

**RAJEEV GANDHI GOVT. POST GRADUATE COLLEGE,  
AMBIKAPUR, SURGUJA (CG), INDIA**  
**Department of Zoology**



**Programme Outcomes and Course Outcomes**  
**For**  
**B.Sc. (Zoology)**  
**SEMESTER SYSTEM**

# **Rajeev Gandhi Govt. P.G. College, Ambikapur**

## **DEPARTMENT OF ZOOLOGY**

### **Programme Outcomes**

**PO-1 Knowledge and Understanding-** After studying this program, student will be more equipped to learn and know about different biological system.

**PO-2 Critical Thinking-** Drawing upon this knowledge, they will be able to give specific examples of the physiological adaptations, development, reproduction and behavior of different forms of life.

**PO-3 Problem Solving-** Student will be able to explain how organisms function at the level of the gene, genome, cell, tissue and organ-system.

**PO-4 Analytical reasoning-** Analyze complex interactions among the various animals of different phyla, their distribution and their relationship with the environment.

**PO-5 Academic Knowledge-** Apply the Knowledge of internal structure of cell, its functions in control of various metabolic functions of organism.

**PO-6 Research Skill-** Correlates the physiological processes of animals and relationship of organ systems.

**PO-7 Business Skill enhancement Course-** Gain knowledge of Agro based small scale industries like Sericulture, fish farming, butterfly farming and vermi-compost preparation.

**PO-8 Human welfare-** Understands about various concepts of genetics and its importance in human health.

**PO-9 Ethics awareness-** Apply ethical principles and commit to professional ethics and responsibilities in delivering his duties. Develop empathy and love towards the animals.

## **Program Specific Outcomes**

**1.PSO**-Understand the nature-Understand the nature and basic concepts of cell biology, genetics, taxonomy, physiology, ecology and applied Zoology.

**2.PSO**-Analyse the relationships among animals, plants and microbes.

**3.PSO**-Laboratory Knowledge-Perform procedures as per laboratory standards in the areas of Taxonomy, Physiology, Ecology, Cell biology, Genetics, Applied Zoology, tools and techniques of Zoology, Animal biotechnology, Immunology and research methodology.

**4.PSO**-Understand the applications of biological sciences in Apiculture, Aquaculture, Agriculture and Medicine.

**5.PSO**-Gains Knowledge about research methodologies, effective communication and skills of problem solving methods.

**ACDEMIC PROGRAMME & SCHEME**  
**BSc. ZOOLOGY (NEP)**

<b>Class</b>	<b>Course Type</b>	<b>Course/Paper</b>	<b>Theory Credit/ hrs</b>	<b>Practical Credit/ hrs</b>
I SEMESTER	DSCCZOO-1	Cell Biology and Non-Chordata	3/45	1/30
I SEMESTER	GECZOO-1	Human Physiology	3/45	1/30
I SEMESTER	VACZOO-1	Vermiculture	2/30	
II SEMESTER	DSCCZOO-2	Chordata and Embryology	3/45	1/30
II SEMESTER	GECZOO-2	Food Nutrition and Health	3/45	1/30
III SEMESTER	DSCCZOO-3	Anatomy and Physiology	3/45	1/30
III SEMESTER	DSECZOO-1	Fish and Fisheries	3/45	1/30
III SEMESTER	VACZOO-2	Sericulture	2/30	
IV SEMESTER	DSCCZOO-4	Vertebrate Endocrinology, Reproductive Biology, Behavior, Evolution and Applied Zoology	3/45	1/30
IV SEMESTER	DSECZOO-2	Economic Zoology	3/45	1/30
V SEMESTER	DSCCZOO-5	Ecology, Environmental Biology, Toxicology, Microbiology and Medical Zoology	3/45	1/30
V SEMESTER	DSECZOO-3	Diversity of Chordates	3/45	1/30
V SEMESTER	GECZOO-3	Biodiversity Conservation and Sustainable Development	3/45	1/30
VI SEMESTER	DSCCZOO-6	Genetics, Cell Physiology, Biochemistry, Biotechnology and Biotechniques	3/45	1/30
VI SEMESTER	DSECZOO-4	Fundamentals of Biochemistry	3/45	1/30
VI SEMESTER	GECZOO-4	Human Health and Diseases	3/45	1/30



**Undergraduate Interdisciplinary Course- Semester-I (BA/B.Sc. Math)**  
**GECZOO-1- -Human Physiology**  
**Course outcomes**

After successfully completing this course, the students will be able to:

CO 1- Understand the process of digestion and its control

CO 2- Develop understanding in muscle structure and contraction mechanism

CO 3- Learn the process of respiration and transport of gases

CO 4- Understand kidney structure and regulation of urine formation

CO 5- Understand heart structure and functioning

CO 6- Understand function of endocrine glands and formation of gametes.

**Mapping of Programme and Course outcome**

**(GEC- Human Physiology)**

		CO-1	CO-2	CO-3	CO-4	CO-5	CO-6
PO-1	Knowledge, understanding	✓	✓				✓
PO-2	Critical Thinking		✓	✓	✓		
PO-3	Problem Solving				✓		✓
PO-4	Analytical Reasoning						
PO-5	Academic Knowledge			✓			
PO-6	Research Skill		✓	✓	✓	✓	✓
PO-7	Business Skill						
PO-8	Human Welfare			✓	✓	✓	
PO-9	Ethics Awareness						

## VACZOO-1 Vermiculture

### Course Outcomes

After completing the course the students will able to demonstrate:-

- CO 01- Understand the organic solid waste can be managed through vermiculture.
- CO 02- Vermicomposting can be used for biodegradable waste management.
- CO 03- Vermi-compost is superior to traditional compost due to its ability to improve the soil structure and to increase its water-holding capacity.
- CO 04- Explain the ecological characteristics and beneficial of earthworm have been clearly demonstrated.
- CO 05- Demonstrate the experimental technique for Vermiculture.
- CO 06- Discuss the improvement of plant growth and yield.
- CO 07- Understand the, how does vermicomposting help the environment.
- CO 08- To understand the improvement of soil physical, chemical and biological properties.

### Mapping of Programme and Course outcome

#### (Vermiculture)

		CO-1	CO-2	CO-3	CO-4	CO-5	CO-6	CO-7	CO-8
PO-1	Knowledge, understanding								✓
PO-2	Critical Thinking		✓						✓
PO-3	Problem Solving	✓			✓			✓	
PO-4	Analytical Reasoning			✓					
PO-5	Academic Knowledge								✓
PO-6	Research Skill		✓	✓	✓	✓			✓
PO-7	Business Skill	✓			✓		✓		✓
PO-8	Human Welfare	✓		✓	✓	✓	✓		
PO-9	Ethics Awareness				✓		✓	✓	

**B.Sc.-II Semester**

## DSCCZOO-2 -Chordata and Embryology

### Course Outcome

#### Course Outcome-

CO- 1.Studentsstudy the classification, structural peculiarities of Hemichordata, protochordata and their evolutionary Importance.

CO-2.Students will be able to analyse the Comparative knowledge to Petromyzon and Myxine.

CO-3. Students will be able to understand the principles of taxonomy, systematics and classification of Chordata.

CO -4. Students will be able to gain a comprehensive knowledge of Poisonous and non poisonous snakes.

CO -5. Students will understand about snake venom and poison apparatus.

CO-6. Students will be able to analyze the process of metamorphosis of amphibians.

CO-7.Students will be able to gain a comprehensive knowledge about Migration, Flight adaptation and Perching mechanism in Bird.

CO-8.Students will be able to evaluation of Prototheria, Metatheria, Eutheria and their affinities.

### Mapping of Programme and Course outcome

#### (Chordata and Embryology)

		CO-1	CO-2	CO-3	CO-4	CO-5	CO-6	CO-7	CO-8
PO-1	Knowledge, understanding		✓					✓	
PO-2	Critical Thinking				✓		✓		
PO-3	Problem Solving				✓	✓			
PO-4	Analytical Reasoning	✓	✓	✓					✓
PO-5	Academic Knowledge								
PO-6	Research Skill				✓	✓		✓	
PO-7	Business Skill					✓			
PO-8	Human Welfare					✓			
PO-9	Ethics Awareness				✓			✓	



## **GECZOO-2-Food Nutrition and Health**

### **Course Outcome-**

- 1.CO-The course covers the basic concepts of balanced diet for people of different ages besides focusing on the consequences of malnutrition and the deficiency diseases and the diseases caused due to poor hygiene.
- 2.CO-Understand the role of food and nutrients in health and disease.
- 3.CO- Implement strategies for food access, procurement, preparation and safety that are relevant for the culture, age, literacy
4. CO-Perform food system management and leadership functions that consider sustainability in business.

### **Mapping of Programme and Course outcome**

#### **(Food Nutrition and Health)**

		CO-1	CO-2	CO-3	CO-4
PO-1	Knowledge, understanding	✓			
PO-2	Critical Thinking				
PO-3	Problem Solving	✓	✓		
PO-4	Analytical Reasoning			✓	
PO-5	Academic Knowledge				
PO-6	Research Skill	✓			
PO-7	Business Skill				✓
PO-8	Human Welfare	✓	✓		
PO-9	Ethics Awareness				

## (Comparative Anatomy of various organ systems of Vertebrates)

### Course out Come

CO-1.Students will have understood the structure of different Integument and its derivatives.

CO-2.They will also understand the Comparative anatomy of various organ systems of vertebrates.

CO-3.Understands about structure, composition of scales, hair and feathers.

