B. Sc. First Year Syllabus w.e.f. June, 2019

Zoology Semester -I Paper: CCZ-I: Biodiversity of Invertebrates and Chordates

Outcome of the Course:

After the completion of the course students will be able to understand:

1. The student will be able to identify a given invertebrate upto class level.

2. Ability to understand the contribution of Invertebrates in the biodiversity index of any given habitat. 3. Ability to understand and appreciate the ecological and economic importance of invertebrates and vertebrates.

4. Ability to identify and describe external morphology and internal anatomical features of representative invertebrate species.

Zoology Semester -I Paper: CCZ-I: Biodiversity of Invertebrates and Chordates

Outcome of the Course:

After the completion of the course students will be able to understand:

1. The student will be able to identify and understand the Biodiversity of Chordates.

2. Ability to understand anatomical relation between different vertebrate classes.

3. The learner will be able to understand the economic importance of Chordates.

Semester –II Paper: CCZ-II: Comparative Anatomy and Developmental Biology of Vertebrates

Outcome of the Course:

After the completion of the course students will be able to understand:

1. The student will be able to identify and understand comparative anatomical structure of vertebrate organ systems.

2. The learner will be able to understand the evolution of various organs and systems in the vertebrate body according to its environment.

3. Understand the plasticity of organ systems to adapt to the environment and acquire different novel forms.

Semester –II Paper: CCZ-II: Comparative Anatomy and Developmental Biology of Vertebrates

Outcome of the Course:

After the completion of the course students will be able to understand:

1. The student will be able to explain the basics processes of vertebrate embryonic development.

2. Ability to describe the various steps in vertebrate development.

3. Identify and explain about the different embryonic structures.

4. Describe the functions of different extra-embryonic structures.

5. Understanding of the Assisted Reproductive Technologies.

Zoology Semester –I &II Paper: CCZP-I Section –A&B

Title of Paper: Practical Paper V:Biodiversity of Invertebrates and Chordates & Comparative Anatomy and Developmental Biology of Vertebrates(Based on P-I,II,III&IV)

Outcomes:

After the completion of the course students will be able to understand:

1. Ability to understand the anatomical organization of organs and systems in representative species.

2. Ability to identify and describe structure and functions of different body parts of invertebrates and vertebrates.

3. Students would be able to prepare temporary and permanent mountings of biological material.

4. Students would be able to relate different bones and be able to articulate them to form an skeleton. 5. Students would make observations of organisms in their natural environment and document them.

B. Sc. Second Year

(Semester- III) Semester Pattern effective from June -2017

Zoology CCZ III (Section A) GENETICS (P-VI)

After the completion of the course students will be able to understand:

1. The number of chromosomes in a diploid organism, be able to determine (or at least know the formula for) how many different combinations of chromosomes could be found in the gametes simply due to independent assortment.
2. Be able to predict the phenotypic classes and their ratios from a monohybrid cross involving dominant and recessive alleles
3. Be able to predict the phenotypic classes and their ratios from a cross involving co-dominant or incompletely dominant alleles
4. Be able to predict the ratio of a specific genotype and/or phenotype from a cross involving multiple independently assorting genes (with each gene exhibiting only dominant and recessive alleles
5. Be able to recognize when two interacting genes are influencing the expression of each other (e.g. epistatically), which will be reflected in the numbers and ratios of phenotypic classes of the F2 progeny resulting from a dihybrid cross (alterations of a 9:3:3:1 ratio)

CCZ IV (Section A) GENETIC ENGINEERING AND EVOLUTION (P-VIII)

1. Illustrating the use of genomic libraries in gene detection and characterization.
2. Examining the process of restriction mapping.
3. Describing the process of Southern Blot analysis.
4. Summarizing methods used for DNA sequencing.
5. Describing the principles of the Polymerase Chain Reaction (PCR) and their applications.
6. Differentiating organismal and molecular evolution

PRACTICAL PAPER NO. - X Based on P-VI & P-VIII

Genetics, Genetic Engineering and Evolution

Practical Paper: CCZP II [Based on CCZ III & CCZ IV (Section A)]

- After the completion of the course students will get the practical knowledge.

