Eligibility

A Pass in B.Sc. Zoology with Chemistry and Botany as Ancillary Subjects with 50% of marks in Part – III Examination.

Master's Programme

A Master's Programme consists of a number of Courses. A Master's Programme consists of a set of core courses and Elective courses.

Core courses are basic courses required for each programme. The number and distribution of credits for core courses will be decided by the respective faculties.

The respective departments will suggest elective courses and they may be distributed in all four semesters.

A course is divided into five units to enable the students to achieve modular and progressive learning

Semester

An academic year is divided into two semesters, Odd semester and Even semester. The normal semester periods are:

Odd Semester: July to November (90 Working Days)
Even Semester: December to April (90 Working Days)

Credits

The term credit is used to describe the quantum of syllabus for various programmes in terms of hours of study. It indicates differential weightage given according to the contents and duration of the courses in the curriculum design.

The minimum credit requirement for the two year Master's Programme shall be 90, of which the core courses shall carry 70 credits and the elective course shall carry 16 credits and soft skill (English/Tamil/Computer Science) shall carry 4 credits.

Courses

Each course may consist of lectures/tutorials/laboratory work/ seminar/project work/practical training /report/Viva-Voce etc.

Course Weight

Core and elective courses may carry different weights. For example, a course carrying one credit for lecture, will have instruction of one period per week during the semester if three hours of lecture is necessary in each week for that course then 3 credits will be the weightage. Thus normally, in each of the courses, credits will be assigned on the basis of the lectures/tutorials/laboratory work and other form of learning in a 15 week schedule:

1. One credit for each lecture period per week.
2. One credit for each tutorial per week
3. One credit for every three periods of laboratory or practical work per week
4. One credit for three contact hours of project work in a week
5. One credit for every two periods of seminar

Grading system

The term Grading System indicates a 10-point scale of evaluation of the performance of students in terms of marks, grade points, letter grade and class.
Duration  
The duration for completion of a two year Master’s Programme in any subject is four semesters.

Structure of the Programme  
The Master’s Programme will consist of:
1. Core course, which are compulsory for all students.
2. Elective courses which students can choose from amongst the courses offered by the other Department of faculty as well as by the Department of other faculties. (Arts, Science, Education and Indian language)
3. The Elective subjects will be allotted by counseling by a committee of the respective Heads of the Departments under the Chairmanship of the Dean of the Faculty.
4. Dissertation/ Project work/ Practical training/ Field Work, which can be done in an organization (Government, Industry, Firm, Public Enterprise etc.) approved by the concerned department.

Attendance  
Every teaching faculty handling a course shall be responsible for the maintenance of attendance register for candidates who have registered for the course.

The teacher of the course must intimate the Head of the Department at least seven calendar days before the last instruction day in the semester about the attendance particulars of all students who have secured less than 80% of attendance.

Each student should earn 80% attendance in the courses of the particular semester failing which he or she will not be permitted to sit for the end-semester examination.

However, it shall be open to the authorities of grant exemption to candidate who has failed to obtain the prescribed 80% attendance for valid reasons on payment of Condonation fee and such exemptions should not under any circumstance be granted for attendance below 70%.

Examinations  
The internal assessment for each course carries 25% marks for theory and 40% marks for practical and it is based on two internal assessment tests and a variety of assessment tools such as seminar and assignment. The respective faculty will decide the pattern of question paper. The tests are compulsory.

There will be one End Semester Examination(75% marks for theory and 60% marks for Practical) of 3 hours duration for each course. The respective faculty will decide the pattern of question paper.

Evaluation  
The performance of a student in each course is evaluated in terms of percentage of Marks(PM) with a provision for conversion to Grade Point (GP). The sum total performance in each semester will be rated by GPA while the continuous performance from the 2nd Semester onwards will be marked by Overall Grade Point Average (OGPA).

Marks and Grading  
A Student cannot repeat the assessment of Sessional Test-I and Sessional Test-II. However, if for any compulsive reason, the student could not attend the test. The prerogative of arranging a special test lies with the teacher in consultation with the Head of the Department.

A student has to secure 50% minimum in the End Semester Examination. The student who has not secured a minimum of 50% of Marks Sessional Plus end semester examination in a paper shall be deemed to have failed in that paper.
A candidate who has secured a minimum of 50 Marks in all the Papers prescribed in the programme and earned a minimum of 90 credits will be considered to have passed the Master’s Programme.

Grading

A ten point rating scale is used for the evaluation of the performance of the student to provide letter grade for each course and overall grade for the Master’s programme.

