GONDWANA UNIVERSITY GADCHIROLI

SEMESTER SYSTEM SYLLABUS

FOR

B.Sc. Part III

Subject- Zoology

Semester – V

Paper - I: General Mammalian Physiology –I

Unit – I : Enzymes

1. Enzymes –Distribution and chemical nature of enzymes
2. General properties of enzymes
3. Classification of enzymes
4. Factors affecting enzyme activity

Unit-II : Nutrition and Digestion

1. Structure and functions of digestive glands - (Salivary, Gastric, Intestinal, Liver and Pancreas)
2. Gastrointestinal hormones
3. Digestion and absorption of proteins, carbohydrates and lipids.
4. Vitamins- Fat soluble and water soluble vitamins; Sources, deficiency and diseases

Unit-III : Respiration

1. Respiratory pigments - Types, distribution and properties
2. Mechanism of Respiration
3. Transport of O2 and CO2
4. Respiratory disorders and effects of smoking

Unit-IV : Circulation

1. Composition and functions of blood
2. Blood clotting – Intrinsic and extrinsic factors, blood groups and *Rh* factor
3. Cardiac cycle
4. E.C.G. and Blood pressure

Semester – V

Paper –II : Applied Zoology-I

(Aquaculture and Economic Entomology)

Unit –I: Aquaculture

1. Site selection and construction ,Pre-stocking and post stocking manangement of nursery, rearing and stocking ponds
2. Breeding of fishes by bund and Chinese hatcheries. Induced breeding by hypophysetion. New generation drugs in induced breeding
3. Brief study of freshwater aquaculture system – Polyculture, cage culture, sewage fed fish culture, integrated fish farming
4. Fish products and byproducts, Fish preservation

Unit-II

1. Prawn culture and Pearl culture
2. Fabrication and setting up of aquarium and its maintenance
3. Breeding of aquarium fishes – Live bearers and egg layers
4. Diseases caused by fungi, bacteria, protozoa and helminthes

Unit-III : Economic Entomology (Methods of pest control)

1. Chemical control : Insecticides - Pyrethroids, carbomate and HCN – mode of action,merits and demerits
2. Biological control – Biological agents – predators and parasites; merits and demerits
3. Crop pest: Life cycle, damage and control of

I. Cotton spotted boll worm -*Eariasvitella*

II. Stored grain pest- Rice Weevil,*Sitophilusoryzae*

4. Animal pest:Life cycle, damage and control of –

I. House fly – *Muscanebulo*

II. Stable fly – *Stomoxyscalcitrans*

Unit-IV : Economic Entomology (Industrial entomology) **(9 Periods)**

1. Sericulture - Types of Silkworm. Life cycle and rearing of mulberry silkworm,*Bombyxmori*
2. Life cycle and rearing ofnon mulberry silkworm (Tasar), *Antheraeamylitta* ; Brief idea of cocoon processing for silk fabric - cocoon boiling, reeling, rereeling, winding, doubling, twisting and weaving
3. Apiculture – Types of honey bees. Life cycle, culture, movable frame hive, bee product and its economic importance
4. Lac culture – Lac insect,*Lacciferlacca* - Life cycle, Lac processing, Lac products and Economic Importance

Semester – V

PRACTICAL – V (Based on Paper I and II)

Section A: General Mammalian Physiology - I and

Section B: Applied Zoology–I (Aquaculture and Economic Entomology)

Section A: General Mammalian Physiology – I

1. Detection of action of salivary amylase on starch

2. Detection of carbohydrates, proteins and Lipids

3. Detection of Vitamin A and Vitamin C

4. Measurement of lung capacity

5. Preparation Haemin crystal

6. Total count of WBC and RBC

7. Determination of Hb percentage

8. Study of histological slides of Mammal – T.S. salivary gland, T.S. stomach, T.S. intestine, T.S. pancreas, T.S. liver and T.S. lung

Section B: Applied Zoology–I (Aquaculture and Economic Entomology)

Aquaculture:

1. **Collection and identification of fishes**

a. Freshwater edible fishes – catla, rohu, mrigal, grass carp, silver carp, *Cyprinouscarpio ,Ophiocephalous, Clariaus, Heteropneustes, Wallago, Mystus,*

b. Aquarium fishes – Gold fish, Molly, Sword tail, Kissing *Gourami*

2. **Anatomical Observations**

Anatomical observations, demonstration and detailed explanation of the following with the help of ICT tools/ models/ charts/ photographs etc.

