Institute of Zoology,
Faculty of Life Sciences
University of the Punjab, Lahore
Course Outline

Programme	BS Zoology	**Course Code**	ZOOL-211	**Credit Hours**	1
Course Title	**Biological Techniques**				

Course Introduction

The course aims to:

1. Develop scientific-technical expertise, culture and work habits.
2. Familiarize with the basic tools and techniques of scientific study with emphasis on biological sciences
3. Develop basic understanding of the equipment's usage
4. Develop the skills to collect and preserved animals

Learning Outcomes

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

	Course Content	**Assignments/Readings**
Week 1	**Unit-I** Microscopy: 1.1 Principles of light microscopy: Magnification, Resolution, 1.2 Types of microscopy (Bright field, Dark field, Phase Contrast, Confocal Microscopy)	Cheesbrough, 1998 Gallagher and Wiley, 2008 Class Lecture
Week 2	**Unit-I** 1.3 Electron microscope: 1.3.1 Scanning electron microscope (SEM) 1.3.2 Transmission electron microscope (TEM).	Cheesbrough, 1998 Gallagher and Wiley, 2008 Class Lecture
Week 3	**Unit-II Specimen preparation for optical microscopy:** 2.1 Tissue Fixation, dehydration, clearing, embedding,	De Robertis, 1987 Cheesbrough, 1998 Gallagher and Wiley, 2008 Class Lecture Jones et al., 1994
Week 4	2.2 Introduction to Microtomy and its types, Section cutting (transverse, longitudinal section)Staining: Hematoxylin and Eosin staining 2.3 Tissue mounting (dry mount, wet mount)	
Week 5	2.4 Use of stage and ocular micrometers 2.4.1 Calibration of ocular micrometer and measurement of size animal and plant cell and nuclei	

Week 6	*Unit III Standard unit system for weight, length, volume and Micrometery:* 3.1 Diferent Measurement systems (length; surface; weight, volume, temperature), Calculations and related conversions	Cheesbrough, 1998 Gallagher and Wiley, 2008 Class Lecture
Week 7	3.2 Concentrations- percent volume; ppt; ppm - molarity, normality, molality 3.3 Preparation of stock solutions of various strengths	
Week 8	*Unit IV Separation and purification techniques:* 4.1 Centrifugation and its types	Curos, 1997 Dean, 1999 Cheesbrough, 1998 Gallagher and Wiley, 2008 Class Lecture
Week 9	4.2 Filtration and its types, 4.3 Cell fractionation	
Week 10	*Unit V Chromatography:* 5.1 Chromatography: Principle, applications, 5.2 types, 5.2.1 Paper chromatography 5.2.2 Thin layer chromatography	Curos, 1997 Dean, 1999 Gallagher and Wiley, 2008 Class Lecture Internet sources
Week 11	5.2.3 Column chromatography 5.3 High pressure liquid chromatography.	
Week 12	*Unit VI Spectrophotometry:* 6.1 Visible/UV spectrophotometry Principle, applications, types	Curos, 1997 Dean, 1999 Gallagher and Wiley, 2008 Class Lecture Internet sources
Week 13	*Unit VII Basic principles of Sampling and Preservation:* 7.1 Sampling of animals from soil, water and air 7.2 Preservation of dry and wet specimens. 7.3 Preservation techniques. lyophilization, preservation in ethanol, formalin etc.	Curos, 1997 Dean, 1999 Class Lecture Internet sources
Week 14	7.4 Taxidermy	
Week 15	*Unit VIII DNA sequencing* 8.1 Polymerase chain reaction (PCR), principle and application 8.2 Electrophoresis: Principle, applications and types (Agarose and PAGE).	Curos, 1997 Dean, 1999 Cheesbrough, 1998 Gallagher and Wiley, 2008 Class Lecture
Week 16	8.3 DNA sequencing 8.3.1 Sanger 8.3.2 Maxam Gilbert).	

Textbooks and Reading Material

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.
10. De Robertis, E. D. P., De Robertis Jr. E. N. F. 1987. Cell and Molecular Biology, Lea & Febiger, New York.

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: Types and Number with Calendar

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

Assessment

Sr. No.	Elements	Weightage	Details
1.	Midterm Assessment	35%	Written Assessment at the mid-point of the semester.
2.	Formative Assessment	25%	Continuous assessment includes: Classroom participation, assignments, presentations, viva voce, attitude and behavior, hands-on-activities, short tests, projects, practical, reflections, readings, quizzes etc. class Attendence
3.	Final Assessment	40%	Written Examination at the end of the semester. It is mostly in the form of a test, but owing to the nature of the course the teacher may assess their students based on term paper, research proposal development, field work and report writing etc.