# 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

# B.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**<br>"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**<br>"To educate the values and discipline to young minds by teaching Life science". |
| **MISSION OF THE DEPARTMENT**<br>"To produce intellectually enlightened youth with biological knowledge, accomplished the target of attaining social transformation with life science". |
| **OBJECTIVES OF THE DEPARTMENT**<br>• To help the students to understand the formation and functioning of Living organisms.<br>• To unveil the secrets of development and evolution by teaching cellular, molecular, genetic aspects of life.<br>• To impart knowledge about the various technologies in life sciences.<br>• 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 UG courses, a student must earn a minimum of **140 (+4)** credits as mentioned in the table below. The total number of minimum courses offered by a department is given in the course pattern.

## UNDER GRADUATE COURSE PATTERN (2021 ONWARDS)

| PART | SEMESTER | SPECIFICATION | NO. OF COURSES | HOURS | CREDITS | TOTAL CREDITS |
|---|---|---|---|---|---|---|
| I | I - IV | Part I | **4** | **22** | **12** | **24** |
| II | I - IV | Part II | **4** | **22** | **12** | |
| III | I - VI | Core courses Theory | **9** | **49** | **42** | **92** |
| | I - VI | Core courses Practical | **4** | **23** | **17** | |
| | I - IV | Allied Course Theory | **4** | **20** | **12** | |
| | I - IV | Allied Course Practical | **4** | **6** | **8** | |
| | V - VI | Elective Course | **3** | **15** | **13** | |
| | | | | | | |
| IV | I<br>II<br>V | Value Education<br>Environmental Studies<br>Soft Skills Development | **3** | **6** | **6** | **22 + (4)** |
| | I - II | Value Added Course (CLP) | **2** | **4** | **(2)** | |
| | III | Extra Credit Course (MOOC) | **1** | **-** | **(2)** | |
| | III - IV | Non Core Elective | **2** | **4** | **4** | |
| | IV - V | Skill Based Elective | **3** | **6** | **12** | |
| V | VI | Gender Education | **1** | **1** | **1** | **2** |
| | | Extension Activities | 1 | - | **1** | |
| **TOTAL** | | | | **180** | **140 + (4)** | **140 + (4)** |

**Course Pattern**

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

**Part - I:** Language (Tamil)

**Part - II:** General English

**Part - III:** Core Course (Theory) Allied, Core Electives)

**Part - IV:** Value Education, Value Added Course, Extra Credit Course, Environmental Studies, Non Core Elective and Soft Skills Development.

**Part - V:** Gender Education and Extension Activities (NSS, NCC, Sports and Games, PEC, FAPA, YRC, RRC, RC, LC and CC).

## 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.

## Noncore elective

Noncore elective Core should be shared by the various Departments of college. This course should be opted by all the students belonging to the particular Department. Each department of the respective college should allocate themselves the schedule and the units of the course.

## 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.

## Value Education Courses

There are four courses offered in the first semesters for the First year students.

## Non-Major Elective / Skill Based Elective

These courses are offered in two perspectives as electives "Within college".

## Subject Code Fixation

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

| Year of Revision | UG Code of the Dept | Semester | Specification of Part | Running number in the part |
|---|---|---|---|---|
| ↓ | ↓ | ↓ | ↓ | ↓ |
| **21** | **U21** | ***x*** | ***x*** | ***xx*** |
| **21** | **UZO** | **1** | **x** | **1** |

For example:

**I B.Sc., ZOOLOGY - BIOLOGY OF INVERTEBRATES**

The code of the paper is **U21 ZO 1C1.**

Thus, the subject code is fixed for other subjects.

## EXAMINATION

### Continuous Internal Assessment (CIA):

| UG - Distribution of CIA Marks | |
|---|---|
| **Passing Minimum: 40 Marks** | |
| **Theory CIA Maximum = 25** | **Theory CIA Minimum = 10** |
| **Practical CIA Maximum = 40** | **Practical CIA Minimum = 16** |

### 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

$$GPA = \frac{\sum_{i=1}^{n} C_i G_i}{\sum_{i=1}^{n} C_i}$$

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

*Where,* '$C_i$' is the Credit earned for the Course - i,

'$G_i$' 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**

| CGPA | Classification of Final Results | Corresponding Grade |
|---|---|---|
| 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 Under 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 B.Sc. Programme, graduates will be able to

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

## PROGRAM SPECIFIC OUTCOMES

**On Successful completion of their B.Sc. Zoology Programme the Student will have ability to**

| | |
|---|---|
| **PSO1** | Identify and classify diversified invertebrate and chordate species based on the knowledge of taxonomy and evolution. |
| **PSO2** | Interpret and explain the cell biological phenomena with physical principles, adapt the physiological systems with biochemical and immunological aspects to healthy life. |
| **PSO3** | 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. |
| **PSO4** | Analyze and apply various tools of statistics and databases for the betterment of life and environment. |
| **PSO5** | Apply the principles of development biology, microbiological phenomena and cell biology for the human welfare through biotechnology and genetic engineering. |
| **PSO6** | Classify and study the significance of various entomological and microbiological species. Apply the knowledge of aquaculture, vermiculture, sericulture and poultry farming for self-employment. |
| **PSO7** | Perceive the anatomical, physiological, biochemical and cellular process of various life forms with changing environmental conditions, understand the evidences for evolution of life and analyse 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 verbsusedfor course objectives, outcomes and question setting. (K)* | | | | | |
|---|---|---|---|---|---|
| **K1** | **K2** | **K3** | **K4** | **K5** | **K6** |
| **REMEMBERING** | **UNDERSTANDING** | **APPLYING** | **ANALYSING** | **EVALUATING** | **CREATING** |
| List, Define, Describe, Recall Arrange, List, Outline, State Identify, etc. | Comprehension, Explain, Summarise Describe, Illustrate, Review, Classify,Clarify, Distinguish, Estimate, GiveExample(S), Identify, etc. | Apply, Interpret, Manipulate, Relate, Use Compute, Demonstrate Illustrate, Sketch, Solve, etc. | Analyse, 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*** | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | **COGNITIVEPROCESSDIMENSION** | | | | | |
| | **BLOOM'S TAXONOMY REVISED (*example verbs for learning outcomes in italics*)** | **REMEMBERING** Recall and retrieval of foundational disciplinary information. | **UNDERSTANDING** Make meaning out of Information. | **APPLYING** Use information in a similar situation. | **ANALYSIING** Take apartinformation and explore component connections. | **EVALUATING** Examine critically and judge. | **CREATING** Create something new. |
| **KNOWLEDGE DIMENSION** | **A. FACTUAL KNOWLEDGE** Foundational information in a discipline. | *List* | *Summarize* | *Respond* | *Select* | *Check* | *Generate* |
| | **B. CONCEPTUAL KNOWLEDGE** Connection of foundational elements to overallstructure andfunction. | *Recognize* | *Classify* | *Provide* | *Differentiate* | *Determine* | *Assemble* |
| | **C. PROCEDURAL KNOWLEDGE** Methods for investigating and acting. | *Recall* | *Clarify* | *Carry Out* | *Integrate* | *Judge* | *Design* |
| | **D. META-COGNITIVE KNOWLEDGE** Reflection on thinking in the discipline. | *Identify* | *Predict* | *Use* | *Deconstruct* | *Reflect* | *Create* |

*(sources - Anderson LW, KrathwohlD. R, January 2001, **A Taxonomy for Learning, Teaching and Assessing: A Revision of Bloom's Taxonomy of Educational Objectives**, Edition: 1st, Publisher: New York: Longman, ISBN: ISBN: 0321084055, 9780321084057.

-Anderson &Krathwohl, and AModel for Learning Objectives, Lowa State University Center for Excellence in Learning and Teaching).

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

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## B.Sc., ZOOLOGY - COURSE STRUCTURE UNDER CBCS SYSTEM

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

| SEMESTER | PART | COURSE | COURSE TITLE | COURSE CODE | INSTR. HOURS/ WEEK | CREDIT | EXAM HOURS | MARKS | | TOTAL MARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | INT | ESE | |
| I | I | Tamil - I | Tamil - I | **U21L1T1** | 5 | **3** | 3 | **25** | **75** | 100 |
| | II | English - I | English- I | **U21LIE1** | 5 | **3** | 3 | **25** | **75** | 100 |
| | III | Core Course - I | Biology of invertebrates | **U21ZO1C1** | 6 | **5** | 3 | **25** | **75** | 100 |
| | | Core Course - II | Practical - I (For CC I and III) | | 3 | - | - | - | - | - |
| | | First Allied Course - I | Allied Chemistry -I | **U21CH1A1** | 5 | **3** | 3 | **25** | **75** | 100 |
| | | First Allied Course - II | Allied Chemistry- II (practical) | - | 2 | - | - | - | - | - |
| | IV | Value Education | Value education | **U21VE1** | 2 | **2** | 3 | **25** | **75** | 100 |
| | | Value added course | CLP /SAP (Computer LiteracyProgramme /Special Assistance Programme) | | 2 | | | | | |
| | | | | | **30** | **16** | | | | **500** |
| II | I | Tamil - II | Tamil- II | **U21L2T2** | 5 | **3** | 3 | **25** | **75** | 100 |
| | II | English - II | English- II | **U21L2E2** | 5 | **3** | 3 | **25** | **75** | 100 |
| | III | Core Course - II | Practical - I (For CC - I and III) | **U21ZO2C2P** | 3 | **4** | 3 | **40** | **60** | 100 |
| | | Core Course - III | Biology of Chordates | **U21ZO2C3** | 6 | **5** | 3 | **25** | **75** | 100 |
| | | Allied Course - II | Allied Chemistry - II Practical | **U21CH2A2P** | 2 | **4** | 3 | **40** | **60** | 100 |
| | | Allied Course - III | Allied Chemistry - III | **U21CH2A3** | 5 | **3** | 3 | **25** | **75** | 100 |
| | IV | Environmental Studies | Environmental Studies | **U21ES2** | 2 | **2** | 3 | **25** | **75** | 100 |
| | | Value added course | CLP / SAP (Computer Literacy Programme / Special Assistance Programme) | | 2 | **(2)** | | | | |
| | | | | | **30** | **24** | | | | **700** |
| III | I | Tamil - III | Tamil- III | **U21L3T3** | 6 | **3** | 3 | **25** | **75** | 100 |
| | II | English - III | English- III | **U21L3E3** | 6 | **3** | 3 | **25** | **75** | 100 |
| | III | Core Course - IV | Cell Biology and Biophysics | **U21ZO3C4** | 6 | **5** | 3 | **25** | **75** | 100 |
| | | Core Course - V | Practical - II (For CC - IV and VI) | | 3 | - | - | - | - | - |
| | | Second Allied Course - I | Allied Botany - I | **U21BO3A4** | 5 | **3** | 3 | **25** | **75** | 100 |
| | | Second Allied Course - II | Allied Botany - II - (Practical) | | 2 | - | - | - | - | - |
| | IV | Non Core Elective - I | Medicinal Botany | **U21BO3NI** | 2 | **2** | 3 | **25** | **75** | 100 |
| | | Extra Credit Course | Massive Open Online Course (MOOC) | | | **(2)** | | | | |
| | | | | | **30** | **16** | | | | **500** |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| IV | I | Tamil - IV | Tamil- IV | **U21L4T4** | 6 | **3** | 3 | **25** | **75** | 100 |
| | II | English - IV | English- IV | **U21L4E4** | 6 | **3** | 3 | **25** | **75** | 100 |
| | III | Core Course - V | Practical - II (For CC - IV and VI) | **U21ZO4C5P** | 2 | **4** | 3 | **40** | **60** | 100 |
| | | Core Course - VI | Genetics and Molecular Biology | **U21ZO4C6** | 5 | **5** | 3 | **25** | **75** | 100 |
| | | Second Allied Course - II | Allied Botany - II(Practical) | **U21BO4A5P** | 2 | **4** | 3 | **40** | **60** | 100 |
| | | Second Allied Course - III | Allied Botany - III | **U21BO4A6** | 5 | **3** | 3 | **25** | **75** | 100 |
| | IV | Skill Based Elective - I | Vermitechnology | **U21ZO4S1** | 2 | **4** | 3 | **25** | **75** | 100 |
| | | Non Core Elective - II | Economic Botany | **U21BO4N2** | 2 | **2** | 3 | **25** | **75** | 100 |
| | | | | | **30** | **28** | | | | **800** |
| V | III | Core Course - VII | Animal Physiology and Biochemistry | **U21ZO5C7** | 5 | **5** | 3 | **25** | **75** | 100 |
| | | Core Course - VIII | Biotechnology and Microbiology | **U21ZO5C8** | 5 | **4** | 3 | **25** | **75** | 100 |
| | | Core Course - IX | Organic Evolution | **U21ZO5C9** | 4 | **3** | 3 | **25** | **75** | 100 |
| | | Core Course - X | Practical - III (For CC - VII To IX) | | 3 | **-** | - | **-** | **-** | - |
| | | Core Course - XI | Practical - IV (For CC - XII And XIII) | | 3 | **-** | - | **-** | **-** | - |
| | | Elective Course - I | Poultry Science | **U21ZO5E1** | 4 | **4** | 3 | **25** | **75** | 100 |
| | IV | Skill Based Elective - II | Medical Laboratory Technology | **U21ZO5S2** | 2 | **4** | 3 | **25** | **75** | 100 |
| | | Skill Based Elective - III | Biostatistics and Bioinformatics | **U21ZO5S3** | 2 | **4** | 3 | **25** | **75** | 100 |
| | | Soft Skill Development - I | Soft Skills Development | **U21SSD3** | 2 | **2** | 3 | **25** | **75** | 100 |
| | | | | | **30** | **26** | | | | **700** |
| VI | III | Core Course - X | Practical - III (For CC - VII To IX) | **U21ZO6C10P** | 3 | **4** | 3 | **40** | **60** | 100 |
| | | Core Course - XI | Practical - IV (For CC - XII And XIII) | **U21ZO6C11P** | 3 | **5** | 3 | **40** | **60** | 100 |
| | | Core Course - XII | Ecology and Toxicology | **U21ZO6C12** | 6 | **5** | 3 | **25** | **75** | 100 |
| | | Core Course - XIII | Developmental Biology and Immunology | **U21ZO6C13** | 6 | **5** | 3 | **25** | **75** | 100 |
| | | Elective Course - II | Entomology | **U21ZO6E2** | 6 | **5** | 3 | **25** | **75** | 100 |
| | | Elective Course - III | Aquaculture | **U21ZO6E3** | 5 | **4** | 3 | **25** | **75** | 100 |
| | V | Gender Studies | Gender Studies | **U21EA4** | 1 | **1** | 3 | **25** | **75** | 100 |
| | | Extension Activities | Extension Activities (NSS/ NCC/ RRB/YRC/Fine Arts/Environmental Education/ Population Education Club/ Rotaract Club/ Leo Club/ Consumer Club/ Sports and Games) | | - | **1** | - | **-** | **-** | - |
| | | | | | **30** | **30** | | | | **700** |
| **TOTAL** | | | | | **180** | **140 + (4)** | | | | **3900** |

**CHAIRMAN BOARD OF STUDIES IN ZOOLOGY**

**CONTROLLER OF EXAMINATIONS**

| NO. OF CREDITS: 5 | COURSE CODE: U21ZO1C1 |
|---|---|

# GOVERNMENT ARTS COLLEGE (AUTONOUMOUS), KARUR - 639005

## B.Sc., ZOOLOGY - I SEMESTER - CORE COURSE - I

(For the candidates admitted from the year 2021- 22 onwards)

## BIOLOGY OF INVERTEBRATES

**COURSE OBJECTIVES:**

1. To learn the Taxonomy and general characters of animal kingdom.
2. To develop knowledge about morphology, anatomy and life-cycle of selected invertebrate animals.

| | |
|---|---|
| **UNIT - I** | Concept of five kingdom classification of life. Introduction to Protista & Animal kingdom - Systems of classification & nomenclature.Classification of animals based on symmetry and coelom.**Phylum protozoa:** General characteristics and classification up to class level with examples. Type Study: *Paramoecium.* **General Topics:** Protozoan parasite -*Plasmodium* - Life History, Pathogenesis and Control Measures, Nutrition in protozoa. |
| **UNIT - II** | **Phylum Porifera:** General characters and classification up to class level with examples. Type Study: *Ascon* sponge. **General topics:** Canal System in Sponges **Phylum Coelenterata:** General characters and Classification up to class level with examples. Type study: *Obelia*. **General Topics:** Polymorphism in Hydrozoa, Corals & Coral Reef. |
| **UNIT - III** | **Phylum Platyhelminthes:** General characters and Classification up to class level giving examples. Detailed study: *Fasciola hepatica*. **General topics:** Parasitic adaptations.<br>**Phylum Nemathelminthes;** General characters and classification up to class level giving examples. Detailed study: *Ascarislumbricoides*. **General Topics:** Nematode parasites. |
| **UNIT - IV** | **Phylum Annelida:** General Characters and classification up to class level with examples Type Study: Earthworm.**General topics:** Excretion in Annelids, Metamerism in annelida.<br>**Phylum Arthropoda:** General characters and classification up to class level with examples. Type study: Cockroach. **General topics**: Crustacean Larvae and their significance, Mouth Parts of Insects. |
| **UNIT - V** | **Phylum Mollusca:** General Characters and Classification up to class level with examples. Typestudy: *Pila.* **General topics:** Torsion in Molluscs.<br>**Phylum Echinodermata:** General Characters and Classification up to class level with examples. Type Study: *Asterias.* **General Topics:** Water Vascular System in Echinoderms, Larval forms in Echinoderms. |

**Text books:**


1. Arumugam *Net al,* 2013,A Text Book of Invertebrates, by Saras Publications. Nagercoil
2. Jordan. E.L.&Verma.P.S.2006. Invertebrate Zoology, S.Chand & Company Ltd, New Delhi.