CO-4.Student will undertake research in any aspect of animal physiology.

CO-5. Course provides students comprehensive understanding about Circulatory system and Urinogenital system.

CO-6. Students gain evolutionary knowledge about Heart and Aortic arches.

CO-7. Course provides students comprehensive understanding about neurobiology, neurophysiology, molecular neurobiology.

CO-8 Develop an understanding of the evolution of vertebrates thus integrating structure, function and development.

### Mapping of Programme and Course outcome

#### Anatomy and Physiology (Comparative Anatomy of various organ systems of Vertebrates)

		CO-1	CO-2	CO-3	CO-4	CO-5	CO-6	CO-7	CO-8
PO-1	Knowledge, understanding	✓		✓					✓
PO-2	Critical Thinking		✓			✓		✓	
PO-3	Problem Solving						✓		✓
PO-4	Analytical Reasoning		✓				✓	✓	
PO-5	Academic Knowledge	✓						✓	
PO-6	Research Skill		✓		✓		✓		
PO-7	Business Skill								
PO-8	Human Welfare				✓	✓		✓	
PO-9	Ethics Awareness								

**B.Sc. III SEMESTER**

## DSECZOO-1 - Fish and Fisheries

### Course Outcomes

After successfully completing this course, the students will be able to:-

CO1- A detailed understanding of evolutionary strategies and morphological innovations, gene and genome duplication, evolutionary genetics, biogeographical distribution of major groups of fishes.

CO2- An overview of adaptations of fishes to environmental extremes- temperature, pressure, stress.

CO3-Understanding growth and metabolism of fishes by regulation of food intake by neuropeptides and hormones, environmental factors and feed intake.

CO 4- Evaluation of defense mechanism in fishes and their regulation.

CO 5- Learning of fish reproduction for better yield in fish farming.

### Mapping of Programme and Course outcome

#### (Fish and Fisheries)

		CO-1	CO-2	CO-3	CO-4	CO-5
PO-1	Knowledge, understanding	✓			✓	
PO-2	Critical Thinking	✓	✓		✓	
PO-3	Problem Solving					
PO-4	Analytical Reasoning		✓			
PO-5	Academic Knowledge	✓				
PO-6	Research Skill		✓			✓
PO-7	Business Skill					✓
PO-8	Human Welfare					✓
PO-9	Ethics Awareness				✓	

#### B.Sc.-IV Semester

### DSCCZOO-4-Vertebrate Endocrinology, Reproductive biology, Behavior and Evolution

## Course Outcomes

CO-1.They will learn detail of endocrinology with classification of hormones, their biosynthesis.

CO-2.Understand the basic organization of the Endocrine disorder of Pituitary, Thyroid and Pancreas.

CO -3. Students of this class will be able to understand the importance of hormones in the Gametogenesis.

CO-4. After successfully completing this course, the students will be able to demonstrate knowledge of key concepts in animal behavior.

CO-5.Learn a wide range of theoretical and practical techniques used to study animal behavior.

CO-6.Thinking ability, flexibly and apply knowledge to new behavior problem.

CO -7. Students will be able to biological and chemical pest control.

CO -8. Gives knowledge of silk worm rearing and Mulberry cultivation.

## Mapping of Programme and Course outcome

### (Vertebrate Endocrinology, Reproductive biology, Behavior and Evolution)

		CO-1	CO-2	CO-3	CO-4	CO-5	CO-6	CO-7	CO-8
PO-1	Knowledge, understanding	✓			✓		✓		
PO-2	Critical Thinking		✓	✓	✓	✓	✓		
PO-3	Problem Solving			✓		✓			✓
PO-4	Analytical Reasoning		✓						
PO-5	Academic Knowledge			✓	✓	✓			
PO-6	Research Skill		✓					✓	
PO-7	Business Skill						✓	✓	✓
PO-8	Human Welfare					✓			✓
PO-9	Ethics Awareness								

**B.Sc.-IV Semester**

**DSEZOO-2-Economic Zoology**

**Course outcome**

CO-1 After successfully completing the course, the students will be able to economic important of vertebrate.

CO-2 Acquire the skills to manage a dairy farm or to start one with adequate inputs.

CO-3 Identify the types of insect pests particularly the most common one.

CO-4 To impact training in extension management and transfer of Fish culture.

CO-5 Understand the effective way of insect pest management strategy.

CO-6 Understand conditioning factors and how they can be manipulated aquaculture.

CO-7 Identify where to purchase equipment and demonstrate how to assemble Sericulture.

CO-8 After completing this course the learner will be able to critical understanding of environmental impact.

### **Mapping of Programme and Course outcome**

#### **(Economic Zoology)**

		CO-1	CO-2	CO-3	CO-4	CO-5	CO-6	CO-7	CO-8
PO-1	Knowledge, understanding								
PO-2	Critical Thinking				✓				✓
PO-3	Problem Solving				✓		✓		
PO-4	Analytical Reasoning			✓			✓		
PO-5	Academic Knowledge					✓			
PO-6	Research Skill		✓	✓			✓	✓	
PO-7	Business Skill	✓	✓			✓		✓	
PO-8	Human Welfare	✓	✓			✓			
PO-9	Ethics Awareness	✓	✓						✓

#### **B.Sc.-V Semester**

#### **DSCCZOO-5- Ecology, Environmental Biology: Toxicology, Microbiology and Medical Zoology**

#### **Course outcomes**

CO-1.Students will understand the various features and aspects of population ecology, community ecology and ecosystem ecology.

CO-2.They will acquire knowledge about environmental biology in details.

CO-3.Understands laws of limiting factor of environment.

CO-4. It provides opportunities for student's research projects, internships in assessing the effects of poisonous animal.

CO-5.They will also know the various tools and techniques related to industrial microbiology.

CO-6. Understanding of Industrial microbiology and production of penicillin .

CO-7. Student's gains knowledge about microbiology of milk and milk production.

CO-8.They also will acquire knowledge about some parasites for their life cycle, pathology, diagnosis, symptoms and treatment.

### **Mapping of Programme and Course outcome**

**(Ecology, Environmental Biology: Toxicology, Microbiology and Medical Zoology)**

		CO-1	CO-2	CO-3	CO-4	CO-5	CO-6	CO-7	CO-8
PO-1	Knowledge, understanding	✓							
PO-2	Critical Thinking		✓			✓			
PO-3	Problem Solving		✓			✓		✓	✓
PO-4	Analytical Reasoning				✓				
PO-5	Academic Knowledge			✓					
PO-6	Research Skill		✓	✓			✓		
PO-7	Business Skill						✓	✓	
PO-8	Human Welfare					✓	✓	✓	✓
PO-9	Ethics Awareness	✓					✓		✓

### **B.Sc. V SEMESTER**

### **PDSECZOO-3-DIVERSITY OF CHORDATES**

### **Course Outcomes**

CO-1 Develop an understanding of the evolution of vertebrates thus integrating structure, function and development.

CO-2 Understand the morphology of vertebrates with their ecology, behaviour and physiological adaptation in diverse habitats.

CO-3 Detailed discussions of major organ systems.

CO-4 Undertake research in any aspect of animal physiology in future.

### **Mapping of Programme and Course Outcome**

#### **(DIVERSITY OF CHORDATES)**

		CO-1	CO-2	CO-3	CO-4
PO-1	Knowledge, understanding	✓	✓		
PO-2	Critical Thinking			✓	✓
PO-3	Problem Solving		✓		
PO-4	Analytical Reasoning			✓	
PO-5	Academic Knowledge	✓			
PO-6	Research Skill	✓	✓		✓
PO-7	Business Skill				
PO-8	Human Welfare				
PO-9	Ethics Awareness				

### **UNDERGRADUATE SEMESTER-V**

#### **GECZOO-3-Biodiversity conservation and sustainable development**

#### **Course Outcomes**

**CO-1** Develop understanding for the environment which is largely degraded in the current scenario.

**CO-2** Understand the importance of biodiversity and the consequences of biodiversity loss.

**CO-3** Follow the concept of green technology and the eco-friendly practices and other prospects of environment protection.

**CO-4** Understand and practice appropriate legal/regulatory and ethical issues in the context of the work environment.

**CO-5** Design research projects.

### **Mapping of Programme and Course outcome**

#### **(Biodiversity conservation and sustainable development)**

		CO-1	CO-2	CO-3	CO-4	CO-5
PO-1	Knowledge, understanding	✓			✓	
PO-2	Critical Thinking	✓	✓			
PO-3	Problem Solving	✓	✓	✓		
PO-4	Analytical Reasoning					
PO-5	Academic Knowledge		✓		✓	
PO-6	Research Skill	✓	✓	✓		✓
PO-7	Business Skill					
PO-8	Human Welfare	✓	✓	✓		✓
PO-9	Ethics Awareness	✓				

### **B.Sc.VI Semester**

### **DSCCZOO-6-Genetics, Cell Physiology, Biochemistry, Biotechnology and Biotechniques**

### **Course outcomes**



CO-1.Students will learn the fundamental genetics like linkage and linkage map.

CO-2.Understanding the chromosome anomalies and associated diseases.

CO-3.Knowledge about gene and chromosomal mutation.

CO-4.To studies the mechanism of active transport and its role in mitochondria and Endoplasmic reticulum.

CO-5. Understanding of general idea about pH and buffer .

CO-6.They will also understand the nature, mechanism of protein and their metabolism.

CO-7.To understands the scope and importance of tissue culture, hybridoma, transgenic animals and gene library.

