

**Tantia University**  
Sri Ganganagar  
Ph.D. Course Work Syllabus  
(Revised as Per UGC Regulation 2022)  
**Zoology**

**Maximum Marks-120**

**Minimum Marks-66**

**PART-A**

**Part A- 60 Marks**

**Total Credits = 6**

**Total Hours=6x45= 270 Hours**

**Introduction to Research**

Introduction of Research, Research methodology, Defining Research problem and formulation of hypothesis, research design, sampling design, measuring and scaling techniques, methods of data collection.

Pure and Applied Research, Exploring or Formulative Research, Descriptive Research, Diagnostic Research/Study, Evaluation Research/Studies, Action Research, Experimental Research, Historical Research, Surveys, Case Study, Field Studies

Research Ethics: Characteristics and format of research paper, article, thesis writing, review of Related Literature, Purpose of the review, Identification of the related literature. Organizing the related literature.

**Statistics**

Concept of statistics, relevance in research, parametric and non-parametric data; graphical representation of data: histogram, frequency polygon, ogive and pie chart; Measures of Central Tendency, Correlation, t-test chi square test

**Computer Application**

Basic and fundamental knowledge of Computer and its Applications. Introduction, Application Area, Operating System, Windows, Office, Internet.

**PART-B**

**Part B- 60 Marks (Subject based)**

**Total Credits = 6**

**Total Hours=6x45= 270 Hours**

1. Killing and Fixation, Collection and preservation: of biological samples.
2. PAS, Metachromasia and Feulgen Staining techniques.

3. Different types of microscopes: Phase contrast, Fluorescence, Polarizing and Electron microscopes TEM and SEM. Microscopic techniques: Visualization of cells and subcellular components by light microscopy, resolving powers of different microscopes, microscopy of living cells, scanning and transmission microscopes, different fixation and staining techniques for EM, freeze-etch and freeze-fracture methods for EM, image processing methods in microscopy.
4. Different types of microtomes: Rocking, Rotary, Freezing microtomes. Cryotechniques (Freeze drying and freeze substitution), Fresh and fixed frozen sections and Ultratome.
5. Centrifuges, High speed centrifuge, Ultracentrifuge.
6. pH Meter.
7. Colorimeter, Spectrophotometer and Flame photometer.
8. Balance types: Electric and Electronic balance.
9. Electrophoresis: Principles of Electrophoresis types of electrophoresis, paper and gel electrophoresis and their comparison. Blotting techniques.
10. Chromatography: Principles of chromatography, types of chromatography, TLC, two dimensional and column chromatography, GC, HPLC.
11. Electrophysiological Equipment: Kymographic equipment and Oscilloscope. Patch clamp.
12. Photomicrography.
13. Radiation: Types of radiations, Principles of Autoradiography; Scintillation and Gamma counter.
14. Principles and working system of audiovisual equipments.
15. Use of computers in Life Science, Fundamentals of Computer architecture. Computational methods: Nucleic acid and protein sequence databases; data mining methods for sequence analysis, web-based tools for sequence searches, motif analysis and presentation.
16. Histochemical and immunotechniques: Antibody generation, detection of molecules using ELISA, RIA, western blot, immunoprecipitation, flow cytometry and immunofluorescence microscopy, detection of molecules in living cells, *in situ* localization by techniques such as FISH and GISH.