**Reference books:**


1. Kotpal RL, Agarwal SK & Khetarpal RP Invertebrates, Rastogi Publications, Meerut.
2. Ekambaranatha Ayyar & T.N. Ananthakrishnan, Manual of Zoology Vo. l -I, Part I&II S.Viswanathan Pvt. Ltd. Chennai.
3. Barnes, R.D. Invertebrate Zoology (1982) VI Edition. Holt Saunders InternationalEdition.
4. Anderson D.T. (2001).Invertebrate Zoology, Second Edn. Oxford University Press.
5. Barrington, E. J. W. (1967). Invertebrate structure and function. ELBS and Nelson, London
6. Dhami.P.S, Dhami J.K (1979). Invertebrate Zoology. R. Chand and Co. Delhi.
7. Mayr .E (1980). Principles of Systematic Zoology.Tata McGraw Hill Publishing Co., New Delhi
8. Pechenik J.A (2005). Biology of Invertebrates, Tata McGraw Hill Publishing Co., NewDelhi.


**CHAIRMAN - BOS** **CONTROLLER OF EXAMINATIONS**

**Course Outcomes**

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

1. Understand the taxonomical classification, diversity, biology and lifecycle ofinvertebrates.
2. Analyse the salient features of various phyla, perceive the increasing complexity in organisation and physiology of invertebrates.
3. Explain the beneficial and harmful nature of invertebrate fauna.
4. Relate the morphological and anatomical features with physiological and evolutionary featuresof animals.
5. Understand the significance of corals, parasites and larval forms.

| **Nature of Course** | | | |
|---|---|---|---|
| Knowledge and skill | ✓ | Employability oriented | ✓ |
| Skill oriented | | Entrepreneurship oriented | |

**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 | - | 2 | 2 | 1 | - | 2 | 2 | 1 | 2 | 1.6 |
| CO2 | 2 | 3 | 1 | 3 | 2 | 2 | 3 | 2 | 1 | 2 | 1 | 2 | 2.0 |
| CO3 | 2 | 3 | - | 3 | 2 | 2 | 2 | 1 | 2 | 3 | - | 2 | 1.83 |
| CO4 | 3 | 2 | 2 | 2 | 3 | 1 | 3 | 3 | 2 | 2 | 2 | 1 | 2.16 |
| CO5 | 2 | 1 | 3 | 3 | 2 | 2 | 2 | 1 | 1 | 2 | 2 | - | 1.75 |
| Over all mean score for COs | | | | | | | | | | | | | 1.87 |

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

**Result: The Matrix score of this Course is 1.87(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:

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

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

**CHAIRMAN - BOS** **CONTROLLER OF EXAMINATIONS**

| NO. OF CREDITS: 4 | COURSE CODE: U21ZO2C2P |
|---|---|

# GOVERNMENT ARTS COLLEGE (AUTONOUMOUS), KARUR - 639005

## B.Sc., ZOOLOGY - II SEMESTER - CORE COURSE - II

(For the candidates admitted from the year 2021-22 onwards)

## PRACTICAL - I (FOR CC - I AND III)

## BIOLOGY OF INVERTEBRATES AND BIOLOGY OF CHORDATES

**COURSE OBJECTIVES:**

1. To identify the invertebrates and vertebrate specimens.
2. To develop theskills indissecting animals either by using real animal or through virtual mode.

| | |
|---|---|
| **1. DISSECTIONS** | Earthworm - Nervous System.<br>Cockroach - Digestive System, Nervous System<br>Fish - Digestive System<br>**VIRTUAL DISSECTION**<br>Frog - Digestive, Arterial and Venous System |
| **2. MOUNTINGS** | Earthworm - Body and Penial setae.<br>Cockroach - Mouth Parts<br>Honey Bee - Mouth Parts<br>Mosquito - Mouth Parts, Fish - Placoid, Cycloid and Ctenoid scales. |
| **3. SPOTTERS: INVERTEBRATES** | *Amoeba, Euglena, Paramoecium, Ascon, Euplectella*, Sponge - gemmule, *Obelia*-colony, *Physalia, Ephyra larva, Metridium, Fasciola hepatica,* Cercaria and Redia larvae. *Taeniasolium, Taenia* - scolex*, Planaria, Ascaris* - male and female. *Microfilaria, Megascolex, Nereis, Nereis* - parapodium, *Nereis* -T.S., *Leech* - Entireand T.S., Trochophore larva,*Penaeus, Scorpion, Peripatus, Lamellidens, Pila, Sepia,Chiton, Octopus,Asterias, Echinus,* Pedicellaria, *Holothuria,* Ophiopluteus larva and Bipinnaria larva. |
| **4. SPOTTERS: CHORDATES** | *Amphioxus, Ascidia, Balanglossus,* Tornaria larva.<br>*Petromyzon, Scoliodon, Trygon, Narcine, Clarias, Gambusia, Echeneis, Hippocampus (Male), Synapta, Exocoetus, Anabas, Protopterus.*<br>*Rana, Alytes, Hyla, Salamander, Ichthyophis,* Axolotl larva.<br>*Calotes, Draco, Varanus, Najanaja, Viperarussellii, Enhydrina, Chelone*<br>*King fisher, Psittacula, Columba,*Quil feather<br>*Ornithorhynchus, Rattus, Pteropus, Oryctolagus, Loris.* |
| **5. DENTITION& OSTEOLOGY** | Rabbit & Man<br>**Pigeon** - Synsacrum<br>**Rabbit** - Pectoral and Pelvic girdles, Bones of Fore limb & Hind limb. |

**Mark distribution for the Practical Examination:**

1. Major Practical (Invertebrata / Chordata) : 20
2. Mounting : 10
3. Spotters: (Invertebrata -2 Chordata - 2 Dentition/Osteology-1) : 20
4. Record : 10

**Total:60**

## Text books:


1. Ekambaranatha Ayyar and T.N.Ananthakrishnan, 1995, "A Manual of Zoology". Vol: 2 (part 1 & 2), S. Viswanathan, Chennai.
2. Lal, SS 2004, A Text Book of Practical Zoology: Invertebrate, Rastogi, Meerut.
3. Lal, SS 2004, A Text Book of Practical Zoology: Vertebrate, Rastogi, Meerut.


## Reference books:


1. Newman. H.H., 1939, "The Phylum Chordata", McMillan, Newyork.
2. De Beer G, 1966, "Vertebrate Zoology", Sedgwick & Jackson, London.
3. 3.Young J.Z., 1950, "The Life of Vertebrates", Oxford University Press, London
4. Barrington, E. J.W. (1967). Invertebrate structure and function. ELBS and Nelson, London
5. Dhami. P.S, Dhami J.K (1979). Invertebrate Zoology. R.Chand and Co. Delhi.
6. Mayr .E (1980). Principles of Systematic Zoology. Tata McGraw Hill Publishing Co., New Delhi
7. Pechenik J.A (2005). Biology of Invertebrates, Tata McGraw Hill Publishing Co., New Delhi.


**CHAIRMAN - BOS** **CONTROLLER OF EXAMINATIONS**

## Course Outcomes

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

1. Get Familiar with Scientific method of identifying the organisms.
2. Dissect and explain the internal anatomy of selected animals.
3. Analyse the importance of mouth parts of various insects.
4. Relate structure and function of specified structures in invertebrate and vertebrate animals.
5. Understand the biological significance of animal groups; illustrate the dentition and skeletal structure.

| **Nature of Course** | | | |
|---|---|---|---|
| Knowledge and skill | | Employability oriented | |
| Skill oriented | | Entrepreneurship oriented | |

**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** | **2** | **1** | **2** | **3** | **1** | **2** | **2** | **3** | **3** | **2.33** |
| **CO2** | **2** | **3** | **3** | **2** | **2** | **2** | **3** | **-** | **2** | **-** | **2** | **3** | **1.83** |
| **CO3** | **3** | **2** | **3** | **3** | **2** | **2** | **3** | **2** | **-** | **2** | **1** | **3** | **2.16** |
| **CO4** | **2** | **1** | **2** | **2** | **3** | **2** | **3** | **3** | **2** | **3** | **2** | **2** | **2.33** |
| **CO5** | **2** | **3** | **2** | **3** | **2** | **3** | **2** | **3** | **2** | **2** | **2** | **2** | **2.33** |
| **Over all mean score for COs** | | | | | | | | | | | | | **2.19** |

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

**Result: The Matrix score of this Course is 2.19 (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:

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

**CHAIRMAN - BOS** **CONTROLLER OF EXAMINATIONS**

| NO. OF CREDITS: 5 | COURSE CODE: U21ZO2C3 |
|---|---|

**GOVERNMENT ARTS COLLEGE (AUTONOUMOUS), KARUR - 639005**

**B.Sc., ZOOLOGY - II SEMESTER - CORE COURSE - III**

(For the candidates admitted from the year 2021 - 22 onwards)

# BIOLOGY OF CHORDATES

**COURSE OBJECTIVES:**

1. To know about the classification, general features and anatomy of vertebrate animals.
2. To learn about the evolutionary significance of prochordates, adaptations, and dentition inanimalsdiversity of animals with phylogenetic context.

| | |
|---|---|
| **UNIT - I** | General characters of Prochordata and its outline classification up to class level.<br>**Type study:** Prochordata - *Balanoglossus* and *Amphioxus*<br>**General Topics:**Origin of chordates,<br>Retrogressive Metamorphosis in Ascidian. |
| **UNIT - II** | General characters and classification of Cyclostomes and Pisces up to order level.<br>**Type study:***Petromyzon* and *Scoliodon*. (Excluding endoskeleton)<br>**General Topics:** 1.Accessory Respiratory organs in Fishes,<br>2.Migration of fishes. |
| **UNIT - III** | General characters and classification of Amphibia and Reptilia up to order level.<br>**Typestudy**: *Rana*and *Calotes*. (Excluding endoskeleton)<br>**General Topics**: 1.Parental care in Amphibia.<br>2. Identification of Poisonous and non poisonous snakes of India - Biting mechanism - Poison apparatus.<br>3. Sphenodon as living fossil. |
| **UNIT - IV** | General characters and classification of Aves up to order level<br>**Type study:** *Columba* (Excluding endoskeleton)<br>**General Topics:**<br>1. Origin of birds<br>2. Flightless birds and their distribution<br>3. Flight adaptations in birds |
| **UNIT - V** | General characters and classification of Mammalia up to order level.<br>**Type study:***Oryctolagus*(Excluding endoskeleton)<br>**General Topics:**<br>1.Aquatic mammals and their adaptations<br>2.Prototheria and Metatheria<br>3.Dentition in Mammals |

**Text books:**


1. Thangamani A, Prasannakumar S, Narayanan LM, Arumugam N A Text Book of Chordates, Saras Publications, Nagercoil.
2. Verma PS, Chordate Zoology, S Chand Publishers, New Delhi.


**Reference books:**


1. Kotpal, R.L.A, Modern Text Book of Zoology-Vertebrates. Rastogi Publication,2009.
2. Ekambaranath Ayyar& T.N. Ananthakrishnan, Manual of Zoology Vol - II, S.Viswanathan Pvt. Ltd. Chennai.
3. Young, J.Z. 1950. Life of Vertebrates. Clarendon Press, Oxford, UK.
4. Pough Harvey F, Christine M.Janis and John B.Heiser.2002. Vertebrate Life, Pearson Education Inc. New Delhi.


**CHAIRMAN - BOS** **CONTROLLER OF EXAMINATIONS**

## Course Outcomes

On completion of this course the students will be able to

1. Understand the general characters and compare the morphological and anatomical features of prochordates and discuss the origin of chordates.
2. Examine the diversity of Cyclostomes and Pisces and accessory respiratory organs of fishes, and migration.
3. Classify the animal groups of Amphibia and Reptilia based on their features, observe the importance of parental care, and compare poisonous and non-poisonous snakes.
4. Identify and understand the morphological and anatomical features of birds, describe theorigin of birds, recognize the values of flightless birds in evolution.
5. Develop knowledge about adaptations of aquatic mammals, distinguish features between prototheria and metatheria, discuss about dentition in mammals.

| **Nature of Course** | | | |
|---|---|---|---|
| Knowledge and skill | ✓ | Employability oriented | ✓ |
| Skill oriented | | Entrepreneurship oriented | |

**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 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 1 | 1.91 |
| CO2 | 2 | 2 | 3 | 2 | 2 | 3 | 2 | 2 | - | 2 | 2 | 2 | 2.0 |
| CO3 | 2 | 1 | 2 | 2 | 3 | 2 | 1 | 1 | 2 | 2 | 1 | 2 | 1.75 |
| CO4 | 3 | - | 2 | 2 | 1 | 2 | 2 | 2 | 2 | 3 | 1 | 2 | 1.83 |
| CO5 | 2 | 2 | 2 | 2 | - | 1 | 2 | 1 | 2 | 2 | - | 2 | 1.50 |
| Over all mean score for COs | | | | | | | | | | | | | 1.79 |

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

**Result: The Matrix score of this Course is 1.79 (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:

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

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

**CHAIRMAN - BOS** **CONTROLLER OF EXAMINATIONS**

| NO. OF CREDITS: 5 | COURSE CODE: U21ZO3C4 |
|---|---|

# GOVERNMENT ARTS COLLEGE (AUTONOUMOUS), KARUR - 639005

## B.Sc., ZOOLOGY - III SEMESTER - CORE COURSE - IV

(For the candidates admitted from the year 2021 - 22 onwards)

## CELL BIOLOGY AND BIOPHYSICS

**COURSE OBJECTIVES:**

1. To study about the structure and properties of cell and cell organelles.
2. To know the ultra-structure, organization of cell organelles. Relate the cell cycle and cancer biology.
3. To understand the biophysical properties of cell, laws and principles in physics related to biology, types and applications of spectrophotometry and microscopy.

| | CELL BIOLOGY |
|---|---|
| **UNIT - I** | Cell types - prokaryotic and eukaryotic cells - Ultra structural organization of Plasma membrane - models of plasma membrane - fluid mosaic model and functions - permeability, passive transport, active transport, endocytosis, exocytosis; Modifications of plasma membrane. Cytoplasm - Physico - Chemical and biological properties. |
| **UNIT - II** | Endoplasmic Reticulum - Ultra structure types and functions. Golgi complex - Morphology, structure, role in secretion and other functions. Ribosomes, Lysosome and Centrosome - Morphology and functions. Mitochondria - Ultrastructure and functions. |
| **UNIT - III** | Ultra-Structure of inter-phase nucleus and nucleolus: Organization of chromosome - Giant chromosomes - Microtubules and microfilaments - Cell cycle-Cell division - mitosis and meiosis. Cancer Biology - Types and Cytological Changes. |
| | **BIOPHYSICS** |
| **UNIT - IV** | Scope of biophysics: Colloids - types, properties - Electro-kinetic properties, Donnan equilibrium, Tyndall effect, Surface tension, Brownian movement, Filtration, Osmosis, Dialysis, Adsorption, Components of light: Beer-Lambert's law of absorption of light - colorimetry and spectrophotometry. |
| **UNIT - V** | Laws of thermodynamics - Entropy and Enthalpy; Bioelectricity-Radioactivity - Types, measurement of radioactivity - Geiger - Muller counter. Microscopy - Principles and application of light and electron microscopes (SEM and TEM), Phase contrast and fluorescent microscopes. |

**Text books:**


1. Arumugam.N, 2011, Cell Biology, Saras Publications, Nagercoil.
2. Thiraviaraj, S., 1998, Biophysics, .Saras Publications, Nagercoil.


