



**GOVERNMENT ARTS COLLEGE (AUTONOMOUS), KARUR - 639 005.**

(Re-accredited with 'A' Grade by NAAC and Affiliated to Bharathidasan University, Tiruchirappalli)

**PG AND RESEARCH DEPARTMENT OF ZOOLOGY**

**M.SC., ZOOLOGY COURSE STRUCTURE UNDER CBCS SYSTEM**

(For the candidates admitted from the year 2021-2022 onwards)

**AIM, VISION, MISSION AND OBJECTIVES OF THE ZOOLOGY DEPARTMENT**

**AIM OF THE DEPARTMENT**

“To provide education to all unprivileged pupils, To uplift them to higher economic and social level; To impart scientific knowledge for exploring the hidden areas of life - sciences. To produce energetic eco-friendly human being with good character and conscience; To make them help their family and society”.

**VISION OF THE DEPARTMENT**

“To educate the values and discipline to young minds by teaching Life science”.

**MISSION OF THE DEPARTMENT**

“To produce intellectually enlightened youth with biological knowledge, accomplished the target of attaining social transformation with life science”.

**OBJECTIVES OF THE DEPARTMENT**

- To help the students to understand the formation and functioning of Living organisms.
- To unveil the secrets of development and evolution by teaching cellular, molecular, genetic aspects of life.
- To impart knowledge about the various technologies in life sciences.
- To create awareness of conserving the environment.

**What is Credit system?**

Weightage to a course is given in relation to the hours assigned for the course. The following Table shows the correlation between credits and hours. However, there could be some flexibility because of practical, field visits, tutorials and nature of project work. For PG courses, a student must earn a minimum of **90 (+4)** credits as mentioned in the table below. The total number of minimum courses offered by a department is given in the course pattern.

## POST GRADUATE COURSE PATTERN (2021 ONWARDS)

PART	SEMESTER	SPECIFICATION	NO. OF COURSES	HOURS	CREDITS	TOTAL CREDITS
III	I - IV	Core courses Theory	<b>10</b>	<b>60</b>	<b>47</b>	<b>86</b>
	I - IV	Core courses Practical	<b>4</b>	<b>24</b>	<b>16</b>	
	I- IV	Elective Course	<b>5</b>	<b>30</b>	<b>23</b>	
	II	Extra credit course Internship programme (It should be completed in the semester Holidays)	<b>1</b>	<b>-</b>	<b>(2)</b>	<b>(4)</b>
	III	Extra Credit Course Massive Open Online Course (MOOC)	<b>1</b>	<b>-</b>	<b>(2)</b>	
	IV	Project Work	<b>1</b>	<b>6</b>	<b>4</b>	<b>4</b>
<b>TOTAL</b>				<b>120</b>	<b>90</b> <b>+</b> <b>(4)</b>	<b>90</b> <b>+</b> <b>(4)</b>

### Course Pattern

The Postgraduate degree course consists of five vital components. They are as follows:

**Part - III:** Core Course (Theory), Core Practical, Core Electives, Project Work, Extra credit course.

**Part - IV:** Internship Programme, MOOC's.

### Core Courses

A core course is the course offered by the parent department related to the major subjects, components like theories, practical's, Project work, field visits and etc.

### Core Elective

The core elective course is also offered by the parent department. The objective is to provide choice and flexibility within the department. There are THREE core electives. They are offered in different semesters according to the choice of the college.

### Extra Credit Courses

In order to facilitate the students gaining extra credits, the extra credit courses are given. There are two extra credit courses - Massive Open Online Courses (MOOC) and Skill-based Course - offered in the III and V Semesters respectively. According to the guidelines of UGC, the students are encouraged to avail this option of enriching by enrolling themselves in the MOOC provided by various portals such as SWAYAM, NPTEL, etc. Skill based course is offered by the department apart from their regular class hours.

## Subject Code Fixation

The following code system (11 characters) is adopted for Under Graduate courses:

Year of Revision	PG Code of the Dept	Semester	Specification of Part	Running number in the part
↓	↓	↓	↓	↓
<b>2021</b>	<b>P21</b>	<b>x</b>	<b>x</b>	<b>xx</b>
<b>2021</b>	<b>PZO</b>	<b>1</b>	<b>x</b>	<b>1</b>

For example:

**I M.Sc., ZOOLOGY - STRUCTURE AND FUNCTION OF INVERTEBRATES**

The code of the paper is **P21 ZO 1C1**.

Thus, the subject code is fixed for other subjects.

## EXAMINATION

### Continuous Internal Assessment (CIA):

<b>PG - Distribution of CIA Marks</b>	
<b>Passing Minimum: 50 Marks</b>	
<b>Theory CIA Maximum = 25</b>	<b>Theory CIA Minimum = 10</b>
<b>Practical CIA Maximum = 40</b>	<b>Practical CIA Minimum = 16</b>

### End - Semester Tests

Centralized - Conducted by the office of Controller of Examinations.

### Semester Examination

Testing with Objective and Descriptive questions.

**Section - A:** 10 Questions x 2 Marks = 20 Marks (No Choice - Two questions from each unit)

**Section - B:** 5 Questions x 5 Marks = 25 Marks (Either... or Type - One pair from each unit)

**Section - C:** 3 Questions x 10 Marks = 30 Marks (3 Out of 5 - One question from each unit)

### Duration of Examination:

3- Hours examination for courses.

## Grading System

### 1. Grading

Once the marks of the CIA and the end-semester examination for each of the courses are available, they will be added. The marks thus obtained, will then be graded as per the scheme provided in Table 1.

From the second semester onwards the total performance within a semester and the continuous performance starting from the first semester are indicated by **Semester Grade Point Average (GPA)** and **Cumulative Grade Point Average (CGPA)**, respectively. These two are calculated by the following formulae

$$\text{GPA} = \frac{\sum_{i=1}^n C_i G_i}{\sum_{i=1}^n C_i} \quad \text{WAM (Weighted) Average Marks} = \frac{\sum_{i=1}^n C_i G_i}{\sum_{i=1}^n C_i}$$

Where, 'C<sub>i</sub>' is the Credit earned for the Course - i,

'G<sub>i</sub>' is the Grade Point obtained by the student for the Course 'i'.

'M' is the marks obtained for the course 'i', and

'n' is the number of Courses **Passed** in that semester.

CGPA: Average GPA of all the Courses starting from the first semester to the current semester.

## 2. Classification of Final Results

- i) For each of the three parts, there shall be separate classification on the basis of the CGPA, as indicated in the following Table - 2.
- ii) For the purpose of Classification of Final Results, the Candidates who earn CGPA 9.00 and above shall be declared to have qualified for the Degree as 'Outstanding'. Similarly, the candidates who earn the CGPA between 8.00 - 8.99, 7.00 - 7.99, 6.00 - 6.99 and 5.00 - 5.99 shall be declared to have qualified for their Degree in the respective programmes as 'Excellent', 'Very Good', 'Good' and 'Above Average' respectively.
- iii) Absence from an examination shall not be taken as an attempt.

**Table - I - Grading of the Courses**

Marks Range	Grade Point	Corresponding Grade
90 and above	10	O
80 and above but below 90	9	A+
70 and above but below 80	8	A
60 and above but below 70	7	B+
50 and above but below 60	6	B
40 and above but below 50	5	C
Below 40	0	RA

**Table - 2 - Final Result**

<b>CGPA</b>	<b>Classification of Final Results</b>	<b>Corresponding Grade</b>
9.00 and above	O	Outstanding
8.00 to 8.99	A+	Excellent
7.00 to 7.99	A	Very Good
6.00 to 6.99	B+	Good
5.00 to 5.99	B	Above Average
4.00 to 4.99	C	Average
Below 4.00	RA	Re – Appearance

Credit based weighted Mark System is adopted for individual semesters and cumulative semesters in the column 'Marks Secured' (for 100).

**Declaration of Result:**

Mr./Ms. \_\_\_\_\_ has successfully completed the Post Graduate in \_\_\_\_\_ programme. The candidate's Cumulative Grade Point Average (CGPA) in Part - III is \_\_\_\_\_ and the class secured is \_\_\_\_\_ by completing the minimum of **90** credits. The candidate has acquired \_\_\_\_\_ (if any) extra credits offered by the parent department courses.

## PROGRAMME OUTCOMES - POs

At the end of the M.Sc. Programme, graduates will be able to

<b>PO1</b>	Understand; analyze and apply the Life science knowledge in different fields by integrating the knowledge of chemistry, physics, mathematics, and computer science with analytical capability.
<b>PO2</b>	Creates and enhance the ability of scientific thinking power and effective Communication knowledge skill with society.
<b>PO3</b>	Take part in multi-disciplinary scientific activities and work towards the development of society.
<b>PO4</b>	Develop the strategies for the conservation of environment; create awareness for the utilization of natural resources leading to sustainable development with ethical approach.
<b>PO5</b>	Assess and utilize the science principles and processes for the creation of new potential self-employment leading to the property of the society.

### AIM, VISION, MISSION AND OBJECTIVES OF THE ZOOLOGY DEPARTMENT

#### AIM OF THE DEPARTMENT

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#### VISION OF THE DEPARTMENT

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#### OBJECTIVES OF THE DEPARTMENT

- To help the students to understand the formation and functioning of Living organisms.
- To unveil the secrets of development and evolution by teaching cellular, molecular, genetic aspects of life.
- To impart knowledge about the various technologies in life sciences.
- To create awareness to conserve the environment.

## PROGRAMME SPECIFIC OUTCOMES

**On Successful completion of their M.Sc. Zoology Programme the Students will have the ability to**

<b>PSO1</b>	Identify and classify diversified invertebrate and chordate species based on the knowledge of taxonomy and evolution.
<b>PSO2</b>	Interpret and explain the cell biological phenomena with physical principles, adapt the physiological systems with biochemical and immunological aspects to healthy life.
<b>PSO3</b>	Assess the variation among fauna which are adapted to changing environment and relate them with molecular genetics mechanism. Relate the nature with life and review the importance of conservation of nature for the sustainable development of world.
<b>PSO4</b>	Analyze and apply various tools of statistics and databases for the betterment of life and environment.
<b>PSO5</b>	Apply the principles of development biology, microbiological phenomena and cell biology for the human welfare through biotechnology and genetic engineering.
<b>PSO6</b>	Classify and study the significance of various entomological and microbiological species. Apply the knowledge of aquaculture, vermiculture, sericulture and poultry farming for self-employment.
<b>PSO7</b>	Perceive the anatomical, physiological, biochemical and cellular process of various life forms with changing environmental conditions, understand the evidences for evolution of life and analyze the biometrics using statistical tools in lab.

### Teaching, learning and evaluation methods:

Conventional black board, chalk and talk method, OHP, LCD, Smart board, Models, Charts, Mind Maps, Quiz, Online Quiz, Open book exams, Online Teaching, Examination, Group Discussion, Debate, Seminars, Live specimens, Museum Specimens and Field Visit.

### Bloom's Taxonomy Action verbs used for course objectives, outcomes and question setting. (K)\*

<b>K1</b>	<b>K2</b>	<b>K3</b>	<b>K4</b>	<b>K5</b>	<b>K6</b>
<b>REMEMBERING</b>	<b>UNDERSTANDING</b>	<b>APPLYING</b>	<b>ANALYSING</b>	<b>EVALUATING</b>	<b>CREATING</b>
List, Define, Describe, Recall Arrange, List, Outline, State Identify, etc.	Comprehension, Explain, Summaries Describe, Illustrate, Review, Classify, Clarify, Distinguish, Estimate, Give Example(S), Identify, etc.	Apply, Interpret, Manipulate, Relate, Use Compute, Demonstrate Illustrate, Sketch, Solve, etc.	Analyze, Compare Relate, Categorize Criticize, Diagram Differentiate, Distinguish, Infer, Examine, Outline, Experiment, Discuss, Point Out, etc.	Judge, Justify Assess, Estimate, Evaluate, Interpret Compare, Conclude, Describe, Explain, Determine, etc.	Create, Judge, Design, Rewrite Summarize Categorize, Develop, Formulate, Generate, Revise, Rearrange, Synthesize, etc.

Mapping of Student Learning Outcomes*							
BLOOM'S TAXONOMY REVISED <i>(example verbs for learning outcomes in italics)</i>		COGNITIVE PROCESS DIMENSION					
		<b>REMEMBERING</b> Recall and retrieval of foundational disciplinary information.	<b>UNDERSTANDING</b> Make meaning out of Information.	<b>APPLYING</b> Use information in a similar situation.	<b>ANALYSING</b> Take apart information and explore component connections.	<b>EVALUATING</b> Examine critically and judge.	<b>CREATING</b> Create something new.
KNOWLEDGE DIMENSION	<b>A. FACTUAL KNOWLEDGE</b> Foundational information in a discipline.	<i>List</i>	<i>Summarize</i>	<i>Respond</i>	<i>Select</i>	<i>Check</i>	<i>Generate</i>
	<b>B. CONCEPTUAL KNOWLEDGE</b> Connection of foundational elements to overall structure and function.	<i>Recognize</i>	<i>Classify</i>	<i>Provide</i>	<i>Differentiate</i>	<i>Determine</i>	<i>Assemble</i>
	<b>C. PROCEDURAL KNOWLEDGE</b> Methods for investigating and acting.	<i>Recall</i>	<i>Clarify</i>	<i>Carry Out</i>	<i>Integrate</i>	<i>Judge</i>	<i>Design</i>
	<b>D. META-COGNITIVE KNOWLEDGE</b> Reflection on thinking in the discipline.	<i>Identify</i>	<i>Predict</i>	<i>Use</i>	<i>Deconstruct</i>	<i>Reflect</i>	<i>Create</i>

\*(Sources - Anderson L W, Krathwohl D. R, January 2001, **A Taxonomy for Learning, Teaching and Assessing: A Revision of Bloom's Taxonomy of Educational Objectives**, Edition: 1<sup>st</sup>, Publisher: New York: Longman, ISBN: ISBN: 0321084055, 9780321084057.

Anderson & Krathwohl, and A Model for Learning Objectives, Iowa State University Center for Excellence in Learning and Teaching).





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**M.Sc., ZOOLOGY - COURSE STRUCTURE UNDER CBCS SYSTEM**

(For the candidates admitted from the year 2021-2022 onwards)

SEMESTER	COURSE	COURSE TITLE	COURSE CODE	INSTR. HOURS /WEEK	CREDIT	EXAM HOURS	MARKS		MARKS
							INT	INT	
<b>I</b>	Core Course - I	Structure and Function of Invertebrates	P21ZO1C1	6	4	3	25	75	100
	Core Course - II	Comparative Anatomy of Chordates	P21ZO1C2	6	4	3	25	75	100
	Core Course - III	Microbiology and Immunology	P21ZO1C3	6	4	3	25	75	100
	Core Course - IV	Practical - I (CC - I, II & III)	P21ZO1C4P	6	4	3	40	60	100
	Elective Course-I	General and Applied Entomology	P21ZO1E1	6	4	3	25	75	100
				<b>30</b>	<b>20</b>				<b>500</b>
<b>II</b>	Core Course - V	Cell and Molecular Biology	P21ZO2C5	6	5	3	25	75	100
	Core Course - VI	Developmental Biology	P21ZO2C6	6	5	3	25	75	100
	Core Course - VII	Evolution	P21ZO2C7	6	5	3	25	75	100
	Core Course - VIII	Practical - II (CC-V, VI & VII)	P21ZO2C8P	6	4	3	40	60	100
	Elective Course - II	Applied Zoology	P21ZO2E2	6	5	3	25	75	100
	Extra Credit Course	Internship Programme		-	(2)	-	-	-	-
				<b>30</b>	<b>24</b>				<b>500</b>
<b>III</b>	Core Course - IX	Comparative Animal Physiology	P21ZO3C9	6	5	3	25	75	100
	Core Course - X	Biochemistry	P21ZO3C10	6	5	3	25	75	100
	Core Course - XI	Practical - III (CC-IX& X)	P21ZO3C11P	6	4	3	40	60	100
	Elective Course - III	Computer applications and Bioinformatics	P21ZO3E3	6	5	3	25	75	100
	Elective Course - IV	Biotechnology	P21ZO3E4	6	5	3	25	75	100
	Extra Credit Course	Massive Open Online Course (MOOC)		-	(2)	-	-	-	-
				<b>30</b>	<b>24</b>				<b>500</b>
<b>IV</b>	Core Course - XII	Genetics	P21ZO4C12	6	5	3	25	75	100
	Core Course - XIII	Environmental Biology	P21ZO4C13	6	5	3	25	75	100
	Core Course - XIV	Practical - IV (CC-XII & XIII)	P21ZO4C14P	6	4	3	40	60	100
	Elective Course - V	Research methodology and Biostatistics.	P21ZO4E5	6	4	3	25	75	100
	Project	Project Work	P21ZO4PW	6	4	-	*	**	100
				<b>30</b>	<b>22</b>				<b>500</b>
<b>TOTAL</b>				<b>120</b>	<b>90 + (4)</b>				<b>2000</b>

\* Viva Voce Exam 20 Marks; \*\* Dissertation - 80 Marks.

