

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

**Rules and Regulations, Course Scheme and Scheme of Examination governing the M.Sc.
Degree Course in ZOOLOGY
(For those admitted in June 2017 and later)**

I. OBJECTIVES OF THE COURSE:

The objectives of the M.Sc. Degree Course in Zoology are

- ❖ To meet the academic to applied aspects in zoology suited to real problems of regional and National needs
- ❖ To expose learners to frontier and thrust areas of Biology(Zoology)
- ❖ To train learners for better performance in various competitive examination and in research careers.
- ❖ To enable the learners to acquire and develop self- study habits and
- ❖ To shape the learners to become worthy citizens of the Nation in the field of Zoology and interrelated fields.

II. ELIGIBILITY FOR ADMISSION

Applications seeking admission into the M.Sc. Degree Course in Zoology should have a Bachelor's Degree in Zoology / Advanced Zoology/ Animal Sciences of the Periyar University or any of the above degree of any other university accepted by the Syndicate of the Periyar University as equivalent thereto, subject to such condition as may be prescribed therefore shall be permitted to appear and qualify for the M.Sc degree examination after a course of study of two academic years. They should have secured a minimum of 50% of marks in Part III of the degree course. In the case of SC/ST students, the required minimum marks for admission in part – III will be 45%.

III. DURATION OF THE COURSE

The course for the degree of Master of Science in Zoology shall consist of two academic years divided into four semesters. Each semester consists of 90 working days.

IV. REGISTRATION UNDER CBCS

At the beginning of each semester, the students will be enlightened with the elective papers offered in the respective odd / even semester. The students should register their options with the parent department in writing about the choice of elective papers for that semester. The selected elective papers should be such that the paper has not been already studied either as a full paper or a part thereof and such paper should not place as core paper in their major department. The department offering a particular elective paper, will select and finalize the list of students to be admitted to that elective paper. The Principal has the discretion to fix the minimum strength for each elective paper in consultation with the Head of the department concerned.

V. CONTINUOUS INTERNAL ASSESSMENT (CIA)

The performance of the students will be assessed continuously and the Internal Assessment Marks for theory will be as under:

1. Average of two CIA & Model Exam - 10 Marks
2. Seminar - 5 Marks
3. Assignment - 5 Marks
4. Attendance - 5 Marks

Total = 25 Marks

Internal Assessment Marks for practical will be as under:

1. Attendance - 10 Marks
2. Observation Note - 10 Marks
3. Model Exam - 20 Marks

Total = 40 Marks

Attendance Breakup

THEORY:

Range	Marks
76-80	1
81-85	2
86-90	3
91-95	4
96-100	5

PRACTICALS:

Range	Marks
76-80	2
81-85	4
86-90	6
91-95	8
96-100	10

VI. DISTRIBUTION OF MARKS

THEORY:

Internal Assessment - 25 marks
 External Examination - 75 marks

PRACTICALS:

Internal Assessment - 40 marks
 External Examination - 60 marks

VII. ATTENDANCE

Each student must put in a minimum attendance of 75% of the working days of the college in each semester so as to become eligible to appear for the Terminal Examinations. Shortage of attendance in regular classes on the part of any student, not exceeding 10% below the prescribed minimum of 75% may be condoned on medical grounds. Such condonation shall be granted by the Principal on merits. The application for condonation shall be accompanied by a condonation fee, prescribed by the Principal. If a student earns less than 75% attendance in the regular classes in a

particular semester and is either ineligible for condonation of shortage of attendance or is not granted condonation, then the student will not be permitted to appear for the Terminal Examinations and the students will have to repeat that semester.

VIII. PASSING MINIMUM

For a pass in each paper, a candidate should secure a minimum of 50% marks in the Terminal Examinations and a minimum of 50% marks in aggregate (i.e., internal and external marks put together).

In the Project and *viva voce*, a candidate should secure a minimum of 50% marks in Project and *viva voce* separately and an aggregate of 50% marks in Project and *viva voce* put together, to get a pass.

