**B.Sc., Zoology**

Syllabus

AFFILIATED COLLEGES

**Program Code:22F**

**2025-26 2026 onwards**



**BHARATHIAR UNIVERSITY**

**(A State University, Accredited with “A” Grade by NAAC, Ranked 13th among Indian Universities by MHRD-NIRF,**

**World Ranking: Times -801-1000,Shanghai -901-1000, URAP - 982)**

**Coimbatore - 641 046, Tamil Nadu, India**

# PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

|  |  |
| --- | --- |
| **PROGRAM EDUCATIONAL OBJECTIVES (PEOs)** | |
| The **B. Sc. Zoology** program describe accomplishments that graduates are expected to attain  within five to seven years after graduation | |
| **PEO1** | To enhance the professional skills by means of continuous education and  development. |
| **PEO2** | To impart complex technical knowledge relating to Zoology in a clear and concise manner in writing and oral skills. |
| **PEO3** | To make the graduates capable of using computers and appropriate software for analysis and employing modern tools in biological observations. |
| **PEO4** | To enable the graduates, recognize the need and apply their knowledge in general and various disciplines. |
| **PEO5** | To help the students pursue lifelong learning and constant improvement of their knowledge and skills in the diverse field with the high professional and ethical standards. |
| **PEO6** | Attain skill to function in multidisciplinary environment to meet desired needs within  realistic constraints such as environmental, social, ethical, health, safety, and sustainability. |
| **PEO7** | To help them understand the local, National and global issues related to the development and to be considerate on the impact of the issues. |
| **PEO8** | To exhibit the ability to communicate effectively and to function successfully as a  team member and leader. |
| **PEO9** | To explore and assess research work on the field of emergencies and diversity particularly in the field of the Public Health aspects. |
| **PEO10** | Capacity to analyze and communicate in order to formulate strategies for mitigation in future scenarios with the ability to clearly present and derive conclusions. |

**PROGRAM SPECIFIC OUTCOMES (PSOs)**

|  |  |
| --- | --- |
| **PROGRAM SPECIFIC OUTCOMES (PSOs)** | |
| After the successful completion of B.Sc., Zoology program, the students are expected | |
| **PSO1** | To provide knowledge of various animals from primitive to highly evolved forms. |
| **PSO2** | To understand prospective of various branches of Zoology and analyze the  interaction between animals with their ecosystems. |
| **PSO3** | To understand the morphology and functional characteristic at cellular and sub-  cellular (molecular) level. |
| **PSO4** | To equip students with laboratory skills as well as field based studies to make a  successful career in Zoology. |
| **PSO5** | To highlight importance of biodiversity and create awareness about methods of conservation and sustainability. |
| **PSO6** | To understand the applications of Zoology in daily life, Medicine, Apiculture,  Aquaculture, Industrial Microbiology and Agriculture. |
| **PSO7** | To gain knowledge about problem solving methods, effective communication skills and prepare the students to pursue higher studies and find employment in different sectors. |
| **PSO8** | To ensure quality performance, achieve excellence in education and  research in the field of Zoology. |

**PROGRAM OUTCOMES (POs)**

|  |  |
| --- | --- |
| **PROGRAM OUTCOMES (POs)** | |
| On successful completion of the B. Sc. Zoology program the student will be able to: | |
| **PO1** | Study animals of diverse phyla, their distribution and association with the surroundings. |
| **PO2** | Gain information and skill in the fundamentals of animal sciences and  understand the multifarious connections with different living organisms. |
| **PO3** | Achieve knowledge on internal structure of cell, its functions and various metabolic functions of organisms to correlate the physiological, biochemical processes of animals and relationship of organ systems. |
| **PO4** | Gain knowledge and awareness about biodiversity as well as the importance of protection of endangered species. |
| **PO5** | Understand the complex evolutionary processes and behavioral pattern of different  animals. |
| **PO6** | Understand the environmental conservation processes, pollution control methods and its importance. |
| **PO7** | Achieve knowledge in applied fields like Sericulture, Poultry forming and  Apiculture alongside Statistical and Laboratory techniques. |
| **PO8** | Understand the concepts and importance of Biotechnology, Bioinformatics, Genetics, Genetic engineering and its application in various fields. |
| **PO9** | Apply ethical principles and assign to professional ethics and responsibilities in  delivering one’s own duties. |
| **PO10** | Apply the knowledge of Zoology in treating animals and protecting nature paving way for sustainable environment. |

## BHARATHIAR UNIVERSITY: COIMBATORE 641 046

**Branch VI: B. Sc., ZOOLOGY (CBCS PATTERN) (Revised Scheme-17.05.2025)**

*(For the students admitted from the academic year* ***2025-2026****)*

**Scheme of Examination**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Part** | **Course Code** | **Title of the Course** | **Hours/ Week** | | **Examination** | | | | | | | | **Credits** |
| **Duration**  **in Hours** | **Maximum Marks** | | | | | | |
| **CIA** | **CEE** | | | **Total** | | |
|  |  | **Semester I** | | | | | | | | | | | | |
| I | 11T | Language – I | 6 | 3 | | 25 | | | 75 | | 100 | | 4 |
| II | 12E | English – I | 6 | 3 | | 25 | | | 75 | | 100 | | 4 |
| III | 13A | Core Paper I: Animal Diversity – Non Chordata | 6 | 3 | | 25 | | | 75 | | 100 | | 4 |
| III |  | Core Practical I | 4 | 3 | |  | | |  | |  | |  |
| III | 1AJ/1AH  1AB | Allied A: Paper I Botany/Chemistry/ Biochemistry | 4 | 3 | | 20 | | | 55 | | 75 | | 3 |
|  |  |  |  |  | |  | | |  | |  | |  |
| III |  | Allied Practical | 2 |  | |  | | |  | |  | |  |
| IV | 1FA | Environmental Studies\* | 2 | 3 | | - | | | 50 | | 50 | | 2 |
|  |  | **Total** | **30** |  | | **95** | | | **330** | | **425** | | **17** |
|  |  | **Semester II** | | | | | | | | | | | | |
| I | 21T | Language – II | 6 | 3 | | 25 | | 75 | | 100 | | 4 | |
| II | 22E | English – II | 4 | 3 | | 25 | | 25 | | 50@ | | 2 | |
| II | 2NM | Language Proficiency for Employability  <http://kb.naanmudhalvan.in/Special:Filepath/Cambridge_Course_Details.pdf> | 2 |  | | 25 | | 25 | | 50# | | 2 | |
| III | 23A | Core Paper II : Animal Diversity– Chordata | 6 | 3 | | 25 | | 75 | | 100 | | 4 | |
| III | 23P | Core Practical I | 4 | 3 | | 25 | | 75 | | 100 | | 4 | |
| III | 2AJ/2AH  2AB | Allied A: Paper II Botany/Chemistry | 4 | 3 | | 20 | | 55 | | 75 | | 3 | |
| III | 2PJ/2PH/ 2PB | Allied Practical | 2 | 3 | | 20 | | 30 | | 50 | | 2 | |
| IV | 2FB | Value Education – Human Rights\* | 2 | 3 | | - | | 50 | | 50 | | 2 | |
|  |  | **Total** | **30** |  | | **165** | | **410** | | **575** | | **23** | |
|  |  | **Semester III** | | | | | | | | | | | | |
| I | 31T | Language – III | 6 | 3 | | 25 | | 75 | | 100 | | 4 | |
| II | 32E | English – III | 6 | 3 | | 25 | | 75 | | 100 | | 4 | |
| III | 33A | Core Course III: Comparative  Anatomy of Vertebrates | 5 | 3 | | 25 | | 75 | | 100 | | 4 | |
| III |  | Core Practical II | 2 |  | |  | |  | |  | |  | |
| III | 3AH/3AJ | Allied B: Paper I Chemistry/Botany | 4 | 3 | | 20 | | 55 | | 75 | | 3 | |
| III |  | Allied Practical | 2 |  | |  | |  | |  | |  | |
| IV | 3ZA | Skill Based I: Sericulture | 2 | 3 | | 20 | | 55 | | 75 | | 2 | |
| IV | 3HW | Health and Wellness\*\*\* | 1 |  | |  | |  | |  | | 1 | |
| IV | 3FC | Tamil / Advanced Tamil\* (OR) Non-major elective - I (Yoga for Human Excellence)\* / Women’s Rights\* | 2 | 3 | | - | | 50 | | 50 | | 2 | |
| IV | 3NM | Naan Mudhalvan-Digital skills for Employability\*\* |  |  | | 25 | | 75 | | 100 | | 2 | |
|  |  | **Total** | **30** |  | | **140** | | **460** | | **500+**  **100** | | **22** | |

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Part** | **Course**  **Code** | **Semester IV** | | | | | | |
| I | 41T | Language – IV | 6 | 3 | 25 | 75 | 100 | 4 |
| II | 42E | English – IV | 6 | 3 | 25 | 75 | 100 | 4 |
| III | 43A | Core Course IV: Ecology, Evolution and Zoogeography | 4 | 3 | 25 | 75 | 100 | 4 |
| III | 43P | Core Practical II | 2 | 3 | 25 | 75 | 100 | 4 |
| III | 4AH/4AJ | Allied B: Paper II Chemistry/Botany | 4 | 3 | 20 | 55 | 75 | 3 |
|  | 4PH/ 4AJ | Allied Practical | 2 | 3 | 20 | 30 | 50 | 2 |
| IV | 4ZB | Skill Based II:  Biostatistics and Computer Applications | 2 | 3 | 20 | 55 | 75 | 3 |
| IV | 4NM | Employability Readiness- Naan Mudhalvan Course\*\* | 2 | - | 25 | 75 | 100 | 2 |
| IV | 4FE | Tamil\*/Advanced Tamil\* (OR) Non-major elective -II (General Awareness\*) | 2 | 3 | - | 50 | 50 | 2 |
|  |  | **Total** | **30** |  | **185** | **565** | **650+**  **100** | **28** |
|  |  | **Semester V** | | | | | | |
| III | 53A | Core Course V: Cell Biology and Biochemistry | 5 | 3 | 25 | 75 | 100 | 4 |
| III | 53B | Core Course VI: Microbiology | 5 | 3 | 25 | 75 | 100 | 4 |
| III | 53C | Core Course VII: Genetics and Immunology | 5 | 3 | 25 | 75 | 100 | 4 |
| III |  | Core Practical III | 2 | - | - | - | - | - |
| III |  | Core Practical IV | 2 | - | - | - | - | - |
| III |  | Elective Course I: A/B/C# | 3 | 3 | 20 | 55 | 75 | 3 |
| III |  | Elective Course II: A/B/C# | 3 | 3 | 20 | 55 | 75 | 3 |
| III |  | Elective Course III: Practical# | 2 | - | - | - | - | - |
| IV | 5ZC | Skill Based Course III: Biophysics and Instrumentation. | 3 | 3 | 20 | 55 | 75 | 3 |
| IV | 5NM | Employability Readiness- Naan Mudhalvan Course-Medical Coding\*\* |  |  | 25 | 75 | 100 | 2 |
|  |  | **Total** | **30** |  | **160** | **465** | **525+**  **100** | **23** |
|  |  | **Semester VI** | | | | | | |
| III | 63A | Core Course VIII: Animal Physiology. | 5 | 3 | 25 | 75 | 100 | 4 |
| III | 63B | Core Course IX: Developmental Biology. | 5 | 3 | 25 | 75 | 100 | 4 |
| III | 63C | Core Course X: Biotechnology. | 5 | 3 | 25 | 75 | 100 | 4 |
| III | 63P | Core Practical III | 2 | 3 | 25 | 75 | 100 | 4 |
| III | 63Q | Core Practical IV | 2 | 3 | 25 | 75 | 100 | 4 |
| III |  | Elective Course I: A/B/C# | 3 | 3 | 20 | 55 | 75 | 3 |
| IV |  | Elective Course II: A/B/C# | 3 | 3 | 20 | 55 | 75 | 3 |
|  | 63R | Elective Course III: Practical# | 2 | 3 | 20 | 55 | 75 | 3 |
| IV | 6ZP | Skill Based Course IV: Practical | 3 | 3 | 20 | 30 | 50 | 2 |
| IV | 6NM | Employability Readiness- Naan Mudhalvan Course –Advanced Medical Coding\*\* | - | - | 25 | 75 | 100 | 2 |
| V | 67A | Extension activities\*\*\* | - | - | 50 | - | 50 | 2 |
|  |  | **Total** | **30** |  | **280** | **645** | **825+**  **100** | **35** |
|  |  | **Grand Total** | **180** |  | **1025** | **2875** | **3500+400** | **140+8** |

\*  No Continuous Internal Assessment (CIA). Only University Examinations.

It is compulsory for the students who opt for any languages other than Tamil to choose

Basic Tamil (for students who have not studied Tamil) or Advanced Tamil (for students

who studied Tamil upto HSC).

\*\* Naan Mudhalvan – Skill courses- external marks will be assessed by Industry and internal

will be offered by respective course teacher.

\*\*\* No University Examinations. Only Continuous Internal Assessment (CIA).

****

## # ELECTIVE COURSES

## 

|  |  |  |  |
| --- | --- | --- | --- |
| **List of Elective Courses (Colleges can choose one course from Elective I & II, Elective**  **III will be the practical of Elective II)** | | | |
| **ELECTIVE COURSES** | **SUBJECTCODE** | | **TITLE OF THE COURSE** |
| Elective Course I | A | 5EA | Human Genetics and Counseling – Course I. |
|  |  | 6EA | Human Genetics and Counseling – Course II. |
|  | B | 5EB | Pest and Their Control – Course I. |
|  |  | 6EB | Pest and Their Control – Course II. |
|  | C | 5EC | Wild life Management and Conservation – Course I. |
|  |  | 6EC | Wild life Management and Conservation – Course II. |
| Elective Course II | A | 5ED | Pathology and Clinical Laboratory Technology – Course I. |
|  |  | 6ED | Pathology and Clinical Laboratory Technology – Course II. |
|  | B | 5EE | Poultry Science & Management – Course I. |
|  |  | 6EE | Poultry Science & Management – Course II. |
|  | C | 5EF | Apiculture – Course I. |
|  |  | 6EF | Apiculture – Course II. |
| Elective Course III | A | 63R | Pathology and Clinical Laboratory Technique – Practical. |
|  | B | 63R | Poultry Science and Management – Practical. |
|  | C | 63R | Apiculture – Practical. |

## # #VALUE ADDED COURSE (OPTIONAL)

|  |  |  |
| --- | --- | --- |
| **S. No** | **PAPAERS** | **TOTAL MARKS** |
| 1. | Medical Emergence Management. | 100 |
| 2. | Vermitechnology | 100 |
| 3. | Economics of Conservation | 100 |
| 4. | Intellectual Property Rights | 100 |



First Semester



|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Course code** | | **13A** | **ANIMAL DIVERSITY - NONCHORDATA** | | **L** | **T** | | **P** | **C** |
| **Core/Elective/ SBS** | | | **Core Course - I** | | **4** | **0** | | **0** | **4** |
| **Pre-requisite** | | | Basic KnowledgeofNon-Chordata | | **Syllabus**  **Version** | | **2025 –**  **2026** | | |
| **Course Objectives:** | | | | | | | | | |
| 1. To identify the phyla of invertebrate animals and recognize their distinguishingfeatures. 2. To understand the taxonomy, relationship and evolutionof animals. 3. To understand the role of invertebrates in biological communities, ecological interactions, andconservation problems. 4. To appraise the diversity of animals in aphylogenetic context. | | | | | | | | | |
| **Expected Course Outcomes:** | | | | | | | | | |
| On the successful completion of the course, student will be able to: | | | | | | | | | |
| 1 | Understand the diversity and general taxonomic rules on animal distribution | | | | | | | K2 | |
| 2 | The learner will be able to identify the animal at basic level and get an idea of adaptation and importance of Non-chordata. | | | | | | | K2 | |
| 3 | Imparts theoretical knowledge about distribution of invertebrate fauna in different  zoogeographical realms. | | | | | | | K3 | |
| 4 | Get knowledge about anatomical features of non-chordate, important parasites and economically important organisms. | | | | | | | K3 | |
| 5 | Analyze the importance of its conservation, sustainableeconomic utilization and its potentials in technologicalprospects. | | | | | | | K4 | |
| **K1** - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** – Create | | | | | | | | | |
|  | | | | | | | | | |
| **Unit:1** | | **CLASSIFICATION AND PROTISTA** | | | **17 hours** | | | | |
| Concept of five kingdom classification of life.  Introduction to Protista and Animal kingdom – Systems of Classification and Nomenclature - levels of organization - Types of symmetry. General characters of Protista and Classification with examples.  **Type study:** Paramecium.  **General Topics:** Parasitic Protozoa, Life cycle of Plasmodium, Locomotion and Nutrition in Protozoa. | | | | | | | | | |
| **Unit:2** | | **PORIFERA AND COELENTERATA** | | | **17Hours** | | | | |
| Characters and classification (up to class) of Porifera and Coelenterate with examples. Salient features of *Ctenophora*.  **Type study:** *Leucosolenia*, *Obelia* Colony.  **General Topics:** Canal system in sponge, Polymorphism in Coelenterate, Diversity (Types) of corals and structure of coral polyp, Coral reefs. | | | | | | | | | |
| **Unit:3** | | **PLATYHELMINTHES, ASCHELMENTHIES AND**  **ANNELIDA** | | **18Hours** | | | | | |
| Characters and classification (up to class) of Platyhelminthes, Aschelmenthies and Annelida with | | | | | | | | | |



|  |  |  |  |
| --- | --- | --- | --- |
| examples. **Type study:** *Taenia, Ascaris, Megascolex*.  **General Topics:** Coelom, Coelomoducts and Metamerism, Parasitic adaptations in Helminthes and Annelids, Filter feeding inPolychaetes. | | | |
| **Unit:4** | | **ARTHROPODA** | **18Hours** |
| Characters and classification (up to class) of Arthropoda with examples.  Brief descriptions of *Limulus* (living fossil), Sacculina (Parasitic castration), Copepods, Scorpion, Spider, *Peripatus*(Affinities), Millipeds and Centipeds.  **Type study:** Cockroach andPrawn,  **General Topics:** Crustacean larvae, Missing links and Economic importance of insects. | | | |
| **Unit:5** | | **MOLLUSCA, ECHINODERMATA AND HEMICHORDATA.** | **18 Hours** |
| Characters and classification (up to class) of Mollusca and Echinodermata with examples. Characters of Hemichordates. Brief descriptions of Fresh water Mussel, *Chiton, Sepia*, Starfish, Sea cucumber and Balanoglossus  **Type study:** Pila, Starfish (External Features and Water Vascular system)  **General Topics:** Larval forms of Mollusca, Torsion and De-torsion in Mollusca, Economically important Mollusca, Echinoderm larva, Evolutionary affinities of Hemichordate. | | | |
| **Unit:6** | | **CONTEMPORARY ISSUES** | **2 Hours** |
| Expert lectures, Online Seminars - Webinars and Field Visits. | | | |
|  | | **Total Lecture Hours** | **90 Hours** |
| **Text Book(s)** | | | |
| 1 | Arumugam N. (2002). *InvertebrateZoology*, Saras publication, Nagercoil, Tamilnadu. | | |
| 2 | Kotpal RL. (2012).*Modern Text Book of Zoology – Invertebrata,* Rostagi, publication, Meerut. | | |
| 3 | Nair NC, Leelavathy S, SoundaraPandian N, Murugan T and Arumugam N. (2010). *A Text Book of Invertebrates,* Saras Publication, Nagercoil, Tamilnadu. | | |
| **Reference Books** | | | |
| 1 | Barnes RD. (1980). *Invertebrate Zoology,* 6th edition. Holt Saunders International Edition, Philadelphia. | | |
| 2 | EkambaranathaAyyar and. Ananthakrishnan TN. (1994). *Manual of Zoology Vol – I, Part I and IIS, Viswanathan* Pvt. Ltd.Chennai. | | |
| 3 | Hyman LH. (1940).*The Invertebrates (6 vols),*McGraw-Hill Companies Inc.New York. | | |
| 4 | Jordan EL and Verma PS (2015). *InvertebrateZoology,* S. Chand and Co, NewDelhi. | | |
| 5 | Kotpal RL, Agarwal SK and Khetarpal RP. (1990).*Invertebrates,* Rastogi Publications,Meerut. | | |
| 6 | MargulisL, Schwartz KV and Dolan M. (1994). *The Illustrated Five Kingdoms: A Guide To*  *The Diversity Of Life On Earth*, HarperCollins College Publishers, New York. | | |
|  | | | |

|  |  |
| --- | --- |
| **Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]** | |
| 1 | <https://swayam.gov.in/nd2_cec19_bt05/preview> |
| 2 | <http://agritech.tnau.ac.in/sericulture/seri_dept%20of%20seri_training.html> |
|  | |

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Mapping with Programme Outcomes** | | | | | | | | | | |
| **COs** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** |
| **CO1** | S | S | L | S | S | M | L | L | M | M |
| **CO2** | S | S | M | S | S | L | L | M | M | M |
| **CO3** | S | S | M | S | S | L | L | M | S | M |
| **CO4** | S | S | M | S | S | L | L | S | S | S |
| **CO5** | S | S | L | S | S | S | M | L | S | M |

\*S-Strong; M-Medium; L-Low



Second Semester

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Course code** | | **23A** | **ANIMAL DIVERSITY - CHORDATA** | | **L** | **T** | | **P** | **C** |
| **Core/Elective/ SBS** | | | **Core Course - II** | | **4** | **0** | | **0** | **4** |
| **Pre-requisite** | | | Basic knowledgeof Chordata | | **Syllabus**  **Version** | | **2025 –**  **2026** | | |
| **Course Objectives:** | | | | | | | | | |
| 1. To understand the taxonomy and relationship and evolution ofanimals. 2. To identify the class of vertebrate animals and recognize their distinguishingfeatures. 3. To appraise the diversity of animals in a phylogeneticcontext. 4. To understand how different body designs solve biological problems related to physiological and environmental challenges. 5. To develop an appreciation for the role of vertebrates in biological communities, ecological interactions, and conservationproblems. | | | | | | | | | |
| **Expected Course Outcomes:** | | | | | | | | | |
| On the successful completion of the course, student will be able to: | | | | | | | | | |
| 1 | Understand the diversity of chordates and their classification. | | | | | | | K2 | |
| 2 | Analyze the significant adaptive features in Fishes, Amphibians, Reptiles, Aves and  Mammals. | | | | | | | K4 | |
| 3 | Understand physiological and anatomical peculiarities, adaptations necessary to  survive in diverse adaptive zones. | | | | | | | K2 | |
| 4 | Familiarize with gradual development of habit and habitats of various animals and  physiological system of chordata. | | | | | | | K4 | |
| 5 | Know the transitional stages and their importance in evolution. | | | | | | | K2 | |
| **K1** - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** – Create | | | | | | | | | |
|  | | | | | | | | | |
| **Unit:1** | | **FISHES** | | | **17 Hours** | | | | |
| General characters and classification of Chordata (up to class) with examples. Brief descriptions of  *Amphioxus*, *Ascidia*, Hag fish, *Scolidon*, Mullet, *Anabas*, Cat fish, Sea horse.  **General topics:** Affinities of Prochordates, Accessory respiratory organs in Teleost, Types of Fins and function, Comparison of Teleost and Elasmobranchs, Evolutionary significance of Dipnoi,  Migration of Fishes. | | | | | | | | | |
| **Unit:2** | | **AMPHIBIA** | | | **17 Hours** | | | | |
| Classification and characters of Amphibia (up to order with examples). Habitat, classification, examples and brief descriptions of Frog, Toad, Salamander, Ambystoma, Tree frog.  **General topics:** Origin of Amphibia, Metamorphosis of Frog, Limbless amphibians, Parental care in amphibian, Paedomorphosis. | | | | | | | | | |
| **Unit:3** | | **REPTILIA** | | **18 Hours** | | | | | |
| Classification and characters of Reptilians (up to order with examples). Habitat, classification,examples and descriptions of *Calotes, Sphenodon*, Varanus, Chameleon, Snakes, Chelonia and Crocodilia  **General topics:** Identification of Poisonous and non-poisonous snakes – Poison apparatus and typesof poison. | | | | | | | | | |



|  |  |  |  |
| --- | --- | --- | --- |
| **Unit:4** | | **AVES** | **18 Hours** |
| Classification and characters of Aves (up to order with examples). Habitat, classification, examples and brief descriptions of Pigeon, Horn bills, Kingfisher, Heron, Parrot, Wood pecker, Finches and Sunbird.  **General topics:** Flightless Birds, Flight Adaptations in Birds, Feet and Beak modifications, Wetland birds, Sound production in Birds. | | | |
| **Unit:5** | | **MAMMALS** | **18 Hours** |
| Classification and characters of Mammals (up to order with examples). Habitat, classification, examples and brief descriptions of Kangaroo, Bat, Rabbit, *Panthera*, *Hyena*, Monkey, Apes, Deer, Elephant and *Rhinoceros.*  **General topics:** Diversity of Marsupials, Affinities of Echidna, Dentition in Mammals, Aquatic mammals and adaptation, Odd and even toed ungulates, Insectivorous mammals, Adaptive radiation in Mammals, Estrous cycle in mammals.. | | | |
| **Unit:6** | | **CONTEMPORARY ISSUES** | **2 Hours** |
| Expert lectures, Online Seminars - Webinars and Field Visits. | | | |
|  | | **Total Lecture Hours** | **90Hours** |
| **Text Book(s)** | | | |
| 1 | Arumugam N. (2019). [*Animal Diversity - Volume - 2 - Chordata*](https://www.saraspublication.com/osc/catalog/animal-diversity-volume-chordata-p-172.html), Saras Publication,Nagercoil, Tamilnadu. | | |
| 2 | Kotpal RL. (2019). *Mordern Text Book of Zoology Vertebrates*, 4th edition, Rastogi Publications,Meerut. | | |
| 3 | Thangamani A, Prasannakumar S, Narayanan LM, Arumugam N. ([2006). *A Text Book of*](https://www.saraspublication.com/osc/catalog/text-book-chordates-p-136.html) *Chordates,* Saras Publication,Nagercoil, Tamilnadu. | | |
| 4 | Verma PS. (2013).*Chordate Zoology,* S. Chand Publishers, NewDelhi | | |
| **Reference Books** | | | |
| 1 | Barrington EJW*.* (1967). *Invertebrate Structure and Functions*, English Language Book Society. | | |
| 2 | EkambaranathaAyyar and Ananthakrishnan TN.(1995). *Manual of Zoology Vol – II*, S. Viswanathan Pvt. Ltd., Chennai. | | |
| 3 | Kotpal RL. (2007).*Modern Text Book of Zoology Vertebrates*, 4thedition, Rastogi Publications,Meerut. | | |
| 4 | Pough Harvey F, Christine M, Janis and John B. Heiser. (2002). *Vertebrate Life*, Pearson Education Inc. NewDelhi. | | |
| 5 | Young JZ. (1950). *Life of Vertebrates,*Clarendon Press, Oxford, UK. | | |

|  |  |
| --- | --- |
| **Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]** | |
| 1 | <https://knowledgeuniverseonline.com/ntse/Biology/Phylum-Chordata.php> |
| 2 | <https://www.onlinebiologynotes.com/phylum-chordata-characteristics/> |
|  | |

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Mapping with Programme Outcomes** | | | | | | | | | | |
| **COs** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** |
| **CO1** | S | S | M | S | S | M | M | L | S | S |
| **CO2** | M | S | S | S | M | M | S | L | S | S |
| **CO3** | M | S | S | M | S | M | S | L | M | M |
| **CO4** | S | S | M | S | S | L | M | L | M | M |
| **CO5** | S | S | M | S | S | M | L | M | M | M |

