**BHARATHIDASAN GOVT. COLLEGE FOR WOMEN**
**(Affiliated To Pondicherry University)**
**(Autonomous)**

**PONDICHERRY - 605 003.**

# PROGRAMME
# B.Sc. ZOOLOGY
# (Choice Based Credit System)

## Course Structure and Curriculum

## 2021-24

## Bharathidasan Govt. College for Women (Autonomous)

## Puducherry

### Department of Zoology

The 8th Meeting of Board of Studies in the Department of Zoology was held on12.05.2022 at 10.30 A.M. (i.e Thursday). The following members were present:

| | Name | Position | Signature |
|---|---|---|---|
| 1. | Dr.S.Rajalakshmi<br>Assistant Professor & HOD | CHAIRMAN | |
| 2. | Dr.M.Thiroumavalavane<br>Assistant Professor | MEMBER | |
| 3. | Dr. S. Muthu<br>Assistant Professor | MEMBER | |
| 4. | Dr. R. Malarvizhi<br>Assistant Professor | MEMBER | |
| 5. | Dr. R. Kandamani<br>Assistant Professor | MEMBER | |

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The faculty members of the department who are also the members of Board of Studies are called to give concurrence to the modification in the V^th semester course paper Biochemistry & Bioinstrumentation paper, similarly in VI th semester course paper Economic Zoology and Environmental Biology and also in II^nd semester Chordata.

The members resolved it and gave their assent to change as mentioned course papers in the programme B.Sc. Zoology. This change will be implied from the 2022- Batch students.

| | Name | Position | Signature |
|---|---|---|---|
| 1. | Dr.S.Rajalakshmi<br>Assistant Professor & HOD | CHAIRMAN | |
| 2. | Dr.M.Thiroumavalavane<br>Assistant Professor | MEMBER | |
| 3. | Dr. S. Muthu<br>Assistant Professor | MEMBER | |
| 4. | Dr. R. Malarvizhi<br>Assistant Professor | MEMBER | |
| 5. | Dr. R. Kandamani<br>Assistant Professor | MEMBER | |

## VISION AND MISSION OF THE DEPARTMENT

**VISION:**

To offer quality basic science education to identify our nature and human life and to promote basic scientific practices following the ethical principles.

**MISSION:**

To introduce modern trends in Zoology with key notes on conservation.

To develop and refine the skills of students to meet the local, national and global needs.

1. **PROGRAMME OBJECTIVES: (200 Words)**

    1. **Academic Excellence and Core competence**

        To provide an access to quality education and enhance the core competencies in Zoology through modern techniques.

    2. **Relevant Curriculum and Learning Environment:**

        To constantly innovate and upgrade the curriculum and teaching methodologies to make Zoology teaching and learning relevant to human life.

    3. **Effective Communication, Teamwork and Leadership skills**

        To provide an academic environment to students which are conducive for academic excellence, creativity, leadership and life-long learning.

    4. **Environmental sustainability, social responsibility and ethics**

        To inculcate responsibility and concern towards environment, biodiversity,

        bioethics, and sustainable development into the curriculum of Zoology.

5. **Skill Development, Entrepreneurship and Lifelong learning**

   To prioritize experimental learning through specialized professional skill training for a better career with a professional attitude.

6. **Insight for Higher Education and Research**

   To inculcate the need of basic zoology to aim higher education and research towards conservation and health policy tools.

## 2. PROGRAMME OUTCOMES (200 Words)

1. **Disciplinary knowledge:** Students will apply the scientific knowledge acquired in Zoology and become skilled professionals adhering to the values of sustainable living.
2. **Communication Skills, Teamwork and leadership qualities:** Students will enhance their communication skills to develop an attitude to work as a team and refine leadership qualities
3. **Critical thinking, problem-solving and analytical reasoning:** Students will demonstrate analytical reasoning, problem-solving, scientific reasoning, and reflective thinking as professionals in all frontiers of life.
4. **Research-related skills and scientific reasoning:** Students will develop and popularize scientific temper to make conceptual contributions in life sciences and promote environmental consciousness.
5. **Skill development, entrepreneurship and lifelong learning:** Students will develop skills, tools and techniques to explore prospective avenues of entrepreneurship in emerging areas of life sciences and pursue lifelong learning.
6. **Environment and ethical awareness:** Students will understand and analyse environmental and ethical issues and contribute towards the betterment of the environment and sustainable growth.
7. **Self-directed learning:** Students will engage in self-paced and self-directed lifelong learning and research through

digital literacy for personal development and professional accomplishment.

## 3. COURSE OUTCOME

| Category | Semester | Course Title | Outcome |
|---|---|---|---|
| DSC – I | Semester I | Invertebrata | Acquire knowledge on invertebrate benthic micro and macro fauna.<br>Researcher in functional organization of invertebrates. |
| | | Main Practical - I | Taxonomist of micro and macro invertebrates. |
| DSE – I Course offered to Botany and Chemistry | | Allied Zoology – I | To enable skill on identification of insects and vectors causing diseases. |
| | | Allied Zoology Practical-I | Acquire knowledge on genetic disorders. |

| | | | |
|---|---|---|---|
| disciplines | | | |
| AECC – I | | Introduction to public administration | ▯ Enable to compete in Indian administration and public services. |
| | | | |
| DSC – II | Semester II | Chordata | ▯ To differentiate structural and functional organization of micro and macro chordates.<br>▯ Research insight on their biology and bioactive compounds. |
| | | Main Practical – II | ▯ To play a role as taxonomist in identification and research pursuit. |
| DSE – II Course offered to Botany and Chemistry disciplines | | Allied Zoology – II | ▯ Knowledge of animal physiology, biochemistry and reproduction. |
| | | Allied Zoology Practical – II | ▯ Acquire knowledge on the major endocrine glands.<br>▯ Identification of food nutrients related to human health. |
| AECC - II | | Environmental studies | ▯ Understand the environment and its biotic and abiotic interactions with man. |
| | | | |
| DSC - III | Semester III | Cell & Molecular Biology | ▯ Knowledge on the molecular structure of DNA and functions.<br>▯ Identify cell organelles acquire research pursuit. |
| | | Main Practical - III | ▯ Understand the various cell divisions and cell cycles |
| SEC - I | | Vermiculture | ▯ Knowledge on the earthworm culture technology & self-employment opportunity.<br>▯ Apply entrepreneurship for vermiculture. |
| DSC - IV | Semester | Genetics & Biotechnology | ▯ Insight on the basis of genetics and biotechnology for higher studies |

| | | | |
|---|---|---|---|
| | IV | Main Practical - IV | Understand the structure , characterization and isolation of DNA |
| SEC - II | | Public health & Hygiene | Awareness and knowledge on health education<br>To enable to students on the health policy tools. |
| DSC - V | Semester V | Animal Physiology | Knowledge on the different parts of the body & its functioning. |
| DSC-VI | | Biochemistry & Bioinstrumentation | Knowledge on the various laboratory instrumentations and its utility in research. |
| DSC - VII | | Immunology | Knowledge on the natural immunity and various cells involved in immunity. |
| SEC-III | | Developmental Biology | Recite the developmental stages of an embryo, oogenesis, spermatogenesis and fertilization.<br>Paraphrase the anomalies of teratogens.<br>Awareness and resolve problems related to infertility which plays a major role in current scenario. |
| GE -I | | Endocrinology & Reproductive Biology | Helps to understand different endocrine glands & its disorders related to human health.<br>Awareness on health policy tools. |
| DSC | | Main Practical V (Anim.Physiol., Biochem. & Bio.Instru.) | Identification of proteins, carbohydrates and fats.<br>Knowledge on handling of various laboratory basic techniques and instruments.<br>Enable to identify blood grouping and DC.<br>Enable to differentiate primary and secondary lymphoid glands. |
| | | Main Practical VI (DB, Immunol. & | Differentiation of oestrous and menstrual cycles. |

| | | | |
|---|---|---|---|
| | | Endo.Rep.Biol.) | |
| | | | |
| DSC-VIII | Semester VI | Economic Zoology | ▯ Knowledge on the beneficial & harmful animals.<br>▯ Enable self-employment on apiculture, sericulture, poultry, lac, pearl and piggery cultures. |
| DSC - IX | | Evolution | ▯ Knowledge on the ancestral history, origin of life & palaeontology. |
| DSC - X | | Aquaculture | ▯ Enable to become fishery inspector, surveyors,<br>▯ Procure knowledge on fishery industry and self-employment.<br>▯ Encounter and overcome problems in aqua farming.<br>▯ Understand the complete protocol of aquarium settings and its maintenance which enhance their entrepreneurial skills in ornamental fish.. |
| SEC-IV | | Biostatistics & Bioinformatics | ▯ To improve the tools of analysis and interpretation of data.<br>▯ Application on medical coding. |
| GE - II | | Environmental Biology | ▯ Knowledge on the various habitats & pollution effects on ecosystem.<br>▯ Enables on the stratification of pond, lake and marine ecosystems.<br>▯ Inculcate wildlife management laws and organizations involved in conservation |
| | | Main Practical – VII (Eco.zool.,Env. Biol.) | ▯ Knowledge on handling of various laboratory basic techniques and instruments.<br>▯ Identification of instruments and its applications to research |

| | | | |
|---|---|---|---|
| | | Main Practical – VIII (Evol., Biostat. Bioinform. & Aqua.) | ▯ To enable a protocol for aquarium settings and its maintenance.<br>▯ To distinguish species for aquaculture.<br>▯ Identification of parasites.<br>▯ Knowledge on pH, salinity and temperatures suitable for aquafarming. |

## 3. COURSE DISTRIBUTION

| **Category** | **No. of Papers** | **Credits** | **Total Credits** |
|---|---|---|---|
| Part I (Language) | 4 | 3 | 12 |
| Part II (English) | 4 | 3 | 12 |
| DSC-(Discipline Specific Course) including practicals | 12<br><br>8 | 4<br><br>3 | 48<br><br>24 |
| DSE- (Discipline Specific Elective) Including practicals Offered to botany & chemistry disciplines. | 4<br><br>4 | 2<br><br>2 | 08<br><br>08 |
| SEC– (Skill Enhancement Course) | 4 | 2 | 08 |
| AECC-(Ability Enhancement Course) | 2 | 2 | 04 |
| GE-(Generic Elective) | 2 | 2 | 04 |
| **Total** | **40** | | **128** |

### 3.2 Course distribution Semester wise – B.Sc. Zoology

| **Semester** | **PART I Language** | **PART II English** | **DSC** | **DSE** | **SEC** | **AECC** | **GE** |
|---|---|---|---|---|---|---|---|