# Internship Programme should be completed during the second semester holidays.

**CHAIRMAN  
BOARD OF STUDIES IN ZOOLOGY**

**CONTROLLER OF EXAMINATIONS**

<b>NO. OF CREDITS: 4</b>	<b>COURSE CODE: P21ZO1C1</b>
<b>GOVERNMENT ARTS COLLEGE (AUTONOMOUS), KARUR - 639005</b> <b>M.Sc., ZOOLOGY - I SEMESTER - CORE COURSE - I</b> (For the candidates admitted from the year 2021 - 22 onwards) <b>STRUCTURE AND FUNCTION OF INVERTEBRATES</b>	
<b>COURSE OBJECTIVES:</b> <ol style="list-style-type: none"> <li>1. To understand the classification of invertebrates based on the principles of taxonomy.</li> <li>2. To learn about the trends in the development of nervous system.</li> <li>3. To know the evolutionary significance of larval forms of invertebrates.</li> <li>4. To study about the locomotion, nutrition feeding mechanism and digestion in invertebrates.</li> <li>5. To understand the behaviour changes in invertebrates.</li> </ol>	
<b>UNIT - I</b>	<b>Principle of animal taxonomy</b> Species concept; International code of zoological nomenclature - Taxonomic procedures. New trends in taxonomy - Animal collection, handling and preservation - Organization of coelom -Acoelomates - Pseudocoelomates - Coelomates: Protostomia and Deuterostomia.
<b>UNIT - II</b>	<b>Locomotion</b> Pseudopodia - Flagella and ciliary movement in protozoa - Hydrostatic movement in Coelenterata, Annelida and Echinodermata - Nutrition and Digestion - Patterns of feeding and digestion in lower metazoa - Filter feeding in polychaeta, Mollusca and Echinodermata.
<b>UNIT - III</b>	<b>Respiration</b> Organs of respiration: gills, lungs and trachea - Respiratory pigments - Mechanism of respiration - Excretion - Organs of excretion: coelom, coelomoducts, nephridia and Malpighian tubules - Mechanisms of excretion - Excretion and osmoregulation.
<b>UNIT - IV</b>	<b>Nervous system</b> Primitive nervous system: Coelenterata and Echinodermata - Advanced nervous system: Annelida, Arthropoda (Crustacea and Insecta) and Mollusca (Cephalopoda) - Trends in neural evolution.
<b>UNIT - V</b>	<b>Larvae of Invertebrates</b> Larval forms of free living invertebrates - Larval forms of parasites - evolutionary significance of larval forms. Minor Phyla -Structural features and affinities - Phoronida and Chaetognatha.
<b>Text book:</b> 1. Kotpal, R.L., Agarwal, S.K. and Khetarpal, R.P.R.,1989, Modern Text Book of Zoology, Rastogi Publications, Meerut.	
<b>Reference books:</b> 1. Hyman, G.H., 1940, The Invertebrates, Vol.I to VII, McGraw Hill Book Co., Inc., N.Y. 2. Barnes, R.D., 1974, Invertebrate Zoology, 4th Ed., Holt Saunders International Edition 3. Barrington, E.J.W. 1976, Invertebrate structure and function. Thomas Nelson and Sons Ltd., London 4. Hyman, L.H., 1951, The Invertebrates. Vol.2. McGraw Hill Co., New York. 5. Barnes, R.D., 1974, Invertebrate Zoology, III edition. W.B. Saunders Co., Philadelphia. 6. Russel-Hunter, W.D., 1970 A biology of higher Invertebrates, the Macmillan Co. Ltd., London	

## Course Outcomes

On completion of this course the students will be able to

1. Develop an in-depth knowledge on the nomenclature, diversity of fauna and new trends in taxonomy.
2. Analyze the mechanism of feeding digestion and locomotion in invertebrates.
3. Describe the mechanism of respiration and excretion in invertebrate fauna.
4. Compare the primitive and advanced nervous system of invertebrates.
5. Understand the significance of larval forms of different invertebrates.

### Nature of Course

Knowledge and skill	✓	Employability oriented	✓
Skill oriented		Entrepreneurship oriented	

### MAPPING

Relationship Matrix for Course Outcomes, Programme Outcomes and Specific Outcomes

Course Outcomes (COs)	Programme Outcomes(POs)					Programme Specific Outcomes(PSOs)							Mean Score of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	
CO1	3	2	-	2	2	3	3	3	-	2	2	2	2
CO2	3	2	2	3	1	3	3	2	1	2	3	-	2.08
CO3	3	2	2	1	-	3	3	2	3	2	2	-	1.91
CO4	3	3	1	-	2	3	3	3	3	3	-	1	2.08
CO5	2	3	-	2	3	2	2	3	3	3	-	2	2.08
<b>Over all mean score for COs</b>													<b>2.014</b>

(Values Reference - 3-High, 2-Medium, 1- Low, - No)

**Result: The Matrix score of this Course is 2.014 (Very High Relationship)**

**Note:**

<b>Scale</b>	1	2	3	4	5	6
<b>Relation</b>	0-0.5	0.5-1.0	1.0-1.5	1.5-2.0	2.0-2.5	2.5-3.0
<b>Quality</b>	Very Poor	Poor	Moderate	High	Very high	Excellent

### Value Scaling:

$\text{Mean Score of Cos} = \frac{\text{Total values}}{\text{Total No. of PSOs}}$	$\text{Over all mean Score for Cos} = \frac{\text{Total of mean score}}{\text{Total of COs}}$
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**COURSE DESIGNER: Dr. A.KARTHIKEYAN**

**CHAIRMAN - BOS**

**CONTROLLER OF EXAMINATIONS**

<b>NO. OF CREDITS: 4</b>	<b>COURSE CODE: P21ZO1C2</b>
<b>GOVERNMENT ARTS COLLEGE (AUTONOMOUS), KARUR - 639005</b>  <b>M.Sc., ZOOLOGY - I SEMESTER - CORE COURSE - II</b> (For the candidates admitted from the year 2021 - 22 onwards)  <b>COMPARATIVE ANATOMY OF CHORDATES</b>	
<b>COURSE OBJECTIVES:</b> <ol style="list-style-type: none"> <li>1. To study the origin and classification of vertebrates.</li> <li>2. To understand the morphology and relationship in vertebrates.</li> <li>3. To identify all organs and organ systems of vertebrates.</li> <li>4. Compare and contrast the organization of different systems in vertebrates.</li> </ol>	
<b>UNIT - I</b>	<b>Origin and classification of Chordata</b> Origin and classification of chordata, Protochordata- Structure and life history of <i>Balanoglossus</i> , <i>Ascidian</i> and <i>Amphioxus</i> -and their evolutionary significance - Importance of the study of vertebrate morphology in relation to other disciplines.
<b>UNIT - II</b>	<b>Integument</b> Vertebrate integument and its derivatives - Development, general structure and functions of skin and its derivatives - Glands, scales, horns, claws, nail, hoofs, feathers and hairs.
<b>UNIT - III</b>	<b>Circulatory &amp; Respiratory systems</b> Blood - Evolution of heart - Evolution of aortic arches and portal systems - Respiratory system - Characters of respiratory tissue - Internal and external respiration - Comparative account of respiratory organs.
<b>UNIT - IV</b>	<b>Skeletal &amp; Urinogenital systems</b> Comparative account of skull, jaw suspensorium, vertebral column - Limbs and girdles - cranial kinesis. Evolution of urinogenital system in vertebrate series.
<b>UNIT - V</b>	<b>Sense organs &amp; Nervous system</b> Receptors - Organs of vision, olfaction, gustation and auditory perception - Lateral line system - Electroreception - Nervous system - Comparative anatomy of the brain in relation to its functions - Comparative anatomy of spinal cord - Nerves-Cranial, Peripheral and Autonomous nervous system.
<b>Text books:</b> <ol style="list-style-type: none"> <li>1. Kotpal, R.L., Agarwal, S.K. and Khetarpal, R.P.R., 1989, Modern Text Book of Zoology, Rastogi Publications, Meerut.</li> <li>2. Sedgwick, A., 2017, A Students Text Book of Zoology, Vol.II</li> </ol>	
<b>Reference books:</b> <ol style="list-style-type: none"> <li>1. Weischert, C.K., 1965, Anatomy of Chordates, McGraw Hill Book Co., Inc., N.Y.</li> <li>2. Romer, A.S., 1979, Hyman's Comparative Vertebrate Anatomy, 3<sup>rd</sup> Ed., The University of Chicago Press, London.</li> <li>3. Alexander, R.M., 1975, The Chordata. Cambridge University Press, London.</li> <li>4. Kent, C.G., 2000 Comparative anatomy of vertebrates.</li> <li>5. Walters, H.E. and Sayles, L.D., 1928, Biology of vertebrates. Macmillan &amp; Co., New York.</li> <li>6. Waterman, A.J., 1971, Chordate structure and function.</li> </ol>	

## Course Outcomes

On completion of this course the students will be able to

1. Extend a deep knowledge on the diversity plan of relationships to vertebrate morphology.
2. Develop a holistic approach on the structure of integument and its derivatives in different vertebrates.
3. Summarize the plan of circulatory and respiratory systems.
4. Discuss and compare various skeletal elements and urinogenital systems.
5. Compare the basic anatomy of nervous system and sense organs.

## Nature of Course

Knowledge and skill	✓	Employability oriented	✓
Skill oriented		Entrepreneurship oriented	

## MAPPING

### Relationship Matrix for Course Outcomes and Programme Specific Outcomes

Course Outcomes (COs)	Programme Outcomes(POs)					Programme Specific Outcomes(PSOs)							Mean Score of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	
CO1	2	2	2	-	1	3	3	3	2	2	2	1	1.91
CO2	3	3	-	1	2	3	1	3	3	2	2	-	1.91
CO3	3	3	-	1	3	3	2	3	3	3	3	3	2.5
CO4	3	3	-	1	2	3	3	3	3	3	-	1	2.08
CO5	3	3	1	1	2	3	2	3	3	3	-	1	2.08
<b>Over all mean score for COs</b>													<b>2.096</b>

(Values Reference - 3-High, 2-Medium, 1- Low, - No)

**Result: The Matrix score of this Course is 2.096 (Very High Relationship)**

### Note:

Scale	1	2	3	4	5	6
Relation	0 - 0.5	0.5 - 1.0	1.0 - 1.5	1.5 - 2.0	2.0 - 2.5	2.5 - 3.0
Quality	Very Poor	Poor	Moderate	High	Very high	Excellent

### Value Scaling:

$\text{Mean Score of Cos} = \frac{\text{Total values}}{\text{Total No. of PSOs}}$	$\text{Over all mean Score for Cos} = \frac{\text{Total of mean score}}{\text{Total of COs}}$
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**COURSE DESIGNER: Dr. A.KARTHIKEYAN**

**CHAIRMAN - BOS**

**CONTROLLER OF EXAMINATIONS**

<b>NO. OF CREDITS: 4</b>	<b>COURSE CODE: P21ZO1C3</b>
<b>GOVERNMENT ARTS COLLEGE (AUTONOMOUS), KARUR - 639005</b> <b>M.Sc., ZOOLOGY - I SEMESTER - CORE COURSE - III</b> (For the candidates admitted from the year 2021 - 22 onwards) <b>MICROBIOLOGY AND IMMUNOLOGY</b>	
<b>COURSE OBJECTIVES:</b> <ol style="list-style-type: none"> <li>1. To know the taxonomy of microorganisms.</li> <li>2. To learn the various infectious diseases.</li> <li>3. To study the innate and acquired immunity.</li> <li>4. To know the antigens and antibody interactions.</li> <li>5. To learn the immunological disorders.</li> </ol>	
<b>UNIT - I</b>	Bacteria -Taxonomy, Structure, Recombination, Growth, Nutrition, Culture - Types of Media and Conditions for Culturing; Viruses -Taxonomy, Structure and Life Cycle of Viruses-T4 Phage and HIV; Viroids and Prions.
<b>UNIT - II</b>	Infectious Diseases - Causative Agents, Modes of Transmission and Control of Polio, Dengue, AIDS. Tuberculosis, Diphtheria, Typhoid, Syphilis and Gonorrhoea. Prevention and Control of microorganisms - Physical and Chemical Methods. Antibiotics and Other Anti-microbial Agents and Mechanism of Drug Resistance.
<b>UNIT - III</b>	Scope of Immunology - Types of Immunity - Innate and Acquired, Passive and Active. Primary and Secondary Lymphoid Organs - Structure and Function of Bone Marrow, Thymus, Spleen, Bursa of Fabricius, GALT, BALM, MALT and Lymph Nodes. Cells of Immune System - Origin and Differentiation of T & B Cells and Macrophage. Humoral and Cell mediated immune response.
<b>UNIT - IV</b>	Antigenicity - Epitopes and haptens, Antibody - Immunoglobulin - Primary Structure of IgG - Classes, Functions, Synthesis. Generation of Antibody Diversity. Complement - Classical and Alternative Pathways and Immunological Significance- Antigen antibody reaction.
<b>UNIT - V</b>	Major Histocompatibility Complex (HLA) and its Products in Man. Transplantation Immunology, Cytokines - Features, Receptors and Immune response, Autoimmune Diseases - Concept and Mechanisms - (Examples - SLE, Rheumatoid arthritis) - Types of Hypersensitivity.
<b>Text books:</b> <ol style="list-style-type: none"> <li>1. Powar, C.B. and Dagainawala. H.F., 1982, General Microbiology Volume I &amp;II, Himalayas Publishing House, Mumbai.</li> <li>2. Ananda narayanan, T. and Jayram Paniker, C.K., 2000, Textbook of Microbiology, 6<sup>th</sup> Ed. Orient Longman Ltd., Chennai.</li> <li>3. Kannan, I., 2011, Immunology, MJP publishers, Chennai.</li> <li>4. Nandhini Shetty, 1996, Immunology: Introductory Text Book New Age International Pvt. Ltd., New Delhi.</li> </ol>	
<b>Reference books:</b> <ol style="list-style-type: none"> <li>1. Pelczar, M.J., Reid, R.D. and Chan. E.C.S, 2002, Microbiology, 5<sup>th</sup> Ed. Tata McGraw Hill Publishing Co. Ltd., New Delhi.</li> <li>2. Barbara J. Howard., 1994, Clinical and pathogenic Microbiology. The C V Mosby Company.</li> <li>3. Kuby J.1994, Immunology, W.H. Freeman &amp; Co., New York.</li> <li>4. Roitt, M.I., 1994, Essential Immunology, Blackwell Science Ltd., UK.</li> <li>5. Sells, S., 1987, Basic Immunology, Elsevier Science Publishing Co., New York.</li> <li>6. W. Paul., 2012, Fundamentals of Immunology, Lippincott Williams &amp; Wilkins</li> </ol>	

