

Raja Mahendra Pratap Singh University, Aligarh

Pre-Ph.D. Course Work Syllabus

Paper-II: Subject Specific Course - Zoology

Credits: 4 Units: 4

Maximum Marks: 100

Course Objectives:

The objective of this course is to provide advanced knowledge of fundamental and modern areas of zoology relevant to doctoral research. It aims to develop analytical, theoretical and experimental skills necessary for conducting independent research in specialized areas of zoology.

Course Outcomes:

At the end of this course students will be able to learn about the various tools and techniques used in biosciences. They will be able to select the instruments and techniques involved in a particular experiment. Students will be able to prepare lab solutions required in lab for experimental design and know the safe laboratory practices and disposal of waste materials.

Unit I:

- Microscopy: Principles of microscopy; Simple and compound microscope, Phase contrast microscopy, fluorescent microscopy, confocal microscopy, Electron microscopy - SEM and TEM, dissecting microscope (Stereomicroscope), Brightfield microscope, digital microscope.
- Histological staining: Types of stains, fixatives, basic histological staining techniques
- Microtome: Different types of microtomes- Rocking, Rotary, Freezing microtomes, Ultramicrotome
- Cryotechniques of freeze drying and freeze substitution, fresh and fixed frozen sections, Cryostat.

Unit II:

- Colorimetry/ Spectrophotometry: Principles and methodology
- Chromatography: Principle of chromatography, types of chromatography, thin layer chromatography (TLC), two-dimensional, column chromatography (Gel exclusion, Ion exchange, Affinity) High Performance Liquid Chromatography (HPLC), Gas liquid chromatography (GLC)
- Autoclave, Laminar Air flow, Lyophilizer
- Homogenizer and Centrifuge: Principle, High speed centrifuge, Differential and Density gradient centrifuge, Ultracentrifuge, Analytical ultracentrifuge.
- Electrophoresis: Principles, types, techniques and applications.

Unit III:

- Nucleic acids: isolation, purification, Southern, Western and Northern blotting techniques
- Genotoxicity Testing: Micronucleus Assay, Comet Assay

- PCR, RT PCR, RIA, ELISA: Principle and Applications
- Spectroscopic techniques: Introduction to spectroscopy, basic principles, instrumentation and applications of UV- VIS absorption, infrared, atomic absorption, fluorescence, circular dichroism, Nuclear Magnetic Resonance Spectroscopy (NMR), mass spectroscopy.

Unit IV:

- Biochemical calculations
- General idea of buffer system, Preparation of buffers such as (phosphate buffer, Tris-cl etc.)
- General idea of concentration measurement of solution viz. molarity normality, molality etc.)
- Management of laboratory chemicals, glassware and working with equipment
- Preparation of specimen, Reagents in aquatic ecology, Animal house management
- Guidelines for Bio-safety, Functioning of Institutional Bio-safety committee, Institutional Animal Ethics Committee and Institutional Ethical Committee, CPCSEA guidelines for Animal Experimentation.

Suggested Readings

1. Keith Wilson and John Walker: Principles and Techniques of Biochemistry
2. B.D. Singh: Biotechnology, Expanding Horizons
3. Prof. Punit Puri: Practical approach to histopathological staining and Microtomy
4. Pavia and Lampman: Introduction to Spectroscopy
5. Atheena Pandian: Types of Microscopes
6. Jennifer D.T. Kruschwitz: Colorimetry and Fundamental colour modelling
7. Elsa Lundanes and Leon Reubsaet: Chromatography, Basic Principles Sample preparations and related methods.
8. Yadav, A. (2020). CPCSEA Guidelines for Laboratory Animal Facility. International Journal of Pharmacology and Pharmaceutical Sciences, 2(1), 09-13.
9. Committee for the Purpose of Control and Supervision of Experiments on Animals. (2021). Guidelines of CPCSEA for experimentation on fishes.
10. Huntingford, F. (Ed.). (2012). The study of animal behaviour. Springer Science & Business Media.
11. Gadagkar, R., Chandrashekara, K., & Nair, P. (1990). Insect species diversity in tropics: Sampling methods and a case study. Journal of the Bombay Natural History Society, 87(3), 337-353.
12. Iknayan, K. J., Tingley, M. W., Furnas, B. J., & Beissinger, S. R. (2014). Detecting diversity: emerging methods to estimate species diversity. Trends in ecology & evolution, 29(2), 97-106.

Evaluation Scheme:

Internal Assessment / Assignment / Seminar: 30 Marks

End Semester Examination: 70 Marks