CO -8.Students gain knowledge about various tools & techniques used in biological systems and gives them insight about their use in research.

## Mapping of Programme and Course outcome

(Genetics, Cell Physiology, Biochemistry, Biotechnology and Biotechniques)

		CO-1	CO-2	CO-3	CO-4	CO-5	CO-6	CO-7	CO-8
PO-1	Knowledge, understanding	✓						✓	
PO-2	Critical Thinking			✓					
PO-3	Problem Solving					✓			
PO-4	Analytical Reasoning		✓		✓				
PO-5	Academic Knowledge		✓				✓		
PO-6	Research Skill					✓			✓
PO-7	Business Skill								
PO-8	Human Welfare					✓			
PO-9	Ethics Awareness								

**B.Sc. VI SEMESTER**

**DSECZOO-4- FUNDAMENTALS OF BIOCHEMISTRY**

**Course Outcomes**

**CO-1 Understand about the importance and scope of biochemistry.**

**CO-2 Understand the concept of enzyme, its mechanism of action and regulation.**

**CO-3 Learn the preparation of models of peptides and nucleotides.**

**CO-4 Learn biochemical test for amino acids, carbohydrates, proteins and nucleic acids.**

**CO-5 Learn measurement of enzyme activity and its kinetics.**

## **Mapping of Programme and Course outcome**

### **(FUNDAMENTALS OF BIOCHEMISTRY)**

		CO-1	CO-2	CO-3	CO-4	CO-5
PO-1	Knowledge, understanding	✓				
PO-2	Critical Thinking		✓	✓		
PO-3	Problem Solving					✓
PO-4	Analytical Reasoning		✓		✓	
PO-5	Academic Knowledge		✓			
PO-6	Research Skill					✓
PO-7	Business Skill					
PO-8	Human Welfare					✓
PO-9	Ethics Awareness					

## **Undergraduate Semester- VI**

### **GECZOO-4-Human Health And Diseases**

#### **Course Outcomes**

**CO-**After completing this course the learners will be able to

CO-1-Develop the implement public health interventions

CO-2-Increase their skills,attitudes and knowledge towards causes of diseases.

CO-3-Apply knowledge of the principles of disease,injury prevention and control.

CO-4 Increase their skills towards knowledge of community health improvement.

CO-5 Prepare expert educational outreach lectures and presentation.

### **Mapping of Programme and Course outcome**

#### **(Human Health and Diseases)**

		CO-1	CO-2	CO-3	CO-4	CO-5
PO-1	Knowledge, understanding	✓			✓	
PO-2	Critical Thinking					✓
PO-3	Problem Solving		✓			
PO-4	Analytical Reasoning	✓			✓	
PO-5	Academic Knowledge					
PO-6	Research Skill	✓	✓	✓		✓
PO-7	Business Skill					
PO-8	Human Welfare	✓		✓		✓
PO-9	Ethics Awareness					

# **Rajeev Gandhi Govt. P.G. College Ambikapur**

*Programme Outcome and Course Outcome*  
**in**  
**Zoology Curriculum**

**SESSION 2023-24**



**Rajeev Gandhi Govt. P.G. College Ambikapur**  
**DEPARTMENT OF ZOOLOGY**

### **Program outcome-**

**PO-1 Knowledge and Understanding-** After studying this program, student will be more equipped to learn and know about different biological system. Drawing upon this knowledge.

**PO-2 Critical Thinking-**They will be able to give specific examples of the physiological adaptations, development, reproduction and behavior of different forms of life.

**PO-3 Problem Solving-**Student will be able to explain how organisms function at the level of the gene, genome, cell, tissue and organ-system.

**PO-4 Analytical reasoning-**Analyze complex interactions among the various animals of different phyla, their distribution and their relationship with the environment.

**PO-5 Academic Knowledge-** Apply the Knowledge of internal structure of cell, its functions in control of various metabolic functions of organism.

**PO-6 Research Skill-** Correlates the physiological processes of animals and relationship of organ systems.

**PO-7 Business Skill enhancement Course-**Gain knowledge of Agro based small scale industries like Sericulture, fish farming butterfly farming and vermicompost preparation.

**PO-8 Human welfare-**Understands about various concepts of genetics and its importance in human health.

**PO-9 Ethic awareness-**Apply ethical principles and commit to professional ethics and responsibilities in delivering his duties. Develops empathy and love towards the animals.

## **Program Specific Outcomes**

**1.PSO** - Understand the nature and basic concepts of cell biology, genetics, taxonomy, physiology, ecology and applied Zoology.

**2.PSO**-Analyse the relationships among animals, plants and microbes.

**3.PSO**-Perform procedures as per laboratory standards in the areas of Taxonomy, Physiology, Ecology, Cell biology, Genetics, Applied Zoology, tools and techniques of Zoology, Animal biotechnology, Immunology and research methodology.

**4.PSO**-Understand the applications of biological sciences in Apiculture, Aquaculture, Agriculture and Medicine.

**5.PSO**-Gains Knowledge about research methodologies, effective communication and skills of problem solving methods.

## M.Sc. Zoology SEMESTER-1 Paper-I

### Course ZOO (11) CCC: Systematics, Biodiversity and Evolution

After successfully completing this course, the students will be able to:

**CO-1** An insight to the overview of evolutionary biology, concept of organic evolution .

**CO-2** Understanding of the universal common ancestor and tree of life, three domain concept of living kingdom

**CO-3** Conceptualization of mode of speciation, evolution, and rules of zoological nomenclature

**CO-4** Understanding the current status and future of biodiversity.

**CO-5** Description of molecular clocks and molecular drive, origin and diversification of eukaryotes and evolution of man

**CO-6** Developed understanding on the diversity of life with regard to non chordates and chordates.

**CO-7** Develop critical understanding how animals changed from a primitive cell to a collection of simple cells to form a complex body plan.

**CO-8** Understand how morphological change due to change in environment helps drive evolution over a long period of time.

### Mapping of Programme and Course outcome (Systematics, Biodiversity and Evolution)

		CO-1	CO-2	CO-3	CO-4	CO-5	CO-6	CO-7	CO-8
PO-1	Knowledge, understanding	✓							
PO-2	Critical Thinking		✓					✓	
PO-3	Problem Solving						✓		
PO-4	Analytical Reasoning			✓					✓
PO-5	Academic Knowledge				✓				
PO-6	Research Skill								
PO-7	Business Skill								
PO-8	Human Welfare					✓			
PO-9	Ethics Awareness								

**M.Sc. ZOOLOGY (SEMESTER I) PAPER-II**  
**Course ZOO (12) CCC Principles of Ecology**

After successfully completing this course, the students will be able to:

**CO1**• Understanding the environmental concepts, characteristics of population and population dynamics and prey predator interactions

**CO 2**• Description of nature of ecosystem, production, food webs, energy flow and biogeochemical cycles,

**CO 3**• Understanding the concept of stress physiology and homeostasis.

**CO 4** Know the evolutionary and functional basis of animal ecology.

**CO 5** Engage in field based research activities to understand well the theoretical aspects taught besides learning techniques for gathering data in the field.

**CO 6** Analyse a biological problem, derive testable hypotheses and then design experiments and put the tests into practice

**CO 7** Solve the environmental problems involving interaction of humans and natural systems at local or global level.

**Mapping of Programme and Course outcome**  
**(Principles of Ecology)**

		CO-1	CO-2	CO-3	CO-4	CO-5	CO-6
PO-1	Knowledge, understanding	✓		✓			
PO-2	Critical Thinking		✓				
PO-3	Problem Solving						✓
PO-4	Analytical Reasoning						✓
PO-5	Academic Knowledge				✓		
PO-6	Research Skill					✓	
PO-7	Business Skill						
PO-8	Human Welfare					✓	
PO-9	Ethics Awareness						



## M.Sc. I SEMESTER

### Course ZOO (13) CCC: Computational Biology, Biostatistics and Bioinformatics.

After successfully completing this course, the students will be able to:

**CO-1** Introduction to basic components of computers, Software (operating systems) and application software used in biological and statistical studies.

**CO-2** To get an insight into the advancement in computerized biology information, introduction to genomics and proteomics databases.

**CO-3** Perform and interpret bioinformatics and statistical analyses with real molecular biology data.

**CO -4** Learning to programming languages such as “C

**CO -5** Acquire knowledge of various databases of proteins, nucleic acids. Primary, secondary and composite databases. BLAST.

#### Mapping of Programme and Course outcome

#### (Computational Biology, Biostatistics and Bioinformatics)

		CO-1	CO-2	CO-3	CO-4	CO-5	CO-6	CO-7	CO-8
PO-1	Knowledge, understanding	✓							
PO-2	Critical Thinking		✓					✓	
PO-3	Problem Solving						✓		
PO-4	Analytical Reasoning			✓					✓
PO-5	Academic Knowledge				✓				
PO-6	Research Skill								
PO-7	Business Skill								
PO-8	Human Welfare					✓			
PO-9	Ethics Awareness								

## M.Sc. I SEMESTER

### Course ZOO (14) OSC: Social outreach and Skill Development

**CO 1** This course will help students to enhanced the academic skills

**CO 2** Developed leadership qualities

**CO 3** Developed self confidence

**CO 4** Communication skills

**CO 5** Managerial skills

**CO 6** Responsibilities towards the rural community.

**CO 7** Engage in social service

### Mapping of Programme and Course outcome (SOCIAL OUTREACH AND INTERNSHIP)

		CO-1	CO-2	CO-3	CO-4	CO-5	CO-6
PO-1	Knowledge, understanding			✓			
PO-2	Critical Thinking					✓	
PO-3	Problem Solving		✓	✓		✓	
PO-4	Analytical Reasoning						
PO-5	Academic Knowledge	✓		✓			
PO-6	Research Skill				✓	✓	
PO-7	Business Skill		✓			✓	
PO-8	Human Welfare			✓	✓	✓	✓
PO-9	Ethics Awareness					✓	

## Course ZOO (15) ECC: Constitutionalism and Indian political system

After successfully completing this course, the students will be able to:

**CO 1** Understand the making of Indian constitution along with the debates of constituent assembly.

**CO 2** Comprehend the amendment procedure of the constitution and the debate about the basic structure of the constitution.

