

MAHARSHI DAYANAND UNIVERSITY
DEPARTMENT OF ZOOLOGY

Ph.D. in Zoology

Programme Specific Outcomes

PSO1: The Doctor of Philosophy program is designed to prepare each student to actively participate in research and teaching in the field of Zoology along with other fields of Life Sciences and in a University or a Research organization.

PSO2: Students are exposed to advanced experimental and theoretical techniques, encouraged to attend National and International conferences as well as workshops during the program.

PSO3: Several research areas of Zoology are interdisciplinary in nature and are funded by various funding agencies, giving students a flavour for both applied and basic research.

PSO4: Students in this programme acquire knowledge, critical thinking skills, and experience in conducting cutting-edge research. Students would gain proficiency in research methodology and assessment techniques in animal science.

PSO5: Students with a PhD degree either pursue a post-doctoral position aiming for an academic career or find employment in industrial R&D laboratories.

Ph.D. Course Work

Scheme of Examination of PhD (Course Work) Examination

Paper No.	Nomenclature	Credits	Evaluation Scheme		Max Marks
			Theory	IA*	
17ZOOPC1	Research methodology	4	80	20*	100
17ZOOPC2	Biostatistics & Computers	4	80	20*	100
17ZOOPC3	Applications of Techniques in Animal Sciences	4	80	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.

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Ph.D. (Course Work) ZOOLOGY
w.e.f. session 2018-19

Course no.: 17ZOOPC1
Course Title: Research Methodology

MM: 80
Time: 3Hr

Course Outcomes

CO1: Students should be able to identify the overall process of designing a research study from its inception to its report.

CO2: Students should know the primary characteristics of quantitative research and qualitative research.

CO3: Students should be able to identify a research problem stated in a study.

CO4: Students should be familiar with ethical issues in educational research, including those issues that arise in using quantitative and qualitative research.

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

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Course no.: 17ZOOPC2
Course Title: Biostatistics & Computers

MM: 80
Time: 3Hr

Course Outcomes

- CO1:** Students would gain knowledge about the assumptions, technique and applications of ANOVA
- CO2:** Students would be able to develop and test research ideas and apply the knowledge of research designs in planning and analysing research.
- CO3:** Students would gain knowledge about office applications of computer in research.

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

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Course no.: 17ZOOPC3

Course Title: Applications of Techniques in Animal Sciences

MM: 80

Time: 3Hr

Course Outcomes

- CO1:** Students would be able to develop basic appreciation of the underlying principles and practical strategy of the analytical and preparative techniques that are fundamental to study and understanding of life processes
- CO2:** Students would be able to develop basic concepts and practical aspects of various kinds of Microscopy, Spectroscopy and separation techniques.
- CO3:** Students would be able to understand the concept of radioisotope techniques, molecular biology techniques and their applications in research.

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 filtration, 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:

1. Molecular cloning A Laboratory Manual 3rd edition Vol. 1, 2, 3- Sambrook and Russell, Churchill press, 2007
2. Molecular Cell Biology, J. Darnell, H. Lodish and D. Baltimore Scientific American Boo