IX. ELIGIBILITY CONDITION FOR GETTING THE DEGREE

A candidate undergoing M.Sc., degree course in Zoology will be eligible for the award of M.Sc., degree in Zoology, if he/she completes the entire course and earns a total of 90 credits, (comprising 70 Hard core and 20 Elective credits).

X. CLASSIFICATION OF CANDIDATES

The successful candidates will be classified as per the details given in the following table:

RANGE OF MARKS	GRADE POINTS	LETTER GRADE	DESCRIPTION
90-100	9.0-10.0	O	OUTSTANDING
80-89	8.0-8.9	D+	EXCELLENT
75-79	7.5-7.9	D	DISTINCTION
70-74	7.0-7.4	A+	VERY GOOD
60-69	6.0-6.9	A	GOOD
50-59	5.0-5.9	B	AVERAGE
00-49	0.0-4.9	U	RE-APPEAR
ABSENT	0.0	AAA	ABSENT

CLASSIFICATION:

CGPA	GRADE	CLASSIFICATION OF FINAL RESULT
9.5-10.0	O+	First Class- Exemplary
9.0 and above but below 9.5	O	
8.5 and above but below 9.0	D++	First Class- Distinction
8.0 and above but below 8.5	D+	
7.5 and above but below 8.0	D	
7.0 and above but below 7.5	A++	First Class
6.5 and above but below 7.0	A+	
6.0 and above but below 6.5	A	
5.5 and above but below 6.0	B+	Second Class

5.0 and above but below 5.5	B	
0.0 and above but below 5.0	U	Re-appear

C_i = Credits earned for course in any semester

G_i = Grade Point obtained for course in any semester

n refers to the semester in which such course were credited

For a Semester:

$$\text{GRADE POINT AVERAGE [GPA]} = \frac{\sum C_i G_i}{\sum C_i}$$

Sum of the multiplication of grade points by the credits of the course

$$\text{GPA} = \frac{\text{-----}}{\text{-----}}$$

Sum of the credits of the courses in a semester

For the entire programme:

$$\text{CUMULATIVE GRADE POINT AVERAGE (CGPA)} = \frac{\sum_n \sum_i C_{ni} G_{ni}}{\sum_n \sum_i C_{ni}}$$

Sum of the multiplication of grade points by the credits of the entire programme

$$\text{CGPA} = \frac{\text{-----}}{\text{-----}}$$

Sum of the credits of the courses of the entire programme

XI. OTHER PROVISIONS

Students failing in any paper in any semester must reappear for the examination in that paper and it is necessary to repeat the course. A student who has already passed a paper will not be permitted to reappear for the purpose of improvement.

A student who fails to attend the examination can reappear in the subsequent Terminal Examinations. However, a student who cannot appear for the examination due to lack of attendance, can appear for the examination only after earning the required minimum attendance.

Repeat Examinations will be conducted for the final semester paper(s) within a month after the publication of final semester results. Hence, a student who fails in the final semester examinations can appear for the above paper only in the Repeat Examinations or in the subsequent year Even Semester Examination.

XII. TRANSITORY PROVISION:

Candidates who were admitted to the PG course of study before 2011-2012 shall be permitted to appear for the examinations under those regulations for a period of three years i.e., up to and inclusive of the examination of April/May 2014. Thereafter, they will be permitted to appear for the examination only under the regulations then in force.

LIST OF ELECTIVE COURSES:

1. Economic Zoology
2. Medical Laboratory Techniques
3. Fishery Biology and Aquaculture
4. First Aid and Home Nursing
5. Radiation Biology
6. Health Education

LIST OF EXTRA DISCIPLINARY COURSES:

1. Sericulture
2. Eco-Toxicology
3. Cancer Biology

M.Sc. DEGREE COURSE IN ZOOLOGY

CHOICE BASED CREDIT SYSTEM (For those admitted in June 2017 and later)