**CO 3** Develop an understanding of various Constitutional statutory bodies.

**CO 4** Understand the working of election commission, and electoral process.

**CO 5** Understand the division of power between various organs of the government at different levels.

**CO 6** This course enables students to develop an understanding of the tenets of Indian constitutionalism by engaging with Constituent Assembly debates.

**CO 7** It enables them to understand the working of different organs of government and analyse the interaction amongst them which often involves both conflict and cooperation.

**CO 8** Moreover, it enables the students to understand the division of powers in Indian federal set-up and its asymmetrical federal arrangements, with special emphasis on the special provisions for governance in fifth and sixth schedules of the constitution.

**CO 9** The students are also familiarized with the process of rural and urban governance and the dynamics of gender and caste in these domains.

### Mapping of Programme and Course outcome

#### (CONSTITUTIONALISM & INDIAN POLITICAL SYSTEM)

		CO-1	CO-2	CO-3	CO-4	CO-5	CO-6	CO-7	CO-8	CO-9	CO-10
PO-1	Knowledge, understanding	✓	✓								
PO-2	Critical Thinking		✓					✓			
PO-3	Problem Solving			✓							
PO-4	Analytical Reasoning			✓					✓	✓	✓
PO-5	Academic Knowledge				✓						
PO-6	Research Skill										
PO-7	Business Skill										
PO-8	Human Welfare		✓	✓		✓					
PO-9	Ethics Awareness										

## M.Sc. I SEMESTER

### Course ECC –Entomology - Insect Diversity, Society and Evolution

After successfully completing this course, the students will be able to:

**CO •1** Identifying beneficial and harmful insects based on comparative study of morphology and their articulation.

**CO •2** Assisting with criminal investigation by evaluating forensically important insects, collection of Data from cadaver site, interpretation of data for predicting time and cause of death.

**CO •3** Identifying potential disease vectors.

**CO •4** Identifying potential biocontrol agents.

### Mapping of Programme and Course outcome (Entomology - Insect Diversity, Society and Evolution)

		CO-1	CO-2	CO-3	CO-4
PO-1	Knowledge, understanding	✓			
PO-2	Critical Thinking		✓		
PO-3	Problem Solving		✓	✓	
PO-4	Analytical Reasoning			✓	
PO-5	Academic Knowledge				✓
PO-6	Research Skill				✓
PO-7	Business Skill				
PO-8	Human Welfare				✓
PO-9	Ethics Awareness				✓

## M.Sc.-I SEMESTER

### Course ECC: Insect Physiology, Toxicology & Vector Biology

After successfully completing this course, the students will be able to:

**CO 1** Learning methods to effectively restrict insect growth.

**CO 2** Devise chemical methods to effectively eliminate harmful insects by mode of action of insecticide.

**CO 3** Usage of methods to effectively restrict multiplication of disease causing agents within the insect vector by elucidating mode of action of insecticide, carcinogenic, mutagenic and teratogenic effects, and evaluation of toxicity.

**CO4** Learning the methods to control the spread of vectors, their economic importance and control of fleas, lice, bugs, mosquitoes, flies and parasitoids.

### Mapping of Programme and Course outcome

#### (Insect Physiology, Toxicology & Vector Biology)

		CO-1	CO-2	CO-3	CO-4
PO-1	Knowledge, understanding	✓			
PO-2	Critical Thinking		✓		
PO-3	Problem Solving				✓
PO-4	Analytical Reasoning	✓		✓	
PO-5	Academic Knowledge				✓
PO-6	Research Skill		✓	✓	
PO-7	Business Skill			✓	✓
PO-8	Human Welfare		✓		✓
PO-9	Ethics Awareness				

## M.Sc. I SEMESTER Paper-V

### Course ECC: Pest Ecology & Agricultural Entomology

After successfully completing this course, the students will be able to:

**CO 1** Identifying pests of agricultural crops by analyzing ecology, pest status, features responsible for evolutionary success of insect species, factors responsible for achieving the status of pest..

**CO 2** An overview of identification, seasonal history, biology, nature of damage and control measures of pests, of cereals, pulse crops, cotton, vegetables, oil seeds, fruit crops, sugarcane and stored grains.

**CO 3** To devise cropping pattern to minimize crop loss by a detailed understanding of agro-ecosystem, phases of population fluctuation, models of population growth, population size and regulatory mechanisms.

**CO 4** A detailed understanding of plant resistance to insects, transgenic plants, development of Bt plant by recombinant DNA technology, resistance management of Bt crop.

### Mapping of Programme and Course outcome (Pest Ecology & Agricultural Entomology)

		CO-1	CO-2	CO-3	CO-4
PO-1	Knowledge, understanding	✓			
PO-2	Critical Thinking		✓		✓
PO-3	Problem Solving		✓		
PO-4	Analytical Reasoning			✓	
PO-5	Academic Knowledge				✓
PO-6	Research Skill				
PO-7	Business Skill				
PO-8	Human Welfare	✓	✓	✓	
PO-9	Ethics Awareness				✓

## M.Sc.-I SEMESTER Paper-V

### Course ECC; Invertebrates- structure and function

By the end of the course, students should be able to-

**CO -1** Describe basis of classification of Invertebrate.

**CO -2** Describe different physiological body processes of invertebrates.

**CO -3** Describe larval forms of invertebrate.

**CO -4** Describe characteristics and significance of Minor Phyla.

**CO-5** Understand the relative position of individual organ and associated structures through dissection of the invertebrate representatives.

**CO-6** Realize that very similar physiological mechanisms are used in very diverse organisms.

**CO-7** Undertake research in any aspect of animal physiology in future.

### Relationship of Programme and Course outcome

#### (Invertebrates- structure and function)

		CO-1	CO-2	CO-3	CO-4	CO-5	CO-6	CO-7
PO-1	Knowledge, understanding	✓			✓	✓		
PO-2	Critical Thinking		✓	✓		✓	✓	✓
PO-3	Problem Solving					✓	✓	✓
PO-4	Analytical Reasoning	✓		✓				
PO-5	Academic Knowledge		✓	✓	✓			
PO-6	Research Skill		✓				✓	✓
PO-7	Business Skill							
PO-8	Human Welfare					✓		
PO-9	Ethics Awareness							

## M.Sc. II Semester Paper-I

### Course ZOOL (21) CCC– Genetics and Cytogenetics

After successfully completing this course, the students will be able to:

**CO -1** Understanding of Mendel’s principle, its extension and chromosomal basis.

**CO -2** Determination of gene action from genotype to phenotype including penetrance and expressivity, gene interaction, epistasis, pleiotropy; nature of the gene and its functions.

**CO- 3** Evolution of the concept of the gene and fine structure of gene.

**CO- 4** Capability to perform gene mapping using 3- point test cross in *Drosophila*, gene mapping in humans by linkage analysis in pedigrees.

**CO- 5** Describing structural and functional organization of a typical eukaryotic gene, transcription factors, enhancers and silencers, and non-coding genes.

**CO -6** Depicting the mechanism of sex determination and dosage compensation in human and other model organisms.

**CO-7** Understanding the chromosome anomalies and associated diseases.

**CO-8** Identify link between genetics and cancer with emphasis on oncogenes, chromosome rearrangement and cancer, tumor suppressor genes and genetic pathways to cancer.

### Mapping of Programme and Course outcome

#### (Genetics and Cytogenetics)

		CO-1	CO-2	CO-3	CO-4	CO-5	CO-6	CO-7	CO-8
PO-1	Knowledge, understanding	✓	✓						
PO-2	Critical Thinking		✓	✓				✓	
PO-3	Problem Solving					✓		✓	✓
PO-4	Analytical Reasoning			✓				✓	✓
PO-5	Academic Knowledge			✓	✓				✓
PO-6	Research Skill					✓			
PO-7	Business Skill							✓	
PO-8	Human Welfare						✓		✓



**M.Sc. II SEMESTER ZOO( 22) CCC – Principles of Gene Manipulation structure, function of genes**

**CO -1** Imparting knowledge of basic recombinant DNA techniques, preparation of restriction maps and mapping techniques.

**CO -2** Understanding of method and applications of nucleic acid probes, blotting techniques, DNA fingerprinting, DNA footprinting, methyl interference assay and polymerase chain reaction.

**CO -3** Developing skill to understand biology of cloning and expression vectors.

**CO -4** Description of gene cloning strategies by transformation of E. coli and other cells.

**CO -5** Defining key strategies to express cloned genes including phage display.

**CO -6** Exposure to principles of DNA sequencing, automated sequencing methods; synthesis of oligonucleotides, primer design. Understanding a concept of changing genes- directed evolution, protein engineering in microbes.

**CO -7** Introduction to gene manipulation methods in animals, transgenic technology, application of recombinant DNA technology; gene knockouts, gene silencing, mouse disease models, somatic and germ-line therapy.

