

COURSE SCHEME AND SCHEME OF EXAMINATIONS
M.Sc. DEGREE COURSE IN ZOOLOGY
CHOICE BASED CREDIT SYSTEM (OBE PATTERN)
(For those admitted in June 2020 and later)

| Sem | Subject Code | Core/ Elective | Title of the paper | HRS/ Week | Credit | Exam (Hours) | Int. Mark | Ext. Mark | Mark |
|--------------------|--------------|----------------|---|------------|-----------|--------------|------------|-------------|-------------|
| <i>I</i> | 20P1ZO01 | Core-I | Taxonomy and Biosystematics | 5 | 4 | 3 | 25 | 75 | 100 |
| | 20P1ZO02 | Core-II | Cell and Molecular Biology | 5 | 4 | 3 | 25 | 75 | 100 |
| | 20P1ZO03 | Core-III | Biochemistry and Biophysics | 5 | 4 | 3 | 25 | 75 | 100 |
| | 20P1ZO04 | Core -IV | Microbiology and Immunology | 5 | 4 | 3 | 25 | 75 | 100 |
| | 20P1ZOP01 | Core Practical | Core Practical-I | 5 | 4 | 4 | 40 | 60 | 100 |
| | 20P1ZOE01 | Elective- I | Economic Zoology / Apiculture | 5 | 4 | 3 | 25 | 75 | 100 |
| Total | | | | 30 | 24 | | 165 | 435 | 600 |
| <i>II</i> | 20P2ZO05 | Core-V | Developmental Biology | 5 | 4 | 3 | 25 | 75 | 100 |
| | 20P2ZO06 | Core-VI | Animal Physiology & Endocrinology | 5 | 4 | 3 | 25 | 75 | 100 |
| | 20P2ZO07 | Core-VII | Molecular Genetics | 5 | 4 | 3 | 25 | 75 | 100 |
| | 20P2ZOP02 | Core Practical | Core Practical-II | 5 | 4 | 4 | 40 | 60 | 100 |
| | 20P2ZOE02 | Elective- II | Medical Laboratory Techniques / Radiation Biology | 4 | 3 | 3 | 25 | 75 | 100 |
| | 20P2ZOE03 | Elective- III | Ichthyology / Biodiversity and conservation Biology | 5 | 4 | 3 | 25 | 75 | 100 |
| Total | | | | 30 | 24 | | 165 | 435 | 600 |
| <i>III</i> | 20P3ZO08 | Core- VIII | Animal Biotechnology | 6 | 5 | 3 | 25 | 75 | 100 |
| | 20P3ZO09 | Core- IX | General and Applied Entomology | 6 | 5 | 3 | 25 | 75 | 100 |
| | 20P3ZO10 | Core- X | Environmental Biology | 6 | 5 | 3 | 25 | 75 | 100 |
| | 20P3ZOP03 | Core Practical | Core Practical – III | 6 | 4 | 4 | 40 | 60 | 100 |
| | 20P3HR01 | - | Human Rights | 2 | 1 | 3 | 25 | 75 | 100 |
| | 20P3ZOED01 | EDC | Sericulture | 4 | 4 | 3 | 25 | 75 | 100 |
| Total | | | | 30 | 24 | | 165 | 435 | 600 |
| <i>IV</i> | 20P4ZO11 | Core- XI | Biostatistics and Research Methodology | 6 | 5 | 3 | 25 | 75 | 100 |
| | 20P4ZO12 | Core- XII | Evolution | 6 | 5 | 3 | 25 | 75 | 100 |
| | 20P4ZOE04 | Elective- IV | First Aid and Home Nursing / Histology | 6 | 4 | 3 | 25 | 75 | 100 |
| | 20P4ZOPR01 | Core- PRI | Project and Viva Voce | 12 | 5 | - | - | 80+20 | 100 |
| Total | | | | 30 | 19 | - | 75 | 325 | 400 |
| Grand Total | | | | 120 | 91 | - | 570 | 1630 | 2200 |

**VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FOR WOMEN
(AUTONOMOUS)**

DEPARTMENT OF ZOOLOGY

M.Sc. DEGREE COURSE IN ZOOLOGY

SEMESTER-I (For those admitted in June 2020 and later) CORE PAPER - I

TAXONOMY AND BIOSYSTEMATICS -20P1ZO01

Contact hours per week - 05

Contact hours per semester: 75

4 CREDITS

SYLLABUS

Course Objectives:

- ❖ To acquire knowledge on the animal classification based on characters
- ❖ To study the fundamentals knowledge on feeding and locomotion of invertebrates
- ❖ To study the comparative anatomy of vertebrates and invertebrates

UNIT I CLASSIFICATION

Importance of taxonomy- **Identification using taxonomic keys, General characteristics of animal phyla**- Organization of coelom: Acoelomates, Pseudocoelomates and Coelomate groups. **Classification of animal phyla upto orders** in invertebrates & Vertebrates

UNIT II NOMENCLATURE

Zoological Nomenclature- History, Monomial, Binomial, Trinomial nomenclature. Homonymy and Synonymy. International Code of Zoological Nomenclature (ICZN) and its rules. Types of Nomenclature: Holotype, Allotype Paratype, Lectotype, Syntype, Neotype and Allotype. Three domains of life.

UNIT III LOCOMOTION& NUTRITION IN INVERTEBRATES

Locomotion and adaptive mechanism of Invertebrates- flagellar- ciliary movement in protozoa, hydrostatic movement in Coelenterates, Annelida and Echinodermata. Nutrition and feeding mechanism in Invertebrates- Nutrition in Protozoa- Types and mode of feeding. Feeding diversity in Insects. Filter feeding mechanism in Metazoan- Crustaceans, Mollusca and Echinodermata.

UNIT IV COMPARATIVE ANATOMY OF INVERTEBRATES

Comparative study of circulatory system, excretory systems, Nervous systems of invertebrates. Types of reproduction in Invertebrates

UNIT V COMPARATIVE ANATOMY OF VERTEBRATES

Comparative study on the structure and functions of alimentary canal and associated glands. Respiratory system of Fishes and Birds.. Excretory system of reptiles and mammals; Nervous system: Brain of Amphibia and Mammals, Reproductive system of Reptiles and Mammals.

REFERENCE BOOKS

1. R.L. Kotpal, (2016). Invertebrates, 11th Edition, Rastogi Publications.
2. R.L. Kotpal, (2016). Modern Text Book of Zoology Vertebrates, Rastogi Publications.
3. Anne EM (2003) Measuring Biological Diversity, Blackwell Publications, UK

4. Hosetti BB (2002) Biodiversity, Daya Books, New Delhi.
5. Colbert H and Edwin ((1989) Evolution of the Vertebrates. 2nd Edition, Wiley Eastern Limited, New Delhi.
6. Barnes RD (1982) Invertebrate Zoology.4th Edition, Holt Saunders International Edition.
7. Barrington EJW (1979) Invertebrate Structure and Functions.2nd Edition, ELBS and Nelson.
8. Waterman AJ (1971) Chordate Structure and Function. The Macmillan Company.

WEB SOURCES:

- <https://www.itis.gov/>
- <https://lib2.colostate.edu/wildlife/taxonomy.html>
- <https://en.wikipedia.org/wiki/Invertebrate>
- <https://en.wikipedia.org/wiki/Vertebrate>
- https://www.diffen.com/difference/Invertebrate_vs_Vertebrate

| SL No | Course Outcome | Knowledge Level |
|--------------|--|------------------------|
| CO1 | Describe the level of organization in Invertebrate and Chordates | K1 |
| CO2 | Bring out the locomotion and adaptive characters of Invertebrates. | K1 |
| CO3 | Summarize the feeding behavior of invertebrates and Chordates | K2 |
| CO4 | Compare the functional morphology of vertebrates and invertebrates. | K1 & K2 |
| CO5 | Discuss the Comparative study on the structure and functions of vertebrate | K1 |

**VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FOR WOMEN
(AUTONOMOUS)**

**DEPARTMENT OF ZOOLOGY
M.Sc. DEGREE COURSE IN ZOOLOGY**

SEMESTER-I

CORE PAPER - II

CELL AND MOLECULAR BIOLOGY – 20P1Z002

(For those admitted in June 2020 and later)

Contact hours per week: 05

Contact hours per semester: 75

4 CREDITS / SYLLABUS

Course Objectives:

- ❖ To study the structure and functional characters of biomolecules
- ❖ To understand the classification of biomolecules
- ❖ To gain knowledge on nucleic acids and enzymes
- ❖ To acquire knowledge about various biophysical techniques

UNIT I: INSTRUMENTATION & BASIC TECHNIQUE (15 Hours)

Microtome- Tissue Preparation, Sectioning, Mounting and Staining Techniques, **Micrometry**, Principles of Electron, Optical, and Phase contract **Microscope**, SEM, TEM, X- Ray Diffraction Analysis.