1. Solving monohybridcross genetic outcomes utilizing branch diagrams and/or Punnett squares
2. Using testcrosses to identify parental genotype and confirm the principle of segregation.
3. Using the laws of probability to statistically analyze the outcomes of genetic crosses.
4. Differentiating between essential genes and both dominant and recessive lethal alleles
5. Listing examples of non Mendelian inheritance
6. Describing the process of bacterial conjugation and how it is used to map bacterial genes
7. Explaining the various methods, such as deletion mapping, used to map and/or define genes in bacteriophages.
8. Demonstrating the regulation of gene expression in lytic and lysogenic bacteriophages.

B.Sc.IInd Year (Semester-III)

CCZ(B) Paper No.VII Comparative Anatomy & Physiology

Course Outcome

⟹ After the completion of the course students will be able to

1) To understand comparative anatomy of vertebrates & how they are evolved as per the environmental conditions.

2) To know about the enzymes their classification their action.

3) To have a knowledge of the digestion process in human being.

4) To create awareness about the vitamin deficiency deficiency diseases.

5) To understand the mechanism of respirations & different organs of respiration in aquatic & Aerial organism .

6) To study the structure of heart and circulation and also to a gain the knowledge of E.C.G and heart diseases.

7) To understand the excretion process in animals.

8) To have knowledge about nerve physiology.

9) To understand how muscles works in our body.

B.Sc.IInd Year (Semester-IV)

CCZ IV (B) Paper No IX Endocrinology , Histology & Biochemistry

⟹ After the completion of the course students will be able to understand.

1) Different endocrine glands in animals and their functions.

2) To understand histology of mammalian organs and tissue.

3) To understand the different metabolic process of carbohydrate proteins and lipids.

B.Sc.IInd Year (Semester-III)

Skill enhancement course (SEC)

SECZ –I (A) : Haematology

- After the completion of the course students develops the skill of
  1. Collection of blood venupuncture and arterial blood.
  2. Determining haemoglobin from blood sample.
  3. Determining total RBC and WBC count from blood sample.
  4. Determining the differential WBC count.

B.Sc.IInd Year (Semester-IV)

Skill enhancement course (SEC)

SECZ –II (D) : Apiculture

- After the completion of the course students develops the skill of

1. Collecting practical information of artificial bee hives and its mechanism.
2. Collection of natural bee hives, wax and honey.
3. Handling of the honey bees for Apiculture.

PRACTICAL PAPER NO. – XI

Based on P-VII & P-IX Comparative Anatomy and Physiology Endocrinology, Histology and Biochemistry Practical Paper: CCZP III [Based on CCZ III & CCZ IV (Section B)]

- After the completion of the course students will get the practical knowledge.
  1. Digestive enzymes present in cockroach .
  2. Haematological study.
  3. Detection of nitrogenous waste products from excretory product of animals.
  4. Histological structures of different organs in mammals.

B. Sc. Third Year Syllabus w.e.f. June, 2018 Zoology

Semester –V

Paper: DSEZ-I; Section –A Title of Paper: Paper-XII -Ecology & Zoogeography

- After the completion of the course students will be able to
  1. To understand and appreciate the interactions of organisms with their environments and the consequences of these interactions for population, community, and ecosystem dynamics.
  2. To be aware of the current environmental issues with an understanding of the basic ecological concepts involved.
  3. To study the local and geographical distribution and abundance of organisms (habitat niche, community, bio-geography).
  4. To understand the inter-relationship between individuals in population and communities (population ecology).
  5. To study the structural adaptations and functional adjustment of organisms to their physical environment.
  6. To study the conservation and management of natural resources and pollution (applied ecology).

Semester –V

Paper: DSEZ-I; Section -B Title of Paper: Paper- XIII (A)-Pisciculture

1. To exchange and circulate information, ideas and practical experience on all matters relating to fisheries and their management.
2. To enable students with Fishery specific knowledge for entering PG courses or fishery industries.
3. To establish and maintain an appropriate Branch and Specialist section structure to meet the local, specialist and overall needs of fisheries interests.