**(Principles of Gene Manipulation, structure and function of genes)**

		CO-1	CO-2	CO-3	CO-4	CO-5	CO-6	CO-7
PO-1	Knowledge, understanding	✓				✓		
PO-2	Critical Thinking	✓	✓					✓
PO-3	Problem Solving						✓	
PO-4	Analytical Reasoning	✓		✓			✓	
PO-5	Academic Knowledge		✓		✓			
PO-6	Research Skill			✓	✓			✓
PO-7	Business Skill							✓
PO-8	Human Welfare				✓	✓		✓
PO-9	Ethics Awareness						✓	✓

**M.Sc. II Semester Paper-III**

## Course ZOO (23): Tools and Techniques for Biology

After successfully completing this course, the students will be able to:-

**CO - 1** Understand the purpose of the technique, its proper use and possible modifications/ improvement.

**CO -2** Learn the theoretical basis of technique, its principle of working and its correct application.

**CO -3** Learn the construction repair and adjustment of any equipment required for a technique.

**CO -4** Learn the accuracy of technique.

**CO -5** Learn the maintenance laboratory equipments/ tools, safety hazards and precautions.

**CO -6** Understand the technique of cell and tissue culture. Learn the preparation of solution of given percentage and molarity.

**CO -7** Understand the process of preparation of buffer. Learn the techniques of separation of amino acids, proteins and nucleic acids.

### Mapping of Programme Outcome and Course outcome (Tools and Techniques for biology)

		CO-1	CO-2	CO-3	CO-4	CO-5	CO-6	CO-7
PO-1	Knowledge, understanding	✓						✓
PO-2	Critical Thinking	✓	✓					✓
PO-3	Problem Solving				✓	✓		
PO-4	Analytical Reasoning		✓	✓	✓	✓		
PO-5	Academic Knowledge				✓			✓
PO-6	Research Skill		✓			✓	✓	
PO-7	Business Skill							
PO-8	Human Welfare					✓	✓	
PO-9	Ethics Awareness							

## Paper- IV Research Methodology and Computer Application: Basics

After completing the course students will be able to demonstrate-

- CO 01- Knowledge of research process reading evaluating developing and analyzing the ideas/ thought in critical/ analytical manner.
- CO 02- literature reviews using print and online database of the subject and allied branches in perspectives of its inter -relation and so on.
- CO 03- competent use of MLA and APA format for citation of print and electronic materials available.
- CO 04- Potentials to identify explain, compare and prepare the key elements of research proposal and research report.
- CO 05- Compare and contrast qualitative and quantitative research paradigms and to explain the use of each in research.
- CO 06- The rationale for research ethics and importance of local processes for Institutional Review Board reviews for its rational improvisation.
- CO 07- How Educational research contributes to the objectives of doctoral programme and specific career in higher education
- CO 08- Competent use of information received in general social welfare and issues relevant and focused in the context of humanity as whole and its positive solutions in larger interest be devised.

### Mapping of Programme and Course outcome (Research Methodology and Computer Application: Basics)

		CO-1	CO-2	CO-3	CO-4	CO-5	CO-6	CO-7	CO-8
PO-1	Knowledge, understanding	✓							
PO-2	Critical Thinking	✓	✓					✓	
PO-3	Problem Solving						✓		✓
PO-4	Analytical Reasoning	✓		✓	✓	✓			✓
PO-5	Academic Knowledge		✓	✓	✓				
PO-6	Research Skill	✓	✓	✓	✓	✓	✓	✓	✓
PO-7	Business Skill							✓	
PO-8	Human Welfare	✓				✓		✓	✓
PO-9	Ethics Awareness	✓					✓		✓

## M.Sc. II Semester Paper-V

### Course ZOO ECC: Environmental and Forest laws

After successfully completing this course, the students will be able to :-

**CO-0 1** Familiar with the laws, policies and institutions in the field of environment

**CO-0 2** Acquire the skills needed for interpreting laws, policies and judicial decisions in a holistic perspective

**CO-0 3** Acquire the ability to evaluate the role of law and policy in conservation and management of natural resources and prevention of pollution

**CO-0 4** Examine different environmental management system and trade related intellectual properties.

**CO-0 5** Evaluate the status of environmental education and public awareness along with their implications.

### Mapping of Programme and Course outcome (ENVIRONMENTAL AND FOREST LAWS)

		CO-1	CO-2	CO-3	CO-4	CO-5
PO-1	Knowledge, understanding	✓				
PO-2	Critical Thinking	✓	✓			✓
PO-3	Problem Solving		✓		✓	✓
PO-4	Analytical Reasoning		✓	✓		
PO-5	Academic Knowledge				✓	
PO-6	Research Skill		✓			
PO-7	Business Skill					
PO-8	Human Welfare	✓	✓	✓	✓	✓
PO-9	Ethics Awareness	✓	✓	✓	✓	✓

## M.Sc. II Semester Paper-V

### Course ZOO (25) Evolution and Functional Anatomy of Fish

After successfully completing this course, the students will be able to:-

**CO- 1** A detailed understanding of evolutionary strategies and morphological innovations, gene and genome duplication, evolutionary genetics, biogeographical distribution of major groups of fishes.

**CO -2** An overview of adaptations of fishes to environmental extremes- temperature, pressure, stressors.

**CO -3** Understanding growth and metabolism of fishes by regulation of food intake by neuropeptides and hormones, environmental factors and feed intake.

**CO- 4** Evaluation of defense mechanism in fishes and their regulation.

**CO- 5** Learning of fish reproduction for better yield in fish farming.

### Mapping of Programme and Course outcome

#### (Evolution and Functional Anatomy of Fish Theory)

		CO-1	CO-2	CO-3	CO-4	CO-5
PO-1	Knowledge, understanding	✓				
PO-2	Critical Thinking		✓		✓	
PO-3	Problem Solving			✓	✓	
PO-4	Analytical Reasoning			✓		✓
PO-5	Academic Knowledge				✓	
PO-6	Research Skill			✓		
PO-7	Business Skill			✓		
PO-8	Human Welfare					✓
PO-9	Ethics Awareness					

## M.Sc. II Semester Paper-V

### Course ZOO ECC: Aquatic Resources and Their Conservation

After successfully completing this course, the students will be able to:-

**CO 1** Learn classification of riverine fisheries and their hydrological conditions.

**CO 2** A detailed understanding of cold water fisheries, biology of important cold water fishes of India For better production of fishes in extreme condition.

**CO 3** Learning fishing techniques for localizing catches- remote sensing, sonar, radar; crafts and gears.

**CO 4** An overview of post harvest technique to prevent fish spoilage for better preservation and quality control.

**CO 5** Learning the management of aquatic pollution, waste management and fisheries extension services.

### Mapping of Programme and Course out Come (Aquatic Resources and Their Conservation)

		CO-1	CO-2	CO-3	CO-4	CO-5
PO-1	Knowledge, understanding	✓				
PO-2	Critical Thinking		✓			
PO-3	Problem Solving		✓			✓
PO-4	Analytical Reasoning	✓	✓	✓	✓	
PO-5	Academic Knowledge				✓	
PO-6	Research Skill		✓			✓
PO-7	Business Skill		✓			
PO-8	Human Welfare		✓	✓		✓
PO-9	Ethics Awareness			✓		✓

## M.Sc. II Semester Paper-V Course ZOO ECC Aquaculture

**CO -1** Learning aquaculture technology for fresh and marine fishes.

**CO -2** Culturing of fish food organisms like algae; zooplankton for improving nutritive quality.

**CO -3** Management of water quality requirements for aquaculture.

**CO -4** Learning integrated farming by fish-cum-live stock farming, paddy-cum-fish farming, aquaculture engineering-aquahouse.

**CO -5** A detailed learning of transportation of finfish and shellfish, eggs, fry, fingerlings and adults.

**CO -6** Managing improvement in the Nutrition of aquatic animals by leaning feed types, manufacture And ingredients, anti- nutritional factors in fish feed ingredients.

**CO -7** Understanding environmental impact of aquaculture, aquacultural wastes and future developments in waste minimization, environmental consequences of hyper-nutrition.

**CO -8** Learning about fish vaccines- strategy and use in aquaculture

### Mapping of Programme and Course outcome(Aquaculture)

		CO-1	CO-2	CO-3	CO-4	CO-5	CO-6	CO-7	CO-8
PO-1	Knowledge, understanding	✓							
PO-2	Critical Thinking		✓					✓	
PO-3	Problem Solving						✓		
PO-4	Analytical Reasoning			✓					✓
PO-5	Academic Knowledge				✓	✓	✓		
PO-6	Research Skill		✓					✓	✓
PO-7	Business Skill			✓	✓		✓	✓	✓
PO-8	Human Welfare					✓			
PO-9	Ethics Awareness								

## M.Sc. ZOOLOGY III SEMESTER

### PAPER-I Course ZOO (31)

#### CCC: Animal Physiology (Vertebrates)

**CO -1** After going through this course on ‘Animal Physiology (Vertebrates)’, the students have a good understanding of how vertebrate animals work.

**CO -2** Students will be able to understand the biology of vertebrates which is influenced by the different environments of their niches.

**CO -3** The students will be able to explore an original query in animal physiology.

**CO -4** The students will appreciate evolutionary changes and environmental adaptations in different taxa of vertebrates.