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| I | 01 | 01 | 02 | 02 | - | 01 | - |
| II | 01 | 01 | 02 | 02 | - | 01 | - |
| III | 01 | 01 | 02 | 02 | 01 | - | - |
| IV | 01 | 01 | 02 | 02 | 01 | - | - |
| V | - | - | 05 | - | 01 | - | 01 |
| VI | - | - | 05 | - | 01 | - | 01 |
| Total | **04** | **04** | **18** | **08** | **04** | **02** | **02** |

### 3.3 Credits for each Semester

| **Semester** | **Credits** |
|---|---|
| I | 20 |
| II | 20 |
| III | 20 |
| IV | 20 |
| V | 24 |
| VI | 24 |
| Total | **128** |

### 3.4 Course Structure

**SEMESTER – I**

| **SL.No.** | **Course Category** | **Course Code** | **Course Title** | **Credits** | **Lecture/Practical /Tutorial Hours** |
|---|---|---|---|---|---|
| 1 | Part I | D9201 /D9301/D9501 | Tamil/French/Hindi - I | 3 | 3 |
| 2 | Part II | D9001 | English-I | 3 | 3 |
| 3 | DSC-I | DO701 | Invertebrate | 4 | 4+2 |
| 4 | | DO702 | Main Practical - I | 4 | 4+4 |
| 5 | DSE-I | DO404 | Allied Zoology - I | 2 | 3+1 |
| 6 | | DO405 | Allied Zoology Practical - I | 2 | 2+1 |
| 7 | AECC - I | D9604 | Introduction to Public Administration | 2 | 2+1 |
| **Total Credits** | | | | **20** | **30** |

**SEMESTER – II**

| SL.No. | Course Category | Course Code | Course Title | Credits | Lecture/Practical /Tutorial Hours |
|---|---|---|---|---|---|
| 1 | Part I | D9202 /D9302/D9502 | Tamil/French/Hindi - II | 3 | 3 |
| 2 | Part II | D9002 | English-II | 3 | 3 |
| 3 | DSC-II | DO703 | Chordata | 4 | 4+2 |
| 4 | | DO707 | Main Practical - II | 4 | 4+4 |
| 5 | DSE-II | DO409 | Allied Zoology - II | 2 | 3+1 |
| 5 | | DO410 | Allied Zoology Practical - II | 2 | 2+1 |
| 6 | | | | | |
| 7 | AECC - II | | Environmental Studies | 2 | 2+1 |
| **Total Credits** | | | | **20** | **30** |

**SEMESTER – III**

| SL.No. | Course Category | Course Code | Course Title | Credits | Lecture/Practical /Tutorial Hours |
|---|---|---|---|---|---|
| 1 | Part I | D9203 /D9303/D9503 | Tamil/French/Hindi - III | 3 | 3 |
| 2 | Part II | D9003 | English-III | 3 | 3 |
| 3 | DSC-III | DO708 | Cell & Molecular | 4 | 4+2 |

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|---|---|---|---|---|---|
| | | | Biology | | |
| 4 | SEC-I | DO711 | Vermiculture | 2 | 2+1 |
| 5 | | DO712 | Main Practical III | 4 | 2+1 |
| 6 | DSE - III | DO317 | Allied chemistry for zoology | 2 | 2+1 |
| 7 | DSE | DO318 | Allied chemistry practical I for zoology | 2 | 2 +1 |
| **Total Credits** | | | | **20** | **30** |

**SEMESTER – IV**

| **SL.No.** | **Course Category** | **Course Code** | **Course Title** | **Credits** | **Lecture/Practical /Tutorial Hours** |
|---|---|---|---|---|---|
| 1 | Part I | D9204 /D9304/D9504 | Tamil/French/Hindi – IV | 3 | 3 |
| 2 | Part II | D9004 | English-IV | 3 | 3 |
| 3 | DSC-IV | DO713 | Genetics & Biotechnology | 4 | 4+2 |
| 4 | SEC-II | DO714 | Public Health & Hygiene | 2 | 2+1 |
| 5 | | DO715 | Main Practical – IV | 4 | 2+1 |
| 6 | DSE - III | DO319 | Allied chemistry for zoology | 2 | 2+1 |
| 7 | DSE | DO320 | Allied chemistry | 2 | 2 +1 |

| | | | | | |
|---|---|---|---|---|---|
| | | | practical I for zoology | | |
| **Total Credits** | | | | **20** | **30** |

**SEMESTER – V**

| SL.No. | Course Category | Course Code | Course Title | Credits | Lecture/Practical /Tutorial Hours |
|---|---|---|---|---|---|
| 1 | DSC-V | DO716 | Animal Physiology | 4 | 3 |
| 2 | DSC-VI | DO717 | Biochemistry & Bioinstrumentation | 4 | 3 |
| 3 | DSC- VII | DO718 | Immunology | 4 | 4+2 |
| 4 | SEC-III | DO719 | Developmental Biology | 2 | 4+4 |
| 5 | GE-I | DO720 | Endocrinology & Reproductive Biology | 2 | 3+1 |
| 6 | | DO721 | Main Practical - V | 4 | 2+1 |
| | | | Main Practical - VI | 4 | 2 + 1 |
| **Total Credits** | | | | **24** | **30** |

**SEMESTER – VI**

| SL.No. | Course Category | Course Code | Course Title | Credits | Lecture/Practical /Tutorial Hours |
|---|---|---|---|---|---|
| 1 | DSC-VII | | Economic | 4 | 4+1 |

| | | | | | |
|---|---|---|---|---|---|
| | | | Zoology | | |
| 2 | DSC-VIII | | Environmental Biology | 4 | 4+1 |
| 3 | DSE-VI | | Evolution | 4 | 3+2 |
| 4 | SEC-IV | | Biostatistics & Bioinformatics | 4 | 3+2 |
| 5 | GE-II | | Aquaculture | 2 | 2+2 |
| 6 | | | Main Practical VII | 4 | 2+1 |
| | | | Main Practical VII | 4 | 2+1 |
| **Total Credits** | | | | **24** | **30** |

**FIRST SEMESTER**

**DISCIPLINE SPECIFIC COURSE**

**INVERTEBRATA**

**Category DISCIPLINE SPECIFIC COURSE (DSC) – I**

**Paper Code: DO701**

**OBJECTIVES:**

1. To understand the fundamental organization, functions, adaptations, reproductive biology of invertebrate animals and importance of invertebrate taxonomy.

**UNIT – I**

Principles of Taxonomy-Binomial nomenclature. Classification of the animal kingdom. Introduction to Non-Chordates – General characters.

**Protozoa:** Salient features and outline classification up to class with suitable examples. Type study of Amoeba.

**Porifera:** Salient features and outline classification up to classes with examples – Study of *Sycon* with reference to structure, reproduction and development. Canal system in porifera.

**UNIT – II**

**Coelenterata/Cnidaria:** Salient features and outline classification up to classes with examples – Study of Obelia with reference to structure and reproduction – A brief account of Corals and Coral Reefs.

**Ctenophora:** Salient features of Ctenophore with suitable examples.

**UNIT – III**

**Platyhelminthes:** Salient features and outlines classification up to classes with examples – Study of Taenia solium with reference to structure, reproduction, life cycle and parasitic adaptations.

**Nematehelminthes/Aschelminthes:** Salient features and outlines classification up to classes with examples – Study of Ascaris with reference to structure, reproduction and life cycle.

**UNIT - IV**

**Annelida**: Salient features and outlines classification up to classes with examples; Study of Hirudinaria with reference to structure & and its parasitic adaptation.

**Arthropoda**: Salient features and outlines classification up to classes with examples; Study of Palaemon with reference to structure & reproduction; Adaptations of mouth parts in Insects.

**UNIT - V**

**Mollusca**: Salient features and outlines classification up to classes with examples
Study of Unio with reference to structure & reproduction; Torsion in Gastropoda

**Echinodermata**: Salient features and outlines classification up to classes with examples;
Study of Star Fish with reference to structure & Water vascular system.

**REFERENCES:**

1. Barnes: Invertebrate Zoology, Hall Saunders International Publisher, 1982.
2. Barrington: Invertebrate Structure and Function, Nelson Publication, 1979.

3. Ekambaranatha Iyyar.M and T.N. Ananthakrishnan, 1992: Manual of Zoology Vol-1 Viswanathan Printers & Publishers Pvt. Ltd., Madras.
4. Jordon &Verma: Invertebrate Zoology – Chand & Co., Publication, New Delhi.
5. Kotpal, R.L 1992: Protozoa, Porifera, Coelenterata and Minor phyla. Rastogi Publications, Meerut.
6. Prasad SN – A Text book of Invertebrate Zoology – Kitab Mahal, Allahabad, 1997.
7. Barnes, RD. Invertebrate Zoology, Hall Saunders – International Publications, 1982.
8. Barrington. Invertebrate Structure and Function, Nelson Publications, 1979.
9. Hyman, L H. The Invertebrartes, Vol. II (McGraw Hill Publications)
10. Jordon & Verma. Invertebrate Zoology – Chand & Co. Publication, New Delhi.
11. Prasad S.N. A Text book of Invertebrate Zoology – Kitab Mahal, Allahabad, 1997.
12. Ekambaranatha Iyyar.M and T.N. Ananthakrishnan, 1992: Manual of Zoology Vol-1 Viswanathan Printers & Publishers Pvt. Ltd., Madras.

**FIRST SEMESTER**

**MAIN PRACTICAL – I (DSC I)**

(Covering Paper Invertebrata)

**Paper Code: DO702**

**Objective:** To observe various invertebrate phyla and enhance the skill of dissection**.**
To identify Microscopic Slides / Museum Specimens / Models.

PROTOZOA : Amoeba, Entamoeba, Giardia, Trypanosoma and Leishmania.
PORIFERA : Leucopoenia, Sycon, Sponge Spicules
CNIDARIA Physalia, Porpita, Vellela, Obelia-Medusa, Aurelia and Corals
.
PLATYHELMINTHES : Fasciola and Taenia solium
NEMATHELINTHESs : Ascaris, Ancylostoma, Enterobius and Wucherreria
ANNELIDS : Earthworm, Nereis and Leech.
ARTHROPODA : Palaemon, Palamnaeus, Cockroach, Crustacean larvae (Any Two)
MOLLUSCA : Unio and Pila globosa
ECHINODERMATA : Star Fish, Sea urchin, Sea cucumber

MOUNTING: MOUTH PARTS OF INSECTS: 1. Housefly, Mosquito and Honey bee
2. Body setae of Earthworm

PERMENANT SLIDES

1. Prawn appendages (Demonstration only)
2. Dissection of earthworm / cockroach / prawn nervous system - DEMONSTRATION
3. Study of Websites / CDs demonstrating various aspects of Animal Diversity from
   Protozoa to Echinodermata.
4. Visit to a Biological importance location to observe and study Animal Diversity in nature and preparation of report thereof.
5. Preparation of Charts/Models of various aspects of animal Protozoa, Porifera, Cnidaria, Helminthes, Annelida, Arthropoda, Mollusca and Echinodermata.

