KAMARAJ COLLEGE
(AUTONOMOUS)
Accredited with A+ Grade by NAAC
Among Top 150 Colleges in India - NIRF Ranking 2024
இந்து நாடார் சங்கங்களால் 1966-ல் தொடங்கப்பட்ட கல்லூரி
(Affiliated to Manonmaniam Sundaranar University, Tirunelveli)
THOOTHUKUDI - 628 003.

B.Sc., ZOOLOGY

SYLLABUS

(With effect from the academic year 2025 -2026 onwards)

Department Profile

Name of the Programme	B.Sc., Zoology
Programme code	03006
Year of Establishment	1978

Vision:

- Aim to empower students with a deep understanding of the biological sciences, critical thinking skills, and a passion for exploring the wonders of the animal kingdom.

Mission:

- To provide students with a comprehensive education in zoology, emphasizing critical thinking, scientific literacy, and hands-on experience. We aim to inspire students to become informed, engaged, and compassionate citizens, equipped to address the complex challenges facing our planet's biodiversity

College Mail Id	kamarajcoll@gmail.com
College Website	www.kamarajcollege.ac.in

Undergraduate degree programme

1. Introduction

Programme Outcome, Programme Specific Outcomes and Course Outcomes. Students completing this programme can present their core undergraduate discipline clearly and precisely, make abstract ideas precise by formulating them in the language of the specific discipline, describe related ideas from multiple perspectives and explain fundamental concepts. The Zoology program provides a comprehensive understanding of animal biology, preparing students for research, conservation, and wildlife management careers. Completing this programme will also enable the learners to join the teaching profession and enhance their employability for government jobs and jobs in various other public and private enterprises.

Eligibility: Students who have completed +2 courses with Mathematics, Physics, Chemistry and Biology (Or) Physics, Chemistry, Botany and Zoology

Learning Outcomes-Based Curriculum	
Programme:	B.Sc. (Zoology)
Programme Code:	03006
Duration:	3Years (UG)
Programme Outcomes:	
PO1	**Disciplinary knowledge:** Capable of demonstrating Comprehensive knowledge and understanding of one or more Disciplines that form a part of an undergraduate Programme of study
PO2	**Communication Skills:** Ability to express thoughts, ideas, and arguments of others; analyze and synthesize data from a variety of sources; draw valid conclusions and support them with evidence and examples, and address opposing viewpoints.
PO3	**Research and Development:** Design and implement HR systems and practices grounded in research that comply with employment laws, leading the organization towards growth and development.
PO4	**Contributionto the Business World:** To produce employable, ethical, and innovative professionals to sustain in the dynamic business world.

PO5	**Contribution to the Society:** To contribute to the development of the society by collaborating with stake holders for mutual benefit
PO6	**Research-related skills:** A sense of inquiry and capability for asking relevant/appropriate questions, problem arising, synthesizing and articulating; Ability to recognize cause-and-effect relationships, define problems, formulate hypotheses, test hypotheses, analyse, interpret and draw conclusions from data, establish hypotheses, predict cause-and-effect relationships; ability to plan, execute and report the results of an experiment or investigation
PO7	**Cooperation/Teamwork:** Ability to work effectively and respectfully with diverse teams; facilitate cooperative or coordinated effort on the part of a group, and act together as a group or a team in the interests of a common cause and work efficiently as a member of a team
PO8	**Scientific reasoning:** Ability to analyze interpret and conclude quantitative/qualitative data; and critically evaluate ideas, evidence, and experiences from an open-minded and reasoned perspective.

Programme Specific Outcomes

Programme Specific Outcomes On successful completion of the Bachelor of (Zoology) programme, the student should be able to	
PSO1	Placement
PSO2	Entrepreneur
PSO3	Research and development
PSO4	Contribution to Business world
PSO5	Research related skills

Written Examination: Theory Paper (Bloom's Taxonomy based) Question Paper Model

Assessment Pattern

Continuous Internal Assessment (CIA) & End Semester Examination (ESE)

- **CIA: 25**
- **ESE: 75**

Theory Course:

For theory courses, there shall be two tests conducted and the average of the best two can be taken as the Continuous Internal Assessment (CIA). CIA is for 30 marks max and will be converted into 15 marks. The duration of each test shall be 1 Hr.15 mints.

Continuous Internal Assessment (Writing)	15 marks
Assignment (ppt)& Seminar	5 marks
Group Discussion or Viva	5 marks
Total marks	25 marks

For Theory Papers: End Semester Examinations

1.	Part A	10X1=10 Marks (MCQ)
2.	Part B	5 X 5= 25 Marks- Choosing either (a) or (b)
3.	Part C	5X 8=40 Marks-Choosing Either (a) or (b)
	Total marks	75 marks
• The duration of each test shall be 3 hours		

Course Structure for B.Sc., Zoology

(With effect from the academic year 2025 to 2026 onwards)

