Pedagogy:	Lectures/tutorials/assignments	
References/ Readings	Barlow, A., The prokaryotes: A Handbook on the Biology of Bacteria: Ecophysiology, Isolation, Identification, Applications, Volume 1, Springer-Verlag.	
(Latest editions)	Goodfellow, M. and Minnikin, D. E., Chemical Methods in Bacterial Systematics, The Society for Applied Bacteriology. Technical Series No. 20, Academic Press.	
	Goodfellow, M., Mordarski, M. and Williams, S. T., The biology of the actinomycetes, Academic Press.	
	Kurtzman, C. P., Fell, J. W. and Boekhout, T., The Yeasts - A Taxonomic Study, Elsevier.	
	Norris, J. R. and Ribbons, D. W., Methods in Microbiology, Vol. 18 & 19, Academic Press.	
	Prescott, L. M., Harley, J. P. and Klein, D.A., Microbiology. McGraw Hill, New York.	
	Reddy, C. A., Methods for General and Molecular Microbiology, ASM Press.	
	Sneath, A. H. P., Mair, S. N. and Sharpe, E. M., Bergey's Manual of Systematic Bacteriology Vol. 2. Williams & Wilkins Bacteriology Symposium, Series No 2, Academic Press, London/New York.	
Learning Outcomes	1. Apply knowledge of the standard rules of classification systems to categorize microorganisms. 2. Appreciate and explain the dynamic and ever developing nature of the field of microbial taxonomy and systematics.	

Programme: M.Sc. (Microbiology)
Course Code: MIPC-405
Title of the Course: MICROBIAL TAXONOMY AND SYSTEMATICS [P]
Number of Credits: 1, Practical
Contact hours: 30
Effective from Academic Year: 2022-23

Prerequisites	It is assumed that students should have a basic understanding of binomial nomenclature, the basis of classification systems and be familiar with the distinguishing features of different groups of microorganisms.	
Objective:	To understand the tools and techniques of taxonomy and systematics of the microbial world.	
Content:		**(30)**
1.	Morphological, physiological and biochemical characterization of bacteria.	
2.	Chemotaxonomic analysis of cell wall amino acids.	
3.	Characterization of actinomycetes (*Streptomyces* sp.).	
4.	Characterization of yeast (*Saccharomyces cerevisiae*, *Schizosaccharomyces pombe*).	
5.	Characterization of cyanobacteria.	

6.	Phylogenetic analysis of bacterial 16S rRNA sequences – retrieval of sequences from standard databases, BLAST analysis, construction of phylogenetic tree using bioinformatics tools.	
Pedagogy:	Hands-on experiments in the laboratory, video, online data	
References/ Readings	As given under Theory Course MITC-405	
Learning Outcomes	Apply knowledge of the standard techniques of classification systems to categorize and identify microorganisms.	

Programme: M.Sc. (Microbiology)
Course Code: MITC-406
Title of the Course: INDUSTRIAL MICROBIOLOGY [T]
Number of Credits: 3, Theory
Contact hours: 45
Effective from Academic Year: 2022-23

Prerequisites	Basic knowledge about the types of microbes and their products of industrial relevance. Knowledge of microbial biochemistry, physiology, genetics and statistics.	
Objective:	To comprehend concepts of the processes, instruments, management and quality used in the industries to produce the products using microorganisms.	
Content:		
1.		**(15)**
1.1	History of Industrial Microbiology, fermentation processes, descriptive layout and components of fermentation process for extracellular and intracellular microbial products.	
1.2	Microbial growth kinetics: Batch kinetics – Monod's model (single substrate), deviations from Monod's model, dual substrates – sequential utilization, multiple substrates – simultaneous utilization, substrate inhibition, product synthesis (primary and secondary metabolite), toxic inhibition, death constant.	
1.3	Microbial growth kinetics: Fed-batch kinetics – fixed volume, variable volume and cyclic fed-batch, applications and examples of fed-batch systems. Continuous cultivation system – relationship between specific growth rate (μ) and dilution rate, multistage systems, feedback systems (internal and external feedback), applications and examples of continuous cultivation system; comparison between various cultivation systems.	
2.		**(15)**
2.1	Optimization and modeling of fermentation process – single variable design, multivariate screening designs, critical factor analysis, optimization designs for two or more factor, singlet	