**E-LEARNING SOURCES:**

http://www.biologydiscussion.com/invertebrate-zoology/cockroach/dissection-

of-
cockroach-with-diagram-zoology/45031
https://sciencing.com/shrimp-nervous-system-17846.html
https://biology4isc.weebly.com/morphology-and-anatomy-of-cockroach.html
https://www.carolina.com/teacher-resources/Interactive/dissection-buying-gui
de/tr42204.tr
https://opentextbc.ca/biology/chapter/15-1-digestive-systems/

**FIRST SEMESTER**

**ALLIED ZOOLOGY - I FOR BOTANY/ CHEMISTRY MAIN**

**Category DISCIPLINE SPECIFIC ELECTIVE (DSE – I)**

**Paper Code: 404**

**OBJECTIVES:**

To understand the taxonomy of few economically importance insects and vectors. To learn on human syndromes and few aspects of biotechnology.

**UNIT – I**

Introduction to Zoology – Principles of Binomial classification of animals.

**UNIT – II**

**Economic Zoology:**

Parasitism – Protozoan and Helminth Parasites in man (Endamoeba, Plasmodium); Phytoparasitic Nematodes and their control; Biology of vectors transmitting diseases to animals and human (Bed bug, House fly and Mosquito).

Economic importance of Sericulture, Apiculture and fish culture (an outline

Insect Pests of paddy- Rice bug, sugarcane- root borer, coconut-Rhinoceros beetle and brinjal– stem borer.

Pest Management – control of weeds.

**UNIT – III**

**Human genetics:**

Normal and abnormal Karyotype – Non-disjunction (Klinefelter' s syndrome, Turner' s syndrome and Down' s syndrome)
In born errors of metabolism (Phenylketonuria, alkaptonuria and albinism).
Sex- linked inheritance (Hemophilia and Color blindness): Multiple Alleles, Blood groups in man.

**UNIT – IV**

**Environmental Biology:**

Ecosystem – Natural resources – conservation – National parks and Sanctuaries of Tamil Nadu, Pollution in Air, Water and Land.

**UNIT – V**

**Biotechnology:**

Scope – Gene cloning – transgenic animals – Applications of animals cell culture Bioremediation – Intellectual Property Rights (IPR).

**REFERENCES:**

1. Economic Zoology by G. S. Shukla and V. B. Upadhyay; Rastogi Publications.
2. Ekambaranatha Iyyar. M and T.N. Ananthakrishnan, 1992, Manual of Zoology Vol-1 Viswanathan Printers & Publishers Pvt., Ltd., Madras.

## FIRST SEMESTER

## ALLIED ZOOLOGY PRACTICAL – I

## FOR I-B.Sc. BOTANY / CHEMISTRY MAIN

**Paper Code: 405**

Objective: To identify invertebrates Specimens related to vector, economically important pests and eco-conservative strategies.

1. Protozoan Parasite: Entamoeba, Trypanosoma.
2. Helminth Parasite: Taenia solium, Wucherreria bancrofti
3. Insect Pest: Rhinoceros beetle, any fruit borer or paddy pest.
4. Silk worm, Honey bee, Catla catla.
5. Charts or Figures: Syndromes (Klinefelter' s, Turner' s and Down' s Syndromes)
6. Pictures: Any two National Parks and Sanctuaries.

7. Picture: Pollutions of Air/Water/Land.

E-LEARNING SOURCES:

http://www.biologydiscussion.com/invertebrate-zoology/cockroach/dissection-of-cockroach-with-diagram-zoology/45031

https://sciencing.com/shrimp-nervous-system-17846.html

https://biology4isc.weebly.com/morphology-and-anatomy-of-cockroach.html

https://www.carolina.com/teacher-resources/Interactive/dissection-buying-guide/tr42204.tr

https://opentextbc.ca/biology/chapter/15-1-digestive-systems/

**FIRST SEMESTER**

**ABILITY ENHANCEMENT COMPULSORY COURSE (AECC- I):**

**INTRODUCTION TO PUBLIC ADMINISTRATION**

**Paper Code: D9604**

Compulsory Course designed as per the directions issued by Government of India, MHRD, Department of Higher Education (Central University Bureau)
F.No.19-6.2014-Desk U Dated 19-05-2014)

Instruction Method: Lectures and seminars
Evaluation Method: Written Tests
Course duration: One Semester (Two Credits)
Contact Hours: 2 per week

**Course Rationale**

This Course introduces the students to the elements of public administration. This would help them obtain a suitable conceptual perspective on Public Administration. In addition, the course introduces to students, the growth of such institution devices as to meet the need of changing times. The course also aims to instill and emphasize the need of ethical seriousness in contemporary Indian public administration within the Constitutional framework.

**1. Introduction:**

Meaning, nature and Scope of Public Administration and its relationship with other disciplines- Evolution of Public Administration as a discipline – Woodrow Wilson, Henry Fayol , Max Weber and others - Evolution of Public Administration in India – Arthashastra – Colonial Administration upto 1947.

**2. Public Administration in India**

Enactment of Indian Constitution - Union Government – The Cabinet – Central Secretariat -– All India Services – Training of Civil Servants – UPSC – Niti Ayog – Statutory Bodies: The Central Vigilance Commission – CBI - National Human Rights Commission – National Women' s Commission – CAG.

**3. State and Union Territory Administration**

Differential Administrative systems in Union Territories compared to States Organization of Secretariat: -Position of Chief Secretary, Functions and Structure of Departments, Directorates – Ministry of Home Affairs supervision of Union Territory Administration – Position of Lt. Governor in UT – Government of Union Territories Act 1963 – Changing trend in UT Administration in Puducherry and Andaman and Nicobar Island

**4. Emerging Issues in Indian Public Administration**

Changing Role of District Collector – Civil Servants – Politicians relationship – Citizens Charter - Public Grievance Reddressal mechanisms – – The RTI Act 2005 – Social Auditing and Decentralization – Public Private partnership.

**REFERENCES:**


1. A. R. Tyagi, Public Administration, Atma ram sons, New Delhi, 1983.
2. Appleby P.H, Policy and Administration, The University of Alabama Press, Alabama, 1949.
3. Avasthi and Maheswari, Public Administration in India, Agra: Lakshmi Narain Agarwal, 2013.
4. Gerald.E. Caden. Public Administration. Pablidas Publishers, California, 1982.
5. http://cic.gov.in/
6. http://www.mha.nic.in/
7. http://rti.gov.in/
8. http://www.cvc.nic.in/
9. R.B. Jain, Public Administration in India, 21st Century Challenges for Good Governance, New Delhi: Deep and Deep, 2002.
10. Ramesh K Arora, Indian Public Administration, New Delhi: Wishwa Prakashan
11. Ramesh K. Arora. Public Administration, Fresh Perspective. Alekh publishers, Jaipur.
12. Rumki Basu, Public Administration: Concept and Theories, New Delhi:Sterling,2013

**SECOND SEMESTER**

**DISCIPLINE SPECIFIC COURSE (DSC II) : CHORDATA**

**Paper Code:.DO703**

**OBJECTIVES:**

To understand the organization, functional morphology and taxonomical position of chordates.

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**UNIT – I**

Origin and general characters of Chordates

Characteristics & classification of Prochordata up to order with examples

Detailed study – Amphioxus;

Retrogressive Metamorphosis in Ascidia.

**UNIT – II**

Characteristics & Classification of Agnatha up to orders

Gnathostomata (Pisces): Classification up to orders

Detailed study: shark (without endoskeleton)

Acessessory respiratory organs in Fishes

Migration in fishes.

**UNIT – III**

**Amphibia:** Characteristics & Classification up to orders

Detailed Study of Frog (without endoskeleton)

Parental care in Amphibia

**Reptilia:** Characteristics & Classification up to orders

Detailed study of Calotes (without endoskeleton)

Identification and distribution of Poisonous and Non-poisonous snakes in India.

**UNIT – IV**

**Aves:** Characteristics & Classification up to orders

Detailed study: Pigeon (without endoskeleton)

Flight adaptation in birds.

**UNIT – V**

**Mammals:** Characteristics & Classification up to orders

Detailed study: Rat (without endoskeleton)

Aquatic mammals.

**REFERENCES:**

1. De Beer G. – Vertebrate Zoology, Sedgwick & Jackson, London, 1997.
2. Young JZ – The life of Vertebrates, Oxford University Press, London.
3. Newman HH – The Phylum Chordata – MacMillan Company, New York.
4. Ekambarantha Iyyar M and T.N Ananthakrishnan 1992. A manual of Zoology, Vol. II [Chordata]. S. Viswanaathan (Printers and Publishers] Pvt. Ltd., Madras.
5. Kotpal RL – Modern Text Book of Zoology – Revised edition Rastogi Publication, 2003.
6. Jordon E & Verma PS – Chordate Zoology – S. Chand & Co., 2000.
7. Waterman AJ – Chordate structure and function – MacMillan Co., New York, 1981.

E-LEARNING SOURCES:

www.ucmp.berkeley.edu/chordata/chordata.html

http://www.notesonzoology.com/phylum-chordata/cyclostomes/cyclostomes-origin-and-habitat-vertebrates-chordata-zoology/7873

http://www.biologydiscussion.com/zoology/amphibians/class-amphibian-characters-and-classification-animal-kingdom/69912

https://www.kolkatabirds.com/citibirds.html

https://animaldiversity.org/accounts/Columba_livia/

**SECOND SEMESTER**

**AECC - II : ENVIRONMENTAL STUDIES**

**Paper Code: D9701**

**OBJECTIVES:**

1. To know about the Environment.
2. To understand the surrounding.
3. To know about biotic interaction.

**UNIT – I**

Multidisciplinary nature of Environmental Studies – Definition, scope and importance – Need for public awareness.

**Natural resources**: Renewable and Non-renewable resources

i) **Forest resources**: Use and over-exploitation, deforestation, case studies, Timber extraction, mining, dams and their effects on forests and tribal people.

