MAHARSHI DAYANAND UNIVERSITY,
DEPARTMENT OF ZOOLOGY

PhD Course Work in Zoology

Scheme of Examination of PhD (Course Work) Examination Jan-Dec.2017

Paper No.	Nomenclature	Credits	Evaluation Scheme		Max Marks
			Theory	IA*	
17ZOOPC1	Research methodology	4	20*	-	100
17ZOOPC2	Biostatistics & Computers	4	20*	-	100
17ZOOPC3	Applications of Techniques in Animal Sciences	4	20*	-	100
17ZOOPC4	Review writing and presentation/Seminar	1	--	-	50+50
				Grand total	400

* **Internal assessment:**

Two assignments of 10 Marks each.

****Seminar**

Division of marks:
Participation   :10
Seminar   :10
Presentation   :15
Discussion   :15

Total :50

Note: The candidate shall be required to present seminar related to any topic of the theory syllabus or on research problem under the guidance of the Faculty member. The evaluation will be based on the presentation of the seminar jointly by the Department.

Syllabus of PhD (Course Work)

17ZOOPC1: RESEARCH METHODOLOGY

Max Marks: 80+20 (Internal assessment)   **Time allotted: 3 Hours**

Instructions for paper setter
There will be a total of nine questions. Question No. 1 will be compulsory and shall contain eight to ten short answer type questions without any internal choice and it shall cover the entire syllabus. The remaining eight questions will include two questions from each unit. Candidates will be required to attempt one question from each of the four units. They will attempt five questions in all.

UNIT I
Meaning of Research in Biological Sciences - Purpose, Characteristics and Types of Research - Process of Research -Formulation of objectives - Formulation of Hypotheses - Types of Hypotheses - Methods of testing Hypotheses - Research plan and its components - Methods of Research (Survey, Observation, case study, experimental, historical and comparative methods) - Difficulties in Biological research.

UNIT II
Identification and formation of research problem (Hypothesis). Elements in research methodology: Research design (CRD, RBD, LSD). Scientific database: Science Direct and Pubmed.

UNIT III
Ethical, legal, social and scientific issues in Biological Research. A brief idea about the funding agencies such as DST, DBT, ICMR, CSIR and UGC. Role of IPR in Research and Development.

UNIT IV
Writing of Research Proposal, Report and Research Paper: Meaning and types - Stages in preparation - Characteristics - Structure - Documentation: Footnotes and Bibliography - Editing the final draft- Evaluating the final draft- Checklist for the of a good proposal/report/research paper.
Basic knowledge of organizing conferences, symposia, workshop, exhibition etc.

Books Recommended:

- Research Methodology- G.R. Basotia and K.K. Sharma.
- Research Methodology- C.H. Chaudhary, RBSA Publication

Syllabus of PhD (Course Work)

17ZOOPC2: BIOSTATISTICS & COMPUTERS

Max Marks: 80+20 (Internal assessment)   **Time allotted: 3 Hours**

Instructions for paper setter
There will be a total of nine questions. Question No. 1 will be compulsory and shall contain eight to ten short answer type questions without any internal choice and it shall cover the entire syllabus. The remaining eight questions will include two questions from each unit. Candidates will be required to attempt one question from each of the four units. They will attempt five questions in all.

UNIT I
Variables in Biology, Collection, classification and tabulation of data. Frequency distribution, Diagrammatic and Graphical presentation of statistical data, Sampling techniques. Specific applications of measures of Central tendency, Dispersion, Skewness and Kurtosis in research.
Measures of Relationship: Correlation – Simple, Partial and multiple- Regression- Simple and multiple-Association of Attributes – applications in research.

UNIT II
PROBABILITY: - Meaning, Fundamental Concepts, Approaches to measurement of Probability, Random experiments, sample space, events. Mathematical definition of probability of an event. Use of permutations and combinations in calculation of probability.
PROBABILITY DISTRIBUTIONS: - Distribution of binomial, poisson and normal variables and their fittings only Binomial, Poisson and Normal, (areas method only) Distributions (including problems).

UNIT III
Hypothesis Testing and estimation: Fundamentals of hypothesis testing-Standard error point and interval estimates-Important non-parametric tests: Sign, Run Kruskal-Wallis tests and Mann – Whitney test. Level of significance. Definitions and applications of Chi-square test,'t' and 'f' test. Meaning of analysis of variance with linear models. Analysis of variance for one-way classified data, analysis of variance for two-way classified data.

UNIT IV
Computer Basics: Course introduction, MS Windows basics, UNIX basics, File management, E-mail (PINE, EUDORA, Internet mail), File Transfer (ftp, WSftp).
Office Applications: MS Office 2000/XP including MS Word, MS Excel, MS PowerPoint.

Books Recommended:
- Elements of Biostatistics in Health Science- W. Daniell.
- Statistical Methods for Research: S. Singh et al (1988) Central Publishing Ludhiana.
- Fundamental of Statistics – D. N. Enhance.
- Statistical Methods: S.P. Gupta. S. Chand Publication
- Fundamentals of Biostatistics- Khan and Khanna, Ukaz Publication
- Biostatistical analysis- Zerold and Jar.

Syllabus of PhD (Course Work)

17ZOOPC3: APPLICATIONS OF TECHNIQUES IN ANIMAL SCIENCES

Max Marks: 80+20 (Internal assessment)   **Time allotted: 3 Hours**

Instructions for paper setter
There will be a total of nine questions. Question No. 1 will be compulsory and shall contain eight to ten short answer type questions without any internal choice and it shall cover the entire syllabus. The remaining eight questions will include two questions from each unit. Candidates will be required to attempt one question from each of the four units. They will attempt five questions in all.

UNIT-I
Analysing the application of techniques in animal sciences research: types of microscopy; microtomy. Biophysical methods**:** Analysis of biomolecules using UV/visible, fluorescence, circular dichroism, NMR and ESR spectroscopy, structure determination using X-ray diffraction and NMR; analysis using light scattering, different types of mass spectrometry and surface plasma resonance methods.

UNIT - II
Ultracentrifugation (Velocity and buoyant density); Gel filteration, ion exchange & affinity chromatography; thin layer chromatography; gas chromatography; High pressure liquid chromatography (HPLC), Electrophoresis (starch, agarose, PAGE); Electrofocussing. Enzyme technology: Animal protein/enzyme purification; application of biosensor development in different systems

UNIT – III
Determination of toxicity: Acute, Chronic; Nucleic acid hybridization and cot curves; sequencing of nucleic acids; Southern, Northern and South -Western blotting techniques; Polymerase Chain reaction; measuring nucleic acid and protein interaction. Flow cytometry, Karoyotyping; FISH & GISH; Spirometry; Animal tissue culture.

UNIT – IV
Computational methods: Nucleic acid and protein sequence databases; data mining methods for sequence analysis, web-based tools for sequence searches, motif analysis and presentation. Phylogenetic implications of computational data
Radio labeling techniques: detection and measurement; incorporation of radioisotopes in biological tissues and cells, molecular imaging of radioactive material, safety guidelines; Immunoassays & diagnostic applications

Suggested Books:
Molecular cloning A Laboratory Manual 3rd edition Vol. 1,2, 3- Sambrook and Russell, Churchill press, 2007