Sem	Subject Code	Core/ Elective	Title of the paper	HRS/ Week	Credit	Exam (Hours)	Int. Mark	Ext. Mark	Mark
I	17P1ZO01	Core-I	Taxonomy and Comparative Biology of Invertebrate and Vertebrate	5	4	3	25	75	100
	17P1ZO02	Core-II	Cell and Molecular Biology	5	4	3	25	75	100
	17P1ZO03	Core-III	Biochemistry and Biophysics	5	4	3	25	75	100
	17P1ZO04	Core -IV	Microbiology and Immunology	5	4	3	25	75	100
	17P1ZOP01	Core Practical	Practical-I	5	4	4	40	60	100
	17P1ZOE01	Elective- I	Economic Zoology	5	4	3	25	75	100
Total				30	24		165	435	600
II	17P2ZO05	Core-V	Developmental Biology	5	4	3	25	75	100
	17P2ZO06	Core-VI	Animal Physiology	5	4	3	25	75	100
	17P2ZO07	Core-VII	Advanced Genetics	5	4	3	25	75	100
	17P2ZOP02	Core Practical	Practical-II	5	4	4	40	60	100
	17P2ZOE02	Elective- II	Medical Laboratory Techniques	5	4	3	25	75	100
	17P2ZOE03	Elective- III	Fishery Biology	5	4	3	25	75	100
Total				30	24		165	435	600
III	17P3ZO08	Core- VIII	Animal Biotechnology	6	5	3	25	75	100
	17P3ZO09	Core- IX	General and Applied Entomology	6	5	3	25	75	100
	17P3ZO10	Core- X	Environmental Biology	6	5	3	25	75	100
	17P3ZOP03	Core Practical	Practical - III	6	4	4	40	60	100
	17P3HR01	-	Human Rights	2	1	3	25	75	100
	17P3ZOED01	EDC	Sericulture	4	4	3	25	75	100
Total				30	24		165	435	600
IV	17P4ZO11	Core- XI	Biostatistics and Research Methodology	6	5	3	25	75	100
	17P4ZO12	Core- XII	Evolution	6	5	3	25	75	100
	17P4ZOE04	Elective- IV	First Aid and Home Nursing	6	4	3	25	75	100
	17P4ZOPR01	Core- PRI	Project and Viva Voce	12	5	-	-	80+20	100
Total				30	19	-	75	325	400
Grand Total				120	91	-	570	1630	2200

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SEMESTER-I

CORE PAPER - I

**TAXONOMY AND COMPARATIVE BIOLOGY OF INVERTEBRATE &
VERTEBRATES - 17P1ZO01**

(For those admitted in June 2017 and later)

Contact hours per week - 05

Contact hours per semester: 75

**4 CREDITS
SYLLABUS**

UNIT I (15 Hours)

Importance of taxonomy- Identification using taxonomic keys, General characteristics of animal phyla- Classification of animal phyla upto orders. Organization of coelom: Acoelomates, Pseudocoelomates and Coelomate groups. Zoological Nomenclature- Type: Holotype, Paratype, Lectotype, Syntype, Neotype and Allotype

UNIT II (15 Hours)

Locomotion and adaptive mechanism of Invertebrates- flagellary- ciliary movement in protozoa, hydrostatic movement in Coelenterate, 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 III (15 Hours)

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

UNIT IV (15 Hours)

Characteristics features of lampreys. Earliest vertebrates: Ostracoderms- characteristics features and classification. Primitive jawed vertebrates- origin of jaws. Origin of amphibian, Reptiles, Birds and Mammals. Parental care in fishes and amphibia, flight adaptation in birds

UNIT V (15 Hours)

Comparative study on the structure and functions of alimentary canal and associated glands. Respiratory system of Fishes and Birds. Arterial and venous system of reptiles. 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.

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M.Sc. DEGREE COURSE IN ZOOLOGY

SEMESTER-I

CORE PAPER - II

CELL AND MOLECULAR BIOLOGY – 17P1ZO02

(For those admitted in June 2017 and later)

Contact hours per week: 05

Contact hours per semester: 75

**4 CREDITS
SYLLABUS**

UNIT I (15 Hours)

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

UNIT –II (15 Hours)

Introduction of cell. Plasma membrane: Structure and modifications. Functions of plasma membrane. Cell signaling. Cell coat and cell recognition- functions of cell coat. Microtubules and microfilaments – structure, functions, role in cancer formation

UNIT-III (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 (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 (15 Hours)

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

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.