Semester I	Course Code	Name of the Course	Hours /Week L/P	Credit	Duration of ESE (Hrs.)	Marks Allotted		
						CIA	ESE	Total
Part I	25ULTL11	பொதுத்தமிழ்: இலக்கிய வரலாறு I	**6**	**3**	**3**	**25**	**75**	**100**
Part II	25ULEN11	General English - I	**6**	**3**	**3**	**25**	**75**	**100**
Part III Core I	25UMZO11	Invertebrata	**5**	**4**	**3**	**25**	**75**	**100**
CoreI Lab	25UMZOL1	Invertebrata Lab-I	**3**	**2**	**3**	**40**	**60**	**100**
EC1 Discipline /Generic	25UEBO11	Part III Allied Botany	**4**	**3**	**3**	**25**	**75**	**100**
	25UEBOL1	Elective Allied Botany Lab - I	**2**	**2**	**3**	**40**	**60**	**100**
Part-IV SEC 1	25USZO11	Ornamental Fish Farming and Management	**2**	**2**	**3**	**25**	**75**	**100**
FC	25UFZO11	Introduction to Zoology	**2**	**2**	**3**	**25**	**75**	**100**
		Total	**30**	**21**				

****SEC-Skill Enhancement Course** ****CIA-Continuous Internal Assessment**

****EC–Elective Course** ****ESE-EndSemester Examination**

Laboratory Courses Assessment

CIA - 40 marks

ESE- 60 marks

- Mandatory Record submission, attendance, and class participation.
- Two CIA for 40 marks max, the average of the best two can be taken as the Continuous internal marks.

Invertebrata

<table>
<tr><td>Title Of The Course</td><td colspan="5">Invertebrata</td></tr>
<tr><td>Paper Number</td><td colspan="5">CORE I</td></tr>
<tr><td>Course code</td><td colspan="5">25UMZO11</td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">Core</td><td>Year</td><td>I</td><td rowspan="2">Credits</td><td rowspan="2">4</td></tr>
<tr><td>Semester</td><td>I</td></tr>
<tr><td colspan="2" rowspan="2">Instructional Hours Per week</td><td>Lecture</td><td>Tutorial</td><td>Lab Practice</td><td>Total</td></tr>
<tr><td>5</td><td></td><td>-</td><td>5</td></tr>
<tr><td colspan="2">Pre-requisite</td><td colspan="4">Basic knowledge on classification and taxonomy of Invertebrata</td></tr>
</table>

UNIT: I **15 Hours**

Protozoa:

Introduction to Classification, taxonomy and nomenclature. General characters and classification of Phylum Protozoa up toclasses. Typestudy: Paramecium and Plasmodium - Parasitic protozoans (Entamoeba, Trypanosoma & Leishmania) - Economic importance Nutrition in protozoa-Host-parasitic interactions in Entamoeba and Plasmodium- Locomotion in protozoa.

Porifera: General characters and classification up to Classes. Type study: Sycon-Canal system in sponges. Reproduction in sponges

UNIT: II **15 Hours**

Coelenterata: General characters and classification up to classes – Type study: Obelia – Corals and coral reefs – Economic importance of corals and coral reefs – Platyhelminthes: General characters and classification of up to classes. Type study: Fasciola hepatica (General characters, Digestive system, lifecycle and Parasitic adaptations.

UNIT: III **15 Hours**

Aschelminthes: General characters and classification of up to classes – Type study: Ascaris lumbricoides (Anatomy of Male and female, Life cycle and adaptation to parasitism), Nematode Parasites and Diseases – Wuchereria bancrofti, Parasitic adaptations.

Annelida: General characters and classification up to Classes. Type study: Nereis (digestive system, food and feeding habits and Reproductive system.Metamerism.

	15 Hours
UNIT: IV	**Arthropoda**: General characters and classification of Phylum Arthropoda up to Classes. Detailed study: Penaeus indicus. Affinities of Peripatus – Larval forms in Crustacea. Economic importance of Insects: Insect pests of Agricultural Importance- Pest of Sugarcane. Pest of coconut: The rhinoceros beetle (Oryctes rhinoceros). Principles of Integrated Pest Management. **Insects**: Ants and Termites in Indigenous Knowledge. Use of red ant chutney (Kai Chutney) by tribal communities for medicinal and nutritional value (e.g., Odisha)
	15 Hours
UNIT :V	**Mollusca**: General characters and classification of Phylum Mollusca up to Classes. Detailed study: Pila globose (Anatomy, Digestive and Reproductive) Economic importance of Cephalopods. **Echinodermata**: General characters and classification of Phylum Echinodermata up to Classes. Detailed study: Asterias. Water vascular system in Echinodermata – Larval forms of Echinoderms

Pedagogy:

- Chalk-Talk and Classroom Activities
- PPT& Seminar
- Teaching aids

Extended Professional Component (is a part of internal component only,	Questions related to the above topics, from various competitive examinations UPSC/JAM/TNPSC and others to be solved (To be discussed during the Tutorial hours Not To be included in the External Examination on question paper)
Skills acquired from this course	The students are understanding the functional and systematic morphology of different groups of invertebrates They will learn about the origin of Protozoa, Coelenterata helminths Arthropoda Mollusca and Echinodermata

Recommended Texts:

1. Ekambaranatha Iyyar and T.N. Ananthakrishnan,1995Amanual of Zoology Vol.I (Part 1, 2) S. Viswanathan, Chennai
2. Ganguly, Sinha and Adhikari, 2011. Biology of Animals: Volume I, New Central Book Agency; 3rd revised edition. 1008 pp.
3. Sinha, Chatterjee and Chattopadhyay, 2014. Advanced Practical Zoology, Books & Allied Ltd; 3rd Revised edition, 1 07 0 pp.
4. Lal, S.S, 2016. Practical Zoology Invertebrate, Rastogi Publications
5. Verma, P.S. 2010. A Manual of Practical Zoology: Invertebrates, S Chand, New Delhi

References Books:

1 Barnes, R.S.K., Calow, P.,Olive, P.J.W.,Golding ,D.W.and Spicer, J.I. (2002). The Invertebrates: A New Synthesis, III Edition, Blackwell Science

2 Barnes, R.D. (1982). Invertebrate Zoology,V Edition. Holt Saunders International Edition.

3 Barrington, E.J.W. (1979). Invertebrate Structure and Functions. II Edition, E.L.B.S. and Nelson

4 Boradale, L.A. and Potts, E.A. (1961). Invertebrates: A Manual for the use of Students. Asia Publishing Home.

5 Lal, S.S. 2005. Atext Book of Practical Zoology: Invertebrate, Rastogi, Meerut

Web Resourses:

1 https://nbb.gov.in/

2 https://www.agshoney.com/training.htm

3 https://icar.org.in/

4 https://nisa.icar.gov.in/

5. ttps://www.nationalgeographic.com/animals/invertebrates

Course outcomes CO	On completion of this course, students will be able to	Cognitive level
CO1	To understand the basic concepts of lower animals and observe the structure and functions.	K1
CO2	To illustrate and examine the systematic and functional morphology of various groups of invertebrates.	K2
CO3	To differentiate and classify the various groups of animal modes of life and to estimate the biodiversity	K3
CO4	To compare and distinguish the general and specific characteristics of reproduction in lower animals.	K4
CO5	To infer and integrate the parasite and economic importance of invertebrate animals.	K5

Mapping with Programme Outcomes and Programme Specific Outcomes

CO /PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	3	3	2	3	3	2	3	3
CO2	2	3	3	3	2	3	3	2
CO3	3	3	3	2	3	3	3	2
CO4	3	3	3	3	3	3	3	3
CO5	3	2	3	3	2	3	3	2

S- Strong (3) **M- Medium (2)** **L- Low (1)**

CO /PO	PO1	PO2	PO3	PO4	PO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3

Pedagogy:

•Remember and Understanding–Lower level

•Apply and Analyze– Medium Level

•Evaluate and Create – Strong Level

Major Practicals (Invertebrata)

<table>
<tr><td>Title of the Course</td><td colspan="5">Lab On Invertebrata</td></tr>
<tr><td>Paper Number</td><td colspan="5">Core- Major Practicals- I</td></tr>
<tr><td>Course Code</td><td colspan="5">25UMZOL1</td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">Core</td><td>Year</td><td>I</td><td rowspan="2">Credits</td><td rowspan="2">2</td></tr>
<tr><td>Semester</td><td>I</td></tr>
<tr><td colspan="2" rowspan="2">Instructional Hours Per week</td><td>Lecture</td><td>Tutorial</td><td>Lab Practice</td><td>Total</td></tr>
<tr><td>-</td><td>-</td><td>-</td><td>3</td></tr>
</table>

Learning Objectives	
LO1	To dissect and mount various body parts and to study the various functional detail invertebrates
LO2	To understand the organs, organ system and their functions in lower animals.
LO3	To dissect and mount various body parts and to study the various functional detail chordates
LO4	To identify the different groups of invertebrate animals by observing their external characteristics
LO5	To identify the different groups of Invertebrates to gather adequate knowledge and record.

Unit I: Dissection:

1. Cockroach: Nervous system

Unit II:

2. Cockroach: Digestive system

Unit III Mounting:

3. Mouth Parts – Cockroach
4. Mouth Parts - Honey bee
5. Prawn appendages
6. Earthworm – body setae, penial setae (Demo)

UNIT IV

Spotters: (i). Protozoa: Amoeba, Paramoecium Entamoeba histolytica, Plasmodium vivax (ii). Porifera: Sycon (iii). Coelenterata: Obelia – Colony & Medusa, (iv). Platyhelminthes: Planaria, Fasciola hepatica, Taenia solium, (v). Nemathelminthes: Ascaris (Male & Female), vi). Annelida: Nereis, Chaetopteurs, Trochophore larva (vii). Arthropoda: Scorpion, Sacculina, Limulus, Peripatus, Larvae - Nauplius, Mysis, Zoea,. (viii). Mollusca: Chiton, Pila, Sepia, Loligo, Octopus, (ix). Echinodermata: Asterias, Bipinnaria larva

UNIT V Record / Observation Note (Submission Is Mandatory)

Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)	Questions related to the above topics, from various competitive examinations UPSC /TRB/NET/UGC–CSIR/GATE/TNPSC/others to be solved (To be discussed during the Tutorial hour)
Skills acquired from this course	They will earn about the Dissection of animals and understand the morphology characteristics of Protozoa, Coelenterata helminths Arthropoda Mollusca, and Echinodermata
Recommended Texts	1. Ekambaranatha Iyyar and T.N.Ananthakrishnan,1995 Amanual of Zoology Vol.I (Part 1, 2) S. Viswanathan, Chennai 2. Ganguly, Sinhaand Adhikari, 2011. BiologyofAnimals: VolumeI, New Central Book Agency; 3rd revised edition. 1008 pp. 3. Sinha, Chatterjee and Chattopadhyay, 2014. Advanced Practical Zoology, Books & Allied Ltd; 3rd Revised edition, 1 07 0 pp. 4. Lal, S.S, 2016. Practical Zoology Invertebrate, Rastogi Publications.5 5. Verma, P.S.2010.A Manual of Practical Zoology: Invertebates,S Chand, New Delh1

Reference Books	1. Barnes, R.S.K., Calow, P., Olive, P.J.W., Golding, D.W. and Spicer, J.I. (2002).TheInvertebrates:ANewSynthesis,IIIEdition,BlackwellScience 2 Barnes, R.D. (1982). Invertebrate Zoology,V Edition. Holt Saunders International Edition. 3 Barrington, E.J.W.(1979). Invertebrate Structure and Functions.II Edition, E.L.B.S. and Nelson 4 Boradale, L.A.and Potts,E.A.(1961). Invertebrates:A Manual for the use of Students. Asia Publishing Home. 5 Lal, S.S. 2005. Atext Book of Practical Zoology: Invertebrate, Rastogi, Meeru
Web sources	1.https://nbb.gov.in/ 2 https://www.agshoney.com/training.htm20 3 https://icar.org.in/ 4 https://nisa.icar.gov.in/ 5 https://www.nationalgeographic.com/animals/invertebrates

Course outcomes: CO	On completion of this course, the students will be able to	Cognitive Level
CO1	Identify and label the external features of different groups of invertebrate animals.	**K1**
CO2	Illustrate and examine the nervous system and reproductive system of invertebrate animals.	**K2**
CO3	Differentiate and compare the structure, function and mode of life of various groups of animals.	**K3**
CO4	Compare and distinguish the dissected internal organs of lower animals.	**K4**
CO5	Prepare and develop the mounting procedure of economically important invertebrates.	

Mapping with Programme Out Comes and Programme Specific Outcome

CO /PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	3	3	2	3	3	2	3	3
CO2	2	3	3	3	2	3	3	2
CO3	3	3	3	2	3	3	3	2
CO4	3	3	3	3	3	3	3	3

S-Strong (3) **M-Medium (2)** **L-Low (1)**

CO /PO	PO1	PO2	PO3	PO4	PO5
CO1	**3**	**3**	**3**	**3**	**3**
CO2	**3**	**3**	**3**	**3**	**3**
CO3	**3**	**3**	**3**	**3**	**3**
CO4	**3**	**3**	**3**	**3**	**3**

Pedagogy:

- Chalk-Talk and Classroom Activities
- PPT& Seminar
- Teaching aids

Ornamental Fish Farming and Management

<table>
<tr><td colspan="2">Title Of The Course</td><td colspan="4">Ornamental Fish Farming And Management</td></tr>
<tr><td colspan="2">Paper Number</td><td colspan="4">1</td></tr>
<tr><td colspan="2">Subject code</td><td colspan="4">25UMZOL1</td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">SEC</td><td>Year</td><td>I</td><td rowspan="2">Credits</td><td rowspan="2">2</td></tr>
<tr><td>Semester</td><td>I</td></tr>
<tr><td colspan="2" rowspan="2">Instructional Hours
Per week</td><td>Lecture</td><td>Tutorial</td><td>Lab Practice</td><td>Total</td></tr>
<tr><td>2</td><td>-</td><td>-</td><td></td></tr>
<tr><td colspan="6">Learning Objectives</td></tr>
<tr><td>LO1</td><td colspan="5">To gain comprehensive knowledge about the biology, breeding, and care of various Ornamental fish species</td></tr>
<tr><td>LO2</td><td colspan="5">To understand proper aquarium setup and maintenance, identify and manage
common fish diseases,</td></tr>
<tr><td>LO3</td><td colspan="5">Acquiring practical skills in breeding techniques</td></tr>
<tr><td>LO4</td><td colspan="5">To develop the ability to optimize water quality parameters for optimal fish health and vibrant coloration,</td></tr>
<tr><td>LO5</td><td colspan="5">The goal of successfully cultivating ornamental fish for aesthetic purposes and potential commercial applications</td></tr>
</table>

UNIT: 1 **6 Hours**

Introduction to ornamental fish keeping: Scope and importance of ornamental fish culture. Identification of commercially important ornamental fishes – Indigenous and exotic varieties.

UNIT:2 **6 Hours**

Biology of egg layers and live bearers: Breeding, hatchery and nursery management of egg layers (eg. Goldfish) and live bearers (eg.Guppy).