**CO- 5** Understand the physiology at cellular and system levels.

**CO- 6** Learn the determination of haemoglobin content, blood groups and blood pressure.

#### Mapping of Programme and Course outcome

##### (Animal Physiology (vertebrates))

		CO-1	CO-2	CO-3	CO-4	CO-5	CO-6
PO-1	Knowledge, understanding	✓				✓	
PO-2	Critical Thinking		✓			✓	
PO-3	Problem Solving						
PO-4	Analytical Reasoning			✓			
PO-5	Academic Knowledge			✓	✓		
PO-6	Research Skill				✓		✓
PO-7	Business Skill						
PO-8	Human Welfare					✓	
PO-9	Ethics Awareness						



## M.Sc. ZOOLOGY III SEMESTER Course ZOO (32) CCC:

### Developmental Biology

After successfully completing this course, the students will be able to:

**CO -1** Developmental Biology enquires about the fundamental processes that underpin the fertilization of an egg cell and its step-by-step transformation into the fascinating complexity of a whole organism.

**CO -2** Students learn best by doing and by having the opportunity to put what they have learned into practice. Therefore, using various model organism as a learning tool in Developmental Biology.

**CO -3** Students studying this course will be able to understand the structure and function of gametes like eggs and sperms.

**CO- 4** their maintenance so the reproductive health in human and animals is maintained in good condition.

**CO-5** This course will make them suitably knowledgeable to undertake the jobs in the assisted Reproductive technology clinics in the hospitals in addition to the teaching institutions.

### M.Sc. III SEMESTER Mapping of Programme and Course outcome (Developmental Biology)

		CO-1	CO-2	CO-3	CO-4	CO-5
PO-1	Knowledge, understanding	✓				
PO-2	Critical Thinking	✓	✓	✓		
PO-3	Problem Solving		✓			
PO-4	Analytical Reasoning			✓		
PO-5	Academic Knowledge				✓	
PO-6	Research Skill				✓	
PO-7	Business Skill					
PO-8	Human Welfare					✓
PO-9	Ethics Awareness					✓

## M.Sc. ZOOLOGY III SEMESTER Course ZOO (33) CCC:

### Immunology

After successfully completing this course, the students will be able to:-

**CO -1** The students will be able to identify the cellular and molecular basis of immune responsiveness and understand how the innate and adaptive immune responses coordinate to fight invading pathogens.

**CO -2** Understand the immune modulatory strategies essential for generating or suppressing immune responses as required in hypersensitivity reactions.

**CO -3** Learn to review the literature to determine the strengths and weaknesses of the data published in immunology and its novelty.

**CO -4** Design new methods to improve existing vaccines and other immunotherapeutic strategies.

### Mapping of Programme and Course outcome

#### (Immunology)

		CO-1	CO-2	CO-3	CO-4
PO-1	Knowledge, understanding	✓			
PO-2	Critical Thinking	✓	✓		
PO-3	Problem Solving				
PO-4	Analytical Reasoning		✓	✓	
PO-5	Academic Knowledge				✓
PO-6	Research Skill			✓	✓
PO-7	Business Skill				
PO-8	Human Welfare				✓
PO-9	Ethics Awareness				

## M.Sc. III SEMESTER

### Course ZOO (34) OSC: Intellectual property, Human rights and Environment

After successfully completing this course, the students will be able to:-

**CO 1** Students will be able to analyze different types of intellectual property rights in general and protection of products derived from research and issues related to application and obtaining patents

**CO 2** Understand the concept of IPR.

**CO 3** The present course gives a detailed account of intellectual property right, its genesis and scope, the steps involved in submitting and publication of patent, trademark and copyright rules.

**CO 4** Examine various legal issues related to IPR

#### Mapping of Programme and Course outcome

#### (Intellectual property, Human rights and Environment)

		CO-1	CO-2	CO-3	CO-4
PO-1	Knowledge, understanding	✓			
PO-2	Critical Thinking		✓		
PO-3	Problem Solving				
PO-4	Analytical Reasoning			✓	
PO-5	Academic Knowledge				✓
PO-6	Research Skill	✓		✓	✓
PO-7	Business Skill		✓		
PO-8	Human Welfare		✓	✓	✓
PO-9	Ethics Awareness		✓	✓	✓

## M.Sc. III SEMESTER Course ZOO ECC: Tribal Studies

After successfully completing this course, the students will be able to:-

**CO -1** Understand the tribal culture, life and their situation in India.

**CO -2** Know about the Tribal development in India from Pre-independence to Present-day

**CO -3** Develop zeal to work for tribal people and their development in different departments of Government and non-governmental organizations.

### Mapping of Programme and Course outcome (Tribal Studies)

		CO-1	CO-2	CO-3
PO-1	Knowledge, understanding	✓		
PO-2	Critical Thinking		✓	✓
PO-3	Problem Solving			
PO-4	Analytical Reasoning		✓	✓
PO-5	Academic Knowledge		✓	
PO-6	Research Skill			✓
PO-7	Business Skill			
PO-8	Human Welfare		✓	✓
PO-9	Ethics Awareness		✓	✓

## M.Sc. III SEMESTER

### Course ZOO ECC: Molecular Endocrinology and Reproduction (Neuroendocrinology)

After successfully completing this course, the students will be able to:-

**CO -1** Understand the basic organization of the vertebrate brain, and the interaction of hypothalamus with the pituitary and pineal gland.

**CO -2** Learn basic principles of important techniques applied to neuroendocrine research.

**CO -3** Understand neuroendocrine regulation of physiological processes.

**CO -4** Develop the ability of critical thinking of regulatory biology in animals.

### Mapping of Programme and Course outcome

#### (Molecular Endocrinology and Reproduction- (Neuroendocrinology))

		CO-1	CO-2	CO-3	CO-4
PO-1	Knowledge, understanding	✓			
PO-2	Critical Thinking		✓		✓
PO-3	Problem Solving			✓	
PO-4	Analytical Reasoning			✓	
PO-5	Academic Knowledge				✓
PO-6	Research Skill		✓		✓
PO-7	Business Skill				
PO-8	Human Welfare	✓			
PO-9	Ethics Awareness				

## **M.Sc. III SEMESTER ZOO ECC: Molecular Endocrinology and Reproduction (Molecular Endocrinology)**

**CO -1** Students of this class will be able to understand the importance of hormones in the maintenance of reproductive health in human and animals.

**CO -2** This course will make them suitably knowledgeable to undertake the therapeutic research jobs in various pharmaceutical companies as well as in hospitals in addition to the IVF centers.

**CO- 3** The course envisages information on endocrine system with emphasis on the structure of hypothalamus and pituitary.

**CO- 4** The associated hormones and the related disorders will be explained.

**CO- 5** Understand the mechanism of hormone action.

### **Mapping of Programme and Course outcome (Molecular Endocrinology and Reproduction)**

		CO-1	CO-2	CO-3	CO-4	CO-5
PO-1	Knowledge, understanding	✓				
PO-2	Critical Thinking		✓			✓
PO-3	Problem Solving		✓			
PO-4	Analytical Reasoning			✓		
PO-5	Academic Knowledge				✓	
PO-6	Research Skill		✓	✓		
PO-7	Business Skill					
PO-8	Human Welfare		✓	✓		✓
PO-9	Ethics Awareness		✓			

## M.Sc. ZOOLOGY SEMESTER III PAPER-V

### Course ZOO ECC (35): Endocrinology and reproduction

After successfully completing this course, the students will be able to:

**CO -1** Understand endocrine system and the basic properties of hormones.

**CO – 2** Appreciate the importance of endocrine system and the crucial role it plays along with the Nervous system in maintenance of homeostasis.

**CO -3** Gain insight into the molecular mechanism of hormone action and its regulation.

**CO -4** Know the regulation of physiological process by the endocrine system and its implication in diseases.

**CO -5** Gain knowledge about the prevalent endocrine disorders and critically analyze their own and their family`s health issues.

### Mapping of Programme and Course outcome (Endocrinology and reproduction)

		CO-1	CO-2	CO-3	CO-4	CO-5
PO-1	Knowledge, understanding	✓				
PO-2	Critical Thinking		✓			
PO-3	Problem Solving					✓
PO-4	Analytical Reasoning			✓		
PO-5	Academic Knowledge				✓	
PO-6	Research Skill					✓
PO-7	Business Skill					
PO-8	Human Welfare				✓	✓
PO-9	Ethics Awareness					

### **M.Sc. IV SEMESTER Course ZOO (41) CCC: Animal Behavior**

After successfully completing this course, the students will be able to:

**CO -1** Learn a wide range of theoretical and practical techniques used to study animal behaviour.

**CO -2** Demonstrate ability to communicate scientific information in both oral and written formats.

**CO -3** Demonstrate knowledge of key concepts in animal behavior.

**CO -4** Exhibit quantitative research skills (or demonstrate ability to perform all parts of the scientific method)

**CO -5** Demonstrate ability to think flexibly and apply knowledge to new problem.

#### **Mapping of Programme and Course outcome (Animal Behavior)**

		CO-1	CO-2	CO-3	CO-4	CO-5
PO-1	Knowledge, understanding	✓	✓			
PO-2	Critical Thinking		✓			
PO-3	Problem Solving					✓
PO-4	Analytical Reasoning	✓		✓		
PO-5	Academic Knowledge				✓	
PO-6	Research Skill		✓		✓	
PO-7	Business Skill					
PO-8	Human Welfare					
PO-9	Ethics Awareness					



## Course ZOO (42) CCC: Biology of Parasitism

After successfully completing this course, the students will be able to:

- CO -1 Understand the biology behind host-parasite interactions.
- CO -2 Learn about epidemiological concepts of parasitic infections of global importance.
- CO -3 Trained to diagnose, identify and detect some important parasites.
- CO -4 Learn pathological changes associated with parasite infections.
- CO -5 discuss the role of vectors and intermediate hosts in parasite transmission.
- CO -6 Learn the role of vertebrate innate and adaptive immune system in controlling parasites.
- CO -7 Learn molecular biology concepts unique to parasite infections.
- CO -8 Define the biochemical targets of drugs targeting parasites.