**ii) Water resources**: **U**se and over utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems.

iii) **Mineral resources**: Use and exploitation, environmental effects of extracting and using mineral resources, case studies.

iv) **Food resources**: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer – pesticide problems, water logging, salinity, case studies.

v**) Energy resources**: Growing energy needs, renewable and non-renewable energy resources, use of alternate energy sources, case studies.

vi) **Land resources**: Land as a resource, land degradation, man induced landslides, soil erosion and desertification.

Role of an individual in conservation of natural resources

Equitable use of resources for sustainable lifestyles.

**UNIT – II**

**ECO SYSTEMS**: Concept of an Ecosystem – Structure and function of an Ecosystem.

Producers, consumers and decomposers – Energy flow in the Ecosystem

Ecological succession – Food chains, food webs and ecological pyramids.

Introduction, types, characteristic features, structure and function of the following Ecosystems a) Forest Ecosystem b) Grassland Ecosystem c) Desert Ecosystem d) Aquatic ecosystems (Ponds, streams, lakes, rivers, oceans, estuaries).

**UNIT – III**

**BIODIVERSITY AND ITS CONSERVATION**: Introduction: Genetic, species and Ecosystem Diversity Biogeographical classification of India

Value of Biodiversity: Consumptive use, productive use, social, ethical and option values

Biodiversity a Global, National and local levels

India as a mega-diversity nation

Hot spots of Biodiversity

Threats of Biodiversity: Habitat loss, poaching of wild life, Man-wild life conflicts

Endangered and endemic species of India.

Conservation of Biodiversity: In-situ and Ex-situ conservation of Biodiversity.

**UNIT – IV**

**ENVIRONMENTAL POLLUTION**: Definition – Cause, effects and control measures of Air pollution – Water pollution – Soil pollution – Marine pollution – Noise pollution – Thermal pollution – Nuclear hazards

Solid waste, management: Causes, effects and control measures of urban and industrial wastes

Role of an individual in prevention of pollution – Pollution case studies

Disaster management: Floods, Earthquake, Cyclone and Landslides.

**UNIT: V**

**SOCIAL ISSUES AND THE ENVIRONMENT:** From Unsustainable development – Urban problems related to energy

Water conservation, rain water harvesting, watershed management.

Resettlement and rehabilitation of people: its problems and concerns .Case studies.

Environmental ethics: Issues and possible solutions

Climate change, Global Warming, Acid rain, Ozone layer depletion, Nuclear accident and Holocaust, Case Studies.

Wasteland reclamation – Consumerism and waste products – Environment Protection Act – Air (Prevention and control of Pollution) – Act – Water (prevention and control of pollution Act – Wild life Protection Act – Forest Conservation Act – Issues involved in enforcement of environmental legislation – Public awareness.

Human Population and the Environment: Population growth, variation among nations

Population explosion- family welfare Programme – Environment and human health; Human Rights – Value Education

HIV / AIDS – Women and Child Welfare

Role of Information Technology in Environment and human health.

**REFERENCES:**

1. Agarwal, KC – Environmental Science, Nidi Publishers, 2001.
2. BharuchErich – The Biodiversity of India, Mappin Publication, 2001.
3. Brunner RC -= Hazardous Waste Incineration, McGraw Hill Publishers, 1989.
4. Jadhav, H – Environmental Protection and Laws, Himalaya Publication, 2000.
5. Odom EP – Fundamentals of Ecology, WB Saunders Publication, 1971.
6. Clarke G – Elements of Ecology, John Wiley and Sons, New York.
7. Varma PS and Agarwal VK – Principles of Ecology, S. Chand & Co., New Delhi.
8. Sharma BK &Kahn – An introduction to environment pollution, Good Pub, Meerut.
9. Text Book of Environmental Studies (for undergraduate courses – University Grand Commission (UGC) – University Press.

**SECOND SEMESTER**

**DISCIPLINE SPECIFIC ELECTIVE (DSE) II**

**ALLIED ZOOLOGY II – FOR BOTANY / CHEMISTRY MAIN**

**Paper Code: DO409**

**OBJECTIVES:**

1. To know about the body functions.
2. To understand the physiological process.
3. To know about the interactions of different system in human.

**UNIT – I**

**Nutrition:** Proteins, Carbohydrates, Fats (Brief account); Vitamins, Physiology of digestion and absorption – Malnutrition.

**UNIT – II**

**Respiration:** Respiratory Organs

Transport of gases – Respiratory pigment (Haemoglobin)

**UNIT – III**

**Excretion:** Excretory products: Ammonia, Urea and Uric Acid –

Structure of Kidney – Urine formation.

**UNIT – IV**

**Circulation:** Composition and functions of blood – Physiology of heart –

Blood pressure – Blood Coagulation – Osmotic and Ionic regulations.

**UNIT – V**

**Endocrine Glands:** Structure and functions of Pituitary, thyroid, Adrenal and Gonads

Feedback regulation of Hormones.

**Immunity:** Antigen – Antibody: Humoral and Cell mediated immunity.

**REFERENCES:**

1. Verma PS & Agarwal VK – Animal Physiology – S. Chand & Co., New Delhi, 2004.
2. Rastogi SL – Essentials of Animal Physiology, New Age International Publisher, New Delhi, 2002.
3. Berry AK. – A Text Book of Animal Physiology – Emkay Publications, New Delhi, 2000.
4. Jain PC and Anantharaman MS – Animal Physiology & Related Biochemistry -Vishal Publication, Jalandhur,2003.
5. Prosser CL. – Comparative Animal Physiology, Prentice Hall Publisher.

6. Williams S. Hore – General and Comparative Physiology- Prentice Hall India Pvt. Ltd,1987.
**7.** Roite M - Essentials Immunology – Blackwell Scientific Publishers.

## SECOND SEMESTER

## MAIN PRACTICAL – II (DSC II)

(Covering papers Chordata and Environmental Studies)

**Paper Code: DO707**

Observation and Identification of Microscopic Slides/Museum/Specimens/Picture/Models.

1. Protochordata: Amphioxus, Balanoglossus, Ascidia and Larval forms, Pisces (Shark, Anabas, Mullet, Arius, Eel, Narcine, hippocampus.) Amphibians, (Ichthyophis, Ambystoma, Axolotl larva, Frog, Bufo, Hyla) Reptiles,(Turtle, Crocodile, Draco, Calotes, Sea snake, Python, Naja) Aves,(Pigeon, Parrot, woodpecker, Kingfisher, Duck) and Mammals (Bat, Flying fox, rat, Manis, Dolphin, Seal).

2. Study of the following skulls with reference to dentition: Dog, Rat.

3. Study of Websites / CDs demonstrating various aspects of Animal Diversity from Protochordates to Mammals.

4. Visit to a Biological important location to observe and study Animal Diversity to nature and preparation of report thereof.

5. Field Visit to wild life sanctuaries and National parks (Tour report submission)

6. Analysis of water samples for the following estimation:
   a) Estimation of dissolved Oxygen.
   b) Estimation of dissolved Carbon dioxide
   c) Estimation of Salinity
   d) Estimation of Carbonates and Bicarbonates

7. Observation of permanent slide of Placoid scales of shark.
8. Dissection of fish digestive system - DEMONSTRATION.
9. Dissection of fish reproductive system – DEMONSTRATION
10. Dissection of fish cranial nerves - DEMONSTRATION

## SECOND SEMESTER

## DSE – II

## ALLIEFD ZOOLOGY PRACTICAL – II

## FOR I-B.Sc. BOTANY/ CHEMISTRY DISICPLINES

## Paper code: DO410

Specimen/Picture/Slide/Experiment:

1. Hb estimation.

2. Blood grouping.

3. Nutrients qualitative tests.

4. Test for Nitrogenous waste products - $NH_3$, Urea and Uric acid.

5. Observation of permanent slides on endocrine glands: Testes, Ovary, Pituitary, Adrenal and
   thyroid.

6. Spotters: Stethoscope, sphygmomanometer.

## THIRD SEMESTER

## DSC – III

## CELL & MOLECULAR BIOLOGY

**Paper Code: DO708**

**OBJECTIVES:**

1. To learn the structure and functions of various cellular components.
2. To understand the molecular basis of cell structure DNA structure and functions.

**Unit – I**

History of cell biology – Cell theory – Cell as the basic unit of living organism, Difference between Prokaryotic and Eukaryotic cell, Ultra structure of an Animal Cell, Plasma membrane – Ultra structure, chemical composition, models ( Bilayer, Unit membrane, fluid mosaic) and functions.

**Unit - II**

Cell organelles – Ultra structure, chemical composition and functions of Endoplasmic reticulum, Ribosomes, Golgi complex, Lysosomes, Centrioles and Mitochondria.

**Unit – III**

Nucleus and Nucleolus – structure, composition and functions. Chromosomes – structure, heterochromatin and Euchromatin, Giant chromosome – polytene and lambrush Cell Cycle
– mitosis and meiosis.

**Unit – IV**

Nucleic acids – Molecular structure of DNA and RNA, DNA replication, Transcription, Types of RNA, Protein Synthesis (Eukaryotic), Regulation of Protein Synthesis.

**Unit – V**

Gene Mutation, Molecular basis of Gene Mutation (Sickle cell anemia, phenylketonuria)
– Mutagenic agents - Physical and chemical. DNA Repair, DNA Recombination
DNA bar coding- role of mitochondrial DNA in bar coding;

**REFERENCES:**

1. Verma PS & Agarwal VK – Cell Biology, S. Chand Co., New Delhi.
2. Sundararajan S – Introduction to Cell Biology, Vikas Publishing House Pvt. Ltd., New Delhi.
3. Ambrose EJ & Sastry DM – Cell Biology, EBBS Publication.
4. Swanson UP and Webster PL – The Cell, Prentice Hall New Delhi.
5. Giese AG – Cell Physiology – WB Saunders Publishers, Philadelphia, 1989.
6. Power CB – Cell Biology – Himalaya Publishing House, New Delhi, 2000.

E-LEARNING SOURCES:

https://www.jagranjosh.com/general-knowledge/what-is-the-difference-between-prokaryotic-and-eukaryotic-cells-1523518350-1

https://www.toppr.com/guides/biology/the-fundamental-unit-of-life/cell-organelle/

https://www2.le.ac.uk/projects/vgec/highereducation/topics/dna-genes-chromosomes

https://www.fasebj.org/doi/abs/10.1096/fasebj.7.12.8375618?journalCode=fasebj

https://www.slideshare.net/drtousif/cytotechniques-53024981

## THIRD SEMESTER

## SKILL ENHANCEMENT COURSE (SEC)- III:

## VERMICULTURE

**Paper Code: DO711**

**OBJECTIVES:**

To impart training on Earthworm culture technology

To create knowledge on Self Employment Opportunity

**UNIT - I**

Introduction:

Definition and concept of vermiculture, Soil: major types (red soil, black soil, alluvial soil).

