Zool-212 & 212L BIOLOGICAL TECHNIQUES Cr: 3(1+2)

Course Objectives:

1. To course aim to demonstrate the knowledge of skills
2. To familiarize with the basic tools and techniques of scientific study with emphasis on biological sciences
3. To develop basic understanding of the equipments handling/usage
4. To develop scientific technical expertise, culture and work habits.
5. To know how to collect and preserved animals

Course Learning Outcome:

After successfully completion of this course,

1. Students must be able to identify the instrument
2. Able to use instrument for identification, measurement, fixing and cutting of tissue
3. Able to apply a practical and research skill
4. Able to operate use the lab equipment efficiently.
5. Able to collect and preserved the specimen in dry and wet form.
6. Developed expertise in Preservation techniques – Taxidermy - Rearing techniques, Laboratory and field

Course Contents:

1. **Microscopy:**

- Principles of light microscopy: Magnification, Resolution,
- Types of microscopy (Bright field, Dark field, Phase Contrast)
- Confocal Microscopy
- Electron microscope: Scanning electron microscope and Transmission electron microscope (SEM and TEM).

2. **Standard unit system for weight, length, volume and Micrometery**:

- Diferent Measurement systems (length; surface; weight, volume, temperature), Calculations and related conversions
- Concentrations- percent volume; ppt; ppm - molarity, normality, molality
- Preparation of stock solutions of various strengths
- Use of stage and ocular micrometers
- Calibration of ocular micrometer and measurement of size animal and plant cell and nuclei

3. **Specimen preparation for optical microscopy**:

- Introduction to Microtomy and its types
- Tissue Fixation, dehydration, clearing, embedding, Section cutting (transverse, longitudinal section)

- Tissue mounting (dry mount, wet mount)
- Staining: Hematoxylin and Eosin staining

4. Separation and purification techniques:

- Cell fractionation
- Centrifugation and its types
- Filtration and its types,

5. Chromatography:

- Chromatography: Principle, applications, types,
- Paper chromatography and thin layer chromatography
- Column chromatography
- High pressure liquid chromatography.
- Electrophoresis: Principle, applications and types (Agarose and PAGE).

6. Spectrophotometry:

- Principle, applications, types
- Visible/UV spectrophotometry

7. Basic principles of Sampling and Preservation:

- Sampling from soil, water, air, plants and animals
- Preservation of dry and wet specimens.
- Preservation techniques. lyophilization, preservation in ethanol, formalin etc.

8. DNA sequencing

- Polymerase chain reaction (PCR), principle and application
- DNA sequencing (Sanger and Maxam Gilbert).

Practicals:

1. Preparation of slides (dry mount and wet mount)
2. Observation of wet mounts of human cheek cells employing bright and dark field microscopy
3. Measurement of cell size: bacterial and eukaryotic cell
4. Recording of microscopic observations with the help of camera lucida
5. Liquid handling: proper use of pipettes and micropittes
6. Hematoxylin and eosin staining
7. Gram's staining,
8. Handling of centrifuge machines
9. Paper Chromatography
10. Thin layer chromatography of amino acids
11. Spectrophotometric estimation of glucose
12. Collection and Preservation of representative animals of various phyla

Teaching-Learning Strategies

Teaching will be a combination of class lectures, class discussions, and group work. Short videos/films will be shown on occasion.

Assignments

The sessional work will be a combination of written assignments, class quizzes, presentation, and class participation/attendance.

Assessments and Examination

Sessional Work: 25 marks
Midterm Exam: 35 marks
Final Exam: 40 marks

Books Recommended:

1. Dean, J. R. 1999. Extraction Methods for Environmental Analysis. John Wiley and Sons Ltd. UK.
2. Cheesbrough, M. 1998. District Laboratory Practice in TropicalCountries. Part I. Cambridge University Press, UK.
3. Cheesbrough, M. 1998. District Laboratory Practice in TropicalCountries. Part II. Cambridge

University Press, UK.
4. Curos, M. 1997.Environmental Sampling and Analysis: Lab Manual. CRC Press LLC. USA.
5. Curos, M. 1997.Environmental Sampling and Analysis: ForTechnician. CRC Press LLC. USA.
6. Slingsby, D., Cock, C.1986. Practical Ecology. McMillan Education Ltd. London.
7. Rob Reed/ David HOLMES, Jonathan Weyers/ Allan Jones Pearson, Practical skill in bio-molecular sciences.
8. Gallagher, S.R. and Wiley E.A. 2008. Current protocols essential laboratory Techniques. John Wiley & Sons Inc, USA.
9. Jones, A. Reed, R and Weyers, J. 1994. Practical skills in Biology. Longman Singapore Publishers (Pte) Ltd.