### Mapping of Programme and Course outcome (Biology of Parasitism)

		CO-1	CO-2	CO-3	CO-4	CO-5	CO-6	CO-7	CO-8
PO-1	Knowledge, understanding	✓							
PO-2	Critical Thinking		✓					✓	
PO-3	Problem Solving								
PO-4	Analytical Reasoning			✓					✓
PO-5	Academic Knowledge				✓				
PO-6	Research Skill			✓		✓	✓		
PO-7	Business Skill								
PO-8	Human Welfare				✓	✓			✓
PO-9	Ethics Awareness								

## M.Sc. IV SEMESTER

### Course ZOO-SSC/PR J-44: Dissertation

After successful completion of the course the student will be able to

**CO -1** Designing of research work.

**CO -2** Formulation of research methodology.

**CO -3** Methods implementation and gathering of research data and application of statistics.

**CO -4** Research result formulation and interpretation.

### Mapping of Programme and Course outcome (Dissertation)

		CO-1	CO-2	CO-3	CO-4
PO-1	Knowledge, understanding	✓			
PO-2	Critical Thinking		✓		
PO-3	Problem Solving				
PO-4	Analytical Reasoning	✓		✓	
PO-5	Academic Knowledge				✓
PO-6	Research Skill	✓	✓	✓	✓
PO-7	Business Skill				
PO-8	Human Welfare	✓	✓	✓	✓
PO-9	Ethics Awareness				



## M.Sc. ZOOLOGY SEMESTER IV

### Course ZOO ECC: Genomics, Metagenomics and Epigenetics-Genomics

**CO -1** After successful completion of the course the student will be able to design and comprehend experimental strategies for whole genome, transcriptome and proteome analysis.

**CO- 2** The student should be able to appropriately access and utilize various online and offline tools and databases related to genomic analysis.

**CO -3** To understand and find cures for diseases.

### Mapping of Programme and Course outcome)

### (Genomics, Metagenomics and Epigenetics- Genomics)

		CO-1	CO-2	CO-3
PO-1	Knowledge, understanding	✓		✓
PO-2	Critical Thinking		✓	
PO-3	Problem Solving		✓	
PO-4	Analytical Reasoning			✓
PO-5	Academic Knowledge		✓	
PO-6	Research Skill			✓
PO-7	Business Skill			
PO-8	Human Welfare			✓
PO-9	Ethics Awareness			✓

## M.Sc. ZOOLOGY IV SEMESTER -PAPER-V

### Course ZOO ECC: Metagenomics- Epigenetics and Chromatin Biology

**CO -1** It is expected that the students after completing this course would acquire the theoretical knowledge of genetics.

**CO -2** Practical comprehensions for designing the research problems at higher level.

**CO- 3** They also would understand the connect the metabolic reprogramming and development of diseases through the lens of epigenetics.

**CO -4** Genomics which attempts to give answers to the questions why public health, contributing to disease ,diagnosis, prevention, and treatment and informing reproductive decisions.

#### Mapping of Programme and Course outcome (Metagenomics- Epigenetics and Chromatin Biology)

		CO-1	CO-2	CO-3	CO-4
PO-1	Knowledge, understanding	✓			
PO-2	Critical Thinking		✓	✓	
PO-3	Problem Solving				✓
PO-4	Analytical Reasoning			✓	
PO-5	Academic Knowledge				✓
PO-6	Research Skill		✓		✓
PO-7	Business Skill				
PO-8	Human Welfare				✓
PO-9	Ethics Awareness				✓

## M.Sc. ZOOLOGY SEMESTER IV PAPER V

### Course ZOO ECC: Biomolecules and Metabolic Regulation

**CO -1** It is expected that a student after taking up this course would acquire the knowledge and understanding of evolutionary design of each metabolic pathways and its intermediates.

**CO -2** The student would be able to predict the futuristic outcome of failure of metabolic pathways  
Consequently.

**CO- 3** A scheme of intervention for metabolic failure through life style management can be predicted and which may also result into design of drugs.

### Mapping of Programme and Course outcome (Biomolecules and Metabolic Regulation)

		CO-1	CO-2	CO-3
PO-1	Knowledge, understanding	✓		
PO-2	Critical Thinking	✓	✓	
PO-3	Problem Solving			
PO-4	Analytical Reasoning	✓		✓
PO-5	Academic Knowledge			
PO-6	Research Skill		✓	
PO-7	Business Skill			
PO-8	Human Welfare			✓
PO-9	Ethics Awareness			

## M.Sc. ZOOLOGY SEMESTER IV Paper-V

### Course ZOO ECC: Population Genetics, Evolution and Genetics Variability

After successful completion of the course the student will be able to:-

**CO- 1** Understand the uses and limitations of phylogenetic trees.

**CO- 2** Students will gain knowledge about the relationship of the evolution of various species and the environment they live in.

**CO -3** They will be motivated to work towards mitigating climate change so that well adapted species do not face extinction as a result of sudden drastic changes in environment.

**CO- 4** The knowledge gained from study of variations, genetic drift can be applied to ensure that conservation efforts for small threatened populations are focused in right direction.

**CO -5** The course would allow the students to predict the practical implication of various evolutionary forces acting on the human population in the field of human health, agriculture and wildlife conservation.

**CO- 6** Use of various software can generate an interest in the mind of learners towards the field of bioinformatics and coding used in programming language.

### Mapping of Programme and Course outcome

#### (Population Genetics, Evolution and Genetics Variability)

		CO-1	CO-2	CO-3	CO-4	CO-5	CO-6
PO-1	Knowledge, understanding	✓					
PO-2	Critical Thinking		✓		✓	✓	✓
PO-3	Problem Solving						
PO-4	Analytical Reasoning		✓	✓			
PO-5	Academic Knowledge				✓		
PO-6	Research Skill						
PO-7	Business Skill						
PO-8	Human Welfare					✓	
PO-9	Ethics Awareness						

## Department of Zoology

### Rajiv Gandhi Govt.P.G. College Ambikapur

#### Curriculum Relevance of course to Local/Regional/National/Global

Class/paper	Course Type	Course Name	Course Content/relevant	Local	Regional	National	Global
M.Sc. I Sem/ paper-I	CCC (11)	Systematics, Biodiversity and Evolution	IV unit-ICZN, In this paper we study about ICZN, which shows the local diversity of different animal. The international code of zoological nomenclature gives local names and provides stability and order to the scientific name of animals, through which we can get knowledge about the huge animal diversity in India also.	✓	✓	✓	✓
M.Sc. I Sem/ paper-II	CCC (12)	Principle of Ecology	II unit- In this paper we get to study about all the Environmental Hazards and management, global warming, atmospheric Ozone, Acid rain and relationships between living organism and the physical, chemical and biological factor that are affecting our Earth and to get the solution at local level of all this complexities of environment.	✓	✓	✓	✓
M.Sc I Sem/ paper-III	CCC (13)	Computational Biology, Biostatistics and Bioinformatics	By studying computational biology we can get the Database by comparison of local gene sequence, also developing algorithms, specifically for solving or simplifying biology problems.	✓		✓	✓
M.Sc I Sem/ paper-IV	OSC (14)	Social Outreach and Skill Development	This paper is beneficial for local level and global level, from this students get motivation in the field of education and health. Internship and entrepreneurship gives many ideas, to them at local, regional and global level also help in career decision making.	✓	✓	✓	✓
M.Sc I Sem/ paper-V	ECC (15)	Constitutionalism & Indian Political system	In this paper we get knowledge about constitution of our country and all other countries too. It protects peoples rights to life and liberty and is essential for a democratic democracy. Make people aware of their rights and laws, also shows the importance of local bodies like gram panchayat.	✓	✓	✓	✓
	ECC	Entomology- Insect diversity,	In this paper we get knowledge about the local insect diversity and their evolution	✓		✓	



		Society and Evolution Theory					
	ECC	Entomology- Insect physiology, Toxicology & Vector Biology	We get knowledge about insect physiology and helps the pathologist to understand the origin and progression of diseases.	✓		✓	✓
	ECC	Entomology- Pest Ecology & Agricultural Entomology	Pest ecology focuses on preventive rather reactive approaches to pest management helps farmers at local and global level in agriculture.	✓			✓
	ECC	Invertebrate- structure and function	We get the knowledge about invertebrate animals their structure and function.	✓	✓	✓	

Class/Paper	Course Type	Course Name	Course Content/relevant	Local	Regional	National	Global
M.Sc II Sem/ Paper-I	CCC (21)	Genetics and Cytogenetics	Unit-V Genetics and cancer-This paper gives knowledge about the genetic medicine, oncology and hematology, blood group to local people also. We get knowledge about genetics disease and their inheritance and their cure.	✓	✓	✓	✓
M.Sc II Sem /Paper-II	CCC (22)	Principle of gene Manipulation, structure, function of gene	Unit-II Through this paper we get knowledge about DNA fingerprinting. That is used as evidence in courts to identify bodies, track down blood relatives. Some of them like gene therapy which is beneficial for genetic disease. Transgenic technology allows improvement of nutrients in animal products, including their quantity and quality.	✓	✓	✓	✓
M.Sc II Sem /Paper-III	CCC (23)	Tools and Techniques for biology	In this paper we will study about different types of instrument that is used in biology have many advantages and this tools are very beneficial for humans like cryopreservation.	✓	✓	✓	✓
M.Sc II Sem/ Paper-IV	OSC (24)	Research Methodology & Computer Application: Basics	By doing research at local area and publishing it in international journal . students get the knowledge of computer and their application in field of research also help students in their computer skill and research operations.	✓	✓	✓	✓