: a. Digestive system, reproductive system and brain with pituitary of cultural fishes.

b. Gonosomatic index.

3. **Fabrication and setting up of aquarium**

4. **Mounting**: Scales of fishes, zooplankton

Economic Entomology:

1. **Study of Insect Pest**

a. Agriculture pest – Grasshopper, Red Cotton bug, Gram pod borer, Cotton pink bollworm, Cotton spotted bollworm

b. Medical pest – House fly, Mosquito, *Pediculushumanus*

c. Veterinary pest – Stable fly, Dog tick, Bird lice

d. Stored grain pest – Stored grain weevil, Flour moth

e. Useful Insects – Honeybee, Silk moth, Lac insect, Dragon fly, Lady bird beetle

2. **Mounting** : Study of permanent Preparation of the following with the help of already available permanent slides ICT tools/ models/ charts/ photographs etc. (Any five)
Mouth parts, Legs, wings of any insects and sting of Honeybee

3. **Visit** to – Fish farm, Apiculture, Sericulture, Agricultural educational centre, Sea shore and Lake.

Distribution of Marks Total Marks 30

1 Physiology experiment	05
2. Identification and comment on spots	08
(2 from Mammalian histology,3 from Aquaculture and 3 from Economic Entomology)	
3. Anatomical Observations	05
4. Permanent stained preparation.....	03
5. Submission ,collection and study tour report.....	03
5. Submission of practical record.....	03
6. Viva voce.....	03

Total 30

GONDWANA UNIVERSITY GADCHIROLI

SEMESTER SYSTEM SYLLABUS

FOR

B.Sc. Part III

Subject- Zoology

Semester – VI

Paper - I: General Mammalian Physiology –II

Unit –I : Nerve and Muscle Physiology

1. Types of neurons, E.M. structure of neuron
2. Conduction of nerve impulse
3. Ultrastructure of striated muscle, Sliding filament theory of muscle contraction
4. Properties of muscles (Twitch, Tetanus, Tonus, Summation, All or None Principle, Muscle fatigue)

Unit-II : Excretion

1. Structure of uriniferous tubule
2. Mechanism of urine formation
3. Counter – current mechanism
4. Normal and abnormal constituents of urine; Elementary idea of dialysis

Unit-III : Endocrinology

1. Structure and functions of pituitary gland
2. Structure and functions of thyroid and parathyroid gland
3. Structure and functions of adrenal gland
4. Structure and functions of pineal gland

Unit-IV : Reproduction

1. Oestrous and menstrual cycle
2. Male and female sex hormones
3. Causes of infertility in male and female
4. Contraceptives– Mechanical and hormonal ;*In-vitro* fertilization

Semester - VI

Paper - II :Applied Zoology –II

(Biotechniques, Microtechnique, Immunology, Bioinformatics and Biostatistics)

Unit –I :Biotechniques

1. **Concepts of sterilization**: Filtration, autoclaving, dry heat sterilization,wet sterilization and radiation
2. **Separation of biomolecules**: Centrifugation (Sedimentation, density gradient); Chromatography (Elementary idea ofthin layer, gel filtration and ion exchange-Principles and applications)
3. **Electrophoresis**: Agarose gel electrophoresis, SDS-PAGE
4. Principles of colorimeter and spectrophotometers

