport - membrane pumps - mechanism of sorting and regulation of intra cellular transport - electrical properties of membrane - cell wall.	18
II	<b>Ultrastructure of the Cell and Organization:</b> Mitochondria - Golgi bodies - Lysosomes - Endoplasmic reticulum - Ribosomes - Plastids - Chloroplast - Vacuoles - Peroxisomes - Cytoskeleton. Nucleus - structure of chromatin and chromosomes - heterochromatin and euchromatin - unique and repetitive DNA - interrupted gene - gene families.	18
III	<b>Regulation of Cell Cycle and Molecular Basis of Cancer:</b> Cell division, cell cycle and cancer: Mitosis and meiosis - their regulation - steps in cell cycle - regulation and control of cell cycle - oncogenes - tumour suppressor genes - cancer and cell cycle - metastasis - interaction of cancer cell with normal cell - apoptosis - therapeutic interventions of uncontrolled cell growth.	18
IV	<b>Molecular Biology of DNA Replication and RNA Synthesis:</b> Structure and forms of DNA, Replication - Semi conservative, rolling and D-loop models, mechanisms of replication. Homologous and site specific recombination. Structure and types of RNA - RNA polymerases - stages of transcription - transcriptional factors - Post transcriptional modifications - RNA processing - capping, splicing, polyadenylation and RNA editing (CRISPR).	18
V	<b>Molecular Basis of Translation and Operon Regulation:</b> Genetic code - properties - deciphering and exceptions to universality - stages of translation - translation factors - aminoacylation of tRNA - aminoacyl tRNA synthetase - translational proofreading - translational inhibitors - Post translational modifications of proteins. Inducible and repressible systems Lac operon system - Lac positive and negative control mechanisms trp operon	18
<b>Total</b>		<b>90</b>
Course Outcomes		Knowledge Level
CO	On completion of this course, students will	

1	Explain the structure, functions and properties of cell membrane	K1, K2
2	Discuss the mechanisms and control of inter-cellular Communication.	K1,K2
3	Evaluate the events involved in transcription and post Transcriptional modifications.	K1,K2,K3,K4, K5, K6
4	Demonstrate influence of cell communication, signaling And molecule transport	K1,K2
5	Analyse regulation of gene expression and regulation.	K1,K2,K3,K4, K5, K6

**K1-Knowledge K2-Understand K3-Apply K4- Analyse K5- Evaluate K6- Creating**

**Textbooks**

1.	De Robertis EDP and De Robertis EMF (2010) <i>Cell and Molecular Biology</i> , Eighth edn, BI Waverly Pvt. Ltd, New Delhi.
2.	Watson JD, Baker TA, Bell SP, Alexander G and Levine M (2013) <i>Molecular Biology of the Gene</i> , Seventh edn, Benjamin-Cummings Pub Co., San Francisco, USA.

**Reference Books**

1.	Alberts B, Johnson A, Lewis J, Raff M, Roberts K and Walter P (2002) <i>Molecular Biology of the Cell</i> , Third edn, Garland Science Publisher, New York.
2.	Kleinsmith LJ and Kish VM (1995) <i>Principles of Cell and Molecular Biology</i> , Second edn, Harper Collins College Publishers, New York.
3.	Hartl DL and Jones WJ (2005) Genetics - <i>Analysis of genes and genomes</i> . Sixth edn, Jones & Barlett Publishers, Massachusetts.
4.	Cell biology – Ambrose Darothy.

**e-Resources**

1.	<a href="https://www.swayamprabha.gov.in/index.php/program/archive/9">https://www.swayamprabha.gov.in/index.php/program/archive/9</a>
2.	<a href="https://ncert.nic.in/textbook.php">https://ncert.nic.in/textbook.php</a>

**Mapping with Programme Outcomes:**

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

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

**Level of Correlation between PSO's and CO's**

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

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

## COURSE CONTENTS AND LECTURE SCHEDULE

Module No.	Topic	No. of Lectures
<b>UNIT - I</b>		
1.1	<b>Cell membrane:</b> Structure of membrane models - lipid bilayer and membrane proteins Diffusion.	6
1.2	Osmosis, ion channels and active transport - membrane pumps - mechanism of sorting.	6
1.3	regulation of intra cellular transport - electrical properties of membrane - cell wall.	6
<b>UNIT - II</b>		
2.1	<b>Ultrastructure of the Cell and Organization:</b> Mitochondria - Golgi bodies - Lysosomes.	6
2.2	Endoplasmic reticulum - Ribosomes - Plastids - Chloroplast - Vacuoles - Peroxisomes - Cytoskeleton.	6
2.3	Nucleus - structure of chromatin and chromosomes - heterochromatin and euchromatin.	3
2.4	unique and repetitive DNA - interrupted gene - gene families.	3
<b>UNIT - III</b>		
3.1	<b>Regulation of Cell Cycle and Molecular Basis of Cancer:</b> Cell division, cell cycle and cancer: Mitosis and meiosis - their regulation - steps in cell cycle.	6
3.2	Regulation and control of cell cycle - oncogenes - tumour suppressor genes - cancer and cell cycle.	6
3.3	Metastasis - interaction of cancer cell with normal cell - apoptosis - therapeutic interventions of uncontrolled cell growth.	6
<b>UNIT - IV</b>		
4.1	<b>Molecular Biology of DNA Replication and RNA Synthesis:</b> Structure and forms of DNA, Replication - Semi conservative, rolling and D-loop models.	6
4.2	Mechanisms of replication. Homologous and site specific recombination. Structure and types of RNA.	6
4.3	RNA polymerases - stages of transcription - transcriptional factors - Post transcriptional modifications	3
4.4	RNA processing - capping, splicing, polyadenylation and RNA editing.	3
<b>UNIT - V</b>		
5.1	<b>Molecular Basis of Translation and Operon Regulation:</b> Genetic code - properties - deciphering and exceptions to universality.	6
5.2	Stages of translation - translation factors - aminoacylation of tRNA - aminoacyl tRNA synthetase.	3

5.3	Translational proofreading - translational inhibitors - Post translational modifications of proteins.	3
5.4	Inducible and repressible systems Lac operon system.	3
5.5	Lac positive and negative control mechanisms trp operon.	3
<b>Total</b>		<b>90</b>

**Course Designer**

**Name: Mr. S. Basil Mohamed**

Assistant Professor of Zoology

Course Code	Course Title	Category	Hours	Credits	Marks		
					CIAE	TEE	Total
26PZYCC13	GENETICS	Core - III	6	5	25	75	100

### Course Objectives

It educates the students on the patterns of inheritance, knowledge in simple Mendelian inheritance concept of linkage and disorders of genetic origin.