<b>Course Outcomes</b>
<b>On completion of this course the students will be able to</b>
<ol style="list-style-type: none"> <li>1. Classify the bacteria and viruses; Illustrate their structure and life cycle.</li> <li>2. Understand the cause, transmission, and prevention and control measures of infectious diseases.</li> <li>3. Explain the different types of immunity, structure and function of lymphoid organs.</li> <li>4. Define antigen and antibody and understand the antigen-antibody reactions.</li> <li>5. Illustrate the mechanism of transplantation, autoimmune diseases and hypersensitivity.</li> </ol>

<b>Nature of Course</b>			
Knowledge and skill	✓	Employability oriented	✓
Skill oriented		Entrepreneurship oriented	

### MAPPING

#### Relationship Matrix for Course Outcomes and Programme Specific Outcomes

Course Outcomes (COs)	Programme Outcomes(POs)					Programme Specific Outcomes(PSOs)							Mean Score of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	
CO1	2	3	2	2	3	2	3	3	3	2	2	2	2.41
CO2	1	2	-	1	1	-	2	3	3	3	-	-	1.33
CO3	3	3	3	3	3	1	3	3	3	3	3	2	2.75
CO4	1	-	1	-	3	1	2	2	2	3	-	2	1.41
CO5	-	3	3	2	2	-	2	3	3	3	3	3	2.25
<b>Over all mean score for COs</b>													<b>2.03</b>

(Values Reference - 3-High, 2-Medium, 1- Low, - No)

**Result: The Matrix score of this Course is 2.03 (Very High Relationship)**

#### Note:

<b>Scale</b>	1	2	3	4	5	6
<b>Relation</b>	0 - 0.5	0.5 - 1.0	1.0 - 1.5	1.5 - 2.0	2.0 - 2.5	2.5 - 3.0
<b>Quality</b>	Very Poor	Poor	Moderate	High	Very high	Excellent

#### Value Scaling:

<b>Mean Score of Cos</b> = $\frac{\text{Total values}}{\text{Total No. of PSOs}}$	<b>Over all mean Score for Cos</b> = $\frac{\text{Total of mean score}}{\text{Total of COs}}$
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**COURSE DESIGNER: Dr. R.BABUNATH**

**CHAIRMAN - BOS**

**CONTROLLER OF EXAMINATIONS**

NO. OF CREDITS: 4	COURSE CODE: P21ZO1C4P												
<p><b>GOVERNMENT ARTS COLLEGE (AUTONOMOUS), KARUR - 639005</b></p> <p><b>M.Sc., ZOOLOGY - I SEMESTER - CORE COURSE - IV</b> (For the candidates admitted from the year 2021 - 22 onwards)</p> <p><b>PRACTICAL - I (CC - I, II AND III)</b></p> <p><b>(STRUCTURE AND FUNCTION OF INVERTEBRATES, COMPARATIVE ANATOMY OF CHORDATES &amp; MICROBIOLOGY AND IMMUNOLOGY)</b></p>													
<p><b>COURSE OBJECTIVES:</b></p> <ol style="list-style-type: none"> <li>1. To study the taxonomy of invertebrates and chordates.</li> <li>2. To know the invertebrate larval forms.</li> <li>3. To learn the culture techniques.</li> <li>4. To identify the lymphoid organs.</li> </ol>													
<p><b>BIOLOGY OF INVERTEBRATES &amp; CHORDATES</b></p>	<p><b>Taxonomy</b> Identification and Classification of at least 50 representative animals belonging to major classes of Invertebrate phyla and phylum Chordata by studying their salient features.</p>												
	<p><b>Mounting</b> <i>Nereis</i> sp. - Parapodium, Scales of Fishes - Placoid, Cycloid, Ctenoid scales. Honey bee - Sting apparatus and Mouth parts.</p>												
	<p><b>Spotters</b> Invertebrate Larval forms, Minor Phyla - <i>Chaetognatha</i> and <i>Phoronida</i>.</p>												
	<p><b>Dissections</b> Demonstration - Dissections Arterial System and Cranial nerves - Shark, Frog, Using Video Clippings.</p>												
<p><b>MICROBIOLOGY</b></p>	<p>Culture Techniques - Culture of Bacteria, Bacterial Growth Curve, Preparation of Smears, Simple Staining and Gram Staining. Hanging drop method.</p> <p>1. <b>Spotters:</b> Micrometers, Compound Microscope, Autoclave, Petri dish, Inoculation loop, Colony counter, Laminar Air Flow Chamber, Incubator.</p>												
<p><b>IMMUNOLOGY</b></p>	<p>Identification of lymphoid organs in rat / mouse - Demonstration. Determination of human blood group and Rh typing by haemagglutination test.</p> <p>Detection of the presence of precipitating antibody (IgG) with soluble antigens by precipitin ring test.</p>												
	<p><b>Spotters:</b> Antibody structure - IgG model, Immunoelectrophoresis, ELISA reader.</p>												
<p><b>A record of laboratory work shall be submitted at the time of practical Examination.</b></p> <p><b>Mark distribution for the Practical Examination:</b></p> <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 60%;">Invertebrata &amp; Chordata Taxonomy</td> <td style="text-align: right;">: 10 (2 x 5 = 10)</td> </tr> <tr> <td>Invertebrata / Chordata Mounting</td> <td style="text-align: right;">: 10</td> </tr> <tr> <td>Microbiology &amp; Immunology</td> <td style="text-align: right;">: 10</td> </tr> <tr> <td>Spotters (Microbiology &amp; Immunology)</td> <td style="text-align: right;">: 20 (4 x 5 = 20)</td> </tr> <tr> <td>Record</td> <td style="text-align: right;">: 10</td> </tr> <tr> <td style="text-align: center;"><b>Total</b></td> <td style="text-align: right;"><b>: 60</b></td> </tr> </table>		Invertebrata & Chordata Taxonomy	: 10 (2 x 5 = 10)	Invertebrata / Chordata Mounting	: 10	Microbiology & Immunology	: 10	Spotters (Microbiology & Immunology)	: 20 (4 x 5 = 20)	Record	: 10	<b>Total</b>	<b>: 60</b>
Invertebrata & Chordata Taxonomy	: 10 (2 x 5 = 10)												
Invertebrata / Chordata Mounting	: 10												
Microbiology & Immunology	: 10												
Spotters (Microbiology & Immunology)	: 20 (4 x 5 = 20)												
Record	: 10												
<b>Total</b>	<b>: 60</b>												



**Course Outcomes****On completion of this course the students will be able to**

1. Observe, analyze the characters of different fauna and classify them.
2. Study the different types of scales and their significance.
3. Dissect and display the cranial nerves and arterial system virtually.
4. Analyse the growth of the bacteria in their culture.
5. Identify the lymphoid organs and detect the blood group.

**MAPPING****Relationship Matrix for Course Outcomes and Programme Specific Outcomes**

Course Outcomes (COs)	Programme Outcomes(POs)					Programme Specific Outcomes(PSOs)							Mean Score of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	
CO1	1	2	-	-	2	3	3	2	2	1	-	1	1.41
CO2	1	-	-	2	3	3	3	3	3	2	-	1	1.75
CO3	3	3	-	3	1	3	3	3	3	2	1	1	2.16
CO4	3	2	3	3	2	3	3	3	2	2	1	2	2.41
CO5	3	3	3	3	3	3	3	3	3	3	-	2	2.66
<b>Over all mean score for COs</b>													2.078

(Values Reference - 3-High, 2-Medium, 1- Low, - No)

**Result: The Matrix score of this Course is 2.078 (Very High Relationship)****Note:**

Scale	1	2	3	4	5	6
Relation	0 - 0.5	0.5 - 1.0	1.0 - 1.5	1.5 - 2.0	2.0 - 2.5	2.5 - 3.0
Quality	Very Poor	Poor	Moderate	High	Very high	Excellent

**Value Scaling:**

$\text{Mean Score of Cos} = \frac{\text{Total values}}{\text{Total No. of PSOs}}$	$\text{Over all mean Score for Cos} = \frac{\text{Total of mean score}}{\text{Total of COs}}$
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**COURSE DESIGNER: Mrs. S.SENTHAMIL SELVI****CHAIRMAN - BOS****CONTROLLER OF EXAMINATIONS**

<b>NO. OF CREDITS: 4</b>	<b>COURSE CODE: P21ZO1E1</b>
<b>GOVERNMENT ARTS COLLEGE (AUTONOMOUS), KARUR - 639005</b> <b>M.Sc., ZOOLOGY - I SEMESTER - ELECTIVE COURSE - I</b> (For the candidates admitted from the year 2021 - 22 onwards) <b>GENERAL AND APPLIED ENTOMOLOGY</b>	
<b>COURSE OBJECTIVES:</b>	
<ol style="list-style-type: none"> <li>1. To know the classification of insects.</li> <li>2. To identify the parts of insects.</li> <li>3. To study the different organ systems of insects.</li> <li>4. To study of insects relationship between abiotic and biotic factors.</li> <li>5. To understand the medically important insects and pest of various crops.</li> </ol>	
<b>UNIT - I</b>	<b>Taxonomy</b> Basics of Insects Classification, Classification up to Order Level, Key Characteristics of South Indian Insects.
<b>UNIT - II</b>	<b>External anatomy and Growth</b> External Anatomy of a Typical Insect - Exoskeleton, Head, Thorax, and Abdomen. Mouth Parts in Insects, Different Types of Larvae and Pupae - Growth and Metamorphosis of Insects.
<b>UNIT - III</b>	<b>Physiology of Insects</b> Digestive System, Excretory System, Respiratory System, Circulatory System Nervous System and Sense organs, Reproductive System, Endocrine System and Pheromones.
<b>UNIT - IV</b>	<b>Ecology of Insects</b> Abiotic Factors Affecting Insects - Temperature, Moisture, Air-currents, Diapause, Light, Food, Habitat - Terrestrial and aquatic, Biotic factors - Capacity for Increase, Protection, Competition Parental Care, Trophylaxis, Commensalism, Captives, Food Storage, Natural Enemies, Insects and Plant associations, and Social Insects.
<b>UNIT - V</b>	<b>Medical Entomology</b> Insect Vectors, Vector borne diseases and their control.  <b>Agricultural Entomology</b> Insect Pest of Crops and their control measures: Paddy, Groundnut, Coconut, Cotton. Sugarcane, Brinjal, Lady's finger, Pests of Stored grains (Rice weevil - <i>Sitophilus oryzae</i> and Red flour beetle - <i>Triboliumcastaneum</i> ).  Pest Control: Prophylactic, Mechanical, Chemical and Biological Control measures. Integrated Pest Management.
<b>Text books:</b> 1. Ambrose Dunston P., 2004, The Insects: Structure, Function and Biodiversity, Kalyani Publishers, Ludhiana. 2. Vasantharaj David, B. and Kumaraswami, T., 1982, Elements of Economic Entomology, Popular Book Depo, Chennai.	
<b>Reference books:</b> 1. Chapman, R.F., 1998, The Insects: Structure and Function, Cambridge University Press. 2. Nayar, K.K., T.N. Ananthkrishnan, and B.V. David, 1986, General and Applied Entomology, Tata McGrawHill Publishing House, New Delhi. 3. Wigglesworth, V.B., 1979, Principles of Insect Physiology, 9 <sup>th</sup> Ed. Chapman & Hall, London. 4. Snodgrass, R.E., 1985, The Principles of Insect Morphology, McGraw Hill & Co., New York. 5. Tembhare, D.B., 2012, Modern Entomology, Himalaya Publishing House, Mumbai.	

<b>Course Outcomes</b> <b>On completion of this course the students will be able to</b>
1. Identify and classify different insects and measure the biodiversity. 2. Understand the morphological and patterns of metamorphosis among insects. 3. Explain the physiology of insects. 4. Understand the effect of ecological factors, plant associations and social life in insects. 5. Assess the damages caused by the insect pests of crops and interpret their control measures.

<b>Nature of Course</b>			
Knowledge and skill	✓	Employability oriented	✓
Skill oriented	✓	Entrepreneurship oriented	

**MAPPING**

**Relationship Matrix for Course Outcomes and Programme Specific Outcomes**

Course Outcomes (COs)	Programme Outcomes(POs)					Programme Specific Outcomes(PSOs)							Mean Score of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	
CO1	3	2	3	-	-	3	2	3	3	-	3	2	2.0
CO2	2	2	3	2	-	2	-	3	3	3	2	-	1.83
CO3	2	3	1	2	3	-	3	3	3	3	2	-	2.08
CO4	1	2	2	3	3	2	3	-	2	3	3	3	2.25
CO5	2	2	3	2	2	3	1	3	2	3	-	2	2.08
<b>Over all mean score for COs</b>													<b>2.048</b>

(Values Reference - 3-High, 2-Medium, 1- Low, - No)

**Result: The Matrix score of this Course is 2.048 (Very High Relationship)**

**Note:**

<b>Scale</b>	1	2	3	4	5	6
<b>Relation</b>	0 - 0.5	0.5 - 1.0	1.0 - 1.5	1.5 - 2.0	2.0 - 2.5	2.5 - 3.0
<b>Quality</b>	Very Poor	Poor	Moderate	High	Very high	Excellent

**Value Scaling:**

<b>Mean Score of Cos</b> = $\frac{\text{Total values}}{\text{Total No. of PSOs}}$	<b>Over all mean Score for Cos</b> = $\frac{\text{Total of mean score}}{\text{Total of COs}}$
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**COURSE DESIGNER: Dr. R.BABUNATH**