\*S-Strong; M-Medium; L-Low



|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Course code** | | | **23P** | **ANIMAL DIVERSITY –**  **NON CHORDATA AND CHORDATA** | **L** | **T** | **P** | | **C** |
| **Core/Elective/ SBS** | | | | **Core Practical - I** | **0** | **0** | **4** | | **4** |
| **Pre-requisite** | | | | Practical knowledge of Non-Chordata and Chordata | **Syllabus**  **Version** | | **2025 –**  **2026** | | |
| **Course Objectives**: | | | | | | | | | |
| 1. Learn and be familiar with the Laboratory techniques by means of using digital different methodologies. 2. Examine and understand the external and internal anatomy of Invertebrate and Chordate. 3. To understand the taxonomic position, body organization and evolutionary relationship of animals. 4. To inculcate the significance of various non chordates and chordates. | | | | | | | | | |
| **Expected Course Outcomes:** | | | | | | | | | |
| On the successful completion of the course, student will be able to: | | | | | | | | | |
| 1 | Evaluate the biological significance, structure and functions of various animals. | | | | | | K5 | | |
| 2 |  | Able to enlighten the adaptation and unique characters of animals and their role in the development. | | | | |  | K2 | |
| 3 | Apply knowledge and come to know how to handle different organisms. | | | | | | K3 | | |
| 4 | Analyze and to observe various specimens by using Microscope. | | | | | | K4 | | |
| **K1** - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** – Create | | | | | | | | | |
| **INSTRUCTION:**  The Board of studies does not encourage the dissection of animals and advised to rely of alternative digital methods. Those departments undertaking dissection should compulsorily constitute a dissection monitoring committee as per UGC rules. It is to be ensured that the animals used for dissection is not removed from the wild and is in compliance with UGC regulations time to time. It is the duty of the college/department to adhere strictly to the Wildlife Protection Act and its amendments. | | | | | | | | | |
| **MAJOR PRACTICAL** | | | | | | | | | |
| Prawn / Cockroach / Earthworm/ Fish (Any two) Digestive System and Nervous system. Micrometry measurement of given Protozoan /Micro arthropod / Any sample. | | | | | | | | | |
| **MINOR PRACTICAL** | | | | | | | | | |
| 1. Prawn/ Cockroach/Mosquito (Any two): Mounting of Appendages/   Mouth parts Earth worm: Mounting of body setae   1. Fish: Mounting of Scales 2. Motility of Paramecium – Hanging drop method. | | | | | | | | | |
| **SPOTTERS** | | | | | | | | | |
| 1. **Classify Giving Reasons:**   *Paramecium, Obelia*, Liver Fluke, *Ascaris, Pila*, Star Fish, *Balanoglossus*, Any Fish, Tree Frog, Snake, King Fisher And Bat.   1. **Draw Labeled Sketches**: Trochophore, Any Echinoderm Larvae. | | | | | | | | | |



|  |  |
| --- | --- |
| 1. **Biological Significance:***Paramecium*–Conjugation, Malaria Parasite, Gemmules, *Limulus*, Hippocampus, Nautilus. Axolotl Larva. 2. **Relate Structure And Function:**   Spicules Of Sponges, Scolex of Tapeworm, *Nereis* Parapodium, Carapace And Plastron, Electric Organ – *Narcine*.   1. **Descriptive Notes:**   *Hydra, Physalia*, Rotifer, Sea Cucumber, Chiton, Placoid Scales, Chameleon, Quill Feather. | |
| **VISITANDSUBMISSIONOF REPORT**   1. Visit to any nearby area of biodiversity significance (Report should be included inrecord). 2. Photo Album of Invertebrates and Vertebrates with identification and classification (Evaluationof report should be based on field effort, diversity of photos, classification and identification. Costly presentation of photos albums should compulsorily be discouraged, as the objective of this isto   make students familiar with fauna). | |
| **QUESTION PATTERN: 75 MARKS**  **Major: 25, Minor: 10, Record: 10, Spotter: 25 (5 spotters each carry5 marks),**  **Album: 05 marks.** | |
|  | |
| **Text Book(s)** | |
| 1 | Arumugam N, Thangamani A, Prasanna Kumar S, Narayanan LK, Jayasurya.(2013).*Practical Zoology Volume 2 Chordata,* Saras Publication, Nagercoil, Tamilnadu. |
| 2 | Jayasurya, Ram Prabhu R, Arumugam N, Nair NC, Leelavathy S, Soundara Pandian N, Murugan T.(2013). *Practical Zoology Volume 1Invertebrate,* Saras Publication,  Nagarcoil,TamilNadu. |
| 3 | Lay SS. (2004). *A text book of Practical Zoology Invertebrate,*Rastogi Publications, Shivaji Road, Meerut, India |
| 4 | Verma PS. (2000).*A Manual of Practical Zoology- Chordates*, S. Chand Publications, New  Delhi. |
|  | |

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Mapping with Programme Outcomes** | | | | | | | | | | |
| **COs** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** |
| **CO1** | S | S | M | S | S | L | M | M | S | S |
| **CO2** | S | S | M | S | S | L | M | L | S | S |
| **CO3** | S | S | L | S | M | L | M | L | S | S |
| **CO4** | S | S | L | S | M | L | S | L | S | S |

\*S-Strong; M-Medium; L-Low



Third Semester



|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Course code** | | **33A** | **COMPARATIVE ANATOMY OFVERTEBRATES** | | **L** | **T** | | **P** | **C** |
| **Core/Elective/ SBS** | | | **Core Course - III** | | **4** | **0** | | **0** | **4** |
| **Pre-requisite** | | | Basic knowledge on Structural Anatomy of  Vertebrates | | **Syllabus**  **Version** | | **2025 –**  **2026** | | |
| **Course Objectives:** | | | | | | | | | |
| 1. Recognition of the morphological and anatomical structure for the major groups of vertebrates from an evolutionary point of view. 2. Gain understanding of how organism form, function and diversity evolved 3. To understand the structural complexity in advanced taxa. | | | | | | | | | |
| **Expected Course Outcomes:** | | | | | | | | | |
| On the successful completion of the course, student will be able to: | | | | | | | | | |
| 1 | Familiarize with structural organization, biology, and functioning of each organ and formation of organ systems. | | | | | | | K2 | |
| 2 | Students also gain knowledge about fundamental steps in vertebrate development and understand the increasing complexity of organ systems with advancement of evolution. | | | | | | | K2 | |
| 3 | The students will be able to describe the vertebrate structures and relate morphology,  function and evolution. | | | | | | | K3 | |
| 4 | Relate the concepts of homology, analogy, morphogenesis, ontogeny, and phylogeny relative to the anatomical features of vertebrates. | | | | | | | K3 | |
| 5 | Provide a strong basic insight in understanding advanced courses like Physiology and Biochemistry. | | | | | | | K4 | |
| **K1** - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** – Create | | | | | | | | | |
|  | | | | | | | | | |
| **Unit:1** | | **DIGESTIVE AND RESPIRATORY SYSTEM** | | | **15 Hours** | | | | |
| Comparative account of Digestive system of shark, frog, pigeon and rabbit – Ruminant stomach and function. Gills of fishes – Pharyngeal derivatives – Swim Bladder - Comparative account of Lungs  and air ducts in Vertebrates. | | | | | | | | | |
| **Unit:2** | | **NERVOUS SYSTEM** | | | **14 Hours** | | | | |
| Comparative account on structure of Brain, Cranial and spinal nerves of Shark, Frog and Rabbit.  Sense organs of vertebrates. | | | | | | | | | |
| **Unit:3** | | **SKELETAL SYSTEM** | | **15 Hours** | | | | | |
| Regions of Vertebral column - Structure of typical vertebrae - Types of vertebrae – Ribs and sternum. Comparison of Skull, Pelvic, pectoral girdle and limbs of Shark, Frog and Rabbit.  Account of skull of Reptiles. Exoskeleton of Vertebrates (Scales, Feathers, hairs etc.). | | | | | | | | | |
| **Unit:4** | | **CIRCULATION AND MUSCULATURE** | | **15 Hours** | | | | | |



|  |  |  |  |
| --- | --- | --- | --- |
| Aorta and aortic arches – Comparative account of heart, arterial system and venous system in shark, frog, *Calotes*, pigeon and rabbit. Brief account of appendicular musculature – Electric organs  in fish. | | | |
| **Unit:5** | | **URINOGENITAL SYSTEM** | **14Hours** |
| Comparison of Pronephros – Mesonephros and Metanephros with examples. Comparison of  Urinogenital system of shark, frog, *Calotes*, pigeon and rabbit. | | | |
| **Unit:6** | | **CONTEMPORARY ISSUES** | **2 Hours** |
| Expert lectures, Online Seminars - Webinars and Field Visits. | | | |
|  | | **Total Lecture Hours** | **75 Hours** |
| **Text Book(s)** | | | |
| 1 | Arumugam N. (2019). [*Animal Diversity - Volume - 2 - Chordata*](https://www.saraspublication.com/osc/catalog/animal-diversity-volume-chordata-p-172.html), Saras Publication,Nagercoil,Tamilnadu. | | |
| 2 | Kotpal Rl. (2017-2018).*Chordata And Comparative Anatomy,* 1st edition, Rastogi Publications,Meerut. | | |
| 3 | Thangamani A, Prasannakumar S, Narayanan LM, Arumugam N. ([2006). *A Text Book of*](https://www.saraspublication.com/osc/catalog/text-book-chordates-p-136.html) *Chordates,* Saras Publication,Nagercoil, Tamilnadu. | | |
| **Reference Books** | | | |
| 1 | EkambaranathaAyyar and Ananthakrishnan TN.(1969). *Manual of Zoology Vol – II*, S. Viswanathan Pvt. Ltd.Chennai. | | |
| 2 | Kent GC. (2015). *Comparative Anatomy of Vertebrates*, 9th edition, McGraw-Hill, Newyork. | | |
| 3 | Kulshrethra SK. (2002). *Comparative Anatomy of Vertebrates*[, Anmol Publications Pvt. Ltd.](https://www.sapnaonline.com/shop/Publisher/Anmol%20Publications%20Pvt%20Ltd) NewDelhi. | | |
| 4 | Saxena RK and SumithraSaxena. (2015). *Comparative Anatomy of Vertebrates,* 2nd Revised edition, Viva Books Private Limited, New Delhi. | | |
| 5 | Waterman AJ. (1971).*Chordate Structure and Function*, MacMillan and Co Ltd, New York. | | |
|  | | | |
| **Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]** | | | |
| 1 | <https://www.athabascau.ca/syllabi/biol/biol320.php> | | |
|  | | | |

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Mapping with Programme Outcomes** | | | | | | | | | | |
| **COs** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** |
| **CO1** | S | S | M | S | S | M | M | L | S | M |
| **CO2** | M | S | S | S | S | M | M | L | M | M |
| **CO3** | M | S | S | S | S | L | M | M | M | S |
| **CO4** | M | S | S | S | S | L | M | L | M | M |
| **CO5** | M | S | S | S | S | L | M | S | M | M |

\*S-Strong; M-Medium; L-Low



|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Course code** | | **3ZA** | **SERICULTURE** | | | **L** | **T** | | **P** | **C** | |
| **Core/Elective/ SBS** | | | **Skill Based Course - I** | | | **3** | **0** | | **0** | **3** | |
| **Pre-requisite** | | | Basic knowledge on Silkworms and Rearing  Techniques | | | **Syllabus**  **Version** | | **2025 –**  **2026** | | | |
| **Course Objectives:** | | | | | | | | | | | |
| 1. Introduce the concepts of origin, growth and study of Sericulture as science. 2. To develop a basic skill and knowledge in Sericulture. 3. Enlighten the general aspects of Sericulture industry. | | | | | | | | | | | |
| **Expected Course Outcomes:** | | | | | | | | | | | |
| On the successful completion of the course, student will be able to: | | | | | | | | | | | |
| 1 | The learner will be able to practice Sericulture as a passion or profession. | | | | | | | | K2 | | |
| 2 | Understand the scientific approach of mulberry cultivation and silk worm rearing techniques. | | | | | | | | K2 | | |
| 3 | Able to identify and follow regulation practices for the disease and pest control of  the mulberry plant and silk worm. | | | | | | | | K3 | | |
| 4 | Learn about the various skills that are necessary for self employment. | | | | | | | | K4 | | |
| **K1** - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** – Create | | | | | | | | | | | |
|  | | | | | | | | | | | |
| **Unit:1** | | **MULBERRY CULTIVATION** | | | | **9 Hours** | | | | | |
| Brief outline of History of Sericulture - Scope and opportunities in Sericulture – Types of Silk - Organic Silk - Vanya Silk. Mulberry cultivation: Nursery – Planting – irrigation – Pruning – harvesting. | | | | | | | | | | | |
| **Unit:2** | | **SILK WORMS** | | | | **8 Hours** | | | | | |
| Morphology of Silk worm –Types of Silkworm –Silk glands - Life cycle of Silkworm. Brief out  line of non-mulberry sericulture and its potential. | | | | | | | | | | | |
| **Unit:3** | | **REARING** | | | **9 Hours** | | | | | | |
| Silkworm rearing–Outdoor and Indoor rearing–Rearing house–Hatching–Incubation– Feeding Silkworms–Protection and rearing–Rearing Appliances–Mounting and Harvesting. | | | | | | | | | | | |
| **Unit:4** | | **DISEASES** | | | **9 Hours** | | | | | | |
| Hygiene conditions in silk production- fungal infection to cocoon. Silk worm Diseases –causative agents, types and prevention-Bacterial disease – Flacheria; Viral diseases –Grasserie; Fungal disease – Muscardine ; Protozoan diseases – Pebrine. | | | | | | | | | | | |
| **Unit:5** | | **PROCESSING** | | | **8 Hours** | | | | | | |
| Silk fiber formation – Properties of cocoon filament – Pre -reeling process – Cocoon boiling.  Reeling technology – Re-reeling technology – raw silk industry – byproducts of Silk industries. | | | | | | | | | | | |
| **Unit:6** | | **CONTEMPORARY ISSUES** | | | **2 Hours** | | | | | | |
| Expert lectures, Online Seminars - Webinars and Field Visits. | | | | | | | | | | |
|  | | **Total Lecture Hours** | | **45 Hours** | | | | | | |



|  |  |
| --- | --- |
| **Text Book(s)** | |
| 1 | Ganga G and Sulochana Chetty J. (2006). *An introduction to Sericulture,*2nd edition, Oxford  and IBH publishing co. pvt.Ltd, New Delhi. |
| 2 | Ganga G. (2017). *ComprensiveSericulture*, 2nd edition, Oxford and IBH publishing co. pvt.Ltd,  New Delhi. |
| 3 | Dandin SB, Jayant Jayaswal and Giridhar K. (2000). *Handbook of Sericulture Technologies*,  Central Silk Board, Bangalore. |
| 4 | Madan Mohan Rao M. (2019). *An Introduction to Sericulture*, BS publications, BSP books, Hyderabad. |
| 5 | Manisha [Bhattacharyya.](https://www.amazon.in/s/ref%3Ddp_byline_sr_book_1?ie=UTF8&field-author=Dr.%2BManisha%2BBhattacharyya&search-alias=stripbooks) (2019). *Economics of Sericulture*,Rajesh Publications, Delhi. |
| 6 | Shankar  [Reddy](https://www.amazon.in/s/ref%3Ddp_byline_sr_book_1?ie=UTF8&field-author=J.%2BP.%2BA.%2BShankar%2BR.%2BReddy&search-alias=stripbooks) JPAR. (2009). *Sericulture*, Commonwealth Publishers, Delhi. |
| **Reference Books** | |
| 1 | *Diseases and Pests of Mulberry and Their Control*. (1991) Pub. By Director Central Silk Board  and Training Institute, Mysore. |
| 2 | Hrccrama Reddy G. (1988). *Silkworm Breeding*, Oxford and IBH Publishing Co. Pvt. Ltd, New Delhi. |
| 3 | Pradan S. (1983). *Agricultural Entomology and Pest Control,*Published by ICAR, New Delhi |
| 4 | Sarkar DC. (1988). *Ericulture in India,*Central Silk Board, Government of India,Bangalore. |
| 5 | Tanaka Y. (1964). *Sericology*, Central Silk Board Publication,Bangalore. |
|  | |
| **Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]** | |
| 1 | <https://swayam.gov.in/nd2_cec19_bt05/preview> |
| 2 | <http://agritech.tnau.ac.in/sericulture/seri_dept%20of%20seri_training.html> |
|  | |

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Mapping with Programme Outcomes** | | | | | | | | | | |
| **COs** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** |
| **CO1** | M | S | M | S | M | M | S | L | S | S |
| **CO2** | M | S | M | M | M | M | S | L | S | S |
| **CO3** | S | S | L | M | M | M | S | L | S | S |
| **CO4** | S | S | M | L | M | M | S | L | S | S |

\*S-Strong; M-Medium; L-Low



Fourth Semester



|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Coursecode** | | **43A** | **ECOLOGY, EVOLUTION AND ZOOGEOGRAPHY** | | **L** | | **T** | **P** | **C** |
| **Core/Elective/**  **SBS** | | | **Core Course - IV** | | **4** | | **0** | **0** | **4** |
| **Pre-requisite** | | | Knowledge on Ecosystem Structure and Functions, Animal Relationship, Environmental Pollution, Evolution and Zoogeographical Regions. | | **Syllabus Version** | | | **2025 –**  **2026** | |
| **Course Objectives:** | | | | | | | | | |
| 1. To develop awareness about the environment and the interaction of various components. 2. Learn about the adaptations and its significance in relation to evolution. 3. To make the students aware of how organic evolution occurred and how the various life forms come into existence. 4. To make the students aware of the historical periods during the evolution of earth and status of fauna during the particular age. 5. Know about the various zoogeographical regions and their climatic and faunal peculiarities. | | | | | | | | | |
| **Expected Course Outcomes:** | | | | | | | | | |
| On the successful completion of the course, student will be able to: | | | | | | | | | |
| 1 | The students will be able to present an overview of diversity of life forms in an ecosystem. | | | | | | K2 | | |
| 2 | The learner can correlate choice of habitat for organisms to abiotic factors, aspects of energy transfer and will be able to explain the necessity for and adaptations, providing examples. | | | | | | K3 | | |
| 3 | To describe the history and development of evolutionary thought, list and describe the evidence for evolution and its required corollaries and mechanisms by which evolution occurs. | | | | | | K2 | | |
| 4 | Able to explain the history of life on earth, climatic and faunal peculiarities. | | | | | | K2 | | |
| 5 | Understand the Zoogeographical regions, distribution, climate change and gain  knowledge about evolution of human. | | | | | | K2 | | |
| **K1** - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** – Create | | | | | | | | | |
|  | | | | | | | | | |
| **Unit:1** | | | | **ECOLOGICAL CONCEPTS** | | **15 Hours** | | | |
| Ecosystem structure and function. Limiting factors. Biogeochemical cycles: Carbon, Nitrogen, water and Phosphorous. Concept of Species, Population dynamics and Growth curves. Food web Pyramids and Tropic levels. Animal relationships: - Mutualism, commensalism, parasitism,  competition, predation. | | | | | | | | | |
| **Unit:2** | | | | **ECOSYSYEMS** | | **14 Hours** | | | |
| Habitat ecology: Freshwater, Estuarine and Terrestrial ecosystems (Detailed study). Ecotone and edge effect. Air, Water, Noise and Thermal Pollution. E-Waste – definition and management.  Fundamentals of Machine Learning. | | | | | | | | | |
| **Unit:3** | | | | **THEORIES OF EVOLUTION** | | **14 Hours** | | | |
| Theories of Organic evolution. Fossils – types and formation. Evidences of evolution Convergent and  Divergent evolution. Natural selection – Isolation Speciation. | | | | | | | | | |



|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Unit:4** | | | | **GEOLOGICAL TIME SCALE** | | **15 Hours** |
| Hardy -Weinberg Equilibrium and Genetic drift. Colouration - Mimicry types and Significance.  Geological time scale (Pre-Cambrian Eon; Up to periods for Paleozoic and Mesozoic era; up to Epoch for Cenozoic era). | | | | | | |
| **Unit:5** | | | | **ZOOGEOGRAPHY** | | **15 Hours** |
| Zoogeographical regions – Palaearctic, Nearctic, Neotropical, Oriental, Australian and Ethiopian regions - their Climatic and faunal peculiarities. Wallace line, Discontinuous distribution - Continental  Drift. Brief outlines of Human evolution. | | | | | | |
| **Unit:6** | | | **CONTEMPORARY ISSUES** | | **2 Hours** | |
| Expert lectures, Online Seminars - Webinars and Field Visits. | | | | | | |
| **Total Lecture Hours** | | | | | | **75 Hours** |
| **Text Book(s)** | | | | | | |
| 1. Arumugam N and MeyyanRP. (2014).*Cell Biology, Molecular Biology, Genetics, Evolution and Ecology*, Volume-I, Saras Publication, Nagercoil, Tamilnadu. | | | | | | |
| 2. Gupta PK. (2005).*Cytology, Genetics and Evolution*. Rastogi Publications, Meerut. | | | | | | |
| 3. Verma PS and Agarwal VK. (2006).*Cell Biology, Genetics, Evolution and Ecology*, S. Chand Publishers, New Delhi. | | | | | | |
| **References** | | | | | | |
| 1 | Arumugam N. (2007).*Organic Evolution,* Saras Publication, Nagercoil, Tamilnadu. | | | | | |
| 2 | Barton NH, Briggs DEG, Eisen JA, Goldstein DB and Patel NH. (2007).*Evolution*, Cold  Spring, Harbour Laboratory Press. | | | | | |
| 3 | Benton AH and Werner WE. (1976). *Field Biology and Ecology*, Tata McGraw Hill, New  Delhi. | | | | | |
| 4 | Chapman JL and Reiss MJ.(1992). *Ecology: Principles and Applications*, Cambridge  University Press, New Delhi | | | | | |
| 5 | Odum EP. (1971).*Fundamentals of Ecology,* 3rdedition,W.B Saunders College Publishing,  Philadelphia | | | | | |
| 6 | Sharma PD. (2014). *Elements of Ecology*, Rastogi Publications, Meerut. | | | | | |
|  | | | | | | |
| **Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]** | | | | | | |
| 1 | | htt[ps://www](http://www.classcentral.com/report/swayam-moocs-course-list/).[classcentral.com/report/swayam-moocs-course-list/](http://www.classcentral.com/report/swayam-moocs-course-list/) | | | | |
| 2 | | <https://nptel.ac.in/gate_paper.html> | | | | |
| 3 | | <https://swayam.gov.in/nd2_cec20_hs31/preview> | | | | |
| 4 | | htt[ps://www](http://www.swayamprabha.gov.in/).[swayamprabha.gov.in/](http://www.swayamprabha.gov.in/) | | | | |
| 5 | | [www.kanchiuniv.ac.in/assets/SWAYAM-BOOKLET.pdf](http://www.kanchiuniv.ac.in/assets/SWAYAM-BOOKLET.pdf) | | | | |

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Mapping with Programme Outcomes** | | | | | | | | | | |
| **COs** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** |
| **CO1** | S | S | S | S | M | S | S | S | M | S |
| **CO2** | S | S | S | S | M | S | S | S | M | S |
| **CO3** | S | S | S | S | S | S | S | M | S | S |
| **CO4** | S | S | S | S | S | S | S | M | S | M |
| **CO5** | M | M | L | M | S | M | L | M | S | S |

\*S-Strong; M-Medium; L-Low



|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Course code** | | | | **4ZB** | **BIOSTATISTICS AND COMPUTERAPPLICATIONS** | | **L** | **T** | | **P** | **C** | |
| **Core/Elective/ SBS** | | | | | **Skill Based Course - II** | | **3** | **0** | | **0** | **3** | |
| **Pre-requisite** | | | | | Basic knowledge on Statistical tools and Computer  Applications | | **Syllabus**  **Version** | | **2025 –**  **2026** | | | |
| **Course Objectives:** | | | | | | | | | | | | |
| 1. To develop awareness about the application of statistics in Zoology. 2. To train how the biological data are processed and interpretations are made. 3. To give an introduction to computer and databases. | | | | | | | | | | | | |
| **Expected Course Outcomes:** | | | | | | | | | | | | |
| On the successful completion of the course, student will be able to: | | | | | | | | | | | | |
| 1 | | | The course will give an idea how data should be managed and Processed. | | | | | | | K2 | | |
| 2 | | | Express statistical reasoning skills correctly and contextually. | | | | | | | K4 | | |
| 3 | | | The course will develop the research aptitude of the students. | | | | | | | K3 | | |
| 4 | | | Apply basic statistical concepts commonly used in basic analytical techniques to  generate results. | | | | | | | K4 | | |
| **K1** - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** – Create | | | | | | | | | | | | |
|  | | | | | | | | | | | | |
| **Unit:1** | | | | **SAMPLING AND GRAPHS** | | | **9 hours** | | | | | |
| Types of Sampling –Concept of Sampling in Biology. Frequency distribution – Individual, discrete and Continuous series.  **Drawing practice**: Histogram, Ogive, Bar, Pie chart. | | | | | | | | | | | | |
| **Unit:2** | | | | **MEASURES OF CENTRAL TENDENCY** | | | **8 hours** | | | | | |
| Concepts and equations of Mean and Deviation (individual, discrete and continuous series).  **Problem Solving:** Mean, Median, Mode and Standard Deviation (individual series alone). | | | | | | | | | | | | |
| **Unit:3** | | | | **CO-RELATION AND REGRESSION** | | **8 hours** | | | | | | |
| Concept and types of Correlation and Regression.  **Problem Solving*:*** Co-efficient of Correlation, Regression for X on Y and Y on X. | | | | | | | | | | | | |
| **Unit:4** | | | | **TEST OF SIGNIFICANCE** | | **9 hours** | | | | | | |
| Concept of Students “t” test and Chi square test.  **Problem Solving:** “t” test – independent and dependent, Chi square test. | | | | | | | | | | | | |
| **Unit:5** | | | | **COMPUTER APPLICATIONS** | | **9 hours** | | | | | | |
| Central Processing Unit – Output and Input devices – Storage devices – Software and Hardware – Basic Operation of MS Word, Excel and Power point – Browsers and search engines.  Introduction to Biological Databases – Significance of NCBI. | | | | | | | | | | | | |
| **Unit:6** | | | | **CONTEMPORARY ISSUES** | | **2 hours** | | | | | | |
| Expert lectures, Online Seminars - Webinars and Field Visits. | | | | | | | | | | | | |
|  | | | | **Total Lecture Hours** | | **45 hours** | | | | | | |
| **Text Book(s)** | | | | | | | | | | | | |
| 1 | Arumugam N. (2015).*Basic Concepts of Biostatistics,* Saras Publication Nagercoil, Tamilnadu. | | | | | | | | | | | |
| 2 | | Ramakrishnan P. (2019).*Biostatistics,* Saras Publication Nagercoil, Tamilnadu. | | | | | | | | | |
| 3 | | Sundaralingam R, Arumugam N, Kumaresan V, Gopi A and Meena A. (2014). *Bio Statistics,*  *Computer Application and Bioinformatics,*Saras Publication Nagercoil, Tamilnadu. | | | | | | | | | |
| **Reference Books** | | | | | | | | | | | |
| 1 | | Banerjee PK. (2007). *Introduction to Biostatistics,* S. Chand Publication, New Delhi. | | | | | | | | | |
| 2 | | Baxevanis A and Outllette.(2005). *Bioinformatics a Practical Guide To The Analysis of Genes*  *and proteins,* Willy – Intersience, Hoboken, NJ. USA. | | | | | | | | | |
| 3 | | Kulkarni AP. (2005). *Basics of Biostatistics,* CBS Publishers, Delhi. | | | | | | | | | |
| 4 | | Satguru prasad. (2018). *Elements of Biostatistics*, 3rd edition, Rastogi publication, Meerut. | | | | | | | | | |
|  | | | | | | | | | | | |
| **Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]** | | | | | | | | | | | |
| 1 | | <https://www.edx.org/learn/biostatistics> | | | | | | | | | |
| 2 | | <https://www.classcentral.com/tag/biostatistics> | | | | | | | | | |
|  | | | | | | | | | | | |

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Mapping with Programme Outcomes** | | | | | | | | | | |
| **COs** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** |
| **CO1** | M | M | L | L | M | M | S | S | S | S |
| **CO2** | M | M | L | M | M | M | S | S | M | M |
| **CO3** | M | M | M | L | M | M | S | S | M | S |
| **CO4** | M | M | L | M | M | M | S | S | M | S |