UNIT	Contents	No. of Hours
I	<b>Mendelian principles and chromosomal basis of inheritance:</b> Study of heredity, testing genetic hypotheses, multiple alleles, gene interactions, chromosome theory of heredity, extra nuclear inheritance, sex chromosome & sex determination, sex linked, sex influenced genes, rearrangement of chromosome structure and dosage compensation.	18
II	<b>Linkage, crossing over and chromosome mapping:</b> Linkage - types - an exception to Mendel's principle of independent assortment, crossing over as physical basis of recombination, chromosome mapping using recombination frequency, linkage maps using tetrad analysis.	18
III	<b>Microbial genetics:</b> Mechanisms of genetic exchange in bacteria through transformation, conjugation and transduction. Bacteriophage T4 and lambda, rII locus of bacteriophage T4, evolution of the concept of gene as a unit of structure, function, and complementation test as an operational definition of the gene.	18
IV	<b>Chromosomal syndrome:</b> Chromosomal Aberrations–DNA Damage and repair mechanisms–Molecular basis of mutations. In born errors of metabolism: Phenylketonuria, Alkaptonuria, Albinism, Lesch-Nyhans syndrome, ADA deficiency, Galactosemia, G6PD deficiency, Tay Sachs disease and Gaucher's disease.	18
V	<b>Human Genetics:</b> Human karyotype, banding techniques, genetic traits and inborn errors in man. Variations in chromosome number - Genetics of human behavioural traits. Twin studies - Pedigree analysis - symbols - sex linked and autosomal pedigree. Eugenics, Euthenics and genetic counselling.	18
<b>Total</b>		<b>90</b>

Course Outcomes		Knowledge Level
CO	On completion of this course, students will	
1	Demonstrate Mendel's laws of inheritance and recognize the deviations from them	K1, K2
2	Explain principles of genetic linkage and chromosome mapping	K1, K2
3	Justify the nature of various genetic disorders, their diagnosis and origin	K1, K2, K3, K4, K5
4	Categorize the genetic disorders which play a vital role in various metabolic activities	K1, K2, K3, K4, K5, K6

5	Identify the syndromes and develop knowledge on Genetic counseling to treat various genetic disorders	K1, K2,K3, K5, K6
<b>K1-Knowledge K2-Understand K3-Apply K4- Analyse K5- Evaluate K6- Creating Textbooks</b>		
1.	Snustad DP and Simmons MJ (2010) <i>Principles of Genetics</i> , Fifth edn, John Wiley & Sons, Inc, New York.	
<b>Reference Books</b>		
1.	Brooker RJ (2005) <i>Genetics- Analysis and Principles</i> , Second edn, McGraw-Hill Book Company, Boston, USA.	
2.	Hartl DL and Jones WJ (2005) <i>Genetics - Analysis of Genes &amp; Genomes</i> , Sixth edn, Jones & Barlett Publishers, Massachusetts.	
3.	Hexter W and Yost HT (1977) <i>The Science of Genetics</i> , Prentice Hall of India Private Ltd., New Delhi.	

### Mapping with Programme Outcomes:

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

**Strong-3      Medium-2      Low-1**

### Level of Correlation between PSO's and CO's

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

**Strong-3      Medium-2      Low-1**

### COURSE CONTENTS AND LECTURE SCHEDULE

Module No.	Topic	No. of Lectures
<b>UNIT - I</b>		
1.1	<b>Mendelian principles and chromosomal basis of inheritance:</b> Study of heredity, testing genetic hypotheses, multiple alleles.	6
1.2	Gene interactions, chromosome theory of heredity, extra nuclear inheritance, sex chromosome & sex determination.	6
1.3	Sex linked, sex influenced genes, rearrangement of chromosome.	3
1.4	Structure and dosage compensation.	3
<b>UNIT - II</b>		

2.1	<b>Linkage, crossing over and chromosome mapping:</b> Linkage - types - an exception to Mendel's principle of independent assortment.	6
2.2	Crossing over as physical basis of recombination, chromosome mapping using recombination frequency.	6
3.3	Linkage maps using ordered tetrad data.	6
<b>UNIT - III</b>		
3.1	<b>Microbial genetics:</b> Mechanisms of genetic exchange in bacteria through transformation, conjugation and transduction.	6
3.2	Bacteriophage T4 and lambda, rII locus of bacteriophage T4, evolution of the concept of gene as a unit of structure.	6
3.3	Function, and complementation test as an operational definition of the gene.	6
<b>UNIT - IV</b>		
4.1	<b>Chromosomal syndrome:</b> Chromosomal Aberrations–DNA Damage and repair mechanisms–Molecular basis of mutations.	6
4.2	In born errors of metabolism: Phenylketonuria, Alkaptonuria, Albinism, Lesch-Nyhansyndrome, ADA deficiency.	6
4.3	Galactosemia, G6PD deficiency, Tay Sachs disease and Gaucher's disease.	6
<b>UNIT - V</b>		
5.1	<b>Human Genetics:</b> Human karyotype, banding techniques, genetic traits and inborn errors in man.	6
5.2	Variations in chromosome number - Genetics of human behavioural traits. Twin studies - Pedigree analysis .	6
5.3	symbols - sex linked and autosomal pedigree Eugenics, Euthenics and genetic counselling.	6
<b>Total</b>		<b>90</b>

**Course Designer**

**Name: Ms. P. Vinnoli**

Assistant Professor of Zoology

Course Code	Course Title	Category	Hours	Credits	Marks		
					CIAE	TEE	Total
26PZYCC1P	LAB - I	Core - IV	6	4	40	60	100

### Course Objectives

To enable the students acquire knowledge on diversity of animals with or without back bones and improve the genetic, cellular, molecular, bio techniques and dissection techniques among the students.

UNIT	Contents	No. of Hours
I	<p><b>I. Amoeba</b>, Paramecium, Plasmodium, Euglena and Balantidium</p> <p>II. Leucosolenia, Hyalonema, Euplectela, Spicules and Gemmule of Sponge</p> <p>III. Hydra, Obelia colony and medusa, Sea anemone, Madrepora and Tubipora</p> <p>IV. Fasciola, Planaria, Taeniasolium Bipalium and Ascaris,</p> <p>V. Neries, Chaetopterus, Megascolex, Arenicola and Polygordius</p> <p>VI. Daphnia, Cyclops, Naupilus, Centipede and Peripatus</p> <p>VII. Fresh water mussel, Mytilus, Octopus, Sepia and Pila</p> <p>VIII. Starfish, Sea urchin, Cucumaria, Thyone and Ophiothrix</p> <p>T.S. of sponge – T.S. of Hydra</p> <p>T.S. of liver fluke – T.S. of Nereis larval forms</p>	18
II	<p><b>Dissection / Bio Visual Charts</b></p> <p>Earthworm : Nervous system, Circulatory system</p> <p>Prawn : Appendages and digestive systems, Reproductive system</p> <p>Crab : Nervous system, Sex identification</p> <p>I. Amphioxus, Suckerfish, Mullet, Mugil and Arius</p> <p>II. Cacapus, Rana hexadactyla, Ichthyophis, Alytes and Rhacophorus</p> <p>III. Calotes, Chameleon, Draco, Viper and Cobra</p> <p>IV. Pigeon, Woodpecker, Crane, Partridge and King fisher</p> <p>V. Bat, Loris, Pig embryo, Rabbit embryo and Sheep embryo</p>	18
III	<p><b>GENETICS</b> Culture of Drosophila sex identification, identification of mutants.</p> <p>Mountings of Salivary glands of Chironomous larva.</p> <p>Isolation of DNA from squamous epithelial cells.</p> <p>Pedigree analysis.</p> <p>Human karyotyping and chromosomal abnormalities.</p> <p>Identification of Sex chromatin – Barr body.</p>	18
IV	<p><b>Cell and molecular Biology</b></p> <p>Slides on tissues – Epithelial, connective, bone, muscular and germ cells using Microtome</p> <p>Preparation of Squamous epithelial cells</p> <p>Cell size determination using micrometer</p>	18

