JIWAJI UNIVERSITY, GWALIOR

MASTER OF PHILOSOPHY
(M. Phil.) IN

ZOOLOGY

2020– 2021

The course for Master of Philosophy (M. Phil.) in Zoology shall be of two semesters, i.e., 12 months, but not exceeding 12 months.In the first semester, there shall be threecompulsory theory papers including one of seven special papers on advance Zoology opted by the student. In addition, the student has to submit a review on the published literature in the subject area of special paperopted by the student. The student has to submit a synopsis on a short research project in the respective specialization to be carried out during the second semester, followed by comprehensive viva voce. In the second semester, the student has to complete a short research project(dissertation) under the supervision of a guide (faculty member of the department) as partial fulfillment of M.Phil. degree (the dissertation work may be initiated in the first semester with the consent of the supervisor). The findings of the project work have to be compiled and submitted in the form of a dissertation thesis. The dissertation shall be evaluated as per the rules of the University.The summary of the course structure along with maximum marks (credits) and the marks allotted to the internal assessment and seminars are given in table 1.

19/10/20

Table 1: Course Structure of M.Phil. in Zoology

First semester	Second semester
CBMPHZ – 101: Research Methodology –100 marks (4 Credits) (End semester exam- 60 marks + Internal assessment – 40 marks) CBMPHZ-102: Computer Applications& Bioinformatics –100 marks (4 Credits) (End semester exam- 60 marks + Internal assessment – 40 marks) CBMPHZ-103: Advance Zoology (Optional Special Paper) (a): Aquatic Biology & Fisheries (b): Environmental Toxicology (c): Insect Physiology (d): Molecular & Human Genetics (e): Neurobiology (f): Reproductive Biology (g): Wild Life Biology & Management –100 marks (4 Credits) (End semester exam- 60 marks + Internal assessment – 40 marks) CBMPHZ-104: Review of Published Research in the relevant field (special paper) – 100 marks (4 Credits) CBMPHZ-105: Synopsis submission – 100 marks (4 Credits) CBMPHZ-106: Comprehensive Viva voce – 100 marks (4 Credits)	CBMPHZ – 201: Dissertation work – 300 marks (12 Credits) CBCPHZ-202: Viva voce based on Dissertation work – 100 marks (4 Credits) CBMPHZ-203: Seminars (4) – 100 marks (4 Credits)

DETAILED SYLLABUS

FIRST SEMESTER

CBMPHZ – 101: RESEARCH METHODOLOGY

UNIT-I

Introduction to Research Design:

- Nature and objectives of research, Methods of research: Historical, descriptive and experimental, research process, research approaches, criteria for good research, meaning of research design, need of research design, features of good design, different research designs and basic principles of experimental designs, features of good design, design of experiments.

UNIT-II

Data Collection and Analysis:

- Types of data, methods and techniques of data collection, primary and secondary data, meta analysis, historical methods, content analysis, devices used in data collection, pilot study and pretest of tools, choice of data collection method.

UNIT-III

Data Processing and Analysis:

- Measures of Central Tendency, Measures of Dispersion, Measures of Variation, Measures of Central Tendency vs Measures of Dispersion, Normal Distribution, Measures of Skewness and Interpretation, Correlation and Regression: Types and Applications.

UNIT-IV

Test of Significance:

- Significance of difference in means: Standard deviation and standard error; Z-test, 't' test and Chi-square test: purpose and use, Analysis of variance.

UNIT-V

Paper writing and report generation:

- Basic concept of paper/ thesis writing, and report generation, writing Research Abstract, Introduction, Review of Literature, Results, Conclusion, Concepts of bibliography and References, significance of Report Writing, Types of Research Reports, Methods of presentation of Reports, Formats of publication in Research Journals.