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SEMESTER-I

CORE PAPER - III

**BIOCHEMISTRY AND BIOPHYSICS - 17P1ZO03
(For those admitted in June 2017 and later)**

Contact hours per week - 05

Contact hours per semester: 75

**4 CREDITS
SYLLABUS**

UNIT -I (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 (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 (15 Hours)

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

UNIT -IV (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: (15 Hours)

Biophysical techniques: Separation Methods – Sedimentation – Chromatography methods. Spectroscopes. Introduction and applications of FTIR and Mass spectroscopy. Nuclear Magnetic Resonance (NMR); Radiation Bio physics – Introduction, Types and Function.

REFERENCE BOOKS:

1. Satyanarayana,U, (2015), Essentials of Biochemistry, Books and Allied (P) Limited, Kolkata.
2. Satyanarayana, U and Chakrapani, U (2009), Essentials of Biochemistry, Books and Allied (P) Limited, Kolkata.
3. Jain, J.L. (2007), Fundamentals of Biochemistry, S. Chand & Co. Ltd., New Delhi.
4. Stryer, L. (2006), Biochemistry, W.H. Freeman and Co., New York.
5. Chatterjee, H.N. and Spindle, R. (2005), Text Book of Medical Biochemistry, Jaypee Brothers, New Delhi.
6. Nelson, D.I. and Cox, M.M. (2004), Lehninger Principles of Biochemistry, III Edition, Mac Millon Worth Publishers, New York.
7. Devlin, T.M. (2003), Biochemistry, Wiley-Liss, New York.

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SEMESTER-I

CORE PAPER - IV

MICROBIOLOGY AND IMMUNOLOGY- 17P1ZO04

(For those admitted in June 2017 and later)

Contact hours per week: 05

Contact hours per semester: 75

**4 CREDITS
SYLLABUS**

UNIT – I (15 Hours)

Culture of Microorganism- Pure culture techniques- Isolation and Culture of Microbes and Staining Techniques. Microbial control: Physical agent: Moist heat, dry heat HEPA filter, chemical agent: Phenol, formaldehyde and alcohol.

UNIT – II (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 (15 Hours)

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 (15 Hours)

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

UNIT – V (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.

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) Microbiolgy (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.

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SEMESTER-I **CORE PRACTICAL –I**
BIOCHEMISTRY, CELL AND MOLECULAR BIOLOGY, MICROBIOLOGY
AND IMMUNOLOGY- 17P1ZOP01
(For those admitted in June 2017 and later)

Contact hours per week: 05

Contact hours per semester: 70 Hours

**4 CREDITS
SYLLABUS**

I- Biochemistry

1. Quantitative estimation of Carbohydrate, Protein and Lipids
2. Estimation of Haemoglobin content in Blood.
3. Urine Analysis- Qualitative analysis of Sugar, Albumen and Ketone Bodies.

II- Cell and Molecular Biology

3. Micrometry -measurement of cell size.
4. Study of mitotic cell divisions- Onion Root tip squash preparations.
5. Temporary squash preparation of salivary gland in chironomous larva – Giant Chromosome.

III- Microbiology

6. Simple staining and gram staining techniques.
9. Study of bacterial motility by hanging drop method.
10. Preparation of Media for Bacterial Culture
11. Bacterial Analysis of Milk- Methylene Blue reduction test

IV. Immunology

12. Autoclaving, Electrophoresis techniques- Demo.
13. Demonstration of Antigen- Antibody reaction by interfacial ring test.

Spotters

1. Colorimeter, pH Meter, Mitosis and Meiosis Stages, Entameoba, Salmonella Typhi, Bacillus sp.
2. Tour report of the visit to food preservation, food fermentation and dairy industries

REFERENCE BOOKS:

1. Aneja, K.R. (2014), laboratory Manual Microbiology And Biotechnology, Medtec Publications
2. Pattabiraman,T.N, (2003), Laboratory manual in Biochemisty, All India Pub Distributed.