**Reference books:**


1. DeRobertis, E.D.P and E.M.F. DeRobertis, 1987, Cell and Molecular Biology. VIII Ed. Lea and Febger, Philadelphia.
2. Powar, C.B. 1989, Essentials of Cytology, Himalaya Publishing House, Mumbai.
3. Subramanian M.A. 2008, Biophysics Principles and Techniques, MJP Publishers.
4. Upadhyay, A., Upadhyay, K., and Nath, N., 2004, Biophysical Chemistry, Himalayas Publishing House, Mumbai.


**CHAIRMAN - BOS** **CONTROLLER OF EXAMINATIONS**

| Course Outcomes | |
|---|---|
| **On completion of this course the students will be able to** | |
| 1. Describe the ultra-structure and functions of cell membrane distinguish between the prokaryotic and eukaryotic cells. | |
| 2. Illustrate the cell organelles and relate their structure and functions. | |
| 3. Review the ultra-structure of nucleus and chromosome organization and their role in cancer biology. | |
| 4. Analyse the properties of colloids, biophysical principles and relate the components of colorimetry and spectrophotometry. | |
| 5. Comprehend the laws of thermodynamics, radioactivity and principles, types and applications of microscopy. | |

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

**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 | 2 | 2 | 2 | 3 | 2 | 1 | 3 | 2 | 3 | 2.25 |
| CO2 | 2 | 2 | 2 | 2 | 2 | 2 | 3 | 3 | 2 | 3 | 2 | 2 | 2.25 |
| CO3 | 2 | 2 | 2 | 2 | 2 | 2 | 3 | 2 | 2 | 2 | 2 | 3 | 2.16 |
| CO4 | 3 | 2 | 3 | 2 | 1 | 2 | 3 | 2 | 2 | 2 | - | 2 | 1.91 |
| CO5 | 2 | 2 | 2 | 1 | 1 | 2 | 3 | 2 | 2 | 2 | - | 2 | 1.75 |
| Over all mean score for COs | | | | | | | | | | | | | 2.06 |

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

**Result: The Matrix score of this Course is 2.06 (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:**

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

**COURSE DESIGNER: Dr. R.PRAKASH**

**CHAIRMAN - BOS** **CONTROLLER OF EXAMINATIONS**

| NO. OF CREDITS: 3 | COURSE CODE: U21ZO3A4 |
|---|---|

# GOVERNMENT ARTS COLLEGE (AUTONOUMOUS), KARUR - 639005

## B.Sc., BOTANY& CHEMISTRY - III SEMESTER - SECOND ALLIED COURSE - I

(For the candidates admitted from the year 2021-22 onwards)

## ALLIED ZOOLOGY - I
## INVERTEBRATA AND CHORDATA

**COURSE OBJECTIVES**

1. To study about general features of Invertebrates and Chordates animals.
2. To provide knowledge on animals classification onthe basis of systematic principles.
3. To explain life cycle, physiological systematic and evolutionary significance of animals.

| | |
|---|---|
| | **INVERTEBRATA** |
| **UNIT - I** | General Characters of the Phyla based on the following types<br>Phylum Protozoa - *Paramoecium*<br>Phylum Coelenterata - *Obelia.* |
| **UNIT - II** | General Characters of the Phyla based on the following types.<br>Phylum Platyhelminthes - Fasciola hepatica<br>Phylum Nemathelminthes - *Ascarislumbricoides*<br>Phylum Annelida - *Megascolex* |
| **UNIT - III** | General Characters of the Phyla based on the following types<br>Phylum Arthropoda - *Penaeus*<br>Phylum Mollusca - *Lamellidens*<br>Phylum Echinodermata - *Asterias*. |
| | **CHORDATA** |
| **UNIT - IV** | **General characters of the classes based on the following types**<br>Class Pisces - *Scoliodon;* Class Amphibia - *Rana*; Class Reptilia - *Calotes* - Morphology, digestive, respiratory, circulatory, nervous system, sense organs, excretory and reproductive system. |
| **UNIT - V** | **General Characters of the classes based on the following types**<br>Class Aves - *Columba*; Class Mammalia - *Oryctolagus* - Morphology, digestive, respiratory, circulatory, nervous system, sense organ, excretory and reproductive system. |

**Text books:**

1. Text Book of Invertebrates, Arumugam, N.Saras Publications, Nagercoil.
2. Text book of Chordates, Arumugam, N.Saras Publications, Nagercoil.

**Reference books:**

1. Outlines of Zoology - M.Ekambaranatha Ayyar -Viswanathan Publications.
2. A Manual of Zoology, Vol - I & II M. Ekambaranatha Ayyar -Viswanathan Publications.

**CHAIRMAN - BOS** **CONTROLLER OF EXAMINATIONS**

| Course Outcomes<br>**On completion of this course the students will be able to** |
|---|
| 1. Understand the general characters, importance and evolutionary hierarchy of invertebrate and chordate fauna. |
| 2. Differentiate between invertebrates and chordates. Classify them on the basis of salient features. |
| 3. Perceive the increasing complexity, diversity in organisation and physiology of animals from protozoa to mammalian. |
| 4. Explain the life cycle and physiological systems of animals. |
| 5. Comprehend the interrelationship among different organisms. |

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

**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 | 2 | 2 | 1 | 2 | 2 | 1 | 1 | - | 2 | 2 | 1.58 |
| CO2 | 3 | 2 | 3 | 3 | 2 | 3 | 2 | 2 | 2 | - | 2 | 2 | 2.16 |
| CO3 | 3 | 2 | 2 | 3 | 2 | 1 | 1 | 2 | 1 | - | 2 | 2 | 1.75 |
| CO4 | 2 | 2 | 2 | 3 | 2 | 3 | 2 | - | 1 | - | 2 | 1 | 1.66 |
| CO5 | 2 | 2 | 1 | 3 | 2 | 3 | 2 | 2 | 2 | 2 | 1 | 1 | 1.91 |
| Over all mean score for COs | | | | | | | | | | | | | 1.81 |

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

**Result: The Matrix score of this Course is 1.81 (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:

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

**COURSE DESIGNER: Mrs. S.MEENASHI**

**CHAIRMAN - BOS** **CONTROLLER OF EXAMINATIONS**

| NO. OF CREDITS: 2 | COURSE CODE: U21ZO3N1 |
|---|---|

**GOVERNMENT ARTS COLLEGE (AUTONOUMOUS), KARUR - 639005**

**B.Sc., BOTANY - III SEMESTER -NON CORE ELECTIVE - I**

(For the candidates admitted from the year 2021 - 22 onwards)

# NUTRITION AND DIETETICS

**COURSE OBJECTIVES**

1. To study about the nutrients and their importance for balanced growth of human being.
2. To gather knowledge on digestion, absorption, Basal Metabolic Rate, and energetics of human being.
3. To learn aboutthe dietetics of various category of people.

| | |
|---|---|
| **UNIT - I** | Introduction and scope. Components of food - Carbohydrate, Protein, and lipids, vitamins and minerals - sources and functions - Deficiency diseases, Importance of water in diet. |
| **UNIT - II** | Digestion, absorption and assimilation of carbohydrate, protein, lipid, Calcium, Phosphorous, Potassium, Sodium, Iron, Iodine and Vitamins. |
| **UNIT - III** | Calorific Values of food - Energy units - Balanced diet - BMR- Energy requirements and common diet chart of man, woman, pregnant women, infants children and adolescence. |
| **UNIT - IV** | Nutritional value of food: cereals, fruits, Milk, egg, meat and fish, food spoilage - food adulteration - food poisoning food preservatives, Sterilization, Refrigeration, Dehydration and chemical Preservation. |
| **UNIT - V** | Nutritional requirements: infants, school children, Pregnant and lactating mother, Adolescence and old age, Faulty food habits - causes and diet chart for obesity, Diabetes and cardiac problems. |

**Text books:**


1. Kumud Khanna, Sharda Gupta, Santhosh Jain Passi, Rama Seth. Text Book of Nutrition and dietetics, Second Edition. Elite Publishing House.
2. Shubhangini A Joshi, 2015 Edition 4. Nutrition and Dietetics. Publisher McGraw Hill.


**Reference books:**


1. Swaminathan, M., 1989. Hand of book of food and nutrition, Bapco, Bangalore.
2. Gopalan, C.,B.S.Raasatri and S.Balasubramanian , 1971, Nutritive value of Indian foods, NIN, Hyderabad.
3. Ghosh, S.1981. The feeding care of infants and your children, UNICEF, New Delhi.
4. Goyal, S. and Gupta, P., 2012, Food nutrition and health, S.Chand& Company Ltd.
5. Mudambi, S.R., 1995, Fundamentals of food nutrition. New age International, New Delhi.


**CHAIRMAN - BOS** **CONTROLLER OF EXAMINATIONS**

| Course Outcomes<br>**On completion of this course the students will be able to** |
|---|
| 1. Identify different types and sources of nutrients and their deficiency diseases. |
| 2. Interpret and explain the physiological process of digestion and absorption of nutrients in food materials . |
| 3. Assess the energy requirements and diet for human being. |
| 4. Classify the nutritional value of food and apply the principles of food preservation. |
| 5. Assess the nutritional requirements of different stages of human being and the effect of faulty food habits. |

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

**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 | 3 | 1 | 2 | 2 | 2 | 2 | 2 | 2 | 2.25 |
| CO2 | 2 | 3 | 3 | 2 | 3 | - | 3 | 1 | 2 | 2 | 2 | 2 | 2.08 |
| CO3 | 3 | 2 | 3 | 2 | 3 | - | 2 | 1 | 2 | 2 | 2 | 3 | 2.08 |
| CO4 | 3 | 2 | 3 | 3 | 3 | 1 | 3 | 2 | 2 | 3 | 3 | 2 | 2.50 |
| CO5 | 3 | 2 | 2 | 3 | 3 | - | 3 | 2 | 2 | 3 | 2 | 2 | 2.25 |
| Over all mean score for COs | | | | | | | | | | | | | 2.23 |

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

**Result: The Matrix score of this Course is 2.23 (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:

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

**COURSE DESIGNER: Mrs. S.MEENASHI**

**CHAIRMAN - BOS** **CONTROLLER OF EXAMINATIONS**

| NO. OF CREDITS: 4 | COURSE CODE: U21ZO4C5P |
|---|---|

# GOVERNMENT ARTS COLLEGE (AUTONOUMOUS), KARUR - 639005

## B.Sc., ZOOLOGY - IV SEMESTER - CORE COURSE - V

(For the candidates admitted from the year 2021-22 onwards)

## PRACTICAL - II (FOR CC - IV AND VI)

## CELL BIOLOGY AND BIOPHYSICS & GENETICS AND MOLECULAR BIOLOGY

**COURSE OBJECTIVES:**

1. To demonstrate the mitotic and meiotic cell division, human karyotypes and isolation of genetic material.
2. To study and operate the instruments like colorimeter to verify the Beer Lambert law.
3. To identify the different cells, tissues, muscles & human syndromes, instruments.

| | |
|---|---|
| **1.CELL BIOLOGY& BIOPHYSICS** | **Practical**<br>1.Onion Root Tip - Squash preparation to study different stages of Mitosis<br>2.Grasshopper Testis/*Tradescantia* sp., - Squash preparation to study different stages of Meiosis.<br>3.Chironomus Larva - Mounting of Salivary glands and study of Giant chromosomes.<br>4.Buccal smear preparation -Showing the Squamous epithelial cells.<br>5.Verification of Beer-Lambert law using colorimeter. |
| | **Spotters:**<br>1.Columnar epithelium 2. Ciliated epithelium 3. Squamous epithelium 4. Glandular epithelium 5. Cardiac Muscle 6. Striated Muscle 7. Non-striated Muscle 8. Bone Tissue 9. Blood of human 10. Blood of Frog 11. Micrometers 12. Camera lucida 13.pH meter 14. Colorimeter 15. Spectrophotometer 16. Electrophoretic apparatus. |
| **2.GENETICS& MOLECULAR BIOLOGY** | **Practical**<br>1. Recording of Mendelian traits in Man.<br>2. Drosophila - Male and Female Identification<br>3. Human Karyotypes - Normal Male and Female, Down, Klinefelter's and Turner's Syndrome.<br>4. Pedigree Analysis<br>5. DNA isolation from Human Saliva: Demonstration only.<br>6. Electrophoretic separation of proteins: Demonstration only. |
| | **Spotters:**<br>1. PCR Machine 2. DNA Model 3. RNA Model 4. ATP Model 5.Wire frame & ball and stick model for Myosin and Cytochrome. 6. Phylogenetic tree. |

**A record of laboratory work shall be submitted at the time of practical Examination.**

**Mark distribution for the Practical Examination:**

1. Major practical (Cell Biology and Biophysics) : 20 Marks
2. Minor Practical (Genetics and Molecular biology):10 Marks
3. Spotters (5x4) (Cell Biology - 1, Genetics -1
4. Molecular biology - 2, Biophysics - 1) : 20 Marks
5. Record : 10 Marks

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**Total : 60 Marks**

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**Text books:**


1. EkambaranathaAyyar and T.N.Ananthakrishnan, 1995, "A Manual of Zoology"Vol: 2(part 1 &2), S.Viswanathan, Chennai.
2. Lal, SS 2004, A Text Book of Practical Zoology: Invertebrate, Rastogi, Meerut.
3. Lal, SS 2004, A Text Book of Practical Zoology: Vertebrate, Rastogi, Meerut.

**Reference books:**


1. Newman. H.H., 1939, "The Phylum Chordata", McMillan, New York.
2. De Beer G, 1966, "Vertebrate Zoology", Sedgwick & Jackson, London.
3. Young J.Z., 1950, "The Life of Vertebrates", Oxford University Press, LondonBarrington, E. J. W. (1967). Invertebrate structure and function. ELBS and Nelson, London Dhami. P.S, Dhami J.K (1979). Invertebrate Zoology. R. Chand and Co. Delhi.
4. Mayr .E (1980). Principles of Systematic Zoology. Tata McGraw Hill Publishing Co., NewDelhi .
5. Pechenik J.A (2005). Biology of Invertebrates, Tata McGraw Hill Publishing Co., New Delhi.