V	Squash preparation of onion root tip and observation of mitotic stages Meiosis in goat testis Separation of lymphocytes using histopaque Haemolysis Isolation of DNA from animal tissues Agarose gel electrophoresis of DNA	18
<b>Total</b>		<b>90</b>
<b>Course Outcomes</b>		<b>Knowledge Level</b>
<b>CO</b>	<b>On completion of this course, students will</b>	
1	Develop dissection technique and explain the functional anatomy of selected invertebrates	K1,K2,K3,K4, K5
2	Compare the external characters, classify the affinities the adaptive features of various vertebrates.	K1,K2,K3,K4, K5
3	Identify the chromosomes complement number of an individual's mutant and discussion the principles of segregation, genotype, frequency in a population.	K1,K2,K3,K4, K5,K6
4	Determine the membrane composition and elaborate the structural features of component macromolecules in different cells	K1,K2,K3,K4, K5,K6
5	Understand and apply general concepts of cell and molecular biology to relevant, specific problems	K1,K2,K3,K4, K5,K6
<b>K1-Knowledge K2-Understand K3-Apply K4- Analyse K5- Evaluate K6- Creating</b>		
<b>Textbooks</b>		
1.	Lal, S.S. 2009. <i>Practical Zoology</i> , Rastogi Publications, pp-484.	
2.	Iulius G. D. and D. Pulerà, 2007. <i>The Dissection of Vertebrates: A Laboratory Manual</i> . Academic Press, Imprint of Elsevier Publication, pp-416.	
3.	Verma, P.S. 2000. <i>Manual of Practical Zoology: Chordates</i> , S. Chand Publishing Company, pp-528.	
<b>Reference Books</b>		
1.	Preeti, G., and C. Mridula, 2000. <i>Modern Experimental Zoology</i> , Indus International Publication.	
2.	Sinha, J., A. K. Chatterjee, P. Chattopadhyaya. 2011. <i>Advanced Practical Zoology</i> , Arunabha Sen Publishers, pp-1070.	

**Mapping with Programme Outcomes:**

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

**Strong-3      Medium-2      Low-1**

### Level of Correlation between PSO's and CO's

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

Strong-3      Medium-2      Low-1

### COURSE CONTENTS AND LAB SCHEDULE

Module No.	Topic	No. of Hours
<b>UNIT - I</b>		
1.1	I. Amoeba, Paramecium, Plasmodium, Euglena and Balantidium II. Leucosolenia, Hyalonema, Euplectela, Spicules and Gemmule of Sponge III. Hydra, Obelia colony and medusa, Sea anemone, Madrepora and Tubipora	6
1.2	IV. Fasciola, Planaria, Taeniasolium Bipalium and Ascaris, V. Neries, Chaetopterus, Megascolex, Arenicola and Polygordius VI. Daphnia, Cyclops, Naupilus, Centipede and Peripatus	6
1.3	VII. Fresh water mussel, Mytilus, Octopus, Sepia and Pila VIII. Starfish, Sea urchin, Cucumaria, Thyone and Ophiothrix T.S. of sponge – T.S. of Hydra T.S. of liver fluke – T.S. of Nereis larval forms	6
<b>UNIT - II</b>		
2.1	<b>Dissection</b> Earthworm : Nervous system Prawn : Appendages and digestive systems Crab : Nervous system	6
2.2	I. Amphioxus, Suckerfish, Mullet, Mugil and Arius II. Cacapus, Rana hexadactyla, Ichthyophis, Alytes and Rhacophorus III. Calotes, Chameleon, Draco, Viper and Cobra	6
2.3	IV. Pigeon, Woodpecker, Crane, Partridge and King fisher V. Bat, Loris, Pig embryo, Rabbit embryo and Sheep embryo	6
<b>UNIT - III</b>		
3.1	<b>GENETICS</b> Culture of Drosophila sex identification, identification of mutants. Mountings of Salivary glands of Chironomous larva.	6
3.2	Isolation of DNA from squamous epithelial cells. Pedigree analysis.	6

3.3	Human karyotyping and chromosomal abnormalities. Identification of Sex chromatin – Barr body.	6
<b>UNIT - IV</b>		
4.1	<b>Cell and molecular Biology</b> Slides on tissues – Epithelial, connective, bone, muscular and germ cells	6
4.2	Preparation of Squamous epithelial cells	6
4.3	Cell size determination using micrometer	6
<b>UNIT - V</b>		
5.1	<b>Cell and molecular Biology</b> Slides on tissues – Epithelial, connective, bone, muscular and germ cells Preparation of Squamous epithelial cells	6
5.2	Squash preparation of onion root tip and observation of mitotic stages Meiosis in goat testis	6
5.2	Separation of lymphocytes using histopaque Haemolysis Isolation of DNA from animal tissues Agarose gel electrophoresis of DNA	6
<b>Total</b>		<b>90</b>

**Course Designer**

**Name: Mr. S. Basil Mohamed**

Assistant Professor of Zoology

Course Code	Course Title	Category	Hours	Credits	Marks		
					CIAE	TEE	Total
26PZYGE11	BIostatistics and Bio Informatics	Generic Elective - I	6	3	25	75	100

### Course Objectives

This course is designed to impart a fundamental knowledge on data, sources & acquisition, organization & presentation of data. It targets at teaching certain important bio statistical analyses such as measures of central tendencies, dispersion of data and tests of significance. It also gives an introduction to the usage of SPSS package in bio statistical analysis.