UNIT:3 **6 Hours**

Aquarium plants and their propagation: Food and feeding in ornamental fishes;

formulated feed and Live feed; live feed culture; identification of locally available live feed organisms

UNIT:4 **6 Hours**

Aquarium design and construction: Accessories – aerators, filters and lighting

Maintenance of aquarium and water quality management. Ornamental fish diseases, their prevention, control and treatment methods.

Conditioning, packing, transport and quarantine methods. Economics, trade regulations, domestic and global export potential and marketing strategies

UNIT:5 **6 Hours**

Aquarium Culture and Ayurvedic Influence:

Aesthetic and therapeutic benefits: The concept of maintaining a peaceful and harmonious home (similar to modern aquarium therapy) as part of mental well-being and calmness, deeply ingrained in Indian philosophy.

Pedagogy:

- Chalk-Talk and Classroom Activities
- PPT& Seminar
- Teaching aids

Extended Professional Component (is a part of internal component only, Nottobe included in the External Examination question paper)	Questions related to the above topics, from various competitive examinations UPSC /TRB/NET/UGC–CSIR/GATE/TNPSC /othersto be solved (To be discussed during the Tutorial hour)
Skillsacquired from this course	Importance for their aesthetic values asahob by andasa source of income and identification, culture and maintenance of commercially important ornamental fishes.
Recommended Texts	1. SK., Sarangi N.and Ayyappan S.(2010). Ornamental fishfarming. ICAR, New Delhi. 2, Living Jewels–Ahand book on fresh water ornamentalfish, (1999) MPEDA, Kochi.
Referencebooks:	1. DeyV.K.A. (1997). Ahand book onaqua farming ornamental fishes.MPEDA, Kochi. 2,. Ahilan, B., Felix N. and Santhanam R.(2008),Text book of aquariculture.Daya Publishing House, New Delhi

Web Resources	1.http://ecoursesonline.iasri.res.in/course/view.php?id=297 2.https://www.ofish.org/ 3.https://krishijagran.com/agripedia/income-generation-by-ornamental-fish-4.culture/ https://99businessideas.com/ornamental-fish-farming

Course outcomes: CO	On completion of this course, the students will be able to	Cognitive Level
CO1	To understand scope and importance of ornamental fishes	**K1**
CO2	To understand and able to distinguish the egglayers and live bearer	**K2**
CO3	To prepare the fishfeed formulation	**K3**
CO4	To know about the Construction of Aquarium	**K4**
CO5	To understand the export and marketing strategies	**K5**

Mapping with Programme Out Comes and Programme Specific Outcome

CO /PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	3	3	2	3	3	2	3	3
CO2	2	3	3	3	2	3	3	2
CO3	3	3	3	2	3	3	3	2
CO4	3	3	3	3	3	3	3	3
CO5	3	2	3	3	2	3	3	2

S-Strong (3) **M-Medium (2)** **L-Low (1)**

CO /PO	PO1	PO2	PO3	PO4	PO5
CO1	**3**	**3**	**3**	**3**	**3**
CO2	**3**	**3**	**3**	**3**	**3**
CO3	**3**	**3**	**3**	**3**	**3**
CO4	**3**	**3**	**3**	**3**	**3**
CO5	**3**	**3**	**3**	**3**	**3**

Pedagogy:

- Chalk-Talk and Classroom Activities
- PPT& Seminar
- Teaching aids

Introduction to Zoology

<table>
<tr><td colspan="2">Title Of The Course</td><td colspan="4">Introduction to Zoology</td></tr>
<tr><td colspan="2">Paper Number</td><td colspan="4"></td></tr>
<tr><td colspan="2">Subject code</td><td colspan="4">25UFZO11</td></tr>
<tr><td rowspan="2">Category</td><td>Foundation</td><td>Year</td><td>I</td><td rowspan="2">Credits</td><td rowspan="2">2</td></tr>
<tr><td>course</td><td>Semester</td><td>I</td></tr>
<tr><td colspan="2" rowspan="2">Instructional Hours
Per week</td><td>Lecture</td><td>Tutorial</td><td>Lab Practice</td><td>Total</td></tr>
<tr><td>2</td><td>-</td><td>-</td><td>2</td></tr>
<tr><td colspan="6">Learning Objectives</td></tr>
<tr><td colspan="2">LO1</td><td colspan="4">To Know the different types of animals in the animal kingdom.</td></tr>
<tr><td colspan="2">LO2</td><td colspan="4">To gain knowledge of the various branches of biology.</td></tr>
<tr><td colspan="2">LO3</td><td colspan="4">To attain knowledge on livestock development in India and its prospects</td></tr>
<tr><td colspan="2">LO4</td><td colspan="4">To know the cycle of physiology and biochemistry</td></tr>
<tr><td colspan="2">LO5</td><td colspan="4">To develop the entrepreneurial course in Zoology</td></tr>
</table>

Contents

UNIT :1 **6 Hours**

Animal Biodiversity and Systematics:

Taxonomic hierarchy: Classification of animal kingdom- Two kingdoms and Five kingdom classification- Binomial nomenclature- Different phyla of animal kingdom – Salient features of Invertebrates and Chordates with examples.