## Course Outcomes

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

1. Observe, identify and analyse the different stages of mitotic and meiotic cell divisions, different types of tissues and muscles.
2. Identify and analyse genetic traits of human being and karyotypes.
3. Relate the principles and applications of instruments like pH meter, spectrophotometer, etc.
4. Understand andjustify laws related to colorimeter.
5. Demonstrate and evaluate the DNA and Proteins.

## Nature of Course

| | | | |
|---|---|---|---|
| Knowledge and skill | | Employability oriented | |
| Skill oriented | | Entrepreneurship oriented | |

**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 | 2 | 3 | 1 | 3 | 2 | 2 | 3 | - | 3 | 2.16 |
| CO2 | 3 | 2 | 3 | 3 | 3 | - | 2 | 2 | 2 | 3 | - | 3 | 2.16 |
| CO3 | 3 | 2 | 3 | 3 | 3 | - | 3 | 3 | 2 | 3 | - | 3 | 2.33 |
| CO4 | 2 | 2 | 3 | 2 | 3 | 1 | 2 | 2 | 2 | 3 | - | 3 | 2.08 |
| CO5 | 3 | 2 | 3 | 2 | 3 | 1 | 2 | 3 | 2 | 3 | - | 3 | 2.25 |
| Over all mean score for COs | | | | | | | | | | | | | 2.19 |

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

**Result: The Matrix score of this Course is 2.19 (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:

$$\text{Mean Score of Cos} = \frac{\text{Total values}}{\text{Total No. of PSOs}}$$

$$\text{Over all mean Score for Cos} = \frac{\text{Total of mean score}}{\text{Total of COs}}$$

**COURSE DESIGNER: Mrs. S.MEENASHI**

**CHAIRMAN - BOS** **CONTROLLER OF EXAMINATIONS**

| NO. OF CREDITS: 5 | COURSE CODE: U21ZO4C6 |
|---|---|

# GOVERNMENT ARTS COLLEGE (AUTONOUMOUS), KARUR - 639005

## B.Sc., ZOOLOGY - IV SEMESTER - CORE COURSE - VI

(For the candidates admitted from the year 2021 - 22 onwards)

## GENETICS AND MOLECULAR BIOLOGY

**COURSE OBJECTIVES:**

1. To recall and understand the inheritance in living organism.
2. To obtain knowledge on genetic inheritance at molecular level.
3. To study aboutModern techniques in molecular genetics.

| | |
|---|---|
| | **GENETICS** |
| **UNIT - I** | Mendel's laws of inheritance - Gene interaction - Allelic and Non allelic interaction; Multiple alleles - Incomplete dominance - Co-dominanceEpistasis, Polygenic inheritance Lethal genes.Linkage, Crossing over-Sex determination - Genic Balance theory.Chromosomal, Environmental and hormonal basis of sex determination - Barr bodies. |
| **UNIT - II** | Chromosome - Structure and Function - Chromosomal Aberrations - Chromosomal variation & Non-disjunction - Euploidy, Aneuploidy, Monosomy, Trisomy (Klinefelter, Turner and Down syndromes) - Cytoplasmic inheritance - Pedigree Analysis, Eugenics, Euthenics, Genetic Counselling, Inbreeding and Out breeding, Twins Studies. |
| | **MOLECULAR BIOLOGY** |
| **UNIT - III** | Molecular Genetics: Fine structure of gene-cistron, recon and mutton Mutations - Physical and Chemical mutagens - Molecular basis of mutation. Sickle cell anemia, Inborn errors of Metabolism: Phenylketonuria - Alkaptonuria - Albinism.DNA as genetic material - Transformation - Conjugation - Transduction - DNA Structure, types and replication. |
| **UNIT - IV** | Central dogma of Molecular Biology - Protein biosynthesis - Transcription - Types of RNA - Processing of RNA molecules Genetic code - and Translation - Initiation - Elongation - Termination - Post translational modifications - gene regulation - Operon model. |
| **UNIT - V** | Molecular techniques - Southern, Northern and Western blotting; DNA fingerprinting - PCR - Sanger's DNA Sequencing method. Gene bank and libraries. Human Genome Project. |

**Text books:**


1. Meyyan, R.P., 2005. Genetics, Saras Publications, Nagercoil.
2. Verma, P.S. and V.K.Agarwal, 2002, Genetics, S.Chand& Co. New Delhi.
3. Arumugam, N, 2005. Molecular biology, Saras Publications, Nagercoil.
4. Jeyanthi, G.P.Molecular biology, 2009, MJP Publishers, Chennai.


**Reference books:**


1. Gardner, E.J., 2007, Principles of Genetics, 8th edition, Willey India Publishers.
2. Miglani, G.S., 2007, Advanced Genetics - 2nd edition, Narosa Publishing, New Delhi.
3. Friefelder, D., 2003, Essential of Molecular Biology; Narosa Publishing, New Delhi.
4. Lewin, B. 2008, Genes IX, Jones and Barlett Publishers, Boston.
5. Strickberger, M.W., 2005 Genetics, Prentice Hall of India, New Delhi.


**CHAIRMAN - BOS** **CONTROLLER OF EXAMINATIONS**

| **Course Outcomes**<br>**On completion of this course the students will be able to** |
|---|
| 1. Summarize the Mendelian genetics with allelic and non allelic interaction and sex determination. |
| 2. Discuss the structure and function of chromosomes and different types of chromosomal mutation. |
| 3. Understand the molecular level structure of DNA and molecular basis of mutation. |
| 4. Understand the central dogma of biology at molecular level and its regulation. |
| 5. Explain the principle and applications of modern molecular genetics tools. |

| **Nature of Course** | | | |
|---|---|---|---|
| Knowledge and skill | ✓ | Employability oriented | ✓ |
| Skill oriented | | Entrepreneurship oriented | |

**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 | 2 | 2 | 2 | 2 | 2 | 1 | 2 | 2 | 3 | 2.08 |
| CO2 | 2 | 2 | 2 | 2 | 2 | 2 | 3 | 2 | 1 | 2 | 2 | 3 | 2.08 |
| CO3 | 3 | 2 | 2 | 2 | 1 | 2 | 2 | 3 | 1 | 3 | 2 | 2 | 2.08 |
| CO4 | 3 | 2 | 3 | 2 | 1 | 2 | 2 | 2 | 1 | 2 | 2 | 2 | 2.0 |
| CO5 | 2 | 2 | 3 | 2 | 1 | 1 | - | 2 | - | 2 | 2 | 2 | 1.58 |
| Over all mean score for COs | | | | | | | | | | | | | 1.96 |

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

**Result: The Matrix score of this Course is 1.96 (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:

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

**CPURSE DESIGNER: Dr. R.PRAKASH**

**CHAIRMAN - BOS** **CONTROLLER OF EXAMINATIONS**

| NO. OF CREDITS: 4 | COURSE CODE: U21ZO4A5P |
|---|---|

**GOVERNMENT ARTS COLLEGE (AUTONOUMOUS), KARUR - 639005**

**B.Sc., BOTANY & CHEMISTRY - IV SEMESTER -ALLIED COURSE - II**

(For the candidates admitted from the year 2021-22 onwards)

## ALLIED ZOOLOGY - PRACTICAL - II

**COURSE OBJECTIVES:**

1. To identify the invertebrate and vertebrate animals.
2. To dissect and display the digestion and nervous system of cockroach and earthworm.
3. Ability to understand commercially important Animals and their products.

| | |
|---|---|
| **1. DISSECTIONS** | Earthworm - Nervous System. Cockroach - Digestive System, Nervous System. Fish - Digestive System. |
| **2. MOUNTINGS** | Earthworm - Body setae Cockroach - Mouth Parts. Honey Bee - Mouth Parts. Shark - Placoid Scales Any Carp - Cycloid &Ctenoid Scales. |
| **3.SPOTTERS INVERTEBRATES AND CHORDATES** | *Amoeba, Paramoecium, Ascon sponge, Obelia* colony*, Metridium, Fasciola hepatica, Taeniasolium, Taeniascolex, Planaria, Ascaris, Earthworm, Earthworm* T.S.*, Nereis*, Leech, Leech T.S, Prawn*,* Scorpion, Grasshopper, Centipede*, Peripatus,* Freshwater mussel*, Pila, Sepia,* Seastar*,* Sea-urchin, Sea-cucumber*, Amphioxus, Ascidian, Balanoglossus,* Shark*, Anabas, Exocoetus, Echeneis,* Frog*,* Salamander*,* Calotes*, Draco, Turtle, Najanaja, Viperarussellii,* Pigeon, Parrot, Rat, Rabbit, Bat. |
| **4.COMMERCIAL ZOOLOGY** | Species of animals used in Vermiculture, Apiculture, Sericulture, Aquaculture and Poultry farming. |
| **5.COMMERCIAL ANIMAL PRODUCTS** | Vermicompost, Honey, Bee's wax, Silk, Cod liver oil, Egg of Fowl. |

**Mark distribution for the Practical Examination:**

1. Dissection : 20
2. Mounting : 10
3. Spotters (5x4) (Invertebrata-2, Chordata-1, (Commercial Zoology-2) : 20
4. Record : 10

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**Total: 60**

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**Text book:**

1. A Manual of Practical Zoology.

**Reference books:**

1. Outlines of Zoology - M.Ekambaranatha Ayyar -Viswanathan Publications.
2. A Manual of Zoology, Vol -I & II M.Ekambaranatha Ayyar -Viswanathan Publications.

| **Course Outcomes**<br>**On completion of this course the students will be able to** |
|---|
| 1. Identify the unique characteristics of animals with help of scientific observation. |
| 2. Dissect and explain the Digestive and nervous system of earthworm, cockroach and fish. |
| 3. Identify the different types of mouth parts in insects. |
| 4. Examine the commercially important animals and their products. |
| 5. Illustrate the structure and function of different animals. |

| **Nature of Course** | | | |
|---|---|---|---|
| Knowledge and skill | | Employability oriented | |
| Skill oriented | | Entrepreneurship oriented | |

**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 | 2 | 2 | 1 | 3 | 2 | 3 | - | 2 | 3 | 3 | 2.08 |
| CO2 | 3 | 2 | 3 | 3 | 2 | 2 | 3 | - | - | - | 2 | 3 | 1.91 |
| CO3 | 3 | 2 | 2 | 3 | 2 | 2 | 3 | 2 | - | 1 | 2 | 3 | 2.08 |
| CO4 | 2 | 2 | 2 | 3 | 2 | 3 | 3 | 3 | 1 | 3 | 3 | 3 | 2.50 |
| CO5 | 2 | 2 | 1 | 3 | 2 | 3 | 2 | 3 | 1 | 2 | 2 | 3 | 2.16 |
| **Over all mean score for COs** | | | | | | | | | | | | | 2.14 |

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

**Result: The Matrix score of this Course is 2.14 (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:

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

**COURSE DESIGNER: Dr. K.BALAKRISHNAN**

**CHAIRMAN - BOS** **CONTROLLER OF EXAMINATIONS**

| NO. OF CREDITS: 3 | COURSE CODE: U21ZO4A6 |
|---|---|

# GOVERNMENT ARTS COLLEGE (AUTONOUMOUS), KARUR - 639005

## B.Sc., BOTANY & CHEMISTRY - IV SEMESTER - ALLIED COURSE - III

(For the candidates admitted from the year 2021-22 onwards)

### ALLIED ZOOLOGY - III
### (COMMERCIAL ZOOLOGY)

**COURSE OBJECTIVES:**

1. To generate motivation for Self-Employment.
2. To inculcate knowledge on useful animals to Mankind.
3. To understand the uses of commercially important animals and their products.

| | |
|---|---|
| **UNIT - I** | **Vermiculture:** Introduction - Ecological classification of earthworm - Preparation of vermibed - management - vermiwash - Economic Importance. |
| **UNIT - II** | **Apiculture:** Introduction - species of honeybees - bee colony - Newton's beehive - care and management- extraction of honey - nutritive and medicinal value of honey. |
| **UNIT - III** | **Sericulture:** Introduction - Species of Mulberry, silkworm - types, life cycle of *Bombyxmori* - rearing - silk reeling - Economic importance of silk. |
| **UNIT - IV** | Aquaculture - Construction of pond - Management of pond - Freshwater cultivable fishes - Fish feed - Induced breeding - fish diseases (Furunculosis, Epizootic Ulceractive syndrome (EUS) and Vibriosis). |
| **UNIT - V** | Poultry farming - types of fowls - Management - Poultry nutrition - diseases and their prevention. Economics of Poultry production. |

**Text books:**


1. Shukla.G.S. and V.B.Upadhyay- Economic Zoology, Rastogi Publications.
2. Thiyagarajan, S. 2000 - Commercial Zoology, Tee Jay Publication, Thanjavur (Tamil version).


**Reference books:**


1. Ashan, J and S.P.Sinha -Ahand book of Economic Zoology - S.Chand& Co.
2. Sardar Singh - Bees Keeping in India.
3. Santhanam - Aquaculture.
4. Ullal, S.R and M.N.Narasimhan - Central Silk Board, Government of India, Mumbai.
5. Singh - Livestock and Poultry Production.
6. ManjuYadav, 2003. Economic Zoology, Discovery Publishing House, New Delhi.
7. Rose, S.P., Principles of Poultry science, C & B International.
8. Ismail.S.,Vermiculture.


**CHAIRMAN - BOS** **CONTROLLER OF EXAMINATIONS**

| **Course Outcomes**<br>**On completion of this course the students will be able to** |
|---|
| 1. Apply the commercial knowledge of Zoology to run small scale industries |
| 2. Illustrate to the scientific method of rearing of Earthworm, Honey bee, Silk worm, Fish and fowls. |
| 3. Explore the commercial uses of animal products. |
| 4. Take care and manage the farms in times of disease outbreak and hardships due to seasonal Variations. |
| 5. Produce quality products and market them `according to the needs. |

**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 | 2 | 2 | 1 | 3 | 3 | 1 | 2 | 3 | 2 | 2 | 2.08 |
| CO2 | 3 | 2 | 3 | 3 | 2 | 2 | 3 | 2 | 2 | 3 | 3 | 2 | 2.50 |
| CO3 | 3 | 2 | 2 | 3 | 2 | 3 | 3 | 3 | 3 | 2 | 1 | 3 | 2.50 |
| CO4 | 2 | 2 | 2 | 3 | 2 | 3 | 2 | 3 | 3 | - | 2 | 1 | 2.08 |
| CO5 | 2 | 2 | 1 | 3 | 2 | 3 | 2 | 3 | 3 | 2 | 2 | 1 | 2.16 |
| Over all mean score for COs | | | | | | | | | | | | | 2.26 |

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

| **Nature of Course** | | | |
|---|---|---|---|
| Knowledge and skill | ✓ | Employability oriented | ✓ |
| Skill oriented | ✓ | Entrepreneurship oriented | ✓ |

**Result: The Matrix score of this Course is 2.26 (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:

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

**COURSE DESIGNER: Dr. K.BALAKRISHNAN**

**CHAIRMAN - BOS** **CONTROLLER OF EXAMINATIONS**

| NO. OF CREDITS: 4 | COURSE CODE: U21ZO4S1 |
|---|---|

**GOVERNMENT ARTS COLLEGE (AUTONOUMOUS), KARUR - 639005**

**B.Sc., ZOOLOGY - IV SEMESTER - SKILL BASED ELECTIVE - I**

(For the candidates admitted from the year 2021-22 onwards)

# VERMITECHNOLOGY

**COURSE OBJECTIVES:**

1. To learn about the biology of earthworms.
2. To study about the procedures and techniques in vermicomposting.
3. To know the significance of vermicompost in organic farming

| | |
|---|---|
| **UNIT - I** | **Introduction:** Earthworms - Ecological types -Trophic classification of earthworm. Physical and chemical effects of earth wormon soil. |
| **UNIT - II** | **Earthworm:** Structure - External features - Internal features - Breeding - Earthworms: Lifecycle. |
| **UNIT - III** | Earthworms for culture - Vermiculture and vermitech - Preparations for starting vermiculture - Vermibeds. Production and Application of vermiwash. |
| **UNIT - IV** | Organic waste and its sources - vermicomposting - factors affecting - Economics of vermiculture - NABARD - KVIC supports to vermiculture. |
| **UNIT - V** | Applications of vermiculture - Effect of earthworms on plant growth applications in organic agriculture - Earthworms in medicine, as feed and otheruses. |

**Text books:**


1. Thiagarajan, S., 2002. Commercial Zoology Tee Jay Publications Vermitecnology.
2. RamalingamR., 2007. Manbulu Va1arppu, Tamil Nadu Higher Education Council, Chennai.
3. ArumugamN., 2012, Vermitechnology, SARAS Publication, Nagarcoil.


