Programme: M.Sc. (Microbiology)

Course Code: MIC 201

Title of the Course: TECHNIQUES AND INSTRUMENTATION IN MICROBIOLOGY

Number of Credits: 3

Effective from Academic Year: 2018-19

Prerequisites	The student should be familiar with the concepts in basic chemistry and should be able to use basic instruments in Microbiology.	
Objective:	This course develops the concepts of methodology involved in studying the different components of microbial cell and various techniques and instruments involved in product analysis.	
Content:		
1.		**(12)**
1.1	**Chromatographic techniques:**	
	GC, HPLC, detectors, column/s matrix- Ion-exchange, affinity and molecular exclusion. (using examples for separation of microbial lipids, pigments, nucleic acids and proteins/enzymes).	
1.2	**Centrifugation:**	
	Principles, methodology, application; Density gradient centrifugation; Ultracentrifugation (Separation of ribosomal subunits of bacteria).	
1.3	**Spectrophotometry:**	
	Atomic Absorption Spectrophotometry (AAS), UV-Visible, fluorimetry, Fourier transformation infra-red spectroscopy (FTIR), NMR, MS.	
2.		**(12)**
2.1	**Microscopy:**	
	Epifluorescence filter technique (DEFT), SEM, TEM, Confocal microscopy.	
2.2	**Radio-isotope and tracer techniques:**	
	Isotope and types of isotopes, Radio-activity counters, Autoradiography,	
2.3	**Cell and tissue culture techniques:**	
	Primary and secondary/established cell lines, Monolayer and suspension cultures, Fluorescence activated cell sorting (FACS), Biohazards and Biosafety cabinet.	
3.		**(12)**
3.1	**Electrophoretic technique:**	
	PAGE, IEF, , PFGE, DGGE, TGGE, Single stranded conformation polymorphism (SSCP), Electroporator, Micro-array technique.	
3.2	**Isolation of cell organelles:**	
	Different methods of cell lysis/ breakage and isolation and purification of various cell organelles - Cell surface structures, cell envelopes, plasma membranes, peptidoglycan, Outer membrane, ribosomes, protoplasts, spheroplast.	

3.3	**Others:**	
	X-ray diffraction.	
Pedagogy:	Lectures/tutorials/assignments/self-study	
References/ Readings	Wilson, K. and Walker, J., Principles and Techniques of Biochemistry and Molecular Biology, Cambridge University Press, N.Y., USA.	
	Cooper, T. G., The Tools of Biochemistry, Wiley India Pvt. Ltd.	
	Goswami, C., Paintal, A. and Narain, R., Handbook of Bioinstrumentation, Wisdom Press, New Delhi.	
	Norris, J. R. and Ribbons, D. W., Methods in Microbiology, Volume 5, Part B, Academic Press.	
	Colowick, S. P. and Kaplan, N. O., Methods in Enzymology, Vol. VI, Academic Press, N.Y.	
	Parakhia, M. V., Tomar, R. S., Patel, S. and Golakiya, B. A., Molecular Biology and Biotechnology: Microbial Methods, New India, Pitampura.	
	Sambrook, J., Fritsch, E. F. and Maniatis, T., Molecular Cloning: A Laboratory Manual, Cold Spring Harbor Laboratory Press, USA.	
	Jayaraman, J., Laboratory Manual in Biochemistry, John Wiley & Sons Limited, Australia.	
Learning Outcomes	Ability to use techniques and instruments involved in the study of microorganisms and their products.	