M.Sc II Sem /Paper-V	ECC	Environmental and Forest Laws	Environmental law ensures that individuals, governments and cooperatives do not cause harm to the environment and make people more care towards their nature at local, regional and global level.	✓	✓	✓	✓
	ECC (25)	Evolution and Functional Anatomy of Fish Theory	In this paper we get knowledge about structure and functions of different type of fishes like hill stream fishes, marine fishes and also about some of the local fishes.	✓	✓	✓	✓
	ECC	Aquatic Resources and their Conservation	It provides the conservation for aquatic resources strategies support and sustainable development by protecting biological resource also we get knowledge about fish preservation and conservation Techniques.	✓		✓	✓
	ECC	Aquaculture	To get the knowledge about the cultural Technology and diseases of aquatic food organism. This paper gives the practice of fisheries and their application and to get more fish production at local level.	✓	✓		

Class/paper	Course Type	Course Name	Course Content/relevant	Local	Regional	National	Global
M.Sc III Sem/ paper-I	CCC (31)	Animal Physiology(Vertebrate)	Through this paper we get knowledge about animal's anatomy and their physiology at global, National, Regional and at local level. Also we study about brief description about animal physiology.	✓	✓	✓	✓
M.Sc III Sem/ paper-II	CCC (32)	Developmental Biology	In this paper we study about the embryonic development, invitro fertilization and its process, which occurs inside animal body.	✓	✓	✓	✓
M.Sc III Sem/ paper-III	CCC (33)	Immunology	This paper has great significance globally, regionally and at local level, as it shows the knowledge about immune system in human being.	✓	✓		✓
M.Sc III Sem/ paper-IV	OSC (34)	Intellectual Property Rights, Human Rights and Environment: Basics	This paper gives the information about patent rules on global level and knowledge of National human right, regional court, local human right.	✓	✓	✓	✓
M.Sc. III Sem/ paper-V	ECC (35)	Tribal Studies	This paper gives the knowledge of tribals health problems on the National, Regional and local level along with this the knowledge	✓	✓	✓	

			of tribal development program also acquired.				
	ECC	Molecular Endocrinology and Reproduction	In this paper, we get knowledge about human and animal's neuro endocrine system at molecular level.	✓		✓	
	ECC	Endocrinology and Reproduction	This paper gives us knowledge of endocrine system and explain the role of hormones in reproduction, which are important on regional, local, national and international level.	✓	✓	✓	✓

Class	Course Type	Course Name	Course Content/relevant	Local	Regional	National	Global
M.Sc. IV Sem/ paper-I	CCC (41)	Animal Behavior	We get the knowledge about animal behavior of whole world and of our nation. It shows different behavior according to the regional area.	✓	✓		✓
M.Sc. IV sem /paper –II	CCC (42)	Biology of Parasitism	In this paper we know about the parasitic diseases. That are found in local and regional area and for cure of that diseases, vaccines are made at national and international level, which is beneficial for whole world	✓		✓	✓
M.Sc IV Sem /paper-III	CCC (43)	Molecular cell Biology	In this paper we get knowledge about the cell of molecular level gives information about cell activity and the formation and functional execution of various cell structures at molecular level.				✓
M.Sc IV Sem/ paper-IV	OSC (44)	Dissertation	In this paper student get's knowledge about the process of research wick help them to publish the paper at international, national and regional journals and this information provide all over the world.	✓	✓	✓	
M.Sc. IV Sem./ paper-V	ECC	Genomic, Metagenomics and Epigenetics	This paper gives knowledge about genome, which is further beneficial for all people at international level.			✓	✓
	ECC	Metagenomics, Epigenetic	By studying this paper we get knowledge about genome which is important at the international level.			✓	✓

		s and Chromatin Biology					
	ECC-45	Biomolecules and Metabolic regulation	In this paper students get knowledge about metabolic regulation which is important at the international level.			✓	✓
	ECC	Population genetic, Evolution and genetics variability	In this paper we get knowledge about population genetic which is available all over the world			✓	✓

Class	Course Type	Course Name	Course Content/relevant	Local	Regional	National	Global
B.Sc.-I Sem	DSCC	Cell Biology and Non-chordata	Unit-I By understanding cell biology student can get knowledge about molecular aspects of various cellular structures and processes. This knowledge is beneficial for medical science as well as analysis of database of genetic and cell information. Unit-II ,III,IV –By studying non-chordata student can understand significance of lower chordates in ecosystem and also get knowledge about evolution of higher animal from lower organism or phylogenetic relatives of chordates.			✓	✓
B.Sc. I Sem	GEC	Human Physiology	BY studying this paper students can understand various physiological processes in human being.	✓		✓	✓
B.Sc. I Sem	VAC	Vermiculture	Student get knowledge about benefits of vermicompost in agriculture, waste management, and its impact on environment.	✓	✓	✓	✓
B.Sc. II Sem	DSCC	Chordata and Embryology	Unit-I, II-To understand the role of chordates in their environment or ecosystem, To know evolutionary process and economic importance of animals.	✓		✓	

			Unit-III, IV-To understand developmental process of different animals and beginning of human life. Also helpful to understand normal development and malformations and causes of variation in development. It have wide scope to contribute in the fertility industry				
B.Sc. II Sem.	GEC	Food Nutrition and Health	This paper gives knowledge about balanced diet for human, consequences of malnutrition and deficiency disease.	✓	✓	✓	✓
B.Sc. III Sem.	DSCC	Anatomy and Physiology	Unit I, II, III, IV, V-Study of anatomy and physiology of different vertebrates reveals evolutionary relationship between organism. This also helps to learn the baselines of animal health and biological system, and how to diagnose disease.			✓	✓
B.Sc. III Sem.	DSEC	Fish and Fisheries	In this chapter its gives the theoretical and practical knowledge of fish culture in local and Regional level. It provides food for billions of people around the world, and plays an important role in the local economy of coastal communities in many countries.	✓	✓	✓	
B.Sc. IV Sem	DSCC	Vertebrate Endocrinology, Reproductive biology, Behavior, Evolution and Applied Zoology	Through endocrine system we get the knowledge of endocrine system of vertebrate. It discusses the intimate physiology of endocrine system and the pivotal role of hormones in coordinating basic body processes such as nutrition, reproduction etc.	✓			✓
B.Sc IV Sem	DSEC	Economic Zoology	This paper deals with the application of zoological knowledge for the benefit of mankind.	✓		✓	✓
B.Sc V Sem	DSCC	Ecology, Environmental Biology, Toxicology , Microbiology and	Unit I&II provide knowledge about global environmental issues, independence of animals with their nature,It also helps to grow knowledge about maintaining environment clean as well as sustaining biodiversity in changing climate.It also helps to manage our natural resources, and protect human health.	✓	✓	✓	✓

		Medical Zoology	<p>Unit-III Toxicology improves knowledge of toxic effects of various toxic substance on human health and environmental also. Student can also get knowledge to prevent or reduce a disease or other negative health outcome due to toxic substance.</p> <p>Unit-IV-Microbiology gives idea about both good &amp; bad effects of microorganism. Treatment of diseases and use of microbes in industrial applications production of antibiotics etc.</p> <p>Unit-V Medical zoology is important to understand and the spreading and controlling of animal born or parasitic diseases that can affect human health student get knowledge to control and prevent such diseases.</p>				
B.Sc. V Sem.	DSEC	Diversity of Chordates	<p>Through the course amazing diversity of living forms from simple to complex one in the world. It enlightens how each group of organisms arose and how did they establish themselves in the environment with their special characteristics.</p>	✓	✓	✓	✓
B.Sc. V Sem.	GEC	Biodiversity Conservation and Sustainable development	<p>The course provides information regarding the status of environment, the depletion of its resources, the loss of biodiversity and the remedial efforts undertaken by various agencies. The course is also focused to creating environmental awareness among learners.</p>	✓	✓	✓	✓
B.Sc. VI Sem.	DSCC	Genetics, Cell physiology, Biochemistry, Biotechnology and Biotechniques	<p>Unit-I Genetics-This unit is designed to revise basic concepts of genetics and then move on to advanced concepts. And include the mechanism of inheritance, gene structure and function, Sex chromosomal and autosomal anomalies, aspects of human genetics etc. A strong attention</p> <p>Unit-IV &amp; V-This unit approach to expose the students to modern techniques and methodologies. The diverse techniques from microscopy to spectroscopy, chromatography etc and applied.</p>	✓		✓	✓
B.Sc. VI Sem.	DSEC	Fundamentals of Biochemistry	<p>This course provides an introduction to structure of biomolecules with emphasis on the techniques used for structure determination and analysis. It powers scientific and medical discovery in fields such as pharmaceuticals, forensics and nutrition.</p>			✓	✓

B.Sc. VI Sem.	GEC	Human Health and Diseases	This chapter covers major diseases that are caused by bacteria, viruses, protozoa, fungi and helminth. Everyone should be aware of the different types of diseases and their effects.	✓			✓
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