3. Wilson, K. and Walker, J. (1994) Principles and Techniques of Practical Biochemistry, Cambridge University Press, Cambridge.
4. Jayaraman, J. (1981) Laboratory Manual of Biochemistry, New Age International (P) Ltd., Publishers, New Delhi.
5. Bowen, W.C. (1980) Experimental Cell Biology, Mac Millan Publishing Co., New Delhi.
6. Dewit, W.C. (1977) Biology of the Cell- Lab Explorations, Saunders Co., New Delhi.
7. Alkamo, P.A. (2003) Manual of Microbiology, V.H.A. Publishers, New York.
8. Gunasekaran, P. (2001) Laboratory Manual in Microbiology, New Age International (P) Ltd., Chennai.
9. State level Workshop on Immunological Techniques (2000) PG and Research Department of Zoology, American College, Madurai.
10. Wilson, K and Walker, J. (1994) Practical Biochemistry Principles and Techniques Cambridge University Press, USA.

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SEMESTER-I **ELECTIVE – I**

**ECONOMIC ZOOLOGY - 17P1ZOE01
(For those admitted in June 2017 and later)**

Contact hours per week: 05

Contact hours per semester: 75

**4 CREDITS
SYLLABUS**

UNIT I: (15 Hours)

Types of honey bees – Diseases and pests of bees – Harvesting and processing of honey – Types of Honey, Maintenance of Apiary, Instruments used in Apiculture.

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

UNIT II: (15 Hours)

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: (15 Hours)

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: (20 Hours)

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: (10 Hours)

20%

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.
7. Shukla, G.S. and Upadhya, V.B. (2005) Economic Zoology, Rastogi Publications, Meerut, India.
8. Tomar, B.S. (2004) Introduction to Economic Zoology, Emkay Publications, New Delhi.
9. Yadav, M (2003) Economic Zoology. Discovery Publishing House, Rastogi Publications, Meerut.
10. Ravindranathan, K.R. (2003) Economic Zoology, Dominant Publishers & Distributors, New Delhi.
11. Jangi, B. S. (1991) Economic Zoology. CRC, first edition, New York.

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SEMESTER-II

CORE PAPER –V

**DEVELOPMENTAL BIOLOGY – 17P2ZO05
(For those admitted in June 2017 and later)**

Contact hours per week: 05

Contact hours per semester: 75

4 CREDITS
SYLLABUS

UNIT– I: (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: (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: (15 Hours)

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

UNIT – IV: (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: (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.
5. Balinsky, B.L, (1981) An Introduction to Embryology, Vth Edition, Saunders Co., Philadelphia.
6. Berrill, N.J. (1986) Developmental Biology, Tata McGraw Hill Publication Co. Ltd., New Delhi.
7. Longo, F.T. (1987) Fertilization, Chapman and Hall, New Delhi.
8. Saunders, J.W. (1982) Developmental Biology, Mc Millan Pub. Co., New York.

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SEMESTER-II

CORE PAPER –VI

**ANIMAL PHYSIOLOGY -17P2ZO06
(For those admitted in June 2017 and later)**

Contact hours per week: 05

Contact hours per semester: 75

**4 CREDITS
SYLLABUS**

UNIT – I: (10 Hours)

Introduction – Physiology of digestion - carbohydrates, proteins and lipids – Physiology of absorption and Assimilation. Balanced diet. Nutrition requirement for Pregnant women and Infant.

UNIT – II (15 Hours)

Types of Respiration – Physiology of respiration and Excretion in Man – Respiratory pigments and their role in O₂ and CO₂ transport in animals.

Circulation: Types of hearts- Working Mechanism of Heart, Cardiac cycle, Electrocardiogram. Factors influencing circulation and coagulation of blood.

