Programme: M. Sc. (Biochemistry)

Course Code: BCO 405

Title of the Course: <mark>Laboratory techniques and Applications of Biochemistry</mark>

Number of Credits: 4

Effective from AY: 2021-22

Prerequisites for the course:	Should have basic knowledge on Biochemistry.	
Course Objectives	1. This course develops basic understanding and skills of various techniques and instruments in biochemistry research Immunology and Environmental science.	
Course Outcomes	1. The Cell biology part of the practical will give them understanding and hands-on training of basic Cell culture techniques needed to work in a Biological research laboratory. 1. Immunology and Immunotechniques unit of this practical will train the students with skillful handling of various techniques in Immunological research. 2. Analytical Biochemistry-II part of this practical will explain the principle and working of basic instruments in analytical laboratory that will train the students in handling various instruments in Analysis. 3. Biochemistry of environmental pollution part of this practical will train the students about analysis of environmentally significant water quality parameters and predicting the environmental quality based on observed data.	
Content		
	I. Cell Biology I. **Microbial culture techniques:** Isolation, identification and characterization and maintenance of bacterial and fungal cells; Cell counting and viability (fungal/bacterial cells).	

	II.**Animal cell culture techniques:** Isolation, culturing and maintenance of cell lines, Microscopic examination, Cell counting, cytotoxicity and viability testing. III. **Plant tissue culture techniques:** Surface sterilization of plant material, excision, Aseptic tissue transfer, callus culture and micropropagation.	

	II. Immunology and Immunotechniques
	
	   1. Agglutination assays:
	   A) Determination of ABO and Rh blood group,
	   B) Latex bead agglutination
	   C) Widal test
	   2. Immunodiffusion assays:
	   A) Single Immunodiffusion
	   3. VDRL test
	   4. Rapid tests:
	   A) Malarial antigens Pv/Pf
	   B) Dengue IgM and IgG antibodies
	   C) Hepatitis HBsAg
	   5. ELISA
	   6. Determination of Immunoglobulins.
	   A) Precipitation of antibodies with $(NH_4)_2 SO_4$
	   B) Determination of antibody concentration.
	   C) Separation and visualization of immunoglobulins by SDS-PAGE.
		24 h

	III. Analytical Biochemistry – II 1. Visualization of cells by Light and Phase contrast microscopy 2. UV-Visible spectroscopic studies to demonstrate Beer-Lambert Law, 3. UV-Visible spectroscopic studies to determine extinction coefficient and quantitative analysis. 4. Measurement of fluorescence using Spectrofluorimeter.	**24h**

	5. Demonstration of: GC, IR, NMR, and Mass/MALDI-TOF 6. Elucidation of structure of cellular metabolites using IR, NMR and Mass profiles.	
	IV. Biochemistry of environmental pollution and remediation 1. Estimation of Dissolved oxygen (DO) using Winkler method. 2. Estimation of Biochemical Oxygen Demands (BOD) of given water sample using 5-day BOD test 3. Estimation of Chemical Oxygen Demands (COD) of water sample 4. Assessment of given water quality using observed BOD and COD values. 5. Detection of sewage pollution by screening for indicator organisms such as *E. coli*. 6. Biotransformation of xenobiotics.	**24 h**
Pedagogy:	Lectures/ tutorials/ laboratory work/ field work/ project work/ viva/ seminars/ assignments/ term papers.	
Text Books/ References / Readings:	1. Bhatia, S., Naved, T., Sardana, S. Animal tissue culture facilities. IOP publishing ltd., 2019. 2. Sharma G.K., Jagetiya, S., Dashora, R. General Techniques of Plant Tissue Culture. Lulu Press Inc., United States. 2015. 3. Prescott, H. Laboratory exercise in Microbiology. MacGraw-Hill Companies. 2002, 5th edition. 4. Vogel's Text book of Quantitative Inorganic Analysis, Pearson Education, Asia, 2000, 6th Ed. In addition to above, references given under respective theory courses (BCO 401, BCO 402, BCO 403, BCO 404) may be referred.	