Semester- VI

Paper: DSEZ-II; Section -A Title of Paper: Paper- XIV-Ethology, Biometry and Bioinformatics

- After the completion of the course students will be able to
  1. To study the behaviour of organism under natural conditions (Ethology).
  2. To understand the concepts of Biometry.
  3. To get acquainted with and apply the fundamentals of applied statistical methodology.
  4. To give students an introduction to the basic practical techniques of bioinformatics.
  5. To emphasize the application of bioinformatics and biological databases for problem solving in real-life & research.
  6. To familiarize student with the use of a wide variety of internet applications, biological database and to enable them to apply these methods under various situations.

Semester- VI

Paper: DSEZ-II; Section -B Title of Paper: Paper- XV(A)-Aquaculture

1. To introduce student to various types of aquaculture and culture methods.
2. To obtain knowledge of fishery science, with a particular emphasis on the biology, assessment, and management of fish and invertebrate fisheries.
3. To create awareness about manmade hazards to aquaculture.
4. To elaborate the role of Larvivorous fishes in relation to public health.
5. To acquire knowledge of Mariculture.
6. To understand and appreciate the role of Government in aquaculture development.

B. Sc. Third Year (Semester V & VI) w.e.f. June, 2018 PRACTICAL QUESTION PAPER SUBJECT: ZOOLOGY

PAPER- DSEZP-I: (Based on DSEZ-I; Section-A& DSEZ-II; Section-A) TITLE OF PAPER - Ecology, Zoo-geography, Ethology, Biometry and Bioinformatics (P-XVI)

Paper: DSEZP-II (Based on DSEZ-I; Section-B& DSEZ-II; Section-B) Title of Paper:

Pisciculture and Aquaculture {XVII (A)}

1. To improve the skills of students in microscopy, whole mount preparation, observations, drawings and laboratory techniques.
2. To acquaint the students with operations of the different laboratory equipment.
3. To equip the student with the necessary skills in standard operating procedures for laboratories and handling of chemicals, reagents and glassware.
4. To instill an understanding of the methods and protocols for handling and maintenance of animals for experiments.
5. To provide basic practical skills and experience in using laboratory techniques in experimentation.
6. To train the students in the analysis of experimental data with statistical and computer aided techniques.
7. To induct the students in the activity of field observation of natural phenomena and organisms through excursion and drafting of reports in a scientific and objective manner.
8. To equip the students with the understanding of taxonomy and other aspects of different organisms so that they become capable of classifying any given organism, at least up to the level of Order.
9. Identification of Fishes.

B.Sc. THIRD Year, Semester – V Skill Enhancement Course

All the skill enhancement courses included in this curriculum are intended to enable the students to become reasonably self sufficient, thereby increasing their employability. Acquisition of these skills by students will open better opportunities for them in the fields of higher studies and research in addition to increasing their employability.

SECZ –III (F) : VERMICULTURE AND VERMICOMPOSTING

The introduction of this skill in the curriculum is with the objective that the learners should be able to do vermiculture in a systematic way and also be able to get hands on experience in all related activities till vermicomposting. This will increase the awareness and skill availability in the need of the day viz. organic farming.

SECZ –IV (G): Aquarium Keeping:

There has been an increasing trend of keeping ornamental fish among the general public. Proportionately there is increasing demand for aquaria and aquarium fish also. This makes the topic of aquarium keeping a viable subject as a skill. This particular paper of skill is intended to train the students in aquarium keeping starting with the very basic aspects of aquarium fabrication, their setting and maintenance. Economic aspects of aquarium keeping are also covered in this course. Related study like fish identification, preparation of supplementary food of concern fish species is also covered. This skill is more self employability oriented.

M. Sc. First Year Syllabus w.e.f. June, 2019

Zoology Semester -I Paper I: Invertebrates: Structure and Function

After the completion of the course students will be able to understand:
Expected Outcomes:
1. Classify animals from different groups based on their features.
2. Explain the similarity and differences in structure and function of organs in different groups of animals.
3. Understanding about importance of integument and skeletal systems.
4. Compare the functional morphology different groups of invertebrates.