Role of Animals in Ayurvedic Medicine:

Animal Products in Healing: Ayurveda, the ancient Indian system of medicine, utilizes animal products (cow **urine**, and **milk** for therapeutic purposes)

UNIT:2 **6 Hours**

Cell Biology & Genetics:

Ultrastructure of a Prokaryotic and Eukaryotic cell- importance of cell organelles. General Account on Mendelism and inheritance- DNA and RNA.

UNIT:3 **6 Hours**

Biochemistry and Physiology: Introduction to the role of essential biological compounds Proteins, Carbohydrates, Lipids, Water and Vitamins. Introduction to organ system of vital physiological functions.

UNIT:4 **6 Hours**

Environmental Biology: Basics of atmosphere and its strata- habitats- concept and components of ecosystem. Developmental Biology: General account of gametogenesis fertilization and developmental stages. Evolution: Origin of life - Darwinism- Modern synthetic theory.

UNIT:5 **6 Hours**

Entrepreneurial Courses in Zoology: General introduction and applications: Aquaculture - Aquarium keeping - Apiculture - Sericulture - Lac culture – Vermiculture - Poultry keeping Dairy farming- Biotechnology-Ecotourism.

Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)	Questions related to the above topics, from various competitive examinations UPSC/TRB/NET/UGC–CSIR/GATE/TNPSC/others to be solved (To be discussed during the Tutorial hour)
Skills acquired from this course	The students are understanding the different types of animals in the animal kingdom, knowledge of the various branches of biology.
Recommended Texts	1. Shukla, G.S. & Upadhyay, V.B. (2014). Applied and Economic Zoology, Rastogi Publications. 1 2, Cherian M.C. & Ramachandran, (1952), Beekeepingin South India – Govt. Press, Chennai. 3. Johnson and Jeyachandra, (2000), Apiculture–, Marthandam, TamilNadu. 4. Kesary, M and M. Johnson, (1998), Sericulture, Depart ment of Zoology, N.M... Christian College, Marthandam. 5. Ganga. G, (2019), Introduction to Sericulture, Oxford and IBH Publishing14. Jhingaran, V.G., (1997), Fish and Fisheries of India, Hindustan Publishing Corporation (India)..

Reference books:	1. Ekambaranatha Iyer, (2000), AManual of Zoology, 10th edition, Viswanathan, S., Printers & Publishers Pvt Ltd 2. Jordan, E.L. and Verma P.S, (1995), Invertebrate Zoology,12th edn.S. Chand &Co. 3. Kotpal, R.L. (2019), Modern text book of Zoology: Invertebrates. Rastogi Publication, New Delhi. 4. Kotpal (2015). ModernText book of Zoology Vertebrates, Rastogipublishers, New Delhi. 5. H.C, Nigam.(2010), Biology of Chordates.,Vishal Publications, NewDelhi 6. Gupta. P.K., (2017),Cell and Molecular Biology, Fifth Revised Edition, Rastogi Publication, Meerut, India. 7. Singh. H.R, & Neeraj Kumar (2017), Animal Physiology and Biochemistry, Vishal Publishing Co.

Web Resources	1. http//lib.mylibrary.com/Open.aspx?id=463009 2. http://globalacademicgroup.com...pdf 3. http://tbmicollege.ac.in>gallery 4. http://www.researchgate.net>3473

Course outcomes: CO	**On completion of this course, the students will be able to**	**Cognitive Level**
CO1	To understand the Animal Biodiversity and Systematic	**K1**
CO2	To understand and able to distinguish the Cell Biology & Genetics:	**K2**
CO3	To understand the Biochemistryand Physiology	**K3**
CO4	To know about the Environmental Biology:	**K4**
CO5	To understand the Entrepreneurial Coursesin Zoology	**K5**

Mapping with Programme Outcomes and Programme Specific Outcome

CO /PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	3	3	2	3	3	2	3	3
CO2	2	3	3	3	2	3	3	2
CO3	3	3	3	2	3	3	3	2
CO4	3	3	3	3	3	3	3	3
CO5	3	2	3	3	2	3	3	2

S-Strong (3) **M-Medium (2)** **L-Low (1)**

CO /PO	PO1	PO2	PO3	PO4	PO5
CO1	**3**	**3**	**3**	**3**	**3**
CO2	**3**	**3**	**3**	**3**	**3**
CO3	**3**	**3**	**3**	**3**	**3**
CO4	**3**	**3**	**3**	**3**	**3**
CO5	**3**	**3**	**3**	**3**	**3**

Pedagogy:

- Chalk-Talk and Classroom Activities
- PPT& Seminar
- Teaching aids

Allied Zoology -I

<table>
<tr><td>Title of the Course</td><td colspan="7">Allied Zoology -I</td></tr>
<tr><td>Paper Number</td><td colspan="7">Elective</td></tr>
<tr><td>Subject code</td><td colspan="7">25UEB011</td></tr>
<tr><td rowspan="2">Category</td><td>Core</td><td>Year</td><td>I</td><td rowspan="2">Credits</td><td rowspan="2">3</td><td rowspan="2">Course Code</td><td rowspan="2">EC1</td></tr>
<tr><td></td><td>Semester</td><td>I</td></tr>
<tr><td colspan="2" rowspan="2">Instructional Hours Per week</td><td>Lecture</td><td>Tutorial</td><td>Lab Practice</td><td colspan="3">Total</td></tr>
<tr><td>4</td><td></td><td></td><td colspan="3">4</td></tr>
<tr><td colspan="8">Learning Objectives</td></tr>
<tr><td>CO1</td><td colspan="7">To acquire a basic knowledge of diversity and organization of Protozoa, Coelenterata, Helminthes and Annelida</td></tr>
<tr><td>CO2</td><td colspan="7">To acquire a basic knowledge of diversity and organization of Arthropoda, Mollusca and Echinodermata</td></tr>
<tr><td>CO3</td><td colspan="7">To comprehend the taxonomic position and diversity among Protochordata, Pisces and Amphibia</td></tr>
<tr><td>CO4</td><td colspan="7">To comprehend the taxonomic position and diversity among Reptilia, Aves and Mammalia</td></tr>
<tr><td>CO5</td><td colspan="7">To acquire detailed knowledge of select invertebrate and chordate forms</td></tr>
</table>

UNIT: 1 **12 Hours**

Diversity of Invertebrates–I Principles of taxonomy. Criteria for classification–Symmetry and Coelom–Binomial Nomenclature. Classification of Protozoa, Coelenterata, Helminthes and Annelida upto classes with two examples.

UNIT: 2 **12 Hours**

Diversity of Invertebrates–II Classification of Arthropoda, Mollusca and Echinodermata upto class level with examples

UNIT: 3 **12 Hours**

Diversity of Chordates–I Classification of Prochordata, Pisces and Amphibia upto orders giving two examples

UNIT: 4 **12 Hours**

Diversity of Chordates–II Classification of Reptilia, Aves and Mammalia up to orders giving two examples

UNIT: 5 **12 Hours**

Animal organization Structure and organization of (i) Earthworm (ii) Rabbit (iii) Prawn

Pedagogy:

- Chalk-Talk and Classroom Activities
- PPT& Seminar
- Teaching aids

Textbooks

1 Ekambaranatha Iyer, 2000. A Manual of Zoology, 10th edition, Viswanathan, S., Printers & Publishers Pvt Ltd

2 Jordan, E.L. and Verma P.S, 1995. Invertebrate Zoology, 12th edn. S. Chand& Co. 3 Kotpal, R.L, 1992. Protozoa, Porifera, Coelenterata, Annelida, Arthropoda, Mollusca, Echinodermata.

Reference Books

1. Ruppert and Barnes, R.D. (2006). Invertebrate Zoology, VIII Edition. Holt Saunders International Edition.

2 Barnes, R.S.K., Calow, P., Olive, P.J.W., Golding, D.W. and Spicer, J.I. (2002). The Invertebrates: A New Synthesis, III Edition, Blackwell Science

3. Barrington, E.J.W. (1979). Invertebrate Structure and Functions, II Edition, E.L.B.S. and Nelson

4. Hyman L.H, 1955. The invertebrates - Vol. I to Vol. VII – Mc Graw Hill Book Co.

5. Parker, J. and Haswell, 1978. A text book of Zoology Vol. I - Williams and WilliamsCourse

Web Resources

1. https://www.nationalgeographic.com/animals/invertebrates/
2. https://www.britannica.com/science/parasitic-disease
3. https://www.nio.res.in/
4. https://greatbarrierreef.org

Learning Outcomes

Course outcomes: CO	On completion of this course, the students will be able to	Cognitive Level
CO1	Recall the characteristic features invertebrates and chordates	**K3**
CO2	Classify invertebrates up to class level and chordates up to order level	**K3**
CO3	Explain and discuss the structural and functional organisation of some invertebrates and chordates	**K3**
CO4	Relate the adaptations and habits of animals to their habita	**K3**
CO5	Analyse the taxonomic position of animals	**K3**

Mapping with Programme Out Comes and Programme Specific Outcome

CO /PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	3	3	2	3	3	2	3	3
CO2	2	3	3	3	2	3	3	2
CO3	3	3	3	2	3	3	3	2
CO4	3	3	3	3	3	3	3	3
CO5	3	2	3	3	2	3	3	2

S-Strong (3) **M-Medium (2)** **L-Low (1)**

CO /PO	PO1	PO2	PO3	PO4	PO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3

Pedagogy:

- Chalk-Talk and Classroom Activities
- PPT& Seminar
- Teaching aids

Lab on Allied Zoology -I

<table>
<tr><td>Title of the Course</td><td colspan="7">Lab on Allied Zoology -I</td></tr>
<tr><td>Paper Number</td><td colspan="7">Elective</td></tr>
<tr><td>Subject code</td><td colspan="7">25UEBOL1</td></tr>
<tr><td rowspan="2">Category</td><td>Core</td><td>Year</td><td>I</td><td rowspan="2">Credits</td><td rowspan="2">2</td><td rowspan="2">Course Code</td><td rowspan="2">EC2</td></tr>
<tr><td></td><td>Semester</td><td>I</td></tr>
<tr><td rowspan="2">Instructional Hours Per week</td><td colspan="2">Lecture</td><td>Tutorial</td><td>Lab Practice</td><td colspan="3">Total</td></tr>
<tr><td colspan="2"></td><td></td><td>2</td><td colspan="3">2</td></tr>
</table>