**UNIT - II:** Influence of soil organisms in vermitechnology-Litter degradation and decomposition. Problems in vermiculture and remedial solutions.

**UNIT - III**

Types of earthworms:

Endemic and exotic species of earthworms, Ecological classification of earthworm-epigeic anecic and endogeic forms. Physical, chemical and biological changes caused by earthworms in soil drilospheres and vermicasts.

**UNIT - IV**

Vermicomposing:

Vermicomposing materials-quality, properties and advantages over chemical fertilizers. Packaging and marketing – cost benefit analysis. Vermiwash and its applications.

**UNIT - V**

Natural enemies of earthworms :

Pest, parasites and pathogens affecting earthworms. Uses of earthworms in food and medicine-ayurvedic and unani. Recycling of food wastes in vermitechnology.

**REFERENCES:**

1. Ismail, S.A 1997, Vermitechnology. The biology of Earthworms. Orient Longman, India, 92 pp.
2. Ranganathan, L.S- 2006- Vermicomposting technology-from soil health to human health.
3. Gupta, P.K. 2008: Vermi composting for sustainable agriculture (2nd edition)-Agriobios-India.
4. Edwards, C.A., and Bothers, B 1996: Biology of Earthworms-Chapman Hall Publ.Co.,London.
5. Talashikar, S.C. 2008: Earthworms in Agriculture.- Agrobios-India.

E-LEARNING SOURCES:

http://www.hillagric.ac.in/edu/coa/agronomy/lect/agron-3610/Lecture-10-BINM-Vermicompost.pdf

https://www.earthwormsoc.org.uk/earthworm-ecology

https://en.wikipedia.org/wiki/Vermicompost

http://agritech.tnau.ac.in/org_farm/orgfarm_vermicompost.html

https://www.calrecycle.ca.gov/organics/worms/wormfact

## THIRD SEMESTER

## MAIN PRACTICAL – III (DSC)

**Paper Code: DO712**

**1**. Study of representative Specimens / Slides related to theory syllabus of Cell Biology and
Molecular Biology.

**2. Cell Biology Experiments**:
a). Squash preparation Onion Root Tip – to study the stages of Mitosis.
b). Study of Meiosis in Slides.
c). Preparation of Buccal Smear in Man
d). Mounting of Polytene Chromosome – Chironomous Larva or Drosophila.
e). Cell organelles separation by using centrifuge.
f). Measurement of Cell.

**3. Molecular Biology Experiments:**
a). Isolation and Estimation of DNA and RNA (Demonstration only)
b). Protein separation by Gel electrophoresis (PAGE) (Demonstration only).

**4. Vermicompost**

a) Harvesting of vermicompost - quality, properties and advantages over chemical fertilizers, packaging and marketing- cost benefit analysis. Vermiwash and its applications.

**Natural enemies of earthworms**

b) Pests, parasites and pathogens affecting earthworms.

c) Uses of earthworms in food and medicine - ayurvedic and unani.

d) Field visit to observe on recycling of food wastes in vermitechnology.

## FOURTH SEMESTER

## DSC – IV

## GENETICS & BIOTECHNOLOGY

## Paper Code: DO713

**OBJECTIVES:**

1. To know the principles of genetics and to integrate biology with technology.

**UNIT – I**

Introduction to genetics , Basis of Mendelian Inheritance and Mendelian Laws, Interaction of Genes – Multiple Alleles – Blood Groups and their Inheritance in Human.

**UNIT – II**

Linkage and crossing over – Drosophila – Morgan' s Experiments - Cytological Evidence for Crossing Over. Sex determination and sex linkage in Drosophila and Man.

**UNIT – III**

Chromosomal aberrations: Euploidy, Aneuploidy and Polyploidy – Turners Syndrome, Klinefelter' s Syndrome, Down syndrome and Cat- Cry Syndrome. Inborn errors of metabolism - Genetic counselling - Eugenics and Euthenics. Hybridization – Inbreeding, Out breeding, Heterosis.

**UNIT – IV**

Definition – Scope and importance of Biotechnology -Tools of Genetic Engineering – Restriction enzymes – nuclease, ligase, polymerase and reverse transcriptase – cloning vectors – plasmid (pBR322), lambda phage, cosmid and plasmids.

**UNIT – V**

Techniques of Genetic Engineering – an overview of R DNA technology, application of R DNA technology in agriculture, medicine and environment.

**REFERENCES:**

1) Verma P.S. and Agarwal V.K. – Concepts of Genetics

2) Rastogi V.B. A text book of Genetics, Kadarnath, Ramnath, Meerat.

3) Sambamurthy. AVSS - Genetics – Narosa Pub. House, New Delhi.

4. P.K.Gupta – Elements of Biotechnology [2001] Rastogi publication, Meerut.

5. Lohar.P.S – Biotechnology (2005) – MJP Publishers, Chennai – 5.

E-LEARNING SOURCES:

http://knowgenetics.org/mendelian-genetics/

https://www.toppr.com/guides/biology/principles-of-inheritance-and-variation/sex-determination/

https://www.khanacademy.org/science/high-school-biology/hs-molecular-genetics/hs-rna-and-protein-synthesis/a/hs-rna-and-protein-synthesis-review?utm_account=Grant&utm_campaignname=Grant_Science_Dynamic&gclid=Cj0KCQjwv8nqBRDGARIsAHfR9wD4CIJH_7zsRoGhQ9jxkSXe3cB2w4T6gLjeU6BDL8JYDOMnNCny0mwaAsnaEALw_wcB

https://www.biology.iupui.edu/biocourses/N100/2k2humancsomaldisorders.html

http://knowgenetics.org/history-of-eugenics

**FOURTH SEMESTER**

**SKILL ENHANCEMENT COURSE (SEC- IV):**

**PUBLIC HEALTH AND HYGIENE**

**Paper Code: DO714**

**Objectives:**

1. To impart awareness on public health and Hygiene.
2. To create knowledge on Health Education.

**UNIT- I Concepts of Public Health and Hygiene**

Nutrition and health- Malnutrition and Over nutrition, Nutritional Deficiencies, Vitamin deficiencies.

**UNIT-II:**

**Environment and Health Hazards :**

Need of Water Purification, Adulteration of Food, Undesirable Changes in Air , Radiation effects, e- waste, Solid waste and Excreta disposal.

**UNIT - III: Communicable Diseases**

Causes, Symptoms, Diagnosis, Treatment and Prevention of Communicable diseases - Malaria, Filaria, Dengue, Tuberculosis, Influenza, Amoebiasis, Jaundice, Venereal disease and AIDS.

**UNIT-IV: Non-Communicable diseases** - Causes, Symptoms, Diagnosis, Treatment and Prevention of non-communicable diseases - Hypertension, Coronary Heart diseases, Stroke, Diabetes, Obesity, Tumour, Haemophilia and Sickle Cell Anaemia and Occupational health Hazards.

**UNIT-V: WHO Programmes** – Ill effects of Smoking, Alcoholism and Drug abuse. WHO programmes - Global filariasis erradication programme, vaccination and awareness programmes, Government and Voluntary Organizations; First Aid- Precautions and awareness on personal hygiene.

**REFERENCES:**

1. Park and Park, 1995: Text Book of Preventive and Social Medicine – Banarsidas Bhanot
   Publ. Jodhpur – India.
2. Public Health at the Crossroads Achievements and Prospects. Robert Beaglehole and
   Ruth Bonita, 2nd Edition, Cambridge University Press.
3. Maxcy Rosenau Last Public Health &. Preventive Medicine, Fourteenth Edition Ed RobertWallace, MD, et al.
5. Epidemiology and Management for Health Care: Sathe, P.V. Sathe, A.P., Popular Prakashan, 6. Mumbai, 1991.
6. International Public Health: Diseases, Programs, Systems, and Policies by Michael Merson, Robert E Black, Anne J Mills Jones and Bartlett Publishers.

## FOURTH SEMESTER

## MAIN PRACTICAL – IV (DSC )

**Paper Code: DO715**

**1. Genetics:**

a) Pedigree analysis – Human
b) Observation of Drosophila – Sexes, wild and mutant varieties.
c) Survey of Mendelian traits in Man.
d) Variation in finger prints.

e) Study of Hardy-Weinberg Law using beads.

f) Study of normal and abnormal Karyotypes from pictures (Down' syndrome, Klinefelter' s

syndrome and Turner' s syndrome).

**2. Biotechnology:**

a) Preparation of medium Bacteria and Blue green Algae.
b) Study of prepared slides, Models or specimen - Escherichia coli, Bacteriophage, Plasmid
c) Demonstration of P.C.R technique: Southern blot, Electrophoresis.
d) Visit to Biotechnology lab and Report.

**3. Public Health & Hygiene:**

1. Spotters: Identification of protein and vitamin deficiencies.
2. Determination of BMI, Blood Pressure, Cholesterol (LDL, HDL) Haemoglobin.
3. Qualitative and quantitative survey methods in public health sciences.
4. Identification of parasitic stages of malaria and filaria through permanent slides.
5. Estimation of blood glucose level in a normal and diabetic persons.
6. Project report on Epidemiological survey of Malaria, Chickungunya and tuberculosis.
7. Epidemiological survey of a slum area to identify the diseases due to poor sanitation and

contaminated drinking water.

8. Visit to a community water purification and treatment plant.
9. Visit to an industry to study occupational health hazard and safety of industrial workers

(sugar/dairy/textile/cement/pharmaceutical)

10. Visit to agricultural fields to study occupational health of farmers and agricultural labourers.

Laboratory Record work shall be submitted at the time of practical examination.

## FIFTH SEMESTER

## DSC– V: ANIMAL PHYSIOLOGY

**Paper Code: DO716**

**OBJECTIVES:**

1. To know about the Body functions.
2. To understand the activities of Organisms.
3. To know about routine life process.

**UNIT – I**

**Introduction** – Chemical foundation of Physiology
**Nutrition –** Types, food & feeding mechanisms
Balanced Diet – Digestion, Absorption and Assimilation
Role of enzymes in Digestion.

**UNIT – II**

**Circulation** – Blood – Composition **-** Functions of Blood and Lymph. Blood group and Coagulation – Structure of Human Heart - Origin, Conduction and Regulation of Heart Beat – Cardiac Cycle, Blood Pressure and ECG.
**Respiration** – Types of Respiratory Organs – Types of Respiratory Pigments
Transport of respiratory gases in man – Respiratory Quotient – Mechanism and Control of Respiration.