UNIT –II :CELL MEMBRANE AND CELL SIGNALLING (15 Hours)

Plasma membrane: Structure and modifications. Functions of plasma membrane. **Introduction of Cell** signaling: Intercellular signaling – Autocrine, Paracrine, Endocrine and Juxtacrine signaling. Intracellular signaling : G protein coupled receptors (GPCRs) and Second messengers. Cell coat and cell recognition- functions of cell coat. Microtubules and microfilaments – structure, functions, role in cancer formation

UNIT-III COMPONENTS OF CELLS (15 Hours)

Endoplasmic reticulum – special functions of Rough Endoplasmic Reticulum and synthesis of exportable proteins. Golgi complex – Synthesis of sphingolipids, glycoproteins, secretory process in pancreas, insulin secretion and GERL region. Lysosome - cell digestive system – functions. Mitochondria – Structure and Function, Respiratory chain, Ribosome – prokaryotic and eukaryotic ribosomes.

UNIT-IV CHROMOSOMES & CELL CYCLE (15 Hours)

Chromosomes – Eu chromatin and Hetero chromatin chromosome, giant chromosome. DNA – Structure, Replication and DNA repair. RNA – types and their role in cellular activities. Cell division- Cell Cycle– Mitosis – Amitosis – Meiosis –Synaptonemal complex and significance. Cell aging.

UNIT-V PROTEIN SYNTHESIS (15 Hours)

Protein synthesis – Transcription in Prokaryotes and Eukaryotes. RNA processing – Capping, polyadenylation, introns, exons. Translation– initiation, elongation and termination of polypeptide chain synthesis. Post translational modifications in Prokaryotes and Eukaryotes.

REFERENCE BOOKS:

1. P.S. Verma & V.K. Agarwal, (2015), Cytology, S.Chand & Co
2. Satyesh Chandra Roy, (2011), Cell Biology, New Central Books
3. Gupta, P.K. (2007) Cell and Molecular Biology, Rastogi Publications, Meerut.

4. DeRobertis, E.D.P. and E.M.F.D. DeRobertis (2007) Cell and Molecular Biology, Lea and Fabiger International Edition, Philadelphia.
5. Watson, J.D, Basker, T.A., Bell, S.P., Gann, A., Levine, M and Losick, R (2004) "Molecular biology of the gene", Pearson Education Pvt. Ltd., Singapore.
6. Bruce, A, Alexander, J, Julian, L, Martin, R, Keith R, and Peter, W, (2002) Molecular Biology of the Cell, Garland Science, Taylor Francis Group, New York.
7. Cooper, G.M. (2001) The cell- A Molecular Biological Approach, ASM Press, Washington.
8. Karp, G. (1985) Cell Biology, Mc Graw Hill Book Company, New York.

WEB SOURCES:

- https://www.cs.helsinki.fi/bioinformatiikka/mbi/courses/09-10/itb/Lectures_1509_and_1709.pdf
- https://molbiomadeeasy.files.wordpress.com/2013/09/fundamental_molecular_biology
- <https://www.studocu.com/en/document/murdoch-university/foundations-of-cell-and-molecular-biology/lecture-notes/lecture-notes-all-lectures-comprehensive-study-notes-for-final-exam/314293/view>.

| SL No | Course Outcome | Knowledge Level |
|--------------|--|------------------------|
| CO1 | Understand the basic instrumentation process and its technique | K1 |
| CO2 | Compare the cell signaling process between the cells and cell organization | K1 |
| CO3 | Explain the ultra structure and functions of Cytoskeletons and Plasma membrane | K2 |
| CO4 | Assess the events of cell cycle, cell death and cancer | K1 & K2 |
| CO5 | Illustrate the process of transcription and post transcriptional amendment in Eukaryotes | K1 |

VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FOR WOMEN
(AUTONOMOUS)
DEPARTMENT OF ZOOLOGY/M.Sc. DEGREE COURSE IN ZOOLOGY
SEMESTER-I CORE PAPER - III

BIOCHEMISTRY AND BIOPHYSICS - 20P1Z003

(For those admitted in June 2020 and later)

Contact hours per week - 05

Contact hours per semester: 75

4 CREDITS/SYLLABUS

Course Objectives:

- ❖ To provide students with relevant knowledge and skills on instrumentation techniques
- ❖ To study principles and types of cell communication and adhesion
- ❖ To acquire advanced knowledge of molecular biology of prokaryotes, and eukaryotes.

UNIT -I BIOCHEMICAL COMPOUNDS (15 Hours)

Structure of Atoms, Molecules and chemical bonds, stabilizing interactions (Van der Waals, electrostatic, hydrogen bonding, hydrophobic interaction, Electrostatic Force). Biological Importance of Water, pH and Buffers.

UNIT II CARBOHYDRATES AND PROTEINS (15 Hours)

Carbohydrates - Classification, structure, function and properties. Metabolism of carbohydrates, TCA Cycle, Glycolysis, HMP Shunt.

Proteins—Classification, Structural organization of proteins (Primary, secondary, tertiary and quaternary structures). Amino acids- Definition, Classification and properties,

UNIT -III LIPIDS (15 Hours)

Lipids –Classification, structure, function and properties of simple and compound Lipids. Biological importance of sterols, cholesterol, Bile acids. Fatty acid Biosynthesis and Beta oxidation of fatty acids.

UNIT -IV NUCLEIC ACIDS & ENZYMES (15 Hours)

Nucleic acids: Composition and Properties of nucleic acids. Enzymes- Definition, Classification and functions of enzymes – Co-enzymes, Iso-enzymes, Allosteric enzymes, Abzymes – Bioenergetics, oxidative phosphorylation, coupled reaction, group transfer, biological energy transducers.

UNIT – V: BIOPHYSICAL TECHNIQUES (15 Hours)

Separation Methods – Sedimentation – Chromatography methods. Spectroscopes. Introduction and applications of FTIR and Mass spectroscopy. Nuclear Magnetic Resonance (NMR); Radiation Bio physics – Introduction and medical applications.

REFERENCE BOOKS:

1. Satyanarayana,U, (2015), Essentials of Biochemistry, Books and Allied (P) Limited, Kolkata.
2. Avinash Upadhyay, Kakoli Upadhyay and Nirmalendu Nath, (2019), Biophysical Chemistry, Himalya Publications
3. Satyanarayana, U and Chakrapani, U (2009), Essentials of Biochemistry, Books and Allied (P) Limited, Kolkata.

4. Jain, J.L. (2007), Fundamentals of Biochemistry, S. Chand & Co. Ltd., New Delhi.
5. Stryer, L. (2006), Biochemistry, W.H. Freeman and Co., New York.
6. Chatterjee, H.N. and Spindle, R. (2005), Text Book of Medical Biochemistry, Jaypee Brothers, New Delhi.
7. Nelson, D.I. and Cox, M.M. (2004), Lehninger Principles of Biochemistry, III Edition, Mac Millon Worth Publishers, New York.
8. Devlin, T.M. (2003), Biochemistry, Wiley-Liss, New York.

WEB SOURCES:

- <http://www.agrimoon.com/wp-content/uploads/Fundamentals-of-Biochemistry.pdf>
- https://www.researchgate.net/publication/221657258_Fundamental_Concepts_in_Biophysics
- [http://www.himpub.com/BookDetail.aspx?BookId=1117&NB=&Book_TitleM=Biophysical%20Chemistry%20\(Principles%20and%20Techniques\)](http://www.himpub.com/BookDetail.aspx?BookId=1117&NB=&Book_TitleM=Biophysical%20Chemistry%20(Principles%20and%20Techniques))
- <https://www.britannica.com/science/nucleic-acid>

| SL No | Course Outcome | Knowledge Level |
|--------------|--|------------------------|
| CO1 | Classify the chemical bonds and forces interacting between molecules | K1 |
| CO2 | Summarize the structure, classification and- metabolic pathways of carbohydrates | K1 |
| CO3 | Understand the Structure, Classification and Metabolism of Proteins & Lipids. | K2 |
| CO4 | Illustrate the metabolic pathway of nucleic acid and enzymes. | K1 & K2 |

**VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FOR WOMEN
(AUTONOMOUS)**

DEPARTMENT OF ZOOLOGY/M.Sc. DEGREE COURSE IN ZOOLOGY

SEMESTER-I

CORE PAPER - IV

MICROBIOLOGY AND IMMUNOLOGY- 20P1Z004

(For those admitted in June 2020 and later)

Contact hours per week: 05

Contact hours per semester: 75

4 CREDITS/ SYLLABUS

Course Objectives:

- ❖ Acquire knowledge on the culture, isolation and control of microorganisms
- ❖ Learn the food preservation techniques and study microbes in food and water
- ❖ Study the organs of immune system and the innate and adaptive immunity
- ❖ To gain knowledge on antigens, antibodies and their production mechanism
- ❖ To study the antigen antibody reactions and immunological disorders

UNIT – I Microorganism Classification & Culture (15 Hours)

Bacteria : Characteristics, Classification and Structure. Bacterial Culture techniques: Culture media, sterilization techniques and culture methods. Economic importance of Bacteria.

