MAHARSHI DAYANAND UNIVERSITY ROHTAK
Department of Zoology
Ph.D. course work 2020-21

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.

Duration: One Semester (Six months)

Total Credit requirement: 14 credits

Program Structure: Ph.D. in Zoology

Ph.D. COURSE WORK

Scheme of Examination of Ph.D. (Course Work) Examination

SEMESTER 1						
Course Code	**Nomenclature of Course**	**Theory marks (end semester examination)**	**Internal Assessment marks**	**Maximum marks**	**Hours /Week**	**Credits**
20ZOOPH11C1 (Compulsory for all Ph.D. Course work)	Research Methodology	80	20*	100	4	4
20MPCC1 (Compulsory for all Ph.D. Course work)	Research and Publication Ethics	40	10**	50	2	2
20ZOOPH11C3	Biostatistics & Computers	80	20*	100	4	4
20ZOOPH11C4	Applications of Techniques in Animal Sciences	80	20*	100	4	4
Total marks/Credits				**350**		**14**

Note: The compulsory course on 'Research and Publication Ethics' shall be offered by Ch. Ranbir Singh Institute of Social and Economic Change for all UTDs/Centres/Institutes passed vide Resolution No. 27 of the 271st meeting of EC held on 29.7.2020.

***Internal Assessment:**

Two assignments of 5 marks each

Two presentations of 5marks each

****Internal Assessment**:

One assignment of 5 marks each

One presentation of 5 marks each

Pass percentage will be 50% in each paper.

Ph.D. Course Work in Zoology syllabus

Name of the Program	Ph.D. Course work in Zoology	**Program Code**	ZOOPH
Name of the Course	Research Methodology	**Course Code**	20ZOO11C1
Hours/Week	4	**Credits**	4
Max. Marks.	80	**Time**	3 Hours

Note: The examiner has to set a total of nine questions (two from each unit and one compulsory question consisting of short answer from all units. The candidate has to attempt one question each from each unit along the compulsory question (5 x 16 = 80 marks)

Course Objectives:

1. To know about the research perspective in life sciences
2. To understand the research hypothesis formulation and testing
3. To understand the elements of research methodology
4. To develop skills w.r.t. Research article/papers writing skills
5. To understand significance of scientific programs in Life Sciences

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.

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.

References:

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

Ph.D. Course Work syllabus in Zoology

Name of the Program	Ph.D. Course work in Zoology	**Program Code**	ZOOPH
Name of the Course	Research and Publication ethics	**Course Code**	20MPCC1
Hours/Week	2	**Credits**	2
Max. Marks.	40	**Time**	3 Hours

Note: The examiner has to set a total of nine questions (two from each unit and one compulsory question consisting of short answer from all units. The candidate has to attempt one question each from each unit along the compulsory question (5 x 8 = 40 marks)

Course Objectives:

1. To study the philosophy of ethics
2. To study the scientific conduct of research
3. To study the publication ethics
4. To know about various journal citation databases
5. To know the importance of quality publications

Course Outcomes:

By completion of course the student is able to

1. Ethics in conduct of scientific research
2. Know the scientific misconducts
3. How to avoid plagiarism and what are the penalties of plagiarism
4. Know the quality of research publications
5. Write research and review articles.

Unit - I

PHILOSOPHY AND ETHICS

1. Introduction to philosophy: definition, nature and scope, concept, branches
2. Ethics: definition, moral philosophy, nature of moral judgments and reactions

SCIENTIFIC CONDUCT

1. Ethics with respect to science and research
2. Intellectual honesty and research integrity
3. Scientific misconducts: Falsification, Fabrication, and Plagiarism (FFP)
4. Redundant publications: duplicate and overlapping publications, salami slicing
5. Selective reporting and misrepresentation of data

Unit - II

PUBLICATION ETHICS

1. Publication ethics: definition, introduction and importance
2. Best practices / standards setting initiatives and guidelines: COPE, WAME, etc.
3. Conflicts of interest
4. Publication misconduct: definition, concept, problems that lead to unethical behavior and vice versa, types
5. Violation of publication ethics, authorship and contributorship
6. Identification of publication misconduct, complaints and appeals
7. Predatory publishers and journals