<table>
<thead>
<tr>
<th>Marks</th>
<th>Grade Point</th>
<th>Letter Grade</th>
<th>Class</th>
</tr>
</thead>
<tbody>
<tr>
<td>90 or above</td>
<td>10</td>
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<td>Exemplary</td>
</tr>
<tr>
<td>85-89</td>
<td>9.0</td>
<td>D ++</td>
<td>Distinction</td>
</tr>
<tr>
<td>80-84</td>
<td>8.5</td>
<td>D +</td>
<td>Distinction</td>
</tr>
<tr>
<td>75-79</td>
<td>8.0</td>
<td>D</td>
<td>Distinction</td>
</tr>
<tr>
<td>70-74</td>
<td>7.5</td>
<td>A ++</td>
<td>First Class</td>
</tr>
<tr>
<td>65-69</td>
<td>7.0</td>
<td>A +</td>
<td>First Class</td>
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<tr>
<td>60-64</td>
<td>6.5</td>
<td>A</td>
<td>First Class</td>
</tr>
<tr>
<td>55-59</td>
<td>6.0</td>
<td>B</td>
<td>Second Class</td>
</tr>
<tr>
<td>50-54</td>
<td>5.5</td>
<td>C</td>
<td>Second Class</td>
</tr>
<tr>
<td>49 or less</td>
<td>RA</td>
<td>Reappear</td>
<td></td>
</tr>
</tbody>
</table>

The Successful candidates are classified as follows:

I Class – 60% Marks and above in overall percentage of Marks (OPM). (6.5 GPA)

II Class – 50-59% Marks in overall percentage of Marks (Less then 6.0 GPA)
Candidates who has obtained 75% and above but below 90% of Marks (OPM) shall be deemed to have passed the examination in First Class (Distinction) provided he/she has passed all the papers prescribed for the programme at the First appearance. Candidates who has obtained 90% and above (OPM) shall be deemed to have passed the examination in First Class (Exemplary) provided he/she has passed all the papers prescribed for the programme at the First appearance.

For the Internal Assessment Evaluation, the break in marks shall be as follows:

Test (Two) - 20 Marks
Assignment - 5 Marks
Total - 25 Marks

Course – Wise Letter Grades
The percentages of marks obtained by a candidate in a course will be indicated in a letter grade.

A student is considered to have completed a course successfully and earned the credits if he/she secures an overall letter grade other than RA. A “letter grade RA” in any course implies a failure in that course. A Course successfully completed cannot be repeated for the purpose of improving the Grade point.

The RA grade once awarded says in the grade card of the student and is not deleted even when he she completes the course successfully later. The grade acquired later by the student will be indicated in the grade sheet of the odd/ even semester in which the candidate has appeared for clearance of the arrears.

A student who secures RA grade in any course which is listed as a core course has to repeat it compulsorily when the examination is held next. If it is an elective course, the student has no option to repeat it when it is offered next or to choose a new elective if he/she so desire in order to get a successful grade. When new elective is chosen in the place of failed elective, the failed elective will be indicated as dropped in the subsequent grade card.
If a student secures RA grade in the Project Work / Field Work / Practical Work/Dissertation, he/she shall improve it and resubmit it if it involves only rewriting incorporating the classification of the evaluators or he/she can re-register and carry out the same in the subsequent semesters for evaluation.
# M.Sc Zoology (CBCS)
## SCHEME OF EXAMINATION

<table>
<thead>
<tr>
<th>Code No</th>
<th>Theory/Practical</th>
<th>L</th>
<th>P</th>
<th>C</th>
<th>Int. Mark 25</th>
<th>Ext. Marks 75</th>
<th>Total</th>
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</tr>
<tr>
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<td>Developmental Biology</td>
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<td>ZOO C 102</td>
<td>Cell Biology</td>
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<td>Soft Skill (English communication)</td>
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<td>Pre lab discussion - Practical III (covering - ZOO C 301, 302 &amp; 303)</td>
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<tr>
<td>ZOO C 401</td>
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<td>ZOO C 402</td>
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<td>ZOO P 404</td>
<td>Core Practical IV</td>
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<td>Pre lab discussion - Practical IV (covering - ZOO C 401, 402 &amp; 403)</td>
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<tr>
<td>ZOO O 415-1 (OR) ZOO O 415-2</td>
<td>Optional III 1 - Public Health &amp; Hygiene (OR) 2- Animal Science</td>
<td>4</td>
<td>4</td>
<td>25</td>
<td>75</td>
<td>100</td>
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<tr>
<td>ZOO O 416-1 (OR) ZOO O 416-2</td>
<td>Optional IV 1 - Animal Culture Technique (OR) 2- Environmental Science</td>
<td>4</td>
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<td>Total</td>
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<td>23</td>
<td>9</td>
<td>90</td>
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Total Core Papers & Practical credits = 70
Total optional & Soft skills credits = 20
Overall Credits = 90

Note: Soft skill (English/Tamil/Computer Science) and optional I, II, III, IV are to be offered by other departments.

