



Institute of Botany
Faculty of Life Sciences
University of the Punjab, Lahore
Course Outline
Semester – I



Programme	BS Botany	Course Code	Bot-110	Credit Hours	2
Course Title	Cell Biology (Theory)				
Introduction					
This course is designed for an introduction to the morphology and functioning of cells, cellular organelles and mechanisms of cell division. It focuses on study of the internal organization of the eukaryotic cell, organelle and membrane function, cell-cell signaling, the extracellular matrix. It also covers Nucleus, its contents and cell cycle including cell division. Other latest trends of cell biology included as per need.					
Learning Outcomes					
Upon completion of this course, the student will be able to:					
<ul style="list-style-type: none">• Describe the fundamental principles of cellular biology.• Apply basic principles of cell biology to the current biological questions.• Develop a deeper understanding of cell structure and how it relates to cell functions.• Understand biomolecules and its role in daily life.• Understand how cells grow, divide, and die by the regulation of important processes.• Understand cell signaling and how it regulates cellular functions.					
Course Contents					
<ul style="list-style-type: none">• <u>Introduction</u>: the discovery of cells, its basic properties, different types of cells.• <u>Structure and function of biological molecules/ Chemical components of cells</u>: Acids, Bases and Buffers, Nature of Biological molecules, four types of biological molecules, carbohydrates, lipids, proteins, Nucleic Acids• <u>Cell wall</u>: Cell Wall Structure and Chemical Composition• <u>Cell membrane</u>: Membrane functions, history, chemical composition of membranes, structure and function of membranes, membrane lipids and membrane fluidity, movement of substances across cell membrane.• <u>Cellular organelles</u>: structure and function of endoplasmic reticulum, Golgi complex, Vacuole, Lysosomes, Ribosomes, Microbodies• <u>Cytoskeleton and Cytoplasm</u>: Chemical composition, structure and function. Microtubules, Microfilaments.• <u>Mitochondria</u>: structure and function, mitochondrial membranes, mitochondrial matrix, function of mitochondria, Peroxisomes.• <u>Chloroplast structure and Function</u>: structure and function, membranes, photosynthetic units and reaction centres, function of chloroplast.• <u>Nucleus</u>: Nuclear membrane, nucleolus, ultrastructure and morphology of chromosomes, karyotype analysis.• <u>Cell signaling Pathways</u>: the basic elements of cell signaling system, G protein coupled Receptors and their second messengers, the role of calcium as an intracellular messenger.• <u>DNA and Chromatin</u>: Chemical structure, different types of Chromatins, Euchromatin and Heterochromatin and their function.• <u>Extracellular Matrix</u>. The extracellular space, interactions of cells with extracellular materials, interaction of cells with other cells.• <u>Cell Division</u>: Cell cycle, Mitosis and Cytokinesis, Meiosis.• <u>Chromosomal Aberrations</u>; Changes in the number of chromosomes, aneuploidy and euploidy; Changes in the structure of chromosomes, deletion, duplication, inversion and translocation, special types of chromosomes.• <u>Trends in cell Biology</u>: the light microscope, Transmission electron microscope, Scanning electron microscope, use of radioisotopes, cell culture, DNA sequencing, DNA libraries, use of Antibodies.					

Programme	BS Botany	Course Code	Bot-110L	Credit Hours	1
Course Title	Cell Biology (Lab)				
Course Contents					
<ul style="list-style-type: none"> ● Study of cell structure using compound microscope. ● Identification of general Biomolecules. ● Extraction and estimation of Biomolecules ● Extraction and estimation of RNA and DNA from plant material. ● Elucidation of ultrastructure of cell through electron microphotographs ● Measurement of cell size ● Slide preparation of Cell wall and its layers. ● Study of Nucleus and its staining in different cells. ● Study of mitosis from prepared slides and by smear/squash method with onion root tip ● Study of meiosis from prepared slides ● Study of chromosome morphology ● Study of variation in chromosome number ● Study of variation in chromosome structure 					
Textbooks and Reading Material					
<ol style="list-style-type: none"> 1. Urry, L. A., Cain, M., Wasserman, S. A., & Jane, R. (2020). <i>Campbell Biology</i>, (13th Ed.), Pearson Education, New York. 2. Alberts, B. (2022). <i>Molecular Biology of Cell</i>. (7th Ed.). W. W. Norton & Company. 3. Karp, G. (2002). <i>Cell and Molecular Biology. Concepts and Experiments</i>. (4th Ed.), John Wiley and Sons. New York. 4. Bretscher, A. (2007). <i>Molecular Cell Biology</i>. W. H. Freeman and Company. 5. Weaver, R. F. (2008). <i>Molecular Biology</i>. McGraw Hill, St. Louis. 6. Gilmartin, P. M., & Bowler, C. (2002). <i>Molecular Plant Biology</i>. (Vol. 1 & 2). Oxford University Press. UK. 7. Lodish, H. (2001). <i>Molecular Cell Biology</i>. W.H. Freeman and Company. 8. Baluska F. et al. (2004) Eukaryotic cells and cell bodies: cell theory revised. <i>Annals of Botany</i>, 94: 9—32. 9. Dobson, C.M. (2005). Structural biology: prying the prions. <i>Nature</i> 435:747—749. 					
Teaching Learning Strategies					
<ul style="list-style-type: none"> ● Lectures ● Group Discussion ● Laboratory work ● Seminar/ Workshop 					
Assignments: Types and Number with Calendar					
<ul style="list-style-type: none"> ● Lecture Based Examination (Objective and Subjective) ● Assignments ● Class discussion ● Quiz ● Tests 					