Virus : Classification- DNA and RNA Virus. Bacteriophages – Multiplication and Life cycle.

UNIT – II Microbial diseases: (15 Hours)

Food Microbiology-Preservation of Food, Contamination, Food Borne diseases- Salmonella, Amoebiasis, Botulism and Aspergillus, Causes, Sources, Mode of Transmission, Symptoms and Control measures. Water Microbiology- Microbes in Water, Water borne diseases - Microbial analysis in potable water- SPC, MPN and membrane filter techniques. Methods of sewage treatment and disposal.

UNIT - III Immune System (15 Hours)

Humoral immunity-Cells involved in the immune system, innate immunity- factors involved in innate immunity, active and passive acquired immunity. Lymphoid organs: Thymus, Bursa of Fabricius and bone marrow, lymph node, spleen, MALT, GALT, Payer's patches, Tonsils.

UNIT IV Humoral and Cell mediated Immunity (15 Hours)

Primary and secondary immune response; Mechanism of antibody production, cell mediated immunity, MHC Classes and Structure. General Structure and Function of Immunoglobulin.

UNIT – V Immunopathology (15 Hours)

Antigen- antibody reaction; immune complex, specificity, binding sites, binding forces, Bonus effect and cross reaction. Hypersensitivity: Factors, types and classification. Transplantation Immunology- Auto immune diseases – Myasthenia gravis, Pernicious anemia, Rheumatoid arthritis, Systemic lupus erythematosus (SLE), Vaccines- principles & types of vaccine - significance.

REFERENCE BOOKS:

1. Venkateshwar Reddy .A & Jayaveera K.N, (2014), Pharmaceutical Microbiology, S.Chand & Co Publications.

2. Purohit, S.S., (2006) Microbiology, V Edition, Agrobios (India) Publishers, Jodhpur.
3. David, Brostoff and Roitt (2006) Immunology, 7th Edn., Mosby & Elsevier Publishing, USA.
4. Dubay, R. C. and Maheshwari D. K. (2005) Text Book of Microbiology, S. Chand & Co. Ltd., New Delhi.
5. Prescott, L.M., Harley, J.P. and Ulein, B.A. (2004) Microbiology (IV Edi). WMC, Broun Publisher, USA.
6. Pelczar, M.J. (2002) Microbiology, McGraw-Hill Education India Ltd., New Delhi.
7. Kuby, J. (1997) Immunology, W.H. Freeman &Co., New York.

WEB SOURCES:

- <http://microbiologyonline.org/>
- <http://periobasics.com/basic-microbiology.html>
- <https://en.wikipedia.org/wiki/Immunology>
- http://www.dphu.org/uploads/attachements/books/books_5451_0.pdf
- http://missinglink.ucsf.edu/lm/immunology_module/prologue/prologue_syllabus_2008.PDF

| SL No | Course Outcome | Knowledge Level |
|--------------|--|------------------------|
| CO1 | Determine the culture of microorganisms and its culture methods | K1 |
| CO2 | Summarize the beneficial characters of microbes in industries | K1 |
| CO3 | Describe the structure and functions of immune cells and lymphoid organs | K2 |
| CO4 | Discuss the structure, types and properties of various Immunoglobulin | K1 & K2 |
| CO5 | List the properties of antigen-antibody reaction, B and T cell | K3 |

**VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FOR WOMEN
(AUTONOMOUS)**

DEPARTMENT OF ZOOLOGY/M.Sc. DEGREE COURSE IN ZOOLOGY

SEMESTER-I

ELECTIVE – 1a

APICULTURE - 20P1ZOE01

(For those admitted in June 2020 and later)

Contact hours per week: 05

Contact hours per semester: 75

4 CREDITS/ SYLLABUS

Course Objectives:

- ❖ To study the economic importance of apiculture
- ❖ To study the importance of honey bees and its byproducts

UNIT – I: SCOPE AND HISTORY

Introduction to Apiculture - Scope, importance and History of bee keeping. **Systematic position** with reasons for honey bee. Apiculture development in India. Role of Honey Bee Research & Training Institutes.

UNIT – II: MORPHOLOGY AND ANATOMY OF BEE

Honey Bee: Morphology, anatomy and life cycle. Honey bee species and identification. Social behavior and different castes of honey bee.

UNIT – III BEE HIVE

Honey bee hive - Types of bee keeping: Traditional and modern bee keeping, structure and location of bee hive. Swarming and pheromone in honey bee hive.

UNIT – IV CARE and MANGEMENT

Apiary care and management – Materials used in apiary. Harvesting and extraction of honey. Honey bee enemies (Wax Moth, Ants, Wasps, Microorganisms & Pests) and disease (Bacterial, viral and fungal) and their management.

UNIT – V ECONOMICS

Apiculture as self-Honey - its properties and application in various fields - Types of value-added honey products. Economics of bee keeping -Preparing bankable bee keeping project: Steps involved in starting a beekeeping project, Funding sources for beekeeping projects.

REFERENCE BOOKS:

1. Cherian R, & K.R. Ramanathan, 1992 – Bee keeping in India,
2. Mishra, R.C., 1985 – Honey bees and their Management in India, ICAR.
3. Singh, S.1982-Bee keeping – ICAR
4. Sharma, P. and Singh L. 1987 – Hand book of bee keeping, Chandigarh
5. Rare, S. 1998-Introduction. to bee keeping, Vikas publishing house.

| SL No | Course Outcome | Knowledge Level |
|--------------|--|------------------------|
| CO1 | Elucidate the role of honey bee in diverse applications. | K1 |
| CO2 | Acquired knowledge about Anatomical characters of honey bees | K1 |
| CO3 | Identify the economically important of honey and bee hive | K2 |
| CO4 | Understand the Apiary care and management | K1 & K2 |
| CO5 | Illustrate properties and application of honey bee in various fields | K3 |

**VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FOR WOMEN
(AUTONOMOUS)**

DEPARTMENT OF ZOOLOGY/M.Sc. DEGREE COURSE IN ZOOLOGY

SEMESTER-I

ELECTIVE – I

ECONOMIC ZOOLOGY - 20P1ZOE01

(For those admitted in June 2020 and later)

Contact hours per week: 05 Contact hours per semester: 75

4 CREDITS - SYLLABUS

UNIT I: LAC CULTURE

Lac Culture : Types of Lac; Life cycle of Lac insect, Harvesting and Extraction of Lac; Uses and Enemies of Lac. Economic Importance -**Honey bee**

UNIT II: POULTRY

Types of birds for poultry – Bio-security measures followed in Poultry farms, Diseases and pests – Egg and meat production – Types of breeds rearing in animal husbandry (Cow, Sheep and Goats, Pigs) – Disease and parasites of animal husbandry. Economic importance.

UNIT III: AQUACULTURE

Aqua culture- Site selection and Construction, Pre stocking and post stocking management of Nursery, rearing and stocking ponds, Fish byproducts. Prawn culture - Methods of prawn fishing, Preservation - Fish and Prawn, Marketing of Prawn.

UNIT IV: VERMICULTURE

Species of earthworm used in vermiculture- Raw materials for vermiculture- Compost Production. Natural enemies and their control measures-Harvesting of vermicompost and worms -Role of vermicompost in agriculture.

UNIT V: PHARMACEUTICALS

Sericulture – Types of Silk worms, **Rearing techniques**, Diseases – Bacterial, Fungal and Protozoan - their managements, reeling and Byproducts.