Reference Books:

1. Research Methodology: Methods and Techniques- C.R. Kothari, New Age Publisher.
2. Research Methodology: R.N. Trivedi and D.P. Shukla, college Book Depot, Jaipur.
3. Research Methodology: D. Chakraborty, Lotus Press.
4. Research Methodology for Life Sciences: N. Arumugam, Saras Publication.
5. Random Data Analysiss and Measurments Procedures: Bendat and Picrsol, Wiley Interscience.
6. Research Methodology: Bin Taylor, G. Sinha and T. Ghoshal, Prentice Hall of India Pvt. Ltd.
7. Methods in Biostatistics: B.K. Mahajan, Jaypee Brothers Medical Publishers, N. Delhi, India.
8. Principles of biostatistics: Marcello Pagano, CRC Press, Taylor and Francis.

CBMPHZ – 102: COMPUTER APPLICATIONS AND BIOINFORMATICS

UNIT-I

Computer Fundamentals:

- Computer Basics and Terminology, Input and output devices, Computer memory, computer generation and Classification, Types of software, Operating Systems &their types, Basic terms related to Windows OS, Computer Networks, LAN, MAN, WAN.
- Research Polishing Tool-MS Word, Creating, editing and saving a word document, Use of Autotext, Tables related operations, graphics.

UNIT-II

Introduction to Spreadsheet and Presentation:

- Introduction to Excel, Use of Spreadsheet in Research, Data Storing, Various Data Types, Use of Formula and Functions, Calculate, Manipulate and Analyses of Data, Preparing charts.
- MS Power Point, Features and Functions, Creating presentation, Animation, Customizing presentation.

UNIT-III

Introduction to Internet and Computer Applications:

- Introduction to Internet, WWW, Searching on Internet, Literature survey, Websites, Search Engines, Anti-Plagiarism software, Viruses and its Types, Protection from Viruses.
- Introduction of computers in Research: Literature Search using various Search Engines, Writing References, Software for Reference arrangement, Statistical Packages: Sigma plot etc.

UNIT-IV

Bioinformatics:

- Applications of bioinformatics in Life Sciences, biological Database: Primary, Secondary and Composite Database, Sequence Database: Nucleic acid (EMBL and GenBank), Protein Database (PIR and SEISS-PROT), Structure Database: Protein Data Bank.
- Sequence Analysis: biological Motivation of Sequence Analysis, Homology, Base Pair Alignment: Local, Global and Tools for Base Pair Alignment: BLAST and FASTA, Multiple Sequence Alignment: Methods.

UNIT-V

Phylogenetic Analysis, Protein Structure Predication, Drug Designing:

- Phylogenetic analysis, methods(character based and distance based methods), tree evaluation, protein structure predication: homology modeling, threading, ab-initio methods, Expressed Sequence Tags (EST) and its applications, Microarray Database and its applications, Biodiversity Informatics (Approaches to documenting Global patterns).

Reference Books:

1. An Introduction to Computational Biochemistry: C. Stan and T. Sal.
2. Introduction to Bioinformatics" A Theoretical and Practical Approach: S.A. Krawetz& D.D. Womble.
3. Bioinformatics, Genes, Proteins and Computers: C.A. Orengo, D.T. Jopnes, J.M. Thornton.
4. Instant Notes on Bioinformatics: D.R. Westhead, J.M. Perish, R.M. Toyman.
5. Essential Bioinformatics: JinXiong
6. An Introduction to Bioinformatics Algorithms: N.C. Jones, P. Pevzner.
7. Bioinformatics: Sequence and Genome Analysis: D.W. Mount.
8. Statistical Methods in Bioinformatics: An Introduction S. Misener, S.A. Krawetz.
9. Bioinformatics: Database and Algorithms: N. Gautham.
10. Bioinformatics Technology: Yi-Ping Phoebe Chen
11. Data Mining: Multimedia, Soft Computing and bioinformatics: S. Mitra, T. Acharya.