\*S-Strong; M-Medium; L-Low



|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Course code** | | | | **43P** | **COMPARATIVE ANATOMY OF VERTEBRATES, ECOLOGY, EVOLUTION AND ZOOGEOGRAPHY** | **L** | **T** | **P** | **C** |
| **Core/Elective/ SBS** | | | | | **Core Practical - II** | **0** | **0** | **2** | **2** |
| **Pre-requisite** | | | | | Practical knowledge on Ecology, Anatomy and  Evolution | **Syllabus**  **Version** | | **2025-26** | |
| **Course Objectives**:   1. To train and be familiar with the Laboratory techniques by means of using multimedia(digital) methodologies. 2. To understand how change in population affect the ecosystem. 3. To inculcate the significance of various species and evolutionary relationship of animals. | | | | | | | | | |
| **Expected Course Outcomes:** | | | | | | | | | |
| On the successful completion of the course, student will be able to: | | | | | | | | | |
| 1 | | Get practical knowledge about the species identification, diversity and their ecological  significance | | | | | | K2 | |
| 2 | | Gain knowledge about the various systems of animals. | | | | | | K2 | |
| 3 | |  | Understand about the water pollution due to anthropogenic activity through various  practical estimations. | | | | | K2 | |
| 4 | | Apply practical knowledge on digital techniques and plankton analysis. | | | | | | K3 | |
| 5 | | Analyze and able to describe specific fauna in relation to practical and field  knowledge. | | | | | | K4 | |
| **K1** - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** – Create | | | | | | | | | |
| **INSTRUCTION:**  The Board of studies does not encourage the dissection of animals and advised to rely of alternative digital methods. Those departments undertaking dissection should compulsorily constitute a dissection monitoring committee as per UGC rules. It is to be ensured that the animals used for dissection is not removed from the wild and is in compliance with UGC regulations time to time. It is the duty of the college/department to adhere strictly to the Wildlife Protection Act and its amendments. | | | | | | | | | |
| **MAJOR PRACTICAL** | | | | | | | | | |
| 1. Estimation of Dissolved Oxygen of river, pond, sewage and industrial effluent. 2. Estimation of salinity. 3. Estimation of free Carbon-di-oxide of water samples. 4. Estimation of Carbonate andBicarbonates. 5.Demonstration of Vertebrate (Frog / Rat):   **Dissection using Multimedia** – Digestive, Brain, 5th Cranial, 10th Cranial, Urinogenital System  (Wherever possible digital dissections recommended). | | | | | | | | | |
| **MINOR PRACTICAL** | | | | | | | | | |
| 1. Estimation of pH of given water Samples. 2. Estimation of Temperature of Given Water Samples. 3.Mounting of Zooplankton (from local water body)   4. Identification of Zoogeographical realms from the world Map and describe the specific fauna. | | | | | | | | | |
| **SPOTTERS** | | | | | | | | | |
| **1.Identify the Typical Vertebrae / Skull:** | | | | | | | | | |
| Fish, Frog, *Calotes*, Pigeon,Rat.   1. **Identify the Fore/HindLimb:**   Fish, Frog, *Calotes*, Pigeon,Rat.   1. **Comment of Animal RelationShip:**   *Sacculina*on Crab /Hermit Crab and SeaAnemone.   1. **EcologicalAdaptation:**   *Chameleon, Balanus, Chaetopterus, Anabas.*   1. **Comment on the EvolutionarySignificance:**   Fossil, Limulus, Analogous and Homologous organs. | | | | | | | | | | |
| **VISIT AND SUBMISSION OF REPORT**  Visit to any Polluted / Pond Ecosystem and submission of a study report with Photos. | | | | | | | | | | |
| **QUESTION PATTERN: 75 MARKS**  **Major: 25, Minor: 10, Record: 10, Spotter: 25 (5 spotters each carry 5 marks),**  **Report: 5marks.** | | | | | | | | | | |
| **TotalPracticalHours 30(Each Semester) x 2 = 60 Hours PerYear** | | | | | | | | | | |
| Text Book(s) | | | | | | | | | | |
| 1 | Jaysura and Arumugam N (2013). *Practical Zoology Vol.3*, Saras Publication, Nagarcoil, Tamil Nadu. | | | | | | | | | |
| 2 | Lal SS. (2008). *A text book of Practical Zoology,* Rastogi Publications, Shivaji Road, Meerut | | | | | | | | | |
| 3 | *“Standard Methods for the Examination of Water and Wastewater”,* (2005) 21th edition, American Public Health Association, Washington. D.C. | | | | | | | | | |

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Mapping with Programme Outcomes** | | | | | | | | | | |
| **COs** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** |
| **CO1** | S | S | M | S | S | L | M | L | S | S |
| **CO2** | M | M | S | S | S | L | S | L | S | S |
| **CO3** | M | M | M | M | M | S | S | L | S | S |
| **CO4** | S | S | M | S | M | M | S | L | S | S |
| **CO5** | S | S | M | S | S | L | S | L | S | S |

\*S-Strong; M-Medium; L-Low



Fifth Semester

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Course code** | | | **53A** | **CELL BIOLOGY AND BIOCHEMISTRY** | | | **L** | **T** | | **P** | **C** |
| **Core/Elective/ SBS** | | | | **Core Paper - V** | | | **4** | **0** | | **0** | **4** |
| **Pre-requisite** | | | | Basic Knowledge of Cell Organelles and  Biochemical Nature **V** | | | **Syllabus**  **Version** | | **2025-26** | | |
| **Course Objectives:** | | | | | | | | | | | |
| 1. T o understand the cytological techniques, types of microscopes and structure and functions of cell organelles. 2. To learn about cellular components underlying the mitotic division. 3. To explain the co-ordination of several organelles which bring out the cellular function. 4. Know about the structure, classification and mechanism of different pathways and biochemical reactions. | | | | | | | | | | | |
| **Expected Course Outcomes:** | | | | | | | | | | | |
| On the successful completion of the course, student will be able to: | | | | | | | | | | | |
| 1 | | Understand the structures and purposes of basic components of cells, especially bimolecular membranes, and organelles. | | | | | | | | K 3 | |
| 2 | | Students can understand how the cellular components are used to generate and utilize  energy in cells. | | | | | | | | K2 | |
| 3 | | Able to explain the cellular components underlying mitotic cell division. | | | | | | | | K2 | |
| 4 | | Gain knowledge of genetic code and process of protein synthesis. | | | | | | | | K4 | |
| 5 | | Apply their knowledge of cell biology to selected examples of changes or losses in  cell function. These can include responses to environmental or physiological changes, or alterations of cell function brought about by mutation. | | | | | | | | K 3 | |
| **K1** - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** – Create | | | | | | | | | | | |
|  | | | | | | | | | | | |
| **Unit:1** | | | **INTRODUCTORYCYTOLOGY** | | | | **14 Hours** | | | | |
| Cell theory - Prokaryotic and Eukaryotic cells. Cytological techniques: Fixation– Sectioning and Staining. Principles and Resolving power of compound microscope, Fluorescence microscope and  Electron microscope. Cell Junctions - Ultra structure and functions of plasma membrane. | | | | | | | | | | | |
| **Unit:2** | | | **CELL ORGANELLES** | | | | **14 Hours** | | | | |
| Nucleus and Nucleolus. DNA structure and function - DNA Replication - Chromatin – Nucleosome. Chromosomes: – Structure, types, giant chromosomes. Ultra structure and functions  of Endoplasmic reticulum, Golgi body. | | | | | | | | | | | |
| **Unit:3** | | | **METABOLISM AND CELL CYCLE** | | | **15 Hours** | | | | | |
| Ultra structure and functions of Lysosomes, Centrosomes, Mitochondria. Glycolysis and Kreb’s  cycle. Electron transport chain and formation of ATP. Cell cycle - Mitosis, Meiosis -regulation. Apotosis and Cancer (brief outlines) | | | | | | | | | | | |
| **Unit:4** | | | **PROTEIN SYNTHESIS** | | | **15 Hours** | | | | | |
| Types and role of RNA- Structure of t-RNA. Ultra structure, function and types of ribosome. Properties of Genetic code - Detailed study of Protein synthesis – Polysome – differences in  Eukaryotes – Short outline of post transcriptional modifications. | | | | | | | | | | | |
| **Unit:5** | | | **BIOCHEMISTRY** | | | **15 Hours** | | | | | |
| Structure and Classification of Carbohydrates, Protein and lipids. Enzymes: - mechanism of action - | | | | | | | | | | | |
| classification and factors influencing enzyme action. Glycogenesis – Glycogenolysis,  Gluconeogenesis and HMP shunt. Beta oxidation of fats. | | | | | | | | | | | |
| **Unit:6** | | | **CONTEMPORARY ISSUES** | | **2 Hours** | | | | | | |
| Expert lectures, Online Seminars - Webinars and Field Visits. | | | | | | | | | | | |
|  | | | **Total Lecture Hours** | | **75Hours** | | | | | | |
| **Text Book(s)** | | | | | | | | | | | |
| 1 | Arumugam N. (2014). *Cell Biology and Molecular Biology*, Saras Publications, Nagercoil,  Tamilnadu. | | | | | | | | | | |
| 2 | Fatima D , Narayanan LM , Meyyan RP, Nallasingam K, Prasannakumar S, Arumugam N.  (2010). *Biochemistry*, Saras Publication, Nagercoil, Tamilnadu. | | | | | | | | | | |
| 3 | Verma PS and Aggarwal VK. (2016).*Cell Biology*, S. Chand Publishers, New Delhi. | | | | | | | | | | |
| 4 | Satynanarayana U and Chakrapani U. (2019).*Essentials Of Biochemistry,* 3rd edition, Books  and Allied Ltd, Delhi. | | | | | | | | | | |
| **Reference Books** | | | | | | | | | | | |
| 1 | **A**mbika Shanmugam. (2012). *Fundamentals of Biochemistry for Medical Students,* Wolters  Kluwer (India) Pvt Ltd, New Delhi. | | | | | | | | | | |
| 2 | De Robertis EDP and De Robertis EMF. (1987). *Cell and Molecular Biology,* Lippincott  Williams and Wilkins,[Philadelphia](https://en.wikipedia.org/wiki/Philadelphia) | | | | | | | | | | |
| 3 | Gupta PK.(2019).*Cell Biology,* 5th Revised edition, Rastogi Publications, Meerut. | | | | | | | | | | |
| 4 | Jain JL, Jain N and Jain S. (2016)*.Fundamentals of Biochemistry,* S. Chand Publications, New  Delhi. | | | | | | | | | | |
| 5 | Pawar CB. (2018). *Cell Biology*, Himalaya Publications, India. | | | | | | | | | | |
|  | | | | | | | | | | | |
| **Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]** | | | | | | | | | | | |
| 1 | https:/[/www](http://www.classcentral.com/report/swayam-moocs-course-list/).[classcentral.com/report/swayam-moocs-course-list/](http://www.classcentral.com/report/swayam-moocs-course-list/) | | | | | | | | | | |
| 2 | <https://www.classcentral.com/course/swayam-cell-biology-13937> | | | | | | | | | | |
| 3 | <https://swayam.gov.in/NPTEL> | | | | | | | | | | |
| 4 | https://nptel.ac.in/courses/102/106/102106025/ | | | | | | | | | | |
|  | | | | | | | | | | | |

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Mapping with Programme Outcomes** | | | | | | | | | | |
| **COs** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** |
| **CO1** | S | S | S | S | M | S | S | S | S | S |
| **CO2** | S | S | S | S | M | S | S | S | S | S |
| **CO3** | S | S | S | S | S | S | S | M | S | S |
| **CO4** | S | S | S | S | S | S | S | M | S | S |
| **CO5** | S | S | S | S | S | S | S | S | S | S |

\*S-Strong; M-Medium; L-Low



|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Course code** | | **53B** | **MICROBIOLOGY** | | **L** | | **T** | **P** | | **C** |
| **Core/Elective/ SBS** | | | **Core Course - VI** | | **4** | | **0** | **0** | | **4** |
| **Pre-requisite** | | | Basic Knowledge about Diversity, Structure and  Applications of Microbiology | | **Syllabus**  **Version** | | | **2025-**  **2026** | | |
| **Course Objectives:** | | | | | | | | | | |
| 1. The course is intended to make aware of the students about the classification, diversity, organization, application and pathogenicity of the microorganisms in the ecosystem. 2. The course will help the students to learn about the various microbial culture techniques and its handling. 3. The course will give an idea that how microbes are used in various industries for generationof various products related to day-to-day life. | | | | | | | | | | |
| **Expected Course Outcomes:** | | | | | | | | | | |
| On the successful completion of the course, student will be able to: | | | | | | | | | | |
| 1 | Provides basic knowledge about taxonomy, diversity and general structure of micro-  organisms. | | | | | | | | K2 | |
| 2 | Familiarize with the culture, sterilization, handling, identification and assessing growth characters of microorganisms. | | | | | | | | K3, | |
| 3 | Understand the general microbial techniques for isolation of pure cultures of bacteria, fungi andalgae. | | | | | | | | K2 | |
| 4 | Get idea about the microbial spoilage and the potentials in the usage of microbes in agriculture. | | | | | | | | K3 | |
| 5 | Familiarize with various aspects of microbial diseases and preventive measures. | | | | | | | | K4 | |
| **K1** - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6**– Create | | | | | | | | | | |
|  | | | | | | | | | | |
| **Unit:1** | | **CLASSIFICATION** | | | | **15Hours** | | | | |
| Characters and basic classification of Kingdom Monera and Fungi. Systematic position of Virus – classification - Structure of bacteriophage and HIV. Viroids and Prions. Ultra-structure of *E. coli*.- -  bacterial cell wall. General structure of fungi. | | | | | | | | | | |
| **Unit:2** | | **BACTERIAL CULTURE** | | | | **15Hours** | | | | |
| Bacterial growth and growth curve – factors influencing bacterial growth. Types of Culture medium – Culture of Bacteria – Sterilization - Medium – techniques. Maintenance – Characteristics of colonies –  staining of bacteria – Bio-fermenters and it role in mass culture. | | | | | | | | | | |
| **Unit:3** | | **FOOD AND AGRICULTURE** | | **15Hours** | | | | | | |
| Control of Microbes. Preservation of Milk. Food Spoilage: Botulism – Staphylococcal –Salmonellosis. Culture of Yeast and economic importance. Microbial Nitrogen fixation - Rhizobium – Azotobacter –  Azospirillum - BGA Bio-fertilizer – VAM fungi – Mycorrhiza. | | | | | | | | | | |
| **Unit:4** | | **INDUSTRIAL MICROBIOLOGY** | | **14Hours** | | | | | | |
| Role of microbes in Industry –Stages – types and methods of Fermentation. Products of fermentation industry – Ethanol - Citric acid - enzymes Antibiotics –food and dairy products. Basics concepts of  Probiotics. | | | | | | | | | | |



|  |  |  |  |
| --- | --- | --- | --- |
| **Unit:5** | | **MEDICAL MICROBIOLOGY** | **14Hours** |
| Causative organism, transmission and preventive measures of Cholera, Typhoid, Tuberculosis, Leprosy,  Syphilis, AIDS, Chicken pox, Hepatitis-B, Polio, Rabies, Swine flu, Dengue, Chikungunya and Covid-19. | | | |
| **Unit:6** | | **CONTEMPORARY ISSUES** | **2 Hours** |
| Expert lectures, Online Seminars - Webinars and Field Visits. | | | |
|  | | **Total Lecture Hours** | **75Hours** |
| **Text Book(s)** | | | |
| 1 | Dubey RC and Maheshwari DK. (2013). *A Textbook of Microbiology*, S. Chand Publishers, New  Delhi. | | |
| 2 | Mani A, Selvaraj AM, Narayanan LM, Arumugam A. (2017).*Microbiology*, Saras Publication,  Nagercoil, Tamilnadu. | | |
| **Reference Books** | | | |
| 1 | Atlas RM. (1995).*Principles of Microbiology*, 1st edition, Mosby-Yearbook, Inc, Missouri. | | |
| 2 | Power CH and Daginawla HF. (2001).*General Microbiology*, Himalaya Publishing House, New Delhi. | | |
| 3 | Pelczar MJ, Chan EC, Pelczar MF. (1981).*Elements of Microbiology,*McGraw-Hill International  Book Company. | | |
| 4 | Ryan KJ, Ray CG, editors. (2018).*Sherris Medical Microbiology,* 7th edition, McGraw-Hill  Education, Singapore. | | |
| 5 | Willey JM, Sherwood L, Woolverton CJ. (2017). *Prescott's Microbiology,* McGraw-Hill, Singapore. | | |
|  | | | |
| **Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]** | | | |
| 1 | <https://nptel.ac.in/courses/102/103/102103015/> | | |
| 2 | <https://nptel.ac.in/courses/102/103/102103015/> | | |
| 3 | <https://nptel.ac.in/courses/102/103/102103015/> | | |
|  | | | |

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Mapping with Programme Outcomes** | | | | | | | | | | |
| **COs** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** |
| **CO1** | S | S | S | S | S | S | L | S | L | S |
| **CO2** | M | S | M | S | S | M | L | S | M | M |
| **CO3** | M | S | M | S | S | S | M | M | L | S |
| **CO4** | M | S | S | S | M | S | M | M | M | S |
| **CO5** | S | S | S | S | S | S | M | S | M | S |

\*S-Strong; M-Medium; L-Low



|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Course code** | | | **53C** | **GENETICS AND IMMUNOLOGY** | | **L** | **T** | | **P** | **C** |
| **Core/Elective/ SBS** | | | | **Core Course - VII** | | **4** | **0** | | **0** | **4** |
| **Pre-requisite** | | | | Basic Knowledge of Genetics, Recombination  and Concepts of Immune System | | **Syllabus**  **Version** | | **2025-**  **2026** | | |
| **Course Objectives:** | | | | | | | | | | |
| 1. To learn the basic principles of inheritance at the molecular, cellular and organism levels. 2. To understand causal relationships between molecule/cell level phenomena and organism-level   patterns of heredity.   1. To learn the mechanism of Mutation and will able to understand how mutations bring   changes in an organism.   1. To give an insight to the cellular components involved in the immunity. 2. To give an awareness of the mechanism, types and concepts regarding immune response. | | | | | | | | | | |
| **Expected Course Outcomes:** | | | | | | | | | | |
| On the successful completion of the course, student will be able to: | | | | | | | | | | |
| 1 | | Students will be able to describe and apply the principles of Mendelian genetics. | | | | | | | K3 | |
| 2 | | Capable to describe the flow of genetic information from DNA to RNA to protein. | | | | | | | K2 | |
| 3 | | Make clear how genes are regulated. The students will be able to explain how  mutations occur and its role in adaptation and how speciation occurs. | | | | | | | K3 | |
| 4 | | Able to develop an idea about the cellular and molecular basis of immune response. | | | | | | | K3 | |
| 5 | | Understand the principles of self-tolerance and autoimmunity and will be able to  relate the potentials of immunology in relation to biotechnology and applied sciences. | | | | | | | K2 | |
| **K1** - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** - Create | | | | | | | | | | |
|  | | | | | | | | | | |
| **Unit:1** | | | **FUNDAMENTALS OF GENETICS** | | | **14Hours** | | | | |
| Importance of Drosophila in genetics – Culture methods - sex identification – common mutations. Mendelian Laws of Inheritance and Non Mendelian inheritance (Incomplete dominance – Co- dominance – Polygenic inheritance – Epistasis –Lethal genes). Crossing over – Linkage in drosophila. | | | | | | | | | | |
| **Unit:2** | | | **RECOMBINATION AND GENETICAL DISORDERS** | | | **15Hours** | | | | |
| Recombination in bacteria: – Transformation – Conjugation – F factor -Sexduction – Transduction  –Generalised and Specialised - Plasmids. Chromosome variation (Ploidy) - Euploidy – Aneuploidy – Gene Balancing – Gynandromorphs – Barr bodies – Chromosomal aberrations- Non disjunction - Klinefelter, Turner and Downsyndrome. | | | | | | | | | | |
| **Unit:3** | | | **MUTATION** | | **14Hours** | | | | | |
| Gene Mutations – Types of Mutations – Physical and Chemical mutagens – DNA repair. Sickle cellanemia–Alkaptonuria–Phenylketonuria–albinism.Operonconcept-Lacandtrpoperons  (outlines)**.** | | | | | | | | | | |
| **Unit:4** | | | **CELLS OF IMMUNE SYSTEM** | | **15Hours** | | | | | |
| Cellsof immunesystem-TypesofImmunity–Innate andacquired-Antigens-Structure,  function and types of antibodies. B and T cell, Epitopes, Haptens, Adjuvants. - Antigen-antibody reactions - T-Cell and B-Cell activation - Monoclonal antibodies. | | | | | | | | | | |
| **Unit:5** | | | **BASIC CONCEPTS OF IMMUNE SYSTEM** | | **15Hours** | | | | | |
| Basic concepts of Major Histocompatibility Complex. - Basic properties and functions of Cytokines, Interferons and complement proteins - Humoral and Cell mediated immunity. Typesof  Hypersensitivity. Concepts of autoimmunity and immunodeficiency - Vaccines. | | | | | | | | | | |
| **Unit:6** | | | **CONTEMPORARY ISSUES** | | **2 Hours** | | | | | |
| Expert lectures, Online Seminars - Webinars and Field Visits. | | | | | | | | | | |
|  | | | **Total Lecture Hours** | | **75Hours** | | | | | |
| **Text Book(s)** | | | | | | | | | | |
| 1 | Verma PS and Agarwal VK. (2010). *Genetics*, S. Chand Publishers, 9th edition, New Delhi. | | | | | | | | | |
| 2 | Meyyan RP. (2017). *FundamentalsofGenetics*, Saras Publication , 5th edition, Nagercoil,  Tamilnadu. | | | | | | | | | |
|  | Ramesh SR. (2017).*Immunology*, McGraw Hill Education India Private Limited. New York. | | | | | | | | | |
| **Reference Books** | | | | | | | | | | |
| 1 | Gardner EJ. (2006). *PrinciplesofGenetics*, 8th edition. John Wiley and Sons, Inc. London, UK. | | | | | | | | | |
| 2 | Primrose SB and Twyman R. (2013). *PrinciplesofGeneManipulationandGenomics*, John  Wiley and Sons; Inc. London, UK. | | | | | | | | | |
| 3 | Delves PJ, Martin SJ, Burton DR, Roitt IM. (2017). *EssentialImmunology*,13th edition, John  Wiley and Sons;Inc. London, UK. | | | | | | | | | |
|  | | | | | | | | | | |
| **Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]** | | | | | | | | | | |
| 1 | <https://swayam.gov.in/nd2_cec20_ma13/preview> | | | | | | | | | |
| 2 | <https://swayam.gov.in/nd2_cec20_bt05/preview> | | | | | | | | | |

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Mapping with Programme Outcomes** | | | | | | | | | | | |
| **COs** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | | **PO9** | **PO10** |
| **CO1** | L | S | S | M | L | L | L | S | | L | S |
| **CO3** | L | M | S | M | M | L | L | S | | L | S |
| **CO3** | L | M | M | L | M | L | L | S | | L | S |
| **CO4** | L | M | S | L | L | L | L | S | L | | S |
| **CO5** | L | M | S | L | L | L | L | S | M | | S |

\*S-Strong; M-Medium; L-Low



|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Course code** | | **5ZC** | | **BIOPHYSICS AND INSTRUMENTATION** | | | **L** | | **T** | **P** | **C** |
| **Core/Elective/ SBS** | | | | **Skill Based Course - III** | | | **3** | | **0** | **0** | **2** |
| **Pre-requisite** | | | | Basic Knowledge of Bio-molecular Interaction  and Principles of Instrumentation | | | **Syllabus**  **Version** | | | **2025-26** | |
| **Course Objectives:** | | | | | | | | | | | |
| 1. To develop skill in understanding and handling molecular science and instrumentation. 2. To make the students capable of understanding the under lying principles of various reaction and biological interactions. 3. To understand the principles and applications of various laboratory instruments. | | | | | | | | | | | |
| **Expected Course Outcomes** | | | | | | | | | | | |
| On the successful completion of the course, student will be able to: | | | | | | | | | | | |
| 1 | Able to know the basics about the molecular bonds and interactions | | | | | | K2 | | | | |
| 2 | The learner will be trained in preparing solutions and handling  instruments at basic level. | | | | | | K3 | | | | |
| 3 | The students will be capable of interpreting and understanding the basis of bioenergetics in living system. | | | | | | K2 | | | | |
| 4 | Gain the knowledge in the area of enzyme and its action. | | | | | | K2 | | | | |
| 5 | Understand and apply skills in biological tools and techniques. | | | | | | K3 | | | | |
| **K1** - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6**– Create | | | | | | | | | | | |
|  | | | | | | | | | | | |
| **Unit:1** | | **BIMOLECULAR INTERACTIONS** | | | | | | **9 Hours** | | | |
| Valence of carbon - Polar and non polar molecules – Covalent, ionic and Co-ordinate bonds. Hydrogen bonding - weak interactions, ester linkage, electrostatic, Disulphide and peptide bonds -  Vander Waals forces. Isomerism and optical activity. | | | | | | | | | | | |
| **Unit:2** | | **SOLUTIONS** | | | | | | **8 Hours** | | | |
| Hydrophiles and Hydrophobes - Acid-Base concept, Molarity, Molality and Normality, Ampholyte,  pH and pKa value - Redox potential – Principles of diffusion and Osmosis – Hypo, Hyper and isotonic solutions. | | | | | | | | | | | |
| **Unit:3** | | **THERMODYNAMICS** | | | **9 Hours** | | | | | | |
| First and Second laws of thermodynamics, Biological applications of enthalpy, free energy, activation energy, unavailable energy and entropy, Thermodynamics of passive and active transport. | | | | | | | | | | | |
| **Unit:4** | | | **SIGNALING AND KINETICS** | | | **9 Hours** | | | | | |
| Enzyme action: Michaelis-Menton equation - Vmax - Km - Line Weaver Burk plot. Action potential  – refractory period – synaptic potential. Excitation and conduction of heart beat. Radio-labeling and  Tracer techniques. | | | | | | | | | | | |



|  |  |  |  |
| --- | --- | --- | --- |
| **Unit:5** | | **INSTRUMENTATION PRINCIPLES** | **8 Hours** |
| Principles and Applications of pH meter – Centrifugation – Chromatography – Electrophoresis - Colorimeter and Spectrophotometer – ECG – interpretation of Electrocardiograph. | | | |
| **Unit:6** | | **CONTEMPORARY ISSUES** | **2 Hours** |
| Expert lectures, Online Seminars - Webinars and Field Visits. | | | |
|  | | **Total Lecture Hours** | **45 Hours** |
| **Text Book(s)** | | | |
| 1 | Arumugam N and Kumaresan V.(2017). *Bio Physics and Bioinstrumentation,* Saras Publication,  Nagercoil, Tamilnadu. | | |
| 2 | Bajpai PK. (2008.) *Biological Instrumentation and Methodology*, S. Chand and Co. Ltd. New  Delhi. | | |
| **Reference Books** | | | |
| 1 | Arumugam N and Kumaresan V. (2015). *Principles and Techniques in Biophysics*, Saras Publication, Nagercoil, Tamilnadu. | | |
| 2 | Jain JL, Jain N and Jain S. (2009). *Fundamentals of Biochemistry*, S. Chand Publications, New  Delhi. | | |
| 3 | Setlow RB and pollard EL. (1962). *Molecular Biophysics*, Pergamon Press. | | |
| 4 | Mohan P Arora (2015). *Bio-Physics*, Himalaya Publishing House, Nagpur. | | |
| 5 | Veerakumari L. (2010). *Bioinstrumentation*, MJP-Publishers, Chennai. | | |
|  | | | |
| **Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]** | | | |
| 1 | <https://nptel.ac.in/courses/102/105/102105034/> | | |
| 2 | <https://nptel.ac.in/courses/102/103/102103083/> | | |
|  | | | |

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Mapping with Programme Outcomes** | | | | | | | | | | |
| **COs** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** |
| **CO1** | S | S | L | M | L | L | L | S | S | S |
| **CO2** | S | S | M | S | M | L | L | S | S | S |
| **CO3** | S | S | M | S | M | M | M | M | S | S |
| **CO4** | S | S | S | S | M | M | M | M | S | S |
| **CO5** | S | S | S | M | S | M | M | S | S | S |

 \*S-Strong; M-Medium; L-Low

Sixth Semester



|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Course code** | | **63A** | **ANIMAL PHYSIOLOGY** | | **L** | **T** | | **P** | **C** |
| **Core/Elective/ SBS** | | | **Core Course - VIII** | | **4** | **0** | | **0** | **4** |
| **Pre-requisite** | | | Basic Knowledge of variousPhysiological Aspects **V** | | **Syllabus**  **Version** | | **2025-26** | | |
| **Course Objectives:** | | | | | | | | | |
| 1. To familiarize students with the principles and basic facts of Animal Physiology. 2. To give students an insight about the molecular and cellular basis of physiological functions in animals. 3. To give an idea about the regulation of organ system functions in a whole animal using a conceptual model of feedback to explain homeostasis. | | | | | | | | | |
| **Expected Course Outcomes:** | | | | | | | | | |
| On the successful completion of the course, student will be able to: | | | | | | | | | |
| 1 | Associate the transport of gases and its influence on metabolism of major food  constituents. | | | | | | | K2 | |
| 2 | Explain the mechanism of circulation and excretion among different vertebrates. | | | | | | | K2 | |
| 3 | Present the structure of a muscle and a nerve and infer its functions. | | | | | | | K3 | |
| 4 | Relate the structure and mechanism of sense organs in animals. | | | | | | | K3 | |
| 5 | Categorize the impact of hormones in the reproductive mechanism of the male  and female organism. | | | | | | | K4 | |
| **K1** – Remember; **K2** – Understand; **K3** – Apply; **K4** – Analyze; **K5** – Evaluate; **K6** – Create | | | | | | | | | |
|  | | | | | | | | | |
| **Unit:1** | | **NUTRITION AND RESPIRATION** | | | **15 Hours** | | | | |
| Nutrition: Digestion and absorption of carbohydrates proteins and lipids. Mineral and Vitamins – its deficiency. Hormonal control of digestion. Respiratory pigments- structure of hemoglobin, Transport of O2 and CO2- Bohr’s effect – Regulation of respiration – Carbon monoxide poisoning, Bronchitis, Asthma – Physiological effects of smoking. | | | | | | | | | |
| **Unit:2** | | **CIRCULATION AND EXCRETION** | | | **15 Hours** | | | | |
| Blood- composition and functions of blood plasma and formed elements, Mechanism of blood clotting, Types of Hearts – Heartbeat and pace maker – Cardiac cycle – ECG – Pulse and blood pressure. Nephron structure and mechanism of urine formation, Excretory products, Osmoregulation in fishes. | | | | | | | | | |
| **Unit:3** | | **MUSCLE AND NERVE PHYSIOLOGY** | | **14 Hours** | | | | | |
| Briefaccountoftypesofmuscles–Ultrastructureofstriatedmuscle,Musclecontractionand  properties. Neurons – structure and types – Impulse propagation, synaptic transmission, Neuro transmitters – Reflex action, Nerve disorders – Epilepsy, Alzheimer’s disease, Parkinson’s disease. | | | | | | | | | |
| **Unit:4** | | **SENSE ORGANS** | | **15 Hours** | | | | | |
| Structure of eye, physiology of vision, visual elements and pigments, photo chemistry of vision – | | | | | | | | | |



|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Eye defects – myopia, hyperopia, presbyopia, astigmatism, cataract – Structure of ear and mechanism of hearing – Hearing impairments – deafness, labyrinthine disease – Olfactory, gustatory and tactile sense organs. | | | | |
| **Unit:5** | | | **REPRODUCTIVE PHYSIOLOGY** | **14 Hours** |
| Puberty, adolescence, pregnancy, parturition, lactation and birth control. Endocrine glands in man  – Hormones, action and disorders – Feed-back mechanism, Outlines of mechanism of hormonal activity. | | | | |
| **Unit:6** | | | **CONTEMPORARY ISSUES** | **2 Hours** |
| Expert lectures, Online Seminars – Webinars and Field Visits. | | | | |
|  | | **Total Lecture Hours** | | **75 Hours** |
| **Text Book(s)** | | | | |
| 1 | ArumugamN and Mariakuttikan A (2014).*AnimalPhysiology*, Saras Publication,  Nagercoil, Tamilnadu. | | | |
| 2 | VeerbalaRastogi. (2007).*AnimalPhysiology*, KedarNathaRamNath Publishers,  Meerut. | | | |
| **Reference Books** | | | | |
| 1 | Lehninger AL, Michael Cox, Nelson DL. (2017).*Biochemistry*, 7th edition, Macmillan, New York. | | | |
| 2 | Reddy PB. (2015). *Text Book of Animal Physiology,* IMRF Publishing house, AndraPradesh,  India. | | | |
| 3 | Verma PS and Agarwal (2000).*AnimalPhysiology*, S. Chand and Company Ltd, New Delhi | | | |
|  | | | | |
| **Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]** | | | | |
| 1 | <https://www.classcentral.com/course/swayam-animal-physiology> | | | |
|  | | | | |