REFERENCE BOOKS:

1. Banerjee, G.C. (2015), Animal Husbandry, Navyug Book International Publications
2. Jawaid, A. and Sinha, S. P. (2008) A Handbook of Economic Zoology. S. Chand Group Publishers, New Delhi.
3. Khan, A. A. (2007) Encyclopedia of Economic Zoology. 2 vols. Anmol Publications Pvt. Ltd., New Delhi.
4. Upadhyay, V.B. (2006) Economic Zoology. Rastogi Publications, Meerut, India.
5. Nigam, H.C. (2006) Modern Trends in Biology & Economic Zoology, Vishal Publishing. Co., Jalandhar.
6. Jabde and Pradip V (2005) Text Book of Applied Zoology, Discovery Publishing House, New Delhi.

**VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FOR WOMEN
(AUTONOMOUS)
DEPARTMENT OF ZOOLOGY
M.Sc. DEGREE COURSE IN ZOOLOGY**

SEMESTER-II

CORE PAPER –V

**DEVELOPMENTAL BIOLOGY – 20P2ZO05
(For those admitted in June 2020 and later)**

Contact hours per week: 05

Contact hours per semester: 75

4 CREDITS
SYLLABUS

Course Objectives:

- To understand the structure of gametes and the events of gametogenesis
- Acquire knowledge on the fertilization and morphogenetic movements in the developing embryo

UNIT– I: GAMETES (15 Hours)

Gametogenesis: Spermatogenesis- Types of Sperm, Ultra structure of Human sperm, Sperm motility and role of sperm in egg activation. Oogenesis- Types of Eggs and egg membranes, Ultra structure of Mammalian egg.

UNIT– II: FERTILIZATION (15 Hours)

Fertilization– Process and significance – Post – fertilization changes. Parthenogenesis (Natural and Artificial). Cleavage – Chemical changes during cleavage – Pattern and plane of cleavage –Fate map.

UNIT – III: ORGANOGENESIS (15 Hours)

Morphogenetic movements – Nucleocytoplasmic interactions in morphogenesis – Gastrulation in Frog and Mammal- (Mouse). Organogenesis – Eye, heart, kidney and brain in Frog, Foetal membranes – Placenta (Human) – classification and physiology.

UNIT – IV: METAMORPHOSIS & REGENERATION (15 Hours)

Morphological and biological changes associated with metamorphosis – Hormonal control of amphibian metamorphosis – Neuro-endocrine control of insect metamorphosis. Regeneration –Types of regeneration - Experimental evidence for Regeneration.

UNIT – V: DIFFERENTIATION (15 Hours)

Embryonic fields and embryonic induction, Types of Differentiation – Genes in differentiation – Inductors and organizers.

REFERENCE BOOKS:

1. Lewis Wolpert (2007) Principles of Development (III edition) Oxford University Press, UK.
2. Gilbert, S.F. (2006) Developmental Biology, 8th edition, Sinauer Associates, Inc. Publishers, Sunderland, Massachusetts.
3. Gilbert, F.S. (2003) Developmental Biology, 7th Edition, Sinauer Associates, Inc. Publishers, Sunderland, Massachusetts.

4. Balinsky, B.I. (2004) An Introduction to Embryology, 5th edition, Thomas Asia Pvt. Ltd, Chennai.

WEB SOURCES:

- <https://study.com/academy/topic/basics-of-developmental-biology.html>
- https://gurukpo.com/Content/Bsc-biotech/Development_Biology.pdf
- <https://www.khanacademy.org/science/biology/developmental-biology/development-and-differentiation/a/introduction-to-development>
- <https://www2.bc.edu/christopher-kenaley/bio3030/Wolpert.Ch1.pdf>

**VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FOR WOMEN
(AUTONOMOUS)**

**DEPARTMENT OF ZOOLOGY
M.Sc., DEGREE COURSE IN ZOOLOGY
(For those admitted in June 2020 and later)**

**SEMESTER – II
Contact hour per week : 05**

**CORE PAPER – VI
Contact hour per semester : 75**

ANIMAL PHYSIOLOGY AND ENDOCRINOLOGY – 20P2ZO06

Unit – I : Digestion and Respiration

Physiology of Carbohydrate, Protein and lipid digestion. **Physiology of digestion** and assimilation. Balanced diet. Nutrient requirement for pregnant women and infants.

Types of respiration. **Physiology of respiration and Excretion**– Gaseous exchange. Respiratory pigments. Transport of oxygen and carbon-dioxide.

Unit – II : Circulation and Excretion

Types of hearts, working mechanisms of heart – Origin and conduction of heart beat. Cardiac cycle and ECG. Blood coagulation factors and mechanism.

- Nature and types of excretory products - Ammonotelism, Ureotelism and Uricotelism. Excretory organs in invertebrates and vertebrates. Structure of nephron, Physiology of urine formation and its control in human.

Unit – III: Nervous and Muscular system

Types of neuron, Structure of typical neuron. Transmission of nerve impulse – Axonomic, synaptic transmission and neuromuscular junction. Reflex action.

Types of muscles. Ultra structure of striated muscle. Mechanism and theories of muscle contraction. Thermoregulation in animals – Aestivation and Hibernation.

Unit – IV: Sense organs and Pituitary gland

Chronobiology – Biological clock and Photoperiodism. Physiology of Photoreceptor – Human eye. Physiology of Phonoreceptor – Human ear.

Hormones of Hypothalamus and its significance. Biological importance of Pituitary gland and its hormones.

Unit – V : Endocrine glands and Hormones

Hormones and significance of Thyroid gland, Parathyroid gland, Pineal gland, Adrenal gland, Pancreas, Gastrointestinal hormones, Testis and ovary.

REFERENCE BOOKS:

1. Moyes, C.D. and Schulte, P. M. (2006) Principles of Animal Physiology, Pearson Education Inc. Chennai.
2. Tortora, G. J. and Derrickson, B. (2006) Principles of Anatomy and Physiology, 11th edition, John Wiley and Sons Inc. USA.
3. Richard W. Hill, Gordon A. Wyse (2004) Animal Physiology, Second Edition, Sinauer Associate, Inc Publishers, USA.

4. Guyton, A.C. (2001) Text book of Medical Physiology 10th edition W. B. Saunders Company, Philadelphia.
5. Prosser, C.L. (1973) Comparative Animal Physiology, 3rd Edition, W.B. Saunders & Co. Philadelphia.

M.Sc. DEGREE COURSE IN ZOOLOGY
SEMESTER-II **CORE PAPER –VII**
MOLECULAR GENETICS -20P2ZO07

(For those admitted in June 2020 and later)

Contact hours per week: 05

Contact hours per semester: 75

4 CREDITS – SYLLABUS

UNIT – I: GENES & GENE REGULATIONS

Eukaryotic genome - Structure of Gene - One Gene One Polypeptide Concept;
Gene Regulations in Prokaryotic & Eukaryotic - GAL & LAC operon system; Karyotype

UNIT – II: MICROBIAL & HUMAN GENETICS (20 Hours)

Methods of Genetics transfer in bacteria- conjugation, transformation and transduction,
Viral genetics – bacteriophage; **Gene and genetic pathways**-Inborn errors of metabolism- Sickle
cell anemia - Phenylketonuria and Alcaptonuria. **Evidence of genetic material in bacteria.**

UNIT - III: MUTATION

Chromosomal and point mutation, Spontaneous and Induced mutation, mutagens: physical,
chemical and biological – Genetic changes in Neoplasia in man.

UNIT - IV: CLASSICAL CONCEPT

Genetic Interactions - Types & Classification - Dosage Composition - X inactivation -
genomic imprinting; Genetic Mapping - Concept - Genetic Mapping & Physical Mapping

UNIT V: APPLIED GENETICS

Application of genetics in animal breeding – application of genetics in crime and law – DNA
finger printing. Genetics basis of twins.

REFERENCE BOOKS:

1. L.M.Narayanaa& A. Mani, 2014. Genetics and Genetic Engineering, Saras Publications
2. B.D. Pandey, 2012. Cytology, Genetics and Molecular Genetics, Mcgraw Hill
3. Klug, W.S., Cummings, M.R., Spencer, C and Palladino, M.A. (2008) Concepts of Genetics, 9th edition (2008), Benjamin Cummings, Canada.
4. Benjamin Lewin (2008) Genes IX, 9th edition, Jones and Barlett Publishers Inc. London.
5. Snustad D. Peter and Simmons J. Micheal, (2006) Principles of Genetics, 4th edition, John Wiley and Sons. Inc., USA.
6. Daniel J. Fairbanks, W. Ralph Andersen (1999) Genetics, Brooks/Cole Pub Co., USA.
7. Eldon J. Gardner, D.P. Snustad, M.J. Simmons, and D. Peter Snustad (1991) Principles of Genetics, 8th edition, John Wiley and Sons. Inc., USA.
8. David Freifelder (1987) Microbial Genetics, Jones & Bartlett Co., USA.
9. Leon A. Snyder, David Freifelder, Daniel L. Hartl (1985) General Genetics, Jones and Bartlett., London.