**UNIT – IV**

**Excretion** – Types of excretory organs – Nitrogenous waste products – Structure and function of kidney- Mechanism of Urine formation in mammals - Ionic and Osmotic regulation in Fishes -Thermoregulation in Mammals.

**UNIT – V**

**Muscle Physiology** – Types of Muscle – Structure, Mechanism and Chemistry of Muscle contraction.
**Neurophysiology** - Types of Neurons – Conduction of Nerve Impulses
Neurotransmitters and reflex arc.

**UNIT -V**

**Receptors:**
Photoreceptor – Structure of a mammalian eye, Retina – visual pigments, Physiology of vision. Phonoreceptor – Structure of mammalian ear, Mechanism of hearing, Physiology of equilibrium, Chemoreceptors.

**REFERENCES:**

1. Verma PS & Agarwal VK – Animal Physiology – S. Chand & Co., New Delhi, 2004.
2. Rastogi SL – Essentials of Animal Physiology, New Age International Publisher, New Delhi, 2002.
3. Berry AK. – A Text Book of Animal Physiology – Emkay Publications, New Delhi, 2000.
4. Jain PC and Anantharaman MS – Animal Physiology & Related Biochemistry - Vishal Publication, Jalandhur, 2003.
5. Prosser CL. – Comparative Animal Physiology, Prentice Hall Publisher.
6. Williams S. Hore – General and Comparative Physiology- Prentice Hall India Pvt. Ltd, 1987.

## FIFTH SEMESTER

## DSC- VI:

## BIOCHEMISTRY & BIOINSTRUMENTATION

**Paper Code: DO717**

**OBJECTIVES:**

1. To know about the biochemical composition.
2. To understand the biochemical process.
3. To know about the techniques in Biology

**UNIT – I**

Introduction to Biological Molecules – Micro and Macro Molecules.

Biological importance of Carbohydrates, Lipids, Proteins and Nucleic Acids

**Carbohydrates** – Classification and structure – simple and complex Carbohydrates

Structure and linkages in Mono, Di, and Polysaccharides.

**Amino Acids** – Classification, structure, and properties – Peptide and Peptide Bonds

**Proteins** - Classification, structure, and properties.

**UNIT – II**

**Lipids**: Fatty Acids – Classification and Structure- Properties of Fats and Oils

Functions of Triglycerides, Phospholipids, and Glycolipids.

**Enzymes**: Classification, characteristics, and functions; Mechanism of Enzyme Action and

Factors affecting Enzyme action.

Vitamins – Water soluble and Fat soluble – Occurrence, Function and Deficiency diseases.

**UNIT – III**

**Energy Metabolism**: Glycogenesis – Glycogenolysis – Glycolysis

Citric Acid Cycle – Oxidative Phosphorylation – Thermodynamic Laws
Energy Transformation – Energy Conservation.

**UNIT-IV: Analytical Instrumentation:**

Centrifuge: Types of Centrifuges and their uses. pH meter, Colorimetry and Spectrophotometry Applications: Basic Principles of Calorimeter and Spectrophotometer. Description and Application of UV-Visible Spectrophotometer.

**UNIT-V: Biomolecules Separation Techniques: Chromatography**: Principles of Chromatography. Types of chromatographic techniques. Paper chromatography; Thin layer chromatography; Gas chromatography.
Electrophoresis: Principles and applications of Electrophoresis (SDS PAGE).

**REFERENCES:**

1. Mathur R & Mehta M. – Biochemistry - Anmol Publications Pvt, Ltd., New Delhi, 2002.
2. Srivastava HS – Elements of Biochemistry – Rastogi Publications, Meerut,2000.
3. Voet and Voet – Biochemistry – 4th Edition, Wiley and Sons, USA,2004.
4. Lehninger AL. – Principles of Biochemistry, 4th edition.
5. Debajyoti Das. – Biophysical Chemistry, Academic Publishers,2014.
6. Murray et al. - Harper' s Biochemistry.
7. Wilson. K and Walker. J.- Principles and Techniques of Practical Biochemistry, 4th edition,
Cambridge University Press.

E-LEARNING SOURCES:

https://accessmedicine.mhmedical.com/content.aspx?bookid=1366&sectionid=73242196
https://opentextbc.ca/anatomyandphysiology/chapter/26-4-acid-base-balance/
https://opentextbc.ca/anatomyandphysiology/chapter/24-2-carbohydrate-metabolism/
https://www.amboss.com/us/knowledge/Lipids_and_fat_metabolism
https://proteinstructures.com/Structure/Structure/Ramachandran-plot.html

## FIFTH SEMESTER

## SEC – III:

## DEVELOPMENTAL BIOLOGY

**Paper Code: DO719**

**OBJECTIVES:**

1. To know about the Embryonic Development
2. To understand the Growth of embryo
3. To know about development of Cells, Tissue and Organs.

**UNIT - I**

Theories in Developmental Biology-theory of preformation, Von Baers Law-Biogenetic Law, Germ plasm Theory, Mosaic and Regulative Theory and Gradient Theory.

Gametogenesis-Spermatogenesis and Oogenesis

Types and structure of sperm, Eggs, Egg membrane, Polarity and Symentry and Vitellogenesis of egg - Morphogenesis and Morphogens.

**UNIT - II**

Fertilization-Definition, Sperm and Egg interaction, biochemical changes, post fertilization changes, Types and significance of fertilization, Parthenogenesis.

Cleavage-Definition, planes, patterns and types of cleavage and Role of Yolk in cleavage. Process of Blastulation

**UNIT - III**

Gastrulation-Definition, Frog and Chick

Cell lineage, Organizer, induction process.

**UNIT - IV**

Extra Embryonic membranes in Chick

Placenta-Formation types and functions.

Organogenesis of eye, heart and brain in chick.

**UNIT - V**

Role of Cytoplasm in genetic control of development

Causation of metamorphosis in Frogs and Insects.

Paedogenesis and Neoteny: Growth and Differentiation, Stem cells, regeneration

Teratogenesis, In vitro fertilization, Embryo transfer and cloning.

**REFERENCES:**


1. Berry AK- Introduction to Embryology, Emkay Publications, New Delhi, 2003.
2. Rastogi VB and Jayaraj MS- Developmental Biology, Ram Nath and Co., New Delhi, 1997.
3. Arumugam N.-Embryology, Saras Publications, Nagaarcoil, 1999
4. Verma PS and Agarwal-A text book of Embryology-S-Chand & NCo., New Delhi, 1999.
5. Balinsky BL- an introduction to Embryology-W.B. Saunders Co., Philadelphia, 1981.
6. Arora, MP- Embryology-4$^{th}$ edition, Himalaya publishing House, Mumbai,2002
7. Gilbert S.F-Developmental Biology-7$^{th}$ edition, Sinauer Associate Inc, Publisher, Massachustts, 2003.

**E-LEARNING SOURCES:**

https://teachmephysiology.com/reproductive-system/embryology/gametogenesis/
https://embryology.med.unsw.edu.au/embryology/index.php/2016Lecture-Gametogenesis-
Fertilization-Movie
http://sitn.hms.harvard.edu/flash/2018/regeneration-axolotl-can-teach-us-regrowing-human-limbs/
http://www.yourarticlelibrary.com/biology/placentation-in-mammals-definition-development-and-types-biology/4987
https://www.mayoclinic.org/tests-procedures/in-vitro-fertilization/about/pac-20384716

## FIFTH SEMESTER

## DSE – III: IMMUNOLOGY

**Paper code: DO718**

**OBJECTIVES:**

1. To study the defence mechanism of the body
2. To understand the immune process.
3. To know about immunological interactions
4. To understand the advances in Immunology

**UNIT – I: Introduction:**

Introduction-Scope of immunology-Historical perspectives- Rh-incompatibilities; Types of immunity-innate and acquired immunity. Immune responses-Primary and Secondary Immune responses, Cell mediated and humoral immune responses.

**UNIT – II: Antigen-Antibody:**

Antigens-Types, Properties , antigenic determinants , haptens, adjuvants, Immunoglobulins – types, structure and properties , Monoclonal and Polyclonal antibodies , Antigen-Antibody interactions.

**UNIT – III: Vaccines:**

Primary and secondary lymphoid organs; Vaccines - Conventional and Modern vaccines. Cells of the immune system, T and B cells - receptors-activation and functions.

**UNIT – IV: Immune disorders:**

Immunologic tolerance and disorders; Autoimmune disease- Grave' s – Myasthenia Gravis – Rheumatoid arthritis – Systemiclupus erythematosus.

**UNIT – V: Hypersensitivity:**

Immune deficiency, Autoimmunity, Hypersensitivity reactions - types and diseases. Types of grafts, Graft rejection.

**REFERENCES:**


1. Ivan M. Roit 1994 Essential Immunology-Blackwell scientific publications, oxford.
2. Janis kuby 1993. Immunology II edition. W.H. Frumenand company, New York
3. William E.Paul 1993, Fundamental Immunology. II edition Raven press, New York.
4. Ian R, Tizard, 1995, Immunology: An Introduction, 4 th edition, Saunders College Publishing.
5. Chakravarthy, A.K (1996)- Immunology, Tata Mc Graw Hill Publishing Co. Ltd, New Delhi.


## FIFTH SEMESTER

## GENERIC ELECTIVE - I:

## ENDOCRINOLOGY & REPRODUCTIVE BIOLOGY

**Paper Code: DO720**

**OBJECTIVES:**

1. To know about the Chemical transmitters
2. To understand the hormone process
3. To know about Hormone interactions

**UNIT - I**

Introduction-General organization of the Vertebrates endocrine system

Hormones-Chemical nature-Characteristics-Synergism, Antagonism and Feedback Regulations – Neurohormones - Mechanism of action of Peptide and steroid hormones.

**UNIT - II**

Hypothalamic & Pituitary gland: Structure, hormones & Functions

Thyroid Gland: Structure-Biosynthesis, regulation and functions of Thyroid hormones
Parathyroid Gland: Structure and functions.

**UNIT - III**

Adrenal Gland: Structure and functions of Adrenal Cortex-Biosynthesis of Cortico steroid from Cholesterol-Adrenal medulla structure and function.
Endocrine Pancreas: Structure and function-Role of Insulin and Glucagon

**UNIT - IV**

Pancreatic (Islets of Langerhans) hormones – Insulin, Glucagon – Biosynthesis, Regulation , Biological action, Gastrointestinal Hormones

**UNIT - V**

Male reproductive system
Structure of Testes, Biosynthesis of testosterone, Regulation and functions Female reproduction system
Structure of Ovary, Biosynthesis of estrogen, Feedback regulation and functions Female Reproductive Cycle – Estrous and Menstrual
Placental hormones – parturition – Lactation - contraceptives.