**Reference books:**


1. Seethalakshimi.M.andShanthi.R.2014.Vermitechnology.SarasPublications, Nagercoil.
2. Sultan.A.Ismail.1977, Vermicology. Thebiology of earthworms. Orient Longman td. Hyderabad.
3. Sathe Tukaram Vithatran, 2004. Vermiculture and Organic Farming.
4. NIIR Board, 2004, The Complete Technology book on Vermiculture and Vermicompost


**CHAIRMAN - BOS** **CONTROLLER OF EXAMINATIONS**

| **Course Outcomes**<br>**On completion of this course the students will be able to** |
|---|
| 1. Identify and classify earthworms and understand their role in soil fertility. |
| 2. Describe structure and the lifecycle of earth worms. |
| 3. Understand and assess earthworms and techniques for vermiculture. |
| 4. Analyse and apply the sources for vermicomposting and self-employment. |
| 5. Identify the applications of earthworms for better life and environment. |

| **Nature of Course** | | | |
|---|---|---|---|
| Knowledge and skill | ✓ | Employability oriented | ✓ |
| Skill oriented | ✓ | Entrepreneurship oriented | ✓ |

**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 | 3 | 3 | 2 | 2 | 2 | 2 | 3 | 2 | 2.5 |
| CO2 | 2 | 1 | 2 | 3 | 3 | 2 | 1 | 2 | 1 | 1 | 3 | 3 | 2.0 |
| CO3 | 2 | 1 | 2 | 3 | 3 | 1 | 2 | 3 | 2 | 2 | 3 | 1 | 2.08 |
| CO4 | 2 | 1 | 2 | 3 | 3 | - | 2 | 3 | 3 | 2 | 3 | 2 | 2.16 |
| CO5 | 2 | 1 | 2 | 3 | 3 | 1 | 2 | 3 | 2 | 2 | 3 | 2 | 2.16 |
| Over all mean score for COs | | | | | | | | | | | | | 2.18 |

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

**Result: The Matrix score of this Course is 2.18 (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:**

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

**COURSE DESIGNER: Mrs. S.MEENASHI**

**CHAIRMAN - BOS** **CONTROLLER OF EXAMINATIONS**

| NO. OF CREDITS: 2 | COURSE CODE: U21ZO4N2 |
|---|---|

**GOVERNMENT ARTS COLLEGE (AUTONOUMOUS), KARUR - 639005**

**B.Sc., BOTANY AND N&D - IV SEMESTER -NON CORE ELECTIVE - II**

(For the candidates admitted from the year 2021 - 22 onwards)

# COMMUNICABLE DISEASES AND MANAGEMENT

**COURSE OBJECTIVES:**

1. To understand the communicable diseases and their management.
2. To highlight the importance and role of bacterial, viral, protozon, fungal diseases and parasites.
3. To create an awareness about the importance of health and hygiene.

| | |
|---|---|
| **UNIT - I** | Classification of communicable diseases, Mode of transmission. Viral diseases - Polio, Rabies, Mumps, Influenza, Measles, Hepatitis, AIDS and Covid 19 - Causes, symptoms, prevention and cure. |
| **UNIT - II** | **Bacterial diseases:** Dysentery, Cholera, Tuberculosis, Tetanus, Diphtheria, Typhoid, STD and Leprosy - causes, symptoms, prevention and cure. |
| **UNIT - III** | **Protozoan Diseases:** Amoebiosis, Leishmaniasis, Trichomonasis and Malaria - Causes, symptoms, prevention and cure. Fungal Diseases: Superficial and Systemic Mycoses. |
| **UNIT - IV** | **Helminth Parasites**: Taeniasis, Ascariasis, Ancylostomiasis and Filariasis - Causes, symptoms, prevention and cure. |
| **UNIT - V** | **Vaccines and Antibiotics:** Types of Vaccines, Vaccination schedule for pregnant mothers and children. Types, sources and importance of antibiotics |

**Text books:**


1. Park,K. 2005 Park's Text book of Preventive and Social Medicine, M/s BanarsidasBhanot, Publishers, Jabalpur, India, 18 Ed.,
2. Kotpal,R.L., A Text Book of Invertebrates, Rastogi Publishers, Meerut.


**Reference books:**


1. Deepak Kumar, 2001, Diseases and Medicines in India; A Historical Overview, Tulika, New Delhi.
2. Turk and Turk, Text Book of Social and Preventive Medicine.


**CHAIRMAN - BOS** **CONTROLLER OF EXAMINATIONS**

| **Course Outcomes**<br>**On completion of this course the students will be able to** |
|---|
| 1. Classify and summarize the mode of transmission of communicable diseases. |
| 2. Understand andanalyse the bacterial and viral diseases in human being. |
| 3. Analyse the symptoms, diagnose the protozoan and fungal diseases in humanbeing and find out solutions. |
| 4. Create awareness about prevention and control measures of communicable diseases. |
| 5. Classify vaccines and assess the aspects of immunity for healthy life. |

| **Nature of Course** | | | |
|---|---|---|---|
| Knowledge and skill | ✓ | Employability oriented | |
| Skill oriented | | Entrepreneurship oriented | |

**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 | 2 | 2 | 1 | 2 | 3 | 3 | 3 | 3 | 2 | 2 | 2.25 |
| CO2 | 3 | 2 | 3 | 3 | 2 | 2 | 3 | 3 | 2 | 3 | 3 | 1 | 2.50 |
| CO3 | 3 | 2 | 2 | 3 | 2 | 3 | 3 | 3 | 2 | 2 | - | 3 | 2.33 |
| CO4 | 2 | 2 | 2 | 3 | 2 | 3 | 2 | 3 | 3 | 2 | 2 | 1 | 2.25 |
| CO5 | 2 | 2 | 1 | 3 | 2 | 3 | 2 | 3 | 3 | - | 2 | 1 | 2.00 |
| Over all mean score for COs | | | | | | | | | | | | | 2.26 |

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

**Result: The Matrix score of this Course is 2.26 (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:

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

**COURSE DESIGNER: Dr. S.MOHANRAJ**

**CHAIRMAN - BOS** **CONTROLLER OF EXAMINATIONS**

| NO. OF CREDITS: 5 | COURSE CODE: U21ZO5C7 |
|---|---|

# GOVERNMENT ARTS COLLEGE (AUTONOUMOUS), KARUR - 639005

## B.Sc., ZOOLOGY - V SEMESTER - CORE COURSE - VII

(For the candidates admitted from the year 2021 - 22 onwards)

## ANIMAL PHYSIOLOGY AND BIOCHEMISTRY

**COURSE OBJECTIVES:**

1. To study about Physiology of human beings.
2. To understand the structural and functional aspects of organ systems in human beings.
3. To understand the basic principles of Biochemistry and Metabolism.

| | |
|---|---|
| **UNIT - I** | **Animal Physiology** - Nutrition - types; calorific values; balanced diet, Digestion in man; malnutrition; peptic ulcer; appendicitis; liver cirrhosis - Respiration: Types of Respiratory pigments - structure of hemoglobin, Transportation of gases - Bohr effect and Haldane effect. Circulation: blood Composition; types of heart; origin and conduction of heart beat; blood pressure; coronary blood vessels; myocardial infarction; ECG, angiogram, angioplasty and by-pass surgery. |
| **UNIT - II** | Types of muscles - Ultra structure of striated muscle, Muscle contraction & properties. Coordinating system: Nerve physiology, types of neuron, impulse transmission, synapse, synaptic transmission, reflex action - Nerve disorders - epilepsy, Alzheimer's disease, Parkinson's disease. Receptors - eye, physiology of vision - Eye defects. Structure of ear and mechanism of hearing - Hearing impairments. |
| **UNIT - III** | Excretion - Types and Excretory products - Kidney and Nephron structure - mechanism of urine formation. Osmotic and ionic regulation in fishes. Endocrinology - Endocrine glands in Man - Hypothalamus, Pituitary, Thyroid, Parathyroid- Adrenal, Endocrine pancreas, Testis and Ovary, Pineal body -Structure, secretion and disorders - Mechanism of hormone action (Steroid & Peptide). |
| **UNIT - IV** | **Biochemistry** - Classification, Structure and functions of carbohydrates proteins and lipids; source, functions, and deficiency diseases of vitamins and minerals (Ca, P, K, Mg, Na, Fe and Cu). |
| **UNIT - V** | Metabolism of carbohydrates, proteins and lipids; energy kinetics, structure of ATP and hormonal control of metabolism. Enzymes - Major Types and characteristics, mode of action - theories, factors affecting enzyme action, Enzyme inhibition and types. |

**Text books:**


1. Mariakuttikan, 2005, Animal Physiology, Saras Publications, Nagercoil.
2. Arumugam, 2007, Biochemistry, Saras Publications, Nagercoil.
3. Verma.P.S. and V.K.Agarwal S.1980, Animal Physiology, S.Chand& Co. Ltd. New Delhi.
4. Ambika Shanmugam, 2009, Fundamentals of Biochemistry for medical students, Karthik Printers Chennai.


**Reference books:**


1. Leninger.L, 1990, Biochemistry, W.H. Freeman & co.
2. Hoar, W.S., 1983, General and comparative physiology, Prentice Hall of India.
3. Harper, H.A., 193, Review of Physiological chemistry, Muruen Ascian Ed.
4. Nagabushanam, R., 1991, Animal Physiology, S.Chand & Co.


**CHAIRMAN - BOS** **CONTROLLER OF EXAMINATIONS**

| **Course Outcomes**<br>**On completion of this course the students will be able to** |
|---|
| 1. Understand the physiological process of digestion respiration and circulation and diseases associated with them. |
| 2. Illustrate the structural features of excretory system and perceive the role of hormones. |
| 3. Interpret the association between the nerve coordination and muscle physiology. |
| 4. Comprehend the structure and function of biological chemicals and deficiency diseases. |
| 5. Understand the role of enzymes on metabolism of biochemical compounds. |

| **Nature of Course** | | | |
|---|---|---|---|
| Knowledge and skill | ✓ | Employability oriented | ✓ |
| Skill oriented | | Entrepreneurship oriented | |

**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** | **2** | **2** | **1** | **2** | **2** | **1** | **2** | **3** | **2** | **2** | **1.91** |
| **CO2** | **2** | **2** | **3** | **1** | **2** | **2** | **1** | **2** | **2** | **3** | **3** | **2** | **2.08** |
| **CO3** | **3** | **2** | **1** | **3** | **1** | **1** | **3** | **3** | **3** | **2** | **1** | **3** | **2.16** |
| **CO4** | **1** | **2** | **3** | **3** | **2** | **2** | **2** | **3** | **3** | **2** | **-** | **1** | **2.00** |
| **CO5** | **2** | **2** | **1** | **3** | **2** | **1** | **2** | **3** | **3** | **2** | **-** | **1** | **1.83** |
| **Over all mean score for COs** | | | | | | | | | | | | | **1.99** |

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

**Result: The Matrix score of this Course is 1.99 (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:

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

**COURSE DESIGNER: Dr. N.ILAVARASAN**

**CHAIRMAN - BOS** **CONTROLLER OF EXAMINATIONS**

| NO. OF CREDITS: 4 | COURSE CODE: U21ZO5C8 |
|---|---|

# GOVERNMENT ARTS COLLEGE (AUTONOUMOUS), KARUR - 639005

## B.Sc., ZOOLOGY - V SEMESTER - CORE COURSE - VIII

(For the candidates admitted from the year 2021 - 22 onwards)

## BIOTECHNOLOGY AND MICROBIOLOGY

**COURSE OBJECTIVES:**

1. To know theof concepts of biotechnologyand familiarise with the tools and techniques of Biotechnology
2. To learn about different types beneficial and harmful microbes and the processing of culture.

| | |
|---|---|
| | **BIOTECHNOLOGY** |
| **UNIT - I** | Scope and importance of biotechnology. **Genetic Engineering:** Tools of genetic Engineering - Restriction Enzymes and vectors; Gene cloning - isolation of desired DNA, insertion of DNA into vector, introducing rDNA into host, identification, selection and expression of cloned DNA. Gene manipulation in Eukaryotes - *Agrobacterium* as natural genetic engineer; Transgenic animals - fish. |
| **UNIT - II** | **Fermentation** - fermented construction, types, process of fermentation - upstream and downstream; types of fermenters - solid state, submerged, and semi solid, uses of fermentation; Ethanol production, Applications of biotechnology in industries. Sources, uses and applications of enzymes; Immobilization of enzymes - need, methods, types and uses. |
| **UNIT - III** | **Medical Biotechnology** - Hybridoma technology and uses; Applications of biotechnology in medicine - production of vaccines - gene therapy, forensic medicine (DNA Finger printing). **Bio-fertilizers** - microbes as bio-fertilizers, culture methods, Single Cell Protein, bio-pesticides; **Environmental Biotechnology:** Biodiversity and its conservation, Applications of biotechnology in agriculture and environment. |
| | **MICROBIOLOGY** |
| **UNIT - IV** | **History and scope of microbiology** - General structure of bacteria and virus - Outline classification of each group and identification - Sterilization techniques - **Bacterial culture:** culture media, continuous and batch culture techniques, bacterial growth, bacterial growth curve, staining of bacteria. **Food Microbiology:** food poisoning, food spoilage, food preservation. |
| **UNIT - V** | **Industrial microbiology:** Production of antibiotics with reference to penicillin. **Soil microbiology**: role of soil microbes in Nitrogen fixation. **Medical microbiology:** Bacterial Diseases: cholera, tuberculosis, leprosy, tetanus, plague, anthrax, herpes - Viral Diseases: Jaundice, small pox, AIDS, Poliomyelitis, causative organism, symptoms, impact on the host and control measures. |

**Text books:**


1. Kumaresan V, 2009: Biotechnology Saras Publication Nagercoil.
2. Mani A, Selvaraj.A.M , Narayanan L.M , Arumugam A, Microbiology, Saras Publication, Nagercoil.
3. Verma PS & Agarwal VK Genetic Engineering, S. Chand Publishers, New Delhi.
4. Dubey, F.C., 2005, Biotechnology, s.Chand Company Limited, New Delhi.
5. Ananthanarayanan, R. & C.K.Jayaram Panicker, 1990. Text Book ofMicrobiology, Orient Longman.