Optional Courses offered by Department of Zoology in the IV Semester

<table>
<thead>
<tr>
<th>Semesters &amp; Code</th>
<th>Title</th>
<th>L</th>
<th>P</th>
<th>C</th>
<th>Int. Ass. Marks 25</th>
<th>End Sem. Exam Marks 75</th>
<th>Total Marks</th>
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<tbody>
<tr>
<td>IV Semester</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Optional III &amp; IV</td>
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<td></td>
</tr>
<tr>
<td>ZOO O 415-1 (OR)</td>
<td>Public Health &amp; Hygiene (OR) Animal Science</td>
<td>4</td>
<td>0</td>
<td>4</td>
<td>25</td>
<td>75</td>
<td>100</td>
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<td>ZOO O 415-2</td>
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</tr>
<tr>
<td>ZOO O 416-1 (OR)</td>
<td>Animal Culture Technique (OR) Environmental Science</td>
<td>4</td>
<td>0</td>
<td>4</td>
<td>25</td>
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<td>100</td>
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<tr>
<td>ZOO O 416-2</td>
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Optional Courses offered to Other Science Department in the II, III and IV Semesters

<table>
<thead>
<tr>
<th>Semesters &amp; Code</th>
<th>Title</th>
<th>L</th>
<th>P</th>
<th>C</th>
<th>Int. Ass. Marks 25</th>
<th>End Sem. Exam Marks 75</th>
<th>Total Marks</th>
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<tbody>
<tr>
<td>II Semester</td>
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<tr>
<td>Optional I</td>
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<tr>
<td>ZOO O 215</td>
<td>Animal Culture Techniques</td>
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<td>0</td>
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<td>25</td>
<td>75</td>
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<tr>
<td>III Semester</td>
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<td>ZOO O 315</td>
<td>Environmental Science</td>
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<td>0</td>
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<td>75</td>
<td>100</td>
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<tr>
<td>IV Semester</td>
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<tr>
<td>Optional III &amp; IV</td>
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<tr>
<td>ZOO O 417</td>
<td>Public Health &amp; Hygiene Animal Science</td>
<td>4</td>
<td>0</td>
<td>4</td>
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Internal Assessment Marks

<table>
<thead>
<tr>
<th>Theory Courses</th>
<th>Maximum Marks 25 Marks</th>
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<tr>
<td>Internal Assessment Test – I</td>
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</tr>
<tr>
<td>Internal Assessment Test – II</td>
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</tr>
<tr>
<td>Assignment</td>
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<tr>
<td>Practical Courses</td>
<td>Maximum Marks</td>
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<td>Test – I</td>
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<td>Test – II</td>
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<td>Total</td>
<td>40</td>
</tr>
<tr>
<td>Total</td>
<td>25</td>
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</tbody>
</table>
Objectives
To make the students understand the various concepts of development.

Unit–I: Gametogenesis

Unit–II: Fertilization
Approach of the sperm to the egg, sperm penetration, essence of activation, acrosome reaction, reaction of the egg, Biochemistry of egg activation-parthenogenesis.

Unit–III: Beginning of Embryogenesis and aspects of Gastrulation
Types of eggs, cleavage, laws of cleavage, patterns of cleavage, physiological and biochemical changes, Role of egg cortex.

Unit–IV: Embryonic Adaptation, Organ Formation and Differentiation

Unit–V: Morphogenetic Processes in the later part of Ontogenesis
Metamorphosis – hormonal regulation of metamorphosis in Amphibia and Insects.

Practical
1. Structure of spermatozoa of fish, frog, chick and mammal
2. Structure of egg in insects, fish, frog, chick and mammal
3. Study of types of cleavage
4. Vital staining of chick blastoderm
5. Analysis of excretory products during chick development
6. Histology of testis showing spermatogenesis
7. Histology of ovary showing oogenesis
8. Regeneration in amphibian
9. Effect of thyroxine on amphibian metamorphosis
10. Study of insect metamorphosis

Text Books

Reference Books
COURSE: ZOO C 102 CELL BIOLOGY

Objectives
To understand the basic concepts of cell structure, function, cell growth, metabolism and diseases.

Unit–I: Cell Structure and Plasma Membrane

Unit–II: Mitochondria
Structure of mitochondria – Shuttle system – Pasteur’s effects – role of mitochondria in metabolism – chemical coupling hypothesis – conformational coupling hypothesis - control of respiratory activity enzyme system.

Unit–III: Other Cytoplasmic Organelles
General morphology and function of Golgi complex and lysosome - Secretory cycles, primary and secondary lysosome, structure and functions of endoplasmic reticulum, structural organization and function of Prokaryotic and Eukaryotic ribosome.