**REFERENCES:**

1. Hadley-Endocrinology 5th edition, CBS Publishers, 2002.
2. Saidapur, S.K-Reproductive Cycles.
3. Nalbandov AV- Reproductive Physiology.
4. Hall PF-The Physiology of Reproduction, Raven Press, New York.
5. Knobil JD, Erving L., Green ward GS and Market CL., - Physiology of Reproduction, Raven Press, New York.

**FIFTH SEMESTER**

**MAIN PRACTICAL - V (DSC )**

(Covering papers Animal Physiology and Biochemistry & Bioinstrumentation)

**Paper Code:DO721**

**EXPERIMENT/SPOTTER:**

**A. ANIMAL PHYSIOLOGY:**

1. Quantitative tests for Protein, Carbohydrate and Fats.
2. Determination of $P^H$.
3. Estimation of Glucose.

4. Estimation of Protein.
5. Qualitative analysis of food substances.

**B. BIOCHEMISTRY**

1. Salivary amylase activity in Human Saliva.
2. Qualitative tests for Ammonia, Urea and Uric Acid.
3. Determination of Oxygen consumption in fresh water fish
4. Blood smear of Man.
5. Osmo-ionic regulation study in RBC

**C. BIOINSTRUMENTATION**

1. Principles and Operation of Centrifuge
2. Principle and Operation of Colorimeter
3. Principle and Operation of Spectrophotometer
4. Principle and Operation of Electrophoresis
5. Principle and Operation of PH meter.

**E-LEARNING SOURCES**:

https://vlab.amrita.edu/?sub=3&brch=63&sim=1094&cnt=1

http://www.biologydiscussion.com/enzymes/enzymes-meaning-mechanism-classification-factors-and-importance/17003

http://bio1511.biology.gatech.edu/module-3-molecules-membranes-and-metabolism/05-respiration-chemiosmosis-and-oxidative-phosphorylation/

https://www.britannica.com/science/vitamin

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**FIFTH SEMESTER**

**MAIN PRACTICAL - VI (DSC )**

**PAPER CODE: DO722**

(Papers Covering Developmental Biology and Immunology and Endocrinology & Reproductive Biology)

**D. DEVELOMENTAL BIOLOGY:**

1. Blastoderm mounting in Chick (demonstration only)

2. Study of the following prepared slides/models
3. Section of testis and Ovary (Mammalian)
4. Slides of Mammalian sperm and ovum
5. Study of Egg types-Frog' s Egg, Hen' s Egg.
6. Study of cleavage stage 2 Cell, 4 Cell, 8 Cell
7. Blastula and Gastrula of Frog-Yolk plug stage, neural plate and neural tube.
8. Studies of different stages of chick embryo- 18 hours (Primitive streak stage), 24 hours, 48 hours, 72 Hours and 96 hours.

**E. <u>IMMUNOLOGY:</u>**

1. Human Blood grouping (ABO and Rh)
2. Study of prepared slides of primary and secondary lymphoid organs
3. Thymus
4. Spleen
5. Bone marrow
6. Lymph node
7. Peyers patches
8. Bursa fabricus
9. T-Cell
10. B-Cell
11. MALT
12. GALT

**F. <u>ENDOCRINOLOGY & REPRODUCTIVE BIOLOGY:</u>**

1. Observation of permanent slides – Pituitary, Thyroid, Pancreas, Adrenal, Testes, Ovary.
2. Test for Pregnancy (demonstration only)
3. Study of different stages of oestrous cycle in rat (demonstration only)
4. Dissect and display the different endocrine glands in rat (demo only).

## <u>SIXTH SEMESTER</u>

## DISCIPLINE SPECIFIC COURSE (DSC VII) :
## ECONOMIC ZOOLOGY
## Paper Code : DO723

**OBJECTIVES:**

1. To know about the Fish/Prawn Culture
2. To understand the Self-employment opportunity
3. Rural based Employment oriented course

**UNIT-I:**

Introduction to economic zoology and scope; Introduction – parasitism, kinds of parasites – host parasitic relationship – parasitic adaptations, Protozoan parasites of man- life history of Entamoeba, trypanosome and plasmodium- causes and effects.
Sericulture and Lac culture.

**UNIT-II:** Apiculture:

Social organization of honey bees – modern methods of apiculture – economic importance – composition- honey – beeswax.

**UNIT-II:** Sericulture:

Types of silkworms – lifecycle – culture practices – mulberry leaves – economic importance
Lac culture: Lac cultivation – composition – economic importance.

**UNIT-IV:**

Economic Importance of Pearl culture - By products of Fishing Industry - Crocodile and Turtle Farming - Snake Venom.

**UNIT-V:**

Poultry - Management of model Poultry farm
Piggery; Dairy and Leather Industries; Pharmaceutical Products from animals.

**REFERENCES:**


1. Shanmugam. K. Fishery Biology and Aquaculture, Leo Publishers, Chennai.
2. Jhingran AVG-Fish and Fisheries of India, Hindustan Publishing Co., New Delhi.
3. Srivastava-Fishery Biology.
4. Introduction to Animal Parasitology. JD Smyth-The English University Press.
5. Elements of Economic Entomology-David and Kumaraswamy - Popular Book Depot.

6. Economic Entomology-Anantha Krishnan-Govt Press.
7. Economic Zoology. G.S. Shukla and V.B. Upadhya-Rastology Publications.

E-LEARNING SOURCES:

https://www.bioscience.com.pk/topics/zoology/item/628-economic-zoology

https://www.epa.gov/sustainable-management-food/types-composting-and-understanding-process

http://vikaspedia.in/agriculture/fisheries/fish-production/culture-fisheries/culture-techniques-of-fishes/breeding-larval-rearing-and-growth-out-of-indian-major-carp

http://www.fao.org/fishery/culturedspecies/Labeo_rohita/en

http://agritech.tnau.ac.in/animal_husbandry/ani_chik_poultry%20rearing.html

https://www.roysfarm.com/poultry-farming/

## SIXTH SEMESTER

## DISCIPLINE SPECIFIC COURSE (DSC VIII):

## ENVIRONMENTAL BIOLOGY

**Paper code:** DO724

**OBJECTIVES:**

1. To enrich the knowledge of environment and conservation strategies and sustainable development.

**UNIT - I**

Scope and concept of ecosystem - Natural and Manmade Ecosystem - Energy flow-Tropic structure and levels - Pyramids, food chain and food web - ecological efficiencies and productivity and its measurement. **Biosphere** – Hydrosphere, Lithosphere, Stratosphere – Biocoenosis (Community) and Biogeocoenosis (Ecosystem). **Abiotic factors**- Water, soil, light and Temperature **Biotic factors** – Animal relationships – Symbiosis, Commensalism, Mutualism, Antagonism, Predation, Parasitism and Competition.

**UNIT - II**

**Population Ecology:**

Structure and Distribution - Growth curves and pyramids - Groups, natality, mortality - Density indices, life study tables-Factors affecting population growth – J – S shaped curves. Carrying capacity - Production regulation and human population control.

**Pollution** – Types of pollution and pollutants – Air pollution and water pollution their biological effect and control

**UNIT – III**

**Fresh Water Ecology** – Physico chemical nature of fresh water – Biotic communities –

lentic (lakes and ponds) and lotic( river) environment- Stratification of ponds and lakes. **Marine Ecology** – Characteristics- salinity, temperature, pressure, zonation and stratification – Biotic communities of pelagic, benthic, intertidal (rocky shore, sandy shore

and muddy shore) and sublittoral zones. **Estuarine Ecology** – Characteristics – Biotic communities and their adaptations.

**UNIT - IV**

**Biogeochemical cycles** – Nitrogen, Carbon and Oxygen – Sedimentary cycles (P and S)

limiting factors- basic concepts -Leibig' s law of minimum- Shelford' s law of tolerance.

**Ecosystem** – Pond ecosystem – Primary and Secondary production – Food chain – Food

Web- Trophic levels – Energy flow- Ecological pyramids- Pyramid of Biomass, Number and Energy. **Terrestial Ecology** – Biomes- Characters- tundra, grassland, forest and desert

biomes- Types of forests in India- Adaptations of animals inhabiting deserts.

**UNIT - V**

**Environmental Biotechnology**:

Bioremediation - Genetically engineered microbes in Bio-Treatment of waste water - Eco-Friendly Bioproducts for Environmental Health - Bio-Piracy. **Wildlife management** – Preservation of wild life – wild life laws enforced- sanctuaries

and national parks.- significance, causes of extinction, concepts of threatened species - red

data book- IUCN, WWF - protected areas, biosphere reserves- biodiversity acts.

**REFERENCES:**

1. Elements of Ecology. P.D. Sharma, Fourth Edition, 1981.
2. Odam, E.P. (1996). Fundamentals of Ecology, Nataraj Publishers, Dehra Dun.
3. Trivedi, P.R. and Gurdeepraj, K. 1992. Environmental Biology. Akashdeep Publishing House, New Delhi.

4. Berwer, A. 1988. The Science of Ecology, Saunder' s college publishing.
5. Bandopadhyay, J. 1985. India' s Environment Crisis and response. Nataraj Publisherss, Dehradun.
6. Smith, R.L, 1986. Elements of Ecology, Harpet and Row Publishers, New York.

## SIXTH SEMESTER

## DISCIPLINE SPECIFIC ELECTIVE (DSE IV) : EVOLUTION

## Paper Code : DO725

**OBJECTIVES:**

To comprehend the scientific concepts of animal evolution.

**UNIT - I**

Evolution Concepts & Theories of Evolution - Darwinism, Lamarckism, Neo-Lamarckism, Neo-Darwinism, Mutation theory & Modern Synthetic Theory of Evolution.

Evidences for evolution – morphological, anatomical, embryological, biochemical and molecular.

**UNIT – II**

Origin of life-Urey Miller Experiment

Outlines of variation, mutation, recombination, ploidy and its role in evolution.

**UNIT - III**

Isolation – types – pre and post mating isolation , role of isolation in speciation. Concepts of species – Speciation types, allopatric – sympatric – parapatric.

**UNIT - IV**

Fossils - types - formation, Dating of fossil, Indian fossils, Geological time scale

Evolution of Elephant, horse and Man.