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Mapping with Programme Outcomes** | | | | | | | | | | |
| **Cos** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** |
| **CO1** | M | L | S | M | M | L | L | M | M | S |
| **CO2** | M | M | S | M | S | L | L | M | S | S |
| **CO3** | L | M | S | M | M | L | L | M | S | S |
| **CO4** | L | M | S | S | M | L | M | M | S | S |
| **CO5** | M | M | S | S | M | L | L | M | S | S |

\*S-Strong; M-Medium; L-Low

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Course code** | | **63B** | **DEVELOPMENTAL BIOLOGY** | | **L** | **T** | | **P** | **C** |
| **Core/Elective/ SBS** | | | **Core Course - IX** | | **4** | **0** | | **0** | **4** |
| **Pre-requisite** | | | Basic Knowledge of Embryology and Techniques  In Developmental Biology **V** | | **Syllabus**  **Version** | | **2025-26** | | |
| **Course Objectives:** | | | | | | | | | |
| 1. To make aware of the students about the theories, concepts and basics of Developmental Biology. 2. To provide students the idea of sex cells, fertilization, cleavage, differentiation and development of organs. 3. To understand the mechanisms which lead to cell determination. | | | | | | | | | |
| **Expected Course Outcomes:** | | | | | | | | | |
| 1 | Understand the concepts of basic developmental biology and needs of Artificial  intelligence. | | | | | | | K2 | |
| 2 | Able to know about pattern, plans and morphogenetic techniques of developing  egg. | | | | | | | K3 | |
| 3 | Gain knowledge about the development of organs in different animals. | | | | | | | K3 | |
| 4 | Know and apply the techniques involved in embryology field. | | | | | | | K3 | |
| 5 | Familiar with reproductive technology and embryo transfer technology. | | | | | | | K4 | |
| **K1** - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** - Create | | | | | | | | | |
|  | | | | | | | | | |
| **Unit:1** | | **GAMETES AND FERTILIZATION** | | | **15Hours** | | | | |
| Basic concepts of developmental biology – theories - Structure human Spermatozoa - Structure of mammalian egg - Egg membranes Patterns of egg - Spermatogenesis – Oogenesis. Fertilization – mechanism and significance – Parthenogenesis. | | | | | | | | | |
| **Unit:2** | | **BLASTULATION AND GASTRULATION** | | | **14Hours** | | | | |
| Cleavage - Planes and Patterns of cleavage - Factors controlling cleavage - Fate map – Use of Artificial Intelligence in mapping. Blastulation– Morphogenetic movements - gastrulation Frog and Chick. | | | | | | | | | |
| **Unit:3** | | **ORGANOGENESIS** | | **14Hours** | | | | | |
| Development of Brain, Eye and Heart in frog. Development of Nervous system in chick and Foetal membranes in Chick and Mammals. | | | | | | | | | |



|  |  |  |  |
| --- | --- | --- | --- |
| **Unit:4** | | **APPLIED EMBRYOLOGY** | **15 Hours** |
| Organizer concept –Structure – mechanism of induction and competence. Nuclear transplantation -  Teratogenesis – Regeneration: types - events and factors. Transgenic mice - Retroviral method – Microinjection method - Embryonic stem cell method. Methods to culture embryo. | | | |
| **Unit:5** | | **PLACENTATION AND TECHNIQUES** | **15Hours** |
| Placentation in Mammals –Estrous - Menstrual cycle and menopause - Pregnancy – trimesters –  development. *Erythroblastosisfoetalis*-Twins – types. Infertility – causes - Test tube baby and Assisted Reproductive Technology – Embryo transfer – Amniocentesis. | | | |
| **Unit:6** | | **CONTEMPORARY ISSUES** | **2 Hours** |
| Expert lectures, Online Seminars - Webinars and Field Visits. | | | |
|  | | **Total Lecture Hours** | **75Hours** |
| **Text Book(s)** | | | |
| 1 | Arumugam N. (2014).*A Text Book of Embryology*, 15th edition, Saras publication,  Nagercoil,Tamilnadu. | | |
| 2 | Verma PS and Agarwal VK. (2010).*ChordateEmbryology*, S. Chand and Company Ltd, New  Delhi. | | |
| **Reference Books** | | | |
| 1 | Balinsky BI and Fabian BC. (2012).*AnIntroductiontoEmbryology*, 5th edition, CBS College  Publishers, Cengage Learning India Pvt. Ltd. New Delhi. | | |
| 2 | Madhavan KS. (2017). *Developmental Biology,* Arjun publishing house, India. | | |
| 3 | Rastogi. (2014).*ChordateEmbryology*, Kedar Nath Ram Nath, Meerut. | | |
| 4 | Sastry KV and Shukla V. *Developmental Biology,* 2nd edition, Rastogi publication, Meerut. | | |
|  | | | |
| **Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]** | | | |
| 1 | <https://swayam.gov.in/nd1_noc20_bt35/preview> | | |
| 2 | [https://www.mooc-list.com/course/developmental-biology-saylororg?](https://www.mooc-list.com/course/developmental-biology-saylororg) | | |
|  | | | |

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Mapping with Programme Outcomes** | | | | | | | | | | |
| **COs** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** |
| **CO1** | M | M | S | M | L | L | M | S | S | M |
| **CO2** | L | M | S | M | L | L | S | S | S | M |
| **CO3** | L | M | S | L | L | L | S | M | M | M |
| **CO4** | L | M | S | L | L | L | S | M | M | M |
| **CO5** | M | M | S | M | L | L | S | S | S | M |

\*S-Strong; M-Medium; L-Low

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Course code** | | | | **63C** | **BIOTECHNOLOGY** | | **L** | **T** | **P** | **C** | |
| **Core/Elective/ SBS** | | | | | **Core Course - X** | | **4** | **0** | **0** | **4** | |
| **Pre-requisite** | | | | | Basic Knowledge about Principles and  Techniques in Biotechnology **V** | | **Syllabus**  **Version** | | **2025-26** | | |
| **Course Objectives:** | | | | | | | | | | | |
| 1. Give a firm foundation in the fundamentals of modern Molecular techniques. 2. The course will give an insight to the mechanism of Gene Expression and Regulation. 3. The course will give idea about various protocols followed in Biotechnology in relation to Animal science. | | | | | | | | | | | |
| **Expected Course Outcomes:** | | | | | | | | | | | |
| On the successful completion of the course, student will be able to: | | | | | | | | | | | |
| 1 | | Give an idea about the various techniques used in modern biotechnology. | | | | | | | K2 | | |
| 2 | | The course will give an insight into the current applications of biotechnology and  advances in the different areas like medical, microbial, environmental, bioremediation, agricultural, animal and forensics. | | | | | | | K2 | | |
| 3 | | Able to understand how microbes are used to engineer various genes. | | | | | | | K3 | | |
| 4 | | Explain the general principles of generating genetically modified organisms and  modern artificial methods in biotechnology. | | | | | | | K3 | | |
| 5 | | Appreciate the importance of Biotechnology in enzyme production,  cryopreservation and biosensors. | | | | | | | K3 | | |
| **K1** - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** - Create | | | | | | | | | | | |
|  | | | | | | | | | | | |
| **Unit:1** | | | | **RECOMBINANT DNA TECHNOLOGY** | | | **15Hours** | | | | |
| Restriction endonuclease – sequence recognition. DNA Ligase. Identification and isolation of gene of interest - Cloning vectors and recombination. Screening of recombinant DNA. Application of recombinant DNA technology. Commercial production of Insulin. Human Genome  Project. | | | | | | | | | | | |
| **Unit:2** | | | | **MOLECULAR TECHNIQUES** | | | **14Hours** | | | | |
| PCR - Principle, types and applications. Electrophoresis – types and  Principle. Blotting – types – applications. DNA finger printing and its applications –RAPD – FISH- RFLP. DNA probes and diagnosis-Introduction to Genome editing. | | | | | | | | | | | |
| **Unit:3** | | | **ANIMAL TISSUE CULTURE** | | | | **15Hours** | | | | |
| Applications – Primary culture. Steps involved in mammalian cell culture- He la and WI38 cell lines – Maintenance of cell lines – Techniques and Application of organ culture. Animal cloning –  Dolly. | | | | | | | | | | | |
| **Unit:4** | | | | **APPLICATIONS** | | **15Hours** | | | | |
| Genetically modified Animals- Single cell Protein from microbes – Biofuels – Solid waste management – Liquid Waste Management – Biogas production - Biopesticides. Production of  bacterial, fungal, algal and yeast biomass – Mushroom Culture. | | | | | | | | | | |
| **Unit:5** | | | | **ENZYME BIOTECHNOLOGY** | | **14Hours** | | | | |
| EnzymeBiotechnology: Microbial production and application of enzymes – Ribozymes- Artificial  enzymes, Immobilization of enzymes- methods and its application. Biosensors, Cryobiology – Methods of Cryo-preservation. | | | | | | | | | | |
| **Unit:6** | | | | **CONTEMPORARY ISSUES** | | **2 Hours** | | | | |
| Expert lectures, Online Seminars - Webinars and Field Visits. | | | | | | | | | | |
|  | | | | **Total Lecture Hours** | | **75 Hours** | | | | |
| **Text Book(s)** | | | | | | | | | | |
| 1 | Dubey RC. (2012). *A Text Books of Biotechnology*, S. Chand and Company, New Delhi. | | | | | | | | | |
| 2 | Kumaresan V. (2015). *Biotechnology* Saras Publication, Nagercoil, Tamilnadu. | | | | | | | | | |
| 3 | Verma PS and Agarwal VK. (2017). *Genetic Engineering*, 9th edition, S. Chand Publishers,  New Delhi. | | | | | | | | | |
| **Reference Books** | | | | | | | | | | |
| 1 | Brown TA. (1995).*Gene cloning*,Chapman and Hall, Publication, London. | | | | | | | | | |
| 2 | Gupta PK. (20170. *Molecular Biology and Biotechnology,* Rastogi publication, Meerut. | | | | | | | | | |
| 2 | Mohan P Arora. (2003). *Biotechnology,* 1st edition, Edited by Chander Kanta, Published by  Himalaya Publishing House. | | | | | | | | | |
| 3 | Primrose SB, Twyman R. (2013). *Principles Of Gene Manipulation And Genomics*, John  Wiley and Sons, India. | | | | | | | | | |
| 4 | Seema S Sambrani. (2017). *A Text Book of Plant and Animal Tissue Culture,* 2nnd edition,  Vision publications, Pune, India. | | | | | | | | | |
|  | | | | | | | | | | |
| **Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]** | | | | | | | | | | |
| 1 | <https://swayam.gov.in/nd2_cec20_bt07/preview> | | | | | | | | | |
| *2* | <https://swayam.gov.in/nd1_noc19_bt20/preview> | | | | | | | | | |
|  | | | | | | | | | | |

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Mapping with Programme Outcomes** | | | | | | | | | | |
| **COs** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** |
| **CO1** | L | M | M | L | L | L | L | S | S | S |
| **CO2** | L | M | M | L | L | L | L | S | S | S |
| **CO3** | L | M | M | L | L | L | L | S | S | S |
| **CO4** | L | S | M | L | L | L | M | M | S | S |
| **CO5** | L | M | M | L | L | L | L | L | S | S |

\*S-Strong; M-Medium; L-Low



|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Course code** | | | **63P** | **CELL BIOLOGY AND BIOCHEMISTRY ANIMAL PHYSIOLOGY AND**  **DEVELOPMENTAL BIOLOGY** | **L** | **T** | | **P** | **C** |
| **Core/Elective/ SBS** | | | | **Core Practical - III** | **0** | **0** | | **2** | **4** |
| **Pre-requisite** | | | | Practical Knowledge in the field of Cell biology, Physiology adaptations and DevelopmentalStages  of Cells | **Syllabus Version** | | | **2025-26** | |
| **Course Objectives**:   1. To observe and identify different cell types and structures using different microscopic techniques. 2. To get awareness of physiological processes of cell and physiological activities of aquatic organisms. 3. To learn the developmental stages of organisms by permanent microscopic slides. | | | | | | | | | |
| **Expected Course Outcomes:** | | | | | | | | | |
| On the successful completion of the course, student will be able to: | | | | | | | | | |
| 1 | Apply concepts and knowledge of the general terminology, cell structure and function. | | | | | | K3 | | |
| 2 | Utilize some of the useful techniques in the field of cell biology (Hematology and  staining) and understand the basic concepts behind these techniques. | | | | | | K2 | | |
| 3 | Assess and able to examine various practical techniques in physiological field. | | | | | | K3 | | |
| 4 | Demonstrate an understanding the scientific methods of physiological adaptations of  animal. | | | | | | K2 | | |
| 5 | Able to discriminate the developmental stages of cells of various living organisms. | | | | | | K4 | | |
| **K1** - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** – Create | | | | | | | | | |
| **MAJOR PRACTICAL** | | | | | | | | | |
| 1. Squash Preparation of Onion root tip – stages ofMitosis. 2. Estimation of RBC and WBC in human Blood (Not for colleges offeringCLT). 3. Oxygen consumption of fresh water fish. 4.Identification of given biochemicalsample:   Monosacchride, Polysacchride, Aminoacid, Protien, Lipid.  5. Analysis of excretory products- Ammonia, urea and uric acid. | | | | | | | | | |
| **MINOR PRACTICAL** | | | | | | | | | |
| 1. Study of Opercula movement of a fish at 10 degree increase andQ10. 2. Activity of salivary amylase (Qualitativeanalysis). 3. Preparation of Haemin crystals. 4. Estimation of Haemoglobin. | | | | | | | | | |
| **SPOTTERS**   1. Giant Chromosome (Demonstration of Polytene chromosome preparation). 2. Meiosis sub stages in Prophase I. (Demonstration suggested with Pollen of any Liliacea). 3. Kymograph (Demonstration of Muscle twitch with PowerPoint). 4. T.S of Pituitary, Thyroid, Adrenal, Ovary and testis. 5. Spermof Man. 6. Egg of Frog. 7. Blastula of Frog. 8. Gastrula of Frog. 9. Development of Chick 18, 24, 48,72hr.   Placenta of Sheep and Rabbit. | | | | | | | | | |
| **QUESTION PATTERN: 75 MARKS**  **Major: 25, Minor: 15, Record: 10, Spotter: 25 (5 spotters each carry 5 marks).** | | | | | | | | | |
| **Total Practical Hours 30(Each Semester) x 2 = 60 Hours PerYear** | | | | | | | | | |
| Text Book(s) | | | | | | | | | |
| 1 | | [Jayasurya, Arumugam N,](https://www.sapnaonline.com/shop/author/jayasurya) [Dulsy Fatima. (2013). *Practical Zoology Vol 3,*](https://www.sapnaonline.com/shop/author/dulsy-fatima)Saras Publication, Nagercoil, Tamilnadu. | | | | | | | |
| 2 | | [Dr. Renu Gupta,](https://www.amazon.in/s/ref%3Ddp_byline_sr_book_1?ie=UTF8&field-author=Dr.%2BRenu%2BGupta&search-alias=stripbooks) [Dr. Seema Makhija,](https://www.amazon.in/s/ref%3Ddp_byline_sr_book_2?ie=UTF8&field-author=Dr.%2BSeema%2BMakhija&search-alias=stripbooks)[Dr. Ravi Toteja](https://www.amazon.in/s/ref%3Ddp_byline_sr_book_3?ie=UTF8&field-author=Dr.%2BRavi%2BToteja&search-alias=stripbooks). (2018).*Cell Biology: Practical Manual*, Prestige Publishers, New Delhi. | | | | | | | |
| 3 | | Trigunayat MM. (2019).*A Manual of Practical Zoology: Biodiversity, Cell biology, Genetics*  *and Developmental Biology part 1,* Scientific publishers, India. | | | | | | | |

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Mapping with Programme Outcomes** | | | | | | | | | | |
| **COs** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** |
| **CO1** | M | M | S | S | M | L | S | S | S | S |
| **CO2** | M | M | S | M | M | L | S | M | S | S |
| **CO3** | M | M | S | S | M | L | S | L | S | S |
| **CO4** | M | S | S | S | M | L | S | L | S | S |
| **CO5** | M | M | M | S | S | L | S | L | M | M |

\*S-Strong; M-Medium; L-Low

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Course code** | | **63Q** | **MICROBIOLOGY, GENETICS,**  **IMMUNOLOGY AND BIOTECHNOLOGY** | **L** | **T** | | **P** | **C** |
| **Core/Elective/ SBS** | | | **Core Practical - IV** | **0** | **0** | | **2** | **4** |
| **Pre-requisite** | | | Practical Knowledge of various techniques in  Microbiology, Genetics and Biotechnology | **Syllabus**  **Version** | | | **2025-26** | |
| **Course Objectives**:   1. To impart hands-on training in basic microbiological techniques. 2. To understand the concepts and obtain practical knowledge in genetics and biotechnology through experiments. 3. To familiarize students with various immunological techniques. | | | | | | | | |
| **Expected Course Outcomes:** | | | | | | | | |
| On the successful completion of the course, student will be able to: | | | | | | | | |
| 1 | Familiar with practical skills in the use of tools, technologies and methods common to  microbiology and biotechnology. | | | | | K3 | | |
| 2 | Able to test the microbiological quality of samples from different sources and  differentiate between Gram-positive and Gram-negative bacteria. | | | | | K4 | | |
| 3 | Gain knowledge about basic immunological principles involved in clinical and applied  science. | | | | | K2 | | |
| 4 | Trained in basic enzyme and immunological assays and be taught to present the results  both qualitatively and quantitatively. | | | | | K4  K2 | | |
| 5 | Understand different sterilization procedures, mounting techniques and media  preparation when handling advanced Biotechnological equipments. | | | | |  | | |
| **K1** - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** – Create | | | | | | | | |
| **MAJOR PRACTICAL** | | | | | | | | |
| 1. Isolation of DNA from any fruit/tissue.  2.Preparation of Culture Media : Liquid and Solid 3.Enumeration of microbes in soil   1. Gram staining Technique. 2. Thin layer chromatography of any Biological sample(Optional). 3. Estimation of activity of Protease and Amylase. | | | | | | | | |
| **MINOR PRACTICAL** | | | | | | | | |
| 1. Quality of Milk – MBR test. 2. Mounting of given fungi. 3. Antigen – Antibody reaction: ABO blood group. 4. Sterilization of the Culture Medium in Autoclave / pressure cooker. 5. Estimation of sugar in given wine sample. 6.Determination of Motility of Microbe:   Hanging drop technique (Do not use curd as *Lactobacillus* is not motile). | | | | | | | | |

|  |  |
| --- | --- |
| **SPOTTERS**  **Genetics:**  Genetic importance - Drosophila male and female, Giant Chromosome.  **Microbiology:**  Autoclave/Pressure Cooker, Electrophoresis unit, Culture media-Plate, Slant and Broth.  **Immunology:**  Thymus gland, WIDAL kit, VDRL kit, Antibiotic sensitivity test.  **Biotechnology:**  Spirullina, Yeast, Penicillin, Azolla, Mushroom seeds, Bio-pesticide (BT/Fungi), Biofertilizer (Nitrosomonas/ Rhizobium/Phosphobacter) | |
| **VISIT ANDSUBMISSION**  Visit to an industry or lab of Biotechnology or Microbiological importance. Report should be submitted in the Practical. | |
| **QUESTION PATTERN: 75 MARKS**  **Major: 25, Minor: 10, Record: 10, Spotter: 25 (5 spotters each carry 5marks), Report: 5 marks.** | |
| **TotalPracticalHours 30(Each Semester) x 2 = 60 Hours PerYear** | |
| Text Book(s) | |
| 1 | Das S. (2020).*Microbiology Practical Manual,* CBS Publication, Delhi. |
| 2 | [Janarthanan](https://www.amazon.in/s/ref%3Ddp_byline_sr_ebooks_1?ie=UTF8&field-author=S%2BJanarthanan&text=S%2BJanarthanan&sort=relevancerank&search-alias=digital-text)S.(2018). *Practical Biotechnology: Methods and Protocols*, Kindle Edition,  Publication Universities Press (India) Private Limited. |
| 3 | [Senthilkumar Balakrishnan,](https://www.amazon.com/s/ref%3Ddp_byline_sr_book_1?ie=UTF8&field-author=Senthilkumar%2BBalakrishnan&text=Senthilkumar%2BBalakrishnan&sort=relevancerank&search-alias=books)[Karthik Kaliaperumal](https://www.amazon.com/s/ref%3Ddp_byline_sr_book_2?ie=UTF8&field-author=Karthik%2BKaliaperumal&text=Karthik%2BKaliaperumal&sort=relevancerank&search-alias=books)and [SenbagamDuraisamy.](https://www.amazon.com/s/ref%3Ddp_byline_sr_book_3?ie=UTF8&field-author=Senbagam%2BDuraisamy&text=Senbagam%2BDuraisamy&sort=relevancerank&search-alias=books) (2017).  *Practical Immunology a Laboratory Manual*, Lap Lambert Academic publishing, Germany. |
| 4 | Trigunayat MM. (2019).*A Manual of Practical Zoology: Biodiversity, Cell biology, Genetics*  *and Developmental Biology part 1,* Scientific publishers, India. |

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Mapping with Programme Outcomes** | | | | | | | | | | |
| **COs** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** |
| **CO1** | L | M | S | M | L | L | S | S | S | S |
| **CO2** | M | M | L | M | L | L | S | S | S | S |
| **CO3** | L | M | M | L | L | L | S | S | S | S |
| **CO4** | L | M | M | L | L | L | S | S | S | S |
| **CO5** | L | M | M | M | M | L | S | S | S | S |

\*S-Strong; M-Medium; L-Low

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Course code** | | **6ZP** | **SERICULTURE, BIOSTATISTICS, COMPUTER APPLICATIONS, BIOPHYSICS AND INSTRUMENTATION** | **L** | **T** | | **P** | **C** |
| **Core/Elective/ SBS** | | | **SKILL BASED COURSE - IV** | **0** | **0** | | **2** | **2** |
| **Pre-requisite** | | | Practical Knowledge in Sericulture, Statistical  tools and Principles of Instrumentation | **Syllabus**  **Version** | | **2025-26** | | |
| **Course Objectives**:  1. To understand the working principles of the instruments in biological instruments. 2.To inculcate the practical knowledge on moriculture and sericulture,  3. To discuss about the basic principles of physics in biology. | | | | | | | | |
| **Expected Course Outcomes:** | | | | | | | | |
| On the successful completion of the course, student will be able to: | | | | | | | | |
| 1 | Relate knowledge on Silkworm rearing and evaluate the quality of cocoon and silk. | | | | | | K3 | |
| 2 | Apply the concepts of computer science related with the statistical analysis. | | | | | | K3 | |
| 3 | Familiarize with the applications of statistics and able apply in the different fields of  biology. | | | | | | K4 | |
| 4 | Understand the basic operations of MS Office in computer applications | | | | | | K2 | |
| 5 | Gain knowledge and understands the working principles of the instruments in  biology. | | | | | | K3 | |
| **K1** - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** – Create | | | | | | | | |
| **MAJOR PRACTICAL** | | | | | | | | |
| 1. Preparation of Chromate solution at various 5 concentration, measure the OD to verify Beer Lambert law. 2. Prepare isotonic, hypotonic and hypertonic solution and put a drop of blood and observe under the microscope. 3. Measure the length of given leaf samples or any other of choice (minimum 20 samples) and calculation of Mean, Median, Mode and Standard Deviation. 4. Given are two groups of samples A and B. A contain 10 leaves (or any other of choice) of a locality and B from other species or locality. Measure the length and check do the samples differ significantly using students“t” test. | | | | | | | | |
| **MINOR PRACTICAL** | | | | | | | | |
| 1. Preparation of Buffer (acetate/ phosphate/ citrate/ borate) ofgiven pH. 2. Identification, sorting and percentage calculation of different typesof cocoons. 3. Based on the given values calculate theCorrelation coefficient. 4. Based on the given values calculate the regression equation based ona variable. | | | | | | | | |



|  |  |
| --- | --- |
| **SPOTTERS**  Mulberry leaf, Silk worm moth, Different instars of larvae, Cocoon, Fungal Parasite of Silk Worm.  Light microscope, pH Meter, Centrifuge, Chromatograph, Colorimeter.  Parts of computer- input and output devices- two each. | |
| **VISIT ANDSUBMISSION**  Visit to an industry or lab of Biotechnology or Microbiological importance. Report should be submitted in the Practical. | |
| **QUESTION PATTERN: 30 MARKS**  **Major:10, Minor: 5, Record: 5, Spotter: 6 (3 spotters each carry 2 marks),**  **Report: 4 marks.** | |
| **Total Practical Hours 30 Hours Per Year(Practical for end semester only)** | |
| Text Book(s) | |
| 1 | Arumugam N, Prasanna kumar S, Narayanan LM, Kumaresan V, Meyyan RP, Mariakuttikan A, Dulsyfatima, Nallasingam K, Jayasurya. *Practical Zoology Volume 3*, Saras publication, Nagercoil, Tamil Nadu. |
| 2 | Ganga G. (2020). *An introduction to Sericulture,*2nd edition, Oxford and IBH publishing,  Delhi. |
| 3 | Rana SVS. (2009). *Biotechniques*-*Theory and Practice*, 2nd edition. Rastogi  Publication, Meerut. |
| 4 | Subramanian MA. (2005). *Biophysics -Principles and Techniques,* 1stedition.- MJP  Publishes, Chennai. |
| 5 | Veer Bala Rastogi. (2009). *Fundamentals of Biostatistics,* 2nd edition. Ane Books, Pvt. Ltd.  New Delhi. |

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Mapping with Programme Outcomes** | | | | | | | | | | |
| **COs** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** |
| **CO1** | S | S | M | S | M | L | S | M | S | S |
| **CO2** | L | L | L | L | M | L | S | S | S | S |
| **CO3** | L | M | M | M | L | L | S | S | S | S |
| **CO4** | L | L | L | L | L | M | S | S | S | S |
| **CO5** | L | M | M | L | L | L | S | M | S | M |

