Semester	**1**
Course	**Multidisciplinary**
Paper Code	M1MB230111T
Paper Title	**Microbes: Application, safety and ethics**
No. of Credits	**3**
Theory / Practical / Composite	**THEORY**
Minimum No. of preparatory hours per week a student has to devote	3 hours/week
Number of Modules	No modules
Syllabus	**History, Development and application of Microbiology -** Development of Microbiology as a discipline, Spontaneous generation vs. biogenesis & abiogenesis. Contributions of Anton von Leeuwenhoek, Louis Pasteur, Robert Koch, Joseph Lister, Alexander Fleming. Role of microorganisms in fermentation, Germ theory of disease, Development of various microbiological techniques and golden era of microbiology, Development of the field of soil microbiology: Contributions of Eminent sceintists: Martinus W. Beijerinck, Sergei N. Winogradsky, Selman A.Waksman Establishment of fields of medical microbiology and immunology through the work of Paul Ehrlich, Elie Metchnikoff, Edward Jenner **Beneficial/Harmful microbes & Ethical concepts of Natural Science** : Brief idea and application , beneficial and harmful microbes, How to protect ourselves-Principal of Biosafety-Concept and safety, safety against radioactivity ,Basic principles and application and laws pertaining to patenting and it's protection. General concepts of patents related to biological research products, Definition and types, Medical Ethics, Environmental Ethics **An overview on Scope of Microbiology:** Brief knowledge about the scope and applications of microbiology in various fields. **Observation and culture of microbes: Microscopy:** Basic Principles of microscopy related to microbiology including resolving power, magnification, numerical aperture, chromatic aberration and use of oil immersion objective. Working principle of bright field, dark field, phase contrast and fluorescent microscope. Difference between light and electron microscopes. Two types of electron microscope- TEM and SEM. **Culture medium and Microbial culture**: Culture medium- Solid and liquid culture medium. Concept of microbial growth in solid and liquid culture medium. Brief knowledge of pure culture, Methods of pure culture isolation and pure culture development.
Learning Outcomes	• To know the safety and ethics related to microbes

	• To understand the scope of microbiology • To know about beneficial and harmful microbes	
Reading/Reference Lists	• Advanced Microbiology online MOOC course by Dr Arup Kumar Mitra https://onlinecourses.swayam2.ac.in/cec22_bt20/preview • Bare Act, 2007.Indian Patent Act 1970 Acts & Rules, Universal Law Publishing Co. Pvt. Ltd., New Delhi. • Kankanala C (2007). Genetic Patent Law & Strategy, 1st Edition, Manupatra Information Solution Pvt. Ltd. New Delhi. • Singh K K (2015). Biotechnology and Intelectual Property Rights: Legal and Social Impliocations, Springer India. • Goel D & Prashar S (2013). IPR, Biosafety and Bioethics. Pearson Senthil Kumar Sadhasivam • Mohammed Jaabir, M. S. 2008. IPR, Biosafety and biotechnology Management. Jasen Publications, Tiruchirappalli, India	
Evaluation	Theory CIA: 15[(10+3)+ 2 attendance)] Semester Exam: 35	Practical (if applicable) CA: Semester Exam: (attendance)
Paper Structure for Theory Semester Exam	Full marks 35 7 questions from 9 each 5 marks (7x5=35)	