**UNIT - V**

Zoogeography- Continental drift and distribution of Animals - Insular fauna. Mimicry, Coloration and Co-evolution. Adaptive Radiation.

**REFERENCES:**


1. Organic Evolution-Veer Bala Rastogi-Meerut Publications
2. Organic Evolution - Arumugam N - Saras Publications, Nagarcoil.
3. Dobzhansky, T., F.J.ayala, G.L.Stebbins and J.M.Valentine 1998. Evolution, Surjeet Publications, New Delhi.


**SIXTH SEMESTER**

**SKILL ENHANCEMENT COURSE (SEC - IV) :**

**BIOSTATISTICS & BIOINFORMATICS**

**Paper Code: DO726**

**OBJECTIVES:**

**UNIT - I**

Introduction to Biostatistics-Methods of Data Collection

Classification on Data based on source and nature of data-construction of frequency tables.

Tables and their characteristic features

Diagrammatic representation-Graphical Representation: Histogram, Frequency Curve, and Frequency Polygon

O-give (more than and less than cumulative frequency curves)

Measures of central tendency: Mean Median and Mode.

**UNIT – II**

Measures of dispersion: variance, range, Standard deviation and standard error

Introduction of chi- square (No problems involved).

**UNIT – III**

Introduction to Bio-informatics-Definition, scope and applications of Bioinformatics – Biological data bases-sequence retrieval system. NCBI, PubMed, Entrez, FASTA and BLAST.

**UNIT – IV**

Proteomics – Definition,

Genomics – Definition, Human Genome Project – Genome and DNA Library – Micro arrays

**UNIT – V**

Basic knowledge of Computers – types of computers and their units

Application of computers in Biology – Internet technology.

**REFERENCES:**


1. Balakrishnan N (2003) - Statistical Methods and Practice-Recent Advances-Narosa Publishing House Pvt. Ltd.
2. Daniel WW (1987). Biostatistics, John Wiley Sons, New York.
3. Gurumani N (2005). An introduction to Biostatistics, MJP Publisher, Chennai.
4. Biostatistics Computer Application Bioinformatics Instrumentation. N. Arumugam-2009, Saras Publications.
5. Bio-informatics. D.R. Westhed, J.H. Parish and R.M Twyman.
6. Basic-Bioinformatics. S. Ignachimuthu, S.J, Narosa Publishing House.
7. Baxevanis AD and Oullette BFF. Bioinformatics-A practical guide to the analysis of genes and proteins.
8. Bio-informatics Principles and Applications. Harshawardhan. PBal; Tata Mc Graw-Hill Publishing Company Ltd., New Delhi.


**SIXTH SEMESTER**

**GENERIC ELECTIVE (GE) - II: AQUACULTURE**

**Paper Code: DO727**

**OBJECTIVES:**

1.To know about the Fish/Prawn Culture

2.To understand the Self-employment opportunity

3.Rural based Employment oriented course

**UNIT - I**

Fresh Water Aquaculture-Important cultivable Fin and Shell fish species

Culture of Carp, Species and Prawn culture

Selection of site, Water Source Management, Maintenance of Nursery Ponds, Rearing Ponds, Production Ponds and Stocking Ponds.

Procurement and Transport of seeds

Composition and types of seeds.

**UNIT - II**

Brackish water culture and Marine Culture

Pearl Oyster culture and Edible Oyster culture

Harvesting and Marketing Aquaculture products

Potential for Ornamental fish culture-Common species for Ornamental Fish culture

Role of Institutions in Aquaculture Activities. -ICAR, CMFRI, CIBA, FFDA, MPEDA

**UNIT - III**

Fish Disease Management-Common Bacterial, viral, fungal, Protozoan and Crustacean diseases-disease symptoms and Treatment

Eradication of Pests and Weeds

Artificial Propagation-Induced Breeding technology

Hypophysation technique.

**UNIT – IV**

Site selection – elementary survey – design and construction of fish and prawn ponds (stocking pond and rearing pond), Maintenance and management of culture ponds. Selection criteria for cultivable species -Culture of Carp, pearl oyster.

Fish disease management: Common bacterial, viral, fungal, protozoan and crustacean diseases, their symptoms and treatment. Control of aquatic weeds, predatory and weed fish control. Feeds for cultivable species – natural, supplementary and artificial feeds.

**UNIT – V**

Marketing the products: Harvesting and transport -marketing the fish to local markets and for export. Quality control and norms of MPEDA for export of fishes- HACCP concept; Fish preservation-canning and freezing method. Products, byproducts and value added products of fishes.

**REFERENCES:**

1. Shanmugam. K-Fishery Biology and Aquaculture, Leo Publishers, Chennai.
2. Jhingran AVG-Fish and Fisheries of India, Hindustan Publishing Co., New Delhi.
3. Costa-Pierce-Ecological Aquaculture, CBS Publishers, 2002.
4. Srivastava-Fishery Biology.
5. Aquaculture-T.V.R. Pillay - Fishing New Books.

## SIXTH SEMESTER

## MAIN PRACTICAL – VII: (DSC )

## PAPER CODE: DO728

(Covering papers Economic Zoology and Environmental Biology)

**A. ECONOMIC ZOOLOGY:**

**Study of following insect vectors through permanent slides/ photographs:**

1. Aedes
2. Culex
3. Anopheles
4. Pediculus humanus capitis
5. Pediculus humanus corporis
6. Phithirus pubis

7. Xenopsylla cheopis
8. Cimex lectularius
9. Phlebotomus argentipes
10. Musca domestica

**Study of Economically important pests of plant :**

1. Rhinoceros beetle
2. Red weevil

3 . Products and value added products of bee keeping: Honey – bee wax, bee venom.

4. Economic importance of Honey bee wax. Value added products of honey.

**5.** Fishery products, by-products and value added products.

**B. ENVIRONEMNTAL BIOLOGY:**

**Study of animal association specimens:**

1. Commensalism
2. Mutualism
3. Ecosystem, Pond, Ocean, Land ,and Forests
4. Energy Flow and Pyramids
5. Pollution, Aquatic, Marine and Estuarine pollution
6. Factors Abiotic and Biotic factors of Ecosystem

**SIXTH SEMESTER**

**MAIN PRACTICAL – VII: (DSC )**

**PAPER CODE: DO729**

(Papers Covering Evolution, Biostatistics & Bioinformatics and Aquaculture)

**C. EVOLUTION:**

1. . Study of Fossils
2. Homologous organs & serial homology of prawn appendages
3. Analogous organs
4. Living fossils
5. Connecting link

## D. BIOSTATISTICS AND BIOINFORMATICS:

### 1. . Biostatistics:

Frequency distribution of given samples to find out arithmetic mean, median, mode range and standard deviation and bar graph & Histogram for a biological date (Variation between any two parameters (Height &Weight)

### 2. Bioinformatics:

Computer components, usage of computer internet and E-mail Download and study at least two samples of Genome sequences (DNA , protein).

### 3. Spotters:

Parts of Computer, Copies of Genome, Sequences of DNA and Proteins.

## E. AQUACULTURE:

1. Study of morphometric & meristic characters of fishes.
2. Identification of some common economically important freshwater & marine fin & shell fishes.
3. Identification, symptoms and treatment of diseases of fishes.
4. Field visit: Visit to ornamental/aqua farms (Tour report submission).

## 5. REGULATIONS

5.1 **Eligibility for Admission:** Candidates for admission to the first year of the Degree of B.Sc. Zoology programme shall be required to have passed the Higher Secondary Examinations conducted by the Government of Tamil Nadu.

5.2 **Duration of the Programme :** The Programme duration is three academic years, containing six semesters.

**5.3Medium of Instruction:**

Medium of Instruction is English

**5.4 Scheme of Examination:**

The end semester examination (ESE) for each course carries a maximum of 75 marks and the continuous internal assessment (CIA) is for 25 marks.

**5.5 Components of Internal Assessment:**

| | | |
|---|---|---|
| Announced / Unannounced Tests | - | 5 marks |
| Assignment | - | 5 marks |
| Attendance | - | 5 marks |
| Model Examination | - | 10 marks |
| Total | - | 25 marks |

**5.6 Attendance Scale:**

| | | |
|---|---|---|
| 96% to 100% | - | 5 |
| 91% to 95 | - | 4 |
| 86% to 90% | - | 3 |
| 81% to 85% | - | 2 |
| 76% to 80% | - | 1 |
| Below 75% | - | Admissible for the examination with condonation fee. |
| Below 60% | - | Not admissible to appear for the examination. |

**5.7 Criteria for ‘ Pass Mark’ :**

| | | |
|---|---|---|
| Minimum pass mark | - | 40 |

No minimum pass mark for Internal Assessment

| | | |
|---|---|---|
| Minimum pass mark for ESE | - | 30 |

## QUESTION PAPER PATTERN FOR THEORY

**Time: 3 Hours**
**Max. Marks: 75**

**Each question paper consists of 3 Sections A, B & C**

**Section – A:** 10 x 2 = 20 marks
Answer All questions.
All questions carry equal marks.

**Section – B:** 5 x 5 = 25 marks
Answer any 5 questions.
Either (or) Pattern.

**Section – C:** 3 x 10 = 30 marks
Answer any 3 out 5 questions.
Open Choice Pattern.

## QUESTION PAPER PATTERN FOR PRACTICAL

**Time: 3 Hours**
**Max. Marks: 75**

I . Question 1. Major practical (12 Marks)
II. Question 2 . Minor practical (6 Marks)
III . Question 3. Spotters ( 4 X 3 = 12) (12 Marks)
IV. Record (5 Marks)
V. Viva Voce

## QUESTION PAPER PATTERN FOR ALLIED ZOOLOGY THEORY FOR BOTANY AND CHEMISTRY DISCIPLINES

**Time: 3 Hours**

**Max. Marks: 60**

**Each question paper consists of 3 Sections A, B & C**

**Section – A:** 8 x 2 = 16 marks
Answer EIGHT questions.
All questions carry equal marks.

**Section – B:** 5 x 4 = 20 marks
Answer ALL FIVE questions.
Either (or) Pattern.

**Section – C:** 3 x 8 = 24 marks
Answer any 3 out 5 questions.
Open Choice Pattern.

## QUESTION PAPER PATTERN FOR ALLIED ZOOLOGY PRACTICAL

**Time: 3 Hours**

**Max. Marks: 15**

I. Question on Minor practical (4 Marks)
II. Identify and Comment on Spotters (3 X 2 = 6 Marks)
III. Record (3 Marks)
IV. Viva Voce (2 Marks)

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