**CHAIRMAN - BOS**

**CONTROLLER OF EXAMINATIONS**

<b>NO. OF CREDITS: 5</b>	<b>COURSE CODE: P21ZO2C5</b>
<b>GOVERNMENT ARTS COLLEGE (AUTONOMOUS), KARUR - 639005</b> <b>M.Sc., ZOOLOGY - II SEMESTER - CORE COURSE - V</b> (For the candidates admitted from the year 2021- 22 onwards) <b>CELL AND MOLECULAR BIOLOGY</b>	
<b>COURSE OBJECTIVES:</b>	
<ol style="list-style-type: none"> <li>1. To provide the knowledge about molecular composition of bio membranes.</li> <li>2. To know the structure and dynamics of cytoskeleton.</li> <li>3. To study the principles of cell-cell adhesion and communication.</li> <li>4. To understand the genome organization and biology of cancer.</li> </ol>	
<b>UNIT - I</b>	<b>Membrane systems</b> Biomembranes - Molecular composition, arrangement and functional consequences - Transport across cell membrane- Diffusion, active transport and pumps and uniports, symports and antiport - Membrane potential - Co-transport by symports or antiporters - Transepithelial movement of glucose and aminoacid.
<b>UNIT - II</b>	<b>Cytoskeleton</b> Microfilaments and microtubules-structure and dynamics - Microtubulus and mitosis - Cell movements, intracellular transport - role of kinesin and dynein, signal transduction mechanisms. Cilia and flagella - Cell-cell signalling - Cell surface receptors - Second messenger system - MAP kinase pathways - Signalling from plasma membrane to nucleus.
<b>UNIT - III</b>	<b>Cell- cell adhesion and Communication</b> Ca <sup>++</sup> dependent homophilic cell-cell adhesion - Ca <sup>++</sup> independent homophilic cell-cell adhesion - Gap junctions and connections - Cell matrix adhesion - Integrins - Collagen - Non-collagen components - Cell cycle - cycline and cyclin dependent kinases - Regulation of CDK- cyclin activity.
<b>UNIT - IV</b>	<b>Genome organization</b> Morphological and functional elements of eukaryotic chromosomes - Hierarchy in organization - Chromosomal organization of coding and non-coding DNA - Regulation of gene expression - Mobile DNA - Genetic analysis in cell biology - FISH, CGH.
<b>UNIT - V</b>	<b>Intracellular protein traffic</b> Protein synthesis on free and bound polysomes - Uptake into ER - Membrane proteins, Golgi sorting, post-translational modifications - Biogenesis of mitochondria, and nuclei - Trafficking mechanisms - Biology of cancer - Biology of aging - Apoptosis-definition, mechanism and significance.
<b>Text books:</b>	
<ol style="list-style-type: none"> <li>1. DeRobertis, E.D.P. and DeRobertis, E.M.E., 1987, Cell and Molecular Biology VIII Ed. Lea and Febger, Philadelphia.</li> <li>2. David Freifelder, 1998, Molecular Biology, II Ed. Narosha Publishing House, New Delhi.</li> </ol>	
<b>Reference books:</b>	
<ol style="list-style-type: none"> <li>1. Powar, C.B., 1985, Cell Biology, Himalayas Publishing House, Bombay.</li> <li>2. Lewis, Keleinsmith and Valeris M.Kish 1988, Principles of cell biology, Harper and Row Publications, New York.</li> <li>3. Prakash S.Lohar, 1965, Cell and Molecular Biology, MJP Publishers, Chennai.</li> <li>4. Gupta, M.L. and Jangir, M.L., 2003, Cell Biology Fundamentals and Application, Student Edition, Jothpur.</li> <li>5. Darnell, JH. Lodish and D. Baltimore, 1986, Molecular Cell biology, Scientific American Book, Inc., USA.</li> <li>6. Alberts, B., D. Bray, J. Lewis, M. Raff, K. Roberts, and, J. D. Watson, 1994, Molecular Biology of the Cell, Garland Publishing Inc., New York.</li> </ol>	

<b>Course Outcomes</b>
<b>On completion of this course the students will be able to</b>
<ol style="list-style-type: none"> <li>1. Explain the ultra-structure and transport across cell organelles.</li> <li>2. Understand the molecular mechanism of cell physiological phenomena.</li> <li>3. Illustrate the cellular communications with matrix adhesion and cell cycling activity.</li> <li>4. Summarize the chromosomal organization of coding and regulation of gene expression.</li> <li>5. Elucidate the process of protein synthesis, biogenesis of mitochondria and nuclei and trafficking Mechanism and significance of apoptosis.</li> </ol>

<b>Nature of Course</b>			
Knowledge and skill	✓	Employability oriented	✓
Skill oriented		Entrepreneurship oriented	

### MAPPING

#### Relationship Matrix for Course Outcomes and Programme Specific Outcomes

Course Outcomes (COs)	Programme Outcomes(POs)					Programme Specific Outcomes(PSOs)							Mean Score of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	
CO1	2	2	-	-	2	3	2	3	3	3	-	2	1.83
CO2	3	3	3	1	2	2	2	2	-	3	-	1	1.83
CO3	3	2	1	1	2	3	2	3	-	3	3	2	2.08
CO4	3	3	3	3	2	3	2	3	2	3	1	2	2.5
CO5	-	3	-	2	1	2	3	3	3	3	3	2	2.08
<b>Over all mean score for COs</b>													<b>2.064</b>

(Values Reference - 3-High, 2-Medium, 1- Low, - No)

**Result: The Matrix score of this Course is 2.064 (Very High Relationship)**

**Note:**

<b>Scale</b>	1	2	3	4	5	6
<b>Relation</b>	0 - 0.5	0.5 - 1.0	1.0 - 1.5	1.5 - 2.0	2.0 - 2.5	2.5 - 3.0
<b>Quality</b>	Very Poor	Poor	Moderate	High	Very high	Excellent

#### Value Scaling:

<b>Mean Score of Cos</b> = $\frac{\text{Total values}}{\text{Total No. of PSOs}}$	<b>Over all mean Score for Cos</b> = $\frac{\text{Total of mean score}}{\text{Total of COs}}$
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**COURSE DESIGNER: Dr. R.PRAKASH**

**CHAIRMAN - BOS**

**CONTROLLER OF EXAMINATIONS**

<b>NO. OF CREDITS: 5</b>	<b>COURSE CODE: P21ZO2C6</b>
<b>GOVERNMENT ARTS COLLEGE (AUTONOUOUS), KARUR - 639005</b> <b>M.Sc., ZOOLOGY - II SEMESTER - CORE COURSE - VI</b> (For the candidates admitted from the year 2021 - 22 onwards) <b>DEVELOPMENTAL BIOLOGY</b>	
<b>COURSE OBJECTIVES:</b>	
<ol style="list-style-type: none"> <li>1. To acquire knowledge about basic concepts of development.</li> <li>2. To understand the events of gametogenesis, fertilization and early development.</li> <li>3. To learn the mechanism of differentiation and organogenesis.</li> <li>4. To study regeneration and screening of genetic disorders.</li> </ol>	
<b>UNIT - I</b>	<b>Basic concepts of development:</b> Potency, commitment, specification, induction, competence, determination and differentiation; morphogenetic gradients; cell fate and cell lineages; stem cells; genomic equivalence and the cytoplasmic determinants; imprinting; mutants and transgenics in analysis of development.
<b>UNIT - II</b>	<b>Gametogenesis, fertilization and early development:</b> Production of gametes, cell surface molecules in sperm-egg recognition in animals; zygote formation, cleavage, blastula formation, embryonic fields, gastrulation and formation of germ layers in animals; embryogenesis, establishment of symmetry.
<b>UNIT - III</b>	<b>Morphogenesis and organogenesis in animals:</b> Cell aggregation and differentiation in Dictyostelium; axes and pattern formation in Drosophila and amphibia; organogenesis - eye lens induction, limb development in amphibia; differentiation of neurons, post embryonic development- larval formation, metamorphosis in amphibia; environmental regulation of normal development; sex determination.
<b>UNIT - IV</b>	<b>Neoteny - Occurrence and significance:</b> Regeneration - Regenerative capacity in the Animal Kingdom - Factors influencing regeneration - Stimulation and Suppression - Polarity and Gradients.
<b>UNIT - V</b>	Programmed cell death, aging and senescence - Asexual reproduction - Assisted Reproductive Technology (ART) - Infertility - Sperm abnormalities - Superovulation - IVF, ICSI and GIFT - Birth control measures - Screening of genetic disorders. Methods of birth control.
<b>Text books:</b> <ol style="list-style-type: none"> <li>1. Gilbert, S.F., 2003, Developmental Biology, 7<sup>th</sup> Ed., Sinamer Associates Inc., Publishers, Saunderland, Massachusetts, USA.</li> <li>2. Arumugam, N., 2012, A Text book of Embryology, Saras Publications, Nagercoil.</li> </ol>	
<b>Reference books:</b> <ol style="list-style-type: none"> <li>1. Balinsky, B.L., 1981, An Introduction to Embryology, 5<sup>th</sup> Ed., Saunders &amp; Co., Philadelphia.</li> <li>2. Berril, N.J., 1986, Developmental Biology, Tata McGraw Hill, New Delhi.</li> <li>3. Browder, L.N., 1980, Developmental Biology, Saunders &amp; Co., Philadelphia.</li> <li>4. Saunders, A.W., 1982, Developmental Biology: Pattern/Principles/ Problems MacMillan Publishing Co., New York.</li> <li>5. Schatten, H and Schatten, G, 1989 Molecular biology of fertilization.</li> </ol>	

<b>Course Outcomes</b> <b>On completion of this course the students will be able to</b>
<ol style="list-style-type: none"> <li>1. Interpret the concepts of development, morphogenetic gradients and cytoplasmic determinants.</li> <li>2. Define the process of gametogenesis, fertilization and development.</li> <li>3. Illustrate the morphogenes in organogenesis, environmental regulation of development and sex determination.</li> <li>4. Illustrate the process of regeneration, influencing factors and development of immune system.</li> <li>5. Discuss the assisted reproductive technology, screening genetic disorders and senescence.</li> </ol>

<b>Nature of Course</b>			
Knowledge and skill	✓	Employability oriented	✓
Skill oriented		Entrepreneurship oriented	

### MAPPING

#### Relationship Matrix for Course Outcomes and Programme Specific Outcomes

Course Outcomes (COs)	Programme Outcomes(POs)					Programme Specific Outcomes(PSOs)							Mean Score of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	
CO1	3	2	-	2	3	2	2	3	3	3	-	3	2.16
CO2	3	3	3	-	2	3	1	3	3	3	1	2	2.25
CO3	3	3	3	-	3	3	1	3	3	3	-	2	2.25
CO4	1	3	2	1	2	3	3	3	3	3	1	2	2.25
CO5	3	3	2	-	3	-	-	3	3	3	2	2	2.0
<b>Over all mean score for COs</b>												<b>2.182</b>	

(Values Reference - 3-High, 2-Medium, 1- Low, - No)

**Result: The Matrix score of this Course is 2.182 (Very High Relationship)**

**Note:**

<b>Scale</b>	1	2	3	4	5	6
<b>Relation</b>	0 - 0.5	0.5 - 1.0	1.0 - 1.5	1.5 - 2.0	2.0 - 2.5	2.5 - 3.0
<b>Quality</b>	Very Poor	Poor	Moderate	High	Very high	Excellent

#### Value Scaling:

Total values	Total of mean score
Mean Score of Cos = -----	Over all mean Score for Cos = -----
Total No. of PSOs	Total of COs

**COURSE DESIGNER: Dr. NILAVARASAN**

**CHAIRMAN - BOS**

**CONTROLLER OF EXAMINATIONS**

<b>NO. OF CREDITS: 5</b>	<b>COURSE CODE: P21ZO2C7</b>
<b>GOVERNMENT ARTS COLLEGE (AUTONOUOUS), KARUR - 639005</b> <b>M.Sc., ZOOLOGY - II SEMESTER - CORECOURSE - VII</b> (For the candidates admitted from the year 2021 - 22 onwards) <b>EVOLUTION</b>	
<b>COURSE OBJECTIVES:</b>	
<ol style="list-style-type: none"> <li>1. To study the different evolutionary theories.</li> <li>2. To understand the role of gene in evolution.</li> <li>3. To know the evolutionary significance of amino acid sequences and phylogeny.</li> <li>4. To develop an idea of artificial evolution.</li> </ol>	
<b>UNIT - I</b>	<b>Emergence of evolutionary theories</b> Lamarck - Darwin - Hugo DeVries - Concepts - evolutionary synthesis - Geological time scale - eras - periods - epoch. Evidences - Morphology and comparative anatomy - Homologous structures, Analogous structures, Adaptive radiation and Atavism.
<b>UNIT - II</b>	<b>Molecular Evolution</b> Role of gene in evolution - Evolution of gene families, molecular drive - Assessment of molecular variation. <b>Origin of higher categories</b> Phylogenetic gradualism and punctuated equilibrium - Major trends in the origin of higher categories - Human Evolution - Biological and cultural evolution - Micro and Macro - evolution - speciation.
<b>UNIT - III</b>	<b>Behavioral Evolution</b> Altruism and evolution - Group selection and kin selection. <b>Molecular phylogenetics</b> Construction of phylogenetic trees - Phylogenetic inference - Distance methods, parsimony methods, maximum likelihood method - Immunological techniques.
<b>UNIT - IV</b>	<b>Amino acid sequences and phylogeny</b> Nucleic acid phylogeny - DNA - DNA hybridizations, Restriction Enzyme sites, Nucleotide sequence comparisons and homologies - Molecular clocks.
<b>UNIT - V</b>	<b>Population genetics and ecology</b> Metapopulations - Monitoring natural populations - Extinction of small populations - Loss of genetic variations - Conservation of genetic resources in diverse taxa - Artificial evolution ( <i>in vitro</i> ).
<b>Text books:</b> <ol style="list-style-type: none"> <li>1. Arumugam, 2011, Essentials of Organic Evolution, Saras Publications, Nagercoil.</li> </ol>	
<b>Reference books:</b> <ol style="list-style-type: none"> <li>1. Strickberger, 2000, Evolution, Jones and Barlett Publishers Inc., London.</li> <li>2. Smith, J.M., 1998, Evolutionary Genetics. Oxford University Press, New York.</li> <li>3. Futuyama, D.J., 1988, Evolution Biology 2<sup>nd</sup> edition, Sinauer Associates, INC Publishers, Sunderland.</li> <li>4. Dobzhansky, Th., F.J. Ayala, G.L. Stebbins and J.M Valentine, 1979, Evolution. Surjeet Publication, Delhi</li> <li>5. Dobzhansky, Th., 1982, Genetic and Origin of Species. Columbia University Press.</li> </ol>	



**Course Outcomes****On completion of this course the students will be able to**

1. Explain molecular variation, principles of micro and macro evolution and speciation.
2. Interpret construction of phylogenetic trees and immunological techniques.
3. Understand nucleic acid phylogeny, nucleotide sequence and homologies.
4. Identify and conserve genetic resources in diverse taxa and artificial evolution.

**Nature of Course**

Knowledge and skill	✓	Employability oriented	✓
Skill oriented		Entrepreneurship oriented	

**MAPPING****Relationship Matrix for Course Outcomes and Programme Specific Outcomes**

Course Outcomes (COs)	Programme Outcomes(POs)					Programme Specific Outcomes(PSOs)							Mean Score of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	
CO1	3	1	-	3	2	3	3	3	3	3	-	2	2.16
CO2	3	3	3	-	2	3	2	3	3	3	2	2	2.41
CO3	3	3	-	2	3	3	3	2	1	3	3	2	2.33
CO4	3	3	-	2	3	3	3	3	3	3	-	2	2.33
CO5	3	3	2	2	2	3	3	3	3	3	-	2	2.41
<b>Over all mean score for COs</b>												<b>2.328</b>	

(Values Reference - 3-High, 2-Medium, 1- Low, - No)

**Result: The Matrix score of this Course is 2.328 (Very High Relationship)****Note:**

<b>Scale</b>	1	2	3	4	5	6
<b>Relation</b>	0 - 0.5	0.5 - 1.0	1.0 - 1.5	1.5 - 2.0	2.0 - 2.5	2.5 - 3.0
<b>Quality</b>	Very Poor	Poor	Moderate	High	Very high	Excellent

**Value Scaling:**

$\text{Mean Score of Cos} = \frac{\text{Total values}}{\text{Total No. of PSOs}}$	$\text{Over all mean Score for Cos} = \frac{\text{Total of mean score}}{\text{Total of COs}}$
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**COURSE DESIGNER: Mr. K.BABU****CHAIRMAN - BOS****CONTROLLER OF EXAMINATIONS**