Semester -I Paper II: Biosystematics, Taxonomy and Evolution

After the completion of the course students will be able to understand:
Expected Outcomes:
1. Classify animals from different groups based on their features.
2. Describe different taxa and elaborate on their anatomical and morphological features.
3. Identify and describe homologies between different groups of animals.
4. Identify and access taxonomic information in different online databases.
5. Describe evolutionary relationship between different taxa.
6. Explain about evolutionary distance between different taxa.
7. Infer phylogenetic information and prepare phylogenetic trees.

Semester -I Paper III: Economic Zoology and Animal Behavior

After the completion of the course students will be able to understand:
Expected Outcomes:
1. Identify animal pathogenic diseases in humans and suggest remedial measures.
2. Evaluate and describe the economic impact of animals on human society.
3. Describe different culture methods relevant to aquaculture.
4. Identify and describe economically important fish and other animals.
5. Identify and explain different types of behavior patterns in animals.
6. Describe the importance of different behaviors in animal husbandry.

Semester -I Paper IV(Elective): Quantitative Biology and Bio-Informatics

After the completion of the course students will be able to understand:
Expected Outcomes:
1) Describe different methods of data handling using computers.
2) Feed and tabulate raw data using computer.
3) Explain and perform data representation using digital methods.
4) Access and download relevant information from different online databases of biological information.
5) Perform basic operations of gene sequence retrieval and compare them using different software.
6) Perform basic operations of protein structure retrieval and comparison using different software.

Semester -II Paper VI: Animal Ecology, Toxicology and Environmental Pollution

After the completion of the course students will be able to understand:
Expected Outcomes:
1. Describe the role of different gases in greenhouse effect.
2. Identify and suggest remedial measures to deal with different types of pollution.
3. Identify and describe adaptations of animals to different ecosystems.
4. Suggest and develop conservation and management stategies for a particular ecological problem.

Semester -II Paper VII: Gamete Biology and Animal Development

After the completion of the course students will be able to understand:
Expected Outcomes:
1. Understand and describe the different developmental processes.
2. Describe different techniques and methods used in experimental embryology.
3. Elaborate on metamorphosis and regeneration in various and relate these processes to abnormalities in animals.
4. Identify and evaluate application of different ART techniques to different infertility conditions.
5. Describe different types of infertility in humans.

Semester -II Paper VIII: Biochemistry and Immunology

After the completion of the course students will be able to understand:
Expected Outcomes:
1. Describe the structure and working of different components of vertebrate immune system.
2. Elaborate about the innate and adaptive immune responses in vertebrates.
3. Describe the different immunological disorders found in man.
4. Explain the different techniques in immunology
5. Elaborate about structure and application of antibodies in clinical therapy and biological research.

Semester -II Paper IX: (Elective) Tools and Techniques for Biology

After the completion of the course students will be able to understand:
Expected Outcomes:

1. Identify and describe the different equipment and tools used in a biology laboratory.
2. Correctly operate different laboratory instruments.
3. Correctly operate different types of microscopes.
4. Prepare tissue for section cutting and correctly operate a microtome.
5. Choose and perform correct staining technique for any given tissue sections.
6. Describe cellular separation techniques.
7. Properly handle and maintain glassware. 8. Properly operate laboratory equipment.

M.Sc. In Zoology Detailed Syllabus
Third Semester Course Code: ZOOL-301
Theory Paper-I Title of the Paper:
VERTEBRATES: STRUCTURE AND FUNCTION

After the completion of the course students will be able to understand:
Expected Outcomes:

1. Origin and concept of vertebrate classification.
2. Vertebrate integument and its derivatives.
3. General plan of circulation in various groups.
4. Comparative study of respiratory system, skeletal system, unrinogenital system, nervous system of vertebrates.
5. Knowledge of different types of sense organs.

Course Code – ZOOL-302
Theory Paper-II Title of the Paper:
MOLECULAR CELL BIOLOGY

After the completion of the course students will be able to understand:
Expected Outcomes:

1. Discuss the most significant discoveries, theories and their impacts in molecular cell biology.
2. Connection of Cells, tissue , organs and their role in plants and animals.
3. Contrast between unicellular and multicellular organisms.
4. Difference between prokaryotic and eukaryotic cells and viruses structure.
5. Aware the student for cancer.
6. Understand the term of cell signaling.