**Reference books:**


1. Primrose SB, Twyman R. Principles of gene manipulation and genomics. John Wiley &Sons; 2013 May 28.
2. Pelczar, M.J., Reid, R.D. and Chan. E.C.S, 2002, Microbiology, 5th Ed. Tata McGraw Hill Publishing Co. Ltd., New Delhi.
2. Sharma, P.D., 1998, Microbiology, Rastogi Publications.
3. Ryan KJ, Ray CG, editors. Sherris medical microbiology. McGraw-Hill Education.
4. Dubey, R.C. and Maheswari, D.K., 2005, Text book of Microbiology, S. Chand & Co. New Delhi.
5. Powar,C.B. and Daginawala. H.F., 1982, General Microbiology Volume I &II, Himalayas Publishing House, Mumbai.


**CHAIRMAN - BOS** **CONTROLLER OF EXAMINATIONS**

| **Course Outcomes**<br>**On completion of this course the students will be able to** |
|---|
| 1. Understanding the tools of genetic engineering and their applications of r DNA technology. |
| 2. Explain the types of fermentation and of fermenters and its application for the productions of useful products at large scale. |
| 3. Recognize the values of bio fertilizers, single cell protein and bio pesticides; illustrate biodiversity and its conservation. |
| 4. Generalize the classification, diversity of microorganisms, and different culture media, about food spoilage and food poisoning. |
| 5. Examine the role of microbes are used in various purpose and disease causing microbes. |

| **Nature of Course** | | | |
|---|---|---|---|
| Knowledge and skill | ✓ | Employability oriented | ✓ |
| Skill oriented | | Entrepreneurship oriented | |

**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 | 1 | 2 | 1 | 2 | 1 | 2 | 2 | 2 | 1 | 1.75 |
| CO2 | 3 | 3 | 1 | 2 | 2 | 2 | 3 | 1 | 3 | 2 | 2 | 1 | 2.08 |
| CO3 | 1 | 2 | - | 2 | 2 | 2 | 3 | 2 | - | 2 | 1 | 2 | 1.58 |
| CO4 | 3 | 2 | 1 | 3 | 2 | 2 | 3 | 2 | 3 | 2 | - | 1 | 2.0 |
| CO5 | 2 | - | 2 | 2 | 2 | 1 | 3 | 2 | 3 | 2 | - | 2 | 1.75 |
| Over all mean score for COs | | | | | | | | | | | | | 1.83 |

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

**Result: The Matrix score of this Course is 1.83 (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:

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

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

**CHAIRMAN - BOS** **CONTROLLER OF EXAMINATIONS**

| NO. OF CREDITS: 3 | COURSE CODE: U21ZO5C9 |
|---|---|

# GOVERNMENT ARTS COLLEGE (AUTONOUMOUS), KARUR - 639005

## B.Sc., ZOOLOGY - V SEMESTER - CORE COURSE - IX

(For the candidates admitted from the year 2021 - 22 onwards)

## ORGANIC EVOLUTION

**COURSE OBJECTIVES:**

1. To learn about Evolution of Life on Earth with its age.
2. To study about Evidences and Principles related evolution of life.
3. To know the Species formation and age of earth with organism evolution.

| | |
|---|---|
| **UNIT - I** | Origin of life, Lamarckism Neo-Lamarckism, Darwinism Neo-Darwinism, De Vries theory of mutation - Types of natural selection. Evidences for evolution - Anatomy, Embryological and Biochemical evidences. |
| **UNIT - II** | Types of evolution - Micro evolution - Colouration and Mimicry. Mechanism of Micro evolution - Transient Polymorphism - Industrial Melanism, Balanced Polymorphism - Sickle Cell Anaemia. |
| **UNIT - III** | Macro evolution - Mechanism - Adaptive Radiation in Mammals - Punctuate equilibrium model - Modern synthetic theory of evolution, Neutrality theory, Molecular clock of evolution - Phylogenetic tree. |
| **UNIT - IV** | Evolutionary Significance of Genetic Drift and Hardy-Weinberg principle, Species Concept - Sub Species and Sibling Species, Process of speciation, Continental Drift Hypothesis - Isolating Mechanism - Adaptive radiation in mammals. |
| **UNIT - V** | The Geological Records - Geological Time scale - Extinction - Types and Causes. Fossils and fossilization: Determination of fossil age-carbon dating Living fossils - Definition and examples, Evolution of Man and Horse. |

**Text books:**


1. Verma, P.S. and Agarwal, V.K., 2002, Concept of Evolution, S.Chand and Company Limited, New Delhi.
2. Arumugam, N., 2002, Organic Evolution, Saras Publication, Nagercoil.
3. **Veerbala Rastogi**, 2019Organic Evolution (Evolutionary Biology) Revised, **Kedarnath Ramnath, meerut.**


**Reference books:**


1. Minkoff E.C. 1983, Evolutionary biology, Addision Wesley Publishers.
2. Arora, M.P., 2000, Animal Behaviour, Himalaya Publishing House, Mumbai.
3. Dobzhansky, T., Ayala, F.J., Stebbins, G.L. and Valentine, J.W., 1977, Evolution, W.H.Freeman and Co., San Francisco.
4. Stan field, W.D., 1977, The Science of Evolution, Collier Macmillan, London.
5. Colbert. E.H. 1970, Evolution of the Vertebrates, Wiley Eastern Edn.
6. Kimura, M. 1983. The Neutral Theory of Molecular Evolution. Cambridge: Cambridge Univ. Press.
7. Crow, J. F. 1991. Basic Concepts in Population, Quantitative, and Evolutionary Genetics. New York: W.H.Freeman


**CHAIRMAN - BOS** **CONTROLLER OF EXAMINATIONS**

| **Course Outcomes**<br>**On completion of this course the students will be able to** |
|---|
| 1. Justify the process of evolution with evidences and theories. |
| 2. Interpret and analyse the ecological factors involved in the evolutionary process from micro to mega evolution. |
| 3. Comprehend the principles and perceive the evolutionary process with examples. |
| 4. Quantify the genetic equilibrium using Hardy-Weinberg principle and understand the balance between the speciation and isolation. |
| 5. Illustrate the age of earth and evolution of animals and human at various time scales with fossil Evidences. |

| **Nature of Course** | | | |
|---|---|---|---|
| Knowledge and skill | ✓ | Employability oriented | ✓ |
| Skill oriented | | Entrepreneurship oriented | |

**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** | **2** | **3** | **2** | **2** | **1** | **3** | **2** | **3** | **3** | **2.23** |
| **CO2** | **2** | **1** | **2** | **1** | **2** | **2** | **3** | **2** | **3** | **2** | **2** | **3** | **2.42** |
| **CO3** | **2** | **2** | **1** | **3** | **1** | **1** | **3** | **3** | **3** | **2** | **1** | **2** | **2.14** |
| **CO4** | **1** | **2** | **3** | **3** | **2** | **2** | **3** | **3** | **3** | **3** | **-** | **1** | **2.14** |
| **CO5** | **2** | **1** | **1** | **2** | **2** | **1** | **3** | **3** | **3** | **3** | **-** | **1** | **2.0** |
| **Over all mean score for COs** | | | | | | | | | | | | | **2.19** |

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

**Result: The Matrix score of this Course is 2.19 (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:

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

**COURSE DESINGER: Mr. K.BABU**

**CHAIRMAN - BOS** **CONTROLLER OF EXAMINATIONS**

| NO. OF CREDITS: 4 | COURSE CODE: U21ZO5E1 |
|---|---|

**GOVERNMENT ARTS COLLEGE (AUTONOUMOUS), KARUR - 639005**

**B.Sc., ZOOLOGY - V SEMESTER - ELECTIVE COURSE - I**

(For the candidates admitted from the year 2021-22 onwards)

# POULTRY SCIENCE

**COURSE OBJECTIVES:**

1. To study about commercial poultry layersand their importance
2. To acquire knowledge on themanagement skill for employment.
3. To motivate the students to run their own poultry farm

| | |
|---|---|
| **UNIT - I** | Introduction to poultry science - Poultry Development in India. Nomenclature of breeds of fowl, classification of fowls, selection of breed for poultry. Housing and equipment - General principles of building poultry sheds. Deep litter system and cages system. |
| **UNIT - II** | Brooding and rearing - Selection and care of hatching Eggs. Methods of brooding. Management of Growers, Layers and Broilers - Lighting of chicks, growers, and layers; Summer and winter management. Debeaking methods, Schedule of vaccination. |
| **UNIT - III** | Poultry Nutrition - Feed additives - Names, allowance and usage of food additives - Modern Feed additives for poultry. Feed making machines- Feed for Broiler and Layer. |
| **UNIT - IV** | Short account on cause, symptoms, prevention, control and treatment of viral, bacterial, fungal and parasitical diseases. Disease and Safety control in farms. |
| **UNIT - V** | Nutritive value of egg and Meat, factors affecting egg size, Abnormal Eggs, storage and preservation of surplus eggs. Economics of Poultry industry. |

**Text books:**


1. Banerjee, G.C., 1992, A textbook of animal husbandry, Oxford and IBM Publishing Co., New Delhi.
2. Gnanamani, M.R., 2010, Modern Aspects of Commercial Poultry Keeping, Deepam Publications, Madurai.


**Reference books:**


1. Sunil Kumar Das, 1994, Poultry production, CBC Publishers and Distribution, Delhi.
2. Shukula, G.S. and Upadhyay, V.B., 1997, Economic Zoology, Rakesh Rastogi Publication, Meerut.
3. Indian Poultry Industry year book 1975-76. By Sakuntbak B. Gupta, C-35, New Bactak Road, New Delhi.


**CHAIRMAN - BOS** **CONTROLLER OF EXAMINATIONS**

| **Course Outcomes**<br>**On completion of this course the students will be able to** |
|---|
| 1. Distinguish the different breeds of fowl in Industry and Construct and design the poultry shed and equipment's needed for rearing. |
| 2. Choose the Breeds for Poultry. |
| 3. Understand the feeding schedule and production of feeds with machinery equipment. |
| 4. Identify and assess the damages caused by the diseases and manage the situation with control measures. |
| 5. Analyse the marketing demands for poultry products and meet out the demands. |

| **Nature of Course** | | | |
|---|---|---|---|
| Knowledge and skill | ✓ | Employability oriented | ✓ |
| Skill oriented | ✓ | Entrepreneurship oriented | ✓ |

**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 | 2 | 3 | 3 | 1 | 3 | 1 | 2 | 3 | 1 | 2.16 |
| CO2 | 2 | 2 | 3 | 3 | 2 | 2 | - | 2 | - | 2 | 3 | 1 | 1.83 |
| CO3 | 3 | 2 | 2 | 3 | 2 | - | 1 | 3 | - | 2 | 3 | - | 1.75 |
| CO4 | 3 | 2 | 2 | 3 | 1 | 1 | 3 | 3 | 1 | 3 | 3 | 2 | 2.25 |
| CO5 | 2 | 3 | 2 | 3 | 2 | 1 | - | 3 | - | - | 3 | 1 | 1.66 |
| Over all mean score for COs | | | | | | | | | | | | | 1.8 |

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

**Result: The Matrix score of this Course is 1.8 (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:**

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

**COURSE DESIGNER: Dr. R.BABUNATH**

**CHAIRMAN - BOS** **CONTROLLER OF EXAMINATIONS**

| NO. OF CREDITS: 4 | COURSE CODE: U21ZO5S2 |
|---|---|

# GOVERNMENT ARTS COLLEGE (AUTONOUMOUS), KARUR - 639005

## B.Sc., ZOOLOGY - V SEMESTER -SKILL BASED ELECTIVE - II

(For the candidates admitted from the year 2021-22 onwards)

## MEDICAL LABORATORY TECHNOLOGY

**COURSE OBJECTIVES:**

1. To study about lab maintenance and self-hygiene.
2. To know the protocol of different diagnostic procedures involved in various medical tests.
3. To explore all laboratory skills.

| | |
|---|---|
| **UNIT - I** | CLINICAL LAB MAINTENANCE - Scope - Hygiene and Safety measures for Technicians - lab safety - Cleaning and maintenance of lab equipments and glass wares - First Aid and Introduction to clinical research. |
| **UNIT - II** | CLINICAL BIOCHEMISTRY Blood chemistry - Preservation of blood – Anticoagulants - Analysis of Blood - separation of serum - platelet count and coagulation test-glucose estimation - Lipid profile - (TGL,HDL,LDL) - hemoglobin - Urea, urine sugar, Albumin and creatine analysis. |
| **UNIT - III** | CLINICAL MICROBIOLOGY Disinfection and Sterilization of lab, Culture media preparation - Serial dilution - Isolation of pure culture - antibiotic sensitive test - Types of staining procedure for microbes. |
| **UNIT - IV** | CLINICAL DIAGNOSTICS Diagnostic Pathological techniques - *Entamoeba* – *Plasmodium* - *Ascaris* Tapeworm - *Schistosoma* - *Wuchereria*. Liver and renal function test - Thyroid test - RTPCR for Covid 19 - semen analysis - stool and sputum analysis. |
| **UNIT - V** | CLINICAL IMMUNOLOGY Separation of antibodies - Ag - Ab reactions - Immuno electrophoresis - ELISA - RIA- Widal test - Pregnancy test - Allergy test (Montoux test) -VDRL test. |

**Text books:**


1. Sood Ramnik., 2006, Textbook of Medical Laboratory Technology, Jaypee Brothers Mechical Pulishers Pvt. Ltd.
2. Gaptesatish, 2014, the short textbook of Medical Laboratory for Technicians, Jaypee brothers Medical Pulishers Pvt. Ltd.
3. Sood Ramnik, 2009, Concies book of Medical Laboratory Technology: Methods and Interpretations, Jaypee Brother Medical Publishers Pvt. Ltd.
4. Barbars H Estridage, Anna P.Reynolds, Norma J. Walters., 1999, Basic Mecdical Laboratory Techniques, Edition 4, Publisher: Cengage Learning, New Delhi.
5. R.Pramilaa., 2008 Pocket book on Laboratory Test for Nurses, Jaypee Brothers Medical Pulishers Pvt Ltd.


**Reference books:**


1. Ramakrishnan S, Solchana KN., 2012, Manual of Medical Laboratory Techniques, Jaypee Brothers Medical Publishers Pvt. Ltd.
2. Rashid Najat, SoodRamnik.,2013. Manual of Laboratory safety, Jaypee Brothers Medical Publishers Pvt. Ltd.
3. Barbarah. Estridge & Anna .P. Reynolds 2008. Laboratory techniques in Hematology, Jaypee Brothers Medical Publishers Pvt. Ltd.