Unit–IV: Nucleus
Structural organization and functions of nucleus, membrane pore complex and nucleolus - Organization of DNA into chromosome, nucleosome, Solenoid, Loops, rosette coil, chromatid, chromosome, Heterochromatin, Euchromatin, Lampbrush chromosome, Polytene chromosome.

Unit–V: Cell Cycle and Cancer

Practicals
1. Light microscope – components, uses and principles
2. Mounting of polytene chromosomes
3. Identification of different stages in meiosis in grasshopper
4. Micrometry (A) Camera Lucida (b) Stage Micrometer (C) Ocular Micrometer
5. Determination of Nucleo - Cytoplasmic index
6. Determination of cell diameter
7. Identification of Cancer tissues
8. Preparation of mitosis in Onion root tip
9. Electrophoretic separation of proteins
10. Identification of different tissues – muscle tissues, skeletal tissues- epithelial tissues – nervous tissue and reproductive tissue

Text Books

Reference Books
Objectives
To make the students to understand the fundamental concepts of genetics, human health related genetic problems, inborn errors and genetic counselling.

Unit–I: Mendel’s Laws & Gene Expression
Principles of segregation and independent assortment-deviation from Mendel’s findings – the chromosome theory of inheritance –DNA is the genetic material-Tobacco Mosaic Virus-penetrance and expressivity-effect of temperature and light on gene expression-environmental effects and twin studies.

Unit–II: Polygenic Inheritance
Polygene concept-mode of inheritance of kernal color in wheat-skin color in man-transgressive variation-heritability-Multiple alleles-ABO blood groups in man-MN blood group-Rh blood group-erythroblastosis foetalis-sickle cell anemia-Thalassemia.

Unit–III: Linkage, Crossing over and Gene Mapping

Unit–IV: Gene fine structure & Molecular Mechanism of Gene Mutations

Unit–V: Genetics of Human Metabolic Disorders
Garrod’s discovery-defects in amino acid, lipid and sugar metabolism – one gene and one enzyme theory – one gene one polypeptide theory – co-linearity of gene and its polypeptide products – chromosomal disorders. Genetic counselling

Practicals
1. Experiments on Mendelian inheritance
2. Experiments on polygenic inheritance
3. Human traits survey
4. Gene frequency calculations.
5. Statistical analysis of genetic data using Chi-square test.
6. Human pedigree construction for a family data.
7. Tracing of genes in family pedigree studies
8. Collection and identification of human finger prints
9. Study of hereditary disorders with the aid of chromosome karyotyping
10. Identification of sex and mutant characters in Drosophila
Text Books

Reference Books
FIRST YEAR: II SEMESTER  
COURSE: ZOO C 201 ANIMAL PHYSIOLOGY

Objectives
To expose the students to understand the various physiological mechanisms functioning in animal kingdom.

Unit–I: Food and Digestion
Composition of food-classification of nutritive substances-digestion-digestive enzymes-absorption-hormonal control of digestion.

Unit–II: Excretion and Osmoregulation

Unit–III: Circulation
Circulation of the blood – Open and Closed systems – vascular pumps – Arthropod heart – Chambered hearts and booster pumps.
Structure of mammalian heart, origin, conduction and regulations of heart beat – patterns of circulations in the vertebrates – ECG – Composition of blood – clotting mechanism – blood groups – buffer system of blood- circulation of body fluids and their regulations.

Unit–IV: Respiration

Unit–V: Neuromuscular and Receptors
Structure of neuron-electrical phenomena of nerves-theories of excitation-synaptic transmission-neuroendocrine system - hormones and their functions.
Structure of muscle-chemical composition – mechanism of muscle contraction-energy for muscle contraction
Mechanoreceptors – chemoreceptors - photoreceptors – phonoreceptors

Practicals
1. Activity of salivary amylase.
2. Effect of substrate concentration and activity of salivary amylase
3. Effect of enzyme concentration and activity of salivary amylase
4. Effect of PH concentration and activity of salivary amylase
5. Quantitative estimation of proteins.
7. Counting of blood cells.
8. Identification of blood groups.
10. Effect of thyroxin on the respiratory metabolism of fish.

Text Books

Reference Books

COURSE: ZOO C 202 MOLECULAR BIOLOGY

Objectives
To understand the molecular basis of the cell structure, function and to familiarise the recent developments and techniques in the field of molecular biology.

Unit–I : Structure and properties of DNA

Unit–II: Replication of DNA

Unit–III : Structure and properties of RNA
RNA polymerases in proaryotes and eukaryotes. Types, structure and functions of RNAs, Transcription in prokaryotes and eukaryotes, ‘rho’ dependent and independent termination, TATA box and Pribnow box.