Unit-II :Microtechnique

1. Fixation, dehydration, clearing, embedding & section cutting
2. Difficulties encountered during section cutting (causes and remedies)
3. Double staining with Haematoxylin and Eosin
4. Histochemical staining techniques for carbohydrates (Periodic acid schiff), proteins (Mercury-bromophenol blue) and lipids (Sudan black-B)

Unit – III: Immunology

1 .**Concepts of immunity –** Innate and acquired immunity, organs of the immune system
2. **Antigen and Antibody -**Structure, types and functions , Antigen-antibody interaction – Precipitation and agglutination
3. **Types of immune response**: B cell response (antibody mediated), T cell response (cell mediated)
4. **Autoimmunity and immunodeficiencies**- Autoimmune diseases and their treatment, AIDS and other immunodeficiencies

Unit-IV : Bioinformatics and Biostatistics

1. Bioinformatics: Definition, Basic concepts in bioinformatics, importance and role of bioinformatics in life sciences
2. Bioinformatics databases- introduction, types of databases
3. Nucleotide sequence databases, Elementary idea of protein databases
4. Biostatistics – Tabulation of data, presentation of data, sampling errors, mean, mode, median, probability, standard error and standard deviation

Semester – VI

PRACTICAL –VI (Based on Paper XI and XII)

(Section A: General Mammalian Physiology – II and Section B: Applied Zoology – II ,Biotechniques, Microtechnique, Immunology, Bioinformatics and Biostatistics)

Section A : General Mammalian Physiology – II

1. Detection of urea, albumin, sugar and creatin in urine

2. Sperm count from any domestic animal (Source of semen: Government artificial insemination centre).

3. Anatomical Observations - Anatomical observations, demonstration and detailed explanation of the following with the help of ICT tools/ models/ charts/ photographs etc.

Endocrine glands of Culturable fishes

4. Study of histological slides of Mammal– T.S.Kidney, Pituitary, Thyroid, Adrenal, testis, ovary, uterus, placenta, medulated and non medulated nerve fibre, smooth and striated muscle

Section B : Applied Zoology – II

(Biotechniques, Microtechnique, Immunology,Bioinformatics and Biostatistics)

1. Separation of amino acids by paper chromatography

2. Separationof proteins by electrophoresis technique

3. Block preparation and section cutting

4. Double staining method (H-E)

(Source of tissue: Animal wastes from local recognized slaughter houses/ poultry farms/ fish markets etc.)

5. Demonstration of carbohydrates, proteins and lipids by histochemical methods

(Source of tissue: Animal wastes from local recognized slaughter houses/ poultry farms/ fish markets etc.)

6. Determination of mean, mode, median from a given biostatistical data and/or graphical representation of the data using computers

7. Use of internet for survey of literature using protein and nucleotide databases(NCBI)

8. Use of softwares like Microsoft offices

9.Immunological diagnosis of pregnancy

10. Antigen –Antibody Reaction

Distribution of Marks **Total Marks 30**

I. Physiology experiment..... 05

II. Identification and comments on spots

(Mammalian histology 3 spots) 03

III. Microtechnique - Section cutting, spreading and 03

H-E staining of given slide

IV. Anatomical observation 05

V. Analysis of given biostatistical data 02

VI. Retrieval of specific literature from given information..... 02

VII. Submission of slides and study tour report..... . 02

VIII. Submission of certified practical record..... 03

IX. Viva voce..... 05

List of Recommended Books: (For Semester V and VI)

Physiology

1. Human Physiology – Chatterjee A. G. vol. I & II
2. Medical Physiology – Gyton
3. T. B. of Animal Physiology – Berry
4. Introduction to Animal Physiology and Related Biotechnology – H. R. Singh
5. Animal Physilogy – Arora M.P.
6. General and Comparative Physiology – Hoar W. S.
7. T. B. of Animal Physiology – Hurkat and Mathur
8. Animal Physiology – Nahbhushan and kodarkar
9. T. B. of Animal Physiology & General Biology – Thakur &Puranik
10. General Endrocrinology – Turner Bagnaro
11. Reproduction and Human welfare – Greep and koblinsky
12. Animal Physiology – Shastri & Goel
13. Animal Physiology – Verma&Tyagi
14. Human Physiology - Vander and sheman
15. Applied Physiology – Keels, Neils and Joels
16. Animal Physiology – Rastogi S. C.
17. Animal Physiology – Veerbala Rastogi
18. Comparative Vertebrate Endocrinology – Beutley
19. T.Y B. Sc Zoology Sem-V- Dhamani,Bakare,Harney & Bhute