**CHAIRMAN - BOS** **CONTROLLER OF EXAMINATIONS**

| **Course Outcomes**<br>**On completion of this course the students will be able to** |
|---|
| 1. Analyse and apply methods for self-hygiene and lab maintenance. |
| 2. Interpret the different diagnostic tests on blood chemistry and asses the health condition. |
| 3. Understand the methods of isolation, culturing and identification of bacteria. |
| 4. Analyse the biological samples for diagnostic purposes. |
| 5. Interpret and explain the clinical immunological techniques related to human health and pregnancy. |

| **Nature of Course** | | | |
|---|---|---|---|
| Knowledge and skill | ✓ | Employability oriented | ✓ |
| Skill oriented | ✓ | Entrepreneurship oriented | ✓ |

**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 | 1 | 2 | 2 | 1 | 3 | 2 | 3 | 2.0 |
| CO2 | 2 | 1 | 2 | - | 3 | - | 3 | 2 | 2 | 3 | 3 | 3 | 2.0 |
| CO3 | 2 | 2 | 2 | 2 | 3 | - | 2 | 2 | 1 | 3 | 3 | 3 | 2.08 |
| CO4 | 3 | 2 | 2 | 1 | 3 | 1 | 2 | 2 | 1 | 3 | 3 | 3 | 2.16 |
| CO5 | 2 | 2 | 2 | - | 3 | - | 3 | 1 | 1 | 2 | 3 | 3 | 1.8 |
| Over all mean score for COs | | | | | | | | | | | | | 2.01 |

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

**Result: The Matrix score of this Course is 2.01 (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:**

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

**COURSE DESIGNER: Dr. S.MOHANRAJ**

**CHAIRMAN - BOS** **CONTROLLER OF EXAMINATIONS**

| NO. OF CREDITS: 4 | COURSE CODE: U21ZO5S3 |
|---|---|

**GOVERNMENT ARTS COLLEGE (AUTONOUMOUS), KARUR - 639005**

**B.Sc., ZOOLOGY - V SEMESTER - SKILL BASED ELECTIVE - III**

(For the candidates admitted from the year 2021 - 22 onwards)

# BIOSTATISTICS & BIOINFORMATICS

**COURSE OBJECTIVES:**

1. To study about the statistical terms and their meaning.
2. To understand the application knowledge over biology.
3. To extend the knowledge and uses of basic bioinformatics software tools and their operations.

| | |
|---|---|
| **UNIT - I** | Data collection - primary and secondary data; Processing the data - classification and tabulation; Organization of data - Individual, Discrete and Continuous Series - Sampling methods. |
| **UNIT - II** | Diagrammatic and Graphical presentation of data - Bar diagram, Pie diagram, Frequency polygon, Frequency curve - Histogram. Measures of central tendency - Mean, Median and Mode. |
| **UNIT - III** | Measures of dispersion - Range, Standard deviation and Variance and Standard error. Correlation - Regression. |
| **UNIT - IV** | Introduction, Biological databases - Primary, Secondary and Composite databases- Structural databases - PDB (Protein Data Bank), SWISPROT, CATH (Class Architecture Topology Homology), SCOP (Structural Classifications of proteins. |
| **UNIT - V** | DNA databases - NCBI, EMBL, DDBJ, Pub Med and GenBank. Human Genome Project. Bioinformatics Tools - BLAST, FASTA, RASMOL, PHYLIP. Sequence Alignment Tool - PAM and BLOSUM. |

**Text books:**


1. Veerabala Rastogi., Edition 3, 2017, Biostatistics, Medtech Publications, New Delhi.
2. Thomas.C. Bartee, 2005, Digital Computer Fundamentals Tata McGraw Hill &Co. New Delhi.
3. Sundaralingam.R, 2008, Bioinformatics, Saras Publications, Nagercoil.


**Reference books:**


1. Gurumani, 2006, Biostatistics, MJP Publishers, Chennai.
2. Zar, J.H., 1974, Biostatistical analysis, Prentice Hall Inc., New Jercy, USA.
3. Balagurusamy, E., 1984, Programming in BASIC, Prentice Hall of India.
4. Rajaraman, V., 1985, Fundamentals of computers, Prentice Hall of India.
5. KaviKishore, Chavali, L.N., 2013, Principles of Biological Databases, Himalayas Publishing House Pvt. Ltd. Mumbai.
6. 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.


**CHAIRMAN - BOS** **CONTROLLER OF EXAMINATIONS**

| **Course Outcomes**<br>**On completion of this course the students will be able to** |
|---|
| 1. Understand the different terms of statistics with collection and organisation of data. |
| 2. Illustrate the data in diagrammatic and graphical methods and their importance. |
| 3. Measure the central tendency and dispersion of data Interpret the data and by using the tools of statistics. |
| 4. Understand the terms and databases of bioinformatics and their importance in biology. |
| 5. Know the applications of various bioinformatics Software's and the Human genome project. |

| **Nature of Course** | | | |
|---|---|---|---|
| Knowledge and skill | ✓ | Employability oriented | ✓ |
| Skill oriented | ✓ | Entrepreneurship oriented | |

**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 | 2 | 3 | 2 | 2 | 1 | 3 | 2 | 3 | 3 | 2.25 |
| CO2 | 2 | 1 | 2 | 1 | 2 | 2 | 3 | 2 | 3 | 2 | 2 | 3 | 2.08 |
| CO3 | 2 | 2 | 1 | 3 | 1 | 1 | 3 | 3 | 3 | 2 | 1 | 2 | 2.0 |
| CO4 | 1 | 2 | 3 | 3 | 2 | 2 | 3 | 3 | 3 | 3 | - | 1 | 2.16 |
| CO5 | 2 | 1 | 1 | 2 | 2 | 1 | 3 | 3 | 3 | 3 | - | 1 | 1.83 |
| Over all mean score for COs | | | | | | | | | | | | | 2.1 |

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

**Result: The Matrix score of this Course is 2.1 (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:

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

**COURSE DESIGNER: Mr. K.BABU**

**CHAIRMAN - BOS** **CONTROLLER OF EXAMINATIONS**

| NO. OF CREDITS: 4 | COURSE CODE: U21ZO6C10P |
|---|---|

# GOVERNMENT ARTS COLLEGE (AUTONOUMOUS), KARUR - 639005

## B.Sc. ZOOLOGY - VI SEMESTER - CORE COURSE - X

(For the candidates admitted from the year 2021 - 22onwards)

## PRACTICAL - III (FOR CC - VII TO IX)

**(Animal Physiology and Biochemistry, Biotechnology and Microbiology & Organic evolution)**

**COURSE OBJECTIVES:**

1. To enumerate the RBC, WBC total count and differential WBC count.
2. To observe and identify the characteristics of the various instruments related to physiology, biochemistry, biotechnology and microbiology.
3. To understand methods of amylase activity, DNA isolation, serial dilution of microorganisms, bacterial mobility, simple and Gram stain of bacteria.
4. To understand the evolutionary importance and relationship of given animals.

| | |
|---|---|
| **I. Physiology and Biochemistry** | **Practical**<br>1. Human salivary Amylase activity in relation to temperature and calculation of $Q_{10}$.<br>2. Enumeration of RBC and WBC<br>3. Differential count of WBC<br>4. Qualitative tests for Protein, Carbohydrate and Lipid<br>5. Qualitative tests for nitrogenous wastes |
| | **Spotters**<br>1) Kymograph, 2) Haemoglobinometer 3) Sphygmomanometer 4) Haemoglobin model 5) pH meter, 6) Colorimeter 7) Spectrophotometer 8) Electrophoresis. |
| **II. Biotechnology and Microbiology** | **Practical**<br>1.Serial Dilution Technique<br>2. Pour Plate Technique<br>3. Observation of Bacterial mobility by hanging drop method<br>4. Simple and Gram staining of Bacteria |
| | **Spotters**<br>1. Transgenic animals: Sheep, Cow & Mouse<br>2. Model of Vectors: $PBR^{322}$, SV40 & Ti Plasmid. 3. PCR, 4. Bacterial Colony Counter, 5. Micropipette, 6. Autoclave 7. Petridish, 8. Inoculation loop. |
| **III. Organic evolution** | **Animals of Evolutionary Significance:**<br>1. Connecting links - *Peripatus, Limulus*<br>2. Colouration - *Chameleon, Lycodon& Krait.*<br>3. Mimicry - *Phyllium*, Stick insect<br>4.Fossils - *Archaeopteryx*, Ammonoid, Nautiloid and Echinoid |

**A record of laboratory work shall be submitted at the time of practical examination.**

**Mark distribution:**

| | | |
|---|---|---|
| 1. Major practical (Physiology and Biochemistry | : | 20 Marks |
| 2. Minor Practical (Biotechnology and Microbiology) | : | 10 Marks |
| 3. Spotters (5x4) Physiology and biochemistry - 1 Biotechnology - 1, Microbiology -1, Evolution -2 | : | 20 Marks |
| 4. Record | : | 10 Marks |
| | **Total**: | **60 Marks** |

**Text book:**

1. A Manual of Practical Zoology.

**Reference books:**

1. Outlines of Zoology - M.Ekambaranatha Ayyar -Viswanathan Publications.
2. A Manual of Zoology, Vol - I & II M.Ekambaranatha Ayyar -Viswanathan Publications.

## Course Outcomes

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

1. Estimate the rate of enzyme activity, enumerate the number of blood cells and analyse the biochemicals qualitatively.
2. Demonstrate the DNA isolation, Serial dilution, simple and Gram staining of microorganisms.
3. Visualize and Interpret characteristics of tools of physiology, biochemistry, biotechnology and microbiology.
4. Perform the statistical calculations of mean, median, mode and standard deviation with biology samples.
5. Identify and analyse the statistical charts and bioinformatic models of biomolecules.

## Nature of Course

| | | | |
|---|---|---|---|
| Knowledge and skill | | Employability oriented | |
| Skill oriented | | Entrepreneurship oriented | |

**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 | 2 | 2 | 2 | 3 | 3 | 2 | 3 | 2 | 3 | 2.41 |
| CO2 | 2 | 3 | 2 | 2 | 2 | 2 | 2 | 3 | 2 | 3 | 2 | 3 | 2.33 |
| CO3 | 2 | 3 | 2 | 2 | 2 | 2 | 2 | 3 | 3 | 2 | 2 | 2 | 2.25 |
| CO4 | 3 | 2 | 2 | 3 | 2 | 2 | 1 | 3 | 3 | 2 | 1 | 2 | 2.16 |
| CO5 | 3 | 2 | 2 | 2 | 1 | 2 | 1 | 2 | 3 | 2 | 1 | 2 | 1.91 |
| Over all mean score for COs | | | | | | | | | | | | | 2.21 |

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

**Result: The Matrix score of this Course is 2.21(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:

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

**CHAIRMAN - BOS** **CONTROLLER OF EXAMINATIONS**

| NO. OF CREDITS: 5 | COURSE CODE: U21ZO6C11P |
|---|---|

# GOVERNMENT ARTS COLLEGE (AUTONOUMOUS), KARUR - 639005

## B.Sc., ZOOLOGY - VI SEMESTER - CORE COURSE - XI

(For the candidates admitted from the year 2021 - 22 onwards)

## PRACTICAL - IV (FOR CC - XII TO XIII)

## (ECOLOGY AND TOXICOLOGY &DEVELOPMENTAL BIOLOGY AND IMMUNOLOGY)

**COURSE OBJECTIVES:**

1. To analyse the quality and toxicity of water samples and interpret the adaptations to various environment.
2. To study and operate the instruments related to environment, animal adaptation with evolutionary principle.
3. Identify thedevelopmental stages of chick embryo, blood group of individuals, Immune organs, visit an ecologically place and study the phenomenon and prepare the report.

| | |
|---|---|
| **Ecology and Toxicology** | **Practical**<br>1. Estimation of Salinity in water samples.<br>2. Estimation of dissolved oxygen in water samples.<br>3. Estimation of Carbonate and bicarbonates water samples.<br>4. Mounting of Zoo Plankton.<br>5. Evaluation of Toxicity of textile/Paper mill effluent through.$LC_{50}$ 96 hr value in Fishes - Demonstration.<br>6. Determination of pH using pH paper and pH meter. |
| | **Adaptation study**<br>1. Animal Association: Mutualism, Commensalism & Parasitism.<br>2. Study of Intertidal (Sandy, Muddy & Rocky) fauna.<br>3. Visit to different habitats for studying the adaptations of animals Educational Tour may be arranged. |
| | **Spotters:**<br>1) Sechi disc 2) Wet and Dry hygrometer 3) Rain gauge<br>4) Six's Maximum- Minimum thermometer 5) Plankton net<br>6) Fortin's Barometer. |
| **Developmental biology and Immunology** | **Practical**<br>1. Chick Blastoderm mounting - Demonstration only.<br>2. ABO blood grouping in human.<br>3. Rh typing in human<br>4. Lymphoid organs of mouse - Demonstration only<br>**Spotters:**<br>1. Examination of prepared microslides: (a) To study Blastula, gastrula & yolk plug stages in frog (b) 24 hours, 48 hours, 72 hours & 96 hours developmental stages in chick.<br>2. Lymphoid organs of mouse-(a) Spleen (b)Thymus, (c) Bone Marrow, (d) Antiserum A,B and D, (e) Ig G Model and (f) Bursa of Fabricius. |

**A record of laboratory work and field visit report shall be submitted at the time of practical Examination.**

1. Major practical (Ecology & Toxicology) : 15 Marks
2. Minor Practical (Developmental biology & Immunology): 10 Marks
3. Spotters (4x5) (Ecology&Toxicology-2 Developmental biology &Immunology - 2) : 20 Marks
4. Field visit report & Record (05 + 10 = 15) : 15 Marks

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**Total : 60 Marks**

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| **Text book:** |
|---|
| 1. A Manual of Practical Zoology |
| **Reference books:** |
| 1. Outlines of Zoology - M.Ekambaranatha Ayyar -Viswanathan Publications.<br>2. A Manual of Zoology, Vol - I & II M.Ekambaranatha Ayyar -Viswanathan Publications. |
| **Course Outcomes**<br>**On completion of this course the students will be able to** |
| 1. Analyse the water samples with handle the different analytical instruments. |
| 2. Identify the structural adaptations of animals in relation to their habitat. |
| 3. Interpret the different developmental stages of chick and frog embryos. |
| 4. Identify and interpret the blood groups with reference to blood transfusion. |
| 5. Collect, organise and interpret the biological samples for project report. |

| **Nature of Course** | | | |
|---|---|---|---|
| Knowledge and skill | | Employability oriented | |
| Skill oriented | | Entrepreneurship oriented | |

**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 | 2 | 3 | 2 | 2 | 1 | 3 | 2 | 3 | 3 | 2.25 |
| CO2 | 2 | 1 | 2 | 1 | 2 | 2 | 3 | 2 | 3 | 2 | 2 | 3 | 2.08 |
| CO3 | 2 | 2 | 1 | 3 | 1 | 1 | 3 | 3 | 3 | 2 | 1 | 2 | 2.0 |
| CO4 | 1 | 2 | 3 | 3 | 2 | 2 | 3 | 3 | 3 | 3 | - | 1 | 2.16 |
| CO5 | 2 | 1 | 1 | 2 | 2 | 1 | 3 | 3 | 3 | 3 | - | 1 | 1.8 |
| **Over all mean score for COs** | | | | | | | | | | | | | 2.05 |

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

**Result: The Matrix score of this Course is 2.05(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:

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

**CHAIRMAN - BOS** **CONTROLLER OF EXAMINATIONS**

| NO. OF CREDITS: 5 | COURSE CODE: U21ZO6C12 |
|---|---|

# GOVERNMENT ARTS COLLEGE (AUTONOUMOUS), KARUR - 639005

## B.Sc., ZOOLOGY - VI SEMESTER -CORE COURSE - XII

(For the candidates admitted from the year 2021 - 22 onwards)

## ECOLOGY AND TOXICOLOGY

**COURSE OBJECTIVES:**

1. To learn about a biotic and biotic factors, types and significance of ecology.
2. To understand the types, components, interactions of the ecosystem.
3. To explore the types and characteristics of the community and population ecology.
4. To know the impact of various types of pollutants and toxicants in biology.

| | |
|---|---|
| | **ECOLOGY** |
| **UNIT - I** | Ecology and Environmental science - definition, scope, branches; a biotic factor - water, soil, temperature and light. Biotic factors - animal relationship - symbiosis, commensalism, mutualism, antagonism, antibiosis, parasitism, predation and competition. |
| **UNIT - II** | Ecosystem - definition, structure and types of ecosystem - forest, desert and pond ecosystem, Components of ecosystem - primary producers - secondary producers - tertiary producers and decomposers, food-chain, food-web, trophic levels, energy flow, pyramid of biomass and pyramid of energy. |
| **UNIT - III** | Community ecology-types, characteristics, stratification of community, community interdependence, Ecotone and Edge effect, Ecological niche, Ecological succession. Population Ecology - definition of population, density, natality, mortality, age distribution, age pyramids, population growth, population equilibrium, biotic potential, regulation of population growth. |
| **UNIT - IV** | Pollution: Introduction and types of pollution Causes, effects and control measures of: - Air pollution, Water pollution, Marine pollution, Noise pollution, Thermal pollution, Nuclear hazards. |
| | **TOXICOLOGY** |
| **UNIT - V** | Toxicology - Scope and importance- Toxicant types - Chronic and acute - Evaluation of toxicity - $LC_{50}$, $LD_{50}$, Antidotes - Biomagnification, biotransformation and Bioaccumulation - Effect of toxic metal, pesticide, teratogen and carcinogen. |

**Text books:**


1. ArumugamN., 2002, Ecology, Saras Publications, Nagercoil.
2. Subramanian M.A., 2004, Toxicology principles and methods.MJP Publishers.