10. Monroe W. Strickberger, (1968), Genetics, 3rd edition, Macmillan Publishing Co. Bangalore.

WEB SOURCES:

- <https://ocw.mit.edu/courses/biology/7-03-genetics-fall-2004/lecture-notes/>
- http://www.bionet.nsc.ru/ICIG/CHM/books/Hartl_Jones_Genetics.pdf
- http://www.bionet.nsc.ru/ICIG/CHM/books/Hartl_Jones_Genetics.pdf
- https://www.bio.bg.ac.rs/materijali_predmeta/med-eng-griffiths-an-introduction-to-genetic-analysis.pdf
- http://gsi.semmelweis.hu/files/ebook/Genetics%20genomics_en.pdf
- <https://www.thesisscientist.com/docs/Study%20Notes/12a79a12-7a79-4d08-8f16-a84e0d70b65d>.

VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FOR WOMEN
(AUTONOMOUS)

DEPARTMENT OF ZOOLOGY
M.Sc. DEGREE COURSE IN ZOOLOGY

SEMESTER-II

ELECTIVE –II

MEDICAL LABORATORY TECHNIQUES -20P2ZOE02

(For those admitted in June 2020 and later)

Contact hours per week: 05

Contact hours per semester: 75

4 CREDITS

SYLLABUS

UNIT – I LABORATORY & SAFETY (15 Hours)

The laboratory: Safety, Contaminants- Physical, Chemical, Biological Contaminants. – Universal work precautions (NWP) for laboratory personnel. Disposing of Biomedical waste.

UNIT – II PARAMETERS (15 Hours)

Haemoglobin content, Differential Count, Haematocrit, packed cell volume, MCH, MCHC, MCV, Erythrocyte sedimentation rate, RBC fragility test, platelet count. Reticulocytocrit, haemorrhagic disorders, clotting time, Bleeding time, prothrombin time.

UNIT – III URINE TESTS (15 Hours)

Knowledge and skill in the study and analysis of urine. Physical parameter,- Colour, odor, p^H, Density. Chemical parameters – Sugar, Albumin, Ketone bodies and their clinical significances pregnancy tests.

UNIT – IV MICROBIAL PARAMETERS (15 Hours)

Microbial analysis of Blood, Urine, Faeces, Sputum. Parasitic analysis in Blood and Faeces, Analysis of semen, and cerebrospinal fluid for clinical investigation.

UNIT – V MODERN ANALYSIS (15 Hours)

Molecular diagnostic techniques – RIA, ELISA, WESTERN BLOT, WIDEL TEST and DNA finger printing.

REFERENCE BOOKS:

1. Sood and Ramnik (2009) Medical Laboratory Techniques, Jaypee Brothers, New Delhi.
2. Kanai L. Mukherjee and Swarajit Ghosh (2009) Medical Laboratory Techniques, , Tata Mc Graw Hill Publishing Company Ltd., New Delhi.
3. B. S. Chauhan (2009) Principles of Biochemistry and Biophysics, first edition, Luxmi publishers, New Delhi.
4. Garrod, L.P. (2008) Medical Laboratory Techniques, BMJ publishers, USA.
5. Estridge, B.H., Reynolds, A.P. and Walters N.J. (2007) Basic Clinical Laboratory Techniques, Cengage Learning, Hyderabad.

**VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FOR WOMEN
(AUTONOMOUS)
DEPARTMENT OF ZOOLOGY
M.Sc. DEGREE COURSE IN ZOOLOGY
(For those admitted in June 2020 and later)**

SEMESTER-II

ELECTIVE –III

ICHTHYOLOGY- 19P2ZOE03

Contact hours per week: 05

Contact hours per semester: 75

**4 CREDITS
SYLLABUS**

Course Objectives:

- To study the types of fish culture and the techniques involved in rearing
- To study the recent techniques of fish rearing under controlled conditions
- To learn recent trends in harvesting and marketing of fishes.

UNIT I: Fin fish and Shell fish Anatomy&Behaviour:

Morphology of skin, colouration, scales, mouth, jaws, teeth, fin and fin rays and their taxonomic importance. Internal anatomy (Fish & Prawn) of alimentary canal and associated structure, Respiratory and accessory respiratory organs, circulatory system, Reproductive system. External Character of Prawn, Crab, Lobster, Bivalves, Gastropods and Cephalopod. Fish behavior: Parental care of fishes. Fish Migration.

UNIT II: Fish Growth:

Isometric and allometric growth, the cube law, analysis of growth check on hard parts(Scale, otolith,), Marking and tagging of fish for growth studies, length-weight relationship.

UNIT III: FISH CULTURE & FARMING:

Importance of fisheries-Aim and qualities of culturable fishes. Types of fish culture: Monoculture – composite culture- Integrated fish culture. Construction and maintenance of fish farm- Types of fish pond- Breeding types

UNIT IV: FISHING METHODS &BY PRODUCTS:

Harvesting-Methods of fishing. Gears and Crafts. Fish market-Fish Copfed, Benfish, Sangams. Fish handling, quality and processing. Preservation and processing methods, Fishery byproducts. Fish spoilage – Rigor mortis. Post-harvest technology.

UNIT V: Fish Nutrition & DISEASE MANAGEMENT:

Food and feeding habit of fish, prawn, crab, bivalves and cephalopod. Fish diseases- Parasitic and Non- Parasitic diseases, Protozoan disease, and Nutritional disorder. Symptoms and Treatment methods.

REFERENCE BOOKS:

1. Jawaid, A. and Sinha, S. P. (2008) A Handbook of Economic Zoology. S. Chand Group Publishers, New Delhi.

2. Shukla, G.S. and Upadhyaya, V.B. (2005) Economic Zoology, Rastogi Publications, Meerut, India.
3. Kamaleswarpandey and. Shukla, J.P. (2005) Fish and Fisheries, Rastogi Publications, Meerut.
4. Yadav, M (2003) Economic Zoology. Discovery Publishing House, Rastogi Publications, Meerut.
5. Shanmugam, K. (1992) Fishery Biology and Aquaculture, Leo Pathippagam, Chennai.
6. Jingran, V.G. (1983) Fish and Fisheries of India, 2nd Edition, Hindusthan Publications, New Delhi.

WEB SOURCES:

- http://himachal.nic.in/WriteReadData/l892s/4_l892s/1402134883.pdf
- https://www.aquariumconnection.com/pdf/fw_disease_rx.pdf
- <http://www.guammarinelab.org/publications/uogmltechrep104.pdf>

VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FOR WOMEN
(AUTONOMOUS)

DEPARTMENT OF ZOOLOGY/M.Sc. DEGREE COURSE IN ZOOLOGY

SEMESTER-III

CORE PAPER: VIII

ANIMAL BIOTECHNOLOGY - 20P3ZO08

(For those admitted in June 2020 and later)

Contact hours per week: 06

Contact hours per semester: 90

5 CREDITS - SYLLABUS

Course Objectives

1. To acquire knowledge on technology used in living organisms
2. To learn the techniques in animal Cell cultures
3. To acquire knowledge about different animal breeding
4. To diagnose different diseases and their rectification techniques by using vaccines & drugs
5. To learn the ethics related to animal biotechnology

UNIT I: GENETIC ENGINEERING

Tools in Genetic Engineering-Enzymes, and Vectors- Plasmids, Cosmids and Phagemids. Methods of gene isolation, DNA sequencing Techniques, PCR – Types and applications, Gene transfer methods.

UNIT II: ANIMAL CELL CULTURE

Requirements in animal tissue culture laboratory instruments and media. Tissue culture, Organ culture - techniques, Advantages and applications, Detection of contaminants, Preservation and storage of cells, Animal tissue culture media, Safety consideration in laboratory cell culture.

UNIT III: ARTIFICIAL ANIMAL BREEDING

Artificial insemination, Transplantation, in-vitro fertilization (IVF), ICSI and embryo transfer. Production and use of transgenic animals, Biotechnology in Aquaculture- Gynogenesis, androgenesis. Transgenic fishes, Ethics of transgenic animals.

UNIT IV: ANIMAL HEALTH AND BIOTECHNOLOGY

Animal health - disease diagnosis, Monoclonal Antibodies - Prophylaxis - vaccines and its types, Antibiotic drugs and their sensitivity tests – Gene therapy.

