**Semester II**
**Name of the Program: M.Sc. Marine Microbiology**
**Course Code: MMI-508**
**Title of the Course: Techniques and Instrumentation in Microbiology**
**Number of Credits: 03**
**Effective from AY : 2022 - 23**

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| **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:** | **Module I**<br>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.<br><br>**Module II**<br>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.<br><br>**Module III**<br>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, | 15 hrs<br><br>15 hrs<br><br>15 hrs |

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| | ribosomes, protoplasts, spheroplast, DNA, RNA; X-ray diffraction, Oxygen analyser. | |
| **Pedagogy:** | Lectures/ assignments/ self-study/ Moodle/ Videos. | |
| **References/ Readings:** | 1. Wilson, K. and Walker, J. (2013). Principles and Techniques of Biochemistry and Molecular Biology, Cambridge University Press, N.Y., USA.<br>2. Cooper, T. G. (2011). The Tools of Biochemistry, Wiley India Pvt. Ltd., Noida.<br>3. Goswami, C., Paintal, A. and Narain, R. (2011). Handbook of Bioinstrumentation, Wisdom Press, New Delhi.<br>4. Parakhia, M. V., Tomar, R. S., Patel, S. and Golakiya, B. A. (2010). Molecular Biology and Biotechnology: Microbial Methods, NIPA New Delhi, Pitampura.<br>5. Jayaraman, J. (2011). Laboratory Manual in Biochemistry, New Age International Publishers, New Delhi.<br>6. Norris, J. R. and Ribbons, D. W. (1971). Methods in Microbiology, Volume 5, Part B, Academic Press, N.Y.<br>7. Colowick, S. P. and Kaplan, N. O. (1963). Methods in Enzymology, Vol. VI, Academic Press, N.Y.<br>8. Sambrook, J., Fritsch, E. F. and Maniatis, T. (2014). Molecular Cloning: A Laboratory Manual, Cold Spring Harbor Laboratory Press, USA. | |
| **Course Outcomes:** | 1. Describe the principle, working and applications of various techniques/instruments.<br>2. Interpret the technique/instrument necessary for metabolite analysis.<br>3. Identify proper Biosafety levels of the work proposed.<br>4. Apply the knowledge to utilise appropriate technique/instrument for any analysis. | |