UNIT – III (20 Hours)

Nature and types of excretory products – Ammonotelism, Urotelism, Uricotelism, Patterns of excretion– Excretory organs- invertebrates and chordates – Physiology of excretion in Mammals – Regulation.

Thermoregulation- Homeotherms, Poikilotherms and Heterotherms, Aestivation and Hibernation.

UNIT – IV (15 Hours)

Types of neurons –Structure of typical nerve cell. Transmission of Nerve impulses Axonomic and Synaptic Transmission - Reflex action - Autonomic nervous system organization and functions.

Muscles and types, Ultra structure of skeletal muscles – Chemical composition – Mechanism of muscle contraction – Regulation and energetics of Muscle contraction.

UNIT – V (15 Hours)

Chronobiology – Biological clock and Photoperiodism.

Physiology of Photoreceptor - mammalian eye. Physiology of Phonoreceptors- Mammalian ear. Physiology of Migration in fishes and birds.

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.

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SEMESTER-II

CORE PAPER –VII

**ADVANCED GENETICS -17P2ZO07
(For those admitted in June 2017 and later)**

Contact hours per week: 05

Contact hours per semester: 75

4 CREDITS - SYLLABUS

UNIT – I: (15 Hours)

Gene concept – fine structure of gene – one gene one polypeptide concept.

Human Genetics

Gene and metabolic pathways. Inborn errors of metabolism in man. Haemoglobin disorders – sickle cell anemia and thalassemia.

Human karyotype preparation and chromosomal syndromes in man – Down, Turner's and Klinefelter's syndromes.

UNIT – II: (20 Hours)

Evidence of genetics materials in Bacteria – genetic exchange and recombination in bacteria – conjugation, transformation and transduction. Viral genetics – bacteriophage.

Enzyme – regulatory mechanism – operon concept – GAL and LAC operon system – gene regulation in protein synthesis in prokaryotes and eukaryotes.

UNIT – III: (10 Hours)

Multiple alleles and sex-linked gene. Gene Interactions. Genetics of races and species formation – genetic load – genetic polymorphism. Dosage compensation – X inactivation – genomic imprinting. Immunogenetics.

UNIT – IV: (15 Hours)

Chromosomal and point mutation, spontaneous and induced mutation, mutagens: physical, chemical and biological – genetic changes in Neoplasia in man.

UNIT – V: (15 Hours)

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.

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SEMESTER-II

ELECTIVE –II

MEDICAL LABORATORY TECHNIQUES -17P2ZOE02

(For those admitted in June 2017 and later)

Contact hours per week: 05

Contact hours per semester: 75

4 CREDITS

SYLLABUS

UNIT – I (15 Hours)

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

UNIT – II (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 (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 (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 (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.
6. Singh, A. and Singh, R (2004) Biophysical Chemistry (Principles and Techniques) Campus Books International, New Delhi.

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SEMESTER-II

ELECTIVE –III

**FISHERY BIOLOGY - 17P2ZOE03
(For those admitted in June 2017 and later)**

Contact hours per week: 05

Contact hours per semester: 75

**4 CREDITS
SYLLABUS**

UNIT I (10 Hours)

Introduction – importance of fisheries. Aim of fish culture Qualities of culturable fishes. Types of fish culture – monoculture – composite culture- Integrated fish culture – paddy cum fish culture.

UNIT II (15 Hours)

Construction and maintenance of fish farm – Type of fish ponds – Management of Fish culture – Breeding – Types of breeding- Induced breeding.

UNIT III (15 Hours)

Harvesting – Methods of fishing – Electric fishing. Gears and Crafts, Transportation and marketing – Structure of a Fish market. Cooperative system – Fish copfed, Benfish, Sangams.

UNIT IV (20 Hours)

Fish handling, quality and processing. Preservation and processing methods, Fishery byproducts. Fish spoilage – Rigor mortis. Post harvest technology.

UNIT V (15 Hours)

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. Kamaleswar pandey 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.