\*S-Strong; M-Medium; L-Low



Elective Course



|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Course code** | | **5EA** | **HUMAN GENETICS AND COUNSELING- I** | | **L** | **T** | | **P** | **C** |
| **Core/Elective/ SBS** | | | **Elective I-A** | | **3** | **0** | | **0** | **3** |
| **Pre-requisite** | | | Basic Knowledge of Chromosomes, Inheritance  And Syndromes | | **Syllabus**  **Version** | | **2025-26** | | |
| **Course Objectives:** | | | | | | | | | |
| 1. The objective of this course is to give a firm foundation on the fundamentals of human chromosomes and their nomenclature and banding methods. 2. The give an idea about various aspects of human genetics, heredity and genetic diseases. 3. Students to gain the knowledge of pedigree analysis and to identify the complications to the basic patterns. 4. To make the students aware of the chromosomal syndromes. 5. To train the students to seek the possibilities of identifying Human genetics as a Profession. | | | | | | | | | |
| **Expected Course Outcomes:** | | | | | | | | | |
| On the successful completion of the course, student will be able to: | | | | | | | | | |
| 1 | The course will give an idea about the various genetic disorders. | | | | | | | K2 | |
| 2 | Students get the knowledge to apply the real life situations. | | | | | | | K3 | |
| 3 | Give an idea to employ the scientific method to generate new knowledge and to solve problems, regarding human heredity. | | | | | | | K4 | |
| 4 | Able to explain the genetic disorders and prompt them to undertake genetics as subject  of research in higher studies. | | | | | | | K4 | |
| **K1** - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** – Create | | | | | | | | | |
|  | | | | | | | | | |
| **Unit:1** | | **CHROMOSOMES** | | | **8 Hours** | | | | |
| Human chromosome – International system of Nomenclature - Chromosome number, Idiogram,  Banding methods (Q, C, G and R banding). | | | | | | | | | |
| **Unit:2** | | **INHERITANCE** | | | **9 Hours** | | | | |
| Monogenic traits, Autosomal inheritance, Dominant, Recessive, Sex-linked inheritance, Sex-limited  and sex-influenced traits, mitochondrial inheritance, MIM number, consanguinity and its effects, | | | | | | | | | |
| **Unit:3** | | **PEDIGREE** | | **8 Hours** | | | | | |
| Pedigree, gathering family history, pedigree symbols, construction of pedigrees, presentation of  molecular genetic data in pedigrees, - Complications to the basic pedigree patterns. | | | | | | | | | |
| **Unit:4** | | **SYNDROMES** | | **9 Hours** | | | | | |
| Human chromosomal disorders (Syndromes) Disorders of chromosome structure and disorders of chromosome number-Trisomy 18, Down’s syndrome, Trosomy 13, Cri-du chat syndrome, Parder- ville syndrome, Jacob’s syndrome Robertson Syndrome,Cystic fibrosis, Muscular dystrophy,  Thalassemia, Major Fragile x Syndrome. | | | | | | | | | |
| **Unit:5** | | **METABOLIC ERRORS** | | **9 Hours** | | | | | |
| Non-Mendelian Inheritance-Mitochondrial disorder, Sex mosaicism - uniparaentalDisomy and Genomic Imprinting. In-born errors of metabolism: Alkaptoneuria – Galactosemia - Gaucher’s disease - Glucose-6-phosphate dehydrogenase deficiency -Tay-Sach’s disease, Niemann Pick  disease. | | | | | | | | | |
| **Unit:6** | | **CONTEMPORARY ISSUES** | | **2 Hours** | | | | | |
| Expert lectures, Online Seminars - Webinars and Field Visits. | | | | | | | | | |
|  | | **Total Lecture Hours** | | **45 Hours** | | | | | |

|  |  |
| --- | --- |
| **Text Book(s)** | |
| 1 | Meyyan RP. (2014). *Fundamentals of Genetics,* Saras Publication, Nagercoil, Tamil Nadu. |
| 2 | Verma PS and Agarwal VK.(2010). *Genetics*, S. Chand Publishers, New Delhi |
| **Reference Books** | |
| 1 | Bhatnagar SM, Kothari Lopa ML. (1999). *Essentials of Human Genetics,* 4th edition-(Reprint 2004) – Orient Longman (P) Ltd., India. |
| 2 | Gangane SD.(2017).*Human Genetics,*Publisher-Reed Elsevier India Pvt.Ltd, India. |
| 3 | Gardner EJ.(2015).*Principles of genetics,*7th edition, John Wiley Sons, Inc., London, UK. |
| 4 | Strickberger MW.(1976).*Genetics,*Published by Macmillian Publishing Co., Inc.,NewYork. |
|  | |
| **Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]** | |
| 1 | [www.classcentral.com](http://www.classcentral.com/) › Subjects › Science › Biology |
| 2 | [nptel.ac.in › courses › noc20 › SEM1 › noc20-bt06](https://nptel.ac.in/noc/courses/noc20/SEM1/noc20-bt06/) |
| 3 | [swayam.gov.in › explorer](https://swayam.gov.in/explorer) |
| 4 | [swayam.gov.in › nd1\_noc20\_bt06 › preview](https://swayam.gov.in/nd1_noc20_bt06/preview) |
|  | |

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Mapping with Programme Outcomes** | | | | | | | | | | |
| **COs** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** |
| **CO1** | S | S | S | S | M | M | S | S | S | S |
| **CO2** | S | S | S | S | M | M | S | S | S | S |
| **CO3** | S | S | S | S | S | S | S | M | S | S |
| **CO4** | S | S | S | S | S | S | S | M | S | M |

\*S-Strong; M-Medium; L-Low



|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Course code** | | **6EA** | **HUMAN GENETICS AND COUNSELING- II** | | **L** | **T** | | **P** | **C** |
| **Core/Elective/ SBS** | | | **Elective I-A** | | **3** | **0** | | **0** | **3** |
| **Pre-requisite** | | | Basic Knowledge of Diseases, Diagnosis and  BehavioralGenetics **V** | | **Syllabus**  **Version** | | **2025-26** | | |
| **Course Objectives:** | | | | | | | | | |
| 1. The give an idea about various aspects of human genetics, heredity and genetic diseaseand various methods of prenataldiagnosis. 2. To make the students aware of the human genome project promises andachievements. 3. To make the students understand the central and unifying position of genetics inbiological services and to create awareness for a bettercommunity. | | | | | | | | | |
| **Expected Course Outcomes:** | | | | | | | | | |
| On the successful completion of the course, student will be able to: | | | | | | | | | |
| 1 | The students will be able to get the knowledge of physiology and genetics of blood groups. | | | | | | | K2 | |
| 2 | Knowledge of research principles and methods applicable in the discipline of  genetic testing approach taken for specific genetic disorders. | | | | | | | K2 | |
| 3 | Gain knowledge of the role of genetics as the underlying cause of various disorders of the human body. | | | | | | | K3 | |
| 4 | The course will give an idea about genes related to behavior and behavioral disorders. | | | | | | | K4 | |
| 5 | To train the students to seek the possibilities of identifying Human genetics and  counseling as a Profession. | | | | | | | K3 | |
| **K1** - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** – Create | | | | | | | | | |
|  | | | | | | | | | |
| **Unit:1** | | **BLOOD GROUP** | | | **8 Hours** | | | | |
| Bloodgroups(major types) -Blood transfusion – *Erythroblastosisfoetalis*. Physiology and  genetics of blood groups. Population genetics: Hardy-Weinberg principle and its application in human population. | | | | | | | | | |
| **Unit:2** | | **DIAGNOSIS** | | | **9 Hours** | | | | |
| Prenatal diagnosis: Chorionic villi sampling, foetoscopy, ultrascopy, amniocentesis - peripheral blood leucocyte culture. Dermatoglyphics: Terminology, methods of observation and printing,  dermatoglyphic features of syndrome. | | | | | | | | | |
| **Unit:3** | | **BRAIN DISEASES** | | **9 Hours** | | | | | |
| Degenerative brain diseases: Stroke - Alzheimer’s disease - Parkinson disease. Chromosomal position effect and gene variegation - epigenetic control of gene activity. Molecular medicines in  cancer therapy. Microarray as a tool for detection of human genetic disorders | | | | | | | | | |
| **Unit:4** | | **BEHAVIOURAL GENETICS** | | **9 Hours** | | | | | |
| Genes related to behaviour - Genetic and environmental manipulations, learning and memory. Dementia – Schizophrenia - Mood disorders - Anxiety disorders - childhood personality  disorders - antisocial personality - criminal behavior. | | | | | | | | | |

|  |  |  |  |
| --- | --- | --- | --- |
| **Unit:5** | | **HUMAN GENOME PROJECT** | **8 Hours** |
| Human Genome Project – History - Sequencing of Human Genome - Promises and Achievements  - Ethical, Legal and Social issues. Other Genome Projects initiated as a direct consequence of HGP completion,Human Genome DiversityProject. | | | |
| **Unit:6** | | **CONTEMPORARY ISSUES** | **2 Hours** |
| Expert lectures, Online Seminars - Webinars and Field Visits. | | | |
|  | | **Total Lecture Hours** | **45 Hours** |
| **Text Book(s)** | | | |
| 1 | Mandal S. (2002). *Fundamentals of Human Genetics,*2nd edition, New Central Book  Agency (P) Limited, Kolkatta. | | |
| 2 | Meyyan RP. (2014). *Fundamentals of Genetics,* Saras Publication, Nagercoil,Tamilnadu. | | |
| 3 | Verma PS and Agarwal VK. (2010). *Genetics*, S. Chand Publishers, New Delhi. | | |
| **Reference Books** | | | |
| 1 | Gangane SD. (2017).*Human Genetics, Publisher*-Reed Elsevier India Pvt.Ltd, India. | | |
| 2 | Gardner EJ. (2015).*Principles of genetics,* 7th edition, John Wiley Sons, Inc., London, UK. | | |
| 3 | Strickberger MW. (1976).*Genetics,*Published by Macmillian Publishing Co., Inc. NewYork. | | |
| 4 | Rickie Lewis. (2011). *Human Genetics – Concept and Application*, 2nd edition, McGraw-Hill  Education Publisher, Europe. | | |
|  | | | |
| **Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]** | | | |
| 1 | [www.classcentral.com](http://www.classcentral.com/) › Subjects › Science › Biology | | |
| 2 | [nptel.ac.in › courses › noc20 › SEM1 › noc20-bt06](https://nptel.ac.in/noc/courses/noc20/SEM1/noc20-bt06/) | | |
| 3 | [swayam.gov.in › explorer](https://swayam.gov.in/explorer) | | |
| 4 | [swayam.gov.in › nd1\_noc20\_bt06 › preview](https://swayam.gov.in/nd1_noc20_bt06/preview) | | |
|  | | | |



|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Mapping with Programme Outcomes** | | | | | | | | | | |
| **COs** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** |
| **CO1** | S | S | S | S | M | M | S | S | M | S |
| **CO2** | S | S | S | S | M | M | S | S | M | S |
| **CO3** | S | S | S | S | S | S | S | M | S | S |
| **CO4** | S | S | S | S | S | S | S | M | S | L |
| **CO5** | S | S | S | S | S | S | S | S | S | L |

\*S-Strong; M-Medium; L-Low



|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Course code** | | | **5EB** | **PEST AND THEIR CONTROL - I** | | | **L** | **T** | | **P** | **C** |
| **Core/Elective/ SBS** | | | | **ElectiveI-B** | | | **3** | **0** | | **0** | **3** |
| **Pre-requisite** | | | | Basic Knowledge in Identification of Pests and  ControlMeasures | | | **Syllabus**  **Version** | | **2025-26** | | |
| **Course Objectives:**   1. To make the learner aware of various pest, pest outbreak and itscontrol methods. 2. Learn to manage pest and diseases in diverseenvironment. 3. To study the different theories related to the ecology of theinsects. | | | | | | | | | | | |
| **Expected Course Outcomes:** | | | | | | | | | | | |
| On the successful completion of the course, student will be able to: | | | | | | | | | | | |
| 1 | | Understand the basic classification and identify the insects using taxonomic keys. | | | | | | | | K2 | |
| 2 | | Able to explain the external morphology of insects and their modifications and  adaptations suitable to the eco-system. | | | | | | | | K2 | |
| 3 | | Acquired the knowledge about various methods and tools adopted for pest control  strategies. | | | | | | | | K4 | |
| 4 | | Gain knowledge about the various biological agents, entomopathogenic organisms and  the importance of IPM in pest management. | | | | | | | | K5 | |
| **K1** - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** – Create | | | | | | | | | | | |
|  | | | | | | | | | | | |
| **Unit:1** | | | **INTRODUCTION,CLASSIFICATION AND IMPORTANCE** | | | | **8 Hours** | | | | |
| Introduction, definition and causes for insect assuming pest status. Classification of pest - Types of  damage caused by pests. Importance of pest control, Pest surveillance and forecasting and pest outbreak. | | | | | | | | | | | |
| **Unit:2** | | | **GENERAL CHARACTERS, BIONOMICS AND CONTROL MEASURES** | | | | **9 Hours** | | | | |
| **Paddy pest:**  **1. *Tryporyzaincertulus*(Lepidoptera) 2. *Orseoliaoryzae*(Diptera)**  **3. *Hieroglyphusbanian*(Orthoptera) 4. *Dicladispaarmigera*(Coleoptera)**  **Wheat pest:**  **1. *Anaphothripssudanensis*(Thysonoptera) 2.*Odentodermisobesis*(Isoptera)**  **3. *Mythimana separate* (Lepidoptera).** | | | | | | | | | | | |
| Unit:3 | | | **GENERAL CHARACTERS, BIONOMICS AND CONTROL MEASURES** | | | 9 Hours | | | | | |
| **Sugarcane pest:**  ***1. Chiloinfuscatellus*(Lepidoptera) 2. *Pyrillaperpusilla*(Hemiptera)**  ***3. Aleurolovusbarodensis*(Hemiptera) 4. *Scirphophaganivella*(Lepidoptera)**  **Cotton pest:**  ***1. Pectinophoragossypiella*(Lepidoptera) 2. *Aphid gossypii*(Hemiptera) *3.Earias vitella*(Lepidoptera) 4. *Dysdercuscingulatus*(Hemiptera).** | | | | | | | | | | | |
| Unit:4 | | | GENERAL CHARACTERS, BIONOMICS AND  CONTROL MEASURES | | | 9 Hours | | | | | |
| **Cereals:1. *Chilopartellus*(Lepidoptera) 2. *Antherigonasoccata*(Diptera).**  **Pulses:1. *Helicoverpaarmigera*(Lepidoptera) 2. *Melanogromyza*obtuse (Diptera)**  **Vegetables:1. *Leucinodesorbonalis*(Lepidoptera) 2. *Pieris brassicae*(Lepidoptera)**  **Fruits:1. *Papiliodemolues*(Lepidoptera) 2. *Daccuscucurbitae*(Diptera).** | | | | | | | | | | | |
| Unit:5 | | | GENERAL CHARACTERS, BIONOMICS AND CONTROL MEASURES | | 8 Hours | | | | | | |
| **Stored Grain pest:**  **1. *Triboliumcastraneum*(Coleoptera) 2. *Sitophilus oryzae*(Coleoptera).**  **House Hold pest:**  **1. Bed bug 2.House fly 3. Human louse 4. Cockroach 5. Mosquitoes.** | | | | | | | | | | | |
| Unit:6 | | | **CONTEMPORARY ISSUES** | | 2 Hours | | | | | | |
| **Expert lectures, Online Seminars - Webinars and Field Visits.** | | | | | | | | | | | |
|  | | | **Total Lecture Hours** | | **45 Hours** | | | | | | |
| **Text Book(s)** | | | | | | | | | | | |
| 1 | Ashok Kumar and Prem Mohan Nigam. (2000). *Economic and Applied Entomology,* Emkay Publication, New Delhi. | | | | | | | | | | |
| 2 | Jawaid Ahsan and Subhas Prasad Sinha. (2000). *A Handbook on Economic Zoology*, S. Chand and co., Ltd., New Delhi. | | | | | | | | | | |
| 3 | Nalina Sundari MS. (2006). *Entomology,* M.J.P Publications, Chennai | | | | | | | | | | |
| 4 | Ravindranathan KR. (2013). *A Text Book of Economic Zoology,* 1st edition, Wisdom Press, New Delhi. | | | | | | | | | | |
| 5 | Vasantharaj David and Kumaraswami K. (1988). *Elements of Economic Entomology*, Popular Book Depot, Chennai. | | | | | | | | | | |
| **Reference Books** | | | | | | | | | | | |
| 1 | Imms AD. (1972). *Text book of Entomology,* Vol. I and II Ed. By Richard and Owen.ELBS | | | | | | | | | | |
| 2 | Jawaid Ahsan and Subhas Prasad sinha. (2000). *A Handbook on Economic Zoology,* S. Chand and co., Ltd., New Delhi. | | | | | | | | | | |
| 3 | Nair KK, Anandhakrishnan TN and David BV. (1992). *General and Applied Entomology,* Tata Mc.Graw Hill Publication, Delhi. | | | | | | | | | | |
| 4 | Rajendra Singh. (2007). *Elements of Entomology,* Rastogi publicatios, Meerut. | | | | | | | | | | |
|  | | | | | | | | | | | |
| **Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]** | | | | | | | | | | | |
| 1 | <https://ucanr.edu/blogs/blogcore/postdetail.cfm?postnum=5007> | | | | | | | | | | |
| 2 | <https://www.pestcontrolcourses.com/pest-control-training-courses-online/> | | | | | | | | | | |
|  |  | | | | | | | | | | |



|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Mapping with Programme Outcomes** | | | | | | | | | | |
| **COs** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** |
| **CO1** | S | S | S | S | M | S | M | M | M | M |
| **CO3** | S | M | M | S | S | M | M | L | L | L |
| **CO3** | S | M | M | S | S | S | S | L | S | M |
| **CO4** | S | S | M | M | M | S | S | L | S | S |

\*S-Strong; M-Medium; L-Low

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Course code** | | | **6EB** | **PEST AND THEIR CONTROL - II** | | | **L** | | **T** | | **P** | **C** |
| **Core/Elective/ SBS** | | | | **Elective I-B** | | | **3** | | **0** | | **0** | **3** |
| **Pre-requisite** | | | | Basic Knowledge of Principles and Methods of  Pest Control andInsecticideTechnologies **V** | | | **Syllabus**  **Version** | | | **2025-26** | | |
| **Course Objectives:**   1. To make the learner aware of various pest, pest outbreak and itscontrol methods. 2. Learn to manage pest and diseases in diverseenvironment. 3. To study the different theories related to the ecology of theinsects. | | | | | | | | | | | | |
| **Expected Course Outcomes:** | | | | | | | | | | | | |
| On the successful completion of the course, student will be able to: | | | | | | | | | | | | |
| 1 | Gain knowledge and apply various techniques in the field to control the pest. | | | | | | | | | | K2 | |
| 2 | Familiarized with classification of insecticides, pesticide residue and environmental  pollution due to toxic insecticides. | | | | | | | | | | K2 | |
| 3 | Acquired the knowledge about various methods and tools adopted for pest control  strategies. | | | | | | | | | | K4 | |
| 4 | Aware about the various techniques and the importance of IPM in pest management. | | | | | | | | | | K5 | |
| 5 | Realize the interaction between plants and insects. | | | | | | | | | | K4 | |
| **K1** - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** – Create | | | | | | | | | | | | |
|  | | | | | | | | | | | | |
| **Unit:1** | | | **PRINCIPLES AND METHODS OF PEST CONTROL** | | | | | **9 Hours** | | | | |
| :  Using techniques such as Mechanical, Biological, Ecologicaland Cultural. Genetic Techniques – Sterile Male Techniques, Quarantine and legislative measures. | | | | | | | | | | | | |
| **Unit:2** | | | **CLASSIFICATIONOFINSECTICIDES** | | | | | **9 Hours** | | | | |
| Based on Mode entry and Mode ofaction:  Chemical nature - Inorganic, Organic compounds- DDT, Endosulfan, Fenitrothion, Malathion, Monocrotophous, OximeCarbamates. | | | | | | | | | | | | |
| **Unit:3** | | | **INSECTICIDE FORMULATIONS**  **AND APPLICATION TECHNOLOGY** | | | **9 Hours** | | | | | | |
| Aerosols, Fumigants, Baits.  Dusting and dusters, sprayers – Manually operated – Hydraulic sprayers, Power operated – Pneumatic sprayer. | | | | | | | | | | | | |
| **Unit:4** | | | **INTEGRATED PEST MANAGEMENT** | | | **8 Hours** | | | | | | |
| Integrated Pest Management (IPM), Chemosterilants, Sex attractants, Pheromonal control. | | | | | | | | | | | | |
| **Unit:5** | | **OTHER PESTS** | | | **8 Hours** | | | | | | | |
| Crab, Snail, Peacock, Parrot and Rat  Concept of Host-Pest Interaction. Binomics and control measures for the pest. | | | | | | | | | | | | |

|  |  |  |  |
| --- | --- | --- | --- |
| **Unit:6** | | **CONTEMPORARY ISSUES** | **2 Hours** |
| Expert lectures, Online Seminars - Webinars and Field Visits. | | | |
|  | | **Total Lecture Hours** | **45Hours** |
| **Text Book(s)** | | | |
| 1 | Ashok Kumar and Prem Mohan Nigam. (2000). *Economic and Applied Entomology,* Emkay Publication, New Delhi. | | |
| 2 | Jawaid Ahsan and Subhas Prasad sinha. (2000). *A Handbook on Economic Zoology,* S. Chand and co., Ltd., New Delhi. | | |
| 3 | Nalina Sundari MS. (2006). *Entomology*, MJP-Publications, Chennai | | |
| 4 | Ravindranathan KR. (2013). *A Text Book of Economic Zoology,* 1st edition, Wisdom Press, New Delhi. | | |
| 5 | Vasantharaj David and Kumaraswami K. (1988). *Elements of Economic Entomology*, Popular Book Depot, Chennai. | | |
| **Reference Books** | | | |
| 1 | Imms AD. (1972). *Text book of Entomology,* Vol. I and II Ed. By Richard and Owen. ELBS | | |
| 2 | Jawaid Ahsan and Subhas Prasad sinha. (2000). *A Handbook on Economic Zoology,* S. Chand and co., Ltd., New Delhi. | | |
| 3 | Nair KK, Anandhakrishnan TN and David BV. (1992). *General and Applied Entomology,*  Tata Mc.Graw Hill Publication, Delhi. | | |
| 4 | Rajendra Singh. (2007). *Elements of Entomology,* Rastogi publicatios, Meerut. | | |
|  | | | |
| **Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]** | | | |
| 1 | <https://ucanr.edu/blogs/blogcore/postdetail.cfm?postnum=5007> | | |
| 2 | <https://www.pestcontrolcourses.com/pest-control-training-courses-online/> | | |
|  | | | |



|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Mapping with Programme Outcomes** | | | | | | | | | | |
| **COs** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** |
| **CO1** | S | S | S | S | M | S | M | M | M | M |
| **CO3** | S | M | M | S | S | M | M | L | L | L |
| **CO3** | S | M | M | S | S | S | S | L | S | M |
| **CO4** | S | S | M | M | M | S | S | L | S | S |
| **CO5** | S | S | M | S | S | S | M | L | S | S |

\*S-Strong; M-Medium; L-Low





|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Course code** | | | **5EC** | **WILDLIFE MANAGEMENT AND**  **CONSERVATION- I** | | **L** | | **T** | | **P** | **C** |
| **Core/Elective/ SBS** | | | | **Elective I-C** | | **3** | | **0** | | **0** | **3** |
| **Pre-requisite** | | | | Basic Knowledge in Wildlife Conservation and its  Importance | | **Syllabus**  **Version** | | | **2025-26** | | |
| **Course Objectives:** | | | | | | | | | | | |
| 1. The course is framed to give introduction to Wildlife management and Conservation. 2. To make student aware of the various areas of wildlife and Job opportunities. | | | | | | | | | | | |
|  | | | | | | | | | | | |
| **Expected Course Outcomes:** | | | | | | | | | | | |
| On the successful completion of the course, student will be able to: | | | | | | | | | | | |
| 1 | | The course will give an idea about the wildlife Management techniques | | | | | | | | K2 | |
| 2 | | The course train the students to assess various conservation strategies | | | | | | | | K3 | |
| 3 | | Gain knowledge about terminology and identification of birds and butterflies. | | | | | | | | K3 | |
| 4 | | Understand the importance of fauna in different reserves. | | | | | | | | K2 | |
| **K1** - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** - Create | | | | | | | | | | | |
|  | | | | | | | | | | | |
| **Unit:1** | | | **INTRODUCTION TO WILDLIFE** | | | | **9Hours** | | | | |
| Scope and opportunities of Wildlife Sciences – Major types of forest types of India - Protected areas  – Sanctuaries - National Parks – Tiger reserves – Biosphere Reserves and their role. | | | | | | | | | | | |
| **Unit:2** | | | **WILDLIFE CONSERVATION** | | | | **9Hours** | | | | |
| IUCN Red Data list – CITES – Endangered Mammals of India and Conversation – Project Tiger and Project Elephant. Conservation of Indian rhino, lion and Thar. Importance of Zoo in Conservation | | | | | | | | | | | |
| **Unit:3** | | | **ORNITHOLOGY** | | **9Hours** | | | | | | |
| Terms used in description of Birds Plumage and parts – Types of Bills – Types of feet – Identification of birds in the field based on tail, bill, crest, leg and colour. | | | | | | | | | | | |
| **Unit:4** | | | **INDIAN BUTTERFLIES** | | **8Hours** | | | | | | |
| Butterflies and Moths – Identification of types of Swallowtails: Club tails – Roses - Bird wings – Mime –Mormon – Raven - Helen - peacock – Jay – Blue bottles – Sword tails – Zebra. Whites, sulfurs and orange-tips. | | | | | | | | | | | |
| **Unit:5** | | | **IMPORTANT RESERVES** | | **8Hours** | | | | | | |
| History, Location, Habitats, Fauna and importance of Mudumalai Tiger Reserve – Sathyamangalam Tiger Reserve – KalakkadMundanthurai Tiger Reserve – Anamalai  Tiger Reserve – Gulf of Mannar. | | | | | | | | | | | |
| **Unit:6** | | | **CONTEMPORARY ISSUES** | | **2 Hours** | | | | | | |
| Expert lectures, online seminars – webinars, field visits | | | | | | | | | | | |
|  | | | **Total Lecture Hours** | | **45 Hours** | | | | | | |
| **Text Book(s)** | | | | | | | | | | | |
| 1 | Balakrishnan M. (2016). *Wild Life Ecology and Conservation,*Scientific publishers, Jodhpur,  India. | | | | | | | | | | |



|  |  |
| --- | --- |
| 2 | Caughley G and Sinclair AR. (2006). *Wildlife Ecology and Management,*Blackwell  Science,United Science. |
| 3 | Ranga MM. (2002). *Wild LifeManagement and Conservation,*Agro-Bios publications, Jodhpur,  India. |
| 4 | Reena Mathur. (2018). *Wild Life Conservation and Management,*Rastogi publication, Meerut. |
| 5 | Sale JB and Berkmueller K. (1998).*Manual of Wildlife Techniques for India,*Establishment of  the Wildlife Institute, India. Field document 11. |
| **Reference Books** | |
| 1 | Ali S, Ripley SD. (1983).*Handbook of The Birds of India and Pakistan,*Compact edition. Oxford University Press and BNHS, Mumbai. |
| 2 | Divan S and Rosencranz A. (2001). *Environmental Law and Policy in India: Cases, Materials*  *and Statutes,*New Delhi: Oxford University Press. |
| 3 | Kehimkar ID. (2008).*Book of Indian Butterflies,*Oxford University Press. |
| 4 | Prater SH and Barruel P. (1997). *The Book of Indian Animals,*Bombay: Bombay Natural  History Society. |
|  | |
| **Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]** | |
| 1 | <https://www.worldwildlife.org/teaching-resources> |
| 2 | <https://www.nwf.org/Educational-Resources/Wildlife-Guide> |
| 3 | <https://swayam.gov.in/nd1_noc20_bt38/preview> |
| 4 | <https://swayam.gov.in/nd1_noc19_bt32/preview> |
|  | |

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Mapping with Programme Outcomes** | | | | | | | | | | |
| **COs** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** |
| **CO1** | S | S | M | S | M | S | M | L | S | S |
| **CO3** | S | S | L | S | M | S | L | L | S | S |
| **CO3** | S | S | M | S | S | S | L | L | S | S |
| **CO4** | S | S | L | S | M | S | L | L | S | S |