NO. OF CREDITS: 4	COURSE CODE: P21ZO2C8P										
<p><b>GOVERNMENT ARTS COLLEGE (AUTONOMOUS), KARUR - 639005</b></p> <p><b>M.Sc., ZOOLOGY - II SEMESTER - CORE COURSE - VIII</b> (For the candidates admitted from the year 2021- 22 onwards)</p> <p><b>PRACTICAL - II (CC - V, VI AND VII)</b></p> <p><b>(CELL AND MOLECULAR BIOLOGY, DEVELOPMENTAL BIOLOGY&amp; EVOLUTION)</b></p>											
<p><b>COURSE OBJECTIVES:</b></p> <ol style="list-style-type: none"> <li>1. To learn the cell measurement and molecular techniques.</li> <li>2. To observe chromosomes.</li> <li>3. To know the evolutionary relationship and adaptations among different animals.</li> <li>4. To study the sperm motility.</li> <li>5. To understand the different developmental stages in animals.</li> </ol>											
<p><b>CELL AND MOLECULAR BIOLOGY</b></p>	<ol style="list-style-type: none"> <li>1. Micrometry - Measuring the Diameter of Microscopic Cells Using Ocular and Stage micrometer.</li> <li>2. Human Buccal Smear.</li> <li>3. Smear and staining of Haemolymph of cockroach and Blood of human being.</li> <li>4. Blood Cells as Osmometers.</li> <li>5. Study of Mitosis in the Cells of Onion Root Tip.</li> <li>6. Observing the Giant chromosomes in the salivary glands of larva of <i>Chironomus</i> sp.</li> </ol> <p><b>Spotters:</b>Phase contrast Microscope, Centrifuge, Homogenizer, Epithelial Tissues (Ciliated, Columnar, Glandular and Squamous epithelium), Smear of Frog's Blood, Muscles (Cardiac, Striated and Non - Striated), Nerve cell and Bone Tissue.</p>										
<p><b>DEVELOPMENTAL BIOLOGY</b></p>	<ol style="list-style-type: none"> <li>1.Preparation of Sperm Suspension and Observation of Spermatozoa in bull semen.</li> <li>2. Study of Rate of Motility of Sperm in Bull Semen.</li> <li>3. Effect of Thyroxine on Metamorphosis of Frog (Demonstration)</li> </ol> <p><b>Spotters:</b> Frog's / Human's sperm, Frog's Egg, 2-Celled Stage, 4-Celled Stage, 8-Celled Stage, 16 Celled Stage, Yolk Plug Stage, Blastula, Gastrula - T.S. of Mammalian Testis &amp; Ovary, Chick Embryo : Primitive Streak, 24 hrs, 48 hrs and 72 hrs.</p>										
<p><b>EVOLUTION</b></p>	<ol style="list-style-type: none"> <li>1. Construction of phylogenetic tree - Demo.</li> </ol> <p><b>Spotters:</b> Homologous and analogous organs. DNA and RNA model.</p> <p>Fossils: Ammonoids, Belemnoids, Nautiloids, Echinoderm fossils and Connecting link - Archaeopteryx.</p>										
<p><b>A record of laboratory work shall be submitted at the time of practical Examination.</b></p> <p><b>Mark distribution for the Practical Examination:</b></p> <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 80%;">Cell and Molecular biology</td> <td style="text-align: right;">: 20</td> </tr> <tr> <td>Developmental Biology</td> <td style="text-align: right;">: 10</td> </tr> <tr> <td>Spotters (CMB-1, DB -1 and EVL-2)</td> <td style="text-align: right;">: 20 (4 x 5 = 20)</td> </tr> <tr> <td>Record</td> <td style="text-align: right;">: 10</td> </tr> <tr> <td style="text-align: center;"><b>Total</b></td> <td style="text-align: right;"><b>: 60</b></td> </tr> </table>		Cell and Molecular biology	: 20	Developmental Biology	: 10	Spotters (CMB-1, DB -1 and EVL-2)	: 20 (4 x 5 = 20)	Record	: 10	<b>Total</b>	<b>: 60</b>
Cell and Molecular biology	: 20										
Developmental Biology	: 10										
Spotters (CMB-1, DB -1 and EVL-2)	: 20 (4 x 5 = 20)										
Record	: 10										
<b>Total</b>	<b>: 60</b>										

**Course Outcomes****On completion of this course the students will be able to**

1. Estimate the diameter of microscopic cells and study the histology.
2. Prepare the squash of any tissue and observe the changes in the chromosomes.
3. Distinguish the different embryonic stages by critical observation.
4. Evaluate the rate of motility of sperm suspension.
5. Justify the Hardy-Weinberg law.

**Relationship Matrix for Course Outcomes and Programme Specific Outcomes**

Course Outcomes (COs)	Programme Outcomes(POs)					Programme Specific Outcomes(PSOs)							Mean Score of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	
CO1	3	-	3	1	3	3	3	2	3	2	-	2	2.08
CO2	3	2	-	2	2	2	-	3	3	2	2	3	2.0
CO3	3	3	-	2	2	3	3	3	3	2	1	2	2.25
CO4	3	3	3	2	-	2	2	2	3	1	-	2	1.91
CO5	3	3	-	3	2	3	-	3	-	3	2	2	2.0
<b>Over all mean score for COs</b>												<b>2.048</b>	

(Values Reference - 3-High, 2-Medium, 1- Low, - No)

**Result: The Matrix score of this Course is 2.048 (Very High Relationship)****Note:**

<b>Scale</b>	1	2	3	4	5	6
<b>Relation</b>	0 - 0.5	0.5 - 1.0	1.0 - 1.5	1.5 - 2.0	2.0 - 2.5	2.5 - 3.0
<b>Quality</b>	Very Poor	Poor	Moderate	High	Very high	Excellent

**Value Scaling:**

Total values	Total of mean score
<b>Mean Score of Cos</b> = $\frac{\text{Total values}}{\text{Total No. of PSOs}}$	<b>Over all mean Score for Cos</b> = $\frac{\text{Total of mean score}}{\text{Total of COs}}$

**COURSE DESIGNER: Mrs. S.SENTHAMIL SELVI****CHAIRMAN - BOS****CONTROLLER OF EXAMINATIONS**

<b>NO. OF CREDITS: 5</b>	<b>COURSE CODE: P21ZO2E2</b>
<b>GOVERNMENT ARTS COLLEGE (AUTONOMOUS), KARUR - 639005</b> <b>M.Sc., ZOOLOGY - II SEMESTER - ELECTIVE COURSE - II</b> (For the candidates admitted from the year 2021- 22 onwards) <b>APPLIED ZOOLOGY</b>	
<b>COURSE OBJECTIVES:</b>	
<ol style="list-style-type: none"> <li>1. To learn the vermi compost technology.</li> <li>2. To provide knowledge on apiculture and sericulture.</li> <li>3. To know the culture practice and economic importance of aquaculture.</li> <li>4. To acquire knowledge about poultry management.</li> </ol>	
<b>UNIT - I</b>	<b>Vermiculture:</b> Introduction to vermiculture. Types of earthworm, Biology of <i>Eisenia foetida</i> . Rearing of earthworms, Vermicompost Technology -Methods and Products, Vermiwash collection, composition and use, Predators and parasites and diseases of Earthworms and their control.
<b>UNIT - II</b>	<b>Apiculture:</b> Systematics, Morphology and Biology of honey bees - Honey bee species - Newton's Beehive- Extraction of honey - Medicinal value of honey - by products-Importance of bee colonies in crop pollination- diseases and Predators and parasites of honeybees and their control.
<b>UNIT - III</b>	<b>Sericulture:</b> Origin and history of Sericulture, Silkworm - Taxonomy, Types, Biology and Lifecycle of <i>Bombyx mori</i> , Rearing of silkworm - Equipments, Methods, Characteristics and quality of Cocoon- Economic importance of Silk and Silk worm, Diseases and Predators and parasites of Silkworm and their control.
<b>UNIT - IV</b>	<b>Pisciculture:</b> Pond construction, Types of fish culture, Cultivable freshwater fishes- Culture of carps Nursery, Rearing and stocking ponds - Preparation of ponds - stocking and post stocking management, harvesting. Aquaponics. Diseases and Enemies of Fresh water fishes and their control. Fish byproducts. Preservation and Marketing of Fishes.
<b>UNIT - V</b>	<b>Poultry Management:</b> Breeds of fowl, Housing and equipment, deep litter system, laying cages, Methods of brooding and rearing, debeaking. Management of growers, layers, broilers - Feed formulations for chicks, growers, phase I to phase III layers and broilers. Diseases and enemies affecting fowl. Nutritive value of egg and meat, factors affecting egg size, storage and preservation of egg, marketing. Economics of poultry industry.
<b>Text books:</b>	
<ol style="list-style-type: none"> <li>1. Ismail, S., 2001, Vermiculture, Orient Longman Ltd., Chennai.</li> <li>2. Seethalakshmi.M, and Shanthi.R., 2014, Vermitechnology, Saras Publications, Nagercoil.</li> <li>3. Rare, S., 1998, Introduction to Bee Keeping, Vikas Publishing House.</li> <li>4. Ganga, G. and Sulochana Chetty, J., 1997, An Introduction to Sericulture, Oxford IBH Publishing Cp. Pvt. Ltd., New Delhi.</li> <li>5. Arumugam, 2002, Aquaculture, SARA Publications, Nager coil.</li> <li>6. Gnanamani, M.R., 2010, Modern Aspects of Commercial Poultry Keeping, Deepam Publications, Madurai.</li> </ol>	
<b>Reference books:</b>	
<ol style="list-style-type: none"> <li>1. <u>Sathe Tukaram Vithatran</u>, 2004, Vermiculture and Organic Farming,</li> <li>2. NIIR Board, 2004, The Complete Technology Book on Vermiculture and Vermicompost</li> <li>3. FAO, 1992, Sericulture Manual-2 (silk worm rearing), Oxford &amp; IBH.</li> <li>4. FAO, 1994, Sericulture Manual-2 (silk reeling), Oxford &amp; IBH.</li> <li>5. Sunil Kumar Das, 1994, Poultry production, CBC Publishers and Distribution, Delhi.</li> <li>6. Shukula, G.S. and Upadhyay, V.B.1997, Economic Zoology, Rakesh Rastogi Publications, Meerut.</li> <li>7. Sakuntbak B.Gupta, 1976, Indian Poultry Industry year book 1975-76.By C-34,New Bactak Road, New Delhi.</li> <li>8. Zade, S.B., Khune, C.J., Sitre, S.R., and Tijare, R.V., 2011, Principles of Aquaculture, Himalaya Publishing House, Mumbai.</li> <li>9. Takeo Imai, 1977, Aquaculture in Shallow seas, Oxford &amp; IBH Publishing Co., New Delhi.</li> <li>10. Gnanamani, M.R., 1991, Profitable Poultry Farming J.Hitone Publications, Madurai.</li> <li>11. Bannerjee, G.C., 1992, A text Book of Animal Husbandry, Oxford &amp; IBM Publishing Co, New Delhi.</li> <li>12. Sharma, P., and Singh, L. 1987, Hand Book of Bee Keeping, Controller Printing and Stationery, Chandigarh.</li> </ol>	

<p><b>Course Outcomes</b>  <b>On completion of this course the students will be able to</b></p> <ol style="list-style-type: none"> <li>1. Assess the role of earthworm, honeybees, silkworm, fish and hen.</li> <li>2. Gain an in depth knowledge on the biology and applications of earthworm, honeybee, silkworm, fish and hen.</li> <li>3. Get familiar with the rearing practices of earthworm, honey bee, silkworm, fish and hen.</li> <li>4. Integrate the organic farming methods with all such fields of applied zoology.</li> <li>5. Obtain the entrepreneurial skills for managing an industry related to vermiculture, apiculture, pisciculture and poultry science.</li> </ol>
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<b>Nature of Course</b>			
Knowledge and skill	✓	Employability oriented	✓
Skill oriented	✓	Entrepreneurship oriented	✓

**MAPPING**

**Relationship Matrix for Course Outcomes and Programme Specific Outcomes**

Course Outcomes (COs)	Programme Outcomes(POs)					Programme Specific Outcomes(PSOs)							Mean Score of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	
CO1	-	3	3	3	3	-	3	3	3	3	-	2	2.16
CO2	1	3	3	3	2	2	3	2	3	3	1	2	2.33
CO3	3	3	3	2	-	2	2	3	3	3	3	2	2.41
CO4	2	3	3	3	2	2	3	3	3	3	3	2	2.66
CO5	-	3	3	3	3	-	3	2	3	3	-	2	2.08
<b>Over all mean score for COs</b>													<b>2.328</b>

(Values Reference - 3-High, 2-Medium, 1- Low, - No)

**Result: The Matrix score of this Course is 2.328 (Very High Relationship)**

**Note:**

<b>Scale</b>	1	2	3	4	5	6
<b>Relation</b>	0 - 0.5	0.5 - 1.0	1.0 - 1.5	1.5 - 2.0	2.0 - 2.5	2.5 - 3.0
<b>Quality</b>	Very Poor	Poor	Moderate	High	Very high	Excellent

**Value Scaling:**

$\text{Mean Score of Cos} = \frac{\text{Total values}}{\text{Total No. of PSOs}}$	$\text{Over all mean Score for Cos} = \frac{\text{Total of mean score}}{\text{Total of COs}}$
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**COURSE DESIGNER: Mr. K.BALAKRISHNAN**

**CHAIRMAN - BOS**

**CONTROLLER OF EXAMINATIONS**

<b>NO. OF CREDITS: 5</b>	<b>COURSE CODE: P21ZO3C9</b>
<b>GOVERNMENT ARTS COLLEGE (AUTONOUOUS), KARUR - 639005</b> <b>M.Sc., ZOOLOGY - III SEMESTER - CORE COURSE - IX</b> (For the candidates admitted from the year 2021 - 22 onwards) <b>COMPARATIVE ANIMAL PHYSIOLOGY</b>	
<b>COURSE OBJECTIVES:</b>	
<ol style="list-style-type: none"> <li>1. To study the levels and physiological adaptation.</li> <li>2. To learn the digestion, circulatory, respiratory and excretory system.</li> <li>3. To acquire knowledge on structure and function of endocrine glands.</li> <li>4. To understand the neural and muscular physiology.</li> </ol>	
<b>UNIT - I</b>	Adaptation - Levels of adaptation - Mechanism of adaptation - Significance of body size - Adaptation, acclimation and acclimatization - Concepts of homeostasis.  Endothermic and physiological mechanism of regulation of body temperature - Physiological adaptation to osmotic and ionic stress; mechanism of cell volume regulation - Osmoregulation in aquatic and terrestrial environments - Adaptations in high altitude - Physiological response to oxygen deficient stress - Physiological response to body exercise - Meditation, Yoga and their effects.
<b>UNIT - II</b>	<b>Digestive system:</b> Digestion, absorption, energy balance, BMR.  <b>Cardiovascular System:</b> Blood and its components, Comparative anatomy of heart structure, myogenic heart and neurogenic heart.
<b>UNIT - III</b>	Respiratory physiology - Structures - Respiratory gases - uptake - respiratory pigments - O <sub>2</sub> & CO <sub>2</sub> dissociation curves - transport of respiratory gases.
<b>UNIT - IV</b>	Excretory physiology - Excretory organs - mechanism of excretion - physiology - adaptations of excretion to environment - Excretory products: synthesis and elimination.  Endocrine glands - Feedback regulation - Pituitary - gonadal axis - Role of reproductive hormones - gamete formation; fertilization; embryonic development; parturition; lactation; neuroendocrine regulation.
<b>UNIT - V</b>	Neural and muscular physiology - Neurons - action potential - nerve impulse transmission - neurotransmitters - mechanism of neural transmission - neuro-degenerative diseases.  Muscle contraction - theories - molecular mechanism of muscle contraction.
<b>Text books:</b> <ol style="list-style-type: none"> <li>1. Echert R. and Randall, D., 1987, Animal Physiology, CBS Publishers and Distributors, New Delhi.</li> <li>2. Mariakuttikan, A., 2011, Animal Physiology. SARAS Publication, Nagerkoil.</li> <li>3. Verma, P.S., Agawam, N.K., Thyagi, B.S., 1980, . Animal Physiology. S.Chand &amp; Co., New Delhi.</li> </ol>	
<b>Reference books:</b> <ol style="list-style-type: none"> <li>1. Hoar, W.S., 1987, General and Comparative Physiology, Prentice Hall.</li> <li>2. Dawson, H (1964) General Physiology, Little Brown Co; Boston.</li> <li>3. Giese, A.C (1979) Cell Physiology and Biochemistry Prentice Hall.</li> <li>4. Hall, J.E., 2013, Text Book of Medical Physiology, Elsevier Inc.</li> </ol>	

