Learning Outcomes	Upon completing of this course, students should be able to - • understand how to summarise statistical data; • apply appropriate statistical tests based on an understanding of study question, type of study and type of data; • interpret results of statistical tests.	

Programme: M. Sc. Biotechnology

Course Code:GBC 191 **Title of the Course:** Lab I: Techniques in Microbiology and Immunology

Number of Credits:3

Effective from AY: 2019-2020

Prerequisites for the course:	No prerequisites required.	
Objective:	This course involves learning techniques to culture microbes and to identify immune reactions in the lab to form the basis for application in microbiology and immunodiagnostics.	
Content:	**MODULEI** • Sterilization and disinfection. • Preparation of solid & liquid media: • Isolation and maintenance of organisms: Streaking, slants and stabs cultures, storage of microorganisms. • Differential and Selective media • Enumeration: serial dilution methods, plating. • Isolation of bacteria from seawater /sediments samples • Study of morphology and cultural characteristics • Gram staining.	36 hours

	• Motility • Antimicrobial sensitivity test and demo of drug resistance • Cultivation of fungi: Slide,chunk and coverslip techniques **Module II** • Determination of Antibody titer using Double Immuno-diffusion • Assesment of Similarity between antigens usingOuchterlony's Double diffusion Test • Estimation Of Antigen Concentration using Radial Immuno Diffusion • Quantative Precipitation Assay • DOT ELISA • Latex Agglutination • Immunoelectrophoresis • Rocket Immunoelectrophoresis	36 hours
Pedagogy:	lectures/ tutorialsassignments/self-study	
References/Readings	1. Laboratory Manual in General Microbiology(2017) Giltner W. Creative Media Partners,LLC 2. Laboratory Methods in Microbiology (2014) Harrigan W. F., McCance M E. Academic Press 3. Handbook of Techniques in Microbiology: A Laboratory Guide to Microbes (2012) Karwa A.S.,. Rai M.K, Singh H.B. 4. Practical Immunology (2008) Frank C.Hay & O.M.R. Westwood. 4 th edition 5. Manual of Molecular and Clinical Laboratory Immunology (2016) Detrick B., Hamilton R.G. & Folds J.D. ASM Press.	
Learning Outcomes	Key hands-on experience of converting and applying theoretical knowledge to laboratory. Application of the varied interactions /reactions to be utilized in research. Students become familiar with microbiology and immunologic techniques that are used in many scientific disciplines as well as clinical medicine.	