

Institute of Microbiology and Molecular Genetics
Faculty of Life Sciences
University of the Punjab, Lahore
Course Outline



Programme	BS	Course Code	MMG406	Credit Hours	3(2+1)
Course Title	CELL AND TISSUE CULTURE TECHNOLOGY				
COURSE INTRODUCTION					
<p>This course offers a comprehensive introduction to cell culture techniques, focusing on the establishment, maintenance, and application of primary cell cultures, cell lines, and 2D cell cultures. Students will learn about the technical and theoretical aspects of cell culture, including subculturing, cryopreservation, cell counting, and sterile techniques. The course will also address the limitations and applications of tissue culture in research and industry.</p>					
LEARNING OUTCOMES					
<p>On the completion of the course, the students will:</p> <ul style="list-style-type: none"> • Develop the ability to establish, maintain, and subculture primary cell cultures. • Develop the ability to establish, maintain, and subculture cell lines. • Implement sterile and aseptic techniques to prevent contamination. • Evaluate the applications and limitations of tissue culture, recognizing the critical concepts of cell confluence and the processes involved in cell passaging. 					
COURSE CONTENT					
<p>This course will cover primary cell cultures, including the introduction to establishing and maintaining them, and the techniques and importance of subculturing cells. Students will learn the differences between cell lines and cell strains and their applications, understand the process and significance of passaging cells, and master cryopreservation techniques for freezing cells for long-term storage and recovery. They will manage cell density and maintain healthy cultures, comprehend cell senescence and its effects, and understand the theoretical background and practical implications of the Hayflick Limit in cell culture. Accurate methods for cell counting will be covered, along with techniques for cell cryopreservation and recovery. The course will teach the use of trypsin to dissociate adherent cells, techniques for plating cells at appropriate densities, and methods for collecting cells from culture. Ensuring contamination-free environments through sterile and aseptic techniques will be emphasized, as well as identifying and preventing bacterial, fungal, and viral contaminations.</p>					
PRACTICALS					
<p>Establishing primary cell cultures from tissue samples, practicing subculturing techniques to maintain and expand cultures, passaging cells to ensure healthy growth, applying cryopreservation methods including the preparation of cryoprotectants and proper storage, and recovering cryopreserved cells to viable cultures.</p>					
TEXTBOOKS AND READING MATERIAL					
<ul style="list-style-type: none"> • Cell Culture Basics Handbook – Gibco https://assets.thermofisher.com/TFS-Assets/BID/Handbooks/gibco-cell-culture-basics-handbook.pdf • Helgason, C. D., & Miller, C. L. (2012). <i>Basic Cell Culture Protocols</i>, 4th Edition, Humana Press, New York, United States. 					

- Doyle, A., & Griffiths, J. B. (2000). *Cell and Tissue Culture: Laboratory Procedures in Biotechnology*, Wiley, Hoboken, United States.

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, practicals, reflections, readings, quizzes etc.
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, fieldwork , report writing etc.

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Programme	BS	Course Code	MMG407	Credit Hours	3(2+1)
Course Title	MONOCLONAL ANTIBODIES				
COURSE INTRODUCTION					
<p>This course is designed to provide a comprehensive understanding of antibodies (Monoclonal/polyclonal) being the fundamental tools in immunology and biotechnology. Antibodies, also known as immunoglobulins, play a crucial role in the immune system by identifying and neutralizing pathogens. The focus will be on the two main types of antibodies, monoclonal and polyclonal, exploring their characteristics, production methods, applications, and implications in research and clinical settings. Monoclonal antibodies are a cornerstone of therapeutic innovation, diagnostic tools, and research advancements. Understanding them is crucial for anyone involved in the biomedical and pharmaceutical fields.</p>					
LEARNING OUTCOMES					
<p>On the completion of the course, the students will be able to:</p> <ol style="list-style-type: none"> 1. Understand the components of the immune system and how they coordinate with each other to provide defense against pathogens. 2. Differentiate between monoclonal and polyclonal antibodies regarding structure and function. 3. Learn the processes of producing monoclonal antibodies, including hybridoma technology and recombinant antibody production. 4. Understand how polyclonal antibodies are generated using animal immunization. 5. Apply the diverse applications of monoclonal and polyclonal antibodies in research, diagnostics, and therapeutics. 					
COURSE CONTENT					
<p>Introduction to components of immune system, Innate and adaptive immunity, Antigen, Kinetics of the antigen, Humoral Immunity and B cell activation and kinetics of antibody production, Structure, function of antibody, genetic basis of antibody diversity, Hybridoma technology and recombinant DNA technology for monoclonal/recombinant antibody production, production of antibody both in vivo (Ascites method) and in vitro (lab scale and large scale production). Purification of monoclonal antibody, antibody engineering, applications of monoclonal and polyclonal antibodies in research, diagnostics, and therapeutics.</p>					
PRACTICALS					
<p>Dissection of mice to better understand the anatomy of mice with a particular focus on visualizing and studying immune organs involved in antibody production, blood typing, semi-quantitative analysis of C reactive proteins, Polyclonal antibody production in mice against ovalbumin. After complete immunization anti-ovalbumin polyclonal antibodies will be checked ovalbumin specific Enzyme Linked Immunosorbent Assay (ELISA).</p>					
TEXTBOOKS AND READING MATERIAL					
<ol style="list-style-type: none"> 1. Abbas, A. K., Lichtman, A. H. and Pober, J. S. 2000. <i>Cellular and Molecular Immunology</i>, 4th edition. Elsevier Saunders, Co. P.A. 					

2. James W. G., 1993. *Monoclonal Antibodies: Principles and Practice*, 3rd edition. Academic Press Harcourt Brace and company publishers. U.K.
3. Zola, H. 1994. *Monoclonal Antibodies: The Second Generation*, BIOS Scientific Pub Ltd. U.K.
4. Harlow E. D., David L., 2006. *Antibodies: A laboratory Manual*. 1st edition. Cold Spring Harbour Laboratory Press. USA.

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**ONE COURSE WILL BE OFFERED AS ELECTIVE-I DEPENDING UPON THE FACILITITES AND FACULTY AVAILBLE