**CHAIRMAN - BOS**

**CONTROLLER OF EXAMINATIONS**

<p><b>Course Outcomes</b>  <b>On completion of this course the students will be able to</b></p>
<ol style="list-style-type: none"> <li>1. Explain the concept of homeostasis, adaptation and regulation of internal milieu.</li> <li>2. Understand the physiological regulatory mechanism to varying temperature, ionic stress and O<sub>2</sub> deficiency.</li> <li>3. Analyze the transport of gases and interpret the changes in CO<sub>2</sub> and O<sub>2</sub> dissociation curves in respiratory physiology.</li> <li>4. Describe the excretory, endocrine, reproductive organs and regulation of their functioning.</li> <li>5. Understand the coordination between the muscles and nerves.</li> </ol>

<b>Nature of Course</b>			
Knowledge and skill	✓	Employability oriented	✓
Skill oriented		Entrepreneurship oriented	

**MAPPING**

**Relationship Matrix for Course Outcomes and Programme Specific Outcomes**

Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)							Mean Score of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	
CO1	3	3	-	2	3	3	2	3	3	2	2	-	2.16
CO2	3	3	2	-	3	3	2	3	2	3	-	2	2.16
CO3	3	3	2	-	2	2	2	3	3	3	-	1	2.0
CO4	3	3	1	-	2	3	1	3	3	3	2	-	2.0
CO5	3	2	-	2	3	1	1	3	3	3	2	1	2.0
<b>Over all mean score for COs</b>													<b>2.064</b>

(Values Reference - 3-High, 2-Medium, 1- Low, - No)

**Result: The Matrix score of this Course is 2.328 (Very High Relationship)**

**Note:**

<b>Scale</b>	1	2	3	4	5	6
<b>Relation</b>	0 - 0.5	0.5 - 1.0	1.0 - 1.5	1.5 - 2.0	2.0 - 2.5	2.5 - 3.0
<b>Quality</b>	Very Poor	Poor	Moderate	High	Very high	Excellent

**Value Scaling:**

$\text{Mean Score of Cos} = \frac{\text{Total values}}{\text{Total No. of PSOs}}$	$\text{Over all mean Score for Cos} = \frac{\text{Total of mean score}}{\text{Total of COs}}$
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**COURSE DESINGER: Dr. N.ILAVARASAN**

**CHAIRMAN - BOS**

**CONTROLLER OF EXAMINATIONS**

<b>NO. OF CREDITS: 5</b>	<b>COURSE CODE: P21ZO3C10</b>
<b>GOVERNMENT ARTS COLLEGE (AUTONOMOUS), KARUR - 639005</b> <b>M.Sc., ZOOLOGY - III SEMESTER - CORE COURSE - X</b> (For the candidates admitted from the year 2021 - 22 onwards) <b>BIOCHEMISTRY</b>	
<b>COURSE OBJECTIVES:</b>	
<ol style="list-style-type: none"> <li>1. To study the structure of atoms, molecules, biomolecules of chemical bonds interactions.</li> <li>2. To understand the bioenergetics and conformation of proteins.</li> <li>3. To know the enzymes and metabolism.</li> </ol>	
<b>UNIT - I</b>	Structure of atoms, molecules and chemical bonds. Principles of biophysical chemistry (pH, buffer, reaction kinetics, thermodynamics, colligative properties).
<b>UNIT - II</b>	Stabilizing interactions (Van der Waals, electrostatic, hydrogen bonding, hydrophobic and hydrophilic interaction, etc.). Composition, nature of bonds/linkages, structure of biomolecules - carbohydrates - Glucose, Sucrose and Glycogen; lipids - Phospholipids, Glycolipids, Choline; proteins - Albumin, Globulin, Nucleo proteins, Phospho proteins, Peptides; nucleic acids and vitamins.
<b>UNIT - III</b>	Enzymes - principles, classification, kinetics and regulation, inhibitors of enzymes - mechanism of enzyme action, isozymes.
<b>UNIT - IV</b>	Conformation of proteins (Ramachandran plot, primary, secondary, tertiary and quaternary structures, domains, motif and folds). Conformation of nucleic acids (helix (A, B, Z), t-RNA, micro-RNA).
<b>UNIT - V</b>	Stability of proteins and nucleic acids. Metabolism of amino acids, carbohydrates, lipids, nucleotides and vitamins. Bioenergetics, glycolysis, oxidative phosphorylation, coupled reaction, group transfer, biological energy transducers.
<b>Text books:</b> <ol style="list-style-type: none"> <li>1. Nelson, D.L., Leninger, A.L. and Cox, M.M., 2008, Lehninger Principles of Biochemistry, W.H. Freeman Co,.</li> <li>2. Ambika Shanmugam, 2003, Fundamentals of Biochemistry for Medical Students.</li> </ol>	
<b>Reference books:</b> <ol style="list-style-type: none"> <li>1. Stryer, L., 1988, Biochemistry, W.H. Freeman &amp; Co. New York.</li> <li>2. Cooper, T.G., 1977, the Tools of Biochemistry, Wiley Interscience Publications, John Wiley &amp; Sons, NewYork.</li> <li>3. Murray, R.K., Granner, D.k., Mayes, P.A., Rodwell, V.W., 1988, Harper's Biochemistry, 21 ed., Appleton &amp; Lange, Medical publications, California.</li> <li>4. Bhagavan, N.V., 2004, Medical Biochemistry, 4<sup>th</sup> Ed., Academic Press (Elsevier) California.</li> </ol>	

**CHAIRMAN - BOS**

**CONTROLLER OF EXAMINATIONS**



**Course Outcomes****On completion of this course the students will be able to**

1. Illustrate the structure of atoms and principles of biophysical chemistry.
2. Understand the interactions, composition and linkages of biomolecules.
3. Classify the enzymes and elucidate the mechanism of enzyme kinetics and bioenergetics.
4. Explain the conformation of proteins and nucleic acids.
5. Interpret the metabolism of aminoacids, lipids and nucleotides.

**Nature of Course**

Knowledge and skill	✓	Employability oriented	✓
Skill oriented		Entrepreneurship oriented	

**MAPPING****Relationship Matrix for Course Outcomes and Programme Specific Outcomes**

Course Outcomes (COs)	Programme Outcomes(POs)					Programme Specific Outcomes(PSOs)							Mean Score of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	
CO1	3	3	-	-	3	3	3	3	3	3	-	2	2.16
CO2	3	3	3	1	-	1	3	3	3	3	2	2	2.25
CO3	3	1	1	1	2	2	3	3	3	3	2	-	2.0
CO4	3	3	3	2	-	2	3	3	3	3	2	-	2.25
CO5	3	3	2	-	1	2	3	3	3	3	-	2	2.08
<b>Over all mean score for COs</b>													<b>2.148</b>

(Values Reference - 3-High, 2-Medium, 1- Low, - No)

**Result: The Matrix score of this Course is 2.148 (Very High Relationship)****Note:**

<b>Scale</b>	1	2	3	4	5	6
<b>Relation</b>	0 - 0.5	0.5 - 1.0	1.0 - 1.5	1.5 - 2.0	2.0 - 2.5	2.5 - 3.0
<b>Quality</b>	Very Poor	Poor	Moderate	High	Very high	Excellent

**Value Scaling:**

<b>Mean Score of Cos</b> = $\frac{\text{Total values}}{\text{Total No. of PSOs}}$	<b>Over all mean Score for Cos</b> = $\frac{\text{Total of mean score}}{\text{Total of COs}}$
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**COURSE DESIGNER: Dr. R.PRAKASH****CHAIRMAN - BOS****CONTROLLER OF EXAMINATIONS**

<b>NO. OF CREDITS: 4</b>	<b>COURSE CODE: P21ZO3C11P</b>														
<b>GOVERNMENT ARTS COLLEGE (AUTONOMOUS), KARUR - 639005</b> <b>M.Sc., ZOOLOGY - III SEMESTER - CORE COURSE - XI</b> (For the candidates admitted from the year 2021 - 22 onwards) <b>PRACTICAL - III (CC - IX AND X)</b> <b>(COMPARATIVE ANIMAL PHYSIOLOGY AND BIO CHEMISTRY)</b>															
<b>COURSE OBJECTIVES:</b> <ol style="list-style-type: none"> <li>1. To learn animal adaptation using different media.</li> <li>2. To carry out routine clinical analysis of blood.</li> <li>3. To able to estimate qualitative and quantitative analysis of carbohydrates, proteins and lipids.</li> <li>4. To understand the working principle and application of instruments.</li> </ol>															
<b>COMPARATIVE ANIMAL PHYSIOLOGY</b>	<p>Oxygen Consumption in Fish</p> <p>Rate of Salt Loss and Salt Gain in Fish Using Different Media</p> <p>Observation of Haemin crystals,</p> <p>Estimation of Haemoglobin by Sahli's method</p> <p>Total RBC count,</p> <p>Total WBC count and Differential count</p> <p>Detection of nitrogenous wastes-Ammonia, Urea and Uric acid.</p> <p><b>Spotters:</b> Haemocytometer, Haemoglobinometer, Sphygmomanometer and Kymograph, Glucometer.</p>														
<b>BIO CHEMISTRY</b>	<p>Qualitative analysis and Quantitative Estimation of Carbohydrates, Proteins and Lipids.</p> <p>Isolation and identification of aminoacids using paper chromatographic method (demo only)</p> <p>Preparation of Solutions - Moles, Milli moles, Micro moles and Nano moles.</p> <p>Calculation of Molarity, Normality and Percentage Buffer Preparation</p> <p>Determination of pH using pH Meter.</p> <p><b>Spotters</b> - Thin Layer Chromatography, Agarose gel Electrophoresis, Ph - Meter Calorimeter, Spectrophotometer, Models of Haemoglobin and ATP.</p>														
<p><b>A record of laboratory work shall be submitted at the time of practical Examination.</b></p> <p><b>Mark distribution for the Practical Examination:</b></p> <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 80%;">1. Comparative Animal Physiology</td> <td style="text-align: right;">: 20 Marks</td> </tr> <tr> <td>2. Bio Chemistry</td> <td style="text-align: right;">: 10 Marks</td> </tr> <tr> <td>3. Spotters (CAP-2, BC-2)</td> <td style="text-align: right;">: 20 Marks (4 x 5 = 20)</td> </tr> <tr> <td>4. Record</td> <td style="text-align: right;">: 10 Marks</td> </tr> <tr> <td></td> <td style="text-align: right;">-----</td> </tr> <tr> <td style="text-align: center;"><b>Total</b></td> <td style="text-align: right;"><b>: 60 Marks</b></td> </tr> <tr> <td></td> <td style="text-align: right;">-----</td> </tr> </table>		1. Comparative Animal Physiology	: 20 Marks	2. Bio Chemistry	: 10 Marks	3. Spotters (CAP-2, BC-2)	: 20 Marks (4 x 5 = 20)	4. Record	: 10 Marks		-----	<b>Total</b>	<b>: 60 Marks</b>		-----
1. Comparative Animal Physiology	: 20 Marks														
2. Bio Chemistry	: 10 Marks														
3. Spotters (CAP-2, BC-2)	: 20 Marks (4 x 5 = 20)														
4. Record	: 10 Marks														
	-----														
<b>Total</b>	<b>: 60 Marks</b>														
	-----														

**Course Outcomes****On completion of this course the students will be able to**

1. Develop Observational, Analytical and Evaluation skills in physiology.
2. Design and demonstrate an experiment.
3. Estimate various haematological and biochemical parameters.
4. Prepare the chemicals required for various practicals.
5. Operate various instruments and devices required for practicals.
6. Verify and justify the laws of absorption with spectrophotometer.

**MAPPING****Relationship Matrix for Course Outcomes and Programme Specific Outcomes**

Course Outcomes (COs)	Programme Outcomes(POs)					Programme Specific Outcomes(PSOs)							Mean Score of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	
CO1	1	2	1	-	3	2	2	3	3	3	-	1	1.75
CO2	1	3	2	-	2	1	2	2	3	3	1	2	1.92
CO3	3	2	-	1	2	-	3	3	3	3	-	1	1.75
CO4	1	3	-	1	2	2	1	2	1	2	3	3	1.75
CO5	2	2	1	2	2	-	2	3	3	-	2	2	1.75
<b>Over all mean score for COs</b>													<b>1.784</b>

(Values Reference - 3-High, 2-Medium, 1- Low, - No)

**Result: The Matrix score of this Course is 1.784 (High Relationship)****Note:**

<b>Scale</b>	1	2	3	4	5	6
<b>Relation</b>	0 - 0.5	0.5 - 1.0	1.0 - 1.5	1.5 - 2.0	2.0 - 2.5	2.5 - 3.0
<b>Quality</b>	Very Poor	Poor	Moderate	High	Very high	Excellent

**Value Scaling:**

Total values	Total of mean score
<b>Mean Score of Cos</b> = $\frac{\text{Total values}}{\text{Total No. of PSOs}}$	<b>Over all mean Score for Cos</b> = $\frac{\text{Total of mean score}}{\text{Total of COs}}$

**COURSE DESIGNER: Dr. N.ILAVARASAN****CHAIRMAN - BOS****CONTROLLER OF EXAMINATIONS**

<b>NO. OF CREDITS: 5</b>	<b>COURSE CODE: P21ZO3E3</b>
<b>GOVERNMENT ARTS COLLEGE (AUTONOMOUS), KARUR - 639005</b> <b>M.Sc., ZOOLOGY -III SEMESTER - ELECTIVE COURSE - III</b> (For the candidates admitted from the year 2021 - 22 onwards) <b>COMPUTER APPLICATIONS AND BIOINFORMATICS</b>	
<b>COURSE OBJECTIVES:</b>	
<ol style="list-style-type: none"> <li>1. To study the different stages of computer and operating system.</li> <li>2. To acquire knowledge about internet, e-mail, e-book and YouTube applications in biology.</li> <li>3. To understand genomics, proteomics and bioinformatics tools.</li> </ol>	
<b>UNIT - I</b>	Evolutionary stages of computer- Hardware and software- CPU, monitor, keyboard, mouse, printer and its types. Operating system; Windows - packages- MS-Word, Power point, Excel; Adobe reader and their uses in biology.
<b>UNIT - II</b>	Internet - Intranet- LAN, WAN - WiFi, Computer virus and Antivirus software, Search Engines- Google, Google Scholar, Searching methods in Browser (web, images, and videos) - e-mail, e-book, Applications of you tube in biology.
<b>UNIT - III</b>	Genomics- Methods of gene sequencing- shot gun- EST- DNA data bases - NCBI, EBI, DDBJ, Pub Med, File format for Gen bank - Mapping data bases- Types of maps- Cytogenetic map, Genetic link map-Information retrieval databases.
<b>UNIT - IV</b>	Proteomics- Relation between Gene and Protein; Mass spectroscopy for protein analysis- Protein array - Protein-Protein interaction- Types of Proteomics - Protein sequence Databases - SWISSPROT, PIR, Protein Structure Database - PDB- Bimolecular interaction pathways and data bases - BIND and MINT.
<b>UNIT - V</b>	Bioinformatics tools - Similarity tools-BLAST, FASTA, sequence alignment - PAM, BLOSUM, MSA - Clustal, Hidden Markov model, Phylogentic analysis - PHYLIP, NJplot, Rasmol - Protein structure prediction - Chou- Fasman method and GOR method.
<b>Text books:</b> <ol style="list-style-type: none"> <li>1. Rajaraman V., 2001, Fundamentals of Computer, Prentice-Hall of India Pvt. Ltd. New Delhi</li> <li>2. Sundaralingam, R. and Kumaresan, V., 2012, Bioinformatics, Saras Publications, Nagercoil</li> </ol>	
<b>Reference books:</b> <ol style="list-style-type: none"> <li>1. Virendra S. Gomase, Nandakishore T.Chikkale, 2009, Proteomics Theory and Practice, Himalaya Publishing House Pvt. Ltd, Mumbai</li> <li>2. KaviKishore, Chavali, L.N., 2013, Principles of Biological Databases, Himalayas Publishing House Pvt. Ltd. Mumbai.</li> <li>3. Baxevanis, A. and Ouellette, B.F.F., 2006, Bioinformatics, A Practical Guide to the Analysis of Genes and Proteins, John Wiley and Sons, New Delhi.</li> <li>4. Balagurusamy E., 2001, Programming in BASIC, 3<sup>rd</sup> Edition, TATA Mc.Graw HillPublishing Company Ltd. New Delhi.</li> </ol>	

**CHAIRMAN - BOS**

**CONTROLLER OF EXAMINATIONS**

## Course Outcomes

On completion of this course the students will be able to

1. Distinguish between the software and hardware and prepare the documents using MS office and Excel.
2. Integrate the computers using LAN and discuss the uses of search engines.
3. Explain gene sequencing methods, mapping databases.
4. Analyze proteins in mass spectroscopy, protein sequence databases and biomolecular interaction pathways.
5. Analyze the similarity and construct the phylogenetic trees.

