

Course Code: MMTC-417

Title of the Course: Techniques and Instrumentation in Microbiology

Number of Credits: 03

Prerequisites for the course:	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:	<p>Module I 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); Centrifugation: Principles, methodology, application; Density gradient centrifugation; Ultracentrifugation (Separation of ribosomal subunits of bacteria); Spectrophotometry: Atomic Absorption Spectrophotometry (AAS), UV-Visible, fluorimetry, Fourier transformation infra-red spectroscopy (FTIR), NMR, IRMS, ICP MS, MALDI-TOF.</p> <p>Module II Microscopy: Epifluorescence filter technique (DEFT), SEM, TEM, Confocal microscopy; Radio-isotope and tracer techniques: Isotope and types of isotopes, Radio-activity counters, Autoradiography, Radiorespirometry; Cell and tissue culture techniques: Primary and secondary/established cell lines, Monolayer and suspension cultures, Fluorescence activated cell sorting (FACS), Biohazards and Biosafety cabinet.</p> <p>Module III Electrophoretic technique: PAGE, IEF, PFGE, DGGE, TGGE, Capillary electrophoresis, Single stranded conformation polymorphism (SSCP), Electroporator, Micro-array technique; Isolation of cell organelles: Different methods of cell lysis/ breakage and isolation and purification of various cell components - Cell surface structures, cell envelopes, plasma membranes, peptidoglycan, Outer membrane, ribosomes, protoplasts, spheroplast, DNA, RNA; X-ray diffraction, Oxygen analyser.</p>	<p>15 hrs</p> <p>15 hrs</p> <p>15 hrs</p>
Pedagogy:	Lectures/ tutorials/ assignments/ self-study/ Moodle/ Videos.	

References/ Readings:	<ol style="list-style-type: none"> 1. Wilson, K. and Walker, J. (2013). Principles and Techniques of Biochemistry and Molecular Biology, Cambridge University Press, N.Y., USA. 2. Cooper, T. G. (2011). The Tools of Biochemistry, Wiley India Pvt. Ltd., Noida. 3. Goswami, C., Paintal, A. and Narain, R. (2011). Handbook of Bioinstrumentation, Wisdom Press, New Delhi. 4. Parakhia, M. V., Tomar, R. S., Patel, S. and Golakiya, B. A. (2010). Molecular Biology and Biotechnology: Microbial Methods, NIPA New Delhi, Pitampura. 5. Jayaraman, J. (2011). Laboratory Manual in Biochemistry, New Age International Publishers, New Delhi. 6. Norris, J. R. and Ribbons, D. W. (1971). Methods in Microbiology, Volume 5, Part B, Academic Press, N.Y. 7. Colowick, S. P. and Kaplan, N. O. (1963). Methods in Enzymology, Vol. VI, Academic Press, N.Y. 8. Sambrook, J., Fritsch, E. F. and Maniatis, T. (2014). Molecular Cloning: A Laboratory Manual, Cold Spring Harbor Laboratory Press, USA. 	
Learning Outcomes:	Ability to use techniques and instruments involved in the study of microorganisms and their products.	