20. T.Y B. Sc Zoology Sem-VI- Dhamani,Bakare,Harney & Bhute

Aquaculture

1. Wealth of India, Raw Material, Vol. IV – ICAR
2. Fishes of India vol I & II- Day
3. Fish & Fisheries of India – Jhingran
4. Hatchery Manual for Common Indian & Chinese carps – Jhivgan&Pallin
5. Fish Pathology – Roberts
6. Introduction of Fishes – Khanna
7. Fishery Science & Indian Fishes – Khanna
8. Fishery Science & Indian Fisheries – Shrivastava
9. A Manual of F. W. Aquaculture – Santhanam
10. An Aid to Identification of Commercial Fishes of India & Pakistan- Mishra
11. Standard Methods for Examination of Water & Waste Water - APHA
12. Hand Book of Breeding of Major Carps by Pituitary Hormones – S. L. Chonder

Entomology

1. T. B. of Applied Entomology – K. P. Shrivastava
2. T. B. of Agricultural Entomology - II S Pruthi
3. Modern Entomology – D. B. Tembhare (2nd Edition)
4. A Hand Book of Practical Sericulture – Ullar S. R. &Narsimhanna M.N.
5. Destructive and Useful Insects – Metcalf C.L. & Flint W.P.
6. General Text Book of Entomology – Richards O. W. & Davis R. G.
7. Agricultural Pests of India & South East Asia – Atawal A.S.
8. Hand Book of Economic Entomology for South Asia – Ayyar& Ram Krishna.
9. Medical Entomology – Hati A. K.
10. Bee-Keeping in India – Singh S
11.Indian Odonatological Bibliography ANDREW, R. J. & MITRA, T. R.
12. A handbook of Common Odonates of Central India, ANDREW, R. J., SUBRAMANIAN, K. A. & TIPLE A.D.

Biotechnique and Microtechnique

1. Animal Tissue Technique – Humason
2. Histological Technique – Devaenport
3. Microtechnique – Jiwaji&Patki
4. Microtechnique – Wankhede
5. Biophysical Chemistry – Upadhyay, Upadhyay and Nath
6. Techniques in Life Sciences – D. B. Tembhare

Immunology

1. Immunology – R. C. Kuby et al.
2. Immunology - Tizzard
3. Immunology - Roitt, Brostoff and D. Male
4. Immunology – Abbas

Bioinformatics and Biostatistics

1. Mount W. 2004. Bioinformatics and Sequence Genome Analysis 2nd Editon CBS Pub. New Delhi.
2. Bergman, N. H. Comparative Genomics. Humana Press Inc. Part of Springer Science+BusinessMedia, 2007.
3. Baxevanis, A. D. Ouellate, B. F. F. 2009. Bioinformatics: A Practical Guide to the Analysis of Genes and Proteins.John-Wiley and Sons Publications, New York.
4. Campbell A. M. and Heyer, L. J. 2007. Discovering Genomics, Proteomics and Bioinformatics, 2nd Edition. Benjamin Cummings.
5. Des Higgins and Willie Taylor 2000. Bioinformatics: Sequence, Structure and Databanks.Oxford University Press.
6. Rashidi H. H. and Buehler 2002. Bioinformatics Basics: Applications in Biological Science and Medicine, CRC Press, London.
7. Gibas Cynthia and Jambeck P. 2001. Developing Bioinformatics Computer Skills: ShroffPublishersand Distributors Pvt. Ltd. (O'Reilly), Mumbai