\*S-Strong; M-Medium; L-Low



|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Course code** | | **6EC** | **WILDLIFE MANAGEMENT AND**  **CONSERVATION- II** | | **L** | **T** | **P** | | **C** |
| **Core/Elective/ SBS** | | | **Elective I-C** | | **3** | **0** | **0** | | **3** |
| **Pre-requisite** | | | Basic Knowledge about Wildlife Techniques,  Census and Animal Behavior | | **Syllabus**  **Version** | | | **2025-26** | |
| **Course Objectives:** | | | | | | | | | |
| 1. The course is framed to train the students about various wildlife techniques. 2. To train the students to find job opportunities as biologists in Reserves. | | | | | | | | | |
| **Expected Course Outcomes:** | | | | | | | | | |
| On the successful completion of the course, student will be able to: | | | | | | | | | |
| 1 | The course will give an idea about the wildlife Management techniques | | | | | | K2 | | |
| 2 | The course trains the students to conduct wildlife related surveys and analyses the wildlife related threats. | | | | | | K3 | | |
| 3 | Gain knowledge about different behavior of wild animals. | | | | | | K2 | | |
| 4 | Get aware about the management of forest and importance of conservation of wild animals. | | | | | | K3 | | |
| 5 | Familiarized with diversity act and eco- tourism as a career development. | | | | | | K4 | | |
| **K1** - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** - Create | | | | | | | | | |
| **Unit:1** | | **WILDLIFE TECHNIQUES**. | | | **8Hours** | | | | |
| Peadometer – Field Compass – GPS – Introduction to GIS – Camera traps – Quadrates - Line  transects – Presence/Absence Survey. | | | | | | | | | |
| **Unit:2** | | **WILDLIFE CENSUS**. | | | **9Hours** | | | | |
| Planning census – sample counts – Block counts – Roadside counts – Dung count – Pugmark and waterhole census – Identifying animals based on indirect signs – Capture recapture techniques –  tiger, co-predator monitoring census methods (WII) – usage of M-stripes. | | | | | | | | | |
| **Unit:3** | | **ANIMAL BEHAVIOUR** | | **9Hours** | | | | | |
| Foraging behaviour - group foraging - Breeding seasons - factors - courtship, polyandry, polygamy -  promiscuity - brood parasites –Aggression – Competition – Social spacing – Territory –Social behaviour of elephants and lion. | | | | | | | | | |
| **Unit:4** | | **WILDLIFE CONSERVATION** | | **9Hours** | | | | | |
| Joint Forest Management - Tribes and forestry programmes- Watershed management – Deforestation – impacts – Afforestation – Habitat fragmentation – corridors – HumanAnimal  Conflicts – Mitigation of Conflicts | | | | | | | | | |
| **Unit:5** | | **WPA AND ECOTOURISM** | | **8Hours** | | | | | |
| Brief outlines of WPA 1972 and amendments - Biological diversity Act 2002 - Forest right Act  2008. Ecotourism – Potentials of eco-tourism as Career of a Zoology graduate. | | | | | | | | | |
| **Unit:6** | | **CONTEMPORARY ISSUES** | | **2 Hours** | | | | | |
| Expert lectures, online seminars – webinars, field visits | | | | | | | | | |

|  |  |  |  |
| --- | --- | --- | --- |
|  | | **Total Lecture Hours** | **45Hours** |
| **Text Book(s)** | | | |
| 1 | Balakrishnan M. (2016). *Wild Life Ecology and Conservation,* Scientific publishers,Jodhpur,  India. | | |
| 2 | Caughley G and Sinclair AR. (2006). *Wildlife Ecology and Management,* Blackwell  Science,United Science. | | |
| 3 | Ranga MM. (2002). *Wild LifeManagement and Conservation,* Agro-Bios publications, Jodhpur,  India. | | |
| 4 | Reena Mathur. (2018). *Wild Life Conservation and Management,* Rastogi publication, Meerut. | | |
| 5 | Sale JB and Berkmueller K. (1998).*Manual of Wildlife Techniques for India,*Establishment of  the Wildlife Institute, India. Field document 11. | | |
| **Reference Books** | | | |
| 1 | Ali S, Ripley SD. (1983).*Handbook of The Birds of India and Pakistan,*Compact edition. Oxford University Press and BNHS, Mumbai. | | |
| 2 | Divan S and Rosencranz A. (2001). *Environmental Law and Policy in India: Cases, Materials*  *and Statutes,* New Delhi: Oxford University Press. | | |
| 3 | Kehimkar ID.(2008). *Book of Indian Butterflies,*Oxford University Press. | | |
| 4 | Prater SH and Barruel P. (1997). *The Book of Indian Animals,*Bombay: Bombay Natural  History Society. | | |
|  | | | |
| **Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]** | | | |
| 1 | <https://www.worldwildlife.org/teaching-resources> | | |
| 2 | <https://www.nwf.org/Educational-Resources/Wildlife-Guide> | | |
| 3 | <https://swayam.gov.in/nd1_noc20_bt38/preview> | | |
| 4 | <https://swayam.gov.in/nd1_noc19_bt32/preview> | | |
|  | | | |



|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Mapping with Programme Outcomes** | | | | | | | | | | |
| **COs** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** |
| **CO1** | S | S | M | S | M | S | M | L | S | S |
| **CO3** | S | S | L | S | M | S | M | L | S | S |
| **CO3** | S | S | M | S | S | S | M | L | S | S |
| **CO4** | S | S | M | S | S | S | M | L | S | S |
| **CO5** | M | M | L | M | M | S | L | L | S | S |

\*S-Strong; M-Medium; L-Low



|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Course code** | | **5ED** | **PATHOLOGY AND CLINICAL**  **LABORATORY TECHNIQUES – I** | | **L** | **T** | | **P** | **C** |
| **Core/Elective/ SBS** | | | **Elective II-A** | | **3** | **0** | | **0** | **3** |
| **Pre-requisite** | | | Basic Knowledge about Clinical Laboratory  Principlesand Techniques | | **Syllabus**  **Version** | | **2025-26** | | |
| **Course Objectives:**   1. To evaluate laboratory and pathologic testing and to learn the pathogenesis of a variety of common and uncommon diseases. 2. To develop knowledge of basic pathologic processes and skills to interpret laboratory data aswell as make clinic pathologiccorrelations. 3. To provide experience in laboratory direction and encourage residents to assume a leadershiprole in the education of other physicians and allied healthprofessionals. | | | | | | | | | |
| **Expected Course Outcomes:** | | | | | | | | | |
| On the successful completion of the course, student will be able to: | | | | | | | | | |
| 1 | Understand the pathologic basis of disease for which a particular test is performed. | | | | | | | K2 | |
| 2 | Greater knowledge related to specimen collection, handling methodologies, and the skills of individuals performing those tests. | | | | | | | K2 | |
| 3 | Gain knowledge to Practice the technical and mechanical aspects of laboratory  pathology and effectively manage a laboratory. | | | | | | | K3 | |
| 4 | Familiarize with the following blood bank and serology testing, hematologic tests,  microscopic examination, Gram-stained techniques etc., | | | | | | | K4 | |
| 5 | Able to identify and understand the limitations of such studies in order to select proper tests suited to a particular diagnostic problem. | | | | | | | K3 | |
| **K1** - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** – Create | | | | | | | | | |
|  | | | | | | | | | |
| **Unit:1** | | **BASIC LABORATORY PRINCIPLES** | | | **9 Hours** | | | | |
| Organization of clinical laboratory - Safety measures - Chemical, fire and Electrical - Lab Technician Duties and Responsibilities - Professionalism and Ethics in laboratory workers, Modern Laboratory set up - Clinic borne infection and personnelhygiene. | | | | | | | | | |
| **Unit:2** | | **BASIC LABORATORY EQUIPMENTS** | | | **8 Hours** | | | | |
| Light Microscope – Incubator - Hot Air Oven – Autoclave - Laminar Air flow Chamber  - Water Bath-Centrifuge –Haemocytometer -Albuminometer – Urinometer- Haemoglobinometer - Microtome - Glassware –Description of Glassware, its use, handling and care. | | | | | | | | | |
|  | | | | | | | | | |
| **Unit:3** | | **PREPARATIONOFREAGENTS** | | **9 Hours** | | | | | |
| Buffer and pH - Preparation of Normal, Per cent and Molar solutions - Physiological saline,Clinical | | | | | | | | | |

|  |  |  |  |
| --- | --- | --- | --- |
| Laboratory records- -Quality control: Accuracy, Precision, and Reference values, use of chemicals  and their interactions, danger signs, production techniques, and disposal methods. | | | |
| **Unit:4** | | **BASICCLINICALCHEMISTRY** | **9 Hours** |
| Collection of blood – Anticoagulants - Separation of Serum and Plasma - Blood cell count and differential count – Estimation of Haemoglobin (Sahlis and Cyanmethemoglobin) - Clotting time -  bleetting time – ESR – PCV – Blood smear and for observation parasites. | | | |
| **Unit:5** | | **AUTOMATIONINCLINICALLABORATORY** | **8 Hours** |
| Semi and Fluid Auto Analyzer – ELISA – Use of PCR – HaemotologyAnalyser – Cell counter –  HPLC Analysis for Haemoglobin Fraction | | | |
| **Unit:6** | | **CONTEMPORARY ISSUES** | **2 Hours** |
| Expert lectures, Online Seminars - Webinars and Field Visits. | | | |
|  | | **Total Lecture Hours** | **45 Hours** |
| **Text Book(s)** | | | |
| 1 | Mukherjee KL. (2010).*Medical Laboratory Technology*, Volume 1, 2 and 3. Tata McGraw- Hill Education, India. | | |
| 2 | Sachdev KN. (1999). *Clinical Pathology and Clinical Bacteriology*, Jaypee Brothers Publishers,New Delhi. | | |
| 3 | Talib VH, Khurana SR. (2009).*Handbook of Medical Laboratory Technology*, CBS Publishers, Delhi. | | |
| 4 | Varley H. (2008). *Practical Clinical Biochemistry*, CBS Publishers, Delhi. | | |
| **Reference Books** | | | |
| 1 | Pagana KD, Pagana TJ. *Mosby'sManualofDiagnosticandLaboratoryTests*-*E-Book,* Elsevier HealthSciences. | | |
| 2 | Vandana Puri, Praeen Kr Gupta. (2020). *Complex Review of Pathology and Hematology for NBE*, 6th edition, CBS Publishers, Delhi. | | |
| 3 | Ajmani PS. (2017). *HandbookofClinicalLaboratoryTechniques*, AITBS Publisher, India. | | |
|  | | | |
| **Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]** | | | |
| 1 | <https://www.emagister.in/distance_learning_pathology_courses-tdist-236.htm> | | |
|  | | | |



|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Mapping with Programme Outcomes** | | | | | | | | | | |
| **COs** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** |
| **CO1** | M | M | M | M | S | M | S | M | S | S |
| **CO2** | M | L | L | M | S | M | S | M | S | S |
| **CO3** | L | S | S | L | M | L | S | L | S | S |
| **CO4** | L | S | S | L | M | M | S | L | S | S |
| **CO5** | L | M | S | L | M | M | L | L | S | S |

\*S-Strong; M-Medium; L-Low



|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Course code** | | **6ED** | **PATHOLOGY AND CLINICAL**  **LABORATORY TECHNIQUES - II** | | **L** | **T** | | **P** | **C** |
| **Core/Elective/ SBS** | | | **Elective II-A** | | **3** | **0** | | **0** | **3** |
| **Pre-requisite** | | | Basic Knowledge to Practice and Manage a  Clinical laboratory | | **Syllabus**  **Version** | | **2025-26** | | |
| **Course Objectives:**   1. To evaluate laboratory and pathologic testing and to learn the pathogenesis of a variety of common and uncommon diseases. 2. To develop knowledge of basic pathologic processes and skills to interpret laboratory data as well as make clinic pathologic correlations 3. To provide experience in laboratory direction and encourage residents to assume a leadership role in the education of other physicians and allied health professionals | | | | | | | | | |
| **Expected Course Outcomes:** | | | | | | | | | |
| On the successful completion of the course, student will be able to: | | | | | | | | | |
| 1 | Greater knowledge related to specimen collection, handling methodologies, and the skills of individuals performing those tests. | | | | | | | K2 | |
| 2 | Able to prepare culture and histopathological techniques to analyze different samples. | | | | | | | K3 | |
| 3 | Familiarize with the blood bank and serology testing, hematologic tests,  microscopic examination, Gram-stained techniques etc., | | | | | | | K4 | |
| 4 | Able to identify and understand the limitations of such studies in order to select proper tests suited to a particular diagnostic problem. | | | | | | | K3 | |
| 5 | Gain knowledge to Practice the technical and mechanical aspects of laboratory  pathology and effectively manage a laboratory. | | | | | | | K4 | |
| **K1** - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** – Create | | | | | | | | | |
|  | | | | | | | | | |
| **Unit:1** | | **FUNCTION TESTS** | | | **8 Hours** | | | | |
| Renal function tests, Liver function tests, Arterial blood gas analysis. | | | | | | | | | |
| **Unit:2** | | **BODY FLUIDS** | | | **9 Hours** | | | | |
| Urine: Collection and preservation - Composition – volume – appearance and odors - Specific gravity - Microscopic examination. Measurement of glucose and protein. Faecal examination:  Microscopic – Occult blood – Helminthes Parasites. Semen analysis: count and motility. | | | | | | | | | |
| **Unit:3** | | **MICROBIOLOGY AND CYTOLOGY** | | **9 Hours** | | | | | |
| Wet Preparations of microbes - Staining preparations: Simple – Differential - Special staining methods Bacterial Identification and Antibiotic susceptibility testing. FNAC – smear and fixation –  PAP Staining – Biopsy for cancer. | | | | | | | | | |

|  |  |  |  |
| --- | --- | --- | --- |
| **Unit:4** | | **HISTOPATHOLOGY** | **8 Hours** |
| Microtome: Fixating – dehydration – clearing – infiltration - embedding – Block preparation – Sectioning – Mounting – Staining. Principle of double (H and E stain) – PASM Staining. | | | |
| **Unit:5** | | **BLOODTRANSFUSION** | **9 Hours** |
| Screening of donor compatibility testing, safety, procurement of supplies. Screening donor's blood for infectious agents -HIV, HCV, HBV, *Trepanoma palladium*, *Plasmodium*, HTLV- Bacterially contaminated Blood. ABO – Rh blood groups - other red cell antigens andantibodies.  Coomb’stest. | | | |
| **Unit:6** | | **CONTEMPORARY ISSUES** | **2 Hours** |
| Expert lectures, Online Seminars - Webinars and Field Visits. | | | |
|  | | **Total Lecture Hours** | **45 Hours** |
| **Text Book(s)** | | | |
| 1 | Mukherjee KL. (2010).*Medical Laboratory Technology*, Volume 1, 2 and 3. Tata McGraw- Hill Education, India. | | |
| 2 | Sachdev KN. (1999). *Clinical Pathology and Clinical Bacteriology*, Jaypee Brothers Publishers,New Delhi. | | |
| 3 | Talib VH, Khurana SR. (2009).*Handbook of Medical Laboratory Technology*, CBS Publishers,Delhi. | | |
| 4 | Varley H. (2008). *Practical Clinical Biochemistry*, CBS Publishers, Delhi. | | |
| **Reference Books** | | | |
| 1 | Pagana KD, Pagana TJ. *Mosby'sManualofDiagnosticandLaboratory Tests-E-Book,* Elsevier HealthSciences. | | |
| 2 | Vandana Puri, Praeen Kr Gupta. (2020). *Complex Review of Pathology and Hematology for NBE*, 6th edition, CBS Publishers, Delhi. | | |
| 3 | Ajmani PS. (2017). *HandbookofClinicalLaboratoryTechniques*, AITBS Publisher, India. | | |
|  | | | |
| **Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]** | | | |
| 1 | <https://www.emagister.in/distance_learning_pathology_courses-tdist-236.htm> | | |
|  |  | | |



|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Mapping with Programme Outcomes** | | | | | | | | | | |
| **COs** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** |
| **CO1** | M | M | M | M | S | M | S | M | S | S |
| **CO2** | M | L | L | M | S | M | S | M | S | S |
| **CO3** | L | S | S | L | M | L | S | L | S | S |
| **CO4** | L | S | S | L | M | M | S | L | S | S |
| **CO5** | L | M | S | L | M | M | L | L | S | S |

\*S-Strong; M-Medium; L-Low

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Course code** | | **63R** | **PATHOLOGY AND CLINICAL LABORATORY TECHNIQUES**  **PRACTICAL** | **L** | **T** | **P** | **C** |
| **Core/Elective/ SBS** | | | **Elective III-A** | **0** | **0** | **2** | **2** |
| **Pre-requisite** | | | Practical Knowledge to Analysis, Interpretand  Evaluate Laboratory test results | **Syllabus**  **Version** | | **2025-26** | |
| **Course Objectives:** | | | | | | | |
| 1. Competent use of laboratory tests and to Interpret laboratory testresults. 2. Discuss the differential diagnosis and laboratory evaluation for apatient. 3. Demonstrate Microbiological staining techniques for rapid diagnosis of causative agents andto understand the clinicalindications. | | | | | | | |
| **Expected Course Outcomes:** | | | | | | | |
| On the successful completion of the course, student will be able to: | | | | | | | |
| 1 | Able to select, interpret tests and explain their clinical uses andlimitations. | | | | | K2 | |
| 2 | Explain and choose appropriate tests for monitoring variousdisorders. | | | | | K3 | |
| 3 | Recognize and assess laboratory tests results of one of their patients. | | | | | K4 | |
| 4 | Summarize and interpret the results of Differential count ofBlood, WBC and  Haemoglobin. | | | | | K5 | |
| **K1** - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** – Create | | | | | | | |
|  | | | | | | | |
| **MAJOR PRACTICAL** | | | | | | | |
| 1. Total countofRBC. 2. Total countofWBC. 3. Differential countofBlood 4. Microscopic identification of pus or cast cells and qualitatively checks for the presence ofblood in urine. 5. Smear the given bacteria with Gram’s staining and interprettheresult. | | | | | | | |
| **MINOR PRACTICAL** | | | | | | | |
| 1. Estimation of Haemoglobin by Sahlismethod. 2.Estimation of Bleeding and Clottingtime  3. Estimation of specific gravity and Albumin in Urine.   1. Semi-quantitative estimation of glucosein urine. 2. Qualitatively detect the presence of bile salts and Urobilinogenin urine. | | | | | | | |

|  |  |
| --- | --- |
| **SPOTTERS**  Malaria parasite, Filarial parasite, Tape Worm, ESR, Autoclave, Microtome, Coomb’s test, Spermatozoa, Incubator, Water bath, Centrifuge. | |
| **VISIT AND SUBMISSION OF REPORT**  Visit to training lab / training to a clinical lab of nearby locality. Report should be submitted in the practical. | |
| **QUESTION PATTERN: TOTAL MARKS: 30 MARKS.**  **Major: 10, Minor: 5, Record: 5, Spotter: 6 (3 spotters each carry 2 marks) Report: 4 marks.** | |
| **TotalPracticalHours 30(Each Semester) x 2 = 60 Hours PerYear** | |
| **Text Book(s)** | |
| 1 | [Mondal](https://www.amazon.in/s/ref%3Ddp_byline_sr_book_1?ie=UTF8&field-author=MONDAL%2BS%2BK&search-alias=stripbooks) SK. (2020).*PathologyPracticals*, 1st edition, CBS publisher, Delhi. |
| 2 | [Yadav.](https://www.amazon.in/s/ref%3Ddp_byline_sr_book_1?ie=UTF8&field-author=Yadav&search-alias=stripbooks) (2015). *Essentials of Practical Pathology for Undergraduates,* Ahuja Publishing  House, Delhi. |

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Mapping with Programme Outcomes** | | | | | | | | | | |
| **COs** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** |
| **CO1** | L | L | S | M | L | L | S | S | S | S |
| **CO2** | L | L | S | L | L | M | S | S | S | S |
| **CO3** | L | L | S | M | L | M | S | S | S | S |
| **CO4** | L | L | S | S | L | M | S | S | S | S |

\*S-Strong; M-Medium; L-Low



|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Course code** | | **5EE** | **POULTRY SCIENCE AND MANAGEMENT– I** | | **L** | | **T** | | **P** | **C** |
| **Core/Elective/ SBS** | | | **Elective II - B** | | **3** | | **0** | | **0** | **3** |
| **Pre-requisite** | | | Basic Knowledge to Identify Breeds, Poultry  Housing, Brooding andRearingTechniques **V** | | **Syllabus**  **Version** | | | **2025-26** | | |
| **Course Objectives:** | | | | | | | | | | |
| 1. To provide with sufficient information and knowledge to allow them to farm poultry commercial and semi-commercialway. 2. Gain basic knowledge about the production of poultry meat and eggs.   3. To understand about the basic principles of poultry nutrition, reproduction and physiology. | | | | | | | | | | |
| **Expected Course Outcomes:** | | | | | | | | | | |
| On the successful completion of the course, student will be able to: | | | | | | | | | | |
| 1 | Introduces current standards for the establishment and management of poultry  house. | | | | | | | | K2 | |
| 2 | Understand the scientific methods of breeding, hatching and various techniques in the poultry field. | | | | | | | | K2 | |
| 3 | Skillfully apply the tools, equipment, and protective mechanism for Poultry farming. | | | | | | | | K4 | |
| 4 | Apply the formulation to provide of good nutrition, management of form birds and  egg production. | | | | | | | | K5 | |
| 5 | Learn about the various skills that are necessary for self employment. | | | | | | | | K6 | |
| **K1** - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** – Create | | | | | | | | | | |
|  | | | | | | | | | | |
| **Unit:1** | | **HISTORY AND IMPORTANCE OF POULTRY**  **FARMING** | | | | **9 Hours** | | | | |
| History and importance of poultry farming - role of poultry farming in rural development and employment potential - Economic contributions to national productivity - egg production, Table breed production and poultry manure. Anatomy and physiology of poultry birds: Digestive and  reproductive system. | | | | | | | | | | |
|  | | | | | | | | | | |
| **Unit:2** | | **BREEDING, HATCHING, INCUBATION AND**  **CULLING** | | | | **9 Hours** | | | | |
| Breeds of poultry birds - scientific methods of breeding - hybrid selection and selecting parents for production - factors for selection - hatching - selecting eggs for hatching. Incubation: natural and artificial incubation - Types of incubators - maintenance of temperature and humidity -  sterilization of room during hatching - separation and culling. | | | | | | | | | | |
|  | | | | | | | | | | |
| **Unit:3** | | **POULTRY HOUSING AND EQUIPMENTS** | | **8 Hours** | | | | | | |
| Space requirements - Types of housing - equipment’s of feeding and watering - protection from enemies and adverse conditions. | | | | | | | | | | |
| **Unit:4** | | **NUTRITION OF POULTRY BIRDS** | | **8 Hours** | | | | | | |
| Feed requirement according to age - feed formulation - classification of feed-stuffs - millingby-  productsanddistilleryby-products.Availabilityofrawmaterialsandtheircost-foodgraders- | | | | | | | | | | |

|  |  |  |  |
| --- | --- | --- | --- |
| usage of antibiotics. | | | |
| **Unit:5** | | **BROODING AND REARING** | **9 Hours** |
| Brooding- types of brooding – natural and artificial brooding – temperature requirement - Rearing of chick, Sexing, characters of good layers and broilers - culling - Debeaking - Caponetts and  capons. | | | |
| **Unit:6** | | **CONTEMPORARY ISSUES** | **2 Hours** |
| Expert lectures, Online Seminars - Webinars and Field Visits. | | | |
|  | | **Total Lecture Hours** | **45Hours** |
| **Text Book(s)** | | | |
| 1 | Banarjee GC (2008). *Poultry*, Oxford and IBH Co pvt Ltd. | | |
| 2 | Gnanamani MR (2010).*Modern Aspects of Poultry Keeping,* Deepam publications, Madurai. | | |
| 3 | Jadhav NV andSiddiqui MF. (2010).*Handbook of Poultry Production and Management,*  Jaypee Brothers Medical Publishers (P) Ltd, New Delhi. | | |
| 4 | Vegad JL (2015). *Poultry Diseases*- *A Guide for Farmers and Poultry Professionals,*  2ndedition.CBS Publishers and Distributors, Delhi. | | |
| **Reference Books** | | | |
| 1 | Chauhan HVS. (2018).*Poultry Diseases, Diagnosis and Treatmen,*New Age International  Publisher, New Delhi. | | |
| 2 | Eiri Board. (2014).*Hand Book of Poultry Farming and Feed Formulations,*Published by Engineers India Research Institute, Delhi. | | |
| 3 | Jagdish Prasad. (2015). *Poultry: Production And Management,* 5th edition, Kalyani  publisher, Delhi. | | |
|  | | | |
| **Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]** | | | |
| 1 | <https://www.classcentral.com/course/swayam-introduction-to-poultry-farming-14160> | | |
| 2 | <https://swayam.gov.in/nd2_nou19_ag09/preview> | | |
|  | | | |



|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Mapping with Programme Outcomes** | | | | | | | | | | |
| **COs** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** |
| **CO1** | M | S | M | M | S | M | S | M | S | S |
| **CO2** | M | S | M | S | S | M | S | M | S | S |
| **CO3** | M | M | L | L | M | L | S | M | S | S |
| **CO4** | M | M | M | S | M | L | S | M | S | S |
| **CO5** | M | S | M | M | S | M | S | M | S | S |

\*S-Strong; M-Medium; L-Low



|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Course code** | | **6EE** | **POULTRY SCIENCE AND**  **MANAGEMENT - II** | | **L** | | **T** | | **P** | **C** |
| **Core/Elective/ SBS** | | | **Elective II-B** | | **3** | | **0** | | **0** | **3** |
| **Pre-requisite** | | | Basic Knowledge in Management of Broilers,  Layers and MarketingofBreeds **V** | | **Syllabus**  **Version** | | | **2025-26** | | |
| **Course Objectives:** | | | | | | | | | | |
| 1. To provide with sufficient information and knowledge to allow them to farm poultry commercial and semi-commercialway. 2. To learn specific areas of poultry production including breeding, nutrition, health andproduct quality and development of entrepreneurial skills in poultryfarming 3. To provide an understanding of poultry production in a broad context from farm tofork. | | | | | | | | | | |
| **Expected Course Outcomes:** | | | | | | | | | | |
| On the successful completion of the course, student will be able to: | | | | | | | | | | |
| 1 | Learn about the various skills that are necessary to manage poultry farms. | | | | | | | | K2 | |
| 2 | Skillfully apply the tools, equipment, and protective mechanism for management of  layers and broilers in Poultry farming. | | | | | | | | K4 | |
| 3 | Apply the methods and techniques in the egg production, preservation and  marketing. | | | | | | | | K3 | |
| 4 | Able to identify and follow regulation practices for the disease and pest control for  birds. | | | | | | | | K4 | |
| 5 | Introduces current standards for the establishment and management of poultry  house. | | | | | | | | K6 | |
| **K1** - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** – Create | | | | | | | | | | |
|  | | | | | | | | | | |
| **Unit:1** | | **MANAGEMENT OF LAYERS** | | | | **9 Hours** | | | | |
| Characteristics of layer chicks - housing, space and lighting requirements - Summer and Winter  management - Changes in feeding programme - Care of egg - Hen sampling - Cannibalism. | | | | | | | | | | |
| **Unit:2** | | **MANAGEMENT OF BROILERS** | | | | **9 Hours** | | | | |
| Characteristics of the Broiler chicks - Housing of broiler chicks - Optimum Conditions - Feeding  and Feed formulations - Sampling. | | | | | | | | | | |
| **Unit:3** | | **DISEASE AND HEALTH MANAGEMENT** | | **9 Hours** | | | | | | |
| Diseases caused by viruses: Marek’s Disease, Ranikhet Disease, Fowl pox, Gumboro disease, Egg drop syndrome.  Diseases caused by Bactria: Salmonellosis, fowl cholera, Tick fever. Diseases caused by Fungi: Aspergillosis, Aflotoxicosis.  Diseases caused by Worms and other Parasites.  Antibiotics, Vaccination, Deworming and Insecticide Treatment. Health cover. | | | | | | | | | | |
| **Unit:4** | | **MARKETING** | | **8 Hours** | | | | | | |
| Marketing, Grading and Preservation of egg - Packing and Transportation of eggs - Difference  between dark and pale yellow yolk and its taste. | | | | | | | | | | |
| **Unit:5** | | **IMPORTANCE OF EGG** | | **8 Hours** | | | | | | |
| Different uses of eggs in preparation of bakery products and other edible items - Nutritive values | | | | | | | | | | |



|  |  |  |  |
| --- | --- | --- | --- |
| of egg - Relationship between customers, Maintenance of prices. | | | |
| **Unit:6** | | **CONTEMPORARY ISSUES** | **2 Hours** |
| Expert lectures, Online Seminars - Webinars and Field Visits. | | | |
|  | | **Total Lecture Hours** | **45 Hours** |
| **Text Book(s)** | | | |
| 1 | Banarjee GC (2008). *Poultry*, Oxford and IBH Co pvt Ltd. | | |
| 2 | Gnanamani MR (2010).*Modern Aspects of Poultry Keeping, Deepam* publications, Madurai. | | |
| 3 | Jadhav NV andSiddiqui MF. (2010).*Handbook of Poultry Production and Management,*  Jaypee Brothers Medical Publishers (P) Ltd, New Delhi. | | |
| 4 | Vegad JL (2015). *Poultry Diseases*- *A Guide for Farmers and Poultry Professionals,*  2ndedition.CBS Publishers and Distributors, Delhi. | | |
| **Reference Books** | | | |
| 1 | Chauhan HVS. (2018).*Poultry Diseases, Diagnosis and Treatmen,*New Age International  Publisher, New Delhi. | | |
| 2 | Eiri Board. (2014).*Hand Book of Poultry Farming and Feed Formulations, Published* by Engineers India Research Institute, Delhi. | | |
| 3 | Jadhav NV andSiddiqui MF. (2010).*Handbook of Poultry Production and Management,*  Jaypee Brothers Medical Publishers, New Delhi. | | |
| 4 | Jagdish Prasad. (2015). *Poultry: Production And Management,* 5th edition, Kalyani publisher,  Delhi. | | |
|  | | | |
| **Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]** | | | |
| 1 | <https://www.classcentral.com/course/swayam-introduction-to-poultry-farming-14160> | | |
| 2 | <https://swayam.gov.in/nd2_nou19_ag09/preview> | | |
|  | | | |



|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Mapping with Programme Outcomes** | | | | | | | | | | |
| **COs** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** |
| **CO1** | M | S | M | M | S | M | S | M | S | S |
| **CO2** | M | S | M | S | S | M | S | M | S | S |
| **CO3** | M | M | L | L | M | L | S | M | S | S |
| **CO4** | M | M | M | S | M | L | S | M | S | S |
| **CO5** | M | S | M | M | S | M | S | M | S | S |