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SEMESTER-II **CORE PRACTICAL –II**

DEVELOPMENTAL BIOLOGY, ANIMAL PHYSIOLOGY

AND ADVANCED GENETICS - 17P2ZOP02

(For those admitted in June 2017 and later)

Contact hours per week: 05

Contact hours per semester: 75

4 CREDITS

SYLLABUS

I: Developmental Biology

1. Staining and mounting of chick blastoderm of various stages.
2. Study of different types of placenta (Specimen).
3. Amphibian metamorphosis: Evaluation of Progressive and Retrogressive changes.

II. Animal Physiology

4. Survey of digestive enzymes in cockroach
5. Determination of rate of salt loss in fish using different experimental media.
6. Determination of Urea, Uric Acid, Ammonia and Creatine in the urine sample.

III: Advanced Genetics

7. Schemes of Pedigree analysis
8. Drosophila culture techniques
9. Drosophila – observation of mutant wings and eyes.
10. Localization of Barr bodies, in the buccal smear.
11. Isolation of DNA Crude method.

Spotters.

Kymograph, Types of Placenta, Types of Egg, Human Sperm, Human Ovary, Pituitary Gland, Adrenal Gland, Adipose Tissue, Smooth Muscle, Striated Muscle, Karyotype.

REFERENCE BOOKS:

1. Benjamin Lewin (2008) Genes IX, 9th edition, Jones and Barlett Publishers Inc. London.
2. Gilbert, S.F. (2006) Developmental Biology, 8th edition, Sinauer Associates, Inc. Publishers, Sunderland, Massachusetts.
3. Moyes, C.D. And Schulte, P. M. (2006) Principles of Animal Physiology, Pearson Education Inc. Chennai.
4. Balinsky, B.I. (2004) An Introduction to Embryology, 5th edition, Thomas Asia Pvt. Ltd, Chennai.
5. Prosser, C.L. (1973) Comparative Animal Physiology, 3rd Edition, W.B. Saunders & Co. Philadelphia.
6. Monroe W. Strickberger, (1968), Genetics, 3rd edition, Macmillan Publishing Co. Bangalore.

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SEMESTER -III

CORE PAPER-VIII

**ANIMAL BIOTECHNOLOGY -17P3ZO08
(For those admitted in June 2017 and later)**

Contact hours per week - 06

Contact hours per semester –90 Hours

**5 CREDITS
SYLLABUS**

UNIT I: Introduction (15 hours)

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 (21 hours)

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

UNIT III: Artificial animal breeding (18 hours)

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

UNIT IV: Animal health and biotechnology (18 hours)

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

UNIT V: Applications and issues related to Biotechnology (18 hours)

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.

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SEMESTER- III

CORE PAPER-IX

GENERAL AND APPLIED ENTOMOLOGY - 17P3ZO09

(For those admitted in June 2017 and later)

Contact hours per week - 06

Contact hours per semester – 90 Hours

5 CREDITS
SYLLABUS

UNIT I (15 Hours)

Classification of Class Insecta - Key characters of insect orders- economic importance with examples for the orders: Orthoptera, Hemiptera, Coleoptera, Diptera, Lepidoptera and Hymenoptera- Insects of agricultural importance symptoms of damage in plants by insects,- Reasons for e insects attaining pest status.

UNIT II (15 Hours)

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 (10 Hours)

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

UNIT IV (10 Hours)

Biology and economic importance of silkworm, Honey bees and lac insects- Insect galls- NPV. Insects in medicine- Beneficial insects: predators- parasites- weed killers- soil builders- scavengers.

UNIT V (15 Hours)

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.

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SEMESTER- III

CORE PAPER- X

**ENVIRONMENTAL BIOLOGY - 17P3ZO10
(For those admitted in June 2017 and later)**

Contact hours per week - 06

Contact hours per semester – 90 Hours

**5 CREDITS
SYLLABUS**

UNIT I (15 Hours)

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 (15 Hours)

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 (15 Hours)

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 (15 Hours)

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 (15 Hours)

Biomes, temperate deciduous forest, temperate grass land, savanna, tropical rain forest and desert, ecotone, estuary, concepts of ecological niche, types of ecological succession.