Unit–IV: RNA Processing, Editing and Genetic Code
Processsing of mRNA, rRNA, tRNA and splicing mechanisms- RNA editing, Genetic code and its properties – Protein synthesis – Protein secretion and Signal hypothesis.

Unit–V: Recombinant DNA Technology
Reverse transcription and cDNA synthesis – steps involved in the recombinant DNA technology –gene targeting –apoptosis and cancer, role of oncogene in cancer.

Practicals
1. Identification of drum stick chromosome in human blood
2. Identification of Barr body in buccal epithelial cells
3. G-banding of chromosome –Geimsa stain
4. Mitotic index
5. Localization of DNA
6. Localization of RNA
7. Localization of carbohydrates
8. Localization of protein
9. Estimation of DNA
10. Estimation of RNA.

Text Books

Reference Books
Objectives
To make students to realize the structure and function of ecosystem, wealth of our natural resources and conservation measures to be taken and create awareness of the laws governing environment.

Unit–I: Ecosystem
Composition of atmosphere – structure and stratification of atmosphere - Hydrological cycle-kinds of ecosystem-structure and functions of ecosystem-energy flow in ecosystem-trophic levels

Unit–II: Natural Resources and Conservation
Types of resources-conventional and non- conventional sources of energy-conservation of soil, land and forest - Deforestation and Afforestation – Conservation strategies (WCS &NCS) - Wild life management in India.

Unit–III: Air and Water Pollution

Unit–IV: Radiation, Noise and Industrial Pollution

Unit–V: Environmental Impact Assessment and Law
The objective of Environmental Impact Assessment (EIA) – Environmental Appraised Committee (EAC) – The Environmental Management Plan (EMP) – Control of Environmental pollution through law – Environmental Protection Act (1986).

Practicals
2. Oxygen sag curve from river.
3. Estimation of dissolved Carbon-di-oxide
4. Estimation of Hydrogen sulphide
5. Estimation of Residual chlorine
6. Estimation of total dissolved Solids
7. Determination of sulphate in water
8. Determination of iron in water
9. Determination of silicate in water
10. Determination of Nitrite/Nitrate in water.

Text Books

Reference Books
ZOO O 215: Optional – I : Statistical Methods

Unit-I
Definition, scope, functions and limitations of Statistics-Collection, Classification, Tabulation of data, Diagrammatic representation of data-Simple, Multiple and Percentage Bar diagram, Pie diagram and Graphical representation of data-Histogram, frequency polygon, frequency curve and Ogives. Primary and Secondary data - Questionnaire method.

Unit-II

Unit-III

Unit-IV
Tests of Significance with their important concepts. Tests for large samples-Test for mean, difference of means, proportion and equality of proportions. Small sample tests – test for mean, difference of Means, paired samples, test for correlation and regression coefficients, Chi square test for goodness of fit and independence of attributes.

UNIT –V
Applications and analysis using SPSS – Analysis of variance one way and two way classifications. Multiple regression analysis, Logistic regression analysis, Factor analysis, Cluster analysis, Discriminant function analysis.

(Note: The emphasis in only on the application of the methods. The derivations of the formulae are not necessary).

Books for study and References:
Objectives
To make the students to learn the application of scientific and Engineering principles to the processing of materials by biological agents to provide goods and service.

Unit–I: Basic Biotechnology
Definition – Scope – Achievements of Biotechnology – Restriction Enzymes, DNA ligases, polymerase etc. Cloning vehicles – Plasmid Bacteriophage, Cosmids, Yeast plasmids- Genomic DNA libraries, cDNA libraries.

Unit–II: Techniques in Biotechnology
Southern blotting, Northern blotting, Western blotting, In-situ hybridization, DNA sequencing PCR, DNA finger printing, DNA probes, site – directed mutagenesis, particle gun, microinjection, electroporation.

Unit–III: Medical Biotechnology
Insulin, Somatotrophin, somatostatin, hormone production, vaccines, interferons, gene therapy, monoclonal antibodies, Antenatal diagnosis, Invitro fertilization technology, Human genome project.

Unit–IV: Agricultural Biotechnology

Unit–V: Microbial and Environmental Biotechnology

Practicals
1. Methods of sterilization
2. Preparation of culture media and Agar slants
4. C.S. of stem and Root nodule of leguminous plants
5. Conn’s direct microscopic count of soil microbial population
6. Standard plate count
7. Antibiotic assay – Streptomycin
8. Purification of Bacteria
9. Agarose Gel Electrophoresis
10. Study of Biogas Plant.

Text Books

Reference Books
Course: ZOO C 302 IMMUNOLOGY

Objectives
To make the students to aware of the basic principles of immunology and expose to the organs and mechanism of immunity.