UNIT	Contents	No. of Hours
I	<b>Introduction, data and collection methods:</b> Biometry - introduction, definition, basic concepts, terminologies. Data - types and sources, collection methods, sampling - random & non-random, classification of data - Sturge's rule. Presentation of data - tabulation, graphical and diagrammatic representation.	18
II	<b>Descriptive statistics:</b> Measures of central tendency - arithmetic mean, median and mode. Measures of dispersion - standard deviation and Standard error - linear regression and simple correlation.	18
III	<b>Tests of significance:</b> Students t-test (simple, paired), F-test - applications of $\chi^2$ (chi-square) test in biology & testing the goodness of fit - Analysis of Variance (ANOVA). Introduction to statistical software - SPSS - data editor - creating coding variables - output viewer - graphic & diagrammatic representations - Elements of Probit analysis.	18
IV	<b>Introduction and Bioinformatics Resources:</b> Computational Biology and Bioinformatics - definition - Biological databases - Nucleic acid sequence databases - GenBank, EMBL and DDBJ. Protein sequence databases - SWISS-PROT, TrEMBL, PIR and PDB. Genome Databases SANGER. NCBI, EBI, TIGR and Other Databases - Patterns/Motifs/System Biology.	18
V	<b>Sequence Similarity Searches:</b> Basic concepts of sequence similarity, identity and homology. Scoring matrices - PAM & BLOSUM series - local versus global alignment. Needleman-wunsch and Smith-waterman algorithms. Heuristic Methods of sequence alignment - FASTA, BLAST & PSI BLAST, Software tools for pairwise & multiple sequence alignment.	18
<b>Total</b>		<b>90</b>
Course Outcomes		Knowledge Level
CO	On completion of this course, students will	
1	Identify the sources and methods of data collection, classification and presentation.	K1
2	Compute the central tendencies, measures of dispersion,	

	standard deviation & error, linear regression and simple correlation.	K1,K2,K3
3	Analyze the significance, goodness of fit, variance & use SPSS package.	K1,K2,K3,K4, K5,K6
4	Utilize biological databases for bioinformatics analysis.	K1,K2,K3,K4, K5,K6
5	Analyze biological sequence alignments and create phylogenetic tree.	K1,K2,K3
<b>K1-Knowledge K2-Understand K3-Apply K4- Analyse K5- Evaluate K6- Creating Textbooks</b>		
1.	Attwood KT, Pettifer RS and D Thorne (2016) <i>Bioinformatics Challenges at the Interface of Biology and Computer Science</i> : Mind the Gap, First edn, John Wiley & Sons, New York.	
<b>Reference Books</b>		
1.	Ignacimuthu S (2005) <i>Basic Bioinformatics</i> , Second edn, Narosa Publishing House, New Delhi.	
2.	Landau S and Everitt BS (2003) A Handbook of Statistical analyses using SPSS, Chapman & Hall/CRC Press, London.	
3.	Lesk AM (2002) <i>Introduction to Bioinformatics</i> , First edn, Oxford University Press, London.	

### Mapping with Programme Outcomes:

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

**Strong-3      Medium-2      Low-1**

### Level of Correlation between PSO's and CO's

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

**Strong-3      Medium-2      Low-1**

### COURSE CONTENTS AND LECTURE SCHEDULE

Module No.	Topic	No. of Lectures
<b>UNIT - I</b>		

1.1	<b>Introduction, data and collection methods:</b> Biostatistics - introduction, definition, basic concepts, terminologies.	6
1.2	Data - types and sources, collection methods, sampling - random & non-random, classification of data.	6
1.3	Sturge's rule. Presentation of data - tabulation, graphical and diagrammatic representation.	6
<b>UNIT - II</b>		
2.1	<b>Descriptive statistics:</b> Measures of central tendency - arithmetic mean, median and mode.	6
2.2	Measures of dispersion - standard deviation and Standard error.	6
2.3	linear regression and simple correlation.	6
<b>UNIT - III</b>		
3.1	<b>Tests of significance:</b> Students t-test (simple, paired), F-test - applications of $\chi^2$ (chi-square) test in biology & testing the goodness of fit.	6
3.2	Analysis of Variance (ANOVA). Introduction to statistical software - SPSS - data editor.	6
3.3	Creating coding variables - output viewer - graphic & diagrammatic representations - Elements of Probit analysis.	6
<b>UNIT - IV</b>		
4.1	<b>Introduction and Bioinformatics Resources:</b> Computational Biology and Bioinformatics - definition.	6
4.2	Biological databases - Nucleic acid sequence databases - GenBank, EMBL and DDBJ.	6
4.3	Protein sequence databases - SWISS-PROT, TrEMBL, PIR and PDB. Genome Databases.	3
4.4	NCBI, EBI, TIGR and SANGER. Other Databases - Patterns/Motifs/System Biology.	3
<b>UNIT - V</b>		
5.1	<b>Sequence Similarity Searches:</b> Basic concepts of sequence similarity, identity and homology. Scoring matrices -	6
5.2	PAM & BLOSUM series - local versus global alignment. Needleman-wunsch and Smith-waterman algorithms	6
5.3	. Heuristic Methods of sequence alignment - FASTA, BLAST & PSI BLAST, Software tools for pairwise & multiple sequence alignment.	6
<b>Total</b>		<b>90</b>

### Course Designer

**Name: Ms. P. Vinnoli**

Assistant Professor of Zoology

Course Code	Course Title	Category	Hours	Credits	Marks		
					CIAE	TEE	Total
26PZYCC21	ANIMAL PHYSIOLOGY	Core - V	6	5	25	75	100

### Course Objectives

To enable the students acquire knowledge on internal physical and chemical functions of animals and to explore the makeup of animals, including their behaviors and their biological structure.

UNIT	Contents	No. of Hours
I	<b>Digestion and respiration:</b> Digestive function - assimilation & absorption, unique food and feeding mechanisms in animals. Mechanism of respiration - respiratory pigments - transport of respiratory gases in the blood - air breathing in fishes - hypoxia - oxygen therapy - control of respiration.	18
II	<b>Circulation and excretion:</b> General pattern and principles of vertebrate circulation blood coagulation - ECG - cardio dynamics - haemo dynamics - microcirculation - tissue fluid exchange - lymphatic circulation - control of heart beat and circulation. Kidneys of vertebrates - body fluids - nitrogen excretion - physiology of urine formation - renal clearance - control of micturition.	18
III	<b>Muscle, nerve cell and signals:</b> Structure of muscle cell - sliding filament theory - cross - bridge function and production of force - role of calcium - electrochemical coupling - neural control of muscle contraction. Components of nervous system - functional morphology of synapse, Impulse - types and transmission, Chemical transmitters - excitation, inhibition and computation.	18
IV	<b>Endocrine and sensory physiology:</b> Endocrine systems in vertebrates - Endocrine function - hormones - target tissues - mechanism of hormone action - endocrine disorders - hormone therapy - hormonal control on metabolism. Sensory qualities - principles - receptors - chemical senses - mechanical senses - optic sense - animal electricity - sorting of sensory information.	18
V	<b>Environmental physiology:</b> Adaptation to the environment - temperature regulation Osmo-ionic regulation. Physiological time - Effect of high altitude - Problems of diving - adaptations - stress physiology.	18
<b>Total</b>		<b>90</b>
Course Outcomes		Knowledge Level
CO	On completion of this course, students will	
1	Explain the feedback system and classify adaptive mechanisms of the animal body.	K1,K2,K3,K4, K5

2	Examine the removal of metabolic wastes and toxins from animal body and the mechanism in which body controls urine output.	K1,K2,K3,K4
3	List out the types of stimuli to which receptors respond	K1,K2,K3,K4
4	Determine the functioning of life, organization and coordination of behavior.	K1,K2,K3,K4, K5,K6
5	Classify the excitability and transmission of impulse in nerve cells and electrical organs in animals.	K1,K2,K3,K4, K5,K6
<b>K1-Knowledge K2-Understand K3-Apply K4- Analyse K5- Evaluate K6- Creating</b>		
<b>Textbooks</b>		
1.	Nielson KS (1997) <i>Animal Physiology</i> - Adaptation and Environment, Fifth edn, Cambridge University Press, London.	
2.	Pocock G, Richards GD and Daly MDB (1999) <i>Human Physiology</i> , Oxford University Press, London.	
<b>Reference Books</b>		
1.	Eckert R (1982) <i>Animal Physiology</i> , Surjeet Publications, New Delhi.	
2.	Widmaier E, Raff H and Strang K (2013) <i>Vander's Human Physiology: The Mechanisms of Body Function</i> , Thirteenth edn, Mc Graw Hill Education, New York.	
3.	Pocock G, Richards GD and Daly MDB (1999) <i>Human Physiology</i> , Oxford University Press, London.	