UNIT V: APPLICATIONS OF BIOTECHNOLOGY IN SOCIETY

Bio fertilizers, Enzymes in detergents and leather industries, Biofuel- Biogas, bio ethanol, safety measures in biotechnology, Bioethics, Intellectual Property Rights and Patent.

REFERENCE BOOKS:

1. Satyanarayana, U. (2010) Biotechnology, Books and Allied Pvt Ltd. Kolkata.
2. Dubey, R.C. (2006) A textbook of Biotechnology, S. Chand Company Ltd. New Delhi.
3. Kumar, H.D. (2008) Modern concepts of Biotechnology, Vikas Publishing House Pvt Ltd., New Delhi.
4. Ranga, M.M. (2003) Animal Biotechnology, Agrobios Publishers, India,
5. Pradeep Parihar, (2004) A textbook of Biotechnology, Student Edition, Jodhpur.
6. Sasidhara, R. (2006) Animal Biotechnology, MJP Publishers. Chennai.

| SL No | Course Outcome | Knowledge Level |
|--------------|--|------------------------|
| CO1 | Define the tools and its uses in genetic engineering | K1 |
| CO2 | Compare the type of cell and its culture technique | K1 |
| CO3 | Analyze the technique of artificial insemination | K2 |
| CO4 | Understand the disease diagnosis process in animals | K1 & K2 |
| CO5 | Elucidate the Enzymes in detergents and leather industries | K1 |

VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FOR WOMEN
(AUTONOMOUS)

DEPARTMENT OF ZOOLOGY/M.Sc. DEGREE COURSE IN ZOOLOGY

SEMESTER-III

CORE PAPER: IX

GENERAL AND APPLIED ENTOMOLOGY - 20P3ZO09

(For those admitted in June 2020 and later)

Contact hours per week: 06

Contact hours per semester: 90 hrs

5 CREDITS/ SYLLABUS

Course Objectives

- 1 To learn the taxonomical importance and classification of insects
- 2 To acquire knowledge about agricultural importance of insect pest
- 3 To identify the pests of stored products and medical importance of vectors
- 4 To learn different pest control measures

UNIT I TAXONOMY OF INSECTS

Classification of Class Insect - Key characters of insect, **Economic importance of insects** with example: Orders - Orthoptera, Hemiptera, Coleoptera, Diptera, Lepidoptera and Hymenoptera. Reasons for insects attaining pest status.

UNIT II TYPES OF PEST IN AGRICULTURE

Life cycles of any four pests of Paddy, Sugarcane, Cotton and Stored products –Nature of Damage and control measures, Life cycle of any two pests of cattle and poultry- control measures.

UNIT III INSECT PEST OF STORED PRODUCTS

Household insects and their control- Cockroach, Lepisma and carpet beetle- Insect vectors of human diseases: brief account on vector biology, pathogens involved, disease transmitted by mosquito and control measure, housefly and flea. Insect vectors of plant diseases- white fly and leaf hoppers.

UNIT IV BENEFICIAL INSECTS

Insect galls- NPV. Insects in medicine- Beneficial insects: predators- parasites- weed killers- soil builders- scavengers.

UNIT V PEST MANAGEMENT

Classification of insecticides based on the mode of entry, mode of action and chemical nature- merits and demerits of chemical methods of pest control, Pest resurgence. - Biological method of pest control, Integrated pest management (IPM)- precautions in handling pesticides- pesticide poisoning, first aid.

REFERENCE BOOKS:

1. Rajendra Singh, 2016. Elements of Entomology. 2nd Edition: Rastogi publications, New Delhi.
2. Nalina Sundari, M.S. and Santhi, R. (2006) Entomology, MJP Publishers, Chennai.
3. David, B.V. (2001) Elements of Economic Entomology, Popular Book Depot, Chennai.
4. Dunston, P. Ambrose (2004) The insects: Structure, Function and Biodiversity, Kalyani Publications, New Delhi.
5. Srivastava, K.P. (1993) Text Book of Applied Entomology, Vol. I & II, Kalyani Publications, New Delhi.

6. Nayar, K.K., Ananthkrishnan, T.N. and David, B.V. (1982) General and Applied Entomology, Tata Mc Graw Hill, New Delhi.
7. Ayyar, T.V.R. (1984) Handbook of Economic Entomology for South India, Books and Periodicals, Supply Service, New Delhi.

| SL No | Course Outcome | Knowledge Level |
|--------------|---|------------------------|
| CO1 | Describe the classification of insects | K1 |
| CO2 | Elucidate the control methods of pest in the different field of agriculture | K1 |
| CO3 | Classify the Households insects and their control | K2 |
| CO4 | Outline the beneficial insects like silkworm and honey bee | K1 & K2 |
| CO5 | List the pest of stored products and their controlling mechanisms | K1 |

VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FOR WOMEN
(AUTONOMOUS)

DEPARTMENT OF ZOOLOGY/M.Sc. DEGREE COURSE IN ZOOLOGY

SEMESTER-III

CORE PAPER: X

ENVIRONMENTAL BIOLOGY - 20P3ZO10
(For those admitted in June 2020 and later)

Contact hours per week: 06

Contact hours per semester: 90 hrs

5 CREDITS/ SYLLABUS

Course Objectives

- ❖ To introduce the students to various concerns regarding the environment, regionally and globally including the natural challenges, pollution and their effects in the changing environment.

UNIT I ECOSYSTEM

Definition and concepts of ecosystem – Types of ecosystem (pond, forest, desert, cropland and estuarine ecosystem). Energy flow in ecosystem food chains, food webs and ecological pyramids.

UNIT II BIODIVERSITY

Definition of biodiversity, value of biodiversity, threats to biodiversity, endemic and endangered species of India. In-situ conservation – protected areas, National parks, wild life sanctuaries, conservation projects – tiger, elephant. Ex-situ conservation Zoological parks, Germ plasm banks, Biosphere reserves, National bureau of animal genetic resources.

UNIT III POLLUTION

Introduction -Types of pollution- Air, water, soil Pollution -effects and control measures. Biomagnification - eutrophication – Environmental Impact Assessment (EIA), bio indicators- bio remediation-bio degradation.

UNIT IV NATURAL RESOURCES

Resources – types, water resources management, Forest resources and chipko movement. Energy resources – renewable and non - renewable. Conventional and non – Conventional sources of energy.

UNIT V ECOLOGICAL HABITATS

Biomes, temperate deciduous forest, temperate grass land, savanna, tropical rain forest and desert, ecotone, estuary, concepts of ecological niche, types of ecological succession. Remote Sensing and GIS - introduction and applications

REFERENCE BOOKS:

1. Gowrikrishna Dasmohapatra (2009) Environment and Ecology (III Edn) VIKAS Publishing House Pvt Ltd, New Delhi.
2. Ahluswalia, V.K. and Sunita Malhotra (2009) Environmental Sciences, Ane Books Pvt Ltd, New Delhi.
3. Misra, S.P and Pandey, S.N. (2009) Essential Environmental Studies, Ane Books Pvt Ltd, New Delhi.
4. Kormondy, E.J. (2007) Concepts of Ecology, Frenitce Hall of India, New Delhi.
5. Agarwal, K.C. (1999) Environmental Biology, Agro Bolanica, Bikaner.

6. Castri, F.D and Younes, T. (1996) "Biodiversity Science And Development" Cab Int., Wallingford, UK.
7. Ananthkrishnan, T.N. (2000) Bioresources Ecology, Oxford and IBH Publishing Co., New Delhi.
8. Odum, E.P., (2003) Fundamentals of Ecology, Holt Saunders, Philadelphia.
9. Odum, E.P., (2000) Basic Ecology, Holt Saunders, Philadelphia.
10. Siddiqui, K.A., (2000) Pollution conservation and forestry, Kitab Mahal, New Delhi.

| SL No | Course Outcome | Knowledge Level |
|--------------|---|------------------------|
| CO1 | Recall the basic concepts of ecosystem | K1 |
| CO2 | Summarize the biodiversity and Energy flow in ecosystem food chains | K1 |
| CO3 | Discuss the forest resource management | K2 |
| CO4 | Understand the biodiversity and its conservation process | K1 & K2 |
| CO5 | List the type of pollution and its controlling mechanisms | K1 |

VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FOR WOMEN
(AUTONOMOUS)

DEPARTMENT OF ZOOLOGY/M.Sc. DEGREE COURSE IN ZOOLOGY

SEMESTER-III

CORE PAPER: X

**GENERAL AND APPLIED ENTOMOLOGY,
ENVIRONMENTAL BIOLOGY AND ANIMAL BIOTECHNOLOGY
(20P3ZOP03)**

(For those admitted in June 2020 and later)

Contact hours per week: 06

Contact hours per semester: 90 hrs

5 CREDITS/ SYLLABUS

I. GENERAL AND APPLIED ENTOMOLOGY

1. Preparation of key for the identification of insects using dichotomous Key.
2. Different types of Mouth parts of insects, their feeding habits (Diagram and description).
3. Study of insects: Beneficial and Harmful insects
4. Observation of important pests of paddy, sugar cane, cotton, pulses, vegetables, fruits and stored products to understand the life history of insects in relation to the life history of plants
5. Field study to understand the various methods of pest managements: (Observation in agro ecosystem).