Unit–I: Immune System

Unit–II: Cells and Organs of the Immune System

Unit–III: Antigens

Unit–IV: Antibodies
Basic structure of immunoglobulins – classification - functions of immunoglobulins - antibody diversity.

Unit–V: Antigen Antibody Interactions
Strength of antigen antibody interactions- Antibody affinity- Antibody avidity-Cross reactivity, Precipitin reaction-Agglutination reaction-Haemagglutination reaction-RadioImmunno Assay (RIA), Enzyme linked Immunosorbant Assay (ELISA)-western blotting.

Practicals
1. Preparation of solutions of different normality, molarity, and dilutions.
2. Demonstration of lymphoid organs
3. Cell imprinting of lymphoid organs
4. Histology of lymphoid organs
5. Study of bone marrow cells
7. Differential count of W.B.C. from blood smear preparation
8. Human blood grouping
9. Antigen antibody interaction-immunology
10. Rapid plasma regain (RpR) test for syphilis

Text Books

Reference Books
COURSE: ZOO C 303 TOXICOLOGY

Objectives
To make the students to understand the various types of toxicants and its impact on living organisms.

Unit–I: Absorption, Distribution and Excretion of toxicants

Unit–II: Bio-Transformation of Toxicants

Unit–III: Bio-chemical basis of Toxicology

Unit–IV: Methods of Toxicology

Unit–V: Chemical and Immuno toxicology

Practicals
1. Observation and recording of Behavioural changes of normal and treated fish.
2. Estimation of oxygen consumption of normal and toxicant treated fishes.
3. Analysis of pesticide residues in vegetables by finger printing technique.
4. Estimation of acid and alkaline phosphatase activity of normal and toxicant treated animal tissue.
5. Estimation of SDH activity in liver tissue of normal and malathion treated fish.
6. Estimation of total protein content in the muscle tissue of normal and endosulfan treated fish.
7. Estimation of Glucose and Glycogen level in the liver tissue of normal and Lead treated fish.
9. Estimation of GSH level in liver tissue of normal and endrin treated mouse.
10. Determination of cell volume in liver tissue of normal and copper treated fish.
11. Histopathological observation of the following
12. Determination of LC₅₀ value of Zinc on fish.
Text Books
1. Sharma, P.D. 1996 Environmental Biology and Toxicology. Rastrogi Publication, meerut, India.

Reference Books
Objective: To understand the physiochemical principles in biochemistry and the basic concepts of the chemistry and metabolism of major biomolecules.

Unit-I Classification and general properties of carbohydrates. Functions of biologically important monosaccharides, disaccharides, homopolysaccharides and heteropolysaccharides. Carbohydrate metabolism: glycolysis, citric acid cycle, gluconeogenesis, pentose phosphate (HMP shunt) pathway, glycogen metabolism (Overview only, structures not required). Diabetes mellitus (elementary details).


Unit V Nucleic acids: purine and pyrimidine bases, nucleosides and nucleotides. Biologically important nucleotides. DNA structure-Watson and Crick model. A, B, and Z forms of DNA. Triple and quadruple structures. DNA supercoiling. DNA denaturation. Differences between DNA and RNA. Major classes of RNA-Structure and biological functions.Minor classes of RNA.

Textbooks:
Second year: IV Semester
COURSE: ZOO C 401: ENTOMOLOGY

Objectives
To make the students to understand the insect by study of their morphology, anatomy and physiology of various systems, acquire knowledge of Sericulture, Apiculture, Vector insects and integrated pest management.

Unit–I: Insect Morphology

Unit–II: Insect Physiology
Structure and physiology of integumentary, digestive, excretory, circulatory, respiratory, endocrine, reproductive and nervous system.

Unit–III: Agricultural Entomology
Insect – pests out break – assessment of insect population – Identification, seasonal history, biology, nature of damage and control measures of major pests of paddy, sugarcane, vegetables (Brinjal).

Unit–IV: Principles and methods of Pest Management

Unit–V: Beneficial insects and Vector insects
Sericulture: biology of silk worm, silk gland, cultivation of mulberry plants, rearing silkworm and uses of silk – Apiculture: types of bees, bee colony, life history, Beekeeping accessories and byproducts of bees and its uses. Useful insects – Biology and control measures of important insect vectors – mosquitoes and houseflies.

Practicals
1. Methods of harmful insect collection, preservation and submission of insect box.
2. Identification of at least 10 insects belonging to different orders.
3. Mounting of salivary gland of cockroach, mouth parts of cockroach, housefly, and mosquito.
4. Mounting of different types of antennae and legs of insects, wings and their venation.
5. Demonstration of digestive, reproductive (male and female) and nervous system of insects (Cockroach and Odontopus).
7. Life history of silkworm (egg, larva, cocoon and adult).
8. Bee keeping equipments and its accessories.
9. Bioassay of insecticides on insects (LC50)
10. Collection and Identification of medically important arthropods (Mosquitoes, house flies, lice and mites).
Text Books

Reference Books
COURSE: ZOO C 402: FISHERIES AND AQUACULTURE

Objectives
To make the students to understand the Indian fisheries scenario in relation to world aquaculture and learn culture practices.