### Mapping with Programme Outcomes:

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

**Strong-3      Medium-2      Low-1**

### Level of Correlation between PSO's and CO's

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

**Strong-3      Medium-2      Low-1**

### COURSE CONTENTS AND LECTURE SCHEDULE

Module No.	Topic	No. of Lectures
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<b>UNIT - I</b>		
1.1	<b>Digestion and respiration:</b> Digestive function - assimilation & absorption, unique food and feeding mechanisms in animals.	6
1.2	Mechanism of respiration - respiratory pigments -	6
1.3	Transport of respiratory gases in the blood.	3
1.4	Air breathing in fishes - hypoxia - oxygen therapy - control of respiration.	3
<b>UNIT - II</b>		
2.1	<b>Circulation and excretion:</b> General pattern and principles of vertebrate circulation blood coagulation.	4
2.2	ECG - cardiodynamics - haemodynamics - microcirculation - tissue fluid exchange.	4
2.3	Lymphatic circulation - control of heart beat and circulation. Kidneys of vertebrates.	4
2.4	Body fluids - nitrogen excretion - physiology of urine formation - renal clearance - control of micturition.	6
<b>UNIT - III</b>		
3.1	<b>Muscle, nerve cell and signals:</b> Structure of muscle cell - sliding filament theory - cross - bridge function and production of force.	6
3.2	Role of calcium - electrochemical coupling - neural control of muscle contraction. Components of nervous system.	6
3.3	Functional morphology of synapse, Impulse - types and transmission, Chemical transmitters - excitation, inhibition and computation.	6
<b>UNIT - IV</b>		
4.1	<b>Endocrine and sensory physiology:</b> Endocrine systems in vertebrates - Endocrine function - hormones - target tissues -	5
4.2	Mechanism of hormone action - endocrine disorders - hormone therapy - hormonal control on metabolism.	6
4.3	Sensory qualities - principles - receptors - chemical senses.	4
4.4	Mechanical senses - optic sense - animal electricity - sorting of sensory information.	3
<b>UNIT - V</b>		
5.1	<b>Environmental physiology:</b> Adaptation to the environment - temperature regulation Osmo-iono regulation.	6
5.2	Physiological time - Effect of high altitude.	6
5.3	Problems of diving - adaptations - stress physiology.	6
<b>Total</b>		<b>90</b>

**Course Designer**

**Name: Ms. P. Vinnoli**

Assistant Professor of Zoology

Course Code	Course Title	Category	Hours	Credits	Marks		
					CIAE	TEE	Total
26PZYCC22	BIOLOGICAL CHEMISTRY	Core - VI	6	5	25	75	100

### Course Objectives

Course on biological chemistry includes physical and chemical concepts in biology, composition, structure and functions of carbohydrates, proteins, lipids and vitamins. Enzymes & enzyme kinetics, metabolism of carbohydrates, proteins, lipids, and vitamins will be taught. It also includes biosynthesis and degradation of purines and pyrimidines

UNIT	Contents	No. of Hours
I	<b>Physical and chemical concepts in biology:</b> Structure of atoms, molecules and chemical bonds. Biomolecule interaction - van der Waals, electrostatic, hydrogen bonding, hydrophobic interaction and covalent bond. Principles of biophysical chemistry- pH, buffer, chemical kinetics, colligative properties.	18
II	<b>Biomolecules:</b> Composition, structure, classification and function - Carbohydrates, lipids, proteins and vitamins. Conformation of proteins - Ramachandran plot, primary, secondary, tertiary & quaternary structures, domains, motif and folds.	18
III	<b>Enzymes and bioenergetics:</b> Enzymes and enzyme kinetics - regulation of enzymatic activity - mechanism of enzyme catalysis - Michaelis -Menten equation - isozymes. Bioenergetics - thermodynamics, free energy, coupled reactions, group transfer and biological energy transducers.	18
IV	<b>Carbohydrate and vitamin metabolism:</b> Types of metabolism. Carbohydrate metabolism - glycolysis, TCA cycle, oxidative phosphorylation, Gluconeogenesis, glycogen metabolism - Glycogenesis and Glycogenolysis, HMP shunt, uronic acid pathway, Vitamin metabolism - vitamins A and C.	18
V	<b>Amino acid, nucleic acid and lipid metabolism:</b> Amino acid metabolism - Urea cycle. Nucleotides - Biosynthesis and degradation of purines and pyrimidines. Biosynthesis and $\beta$ -oxidation of fatty acid, Ketone bodies, metabolism of Phospholipids, Glycolipids, Cholesterol and HDL.	18
<b>Total</b>		<b>90</b>
Course Outcomes		Knowledge Level
CO	On completion of this course, students will	
1	Explain the basic concepts of biochemistry such as chemical bonds, pH, buffer and kinetic properties of biological reactions.	K1,K2,K3,K4, K5
2	Analyze the biomolecular structures of carbohydrates, proteins, lipids and vitamins.	K1,K2,K3,K4

3	Evaluate the regulation and mechanism of enzyme activity and the role of thermodynamic principles in metabolic reactions.	K1,K2,K3,K4
4	Demonstrate the metabolic pathways of carbohydrates and vitamins.	K1,K2,K3,K4, K5,K6
5	Explain the amino acid, nucleic acid and lipid metabolism	K1,K2,K3,K4, K5,K6
<b>K1-Knowledge K2-Understand K3-Apply K4- Analyse K5- Evaluate K6- Creating</b>		
<b>Textbooks</b>		
1.	Voet JG, Pratt CW and Voet D (2016) <i>Fundamentals of Biochemistry</i> : Life at the molecular level, Fifth edn, John Wiley & Sons, New York.	
<b>Reference Books</b>		
1.	Berg JM, Tymoczko L and Stryer L (2012) <i>Biochemistry</i> , Seventh edn, W.H. Freeman, New York.	
2.	Murray RK, Granner DK and Rodwell VW (2006) Harper's Illustrated Biochemistry, Twenty Seventh edn, McGraw Hill Companies, Inc.	
3.	Nelson DL and Cox MM (2013) Lehninger <i>Principles of Biochemistry</i> , Sixth edn, W.H. Freeman, New York.	