CBMPHZ-103: Advance Zoology (Optional Special Paper)
(a): Aquatic Biology & Fisheries
(b): Environmental Toxicology
(c): Insect Physiology
(d): Molecular & Human Genetics
(e): Neurobiology
(f): Reproductive Biology
(g): Wild Life Biology & Management

CBMPHZ-103 (a): AQUATIC BIOLOGY AND FISHERIES

UNIT - I

- Lentic and lotic habitats and their characterization
- Wet lands their characteristics and management
- Macro- and micro nutrients in water and their significance
- Plankton their collection, preservation and quantitative study

UNIT - II

- Primary productivity, secondary productivity and their significance
- Grazing and detritus food chain in aquatic environment
- Estuarine and coastal water environment and their characteristics
- Marine environment and its characteristics

UNIT -III

- Water pollution, causes, control and management
- Pollution in Indian rivers, Ganga action plan
- Marine pollution, causes and control
- Inland Fisheries : Fisheries of rivers and reservoirs and management

UNIT -IV

- Fish and fisheries of Gandhi Sagar and Tighra reservoir
- Management of freshwater fish and prawn culture
- Management of brackish water fish and prawn culture
- Integrated fish forming principles and practice

UNIT -V

- Fishing nets and gear technology
- Fish seed production technology
- Post harvest technology
- Fish biotechnology : Hybridization, transgenic fish
- Fisheries extension and significance

CBMPHZ – 103 (b): ENVIRONMENTAL TOXICOLOGY

UNIT- I

- Introduction and development of environmental toxicology
- Environmental toxicants : Pesticides and Heavy metals
- Absorption, distribution and excretion of toxicants
- Acute, sub acute and chronic toxicity

UNIT- II

- Dose – response relationship
- Behavioral toxicity
- Reproductive toxicity

UNIT - III

- Teratogenecity
- Neurotoxicity
- Hepatoxicity

UNIT- IV

- Nephrotoxicity
- Cardio-vascular toxicity
- Occupational hazards in Industries

UNIT- V

- Aquatic toxicology - toxicants, factors and effects
- Concentration – response relationships in aquatic medium
- Bioaccumulation in aquatic organisms
- Biotransformation and biomagnifications in aquatic organisms

CBMPHZ –10 3 (c): INSECT PHYSIOLOGY

UNIT- I

- Physiology of moulting and tanning
- Biochemistry of contractile elements of insect muscles
- Chemical nature of actin, myosin and tropomyosin
- Functions of haemolymph

UNIT- II

- Coordination and regulation of digestion in insects
- Hormonal control of moulting, metamorphosis, tanning and colour change
- Activation and inhibition by corpora allata.
- Physiological action of corpora allata hormones on reproduction

UNIT -III

- Significance of neurosecretory cells and corpora cardiaca in reproduction
- Corpora allata - prothoracic gland interactions for growth and development
- Physiological and biochemical regulation and determination of development in the egg
- Circadian rhythm

UNIT- IV

- Aging in insects, definition of aging, factors influencing life span (genetic constitution, parental age, length of metamorphosis, temperature nutrition)
- Origin and development of resistance to insecticides
- Insect behaviour, selection of habitat and food by phytophagous, carnivorous and parasitic insects

UNIT- V

- Protection and defense immunity in insects
- Physiology of exodus of migratory insects from breeding site factors controlling take-off
- Physiological approach of insect pest management: Repellents, attractants, anti-feedants, semiochemicals, IGRs etc.

CBMPHZ-10 3 (d): MOLECULAR AND HUMAN GENETICS

UNIT – I

- Overview of Structural and Functional genomics
- Genome structure analysis and physical map of human genome
- Human Genome Project & Human Genome Diversity Project
- Introductory idea of Comparative genomics

UNIT - II

- Human chromosomes (karyotype & nomenclature); techniques in chromosome analysis (Banding and Florescence staining techniques)
- Pedigree analysis of autosomal and sex linked diseases; Complex pedigrees
- Introduction to linkage analysis and gene mapping in humans: Markers and Two-point & multipoint mapping (LOD score)
- Mapping of complex traits in human: Association studies