Unit–I: Capture Fisheries
Present status and scope of capture fisheries -commercially important fishes-Food and feeding habits of important edible fishes-Age and growth -Method of age determination – length - weight relationship.

Unit–II: Culture Fisheries
Present status and scope of culture fisheries- Biology of important cultivable fishes – Marketing of cultured fishes-Major diseases – symptoms and treatments.

Unit–III: Aquaculture Principles and Practices

Unit–IV: Culture Methods

Unit–V: Fish Harvest Technology
Harvesting methods-handling and preservation-Fishing Gears-Fish preservation-fishery byproducts - marketing and economics.

Practical
1. Estimation of pH, total hardness, dissolved O$_2$, salinity
2. Determination of nitrate, sulphate, phosphate and silicate
3. Identification and biology of important cultivable fishes.
4. Morphology and Morphometry study of fish
5. Types of scales in fishes
6. Analysis of gut content of fish
7. Collection and identification of fish parasites
8. Collection and identification of fish predators
9. Identification of commercially important species
10. Demonstration of Hypophysisation technique in fish

Text Books

Reference Books
COURSE : ZOO C 403 : ENDOCRINOLOGY

Objectives
To make the students to learn the objectives and scope of comparative endocrinology, anatomy, morphology and histology of endocrine tissues of vertebrates, crustacean and insect endocrine organs and their functions.

Unit–I: Pituitary Gland
General characteristics of hormones-Pituitary gland-structural organization- Pituitary hormones functions - hypothalamic control.

Unit–II: Thyroid Gland
Thyroid gland-structural organisation- metabolic effects of thyroid hormone- effects of thyroid on reproduction – Parathyroid – structure – function of parathyroid hormone.

Unit–III: Pancreas and Adrenal Glands
Structure of pancreas- function of Insulin and glucagon- Adrenals – structural organization, functions of cortical and medullary hormones.

Unit–IV: Vertebrate Reproductive Endocrinology

Unit–V: Insect and Crustacean Endocrinology
The concepts of neurosecretion – Endocrine system in crustacea – endocrine control of moulting and metamorphosis – Neuroendocrine system in insects- endocrine control of moulting and metamorphosis.

Practicals
1. Demonstration of endocrine organs in vertebrates
2. Demonstration of reproductive systems in vertebrates
3. Histological study of pituitary, adrenal, testis, ovary, corpus luteum, pancreas and thyroid gland
4. Demonstration of reproductive system in insects
5. Demonstration of neuroendocrine complex in insects.
6. Histology of ovary, accessory glands, corpus allatum and brain in insects
7. Demonstration of Parabiosis in cockroach
8. Demonstration of Ovariectomy in cockroach.
9. Vaginal smear showing various stages of estrus cycles
10. Demonstration – influence of insulin on blood glucose level.

Text Books

Reference Books
Optional for students of Zoology Department to be offered in the IV Semester

Optional - III
ZOO O 415-1 PUBLIC HEALTH AND HYGIENE

Objectives
To make the students to aware of public health importance, different diseases, causing organisms to human beings and control measures.

Unit - I

Unit - II
Protozoan and human diseases (Kala-azar, typhoid, amoebic dysentery, cholera, sleeping sickness). Morphology, life cycle and control measures of sand flies, Houseflies and Tsetse fly.

Unit - III
Protozoan and Human diseases. Life cycle and Public Health Importance of Trypanosomiasis, Leishmaniasis ans Trichomoniasis

Unit - IV
Protozoan and Human diseases. Life cycle and Public Health Importance of Taenia solium, Schistosoma and Ascaris.

Unit - V

TEXT BOOK

REFERENCE BOOK
Optional for students of Zoology Department to be offered in the
IV Semester

Optional - III
ZOO O 415 –2 ANIMAL SCIENCE

Objectives
To make the students to acquire knowledge of the biological diversity and their
interspecific relations.

Unit-I
Characteristic features of major Invertebrate and Vertebrate phyla. (Protozoa,
Porifera, Coelenterata, Platyhelminthes, Annelida, Arthropoda, Mollusca and
Echinodermata. Protochordata, Fishes, Amphibia, Reptiles, Birds and Mammals)

Unit-II
Arthropods and vectors of human diseases (mosquitoes, lice, House fly and ticks).
Mode of transmission of pathogens by vectors: control measures of vectors. Useful
insect: silkworm

Unit-III
Important human and veterinary parasites (protozoans and helminthes): morphology and life cycle of Ascaris, Wuchereria. Fasciola. Schistosoma
Leishmania and plasmodium.