Unit - III

DATABASES AND RESEARCH METRICS

(A) Databases

1. Indexing databases
2. Citation databases: Web of Science, Scopus, etc.

(B) Research Metrics

1. Impact Factor of journal as per Journal Citation Report, SNIP, SIR, IPP, Cite Score
2. Metrics: h-index, g index, i10 index, altmetrics

Unit - IV

Practice

OPEN ACCESS PUBLISHING

1. Open access publications and initiatives
2. SHERPA/RoMEO online resource to check publisher copyright & self-archiving policies
3. Software tool to identify predatory publications developed by SPPU
4. Journal finder/journal suggestion tools viz. JANE, Elsevier Journal Finder, Springer Journal Suggested, etc.

PUBLICATION MISCONDUCT

(A) Group Discussions

1. Subject specific ethical issues, FFP, authorship
2. Conflicts of interest
3. Complaints and appeals: examples and fraud from India and abroad

(B) Software tools (2 hrs.) :Use of plagiarism software like Tumitin, Urkund and other open source software tools

References:

1. Bird, A. (2006). Philosophy of Science, Routledge
2. P. Chaddah (2018) Ethics in Competitive Research: Do not get scooped; do not get plagiarised.
3. Indian National Science Academy (INSA), Ethics in Science Education, Research and Governance (2019).
4. Beall, J (2012), Predatory publishers are corrupting open access. Nature, 489(7415), 179.
5. National Academy of Sciences, National Academy of Engineering and Institute of Medicine (2009). On being a Scientist: A guide to Responsible Conduct in Research, Third Edition, national Academic press.

Ph.D. Course Work in Zoology syllabus

Name of the Program	Ph.D. Course work in Zoology	**Program Code**	ZOOPH
Name of the Course	Biostatistics & Computers	**Course Code**	20ZOOPH11C3
Hours/Week	4	**Credits**	4
Max. Marks.	80	**Time**	3 Hours

Note: The examiner has to set a total of nine questions (two from each unit and one compulsory question consisting of short answer from all units. The candidate has to attempt one question each from each unit along the compulsory question (5 x 16 = 80 marks)

Course Objectives:

1. Biostatistics will help to train the scholars in the skilled application of statistical methods to the solution of problems encountered in public health and medicine.
2. Biostatistics help the students in formulating the scientific questions to be answered, determine appropriate sampling techniques, coordinate data collection procedures, and conduct statistical analyses to answer those scientific questions.
3. Biostatisticians also play vital role in the preparation of research material for publication.
4. Show an awareness of what the major computer components are and how they act as system
5. Appreciate that computers need instructions to operate and acquire simple programming skills
6. To foster among students an interest and confidence in using computers; To encourage an understanding of the implications of computers in the modern world

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.

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.

References:

- 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

Ph.D. Course Work in Zoology syllabus

Name of the Program	Ph.D. Course work in Zoology	**Program Code**	ZOOPH
Name of the Course	Applications of Techniques in Animal Sciences	**Course Code**	20ZOOPH11C4
Hours/Week	4	**Credits**	4
Max. Marks.	80	**Time**	3 Hours

Note: The examiner has to set a total of nine questions (two from each unit and one compulsory question consisting of short answer from all units. The candidate has to attempt one question each from each unit along the compulsory question (5 x 16 = 80 marks)

Course Objectives:

1. This paper aims to provide an introduction to various tools and techniques used to gain insight into biological processes.
2. Handling of biological samples and chemicals – life expectancy, precautions and their uses.
3. Solutions preparation, storage, stability, precautions, uses and their mechanism of action.
4. The focus is on studying the techniques used for imaging, isolation, purification and characterization of bio-molecules etc – principles and applications in various areas of sciences.

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.

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 labelling techniques: detection and measurement; incorporation of radioisotopes in biological tissues and cells, molecular imaging of radioactive material, safety guidelines; Immunoassays &

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