UNIT - III

- Genetic basis of certain common diseases: diabetes mellitus, Huntington's disease, muscular dystrophy (DMD & BMD); trinucleotide repeats & diseases
- Genetics of metabolic diseases : General idea of enzyme defects (inborn errors of metabolism), mucopolysaccharidosis, lysosomal disorders, phenylketonuria
- Genetic counseling and prenatal diagnosis

UNIT- IV

- Human genome: General idea on the molecular organization and characteristics of coding and non-coding genes, repeats and mitochondrial genome.
- Cancer: Molecular and chromosomal basis; role of methylation in cancer
- Cancer: Tumor suppressor genes and Oncogenes

UNIT – V

- Methods and components of gene cloning and analysis: Vectors, enzymes, hybridizations methods, quantitative PCR methods, etc.
- Preparation and screening of gene libraries (genomic and cDNA libraries)
- Methods in genotyping: DNA finger printing, RAPD, RFLP & SNP mapping

CBMPHZ –10 3 (e): NEUROBIOLOGY

UNIT - I

- Neuroscience and human health
- Gross anatomy of human brain
- Cytology of neurons
- Non-neuronal cells in the brain – the Glia

UNIT - II

- Histology of major brain regions: Cerebral cortex, hippocampus, cerebellum, brain stem, spinal cord
- Synthesis and trafficking of neuronal proteins
- Pumps: The Na and K^+ pump, the calcium pump, other pumps and transport mechanisms
- Ligand gated ion channels: Nicotinic, acetylcholine, GABA, glycine and glutamate receptors

UNIT - III

- Voltage gated channels: Sodium and calcium channels
- Neurotransmitters and neuromodulators
- Sensation and perception (the sensory system of brain)
- Reflex and voluntary control of movement (The motor system of the brain)

UNIT - IV

- Nervous control of homeostasis and arousal
- Cognitive and affective functions: The higher functions of the brain
- Consciousness
- Evolution of brain

UNIT -V

- Brain and behaviour
- Genes and behaviour
- Reaction of neurons to injury: regeneration and degeneration of neurons
- Learning and memory
- Brain ageing and age associated disorders

CBMPHZ – 103 (f): REPRODUCTIVE BIOLOGY

UNIT- I

- Chemistry and biology of gonadotrophic hormones
- Hypothalamic control of gonadotrophic secretion
- Spermatogenic functions of testis
- Ultrastructure and functions of the Sertoli cells

UNIT- II

- Ultrastructure and functions of the Leydig cells
- Blood testis barrier
- Biochemistry of semen
- Capacitation of spermatozoa
- Structure of mammalian sperm

UNIT- III

- Sperm motility
- Structure and functions of epidydimus, vas deferens and accessory glands
- Induction of ovulation
- Structure and factions of mammalian oviduct

UNIT- IV

- Endocrine control of egg implantation
- Role of hormones in maintenance mammalian pregnancy
- Mechanism of onset of parturition
- Fine structure of placenta and passage of hormones through it

UNIT- V

- Chemistry and biology of human chorionic gonadotrophin
- Role of prostaglandins in reproduction
- Chemical contraceptives for females
- Immunological studies of the endocrine system in relation to reproduction

CBMPHZ – 3 (g): WILDLIFE BIOLOGY AND MANAGEMENT

UNIT -I

- Introduction to Indian Wildlife
- Conservation ethics and values of wildlife
- Forests and Environment
- Bio-geographic zones and wildlife distribution in India

UNIT - II

- Wildlife habitats and ecosystem analysis
- Species diversity analysis
- Wildlife populations and interactions
- Wildlife behaviour

UNIT - III

- Wildlife resources : Uses, exploitation and threats
- Measures for wildlife conservation and management
- National Wildlife Action Plan
- Wildlife legislation and administration

UNIT - IV

- Wildlife protected areas and their management
- Man and Biosphere reserve programmes
- Endangered species and special wildlife projects
- Wildlife organizations : National and International

UNIT -V

- Wildlife Research Techniques
- Role of Zoos in wildlife conservation
- Wildlife Tourism
- Wildlife Education and extension programmes

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