### Mapping with Programme Outcomes:

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

Strong-3      Medium-2      Low-1

### Level of Correlation between PSO's and CO's

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

Strong-3      Medium-2      Low-1

### COURSE CONTENTS AND LECTURE SCHEDULE

Module No.	Topic	No. of Lectures
<b>UNIT - I</b>		
1.1	<b>Physical and chemical concepts in biology:</b> Structure of atoms, molecules and chemical bonds.	6
1.2	Biomolecule interaction - van der Waals, electrostatic, hydrogen bonding, hydrophobic interaction and covalent	6

	bond.	
1.3	Principles of biophysical chemistry- pH, buffer, reaction kinetics, colligative properties.	6
<b>UNIT - II</b>		
2.1	<b>Biomolecules:</b> Composition, structure, classification and function - Carbohydrates, lipids, proteins and vitamins.	6
2.2	Conformation of proteins - Ramachandran plot.	6
2.3	primary, secondary, tertiary & quaternary structures, domains, motif and folds.	6
<b>UNIT - III</b>		
3.1	<b>Enzymes and bioenergetics:</b> Enzymes and enzyme kinetics - regulation of enzymatic activity.	6
3.2	Mechanism of enzyme catalysis - Michaelis-Menten equation - isozymes. Bioenergetics - thermodynamics.	6
3.3	Free energy, coupled reactions, group transfer and biological energy transducers.	6
<b>UNIT - IV</b>		
4.1	<b>Carbohydrate and vitamin metabolism:</b> Types of metabolism. Carbohydrate metabolism - glycolysis, TCA cycle.	6
4.2	Oxidative phosphorylation, Gluconeogenesis, glycogen metabolism - Glycogenesis and Glycogenolysis.	6
4.3	HMP shunt, uronic acid pathway, Vitamin metabolism - vitamins A and C.	6
<b>UNIT - V</b>		
5.1	<b>Amino acid, nucleic acid and lipid metabolism:</b> Amino acid metabolism - Urea cycle. Nucleotides.	6
5.2	Biosynthesis and degradation of purines and pyrimidines. Biosynthesis.	6
5.3	$\beta$ -oxidation of fatty acid, Ketone bodies, metabolism of Phospholipids, Glycolipids, Cholesterol and HDL.	6
<b>Total</b>		<b>90</b>

**Course Designer**

**Name: Dr. P. Raja**

Assistant Professor of Zoology

Course Code	Course Title	Category	Hours	Credits	Marks		
					CIAE	TEE	Total
26PZYCC23	ECOLOGY AND BIO DIVERSITY	Core - VII	6	5	25	75	100

Course Objectives		
The course explains the basic concepts, components of ecosystems, types of Biodiversity and different indices.		
UNIT	Contents	No. of Hours
I	<b>Aim and Scope of Ecology:</b> Abiotic factors and biotic factors, Concept and Dynamics of ecosystem, Types of Ecosystem (Lentic, Lotic, Estuaries and Marine), Energy flow: Lindeman's rule of trophic dynamics, energy flow models. Biogeochemical cycles: Nitrogen, Carbon, Sulphur and Phosphorous cycle, water cycle, limnology.	18
II	<b>Population and community Ecology:</b> Population Ecology-Characteristics of a population-population growth curves-population regulation - concept of meta population. Community Ecology- Biological communities Community structure-Biological communities and species interactions, types of interactions between two species, Lotka-Volterra equation for competition and predation, interspecific competition, Ecological succession, sere-climax community.	18
III	<b>Biodiversity</b> Pollution-sources, effects and control measures of air pollution, water pollution, soil pollution, noise pollution, thermal pollution, nuclear hazards. Biodiversity – convention on biological diversity- patterns of diversity – genetic-species- ecosystem- and guild diversity – alpha-beta-gamma diversity- diversity indices – dominance and evenness- landscape and its elements- endemism and hotspots- indicator species- key stone speciesvalue of biodiversity- ecotourism.	18
IV	<b>wildlife sanctuaries and National Parks (Silent Valley)</b> Biodiversity loss - Causes-IUCN categories of threaten species-red data book- Environmental Impact Assessment-Remote sensing in EIA – biodiversity conservation-In situ conservation – biosphere reserves national parks-wildlife sanctuaries- ex situ conversation – zoological - botanical gardens-sacred grooves- cryopreservation.	18
V	<b>Disaster management:</b> Definition, factors and Significance, Difference between Hazard and Disaster. Natural disasters - Earthquakes, Volcanic Eruption, Landslides, Snow Avalanches, Floods and Flash, Cyclones, Tsunami and Droughts, famine, hurricanes chiahook. Man Made Disasters - Fires and Forest Fires. Nuclear, Biological and Chemical disasters, Road accident.	18

		<b>Total</b>	<b>90</b>
<b>Course Outcomes</b>		<b>Knowledge Level</b>	
<b>CO</b>	<b>On completion of this course, students will</b>		
1	Understand the diversity of animals in various ecosystems and demographic analysis in their habitats	K1,K2,K3,K4, K5,K6	
2	Demonstrate an understanding of key ecological interactions and processes: Community Ecology	K1,K2,K3,K4, K5,K6	
3	Illustrate an compare of key ecological interactions and processes: Population Ecology - Characterization, growth curves.	K1,K2,K3,K4	
4	Classify scales and patterns and threats in biological diversity	K1,K2,K3,K4, K5,K6	
5	Assess the sustainable management aiming at the conservation of species and habitats	K1,K2,K3,K4	
<b>K1-Knowledge K2-Understand K3-Apply K4- Analyse K5- Evaluate K6- Creating</b>			
<b>Textbooks</b>			
1.	Odum, Eugene P., <i>Fundamentals of Ecology</i> , W.B. Saunder's Co. Philadelphia. 5th Edition,2010.		
2.	Sharma, P.D., <i>Ecology and Environment</i> , VII Edition, Rastogi Publications.2005.		
3.	Asthana, D. K., <i>Environment: Problems and Solutions</i> , S. Chand & Company, 2007		
<b>Reference Books</b>			
1.	Clarke, G.L. <i>Elements of Ecology</i> . John Wiley & Sons, New York. 1954		
2.	Odum, E.P. and Barrett, G.W. <i>Fundamentals of Ecology</i> . Thomson Brooks/ Cole (EWP)5th Ed. 2005. 4. Sharma, P.D. Microbiology - Rastogi Publications, Meerut. 1993.		