\*S-Strong; M-Medium; L-Low



|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Course code** | | **63R** | **POULTRY SCIENCE AND MANAGEMENT -**  **PRACTICAL** | **L** | **T** | | **P** | **C** |
| **Core/Elective/ SBS** | | | **Elective Course III - B** | **0** | **0** | | **2** | **2** |
| **Pre-requisite** | | | Practical Knowledge to Rear and Manage Poultry  Breeds | **Syllabus**  **Version** | | **2025-26** | | |
| **Course Objectives:** | | | | | | | | |
| 1. To provide an opportunity to become familiar and acquire a degree of skill in poultryfield. 2. To enlighten the evaluation of the productive performance oflivestock. 3. To reveal the real nature of animal production and their role in ruraldevelopment. | | | | | | | | |
| **Expected Course Outcomes:** | | | | | | | | |
| On the successful completion of the course, student will be able to: | | | | | | | | |
| 1 | Evaluate the importance and value of agricultural products as a feed source in poultry  and differentiate the poultry breeds and their characteristics features. | | | | | | K5 | |
| 2 | Gain practical knowledge in analyzing the abnormalities and grading techniques of  eggs. | | | | | | K2 | |
| 3 | Understand about various techniques debeaking,candling andalso be familiar with  incubators in breeding that are necessary for manage the poultry farm. | | | | | | K2 | |
| 4 | Able to follow proper vaccination practice for the diseases and pest control. | | | | | | K4 | |
| 5 | Field visits make the students to catch up the mills processing, animal feedstuffs and  Hatcheries. | | | | | | K4 | |
| **K1** - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** – Create | | | | | | | | |
|  | | | | | | | | |
| **MAJOR PRACTICAL** | | | | | | | | |
| **Nutritive Value of poultry feed sources:**   1. Carbohydrate sources - Maize, Rice Polish, Rice Bran, WheatBran 2. Vegetable Protein sources - Groundnut Cake, Sesame Cake,CoconutMeal,Cotton Seed, Soybean Meal, Sunflowermeal 3. Animal protein sources - Fish Meal, Meat Meal, Silkworm PupaeMeal 4. Mineral sources - Bone meal, Oyster Shell Meal, LimeStone   **Different type of breeds and their characteristics**   1. American class: Rhode IslandRed 2. Mediterranean class: leghorn,Minorca 3. Asiatic class: Desi birds/Aseel,Kadacknath   **Gradingofeggs**   1. Grade AA 2. GradeA 3. GradeB   **Eggabnormalities**   1. Tinyeggs | | | | | | | | |

|  |  |
| --- | --- |
| 1. Leathery /soft shelleggs 2. Double yoked eggs 3. Blood smearedeggs 4. Dirtyeggs | |
| **MINOR PRACTICAL** | |
| 1. Vaccination schedules for broilers andlayers 2. Debeaking 3. Types ofhousing 4. Eggcandling 5. Cannibalism | |
| **SPOTTERS** | |
| 1. **Comment on the poultry equipments**: Feeding and Wateringequipments. 2. **Draw labeled sketch**: Digestive system, Reproductive system (male andfemale). 3. **Brief description on the medicinal values**: Antibiotics andVaccines. 4. **Poultry diseases**: Symptoms and preventivemethods. 5. **Short notes with diagram**: Brooder andIncubator. | |
| **VISIT AND SUBMISSION OF REPORT**  Visit to poultry markets/farm /study of specific marketing problems/ in house training in college. Report should be submitted in the practical. | |
| **QUESTION PATTERN: TOTAL MARKS: 30 MARKS.**  **Major: 10, Minor: 5, Record: 5, Spotter: 6 (3 spotters each carry 2 marks) Report: 4 marks.** | |
| **TotalPracticalHours 30(Each Semester) x 2 = 60 Hours PerYear** | |
| **Text Book(s)** | |
| 1 | Banarjee GC (2008). *Poultry*, Oxford and IBH Co.pvt Ltd. |
| 2 | Gnanamani MR (2010).*Modern Aspects of Poultry Keeping,*Deepam publications, Madurai. |
| 3 | Rice EJ and Botosford HE. (1949).*Practical poultry management,* John Wiley, Hansen Inc. New York. |
| 4 | Siddiqui SM, Reddy CV and Mathur CR. (1975).*A Practical Manual of Poultry Production*, 1st edition, Kothari Book Depot, India. |



|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Mapping with Programme Outcomes** | | | | | | | | | | |
| **COs** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** |
| **CO1** | S | S | S | S | M | L | S | L | S | S |
| **CO2** | M | S | S | M | L | L | S | L | S | S |
| **CO3** | M | S | S | M | M | L | S | M | S | S |
| **CO4** | M | S | S | M | L | L | S | M | S | S |
| **CO5** | M | S | M | S | M | M | S | M | S | S |

\*S-Strong; M-Medium; L-Low



|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Course code** | | **5EF** | **APICULTURE -I** | | **L** | | **T** | | **P** | **C** | |
| **Core/Elective/ SBS** | | | **ElectiveII-C** | | **3** | | **0** | | **0** | **3** | |
| **Pre-requisite** | | | Basic Introduction about Bees, Beekeeping and  Beekeeping Appliances **V** | | **Syllabus**  **Version** | | | **2025-26** | | | |
| **Course Objectives:** | | | | | | | | | | | |
| 1. To increase the knowledge of bees and bee culture.   * 2. To learn the fundamentals and scientific basis of beekeeping   3. To maintain small apiaries for demonstration, pollination, extraction and popularization of honey  and other by-products of Bee keeping.  4. To build and manage a network of garden and independent beekeeping sites. | | | | | | | | | | | |
| **Expected Course Outcomes:** | | | | | | | | | | | |
| On the successful completion of the course, student will be able to: | | | | | | | | | | | |
| 1 | Introduces current standards for the establishment and management of bees. | | | | | | | | K1 | | |
| 2 | Familiarize with morphology, food and development of bees. | | | | | | | | K2 | | |
| 3 | Skillfully apply the tools, equipment and protective gear for beekeeping. | | | | | | | | K3 | | |
| 4 | Apply the knowledge of good quality of nectar and pollen to planning landscapes and gardens. | | | | | | | | K3 | | |
| 5 | Gain knowledge about various techniques followed in marketing of  Honey. | | | | | | | | K4 | | |
| **K1** - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** – Create | | | | | | | | | | | |
|  | | | | | | | | | | | |
| **Unit:1** | | **INTRODUCTION TO BEES** | | | | **8 Hours** | | | | | |
| Scope and Advantages. Kinds of Honey bee –*Apisdorsata*– *Apisflorea*– *Apiscerana indica* – *Trigonairidipennis*. Honey Bee colony: Worker - Queen – Drones. External Morphology of Worker Bee. | | | | | | | | | | | |
| **Unit:2** | | **LIFE CYCLE AND ANATOMY** | | | | **9 Hours** | | | | | |
| Life cycle and Development of Honey Bee. Food of Honey Bee –Nectar – Pollen – Royal Jelly –  Honey. Pollen, Nectar and Water foraging – Swarming. | | | | | | | | | | | |
| **Unit:3** | | **PRIMITIVE BEEKEEPING** | | **9 Hours** | | | | | | |
| Primitive Beekeeping and structure of Hives - Modern Beekeeping and structure of Hives Advantages and disadvantages of these methods. | | | | | | | | | | |
| **Unit:4** | | **APIARY APPLIANCES** | | **9 Hours** | | | | | | |
| Appliances used in Apiary: Comb frame – foundation sheet – Dummy division board – Drone and Queen excluder – Swarm trap – Smoker – Uncapping knife –Bee veils – Honey extractor – Bee brush –feeders. | | | | | | | | | | |

|  |  |  |  |
| --- | --- | --- | --- |
| **Unit:5** | | **EXTRACTION AND PRESERVATION** | **8 Hours** |
| Honey extractor – Methods of extraction, Processing, Packing and Storage. Marketing of Honey. | | | |
| **Unit:6** | | **CONTEMPORARY ISSUES** | **2 Hours** |
| Expert lectures, Online Seminars - Webinars and Field Visits. | | | |
|  | | **Total Lecture Hours** | **45 Hours** |
| **Text Book(s)** | | | |
| 1 | Atuar Rahman. (2017). *Apiculture In India,* Indian Council of Agricultural Research,India. | | |
| 2 | Jayashree KV, Tharadevi CS and ArumugamN. (2015).*Apiculture*, Saras Publication, Nagercoil, Tamilnadu. | | |
| 3 | Sammataro D, Avitabile A. (2011). *The beekeeper's Handbook*, Cornell UniversityPress. | | |
| 4 | Sathe TV. (2014). *Fundamental of Beekeeping*, Daya PublishingHouse, New Delhi. | | |
| **Reference Books** | | | |
| 1 | Graham J M. (1992). *The Hive At The Honey Bee, Dadant* and Sons, Hamilton, IIIinois. | | |
| 2 | Hem Raj. (2020). *Text Book of Apiculture,*S.Vinesh and Co, publishers, Karnataka, India. | | |
| 3 | Mishra RC. (1995). *Honey Bees and Their Management in India,*ICAR Publication, New Delhi. | | |
| 4 | Sanford MT, Bonney RE. (2010). *Storey's Guide to Keeping Honey Bees: Honey Production, Pollination and Bee Health.* StoreyPublishing, US. | | |
| 5 | Singh S. (1971). *Beekeeping in India*, ICAR publication. | | |
| 6 | Winston M. (1991). *The biology of the honeybee,*Harvard University Press, Massachusetts,  USA. | | |
|  | | | |
| **Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]** | | | |
| 1 | <https://www.beesource.com/forums/showthread.php?320175-Free-online-Beekeeping-course> | | |
| 2 | <https://www.hortcourses.com/courses/bees-beekeeping-and-honey-790.aspx> | | |
|  |  | | |



|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Mapping with Programme Outcomes** | | | | | | | | | | |
| **COs** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** |
| **CO1** | M | S | S | M | M | S | S | L | S | S |
| **CO3** | M | M | M | S | S | M | S | L | S | S |
| **CO3** | M | M | S | M | M | S | S | L | S | S |
| **CO4** | M | S | M | S | M | S | S | L | S | S |

\*S-Strong; M-Medium; L-Low

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Course code** | | | | **6EF** | **APICULTURE -II** | **L** | | | **T** | | **P** | **C** |
| **Core/Elective/ SBS** | | | | | **ElectiveII-C** | **3** | | | **0** | | **0** | **3** |
| **Pre-requisite** | | | | | Basic Knowledge in handling tools for  Management of Bees | **Syllabus**  **Version** | | | | **2025-26** | | |
| **Course Objectives:** | | | | | | | | | | | | |
| 1. 1. Tolearn honey extraction and honey bee health issues.   2. To maintain small apiaries for demonstration, pollination, extraction and popularization of honey  and other by-product of bee keeping.   1. To make awareof various methods of beekeeping and the uses ofitsappliances. | | | | | | | | | | | | |
| **Expected Course Outcomes:** | | | | | | | | | | | | |
| On the successful completion of the course, student will be able to: | | | | | | | | | | | | |
| 1 | Gain knowledge about the importance of honey and also able to classify the honey. | | | | | | | | | | K1 | |
| 2 | Able to identify and follow regulation practices for the control diseases and control of  parasites and enemies. | | | | | | | | | | K3 | |
| 3 | Skillfully apply the tools, equipment, and techniques for management of bee. | | | | | | | | | | K3 | |
| 4 | Be relevant and follow the procedure required for rearing, caring, grafting  and stocking techniques. | | | | | | | | | | K4 | |
| **K1** - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** – Create | | | | | | | | | | | | |
|  | | | | | | | | | | | | |
| **Unit:1** | | | | **HONEY** | | | **9 Hours** | | | | | |
| Types of Honey – Properties of Honey – Nutritional and Medicinal value of Honey. Bee Wax –  Properties and uses. Methods to identify original honey. | | | | | | | | | | | | |
| **Unit:2** | | | **ENEMIES** | | | | | **8 Hours** | | | | |
| Damages and preventive measures for Wasps - Greater and Lesser wax moths - Wax Beetles -  Black Ants Birds and Mammals. | | | | | | | | | | | | |
| **Unit:3** | | **STOCKS AND ECONOMICS** | | | | | | **9 Hours** | | | | |
| Uniting of Stocks - Uses and Principles - Methods of uniting. Artificial feeding methods. Economics  of Beekeeping: Preparation of project – Infrastructure cost –recurring – expected income and gain – Methods to obtain loan | | | | | | | | | | | | |
| **Unit:4** | | **QUEEN REARING** | | | | | | **9 Hours** | | | | |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Types of Honey – Properties of Honey – Nutritional and Medicinal value of Honey. Bee Wax –  Properties and uses. Methods to identify original honey. | | | | |
| **Unit:5** | | | **DISEASES** | **8 Hours** |
| Description of Parasite, Symptoms, Transmission, Diagnosis and Control of Brood Disease and  adult diseases. | | | | |
| **Unit:6** | | | **CONTEMPORARY ISSUES** | **2 Hours** |
| Expert lectures, Online Seminars - Webinars and Field Visits. | | | | |
|  | | | **Total Lecture Hours** | **45 Hours** |
| **Text Book(s)** | | | | |
| 1 | | Atuar Rahman. (2017). *Apiculture In India,* Indian Council of Agricultural Research,India. | | |
| 2 | | Jayashree KV, Tharadevi CS and ArumugamN. (2015).*Apiculture*, Saras PublicationNagercoil,Tamilnadu. | | |
| 3 | | Sammataro D, Avitabile A. (2011). *The Beekeeper's Handbook*, Cornell UniversityPress. | | |
| 4 | | Sathe TV. (2014). *Fundamental of Beekeeping*, Daya PublishingHouse, New Delhi. | | |
| **Reference Books** | | | | |
| 1 | | Graham J M. (1992). *The hive and the honey bee,*Dadant and Sons, Hamilton, IIIinois. | | |
| 2 | | Hem Raj. (2020). *Text Book of Apiculture,*S.Vinesh and Co, publishers, Karnataka, India. | | |
| 3 | | Mishra RC. (1995). *Honey bees and their management in India,*ICAR Publication, New Delhi | | |
| 4 | | Sanford MT, Bonney RE. (2010). *Storey's Guide to Keeping Honey Bees: Honey Production, Pollination and Bee Health.* StoreyPublishing, US. | | |
| 5 | | Singh S. (1971). *Beekeeping in India*, ICAR publication. | | |
| 6 | | Winston M. (1991). *The biology of the honeybee,*Harvard University Press, Massachusetts,  USA. | | |
|  | | | | |
| **Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]** | | | | |
| 1 | <https://www.beesource.com/forums/showthread.php?320175-Free-online-Beekeeping-course> | | | |
| 2 | <https://www.hortcourses.com/courses/bees-beekeeping-and-honey-790.aspx> | | | |
|  |  | | | |
| **Course Designed By: Dr.A.RAJA RAJESWARI, Asst.Prof, Sri Vasavi College, Erode.** | | | | |



|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Mapping with Programme Outcomes** | | | | | | | | | | |
| **COs** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** |
| **CO1** | M | S | S | M | M | S | S | L | S | S |
| **CO3** | M | M | M | S | S | M | S | L | S | S |
| **CO3** | M | M | S | M | M | S | S | L | S | S |
| **CO4** | M | S | M | S | M | S | S | L | S | S |

\*S-Strong; M-Medium; L-Low

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Course code** | | **63R** | **APICULTURE PRACTICAL** | **L** | **T** | | **P** | **C** |
| **Core/Elective/ SBS** | | | **Elective Course III-C** | **0** | **0** | | **2** | **2** |
| **Pre-requisite** | | | Practical Knowledge about Management of Bees,  Extraction and Identifying the Quality of Honey | **Syllabus**  **Version** | | **2025-26** | | |
| **Course Objectives:** | | | | | | | | |
| 1. To increase the knowledge of bees and bee culture. 2. To maintain small apiaries for demonstration, pollination, extraction and popularization of honey and other by-product ofbeekeeping. 3. To build and manage a network of garden and independent beekeeping sites, make awareof various methods of beekeeping and the uses ofitsappliances. | | | | | | | | |
| **Expected Course Outcomes:** | | | | | | | | |
| On the successful completion of the course, student will be able to: | | | | | | | | |
| 1 | Introduces current standards for the establishment and management of bees. | | | | | | K1 | |
| 2 | Familiarized with various techniques like mounting and extraction of honey. | | | | | | K3 | |
| 3 | Identify and describe about different hives, appliances and parasites of bees. | | | | | | K3 | |
| 4 | Gain practical knowledge in identifying the quality of honey. | | | | | | K4 | |
| **K1** - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** – Create | | | | | | | | |
|  | | | | | | | | |
| **MAJOR PRACTICAL** | | | | | | | | |
| 1. ExtractionofHoney. 2. Setting up of a Newton Hive (Cardboards and others canbeused). 3. Estimation of GlucoseinHoney. 4. Mounting of Pro, Meso and Meta thoracic legs ofHoneybee. 5. Dissection of Wax glands (Optional). | | | | | | | | |
| **MINOR PRACTICAL** | | | | | | | | |
| 1. Mounting ofMouthparts. 2. Identifying the qualityofHoney. 3. Qualitative identification of Glucose, Fructose and SucroseinHoney. | | | | | | | | |

|  |  |
| --- | --- |
| **SPOTTERS** | |
| 1. Identification and Description of Whole mount of types ofHoneybees. 2. Identification and Description of types of Primitive andModernHives. 3. Identification and Description of Appliances UsedinApiary. 4. Identification and Description of Parasites ofHoneybee. 5. Identification and Description of Worker, Drone andQueen. | |
| **VISIT AND SUBMISSION OF REPORT**  Visit to apiculture unit of nearby locality or training or in house apiculture in college. Report should be submitted in the practical. | |
| **QUESTION PATTERN: TOTAL MARKS: 30 MARKS.**  **Major: 10, Minor: 5, Record: 5, Spotter: 6 (3 spotters each carry 2 marks) Report: 4 marks.** | |
| **TotalPracticalHours 30(Each Semester) x 2 = 60 Hours PerYear** | |
| **Text Book(s)** | |
| 1 | [David Cramp](https://www.amazon.in/David-Cramp/e/B0034Q0L4C/ref%3Ddp_byline_cont_ebooks_1) A. (2008). *A Practical Manual Of Beekeeping: How to Keep Bees and Develop*  *Your Full Potential as an Apiarist,* Kindle Edition, Spring Hill Publisher, UK. |
| 2 | David Cramp A. (2012). *The Complete Step-by-step Book of Beekeeping: A Practical Guide to Beekeeping, from Setting Up a Colony to Hive Management and Harvesting the Honey, Lorenz* Books. London. |
| 3 | HaikeRieks. (2006).*Practical Guide for Organic Bee keepers,* EPOPA Publication, Netherlands. |



|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Mapping with Programme Outcomes** | | | | | | | | | | |
| **COs** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** |
| **CO1** | S | S | M | S | M | S | S | L | S | S |
| **CO3** | L | M | L | L | M | M | S | L | S | S |
| **CO3** | M | S | L | S | M | S | S | L | S | S |
| **CO4** | L | L | L | M | L | M | S | L | S | S |

\*S-Strong; M-Medium; L-Low

Value Added Course

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Value Added Course** | | **MEDICAL EMERGENCY MANAGEMENT** | **L** | **T** | | **P** | **C** |
| **Value Added Course-I** |  |  | |  |  |
| **Pre-requisite** | | Knowledge to Understand the First Aid Treatment  and Management | **Syllabus**  **Version** | | **2025-26** | | |
| **Course Objectives:** | | | | | | | |
| 1. To understand the scope and role of First AidTreatments. 2. To manage the various incidents using First Aid Treatmentmeasures. 3. To describe the various medical emergencysituations. 4. To learn handling techniques of First AidTreatment. | | | | | | | |
|  | | | | | | | |
| **Expected Course Outcomes:** | | | | | | | |
| On the successful completion of the course, student will be able to: | | | | | | | |
| 1 | To understand the significance of First Aid Treatments and utilize the possible measures for life saving in an unconscious casualty. | | | | | K2 | |
| 2 | To explain the First Aid management for respiratory, wounds and circulation problems. | | | | | K3 | |
| 3 | To list the techniques and equipments for First Aid. | | | | | K4 | |
| 4 | To plan the First Aids for emergency in community and natural disorders. | | | | | K4 | |
| **K1** - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** - Create | | | | | | | |
| **THEORY 10 x 2 =20Hours** | | | | | | | |
| Module 1. First Aid and Aider. Precaution and Preparation.  Module 2. Action of Emergency: Protection from infection, dealing casualty and use of medications.  Module 3.Incidents**:** Pandemic diseases (virus and Bacteria).  Module 4. Accidents: Traffic accidents, Fire accidents, Electrical incidents and Water incidents.  Module 5. Medical Situations: Heart attack, Stroke, Hyper and Hypoglycemia, Seizures.  Module 6. Common Diseases: Fever, Allergy, Anaphylactic shock, Headache, Migraine, Sore throat, Earache and toothache, Abdominal pain, Vomiting and Diarrhea.  Module 7. First Aid materials, Dressings, Cold compresses, Removing clothing and headgear.  Module 8. Casualty handling, Principles of bandaging and types (Roller and Tubular), square knots, hand and foot cover.  Module 9. Emergency Action: Cardio Pulmonary Resuscitation for an adult and infant and chest  compression.  Module 10. Community Emergency: Fire explosions, Earth quakes, Flood and Famine. | | | | | | | |



|  |  |
| --- | --- |
| **PRACTICALS 5 x 2 = 10Hours** | |
| 1. Blood Pressure checking Sitting, Standing and LyingPosition 2. Cardio Pulmonary Resuscitation (CPR)-handlingTest 3. RBC and WBCCount 4. Estimation of Bleeding and Clottingtime 5. Checking Heart Beat and PulseRate. | |
| **Reference Books** | |
| 1 | American college of emergency physicians.(2014). *First Aid Manual,* 5th edition, Dorl Kindersley,Publication, London. |
| 2 | Clement.(2012). *Text book on First Aid and Emergency Nursing,* 1st edition, JPbrothers,  New Delhi. |
| 3 | Philip Jevons. (2006). *Emergency care and First Aid for Nurses, A practical Guide,*Churchill  Living Stone, London. |
| 4 | St. John Ambulance, St. Andrew's Ambulance association and the British red cross society. (2006). *First Aid Manual,* 9thedition, Publication Dorling Kindersley, London. |
|  | |

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Mapping with Programme Outcomes** | | | | | | | | | | |
| **Cos** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** |
| **CO1** | L | M | M | M | L | S | M | M | S | S |
| **CO2** | L | M | M | M | L | S | L | M | S | S |
| **CO3** | L | M | M | M | L | M | S | S | S | S |
| **CO4** | L | M | M | M | L | M | S | S | S | S |

\*S-Strong; M-Medium; L-Low



|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Value Added Course** | | **VERMITECHNOLOGY** | **L** | **T** | | **P** | **C** |
| **Value Added Course-II** |  |  | |  |  |
| **Pre-requisite** | | Basic Knowledge about Rearing Earthworm | **Syllabus**  **Version** | | **2025-26** | | |
| **Course Objectives:** | | | | | | | |
| 1. To understand the importance ofEarthworms. 2. To impart the basic knowledge on Vermicompostingmethods. 3. To familiarize the values of Vermitechnology and its applied aspects of organicfarming. | | | | | | | |
| **Expected Course Outcomes:** | | | | | | | |
| On the successful completion of the course, student will be able to: | | | | | | | |
| 1 | Student gain basic knowledge of Earthworms. | | | | | K2 | |
| 2 | Understand the importance of waste degradation by Eco-friendly method. | | | | | K3 | |
| 3 | Understand the significance of Vermicomposting methods. | | | | | K4 | |
| 4 | Apply knowledge on commercialization of Vermiproducts. | | | | | K4 | |
| **K1** - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** – Create | | | | | | | |
| **MODULE 15 x 2 = 30Hours** | | | | | | | |
| Module 1. Definition, Concept and Need for Vermiculture.  Module 2. Classification of Earthworm Epigeic, Anecic and Endogeic forms.Module 3. Earthworm: General body structure, colour, Anatomy and Body Setae. Module 4. Food habits – Digestive system – Excretion.  Module 5. Reproduction and Life cycle of Earthworm.  Module 6. Vermiculture unit setup. Small scale and Large scale vermin composing.. Module 7. Vermiculture environmental-Air, Moisture. Temperature.  Module 8. Vermicomposting materials –Types of vermicomposting and Requirements. Module 9. Advantages and Maintenance of Vermicomposting.  Module 10. Chemical composition of Vermicompost, Vermi wash, Value addition of  Vermicompost.  Module 11. Uses of earthworms in animal feed industry. Module 12. Bioremediation through Vermitechnology.  Module 13. Role of earthworms in sustainable agriculture - organic farming. | | | | | | | |

|  |  |
| --- | --- |
| Module 14. Earthworm activities – soil fertility and texture - soil aeration.  Module 15. Recycling of different wastes by vermicomposting. | |
| **Text Books** | |
| 1 | Bhatnagar RK and Palta RK. (1996). *VermicultureandVermicomposting*, Kalyani Publishers,  New Delhi. |
| 2 | Gupta PK. (2005). *Vermicomposting for Sustainable Agriculture*,Agro-Bios publication,  Jodhpur, , |
| 3 | Ismail SA. (1997).*Vermicology*-*The biology of Earthworm, Orient* Longman, India. |
| 4 | Ranganathan LS.(2006).*Vermicomposting Technology – From Soil Health to Human Health,*[Agro-Bios Publications](https://www.kopykitab.com/Agrobios), India |
| 5 | Sathe TV. (2004).*Vermiculture and Organic Farming, Daya* Publishing House, India. |
| 6 | Seethalakshmy. (2014). *A Text book of Vermitechnology,* 3rd edition, Saras Publications, Nagerkovil, Tamilnadu. |
| **Reference Books** | |
| 1 | Arun K.Sharma. (2002). *A Hand book of organic forming*, Agrobios, Jothpur, India. |
| 2 | Edwards CA and Lofty JR. (1977) “*BiologyofEarthworms*”, Chapman and Hall Ltd, London. |
| 3 | Lee KE. (1985) “*Earthworms*: *TheirecologyandRelationshipwithSoilsandLand Use*”,  Academic Press, Sydney. |
| 4 | Satchel JE. (1983). “*EarthwormEcology*”, Chapman Hall, London. |
| 5 | Tripathi G. (2003). *VermisourceTechnology*, Discovery Publishing House, India. |

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Mapping with Programme Outcomes** | | | | | | | | | | |
| **Cos** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** |
| **CO1** | S | S | S | S | S | S | S | L | S | S |
| **CO2** | M | M | M | M | S | S | S | L | S | S |
| **CO3** | M | S | S | M | M | S | S | L | S | S |
| **CO4** | M | M | S | M | M | S | S | L | S | S |

\*S-Strong; M-Medium; L-Low



|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Value Added Course** | | | **ECONOMICS OF CONSERVATION** | **L** | **T** | | **P** | **C** |
| **Value Added Course-III** |  |  | |  |  |
| **Pre-requisite** | | | Basic Knowledge in Life Sciences | **Syllabus**  **Version** | | **2025-26** | | |
| **Course Objectives:** | | | | | | | | |
| 1. To create basic awareness about conservation 2. To create awareness to students explore biodiversity for new productdevelopment. 3. To create awareness to understand the economics aspects of Biodiversity | | | | | | | | |
|  | | | | | | | | |
| **Expected Course Outcomes:** | | | | | | | | |
| On the successful completion of the course, student will be able to: | | | | | | | | |
| 1 | | Explore nature in search of new biodiversity products in field of medicine and  agriculture. | | | | | K3 | |
| 2 | | Able to understand the significance and need of conserving resources | | | | | K3 | |
| 3 | | Gain knowledge about importance of Ecosystem services and marine resources. | | | | | K2 | |
| 4 | | Familiar and able to isolate, identify the biodiversity products. | | | | | K3 | |
| 5 | | Aware and create career opportunity in ecotourism. | | | | | K5 | |
| **K1** - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** - Create | | | | | | | | |
| **MODULE 15 x 2 = 30Hours** | | | | | | | | |
| Module 1. Concept of Biodiversity  Module 2. Ecosystems and Community structure Module 3. Spatial and temporal aspects of biodiversity Module 4. Causes of the global loss of biodiversity  Module 5. Invasive species and their impact on ecosystems and biodiversity Module 6. Conservation biology: policy and management  Module 7. Ecosystem services and their importance for human societies Module 8. Biodiversity products  Module 9. Economics of marine resources Module 10. Biodiversity products from Animals. Module 11. Biodiversity products from plants.  Module 12.Biotechnology in Biodiversity  Module 13.Isolation, identification and patenting Biodiversity Products Module 14.Biodiversity as Career  Module 15. Eco-tourism and possibilities. | | | | | | | | |
| **Reference Books** | | | | | | | | |
| 1 | Anderson J and Slater D L.(1981).*Catalogue of Mammals,* Vol. I and II. Cosmo Publications,  New Delhi. | | | | | | | |
| 2 | Hosetti BB, Ramkrishna S. (2016).*Biodiversity* :*Concepts and Conservation*, 1st edition,  Aavishkar Publishers, Distributors, Jaipur | | | | | | | |
| 3 | Prater S H. (1988). *The Book of Indian Animals,* Bombay Natural History Society, Bombay | | | | | | | |
| 4 | Young J Z. (1950). *The Life of Vertebrates,* Clarendon Press, Oxford. | | | | | | | |