Unit-IV
Gametogenesis in animals - Molecular events during fertilization. Cleavage patterns
and fate maps- and gastrulation

Unit-V
Origin of life-different concepts, Theories of organic evolution. (Darwinism, Neo-
Darwinism, Lamarckism and Neo-Lamarckism): speciation.

TEXT BOOKS
   Elementary Parasitology”, S.Viswanathan Printers and Publishers Pvt. Ltd.,
   Chennai.
   Meerut.

REFERENCE BOOKS
   company. Philadelphia.
   Delhi.
   Delhi.
   publishing Ltd., Tokyo.
   Anmol publications Pvt. Ltd., New Delhi.
Objectives
To make the students to understand the methods of vermicomposting and techniques of Sericulture, Apiculture and Aquaculture.

Unit - I
Method of composting - factors responsible for composting – vermicomposting – biofertilizers

Unit- II
Types of honey bees-bee colony-social life in honey bees-types of beehives and other accessories-uses of honey.

Unit - III

Unit - IV
Types of culture-general culture techniques-induced breeding-culture of edible fishes.

Unit - V
Ornamental Fish Culture – Angel fish-Fighter fish-Gold Fish-Gurami and Guppies.

TEXT BOOK


REFERENCE BOOKS

Optional - IV

ZOO O  416-2 ENVIRONMENTAL SCIENCE
(Optional for students of Zoology Department to be offered in the IV Semester)

Objectives
To make the students to become aware of the environmental problems of pollution, wild life sanctuaries and conservation and environmental educations.

Unit-I

Unit – II

Unit-III

Unit-IV

Unit – V

TEXT BOOKS

REFERENCE BOOKS
Optional-I

ZOO O 215 ANIMAL CULTURE TECHNIQUES

Objectives
To make the students to understand the methods of vermicomposting and techniques of Sericulture, Apiculture and Aquaculture.

Unit - I
Method of composting - factors responsible for composting –vermicomposting – biofertilizers

Unit- II
Types of honey bees-bee colony-social life in honey bees-types of beehives and other accessories-uses of honey.

Unit - III

Unit - IV
Types of culture-general culture techniques-induced breeding-culture of edible fishes.

Unit - V
Ornamental Fish Culture – Angel fish-Fighter fish-Gold Fish-Gurami and Guppies.

TEXT BOOK


REFERENCE BOOKS

Optional - II
ZOO O 315 ENVIRONMENTAL SCIENCE
(Optional for students of other science departments to be offered in the III sem.)

Objectives
To make the students to become aware of the environmental problems of pollution, wild life sanctuaries and conservation and environmental educations.

Unit-I

Unit – II

Unit-III

Unit-IV

Unit – V

TEXT BOOKS

REFERENCE BOOKS
ZOO O 417 PUBLIC HEALTH AND HYGIENE

OBJECTIVES
To make the students to aware of public health importance, different diseases, causing organisms to human beings and control measures.

UNIT - I
Introduction to important disease to human beings. Mosquito-borne diseases - malaria, filariasis and chikungunya. Morphology, life cycle of vector mosquitoes - Anopheles, Culex and Aedes species and vector management.

UNIT - II
Protozoan and human diseases (Kala-azar, typhoid, amoebic dysentery, cholera, sleeping sickness). Morphology, life cycle and control measures of sand flies, Houseflies and Tsetse fly.

UNIT - III
Protozoan and Human diseases. Life cycle and Public Health Importance of Trypanosomiasis, Leishmaniasis and Trichomoniasis

UNIT - IV
Protozoan and Human diseases. Life cycle and Public Health Importance of Taenia solium, Schistosoma and Ascaris.

UNIT - V

TEXT BOOK

REFERENCE BOOK
Objectives
To make the students acquire knowledge of the biological diversity and their interspecific relations.

Unit-I
Characteristic features of major Invertebrate and Vertebrate phyla. (Protozoa, Porifera, Coelenterata, Platyhelminthes, Annelida, Arthropoda, Mollusca and Echinodermata. Protochordata, Fishes, Amphibia, Reptiles, Birds and Mammals)

Unit-II
Arthropods and vectors of human diseases (mosquitoes, lice, House fly and ticks). Mode of transmission of pathogens by vectors: control measures of vectors. Useful insect: silkworm

Unit-III

Unit-IV
Gametogenesis in animals - Molecular events during fertilization. Cleavage patterns and fate maps- and gastrulation

Unit-V
Origin of life-different concepts, Theories of organic evolution. (Darwinism, Neo-Darwinism, Lamarckism and Neo-Lamarckism): speciation.

TEXT BOOKS

REFERENCE BOOKS