### Mapping with Programme Outcomes:

CO /PO	P01	P02	P03	P04	P05
<b>CO1</b>	3	3	1	3	3
<b>CO2</b>	3	3	1	3	3
<b>CO3</b>	3	3	2	3	3
<b>CO4</b>	3	2	2	3	3
<b>CO5</b>	3	3	2	3	3

**Strong-3      Medium-2      Low-1**

### Level of Correlation between PSO's and CO's

CO /PSO	PS01	PS02	PS03	PS04	PS05
<b>CO1</b>	3	3	1	3	3
<b>CO2</b>	3	3	1	3	3
<b>CO3</b>	3	3	2	3	3
<b>CO4</b>	3	2	2	3	3
<b>CO5</b>	3	3	2	3	3

**Strong-3      Medium-2      Low-1**

## COURSE CONTENTS AND LECTURE SCHEDULE

Module No.	Topic	No. of Lectures
<b>UNIT - I</b>		
1.1	<b>Aim and Scope of Ecology:</b> Abiotic factors and biotic factors, Concept and Dynamics of ecosystem.	6
1.2	Types of Ecosystem (Lentic, Lotic, Estuaries and Marine), Energy flow: Lindeman's rule of trophic dynamics.	6
1.3	Energy flow models. Biogeochemical cycles: Nitrogen, Carbon.	4
1.4	Sulphur and Phosphorous cycle.	2
<b>UNIT - II</b>		
2.1	<b>Population and community Ecology:</b> Population Ecology- Characteristics of a population-population growth curves-population regulation.	4
2.2	Concept of meta population. Community Ecology- Biological communities Community structure.	4
2.3	Biological communities and species interactions, types of interactions between two species.	4
2.4	Lotka- Voltera equation for competition and predation, interspecific competition, Ecological succession.	6
<b>UNIT - III</b>		
3.1	<b>Biodiversity</b> Pollution-sources, effects and control measures of air pollution, water pollution, soil pollution, noise pollution, thermal pollution, nuclear hazards.	6
3.2	Biodiversity – convention on biological diversity-patterns of diversity – genetic-species.	4
3.3	Ecosystem- and guild diversity – alpha-beta-gamma diversity- diversity indices – dominance and evenness.	4
3.4	Landscape and its elements- endemism and hotspots-indicator species-key stone species value of biodiversity- ecotourism.	4
<b>UNIT - IV</b>		
4.1	<b>Wildlife sanctuaries</b> Biodiversity loss - Causes-IUCN categories of threaten species-red data book- Environmental Impact Assessment.	6
4.2	Remote sensing in EIA – biodiversity conservation-In situ conservation – biosphere reserves national parks.	6
4.3	Wildlife sanctuaries- ex situ conservation – zoological – botanical gardens-sacred grooves- cryopreservation.	6
<b>UNIT - V</b>		
5.1	<b>Disaster management:</b> Definition, factors and Significance, Difference between Hazard and Disaster. Natural disasters – Earthquakes.	6

5.2	Volcanic Eruption, Landslides, Snow Avalanches, Floods and Flash, Cyclones, Tsunami and Droughts.	6
5.3	Man Made Disasters - Fires and Forest Fires. Nuclear, Biological and Chemical disasters, Road accident.	6
<b>Total</b>		<b>90</b>

**Course Designer**

**Name: Dr. P. Raja**

Assistant Professor of Zoology

Course Code	Course Title	Category	Hours	Credits	Marks		
					CIAE	TEE	Total
26PZYCC2P	LAB - II	Core - VIII	6	4	40	60	100

### Course Objectives

Brief about different culture techniques and explain the basic concept components of different habitats and quantitative estimation of planktons. It also explains the ethogram of animal behaviour and vermibed preparation.

UNIT	Contents	No. of Hours
I	<b>Plasticity of pulse rate and heart beat</b> Analysis of human blood - total and differential count of RBC, WBC Estimation of oxygen consumption under stress Determination of Q10 in freshwater fish	18
II	<b>Osmoregulation in an aquatic animal</b> Experiments on sensory organs - vision, hearing and taste Effect of insulin level on vertebrate blood glucose Qualitative analysis of excretory products – Ammonia, Urea, Uric acid Factors affecting salivary amylase activity- pH Temperature	18
III	<b>pH metry.</b> Preparation of biological buffer. Colorimetry. Estimation of Glucose -Anthrone method. Estimation of Protein - Lowry's method. Estimation of lipids	18
IV	<b>Centrifugation technique.</b> Electrophoresis Chromatography: Paper and Thin Layer molarity(m), molality (m) & normality(n)	18
V	<b>Identification of fauna and flora of terrestrial and freshwater ecosystem in our college campus</b> Qualitative estimation of phytoplankton by Luky's drop method and zooplankton by Sedgwick-Rafter cell method. Estimation of primary productivity: light and dark bottle method – effect of depth and light Analysis of water samples for Chlorides, Silicates, Calcium, Total hardness,	18
<b>Total</b>		<b>90</b>
Course Outcomes		Knowledge Level
CO	On completion of this course, students will	
1	Use pH meter, colorimeter, spectrophotometer and centrifuge.	K1,K2,K3,K4, K5,K6
2	Demonstrate paper and thin layer chromatography.	K1,K2,K3,K4

3	Design experiments using quantitative tests for carbohydrates, protein and nucleic acids.	K1,K2,K3,K4, K5,K6
4	Explain the process of excretion and osmoregulation in animals.	K1,K2,K3,K4, K5,K6
5	Evaluate primary productivity and physico-chemical parameters of water samples.	K1,K2,K3,K4, K5,K6
<b>K1-Knowledge K2-Understand K3-Apply K4- Analyse K5- Evaluate K6- Creating</b>		
<b>Textbooks</b>		
1.	Amrit K (2006) <i>Laboratory manual of animal physiology and Biochemistry</i> , First edn, CBS Publishers & Distributors Pvt. Ltd, New Delhi.	
2.	Durairaj G (1987) <i>Animal physiology - A laboratory manual</i> , COSIP-ULP Publications, Dept. of Zoology, University of Madras, Chennai.	
<b>Reference Books</b>		
1.	Jayaraman J (2011) <i>Laboratory manual in Biochemistry</i> , Second edn, New Age International Publishers, New Delhi	
2.	Agarwal SK (2002) <i>Industrial environment: assessment and strategy</i> , APH Publishers, New Delhi.	

### Mapping with Programme Outcomes:

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

Strong-3      Medium-2      Low-1

### Level of Correlation between PSO's and CO's

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

Strong-3      Medium-2      Low-1

### COURSE CONTENTS AND LAB SCHEDULE

Module No.	Topic	No. of Hours
<b>UNIT - I</b>		
1.1	Plasticity of pulse rate and heart beat Analysis of human blood - total and differential count of RBC, WBC.	6

1.2	Estimation of oxygen consumption under stress.	6
1.3	Determination of Q10 in freshwater fish.	6
<b>UNIT - II</b>		
2.1	Osmoregulation in an aquatic animal Experiments on sensory organs - vision, hearing and taste.	6
2.2	Effect of insulin level on vertebrate blood glucose.	6
2.3	Qualitative analysis of excretory products Factors affecting salivary amylase activity.	6
<b>UNIT - III</b>		
3.1	pH metry. Preparation of biological buffer.	6
3.2	Colorimetry. Estimation of Glucose -Anthrone method.	6
3.3	Estimation of Protein - Lowry's method. Estimation of lipids	6
<b>UNIT - IV</b>		
4.1	Centrifugation technique.	4
4.2	Electrophoresis	4
4.3	Chromatography: Paper and Thin Layer.	6
4.4	Molarity(m),molality (m)& normality(n).	4
<b>UNIT - V</b>		
5.1	Identification of fauna and flora of terrestrial and freshwater ecosystem in our college campus.	6
5.2	Qualitative estimation of phytoplankton by Luky's drop method and zooplankton by Sedgwick-Rafter cell method.	4
5.3	Estimation of primary productivity: light and dark bottle method - effect of depth and light.	4
5.4	Analysis of water samples for Chlorides, Silicates, Calcium, Total hardness.	4
<b>Total</b>		<b>90</b>

**Course Designer**

**Name: Dr. P. Raja**

Assistant Professor of Zoology

Course Code	Course Title	Category	Hours	Credits	Marks		
					CIAE	TEE	Total
26PZYGE21	WILDLIFE CONSERVATION AND MANAGEMENT	Generic Elective - II	6	3	25	75	100

### Course Objectives

Identify the necessity for wildlife conservation, causes for wildlife depletion and to interpret establishment of clonal banks, sanctuaries and national parks. Describe the wildlife protective acts, conservation organizations, red data books and role of NGO's organizations in wildlife conservation.