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Mapping with Programme Outcomes** | | | | | | | | | | |
| **COs** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** |
| **CO1** | S | M | M | M | S | S | S | S | S | M |
| **CO2** | M | S | S | S | S | M | M | M | M | M |
| **CO3** | M | M | L | L | L | S | L | M | S | S |
| **CO4** | M | M | L | M | L | S | L | M | S | S |
| **CO5** | M | M | L | L | L | S | L | M | S | S |

\*S-Strong; M-Medium; L-Low





|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Value Added Course** | | **INTELLECTUAL PROPERTY RIGHT** | **L** | **T** | | **P** | **C** |
| **Value Added Course-IV** |  |  | |  |  |
| **Pre-requisite** | | Basic Knowledge to Aware About IPR | **Syllabus**  **Version** | | **2025-26** | | |
| **Course Objectives:** | | | | | | | |
| 1. To introduce fundamental aspects of Intellectual property Rights to students who are going to play a major role in development and management of innovative projects inindustries. 2. To disseminate knowledge on patents, patent regime in India and abroad and registrationaspects. 3. To disseminate knowledge on copyrights and its related rights and registrationaspects. 4. To disseminate knowledge on Design, Geographical Indication (GI), Plant Variety and Layout Design Protection and their registrationaspects. 5. To aware about current trends in IPR and Govt. steps in fosteringIPR. | | | | | | | |
| **Expected Course Outcomes:** | | | | | | | |
| On the successful completion of the course, student will be able to: | | | | | | | |
| 1 | The students once they complete their academic projects shall get an adequate knowledge on patent and copyright for their innovative research works. | | | | | K2 | |
| 2 | During their research career, information in patent documents provides useful insight on novelty of their idea from state-of-the art search. These provide further way for developing their idea or innovations. | | | | | K3 | |
| 3 | Pave the way for the students to catch up Intellectual Property(IP) as an career :  a. R&D IP Counsel, Patent Examiner, Patent and Trademark agent, Entrepreneur. | | | | | K4 | |
| **K1** - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** – Create | | | | | | | |
| **MODULE 15 x 2 = 30 Hours** | | | | | | | |
| Module 1. Introduction and the need for intellectual property right (IPR)  Module2. Kinds of Intellectual Property Rights: Patent, Copyright, Trade Mark, Design, Geographical Indication, Plant Varieties.  Module 3. Layout Design and Genetic Resources. Module 4. Traditional Knowledge and Trade Secret. Module 5. IPR in India.  Module 6. Patents - Elements of Patentability: Novelty, Non Obviousness.  Module 7. Patent office and Appellate Board, Registration Procedure, Remedies and Penalties. Module 8. Nature of Copyright, Registration Procedure, Ownership and license of copyright. Module 9. Related Rights - Distinction between related rights and copyrights Module10.Concept and Kinds of Trademarks (brand names, logos, signatures, and symbols).  Module 11. Registration of Trademarks - Rights of holder. Module 12. Design: Meaning and concept of Novel and Original.  Module 13.Geographical indication: Meaning, Difference between GI and trademarks. | | | | | | | |

|  |  |
| --- | --- |
| Module 14. Plant variety protection: Meaning Benefit sharing and farmers’ rights. Module 15. Layout Design protection: Meaning, Procedure and Effect of registration. | |
| **Text Book(s)** | |
| 1 | . Nithyananda KV. (2019). *Intellectual Property Rights: Protection and Management*, India, IN: Cengage Learning India Private Limited. |
| 2 | 2. Neeraj PandKhusdeepD. (2014). *Intellectual Property Rights*, India, IN: PHI  learning Private Limited. |
| **Reference Books** | |
| 1 | Ahuja V K. (2017). *Law relating to Intellectual Property Rights*, India, IN: Lexis Nexis. |
|  | **E-resources:** |
| 2 | Subramanian N and Sundararaman, M. (2018). *Intellectual Property Rights – An Overview*.  Retrieved from <http://www.bdu.ac.in/cells/ipr/docs/ipr-eng-ebook.pdf> |
| 3 | World Intellectual Property Organisation. (2004). *WIPO Intellectual property Handbook*. Retrieved from <https://www.wipo.int/edocs/pubdocs/en/intproperty/489/wipo_pub_489.pdf> |
| 3 | Journal of Intellectual Property Rights (JIPR): NISCAIR |
|  | **Related Online Contents** |
| 1 | Cell for IPR Promotion and Management [(http://cipa](http://cipam.gov.in/))m[.gov.in/)](http://cipam.gov.in/)) |
| 2 | World Intellectual Property Organisation (http[s://www.wipo.int/about](http://www.wipo.int/about-ip/en/))-[ip/en/)](http://www.wipo.int/about-ip/en/)) |
| 3 | Office of the Controller General of Patents, Designs & Trademarks [(http://www.ipindia.nic.in/)](http://www.ipindia.nic.in/)) |

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Mapping with Programme Outcomes** | | | | | | | | | | |
| **Cos** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** |
| **CO1** | M | L | L | M | M | M | S | M | S | S |
| **CO2** | L | M | L | M | M | M | M | S | S | S |
| **CO3** | M | L | L | M | L | M | M | M | S | S |

\*S-Strong; M-Medium; L-Low



Annexure

**B.Sc. ZOOLOGY**

**SYLLABUS**

## (With effect from 2020 - 2021 and onwards)

**Program Code:22F**



**DEPARTMENT OF ZOOLOGY**

**Bharathiar University**

**(A State University, Accredited with “A “Grade” by NAAC and 13th Rank among Indian Universities by MHRD-NIRF) Coimbatore 641 046, INDIA**

**GUIDELINES FOR CONDUCTING VALUE ADDED COURSES**

**Course Structure**

1. Therequestforapprovalofsyllabusbytheconcerned authoritiesis mandatory atleast15 days before the date of commencement of the course. The Syllabus (15/30hours), ScheduleandtheDetailsofFacultyhandlingthecourseapprovedby theDepartmentalCommitteeandforwardedbyHead of the Department should be enclosed.
   1. Thecourseofferedshouldnotbethesameasanycourselistedinthe curriculumoftherespectiveprogramme/oranyotherprogrammeofferedin University/Colleges.
   2. Thevalueaddedcoursesmaybealsoconductedduring weekends/ vacationperiod.
   3. Thecoursecan be offered any semester in the PGProgrammes.
   4. Industryexperts/eminentacademiciansfromotherInstitutesare also eligible to offer the valueaddedcourse.
   5. The course can be offered only if there are atleast10 students opting forit.
   6. The students may be allowed to take value addedcourses offered by otherdepartmentsafterobtainingpermissionfromHeadoftheDepartment offering thecourse.

## Duration

1. The duration of value added coursesis15 (30)periodsoftheoryoramaximum oftheoryandLaboratorycoursesandthecoursecanhaveamaximumofthree hours perday.For the one (two)creditcourseseither15(30)periodsoftheoryora combination of theory and Laboratory may be offered.

Where, **2 periods**oflaboratory =**1 period**of theory

## Evaluation

1. Thevalueaddedcoursesshallcarry100marksandshallbeevaluatedthrough

## Internal assessments only.

* 1. Two Assessments shall be conducted preferably one in the middle and theother at the end of the course by the Departmentconcerned.
  2. The duration of assessment is one houreach.
  3. Thetotalmarksobtainedinthetestsshallbereducedto100marksand rounded to the nearestinteger.
  4. The Head ofthe Department may identify a faculty memberas coordinatorforthecourse.AcommitteeconsistingoftheHeadoftheDepartment, staffhandlingthecourse(ifavailable),coordinatorandaseniorFaculty membernominatedbytheHead of the Departmentshallmonitorthe evaluationprocess.Thegradesshallbeassignedtothestudentsbythe above committee based on their relativeperformance.
  5. Thecoordinatorforthecourseisresponsibleformaintainingand processing the records with regard to assessment marks andresults.

## Passing Requirement and Grading

1. Thepassingrequirementforvalueaddedcoursesshallbe50%ofthemarks prescribed for the course**(Internal assessmentonly)**
   1. The grade O, A+, A, B+,B obtained for the one/two credit shall figure in the Mark sheet under the title **“Value Added Courses”.** The other grades RA,SA **willnotfigurein the mark sheet.**
   2. Thecreditsearnedthroughvalueaddedcoursesshallnotbeconsidered for calculating GPA andCGPA.
   3. Thecreditsearnedthroughvalueaddedcoursesshallnotbeconsidered forclassification ofdegree.
   4. Ifthecourseisofferedduringanysemester,itwillappearinthat semester'smarksheet.However,ifthecourseisofferedinsummer/ wintervacations,thecoursewillbeincludedinthegradesheetof the subsequent semester.

## Maximum Number of Courses

1. Astudentcan earn a maximum of 3credits during theentireprogramme of studybyattendingvalueaddedcourseswhichwouldbeoverandabovetherequired maximum number of credits for the award of thedegrees.

## Financial Commitment

1. The expenditure tobe incurred forthe conduct ofvalue-addedcoursesshould bemetfromnominalfeescollectedfromthestudentsataratefixedbythe University.However,anyadditionalexpendituremaybesupportedbythe funds ofthe Department.

## APPLICATION FOR CONDUCTING VALUE ADDED COURSES

1. Name of theDepartment:
2. PGprogramme:

## Details of the Value AddedCourses:

* 1. Name of the Value AddedCourses
  2. Type of ValueAddedCourses (Theory/ Lab/ Lab integrated Theory/others)
  3. ShortDescription Enclosure1 enclosed -YES /NO
  4. SyllabusincludingReference Enclosure 2 enclosed - YES /NO

## Targetaudience:

Semester (indicate if more than one) others

## Details of Faculty handling thecourse:

* 1. Name of the Faculty Handling the Value Addedcourse
  2. Details including designationand expertise Enclosure3enclosed-YES /NO
  3. Contactdetails

EmailID :

PhoneNo :

1. **Tentative Time Table** includingdates

ofinternalassessments : Enclosure 4 enclosed - YES /NO

1. Number of students opting for thecourse:
2. Department Consultative Committee-

Minutes : Enclosure 5 enclosed - YES /NO

1. Name and Designation of the Coordinator:

Head of the Department (with date & seal)

## Note:

\* **Fees ifany**

**DETAILS OF COMPLETION OF VALUE ADDED COURSE**

Name ofthe Department : Name of the Value Added Courseoffered

Name of the Faculty offeredthe course

: Academic / Industry

Name ofthe coordinator :

E-Mail :

Contact :

Details of students attended the course:

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **S.No** | **Name of the**  **student** | **Reg.No.** | **Programme** | **Semester** | **Marks** | **Grade** |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |

## (Facultyhandlingthe (Senior FacultyNominated byHOD) Course (ifavailable)

**(Co-ordinator) (Head oftheDepartment)**

**(With Date&Seal)**

**DISTRIBUTION OF EXTERNAL AND INTERNAL MARKS FOR THEORY PAPERS**

**Table – 1(A**): Distribution of marks for **External (CEE)**and **Internal (CIA)**for University (external) examination and **ContinuousInternalAssessment** and passing minimum marks for **TheoryPapers.**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Max.**  **Marks** | **Comprehensive External Examinations**  **(CEE)** | | **Continuous Internal Assessments**  **(CIA)** | | **Overall Passing Minimum**  **(Internal + External)** |
| **Max. Marks** | **Passing**  **Minimum** | **Max.**  **Marks** | **Passing**  **Minimum** |
| 100 | 75 | 30 | 25 | - | 40 |
| 75 | 55 | 22 | 20 | - | 30 |
| 50 | 30 | 12 | 20 | - | 20 |

**Table – 1(B)**: Distribution of marks for the **Continuous Internal Assessment** in the

## TheoryPapers of UG programmes.

|  |  |  |  |
| --- | --- | --- | --- |
| **S. No** | **Component** | **Allotment of Internal Assessment marks for a maximum of** | |
| **25** | **20** |
| 1 | Tests(Average of two tests) | 10 | 8 |
| 2 | End semester model test (3 hours) | 10 | 8 |
| 3 | Seminar/Assignment | 05 | 4 |

**(Each student should attend at least one test)**

**DISTRIBUTION OF EXTERNAL AND INTERNAL MARKS FOR PRACTICALPAPERS**

**Table – 2(A):** Distribution of marks for **External (CEE)**and **Internal (CIA)**University examinations and **Continuous Internal Assessments** and passing minimum marks for the **Practical Courses.**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Max.**  **Marks** | **Comprehensive External Examinations**  **(CEE)** | | **Continuous Internal Assessments**  **(CIA)** | | **Overall Passing Minimum**  **(Internal + External)** |
| **Max. Marks** | **Passing**  **Minimum** | **Max. Marks** | **Passing**  **Minimum** |
| 100 | 75 | 30 | 25 | - | 40 |
| 50 | 30 | 12 | 20 | - | 20 |

Table – 2(B): Distribution of marks for the **Continuous Internal Assessment** in

## UG Practical Courses.

|  |  |  |  |
| --- | --- | --- | --- |
| **S. No** | **Component** | **Allotment of Internal Assessment marks for a maximum of** | |
| **25** | **20** |
| 1 | Experiments  (Minimum 10 experiments to be completed) | 10 | 8 |
| 2 | Tests: One test & one Model exam | 10 | 8 |
| 3 | Record | 5 | 4 |

**QUESTION PAPER PATTERN**

The following question paper patterns shall be followed for **OBE** pattern syllabi for the candidates admitted from the academic year 2023-2024 wherever applicable.

|  |  |  |  |
| --- | --- | --- | --- |
| **MAXIMUM 75 MARKS – WHEREVER APPLICABLE** | | | |
| **Section A** | Multiple choice questions with four options | 10\*1=10 | 10 questions – 2 from each unit |
| **Section B** | Short answer questions of  either / or type like 1.a (or) b | 5\*5=25 | 5 questions – 1 from each unit |
| **Section C** | Essay-type questions of  either / or type like 1.a (or) b | 5\*8=40 | 5 questions – 1 from each unit |

|  |  |  |  |
| --- | --- | --- | --- |
| **MAXIMUM 55 MARKS – WHEREVER APPLICABLE** | | | |
| **Section A** | Multiple choice questions  with four options | 10\*1=10 | 10 questions – 2 from each unit |
| **Section B** | Short answer questions of  either / or type like 1.a (or) b | 5\*3=15 | 5 questions – 1 from each unit |
| **Section C** | Essay-type questions of  either / or type like 1.a (or) b | 5\*6=30 | 5 questions – 1 from each unit |

|  |  |  |  |
| --- | --- | --- | --- |
| **MAXIMUM 30 MARKS – WHEREVER APPLICABLE** | | | |
| **Section A** | Multiple choice questions  with four options | 5\*1=5 | 5 questions – 1 from each unit |
| **Section B** | Short answer questions of  either / or type like 1.a (or) b | 5\*2=10 | 5 questions – 1 from each unit |
| **Section C** | Open Type- Any three | 3\*5=15 | 5 questions – 1 from each unit |

The **GeneralAwareness** paper to have multiple choice questions (with four option) to be evaluated by using **OMR**.

For other courses in Part IV of UG programmes namely, **Environmental Studies, Value Education – Human Rights, Yoga for Human Excellence, Women’s Rights and Constitution of India** the question paper pattern should be **5 out of 10.**

## BHARATHIAR UNIVERSITY: COIMBATORE 641 046

ALLIED ZOOLOGY(CBCS PATTERN)

(For the students admitted from the academic year **2025-2026 & onwards**)

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Course code** | | | **1AK** | **ANIMAL DIVERSITY** | | | **L** | **T** | **P** | **C** | |
| **Core/Elective/SBS/Allied** | | | | **Allied Course-I** | | | **0** | **4** | **0** | **3** | |
| **Pre-requisite** | | | | Basic Knowledge on Diversity of Animal | | | | | | | |
| **Course Objectives:** | | | | | | | | | | | |
| 1. To give a preliminary knowledge of animal diversity and structural organization of animals. 2. To enlighten the students about the diverse forms of Invertebrate and Vertebrate animals present around us. 3. To help our students to distinguish various animals and to know the evolutionary significance. | | | | | | | | | | | |
| **Expected Course Outcomes:** | | | | | | | | | | | |
| On the successful completion of the course, student will be able to: | | | | | | | | | | | |
| 1 | | The student will be able to identify and understand the animal diversity. | | | | | | | K2 | | |
| 2 | | The learner will be able to understand the diversity and basic taxonomy of Non  chordates. | | | | | | | K2 | | |
| 3 | | To analyze the economic importance of different animal species. | | | | | | | K4 | | |
| 4 | | To recognize how different body designs solve biological problems related to  physiological and environmental challenges. | | | | | | | K5 | | |
| 5 | | To realize the role of vertebrates in biological communities, ecological interactions,  and conservation problems | | | | | | | K3 | | |
| **K1** - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** – Create | | | | | | | | | | | |
|  | | | | | | | | | | | |
| **Unit:1** | | | **ANIMAL TAXONOMY** | | | | **10 hours** | | | | |
| Principles of Animal Taxonomy –Kingdom Protozoa –Salient features.  Type study: Paramecium - Habitat, Morphology and Conjugation. Life cycle of Plasmodium. Salient features of Phylum Porifera. | | | | | | | | | | | |
| **Unit:2** | | | **COELENTERATA, PLATYHELMINTHES**  **AND ANNELIDA** | | | | **12 hours** | | | | |
| Outlines of Kingdom Animalia. Salient features of Phylum Coelenterata, Platyhelminthes,  Aschelminthes, Annelida with any two examples. Colonial organization of Obelia, Parasitic adaptations in Helminthes. External features of Earthworm. | | | | | | | | | | | |
| **Unit:3** | | | **ARTHROPODA, MOLLUSCA**  **AND ECHINODERMATA** | | | **12 hours** | | | | | |
| Salient features of Phylum Arthropoda, Mollusca and Echinodermata with any two examples.  Type study: Cockroach – External features, Mouthparts, Digestive, Nervous and Reproductive system. Economic importance of Mollusca. | | | | | | | | | | | |
| **Unit:4** | | | **FISHES AND AMPHIBIA** | | | **12 hours** | | | | | |
| Characters and classification up to Subphylum of Chordates. Salient features of Fishes and Amphibia. Type Study: Frog - External features, Digestive System, Circulatory System,  Urinogenital System and Brain. | | | | | | | | | | | |
| **Unit:5** | | | **REPTILES, AVES AND MAMMALS** | | | **12 hours** | | | | | |
| Salient features Reptiles, Aves and Mammals with two examples. Type study: Rabbit -Morphology, | | | | | | | | | | | |
| Digestive System, Circulatory System, and Urinogenital Systems. | | | | | | | | | | |
| **Unit:6** | | | **CONTEMPORARY ISSUES** | | **2 hours** | | | | | |
| Expert lectures, online seminars – webinars | | | | | | | | | | |
|  | | | | | | | | | | |
|  | | | **Total Lecture hours** | | **60 hours** | | | | | |
| **Text Book(s)** | | | | | | | | | | |
| 1 | Nair NC, Leelavathy S, SoundaraPandian N and Arumugam N. (2013). *A Text Book of*  *Invertebrates,*Saras Publication Nagercoil, Tamilnadu. | | | | | | | | | |
| 2 | Thangamani A, Prasannakumar S, Narayanan LM, Arumugam N. (2013). *A Text Book of*  *Chordates,* Saras Publication, Nagercoil, Tamilnadu. | | | | | | | | | |
| **Reference Books** | | | | | | | | | | |
| 1 | Jordon EL and Verma PS. (2009), *Invertebrate Zoology*, 15th edition, S Chand and Co, Zoology  Delhi. | | | | | | | | | |
| 2 | Kotpal RL. (2014).*Invertebrates – Animal Diversity – I,* 11th edition,Rastogi Publications,  Meerut. | | | | | | | | | |
| 3 | Verma PS. (2010). *Chordate Zoology*, Reveised edition, S Chand Publishers, New Delhi. | | | | | | | | | |
| **Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]** | | | | | | | | | | |
| 1 | <https://www.acs.edu.au/courses/invertebrate-animals-730.aspx> | | | | | | | | | |
|  | | | | | | | | | | |

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Mapping with Programme Outcomes** | | | | | | | | | | |
| **COs** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** |
| **CO1** | S | S | S | S | M | S | M | M | M | M |
| **CO2** | S | M | M | S | S | S | M | L | L | L |
| **CO3** | S | M | M | S | S | S | S | L | S | M |
| **CO4** | S | S | M | M | M | S | S | L | S | S |
| **CO5** | S | S | M | S | S | S | M | L | S | S |

\*S-Strong; M-Medium; L-Low

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Course code** | | | **2AK** | **Physiology, Developmental Biology and Immunology of Animals** | | | **L** | **T** | **P** | **C** |
| **Core/Elective/SBS/Allied** | | | | **Allied Course-II** | | | **0** | **4** | **0** | **3** |
| **Pre-requisite** | | | | Knowledge about Physiology and EmbryologyofAnimals | | | | | | |
| **Course Objectives:** | | | | | | | | | | |
| 1. To give a brief introduction to important Physiological aspects ofanimals. 2. To give an insight to Developmental biology and Immunology ofanimals. 3. To give students idea about biomolecules. | | | | | | | | | | |
| **Expected Course Outcomes:** | | | | | | | | | | |
| On the successful completion of the course, student will be able to: | | | | | | | | | | |
| 1 | | The student will be able explain the basics of advanced concepts in Zoology. | | | | | | | K2 | |
| 2 | | The course may motivate the learners to apply the zoological concepts in their  higher studies and research. | | | | | | | K4 | |
| 3 | | The students will be able to understand the basic physiological process related to  adaptation, metabolism and major requirements | | | | | | | K3 | |
| 4 | | To acquire basic knowledge on Immunology. | | | | | | | K2 | |
| 5 | | The learner will be able to understand the basic concepts of Embryology. | | | | | | | K2 | |
| **K1** - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** – Create | | | | | | | | | | |
|  | | | | | | | | | | |
| **Unit:1** | | | **DIGESTION AND RESPIRATION** | | | | **12 hours** | | | |
| Digestion of Carbohydrates, Protein and Lipids. Types of blood cells - Respiratory pigments–  Structure and function of Hemoglobin - Transport of carbon dioxide. | | | | | | | | | | |
| **Unit:2** | | | **EXCRETION AND NERVOUS SYSTEM** | | | | **10 hours** | | | |
| Ammonotellic, Ureotellic and Uricotellic animals – Structure of Nephron and formation of Urine (Brief outline). Structure of Neuron and conduction of Nerve impulse. | | | | | | | | | | |
| **Unit:3** | | | **MUSCLES AND HORMONES** | | | **12 hours** | | | | |
| Types of Muscles – Structure of Striated Muscle – Sliding Filament Theory.  Role and deficiency of Pituitary hormones, Thyroxine, Insulin and Glucagone, Oestrogen, Progesterone, Androgens and Aldosterone. | | | | | | | | | | |
| **NUnit:4** | | | **DEVELOPMENTAL BIOLOGY** | | | **12 hours** | | | | |
| Structure of Human Sperm and Graffian follicle – Types of vertebrate eggs –Brief outlines of  mechanism of fertilization – Cleavage, Blastula and Gastrula of frog. | | | | | | | | | | |
| **Unit:5** | | | **IMMUNOLOGY** | | | **12 hours** | | | | |
| Types of Immunity – Antigen and antibody reaction –Structure of Immunoglobulin. AIDS:  Causative factors –Symptoms and Prevention. Principle of ELISA. | | | | | | | | | | |
| **Unit:6** | | | **CONTEMPORARY ISSUES** | | **2 hours** | | | | | |
| Expert lectures, Online Seminars - Webinars and Field Visits. | | | | | | | | | | |
|  | | | **Total Lecture hours** | | **60hours** | | | | | |
| **Text Book(s)** | | | | | | | | | | |
| 1 | Arumugam N.(2017). *Developmental Zoology,* Saras Publication, Nagarcoil,Tamilnadu. | | | | | | | | | |
| 2 | Ajoy Paul. (2016). *Textbook of Immunology,* Books and Allied (P) Ltd, Kolkata. | | | | | | | | | |
| 3 | Prasanakumar S, Meena A, MeyyanPillai RP, DulsyFathima, Narayanan LM and Nallasingam K. (2017). *Animal Physiology and Biochemistry,* Saras Publication, Nagarcoil,  Tamilnadu. | | | | | | | | | |
| **Reference Books** | | | | | | | | | | |
| 1 | Lal SS and Sanjeev Kumar.(2015). *Immunology*, Rastogi Publication, Meerut. | | | | | | | | | |
| 2 | Sastry KV and PriyankaMathur. (2018). *Animal Physiology and Biochemistry,* Rastogi  Publication, Meerut. | | | | | | | | | |
| 3 | Yadav PR. (2001). *A Text Book of Embryology,* Campus Books International, New Delhi. | | | | | | | | | |
|  | | | | | | | | | | |
| **Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]** | | | | | | | | | | |
| 1 | <https://www.edx.org/learn/physiology> | | | | | | | | | |
| 2 | <https://onlinecourses.nptel.ac.in/noc20_bt35/preview> | | | | | | | | | |
|  | | | | | | | | | | |
| **Course Designed By: Dr. P.STALIN, Asst.Prof, Erode Arts and Science College, Erode.** | | | | | | | | | | |

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Mapping with Programme Outcomes** | | | | | | | | | | |
| **COs** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** |
| **CO1** | S | S | S | S | M | S | M | M | M | M |
| **CO2** | S | M | M | S | S | M | M | L | L | L |
| **CO3** | S | M | M | S | S | S | S | L | S | M |
| **CO4** | S | S | M | M | M | S | S | L | S | S |
| **CO5** | S | S | M | S | S | S | M | L | S | S |

\*S-Strong; M-Medium; L-Low

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Course code** | | **2PK** | **ALLIED ZOOLOGY PRACTICAL** | **L** | **T** | **P** | **C** |
| **Allied** | | | **ALLIED ZOOLOGY** | **0** | **0** | **2** | **2** |
| **Pre-requisite** | | | Practical Knowledge of Animal Diversity, Microbiology and Physiology | | | | |
| **Course Objectives**: | | | | | | | |
| 1. Learn and be familiar with the Laboratorytechniques. 2. To understand the taxonomic position, body organization and evolutionary relationship ofanimals. 3. To inculcate the significance of various non-chordates andchordates. | | | | | | | |
| **Expected Course Outcomes:** | | | | | | | |
| On the successful completion of the course, student will be able to: | | | | | | | |
| 1 | Familiar with practical skills in the use of tools, technologies and methods common  to microbiology and physiology. | | | | | K2 | |
| 2 | Apply knowledge and come to know how to handle different organisms. | | | | | K3 | |
| 3 | Analyze and to observe various specimens by using Microscope. | | | | | K4 | |
| **K1** - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** – Create | | | | | | | |
| **MAJOR PRACTICAL** | | | | | | | |
| 1. Qualitative detection of carbohydrate, Protein andlipids. 2. Qualitative detection of excretory products (Ammonia, Urea, Uricacid). | | | | | | | |
| **MINOR PRACTICAL** | | | | | | | |
| 1. ABO bloodgroup. 2. Hanging drop preparation to observe motility of Paramecium. | | | | | | | |
| **SPOTTERS** | | | | | | | |
| **Identification and Description of :**   * Paramecium, Paramecium Conjugation, Binary fission * Obelia Colony, Obelia Medusa * Liverfluke, Tape worm, Ascaris male and female * Earthworm, Cockroach/Prawn, Drosophila * Pila, Starfish * Amphioxus * Shark, Scales of Fishes, * Frog, Frog Egg, Blastula and Gastrula. * Quill feather | | | | | | | |

|  |  |
| --- | --- |
| **QUESTION PATTERN: TOTAL MARKS: 30 MARKS.**  **Major: 10, Minor: 05, Record: 05, Spotter: 10(5 spotters each carry 2 marks).** | |
| **TotalPracticalHours 30(Each Semester) x 2 = 60 Hours PerYear** | |
| **Text Book(s)** | |
| 1 | Arumugam N. (2013). *Developmental Zoology*, Saras Publication, Nagercoil, Tamilnadu, India. |
| 2 | Das S. (2020).*Microbiology Practical Manual,* CBS Publication,Delhi. |
| 3 | [Jayasurya, Arumugam N,](https://www.sapnaonline.com/shop/author/jayasurya) [Dulsy Fatima. (2013). *Practical Zoology Vol 3,*](https://www.sapnaonline.com/shop/author/dulsy-fatima)Saras Publication, Nagercoil, Tamilnadu, India. |
| 4 | Singh HR and Neerajkumar. (2014). *Animal Physiology and Biochemistry*, Vishal Publishing Co. Jalandhar, Delhi. |

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Mapping with Programme Outcomes** | | | | | | | | | | |
| **COs** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** |
| **CO1** | S | S | M | S | L | M | S | L | S | S |
| **CO2** | S | S | M | M | M | L | M | L | S | S |
| **CO3** | S | S | L | S | M | L | L | L | S | S |

\*S-Strong; M-Medium; L-Low