II. ENVIRONMENTAL BIOLOGY

6. Estimation of dissolved O₂ in given water sample (Winkler's method).
7. Estimation of CO₂ content in given water sample.
8. Identification and description of fresh water plankton. (Daphnia, Cyclops, Volvox, Paramecium, Euglena).

III. ANIMAL BIOTECHNOLOGY

9. Single cell Protein culture – Demo.
10. Demonstration of southern Blotting and SDS PAGE techniques.
11. Tour reports of the visits to Biotechnological Research Lab / Industries.

IV. RECORD SUBMISSION

REFERENCE BOOKS:

1. David B.V. (Ed.), (1992) Pest Management and Pesticides: Indian Scenario, Namrutha Publications, Madras.
2. Hill D.S. (1987) Agricultural Insect Pests of Tropics and their Control, Cambridge University Press, UK.
3. Michael P. (1984) Ecological Methods for field and Laboratory Investigations, Tata Mc Graw Hill Publishing Company Ltd, New Delhi.
4. Nayar N.K. Ananthakrishnan T.N. and David B.V. (1983) General and Applied Entomology, Tata Mc Graw Hill Publishing Company, New Delhi.
5. Brown, T.A. (2006) Gene cloning -An Introduction, Stanley Thrones (Publishers) Ltd., Cheltenham, U.K.

| SL No | Course Outcome | Knowledge Level |
|--------------|--|------------------------|
| CO1 | List the Preparation of key for the identification of insects | K1 |
| CO2 | Observation of important pests of paddy, sugar cane | K1 |
| CO3 | Analyses the water quality parameters with O ₂ estimations. | K2 |
| CO4 | Demonstration of Blotting and SDS PAGE techniques | K1 & K2 |
| CO5 | Understand the various methods of pest managements | K1 |

VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FOR WOMEN
(AUTONOMOUS)

DEPARTMENT OF ZOOLOGY/M.Sc. DEGREE COURSE IN ZOOLOGY

SEMESTER-III

CORE PAPER: X

EDC: SERICULTURE - 20P3ZOED01
(For those admitted in June 2020 and later)

Contact hours per week: 06

Contact hours per semester: 90 hrs

5 CREDITS/ SYLLABUS

UNIT I INTRODUCTION TO SERICULTURE

History of Sericulture: Silk production, Scope and limitations of sericulture Industry- Life Cycle of Silkworm: *Bombyx mori* Morphology, stages and life cycle.

UNIT II MULBERRY CULTIVATION

Preparation of land for mulberry cultivation, Study of mulberry varieties- Methods of plantation and leaf production- Identification of mulberry diseases, pests and control measures.

UNIT III SILKWORM REARING TECHNIQUES

Grainage operations and activities. Silkworm rearing- Rearing environment condition-shoot harvest method of rearing- spacing and leaf requirement in different stages. Disinfection of rearing houses and appliances- handling of eggs- Transporting of eggs- hatching. –Brushing- young age and late age rearing- Spinning and mounting- Harvesting- transportation and marketing.

UNIT IV DISEASES OF SILKWORM

Silkworm diseases, symptoms and control measures: Protozoan disease-.Pebrine, Bacterial diseases- Flacherie, Viral diseases- Grasserie, Fungal diseases- Muscardine. Pest of Silkworm.

UNIT V SILK PRODUCTION & BY PRODUCTS OF SERICULTURE

Materials for reeling, stifling, cocoon cooking and brushing reeling- raw silk reeling- raw silk testing -classification of silk -By products of sericulture- **Economic importance of silk** worm- Economics of sericulture -a Role of women in Indian sericulture.

REFERENCE BOOKS:

1. Ganga G. and J. Sulochana Chetty (2005) An introduction to sericulture, 2nd Edition Vijay Primlani Publ. For Oxford and IBH Publ. Co. New Delhi.
2. Rangasamy, G. (1987) Manual on sericulture FAO, Vol. I-IV, Agriculture service bulletin, CSB, Bangalore, INDIA.
3. Dandin, S.B. (2004), Hand book of new sericulture technologies, Central Silk Board, Board, Bangalore, pp 287.

| SL No | Course Outcome | Knowledge Level |
|--------------|---|------------------------|
| CO1 | Recognize the scope of Silkworm production | K1 |
| CO2 | Explain the nutritional values of Mulberry plant | K1 |
| CO3 | Apply the silk production process | K2 |
| CO4 | Identify the diseases and competitors in Sericulture industries | K1 & K2 |
| CO5 | List the byproducts from sericulture process | K1 |

VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FOR WOMEN
(AUTONOMOUS)

DEPARTMENT OF ZOOLOGY/M.Sc. DEGREE COURSE IN ZOOLOGY

SEMESTER-IV

CORE PAPER: XI

BIostatistics AND RESEARCH METHODOLOGY - 20P4ZO11

(For those admitted in June 2020 and later)

Contact hours per week: 06

Contact hours per semester: 90 hrs

5 CREDITS/ SYLLABUS

Course Objectives

- ❖ To learn the statistical concepts and uses in Bio / Zoology
- ❖ To identify the problem during the data analysis
- ❖ To provide a foundation and motivation for exposure to statistical ideas
- ❖ To inculcate the certainty that Statistics is important for scientific research
- ❖ To understand the compute and interpret of data

BIostatistics

UNIT I IMPORTANCE OF STATISTICS

Introduction, Concept and importance of **statistics in biology**: Collection of Data- Classification, Tabulation, Diagrammatic presentation and graphical presentation of Data

UNIT II DESCRIPTIVE STATISTICS

Measures of central tendency - Mean, Mode, Median: Measures of Dispersion- Standard Deviation, Standard Error and Coefficient of Variation. Probability and Theoretical Distribution- Binomial and Normal Distribution. Regression and Correlation analysis.

UNIT III TEST OF FINDINGS

T-tests (One sample t-test, Two sample t-test, Paired t-test), Chi-square test and goodness of fit, One-Way and Two Way ANOVA.

RESEARCH METHODOLOGY

UNIT IV FORMAT OF THESIS

Sources of literature collection. Format of thesis - framing the title. Preparation of the first page. Precautions to be taken while preparing introduction, Historical resume and materials and methods. Format of presenting results, including tables, figures and photographs. The art of writing discussion and summary. Guidelines to be followed while writing bibliography.

UNIT V PAPER WRITING

Preparation of Scientific paper for publication in a Journal. Internet and e-journals. Computer aided techniques for data analysis, data presentation and slide preparation.

REFERENCE BOOKS:

1. Gurumani, N. (2005) "An Introduction to Biostatistics", II Edition, MJP Publishers, Chennai .
2. Gurumani, N. (2009) "Research Methodology for Biological Sciences", MJP Publishers, Chennai.
3. Gupta, S.P., (2002) Statistical methods, Sultan Chand and Sons, Educational Publishers, New Delhi.
4. Memering, D. (2000) The prentice Hall Guide to research Writing. Prentice Hall International, London.
5. Khan, I.A., and Khanum, A., 2004 Fundamentals of Biostatistics, Ukaaz Publications, London.

6. Mahajan, B.K. (1997) Methods in Biostatistics for medical students and research workers, 6th edn. Jaypee Brother's Medical Publications Ltd., New Delhi.

| SL No | Course Outcome | Knowledge Level |
|--------------|--|------------------------|
| CO1 | Recall the basic concepts of origin of life on earth | K1 |
| CO2 | Summarize the Measures of Central tendency | K1 |
| CO3 | Interpret the hypothesis with students t test | K2 |
| CO4 | Apply the knowledge of research methodology and frame the hypothesis | K1 & K2 |
| CO5 | Understand the Preparation of Scientific paper for publication | K1 |

VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FOR WOMEN
(AUTONOMOUS)

DEPARTMENT OF ZOOLOGY/M.Sc. DEGREE COURSE IN ZOOLOGY

SEMESTER-IV

CORE PAPER: XII

EVOLUTION - 20P4ZO12

(For those admitted in June 2020 and later)

Contact hours per week: 06

Contact hours per semester: 90 hrs

5 CREDITS/ SYLLABUS

UNIT I EVIDENCES OF EVOLUTION

Introduction, Origin of life – Abiogenesis, Biogenesis, Biochemical origin of life, experiments Urey miller's experiments. Evidences of evolution (morphology and comparative anatomy, Embryology, Physiological and Bio – chemical, Paleontological and Genetic.