Nature of Course			
Knowledge and skill	✓	Employability oriented	✓
Skill oriented	✓	Entrepreneurship oriented	

### MAPPING

#### Relationship Matrix for Course Outcomes and Programme Specific Outcomes

Course Outcomes (COs)	Programme Outcomes(POs)					Programme Specific Outcomes(PSOs)							Mean Score of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	
CO1	-	1	2	3	3	3	2	1	3	2	3	2	2.08
CO2	2	-	3	1	3	2	3	2	1	-	1	3	1.75
CO3	2	3	-	1	3	2	3	2	-	3	2	2	1.92
CO4	2	3	2	3	2	1	3	3	3	3	-	2	2.25
CO5	3	1	-	1	2	3	3	2	-	3	3	3	2.0
<b>Over all mean score for COs</b>													<b>2.0</b>

(Values Reference - 3-High, 2-Medium, 1- Low, - No)

**Result: The Matrix score of this Course is 2.0 (High Relationship)**

**Note:**

<b>Scale</b>	1	2	3	4	5	6
<b>Relation</b>	0 - 0.5	0.5 - 1.0	1.0 - 1.5	1.5 - 2.0	2.0 - 2.5	2.5 - 3.0
<b>Quality</b>	Very Poor	Poor	Moderate	High	Very high	Excellent

#### Value Scaling:

$\text{Mean Score of Cos} = \frac{\text{Total values}}{\text{Total No. of PSOs}}$	$\text{Over all mean Score for Cos} = \frac{\text{Total of mean score}}{\text{Total of COs}}$
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**COURSE DESIGNER: Mr. K. BABU**

**CHAIRMAN - BOS**

**CONTROLLER OF EXAMINATIONS**

<b>NO. OF CREDITS: 5</b>	<b>COURSE CODE: P21ZO3E4</b>
<b>GOVERNMENT ARTS COLLEGE (AUTONOMOUS), KARUR - 639005</b> <b>M.Sc., ZOOLOGY -III SEMESTER - ELECTIVE COURSE - IV</b> (For the candidates admitted from the year 2021 - 22 onwards) <b>BIOTECHNOLOGY</b>	
<b>COURSE OBJECTIVES:</b>	
1. To learn various tools and techniques in biotechnology. 2. To give an idea in different areas like animal, industries, medical, agriculture and environmental.	
<b>UNIT - I</b>	<b>Tools and Techniques of Genetic Engineering:</b> Basic Principles of Genetic Engineering; Restriction enzymes, Linkers/Adaptors; Cloning Vectors - Salient Features and Types; Techniques - Strategies of rDNA Technology, Gene Library, Insertion of a Foreign DNA into a Vector; Transfer of rDNA into a Bacterial Cell, Selection & Screening of Recombinants, Blotting Techniques, Recovery of Cells containing rDNA, Expression of Cloned DNA.
<b>UNIT - II</b>	<b>Animal biotechnology:</b> Equipment for animal cell culture, Types of tissue culture medium, Primary culture, Stable cell line, Cultivation of Animal Cells in a Bioreactor; Somatic Cell Fusion, Applications of Cell Culture - production of PA, Blood Factor VIII and Erythropoietin; Transgenic Animals - Sheep; Biosafety and bioethics.
<b>UNIT - III</b>	<b>Industrial &amp; Environmental Biotechnology:</b> Types of Fermentation - Fermenter Design and types, Upstream and Down Stream Processing; Biofuels - Production of Ethanol, Aminoacids - Tryptophan and Tyrosine; Biodegradation.
<b>UNIT - IV</b>	<b>Enzyme Biotechnology:</b> Microbial Production of Enzymes - Amylase and lipase, Immobilization of Enzymes and its applications.  <b>Agricultural Biotechnology:</b> - Nitrogen fixation- nitrogen fixing organisms, mechanism of fixation; Single Cell Protein - Spirulina Production and Uses, Bio-pesticides; Biofertilizers.
<b>UNIT - V</b>	<b>Medical Biotechnology:</b> Production of Antibiotics - Penicillin, Hormones - Thyroxine, Vaccines, Interferons, Diagnosis of Diseases - MAbs Production, Molecular Markers in Forensic science- RFLPs, RAPD, AFLP, VNTR and Microsatellites, Gene Therapy - Germ Line and Somatic Cell Line Gene Therapy.
<b>Text books:</b> 1. Kumaresan, V., 2006, Biotechnology, Saras Publication, Nagercoil. 2. Dubey, R.C., 2008, A Text book of Biotechnology, S.Chand & Co., New Delhi.	
<b>Reference books:</b> 1. Gupta, P.K., 2006, Elements of Biotechnology, Rastogi Publications, Meerut. 2. Lewin, B., 2002, Gene XI, Oxford University Press, New York.	

**Course Outcomes****On completion of this course the students will be able to**

1. Classify the biotechnological tools and use them to construct gene library and recombinant DNAs.
2. Choose the fermented types, designs, processes and apply bio remedial applications.
3. Explain the types and medium of tissue culture, and applications like tPA, Erythropoietin and transgenic animals.
4. Illustrate the microbial production and immobilization of enzymes.
5. Apply molecular markers in forensic science; diagnose the diseases and possibility of gene therapy.

**Nature of Course**

Knowledge and skill	✓	Employability oriented	✓
Skill oriented	✓	Entrepreneurship oriented	

**MAPPING****Relationship Matrix for Course Outcomes and Programme Specific Outcomes**

Course Outcomes (COs)	Programme Outcomes(POs)					Programme Specific Outcomes(PSOs)							Mean Score of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	
CO1	3	3	2	3	3	2	3	3	3	3	3	2	2.75
CO2	3	3	2	1	-	3	3	3	3	3	3	-	2.25
CO3	3	2	3	2	2	2	3	3	3	3	3	2	2.58
CO4	3	3	-	1	2	2	3	3	3	3	2	2	2.25
CO5	3	3	-	1	2	1	3	3	3	3	3	2	2.25
<b>Over all mean score for COs</b>													<b>2.41</b>

(Values Reference - 3-High, 2-Medium, 1- Low, - No)

**Result: The Matrix score of this Course is 2.41 (Very High Relationship)****Note:**

<b>Scale</b>	1	2	3	4	5	6
<b>Relation</b>	0 - 0.5	0.5 - 1.0	1.0 - 1.5	1.5 - 2.0	2.0 - 2.5	2.5 - 3.0
<b>Quality</b>	Very Poor	Poor	Moderate	High	Very high	Excellent

**Value Scaling:**

<b>Mean Score of Cos</b> = $\frac{\text{Total values}}{\text{Total No. of PSOs}}$	<b>Over all mean Score for Cos</b> = $\frac{\text{Total of mean score}}{\text{Total of COs}}$
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**COURSE DESIGNER: Mrs. S.SENTHAMILSELVI****CHAIRMAN - BOS****CONTROLLER OF EXAMINATIONS**

<b>NO. OF CREDITS: 5</b>	<b>COURSE CODE: P21ZO4C12</b>
<b>GOVERNMENT ARTS COLLEGE (AUTONOUOUS), KARUR - 639005</b> <b>M.Sc., ZOOLOGY - IV SEMESTER - CORE COURSE - XII</b> (For the candidates admitted from the year 2021 - 22 onwards) <b>GENETICS</b>	
<b>COURSE OBJECTIVES:</b>	
<ol style="list-style-type: none"> <li>1. To know the basic concepts of genetics.</li> <li>2. To acquire knowledge of various processes of molecular genetics.</li> <li>3. To study the human and population genetics.</li> <li>4. To learn the types and mechanism of mutation.</li> </ol>	
<b>UNIT - I</b>	<b>Basic concepts of Genetics</b> <b>Mendelian principles:</b> Dominance, segregation, independent assortment. <b>Concept of gene:</b> Allele, multiple alleles, pseudoalleles, complementation tests. <b>Extensions of Mendelian principles:</b> Co-dominance, incomplete dominance, gene interactions, pleiotropy, genomic imprinting, penetrance and expressivity, phenocopy, linkage and crossing over, sex linkage, sex limited and sex influenced characters.
<b>UNIT - II</b>	<b>Gene mapping methods:</b> Linkage maps, tetrad analysis, mapping with molecular markers, mapping by using somatic cell hybrids, DNA foot printing. <b>Extra chromosomal inheritance:</b> Inheritance of Mitochondrial genes, maternal inheritance.
<b>UNIT - III</b>	<b>Microbial genetics:</b> Methods of genetic transfers - transformation, conjugation, transduction and sex-duction, mapping genes by interrupted mating, fine structure analysis of genes. <b>Human genetics:</b> Pedigree analysis, lod score for linkage testing, karyotypes, genetic disorders - Human Genome Project. <b>Quantitative genetics:</b> Polygenic inheritance, heritability and its measurements, QTL mapping.
<b>UNIT - IV</b>	<b>Mutation:</b> Types, causes and detection, mutant types - lethal, conditional, biochemical, loss of function, gain of function, germinal verses somatic mutants, insertional mutagenesis. <b>Structural and numerical alterations of chromosomes:</b> Deletion, duplication, inversion, translocation, ploidy and their genetic implications. <b>Recombination:</b> Homologous and non-homologous recombination including transposition.
<b>UNIT - V</b>	<b>Population Genetics:</b> Genetic equilibrium - Hardy Weinberg Law - distinguishing forces - natural selection - mutation and genetic drift. <b>Molecular Genetics:</b> Structure of gene - genetic code - gene regulation - genome analysis - functional genomics - RNA processing - Transcription: factors and regulation - Translation: control and regulation.
<b>Text books:</b> <ol style="list-style-type: none"> <li>1. Gardner, E.J. and Snustad, D.P., 1984, Principles of Genetics, John Wiley &amp; Sons, New York.</li> </ol>	
<b>Reference books:</b> <ol style="list-style-type: none"> <li>1. Jenkins, J.B., 1983, Human Genetics, the Benjamin Cummins Publishing Co.</li> <li>2. Benjamin Lewin, 2005, Genes VIII, Oxford University Press, New York.</li> <li>3. Strickberger Monroe, W., 1996, Genetics, Prentice Hall of India Pvt. Ltd.</li> <li>4. John.D., Hawkins, 1996, Genes structure and expression, III Ed. Cambridge Univ. Press.</li> <li>5. Mange, E.J. and Mange, A.P., 1997, Human genetics, Rastogi Publications, Meerut.</li> </ol>	



<b>Course Outcomes</b> <b>On completion of this course the students will be able to</b>
1. Discuss the basic concept of genetics and Mendelian principles. 2. Explain the gene mapping methods with molecular markers and DNA foot printing. 3. Understand the pedigree analysis, human genome project and QTL mapping. 4. Identify the structural, numerical alterations of chromosomes and genetic equilibrium. 5. Distinguish between the genetic code and genomic analysis.

<b>Nature of Course</b>			
Knowledge and skill	✓	Employability oriented	✓
Skill oriented		Entrepreneurship oriented	

### MAPPING

#### Relationship Matrix for Course Outcomes and Programme Specific Outcomes

Course Outcomes (COs)	Programme Outcomes(POs)					Programme Specific Outcomes(PSOs)							Mean Score of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	
CO1	3	2	-	1	3	2	2	3	1	2	2	2	1.92
CO2	3	1	1	-	3	-	2	3	2	-	-	3	1.5
CO3	3	1	-	2	2	1	2	3	2	2	-	3	1.75
CO4	3	2	2	1	3	2	2	3	3	-	1	2	2.0
CO5	3	1	-	-	2	2	-	3	1	2	-	3	1.42
<b>Over all mean score for COs</b>												<b>1.718</b>	

(Values Reference - 3-High, 2-Medium, 1- Low, - No)

**Result: The Matrix score of this Course is 1.718 (High Relationship)**

**Note:**

<b>Scale</b>	1	2	3	4	5	6
<b>Relation</b>	0 - 0.5	0.5 - 1.0	1.0 - 1.5	1.5 - 2.0	2.0 - 2.5	2.5 - 3.0
<b>Quality</b>	Very Poor	Poor	Moderate	High	Very high	Excellent

#### Value Scaling:

<b>Mean Score of Cos</b> = $\frac{\text{Total values}}{\text{Total No. of PSOs}}$	<b>Over all mean Score for Cos</b> = $\frac{\text{Total of mean score}}{\text{Total of COs}}$
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**COURSE DESIGNER: Dr. A.KARTHIKEYAN**

**CHAIRMAN - BOS**

**CONTROLLER OF EXAMINATIONS**

<b>NO. OF CREDITS: 5</b>	<b>COURSE CODE: P21ZO4C13</b>
<b>GOVERNMENT ARTS COLLEGE (AUTONOMOUS), KARUR - 639005</b> <b>M.Sc., ZOOLOGY - IV SEMESTER - CORE COURSE - XIII</b> (For the candidates admitted from the year 2021 - 22 onwards) <b>ENVIRONMENTAL BIOLOGY</b>	
<b>COURSE OBJECTIVES:</b>	
<ol style="list-style-type: none"> <li>1. To understand different habitat and niche.</li> <li>2. To provide the knowledge on interactions between organisms and their environments, dynamics of populations and communities.</li> <li>3. To know the different types of pollution and their management to protect health aspects.</li> <li>4. To study the various biomes in biogeography.</li> </ol>	
<b>UNIT - I</b>	<b>The Environment:</b> Physical environment; biotic environment; biotic and abiotic interactions. <b>Habitat and Niche:</b> Concept of habitat and niche; niche width and overlap; fundamental and realized niche; resource partitioning; character displacement.
<b>UNIT - II</b>	<b>Population Ecology:</b> Characteristics of a population; population growth curves; population regulation; life history strategies ( <i>r</i> and <i>k</i> selection); concept of metapopulation - demes and dispersal, interdemec extinctions, age structured populations. <b>Species Interactions:</b> Types of interactions, interspecific competition, herbivory, carnivory, pollination, symbiosis.
<b>UNIT - III</b>	<b>Community Ecology:</b> Nature of communities; community structure and attributes; levels of species diversity and its measurement; edges and ecotones. <b>Ecological Succession:</b> Types; mechanisms; changes involved in succession; concept of climax.
<b>UNIT - IV</b>	<b>Ecology of Ecosystem:</b> Ecosystem structure; Ecosystem function; energy flow and mineral cycling (C, N and P); Ecological pyramids; primary production and decomposition; structure and function of some Indian Ecosystems: terrestrial (forest, grassland) and aquatic (fresh water, marine, estuarine). <b>Biogeography:</b> Major terrestrial biomes; theory of island biogeography; biogeographical zones of India.
<b>UNIT - V</b>	<b>Applied Ecology:</b> Environmental pollution and Bioremediation; global environmental change; biodiversity - status, monitoring and documentation; major drivers of biodiversity change; biodiversity management approaches. <b>Conservation Biology:</b> Principles of conservation, major approaches to management, Indian case studies on conservation / management strategy (Project Tiger, Biosphere reserves).
<b>Text books:</b> <ol style="list-style-type: none"> <li>1. Odum, E.P., 1966, Fundamentals of Ecology, W.B. Saunders Company.</li> </ol>	
<b>Reference books:</b> <ol style="list-style-type: none"> <li>1. Clark, G.L.1954, Elements of Ecology, John Wiley &amp; Sons. Inc. Topman Co., Ltd.</li> <li>2. Kormandy, E.J., 1986, Concepts of Ecology, Prentice Hall of India Private Ltd.</li> <li>3. Kumarasamy, K., Moses, A.A., and Vasanthy, M., 2007, Environmental Studies, BDU, Trichy-24.</li> <li>4. Sharma, 2011 Ecology and Environment.</li> </ol>	

**Course Outcomes****On completion of this course the students will be able to**

1. Understand the habitat niche and its influence on resources and animal interactions.
2. Estimate the characteristics of population, growth and regulation.
3. Interpret the mechanisms of communities and ecological successions.
4. Identify the bio geographical zones and discuss the structure, function and energy flow of an ecosystem.
5. Describe the biodiversity, management approaches, pollution and bioremediation.