Course Code – Zoo - 303 (A) Theory Paper-III Title of the Paper:
INSECT: STRUCTURE & FUNCTION

After the completion of the course students will be able to understand:
Expected Outcomes:

1. Insect structure and its morphology.
2. Different type of mouth parts and feeding habits.
3. To understand the thoarasic appendages of an insect.
4. To have knowledge different system of insect.

Course Code – Zoo - 304 (A) Theory Paper-III Title of the Paper:
INSECT TAXONOMY, INSECT DEVELOPMENT AND ECOLOGY

After the completion of the course students will be able to understand:
Expected Outcomes:

1. To understand the general principle of insect classification.
2. To study the different orders and example of insects.
3. To understand the morphological characteristics.
4. To study the specific characteristics related to the different order.
5. To study the different developmental stages, metamorphosis, and its significance.
6. To understand the effect of different ecological factors on insect.
7. To understand social organization in colonial insect.

Course Code – Zoo - 303 (B)
Theory Paper-III Fishery Science- I Title of the Paper:
FISH MORPHOLOGY, ANATOMY AND PHYSIOLOGY – I

After the completion of the course students will be able to understand:
Expected Outcomes:

1. General structure of fishes and their classification.
2. To study the internal organs and adaptive organs of fishes.
3. To study habits and habitats of fishes.
4. To understand mimicrial behavior of fishes.

Course Code – Zoo - 304 (B)
Theory Paper-IV Fishery Science- I Title of the Paper:
FISH MORPHOLOGY, ANATOMY AND PHYSIOLOGY – II

After the completion of the course students will be able to understand:
Expected Outcomes:

1. Understand migration in fishes.
2. Understand accessory organs in fishes.
3. Types of hormones and their secreting mechanism in fishes.
4. Age and growth of fishes and its market.
5. Useful and harmful fishes to human.

Fourth Semester Course Code: ZOOL-401
Theory Paper-I Title of the Paper: GENETICS AND GENETIC ENGINEERING

After the completion of the course students will be able to understand:
Expected Outcomes:

1. Discribe the principle and law of inheritance.
2. Understand the cell division and types of mutation.
3. To understand sex determination.
4. To understand genetic disorders , syndromes its treatment.
5. To understand chromosomal aberration structural as well as numerical.

Course Code – ZOOL-402
Theory Paper-II Title of the Paper: ENDOCRINOLOGY (With Reference to Mammal / Human)

After the completion of the course students will be able to understand:
Expected Outcomes:

1. Structure histology and secretions of different endocrine glands.
2. Role of different hormones.
3. Effect of less or excess secretion of different organs.
4. Types of diabetes.

Course Code – Zoo - 403 (A)
Theory Paper-III Title of the Paper: ECONOMIC ENTOMOLOGY

After the completion of the course students will be able to understand:
Expected Outcomes:

1. Beneficial insects are reared for food such as honey, substances as lac or silk etc.
2. Uses of insects in drugs & dyes.
3. Benefit of insects in research.
4. Insects useful in forensic entomology.

Course Code – Zoo - 404 (A)
Theory Paper-III Title of the Paper: AGRICULTURE ENTOMOLOGY & PEST MANAGEMENT

After the completion of the course students will be able to understand:
Expected Outcomes:

1. Different types of agriculture pests & their nature of damage.
2. To understand different pest management methods.
3. To have the knowledge of plant protection equipments.

Course Code – Zoo - 403 (B)
Theory Paper-III Title of the Paper: FISHERIES AND FISH CULTURE – I

After the completion of the course students will be able to understand:
Expected Outcomes:

1. To understand the importance of studying the fishery.
2. To study the culturing of fishes.
3. To study the aquatic ecosystem.
4. To study the preservation of fishes.
5. To study the scope of fishery science.

Course Code – Zoo - 404 (B)
Theory Paper-III Title of the Paper: FISHERIES AND FISH CULTURE – II

After the completion of the course students will be able to understand:
Expected Outcomes:

1. Relationship between fish culture & agriculture.
2. Different methods of fish capturing.
3. Meaning of aqua culturing & methods of fish culturing at home.
4. Indian acts on the basis of fishery & environmental acts for protection of environment.