Unit	Contents
I	**Dissection:** 1. Cockroach – digestive system 2. Cockroach – nervous system 3. Fish – digestive system (sardine or any other fish)
II	**Mounting: 1**. Mouth Parts – Cockroach 2. Mouth Parts – Mosquito/ Honey bee 3. Scales– Placoid, Cycloid and Ctenoid 4. Prawn appendages
III	**Spotters:** Paramecium, Plasmodium, Scypha, Leucosolenia, Corals. Taenia solium –entire, Ascaris male and female. Earthworm, Prawn ,Scorpion, Pila, Starfish, Amphioxus, Shark, Frog, Calotes, Pigeon feather and Rabbit
IV	Field visit – Study of fauna on the campus
V	Record / Observation Note (Submission Is Mandatory)

Textbooks

1. Ekambaranatha Iyyar and T. N. Ananthakrishnan, 1995 A manual of Zoology Vol.I (Part 1, 2) S. Viswanathan, Chennai

2. Ganguly, Sinha and Adhikari, 2011. Biology of Animals: Volume I, New Central Book Agency; 3rd revised edition. 1008 pp.

3. Sinha, Chatterjee and Chattopadhyay, 2014. Advanced Practical Zoology, Books & Allied Ltd; 3rd Revised edition, 1 07 0 pp.

4. Lal, S. S, 2016. Practical Zoology Invertebrate, Rastogi Publications.

5. Verma, P. S. 2010. A Manual of Practical Zoology: Invertebates, S Chand, New Delhi

6. Lal S S, (2009). Practical Zoology Vertebrate, Rajpal and Sons Publishing

Reference Books

1, Barnes, R.S.K., Calow, P., Olive, P.J.W., Golding, D.W. and Spicer, J.I. (2002). The Invertebrates: A New Synthesis, III Edition, Blackwell Science

2 Barnes, R.D. (1982). Invertebrate Zoology, V Edition. Holt Saunders International Edition.

3 Barrington, E.J.W. (1979). Invertebrate Structure and Functions. II Edition, E.L.B.S. and Nelson

4 Boradale, L.A. and Potts, E.A. (1961). Invertebrates: A Manual for the use of Students. Asia Publishing Home

6 Lal, S.S. 2005. A text Book of Practical Zoology: Invertebrate, Rastogi, Meeru

Web Resources

1. https://nbb.gov.in/
2. https://www.agshoney.com/training.htm
3. https://icar.org.in/
4. http://www.csrtimys.res.in/
5. http://csb.gov.in/
6. https://nisa.icar.gov.in/
7. https://www.nationalgeographic.com/animals/invertebrates/

Learning Outcomes

Course outcomes: CO	On completion of this course, the students will be able to	Cognitive Level
CO1	Compare and distinguish the dissected internal organs of lower and higher animals	**K3**
CO2	Prepare and develop the mounting procedure of important invertebrate and chordate anatomical parts and to appreciate the structure, function and mode of life	**K3**
CO3	Identify and label the external features of different groups of invertebrate animals	**K3**

Mapping with Programme Out Comes and Programme Specific Outcome

CO /PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	3	3	2	3	3	2	3	3
CO2	2	3	3	3	2	3	3	2
CO3	3	3	3	2	3	3	3	2

S-Strong (3) **M-Medium (2)** **L-Low (1)**

CO /PO	PO1	PO2	PO3	PO4	PO5
CO1	**3**	**3**	**3**	**3**	**3**
CO2	**3**	**3**	**3**	**3**	**3**
CO3	**3**	**3**	**3**	**3**	**3**

Pedagogy:

- Chalk-Talk and Classroom Activities
- PPT& Seminar
- Teaching aids

Blue Print – End Semester Examinations Semester – I

Class: U.G. /P.G. Time: 3 Hours Max. Marks: 75

Section A **(10 x 1 = 10)**

Answer all questions.
Choose the correct answer. (With four options)

	Unit I	Unit II	Unit III	Unit IV	Unit V
Question Nos.	1 & 2	3 & 4	5 & 6	7 & 8	9 & 10

Section B **(5 x 5 = 25)**

Answer all questions choosing either (a) or (b).
Answer should not exceed 250 words

	Unit I	Unit II	Unit III	Unit IV	Unit V
Question Nos.	11 (a) & 11 (b)	12 (a) & 12 (b)	13 (a) & 13 (b)	14 (a) & 14 (b)	15 (a) & 15 (b)

Section C **(5 x 8 = 40)**

Answer all questions choosing either (a) or (b).
Answer should not exceed 500 words

	Unit I	Unit II	Unit III	Unit IV	Unit V
Question Nos.	16 (a) & 16 (b)	17 (a) & 17 (b)	18 (a) & 18 (b)	19 (a) & 19 (b)	20 (a) & 20 (b)