**Reference books:**


1. Odum, E.P., 1971, Fundamentals of Ecology, W.B. Saunders Company, Philadelphia.
2. Clarke, G.L., 1954, Elements of Ecology, John Wiley & Sons, New York.
3. Rastogi, V.B. and M.S. Jayaraj, 1989, Animal Ecology and Distribution of animals, Kedarnath Ramnath.
4. Subramanian.M.A.2004, Toxicology principles and methods.MJP Publishers.
5. Bhattacharya, S., 2011, Environmental Toxicology, Books and Allied Pvt. Ltd., Kokatta.


**CHAIRMAN - BOS** **CONTROLLER OF EXAMINATIONS**

| **Course Outcomes**<br>**On completion of this course the students will be able to** |
|---|
| 1. Distinguish between the biotic and abiotic factors and understand the relationship between them. |
| 2. Illustrate the structure, components and dynamics of ecosystems. |
| 3. Elucidate the characteristics and types of community and population ecology. |
| 4. Execute the strategies to reduce the impact of various types of pollution. |
| 5. Understand and evaluate the effect of toxicants and teratogens. |

| **Nature of Course** | | | |
|---|---|---|---|
| Knowledge and skill | ✓ | Employability oriented | ✓ |
| Skill oriented | | Entrepreneurship oriented | |

**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 | 2 | 3 | 2 | 3 | 1 | 2 | 2 | 2 | 2.41 |
| CO2 | 3 | 3 | 2 | 3 | 2 | 3 | 2 | 3 | 2 | 2 | 2 | 2 | 2.41 |
| CO3 | 3 | 3 | 3 | 2 | 2 | 3 | 2 | 3 | 2 | 2 | 2 | 2 | 2.41 |
| CO4 | 3 | 2 | 3 | 2 | 1 | 2 | 1 | 3 | 2 | 2 | 1 | 2 | 2.0 |
| CO5 | 2 | 2 | 2 | 2 | 1 | 2 | 1 | 2 | 2 | 2 | 1 | 2 | 1.75 |
| **Over all mean score for COs** | | | | | | | | | | | | | 2.19 |

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

**Result: The Matrix score of this Course is 2.19 (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:

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

**COURSE DESIGNER: Dr. R.PRAKASH**

**CHAIRMAN - BOS** **CONTROLLER OF EXAMINATIONS**

| NO. OF CREDITS: 5 | COURSE CODE: U21ZO6C13 |
|---|---|

# GOVERNMENT ARTS COLLEGE (AUTONOUMOUS), KARUR - 639005

## B.Sc., ZOOLOGY - VI SEMESTER - CORE COURSE - XIII

(For the candidates admitted from the year 2021 - 22 onwards)

## DEVELOPMENTAL BIOLOGY AND IMMUNOLOGY

**COURSE OBJECTIVES:**

1. To study about the embryological origin and development of life.
2. To learn about basic immune system and its functions.
3. To understand the Immunological techniques.

| | |
|---|---|
| | **DEVELOPMENTAL BIOLOGY** |
| **UNIT - I** | **Gametes and Gametogenesis:** Structure and types of sperm, egg and egg membranes; Spermatogenesis and spermiogenesis; Oogenesis; growth of Oocyte,Fertilization - External and internal, Parthenogenesis. |
| **UNIT - II** | Parthenogenesis; Cleavage - Planes and Patterns of cleavage, Factors affecting cleavage; Blastulation - types of blastula - Presumptive organ forming areas in frog and chick-fate maps; Gastrulation in frog and chick, Morphogenetic movements - epiboly and emboly. |
| **UNIT - III** | Organogenesis - Development of brain and eye in frog; Organiser concept; Embryonic induction, gradient theory; Regeneration, Nuclear transplantation Foetal membranes in chick, Placentation in mammals; Concept of test tube baby. |
| | **IMMUNOLOGY** |
| **UNIT - IV** | History and scope of immunology, Types of Immunity - Innate - Acquired; Humoral and cell mediated; Lymphoid organs - primary and secondary; Immune response and types - Immune cells - immune cell lineage - Antigens. |
| **UNIT - V** | APCs cells - MHC - B cell and T cell, - Immunoglobulins - structure, types and functions; Antigen - antibody reaction, Immunoelectrophoeresis and ELISA- Immunology of infectious diseases - AIDS. |

**Text books:**


1. ArumugamN., 2002, Embryology, Saras Publications, Nagercoil.
2. Latha P.Madhavee , 2020, A Textbook of Immunology, S.Chand and Company, New Delhi.


**Reference books:**


1. Balinsky, B.I., 1981, an introduction to embryology, W.B. Saunders Company, Philadelphia.
2. Verma, P.S. and V.K.Agarwal, 2005, Chordate Embryology, S.Chand & Co., New Delhi.
3. Nandhini, S. 1994, Immunology Introductory text book, New Age Int (P) Ltd. Publications, New Delhi.
4. Chakravarthy, A.K. 1996, Immunology, Tata McGraw Hill Publishing Co. Ltd., New Delhi.


**CHAIRMAN - BOS** **CONTROLLER OF EXAMINATIONS**

| **Course Outcomes**<br>**On completion of this course the students will be able to** |
|---|
| 1. Acquire an exhaustive knowledge on the stages of Gametogenesis and fertilization. |
| 2. Understand the different patterns of cleavage, gastrulation and morphogenetic movements. |
| 3. Comprehend the concept of organ formation and the processes associated with it. |
| 4. Expand the knowledge about immune organs and cells. |
| 5. Develop the detailed information about the immunity process and tools used in immunology. |

| **Nature of Course** | | | |
|---|---|---|---|
| Knowledge and skill | ✓ | Employability oriented | ✓ |
| Skill oriented | | Entrepreneurship oriented | |

**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 | 2 | 2 | 1 | 2 | 2 | 1 | 3 | 2 | 3 | 3 | 2.08 |
| CO2 | 2 | 2 | 3 | 1 | 2 | 2 | 3 | 2 | 3 | 2 | 2 | 3 | 2.25 |
| CO3 | 3 | 2 | 1 | 3 | 1 | 1 | 3 | 3 | 3 | 2 | 1 | 2 | 2.08 |
| CO4 | 1 | 2 | 3 | 3 | 2 | 2 | 3 | 3 | 3 | 3 | - | 1 | 2.16 |
| CO5 | 2 | 2 | 1 | 3 | 2 | 1 | 3 | 3 | 3 | 3 | - | 1 | 2.0 |
| Over all mean score for COs | | | | | | | | | | | | | 2.11 |

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

**Result: The Matrix score of this Course is 2.11 (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:

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

**COURSE DESIGNER: Mr. K.BABU**

**CHAIRMAN - BOS** **CONTROLLER OF EXAMINATIONS**

| NO. OF CREDITS: 5 | COURSE CODE: U21ZO6E2 |
|---|---|

**GOVERNMENT ARTS COLLEGE (AUTONOUMOUS), KARUR - 639005**

**B.Sc., ZOOLOGY - VI SEMESTER - ELECTIVE COURSE - II**

(For the candidates admitted from the year 2021 - 22 onwards)

# ENTOMOLOGY

**COURSE OBJECTIVES:**

1. To study about unique characteristics of insects and skills to classify up to order level.
2. To learn the application of beneficial insects and the control methods of harmful insects.
3. To be familiar with the integrated pest management practice and its significance.

| | |
|---|---|
| **UNIT - I** | Taxonomy - Basics of insect classification, Classification up to order level - Key characteristics with South Indian examples, External Anatomy of a typical insect - Exoskeleton, Head, Thorax and Abdomen, Metamorphosis of insects, Mouth parts in insects, Types of larvae and pupae. |
| **UNIT - II** | Physiology of insects - Digestive system, Excretory system, Respiratory system, Circulatory system, Nervous system and sense organs, Reproductive system, Endocrine system and pheromones. |
| **UNIT - III** | Classification based on Economic Importance of Insects. Insects relation to Public Health - Mosquito and Housefly; Household insect pests - Termite and Cockroach - Beneficial Insects - Economic Importance of Honeybee, Silkworm and Lac insect; Useful Insects - Insect pollinators, Parasites, Predators and Scavengers. |
| **UNIT - IV** | Pest - Definition, Insect pests of Paddy, Sugarcane, Cotton and Groundnut - damages caused and control measures; Common pests of stored products (Rice weevil and flour beetle) and control measures. |
| **UNIT - V** | Methods and Principles of pest Control - Natural, Mechanical, Physical, Chemical and Biological control methods, Integrated Pest Management. Pest surveillance & forecasting pest outbreak. |

**Text books:**


1. Vasantharaj David, B., 2005, Elements of Economic Entomology, Popular Book Depot, Chennai.
2. Nayar, K.K., T.N. Anathakrishnan and B. Vasantharaj David, General and Applied Entomology


**Reference books:**


1. Ambrose Dunston, P. Insects: Structure, Function and Biodiversity
2. Chapman, R.F., The Insects: Structure and Function
3. Wigglesworth, V.B., Principles of Insect Physiology.
4. Krishnan, N.T., 1993, Economic Entomology, J.J. Publications, Madurai.
5. RamkrishnanAyyar, T.V., 1984, Hand Book of Economic Entomology for South India, International Books and Periodicals Supply Service, New Delhi.


**CHAIRMAN - BOS** **CONTROLLER OF EXAMINATIONS**

| **Course Outcomes**<br>**On completion of this course the students will be able to** |
|---|
| 1. Identify the unique characteristics of insects and classify the insects up to order level. |
| 2. Compare the pattern of organization and different physiological systems of Insects. |
| 3. Evaluate the economic value of insects and their by-products. |
| 4. Assess the damages caused by the insect pest and formulate the suitable control measures. |
| 5. Adopt the integrated pest management practice in fields. |

| **Nature of Course** | | | |
|---|---|---|---|
| Knowledge and skill | ✓ | Employability oriented | ✓ |
| Skill oriented | | Entrepreneurship oriented | |

**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 | 2 | 3 | 3 | 2 | 3 | 1 | 2 | 1 | - | 2.00 |
| CO2 | 2 | 2 | 3 | 3 | 2 | 1 | 3 | - | - | 2 | 2 | 3 | 1.91 |
| CO3 | 3 | 2 | 2 | 3 | 2 | 2 | - | 3 | 2 | 2 | 3 | 2 | 2.16 |
| CO4 | 3 | 2 | 2 | 3 | 1 | 3 | 3 | 3 | 1 | 3 | 3 | 3 | 2.50 |
| CO5 | 2 | 3 | 2 | 3 | 2 | 3 | 1 | 3 | 3 | - | 3 | 1 | 2.16 |
| Over all mean score for COs | | | | | | | | | | | | | 2.14 |

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

**Result: The Matrix score of this Course is 2.14 (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:

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

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

**CHAIRMAN - BOS** **CONTROLLER OF EXAMINATIONS**

| NO. OF CREDITS: 4 | COURSE CODE: U21ZO6E3 |
|---|---|

# GOVERNMENT ARTS COLLEGE (AUTONOUMOUS), KARUR - 639005

## B.Sc., ZOOLOGY - VI SEMESTER - ELECTIVE COURSE - III

(For the candidates admitted from the year 2021 - 22 onwards)

## AQUACULTURE

**COURSE OBJECTIVES:**

1. To know about various cultivable fishes and rearing of fishes.
2. To acquire the skill in the field of fisheries.

| | |
|---|---|
| **UNIT - I** | Aquaculture - History and present status in India, Types of aquaculture, Cultivable species of fishes and their qualities. Types of fish ponds, Culture of Live feed organisms - Rotifers and *Artemia*. |
| **UNIT - II** | Types of cultures - Extensive, semi-intensive and intensive culture,Composite fish culture, integrated fish farming - Carps in inland waters, Site selection, Pond construction, pond preparation. Seaweed culture, culture of prawns, pearl oyster culture. |
| **UNIT - III** | Water Quality Management, Fish feed - feed ingredients, feed formulation.Control of predatory organisms, Pathology - Parasitic infection, Diseases of fishes and prawns and their control measures. |
| **UNIT - IV** | Hypophysation or Induced breeding in carps, Hybrid fish, Transgenic fish, Techniques for hatching and spawning, Seed transport and Stocking. Transport of fry and fingerlings. Government participation in aquaculture - CMFRI, CIFRI, MPEDA, FFDA. |
| **UNIT - V** | Methods of Harvesting - Fishing gears and crafts, Freezing techniques, Canning, Smoking, Fish by - products - fish meal, fish oil and fish pickle. Marketing - Export and Import countries, Quality control. |

**Text books:**


1. ArumugamN., 2008. Aquaculture, Saras Publications, Nagercoil, Tamilnadu.
2. Pillay, T.V.R., Kutty, M.N., 2005. Aquaculture principles and practices, Wiley publications, India.
3. Jayaraman K.C. 2010. The Fresh water fishes of Indian Region - Navendra Publishing House, Delhi.
4. Shanmugam K., 1992. Fishery Biology and Aquaculture, Leo pathipagam,Chennai-83.


**Reference books:**


1. Jhingran, V.G. 1975. Fish and fisheries of India, Hindustan Publications, New Delhi.
2. Quereshi, T.A. and Quereshi, N.A., 1983,Indian Fishes, Publishers Brij Brothers, Sultania Road Bhopal (M.P.).
3. CMFRI, Coastal aquaculture - Marine Prawn culture.
4. Yadav 1995. Fish and Fisheries, Daya Publishing House, New Delhi.
5. Day. F. 1978. Fishes of India, Vol I and II Williams Danison and Sons.
6. Roberts, R.J., 1978. Fish Pathology Ballaire Tridele, London.
7. Khma, 1933 An Introduction to Fishes Central Book Dept, Allahabad.
8. Govindan G.K. Fish processing Technology Oxford IBH publishing Co.


**CHAIRMAN - BOS** **CONTROLLER OF EXAMINATIONS**

## Course Outcomes

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

1. Understand the ideal cultivable fishes and the importance of live feed in aquaculture.
2. Elucidate the types of Culture systems and construction of pond.
3. Manage water quality, feed formulation, and disease control.
4. Apply modern breeding methods and identify the Govt. institutions for aquaculture development.
5. Establish own aqua farm with the knowledge on preservation methods, marketing strategy for fishery products and value added products in aquaculture.

## Nature of Course

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

**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 | 2 | 2 | 1 | 2 | 2 | 2 | 3 | 2 | 3 | 2 | 2.0 |
| CO2 | 2 | 2 | 3 | 1 | 2 | 2 | 3 | 2 | 1 | 2 | 2 | 3 | 2.08 |
| CO3 | 3 | 2 | 1 | 3 | 1 | 1 | 2 | 3 | 1 | 2 | 2 | 2 | 1.91 |
| CO4 | 1 | 2 | 3 | 3 | 2 | 2 | 3 | 2 | 2 | 3 | - | 1 | 2.0 |
| CO5 | 2 | 2 | - | 3 | 2 | 1 | 3 | 3 | 2 | 2 | 2 | 3 | 2.08 |
| Over all mean score for COs | | | | | | | | | | | | | 2.01 |

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

**Result: The Matrix score of this Course is 2.01 (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:

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

**COURSE DESIGNER: Dr. N.ILAVARASAN**

**CHAIRMAN - BOS** **CONTROLLER OF EXAMINATIONS**