UNIT II PALEONTOLOGY & THEORIES OF EVOLUTION

Geological time scale, Study of Fossils: Definition, Formation, Types and Determination of Age of Fossils. Evolution of Vertebrate groups, Ostracoderms- characteristics features and classification. Primitive jawed vertebrates- origin of jaws. Origin of amphibian, Reptiles, Birds and Mammals. Lamarckism - Neo Lamarckism, Darwinism – Neo Darwinism,

UNIT III PROCESS OF EVOLUTION

Mutation and their role in Evolution, Types of variation, Elemental forces of Evolution – mutation, Natural selection, Genetic drift, Recombination, Gene pool, gene frequency, Hardy Weinberg law and Evolution.

UNIT IV ORIGIN OF ANIMALS

Speciation, isolating mechanism, Neoteny, mimicry, coloration and its types, Adaptive radiation – Darwin's finches. Cultural evolution of man.

UNIT V ANIMAL DISTRIBUTION

Zoogeography distribution of Fauna and Flora – Oriental region, Australian region, Neotropical region, Ethiopian region, Neo arctic region and Paleoartic region. Insular fauna- Continental Island and Oceanic Islands.

REFERENCE BOOKS:

1. Richa Arora (2009) Patterns of Evolution, Anmol Publishers, New Delhi.
2. Richa Arora (2004) Elements of Evolution, Anmol Publishers, New Delhi.
3. Rastogi, V.B. (2003) Organic Evolution, Kedar Nath, Ram Nath.
4. Strickberger, M.W. (2000) Evolution. Jones & Bartlett Publications.
5. Dodson, E.V. (1960) Evolution process and product. East West Press, New Delhi.
6. Paulamos Moody (1978) Introduction to evolution. Kalyani Publishers, Ludhiana, New Delhi.
7. Kapoor, V.C. (1986). Theory and practice of animal taxonomy. Oxford & IBH Publishers Co., New Delhi.
8. Stebbins, G.L. (1969) The basis of Progressive Evolution, University of North Carolina Press,
9. Dobzhansky, T. (1955) Evolution, Genetics & Man. Wiley Eastern Pvt. Ltd.

| SL No | Course Outcome | Knowledge Level |
|--------------|---|------------------------|
| CO1 | Recall the basic concepts of origin of life on earth | K1 |
| CO2 | Relate the evidences of Geological time scale and fossils | K1 |
| CO3 | Summarize the theories of evolution | K2 |
| CO4 | Discuss the role of speciation | K1 & K2 |
| CO5 | Explain the Zoogeography distribution of Fauna and Flora | K1 |

VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FOR WOMEN
(AUTONOMOUS)

DEPARTMENT OF ZOOLOGY/M.Sc. DEGREE COURSE IN ZOOLOGY

SEMESTER-IV

Elective Paper: IV

FIRST AID AND HOME NURSING - 20P3ZOE04

(For those admitted in June 2020 and later)

Contact hours per week: 06

Contact hours per semester: 90 hrs

5 CREDITS/ SYLLABUS

UNIT I FIRST AID TREATMENTS

Principles of first aid – Insect bite, Dog bite and Snake bite. Medical emergency. 108 and 112 service, First aid box and Laboratory first aid – Fire accidents, Corrosive chemicals.

UNIT II BONE AND HEART

Fracture - Causes, Types, Signs and Symptoms. First aid – Treatment. Effect of heat, heat stroke, signs and symptoms and first aid. First aid for wound, burns and strokes.

UNIT III HOME REMEDY

Home nursing – Definition, observation of patients, Conditions. Importance of habit observation. Clinical thermometer and its uses. Counting of pulse, Respiration, respiratory rate.

UNIT IV STRESS MANAGEMENT

Normal and abnormal blood pressure, Specific infectious diseases. Method of Nursing the patients suffering from illness..

UNIT V HOSPITAL NURSING

Care of sick – Routine nursing care of sick. General application of heat – Hot baths and hot sponging, warm baths and medicated baths. General application of cold bath and sponging.

REFERENCE BOOKS:

1. Park. K. (2011) Text book of preventive and social medicine (21st edn.). M/s Banarsidas Bhanot Publishers, Jabalpur.
2. Indrani., T.K. (2006) First Aid for Nurses (1st edn.), Jaypee Brothers, Medical Publishers (P) Ltd. New Delhi.
3. Shukla, G.S. and Upadhyay, V.B. (2005) Economic Zoology, Rastogi Publication, Meerut.
4. Park. K (2004) Essentials of community health nursing (4th edn.) M/s Banarsidas Bhanot Publishers, Jabalpur.

| SL No | Course Outcome | Knowledge Level |
|-------|--|-----------------|
| CO1 | Recall the basic steps for the first aid process | K1 |
| CO2 | Understand Fracture - Causes, Types, Signs and Symptoms. | K1 |
| CO3 | Summarize the home nursing procedure | K2 |
| CO4 | Discuss the blood pressure | K1 & K2 |
| CO5 | Explain the Routine nursing care of sick | K1 |

VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FOR WOMEN
(AUTONOMOUS)

DEPARTMENT OF ZOOLOGY/M.Sc. DEGREE COURSE IN ZOOLOGY

SEMESTER-IV

PROJECT AND VIVA VOCE - 20P4ZOPR01

(For those admitted in June 2020 and later)

Contact hours per week: 12

Contact hours per semester: 180 hrs

5 CREDITS/ SYLLABUS

ules Governing the Evaluation of Project and Viva-Voce

1. Each student shall select a topic for his/her Project work in consultation with his/her guide and the Head of the department.
2. The Project report should be submitted to the Controller of Examinations (PG Courses) through the Head of the Department one week prior to the commencement of the terminal Examinations. If a candidate fails to submit the project report within the stipulated time, he/she may be permitted to submit the same one day prior to date of *viva voce* examinations with late fee prescribed by the Principal. If the candidate fails to submit the project report one day prior to the date of *viva voce* examination, he/she may be permitted to submit the Project report within a period of one month from the date of conduct of *viva voce*, with extension fee prescribed by the Principal. If the candidate fails to submit the project report even after that extension period, he/she will be treated with on par with failures and he/she has to do another project and to submit the report after six months by paying fee prescribed the Principal.
3. Each student shall submit 2 copies of his/her Project report for valuation.
4. The Project report shall contain a minimum of 25 pages excluding bibliography and appendices.
5. The Project report shall be valued for a total of 80 marks out of which the external examiner and the Guide share 20 marks each. The sum of marks awarded by both the examiners shall be considered to be the final mark. For a pass in the Project report, the student should secure a minimum of 36 marks. If a student fails to get the minimum pass mark in the Project report, he/she shall be permitted to resubmit his / her Project report once again within a period of 6 months from the date of publication of the result.
6. For those candidates who have passed in the evaluation of Project report, there will be a *viva voce* examination on the above. The *vivo voce* carries a maximum of 20 marks and the guide and the external examiner will conduct it jointly. The student should secure a minimum of 10 marks for a pass in the *viva voce* examination, failing which he/she shall be required to reappear for the *viva voce* after a month from the date of *viva voce* already conducted but within a period of 3 months for which he/she will have to pay a fee as prescribed by the Principal.
7. For a pass in this paper as a whole, a student should secure a minimum of 50 marks in Project report and *viva voce* put together.

QUESTION PAPER PATTERN FOR THEORY

Time: 3 Hours

Maximum Marks: 75

Each question paper consists of 3 parts – A, B & C

PART - A (20 x 1 = 20 Marks)

Choose the Best Answer

Four Questions from each Unit

Part - B (5 X 5 = 25 Marks)

Answer All questions (Either or type)

Two questions from each unit.

PART - C (3 x 10 = 30 Marks)

Answer any three questions (Open Choice)

One questions from each unit.

QUESTION PAPER PATTERN FOR PRACTICALS

Time: 4 hours

Maximum Marks: 60

- I. Major practical -20 Marks
- II. Minor practical -10 Marks
- III. Spotters (4 X 5)- 20 Marks
- IV. Record - 10 Marks