UNIT	Contents	No. of Hours
I	<b>Wildlife conservation</b> Definition and aims of Wildlife conservation: Necessity for conservation and causes for Wildlife depletion (Deforestation, Hunting, Poaching, Pollution, Natural calamities, Poor breeding); Knowledge of Wildlife, Protective laws, wildlife protective acts, Restriction of Hunting, Habitat improvement, clonal banks, Census, Epidemic control Establishment of Sanctuaries and National parks	18
II	<b>Organizations for wildlife conservation management</b> : Indian Board for Wild Life conservation (IBWI), World Wildlife Found – India (WWF-India), wild life acts ; Red Data Books and Role of NGO's in wildlife conservation (Wildlife preservation society of India).	18
III	<b>Importance of wildlife and Indian Fauna:</b> Ecological balance, Ecological imbalance economic values, biological diversity Wildlife for aesthetic value, Importance of Indian Fauna - Indian lion, Indian Tiger, Indian Rhino, Indian Elephant, wild Buffalo and Indian Crocodiles. Wildlife conflicts - Conflicts between elephant and man, wolf and man, tiger and man	18
IV	<b>Threats of Biodiversity and Biosphere reserves in India</b> Human activity and loss of Habitat deforestation, desertification, Marine environment Increasing wildlife trade, climate change, poaching, Industrialization and Urbanization Wildlife conservation projects – Tiger, Lion, Elephant, Musk deer, Thamin deer and crocodile. Biosphere reserves in India-National parks, wildlife sanctuaries Wildlife corridors of India with special reference to Andhra Pradesh.	18
V	<b>Wildlife Population Dynamics:</b> Life history strategies; Population growth models; Factors affecting wildlife populations: disease, food availability, predation; Global case studies of threatened wildlife species and their population trends (e.g., African Elephant, Giant Panda, Siberian Tiger)	18
	<b>Total</b>	<b>90</b>
<b>Course Outcomes</b>		<b>Knowledge Level</b>

CO	On completion of this course, students will	
1	Asses the importance of wildlife conservation, establishment of sanctuaries and national parks.	K1,K2,K3,K4, K5,K6
2	Apply the knowledge of wildlife protective acts in conserving animal biodiversity and consider different conservation organizations,	K1,K2,K3,K4, K5,K6
3	Red data books, role of NGO's organizations in wild life conservation.	K1,K2,K3,K4
4	Distinguish the values of wild life, importance of Indian fauna and causes of wild life conflicts	K1,K2,K3,K4, K5,K6
5	Classify the different animal species with the help of acquired practical knowledge through field trips, visiting zoological parks and bird sanctuaries.	K1,K2,K3,K4, K5,K6
<b>K1-Knowledge K2-Understand K3-Apply K4- Analyse K5- Evaluate K6- Creating</b>		
<b>Textbooks</b>		
1.	<i>Wildlife conservation and Management</i> ,Reena Mathur,2018,Rastogi Publication	
2.	<i>Fundamentals of Ecology</i> ,3rdEdition,Madhab Chandra Dash,Satyaprakash Dash	
<b>Reference Books</b>		
1.	<i>Ecology and Environmental Biology</i> (HB) Hardcover – 2014by Purohit SS and Agrawal AK (Author)	
2.	<i>Essentials of ecology &amp; environmental science</i> , 5/E 5th Edition (English, Paperback, S. V. S. Rana) Rural Tourism and Tribal Development December 2006- by S.B. Verma and S.K. Jiloka Fielder L.P.andKareiva, M.P.1997.Conservation biology.	
3.	Saharia, V.V.1982.Wildlife in india.Natraco Pub. Dehradun.	

### Mapping with Programme Outcomes:

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

Strong-3      Medium-2      Low-1

### Level of Correlation between PSO's and CO's

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

Strong-3      Medium-2      Low-1

## COURSE CONTENTS AND LECTURE SCHEDULE

Module No.	Topic	No. of Lectures
<b>UNIT - I</b>		
1.1	<b>Wildlife conservation</b> Definition and aims of Wildlife conservation: Necessity for conservation and causes for Wildlife depletion.	6
1.2	(Deforestation, Hunting, Poaching, Pollution, Natural calamities, Poor breeding); Knowledge of Wildlife, Protective laws.	4
1.3	Wildlife protective acts, Restriction of Hunting, Habitat improvement, clonal banks, Census.	4
1.4	Epidemic control Establishment of Sanctuaries and National parks.	4
<b>UNIT - II</b>		
2.1	<b>Organizations for wildlife conservation management:</b> Indian Board for Wild Life conservation (IBWI).	6
2.2.	World Wildlife Found – India (WWF- India), wild life acts ; Red Data Books.	6
2.3	Role of NGO's in wildlife conservation (Wildlife preservation society of India).	6
<b>UNIT - III</b>		
3.1	<b>Importance of wildlife and Indian Fauna:</b> Ecological balance, economic values.	6
3.2	Biological diversity Wildlife for aesthetic value, Importance of Indian Fauna - Indian lion, Indian Tiger, Indian Rhino.	6
3.3	Indian Elephant, wild Buffalo and Indian Crocodiles. Wildlife conflicts - Conflicts between elephant and man, wolf and man, tiger and man.	6
<b>UNIT - IV</b>		
4.1	<b>Threats of Biodiversity and Biosphere reserves in India</b> Human activity and loss of Habitat deforestation, desertification, Marine environment Increasing wildlife trade.	6
4.2	Climate change, poaching, Industrialization and Urbanization Wildlife conservation projects – Tiger, Lion, Elephant, Musk deer, Thamin deer and crocodile.	7
4.3	Biosphere reserves in India-National parks, wildlife sanctuaries Wildlife corridors of India with special reference to Andhra Pradesh.	5
<b>UNIT - V</b>		
5.1	<b>Wildlife Population Dynamics:</b> Life history strategies; Population growth models.	6
5.2	Factors affecting wildlife populations: disease, food availability, predation.	6

5.3	Global case studies of threatened wildlife species and their population trends (e.g., African Elephant, Giant Panda, Siberian Tiger).	6
<b>Total</b>		<b>90</b>

**Course Designer**

**Name: Dr. P. Raja**

Assistant Professor of Zoology