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, Frenice 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.

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SEMESTER III

CORE PRACTICAL-III

**GENERAL AND APPLIED ENTOMOLOGY,
ENVIRONMENTAL BIOLOGY AND ANIMAL BIOTECHNOLOGY – 17P3ZOP03
(For those admitted in June 2017 and later)**

Contact hours per week - 06

Contact hours per semester – 75 Hours

**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 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.

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SEMESTER III**

**17P3ZOED01 – SERICULTURE (EDC)
(For those admitted in June 2017 and later)**

Contact hours per week - 04

Contact hours per semester – 75 Hours

**4 CREDITS
SYLLABUS**

UNIT I (10 Hours)

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

UNIT II (15 Hours)

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 (15 Hours)

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 (10 Hours)

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

UNIT V (10 Hours)

Materials for reeling, stifling, cocoon cooking and brushing reeling- raw silk reeling- raw silk testing -classification of silk -By products of sericulture- Economics importance 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 Primplani 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.

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SEMESTER IV

CORE PAPER-XI

BIostatISTICS AND RESEARCH METHODOLOGY - 17P4ZO11

(For those admitted in June 2017 and later)

Contact hours per week - 06

Contact hours per semester – 90 hours

5 CREDITS /SYLLABUS

BIostatISTICS

UNIT I (15 hours)

Importance of Statistics in biology, samples and populations, variables in biology, Accuracy and Precision- primary and secondary data, types of classification, Tabulation and types of graphical representations.

UNIT II (15 hours)

Measures of central tendency- Mean, Mode, Median- Measures of Dispersion- variance, standard deviation, Standard error, coefficient of variation. Probability Distribution- Binomial, Normal Distribution, Regression and correlation analysis.

UNIT III (15 hours)

Tests of simple hypothesis using normal and t-distribution, T-tests (One sample t-test, Two sample t-test, Paired t-test), Chi-square test for goodness of fit, F-test for comparing variance, one-way ANOVA.

RESEARCH METHODOLOGY

UNIT IV (10 hours)

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 (15 hours)

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.

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SEMESTER- IV

CORE PAPER-XII

EVOLUTION -17P4ZO12

(For those admitted in June 2017 and later)

Contact hours per week - 06

Contact hours per semester – 55 Hours

**5 CREDITS
SYLLABUS**

UNIT I (15 hours)

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 (15 hours)

Geological time scale, Study of Fossils: Definition, Formation, Types and Determination of Age of Fossils. Evolution of Vertebrate groups, Lamarckism - Neo Lamarckism, Darwinism – Neo Darwinism,

UNIT III (15 hours)

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 (15 hours)

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

UNIT V (15 hours)

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.

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SEMESTER -IV

ELECTIVE- IV

**FIRST AID AND HOME NURSING -17P4ZOE04
(For those admitted in June 2017 and later)**

Contact hours per week - 06

Contact hours per

semester – 65 Hours

**5 CREDITS
SYLLABUS**

UNIT I (10 hours)

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 (15 hours)

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 (15 hours)

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

UNIT IV (10 hours)

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

UNIT V (15 hours)

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.

**VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FOR WOMEN
(AUTONOMOUS)
DEPARTMENT OF ZOOLOGY
M.Sc. DEGREE COURSE IN ZOOLOGY
SEMESTER- IV
PROJECT AND VIVA VOCE -17P4ZOPR01**

Contact hours per week - 12

Contact hours per semester – 175 Hours

5 CREDITS

Rules 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 per 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 *viva 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 2 parts – A & B

PART - A (5 x 5 = 25 Marks)

Answer All questions.

Two questions from each unit.

PART - B (5 x 10 = 50 Marks)

Answer All questions.

Two questions from each unit.

QUESTION PAPER PATTERN FOR PRACTICALS

Time: 3 hours

Maximum Marks: 60

- | | |
|---------------------|------------|
| I. Major practical | -15 Marks |
| II. Minor practical | -10 Marks |
| III. Spotters | - 25 Marks |
| IV. Record | - 10 Marks |