**Nature of Course**

Knowledge and skill	✓	Employability oriented	✓
Skill oriented		Entrepreneurship oriented	

**MAPPING****Relationship Matrix for Course Outcomes and Programme Specific Outcomes**

Course Outcomes (COs)	Programme Outcomes(POs)					Programme Specific Outcomes(PSOs)							Mean Score of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	
CO1	2	1	2	3	1	3	2	3	3	2	3	1	2.17
CO2	-	-	1	3	-	3	1	3	3	-	3	-	1.42
CO3	1	2	2	3	2	3	2	3	3	1	3	2	2.25
CO4	-	-	1	3	-	3	1	3	3	-	3	-	1.42
CO5	2	-	-	3	-	3	-	3	3	2	3	-	1.58
<b>Over all mean score for COs</b>													<b>1.768</b>

(Values Reference - 3-High, 2-Medium, 1- Low, - No)

**Result: The Matrix score of this Course is 1.768 (High Relationship)****Note:**

<b>Scale</b>	1	2	3	4	5	6
<b>Relation</b>	0 - 0.5	0.5 - 1.0	1.0 - 1.5	1.5 - 2.0	2.0 - 2.5	2.5 - 3.0
<b>Quality</b>	Very Poor	Poor	Moderate	High	Very high	Excellent

**Value Scaling:**

$\text{Mean Score of Cos} = \frac{\text{Total values}}{\text{Total No. of PSOs}}$	$\text{Over all mean Score for Cos} = \frac{\text{Total of mean score}}{\text{Total of COs}}$
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**COURSE DESIGNER: Mr. K.BALAKRISHNAN****CHAIRMAN - BOS****CONTROLLER OF EXAMINATIONS**

<b>NO. OF CREDITS: 4</b>	<b>COURSE CODE: P21ZO4C14P</b>										
<p><b>GOVERNMENT ARTS COLLEGE (AUTONOUOUS), KARUR - 639005</b></p> <p><b>M.Sc., ZOOLOGY - IV SEMESTER - CORE COURSE - XIV</b> (For the candidates admitted from the year 2021 - 22 onwards)</p> <p><b>PRACTICAL - IV (CC - XII AND XIII)</b></p> <p><b>GENETICS AND ENVIRONMENTAL BIOLOGY</b></p>											
<p><b>COURSE OBJECTIVES:</b></p> <ol style="list-style-type: none"> <li>1. To know the mendelian traits in man.</li> <li>2. To understand the Hardy - Weinberg law and gene frequency calculation.</li> <li>3. To learn human karyotype and disorders.</li> <li>4. To estimate the physic - chemical parameters of the water and to identify zooplankton.</li> <li>5. To study the different fauna and their adaptations.</li> </ol>											
<p><b>GENETICS</b></p>	<ol style="list-style-type: none"> <li>1. Recording Mendelian Traits in Human Beings</li> <li>2. Hardy - Weinberg Law &amp; Calculation of Gene Frequency of Dominant and Recessive.</li> </ol> <p><b>Spotters:</b> Normal Male and Female Human Karyotype, Down syndrome, Klinefelter's syndrome, Turner's syndrome, Drosophila male and female, DNA and RNA model, Pedigree Analysis - X-linked inheritance (Haemophilia).</p>										
<p><b>ENVIRONMENTAL BIOLOGY</b></p>	<ol style="list-style-type: none"> <li>1. Hydrological Studies of Water Samples with reference to Pollution - Estimation of Chlorides, Calcium and Total Hardness.</li> <li>2. Determination of pH, DO and BOD.</li> <li>3. Quantitative Estimation of Fresh Water Zoo-plankton.</li> <li>4. Mounting of any five Fresh Water Zoo-plankton.</li> <li>5. Report on Ecological Collection of Fauna representing Different Habitat (Study Tour/Field Trip may be arranged for this purpose).</li> </ol> <p><b>Spotters:</b> Secchi Disc, BOD incubator, Maximum and Minimum Thermometer, Wet and Dry bulb Thermometer, Thermometer, Hygrometer, Rain Guage, Sandy, Muddy and Rocky Shore Fauna (each five).</p>										
<p><b>A record of laboratory work shall be submitted at the time of practical Examination.</b></p> <p><b>Mark distribution for the Practical Examination:</b></p> <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 70%;">1. Environmental Biology</td> <td style="width: 30%;">: 20 Marks</td> </tr> <tr> <td>2. Genetics</td> <td>: 10 Marks</td> </tr> <tr> <td>3. Spotters (EB-2, G-2)</td> <td>: 20 Marks (4 x 5 = 20)</td> </tr> <tr> <td>4. Record with tour report</td> <td>: 10 Marks</td> </tr> <tr> <td style="text-align: center;"><b>Total</b></td> <td style="text-align: center;">: <b>60 Marks</b></td> </tr> </table>		1. Environmental Biology	: 20 Marks	2. Genetics	: 10 Marks	3. Spotters (EB-2, G-2)	: 20 Marks (4 x 5 = 20)	4. Record with tour report	: 10 Marks	<b>Total</b>	: <b>60 Marks</b>
1. Environmental Biology	: 20 Marks										
2. Genetics	: 10 Marks										
3. Spotters (EB-2, G-2)	: 20 Marks (4 x 5 = 20)										
4. Record with tour report	: 10 Marks										
<b>Total</b>	: <b>60 Marks</b>										

**Course Outcomes****On completion of this course the students will be able to**

1. Observe the mendelian traits in man.
2. Identify and distinguish between the karyotype of normal human being and syndrome in man.
3. Apply the Hardy- Weinberg and calculate the genetic equilibrium.
4. Estimate the physic-chemical parameters of water samples.
5. Collect the fresh water sample and identify the zoo plankton and study their adaptations.

**MAPPING****Relationship Matrix for Course Outcomes and Programme Specific Outcomes**

Course Outcomes (COs)	Programme Outcomes(POs)					Programme Specific Outcomes(PSOs)							Mean Score of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	
CO1	3	2	-	-	1	3	2	2	2	2	3	3	1.91
CO2	3	-	2	-	3	3	2	3	1	2	1	3	1.91
CO3	2	2	2	1	3	3	-	3	2	1	-	3	1.91
CO4	3	3	1	2	2	-	2	3	2	3	-	3	2.0
CO5	2	3	-	2	2	3	-	3	2	2	2	3	2.0
<b>Over all mean score for COs</b>												<b>1.946</b>	

(Values Reference - 3-High, 2-Medium, 1- Low, - No)

**Result: The Matrix score of this Course is 1.946 (High Relationship)****Note:**

<b>Scale</b>	1	2	3	4	5	6
<b>Relation</b>	0 - 0.5	0.5 - 1.0	1.0 - 1.5	1.5 - 2.0	2.0 - 2.5	2.5 - 3.0
<b>Quality</b>	Very Poor	Poor	Moderate	High	Very high	Excellent

**Value Scaling:**

$\text{Mean Score of Cos} = \frac{\text{Total values}}{\text{Total No. of PSOs}}$	$\text{Over all mean Score for Cos} = \frac{\text{Total of mean score}}{\text{Total of COs}}$
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**COURSE DESIGNER: Dr. A.KARTHIKEYAN****CHAIRMAN - BOS****CONTROLLER OF EXAMINATIONS**

<b>NO. OF CREDITS: 4</b>	<b>COURSE CODE: P21ZO4E5</b>
<b>GOVERNMENT ARTS COLLEGE (AUTONOMOUS), KARUR - 639005</b> <b>M.Sc., ZOOLOGY -IV SEMESTER - ELECTIVE COURSE - V</b> (For the candidates admitted from the year 2021 - 22 onwards) <b>RESEARCH METHODOLOGY AND BIOSTATISTICS</b>	
<b>COURSE OBJECTIVES:</b>	
<ol style="list-style-type: none"> <li>1. To acquire basic knowledge on research.</li> <li>2. To acquire knowledge on dissertation writing and publishing of research papers.</li> <li>3. To learn laboratory hazards and safety measures.</li> <li>4. To study the variables in biology.</li> <li>5. To understand the hypothesis testing, significance of correlation. Regression and application of SPSS in biology.</li> </ol>	
<b>UNIT - I</b>	<b>Research Methodology</b> Meaning of Research in Biological Sciences, Basic and applied research, essential steps in research-Formulating the Research Problem, Extensive Literature Review, Developing the objectives, Preparing the Research Design, Types, Approaches, Methods of Research (Survey, Observation, case study, experimental, historical and comparative methods) , Research ethics - plagiarism, Research funding promoting agencies - State-TANSCHHE, TNSCST, National (ICMR, ICAR, DAE,CSIR, UGC, DST, DBT) - Patent and IPR.
<b>UNIT - II</b>	Preparation and Presentation of Research Report/Dissertation - Components, Tables, Figures, Formatting and Typing. Publication of Results in Journals, Proceedings, Seminars, Symposia, Conferences; Journals- INFLIBNET - Peer reviewed journals (UGC - CARE Listed Journal, WEB OF SCIENCE, SCOPUS) Impact factor, Citation index.
<b>UNIT - III</b>	Laboratory hazard and safety measures - hazardous handling fire electrical and radio hazards, Bio-safety equipment - Disposal of laboratory wastes - Animal maintenance for research - CPCEA guidelines and ethics. Maintenance and sterilization of glass wares and instruments. Preparation of solutions for research- Normality, molarity and percentage solution.
<b>UNIT - IV</b>	<b>Biostatistics</b> Variables in Biology, Collection, classification and tabulation of data. Frequency distribution, Diagrammatic and Graphical presentation of statistical data, Sampling techniques. Measures of Central Tendencies and Measures of Deviation - Standard Deviation, Quartile deviation, Mean deviation and Standard Error; Normal Distribution.
<b>UNIT - V</b>	Hypothesis Testing and estimation: Measures of Relationship: Correlation and Regression analysis. Definitions and applications of Chi-square tests and 'f' test. Analysis of variance (ANOVA) - One way and two way classified data; Application of SPSS and PAST software in biology.
<b>Text books:</b> <ol style="list-style-type: none"> <li>1. Gurumani, 2006, Research Methodology, MJP Publishers, Chennai.</li> <li>2. Gurumani, 2006, Biostatistics, MJP Publishers, Chennai.</li> <li>3. Ramakrishnan P., 2009, Biostatistics, Saras publication, Nagercoil.</li> </ol>	
<b>Reference books:</b> <ol style="list-style-type: none"> <li>1. Basotia G.R. and Sharma. K.K., Research Methodology,</li> <li>2. Chaudhary, C.H. Research Methodology- RBSA Publication,</li> <li>3. Zar, J.H., 1984, Biostatistical Analysis, Prentice Hall, New Jersey, USA.</li> <li>4. Bailey, N.T.J., Statistical Methods in Biology.</li> <li>5. Sokal, R. and James, F., 1981, Introduction to Biostatistics, W. Freeman &amp; Co., USA.</li> <li>6. RaoK.Surya, 2010, Biostatistics for Health and Life Sciences, Himalaya Publishing House Pvt. Ltd., Mumbai.</li> </ol>	

<p><b>Course Outcomes</b>  <b>On completion of this course the students will be able to</b></p> <ol style="list-style-type: none"> <li>1. Design the research work and proceed with financial support obtained from funding agencies.</li> <li>2. Apply various statistical tools and interpret the data and infer the results.</li> <li>3. Understand the Laboratory hazards, safety measures, CPCEA guidelines and research ethics.</li> <li>4. Obtain the financial assistance from various agencies.</li> <li>5. Write the thesis or research paper and publish in a peer reviewed journal.</li> </ol>
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<b>Nature of Course</b>			
Knowledge and skill	✓	Employability oriented	✓
Skill oriented	✓	Entrepreneurship oriented	

**MAPPING**

**Relationship Matrix for Course Outcomes and Programme Specific Outcomes**

Course Outcomes (COs)	Programme Outcomes(POs)					Programme Specific Outcomes(PSOs)							Mean Score of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	
<b>CO1</b>	2	1	2	2	3	2	2	3	1	2	2	3	2.08
<b>CO2</b>	1	1	1	1	3	-	2	3	-	-	-	3	1.25
<b>CO3</b>	1	2	1	2	3	1	2	3	2	2	-	3	1.83
<b>CO4</b>	2	1	1	2	3	2	2	3	3	-	-	3	2.00
<b>CO5</b>	1	1	2	2	3	2	-	3	1	2	-	3	1.67
<b>Over all mean score for COs</b>												<b>1.766</b>	

(Values Reference - 3-High, 2-Medium, 1- Low, - No)

**Result: The Matrix score of this Course is 1.766 (High Relationship)**

**Note:**

<b>Scale</b>	1	2	3	4	5	6
<b>Relation</b>	0 - 0.5	0.5 - 1.0	1.0 - 1.5	1.5 - 2.0	2.0 - 2.5	2.5 - 3.0
<b>Quality</b>	Very Poor	Poor	Moderate	High	Very high	Excellent

**Value Scaling:**

Total values	Total of mean score
$\text{Mean Score of Cos} = \frac{\text{-----}}{\text{Total No. of PSOs}}$	$\text{Over all mean Score for Cos} = \frac{\text{-----}}{\text{Total of COs}}$

**COURSE DESIGNER: Dr. A.KARTHIKEYAN**

**CHAIRMAN - BOS**

**CONTROLLER OF EXAMINATIONS**

<b>NO. OF CREDITS: 4</b>		<b>COURSE CODE: P21ZO4PW</b>
<b>GOVERNMENT ARTS COLLEGE (AUTONOMOUS), KARUR - 639005</b> <b>M.Sc., ZOOLOGY - IV SEMESTER - PROJECT WORK</b> (For the candidates admitted from the year 2021 - 22 onwards) <b>PROJECT WORK</b>		
<b>S.NO</b>	<b>AREA OF WORK</b>	<b>MAXIMUM MARKS</b>
1.	<b>PROJECT WORK</b>	<b>80</b>
2.	<b>VIVA VOCE EXAMINATION</b>	<b>20</b>
<b>TOTAL</b>		<b>100</b>

Viva Voce Exam 20 Marks; Dissertation - 80 Marks.

**CHAIRMAN - BOS**

**CONTROLLER OF EXAMINATIONS**