

		The Maharaja Sayajirao University of Baroda Faculty of Science Department of Microbiology Phone : 0265-2794396		ACADEMIC YEAR 2020-2021	
M.Sc. Microbiology : Regular					
YEAR	I	CORE		CREDIT	3
SEMESTER	II	MBY2201C01-Bioanalytical Techniques and Biostatistics		HOURS	45
OBJECTIVES		To introduce the students to biophysical, immunological and microscopic techniques. To introduce the students to concepts of Biostatistics			
COURSE CONTENT / SYLLABUS					
UNIT-I	Biophysical and Immunological Techniques				15 hrs.
	Structural determination and analysis of biomolecules, Introduction to spectroscopic techniques, UV-Visible absorption spectroscopy, IR, ESR, Raman spectroscopy and other optical techniques like fluorescence; Circular dichroism. Immunological techniques -Techniques for measuring antibody response - RIA, ELISA, Western blotting, ELISPOT assay, Advanced immunological techniques, Immunofluorescence, flow cytometry and immunoelectron microscopy.				
UNIT-II	Microscopic and staining techniques				15 hrs.
	History, General principles and optics of bright field, phase contrast, dark field, fluorescence, differential interference, Polarising, Inverted microscopes etc. Electron microscope & advanced microscopes (Confocal laser scanning, Environmental scanning electron, Scanning tunneling, Atomic force, Cryoelectron, microscope etc.) Digital microscopy Advanced Fluorescence Microscopy Techniques—FRAP, FRET etc. Optical Tweezers. Sample preparation & staining in electron microscopy, Shadowing, Freeze fracture & etching etc. Staining techniques—Simple, differential and special staining.				
UNIT-III	Biostatistics				15 hrs.
	Distributions- normal, binominal and Poisson; Mean, variance, standard deviation and standard error; Coordination and regression; Tests of significance; Analysis of variance Probability: counting, conditional probability, discrete and continuous random variables; Error propagation; Populations and samples, expectation, parametric tests of statistical significance, nonparametric hypothesis tests, linear regression, correlation & causality, analysis of variance, factorial experiment design, Applications in population genetics.				
REFERENCES					
1. Biophysical Techniques- I. D. Campbell 2012, Oxford University Press.					
2. Principles and Techniques of Biochemistry and Molecular Biology- K. Wilson & J. Walker 7 th ed. 2010, Cambridge University press.					
3. Becker's World of the Cell- W. M. Becker, L. J. Kleinsmith & J. Hardin 6 th ed. 2012, Pearson Education.					
4. Microbiology -L. Prescott, J.P. Harley & D.A. Klein 4 th ed. 1999, McGraw-Hill.					
5. Biostatistics for Health Sciences- R.C. Blair & R.A. Taylor 2008, Pearson.					
6. Biostatistics, a Foundation for Analysis in the Health Sciences - W. W. Daniel 1987, Wiley.					
7. Fundamentals of Biostatistics- B. Rosner, 8 th ed. 2015, Cengage Learning Inc.					
8. An introduction to statistics- S. Rasmussen, reprinted ed. 2006, Cengage Learning Inc.					
9. Fundamentals of Biostatistics- B. Rosner 2000, Duxbury Press.					
10. Kuby Immunology- J.A. Owen, J. Punt & S.A. Stranford, & P. Jones 7 th ed. 2013, W. H. Freeman and Co.					
11. Roitt's Essential Immunology- I. M. Roitt & P. J. Delves 10 th ed. 2001, Blackwell Science.					
12. Physical Biology of the Cell. New York- R. Phillips, J. Kondev, & J. Theriot 2009, Garland Science.					
13. Biological Physics: Energy, Information, Life - P. C. Nelson, M. Radosavljević & S. Bromberg 2004, W.H. Freeman.					

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M.Sc. Microbiology : Regular					
YEAR	I	CORE MBY2202C02-Medical Microbiology		CREDIT	3
SEMESTER	II			HOURS	45
OBJECTIVES		To introduce students to concepts of infectious diseases of bacteria, viruses, fungi and protozoa , their pathogenesis, diagnosis and therapy.			
COURSE CONTENT / SYLLABUS					
UNIT-I	Epidemiology, Host-Parasite relationship and, Bacterial diseases				15 hrs.
	Epidemiology : Infectious diseases, disease cycle, epidemiological methods, case studies- Lyme disease, AIDS, Covid-19 etc. Nonspecific host defenses, virulence factors, normal flora and Gnotobiology. Pathogenesis, diagnosis, prevention and treatment of diseases caused by <i>Staphylococcus</i> , <i>Streptococcus</i> , <i>Neisseria</i> , <i>Shigella</i> , <i>Salmonella</i> .				
UNIT-II	Diagnostic principles and Disease control, Bacterial diseases (cont.)				15 hrs.
	Diagnostic principles, control, prevention, antimicrobial therapy. , Pathogenesis, diagnosis, prevention and treatment of diseases caused by <i>Mycobacterium</i> , <i>Treponema</i> . Vaccines and Monoclonal antibodies.				
UNIT-III	Mycoses, Rickettsial, Mycoplasmal ,Chlamydial Protozoan and Viral diseases				15 hrs.
	Superficial, Subcutaneous and systemic mycoses Rickettsia, Mycoplasma and Chlamydia: general characteristics, pathogenesis, diagnosis, prevention and treatment of their disease Animal viruses-Classification, General characters, structural organization, pathogenesis, diagnosis, prevention and treatment of diseases caused by Polio virus, Hepatitis, Rabies, Mumps, Influenza, Herpes, HIV. Protozoan diseases and Prion diseases-Representative examples.				
REFERENCES					
1. Mechanisms of Microbial Disease-M. Schaechter, N. C. Engleberg, B.I.Eisenstein & G. Medoff 3 rd ed.2012, Williams and Wilkins.					
2. Medical microbiology- D. Greenwood , R. Slack, M. Barer & W. Irving, 18 th ed. 2012, Churchill Livingstone.					
3. Kuby Immunology- J.A. Owen, J. Punt & S.A. Stranford, & P. Jones 7 th ed.2013, W. H. Freeman and Company.					
4. Brock Biology of Microorganisms - M.T. Madigan, K. S. Bender & D. H. Buckley, W. Sattley & D. Stahl 15 th ed. Global ed. 2018, Pearson.					
5. Prescott, Harley, and Klein's Microbiology - Joanne M. Willey, Linda M. Sherwood & Christopher J. Woolverton. 7 th ed.2008, McGraw-Hill.					

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M.Sc. Microbiology : Regular					
YEAR	I	CORE MBY2203C03-Biochemistry- II		CREDIT	3
SEMESTER	II			HOURS	45
OBJECTIVES					
		To introduce the students with biochemical techniques and metabolism of carbohydrates, amino acid and nucleotide.			
COURSE CONTENT / SYLLABUS					
UNIT-I	Carbohydrate Metabolism				15 hrs.
	Glycolysis, gluconeogenesis, TCA cycle, ED pathway, HMP shunt, Glyoxylate bypass-History, reactions, enzymes involved, regulation, distribution and energetics . Coordinated regulation of glyoxylate bypass and TCA cycle.				
UNIT-II	Amino acid and nucleotide metabolism				15 hrs.
	Elucidation of biosynthetic pathways, biosynthesis & catabolism of aromatic amino acids, branched amino acids, aspartate family, glycine, serine. Purine-pyrimidine biosynthesis and nucleotide metabolism.				
UNIT-III	Principles and applications of basic techniques				15hrs
	Electrophoresis, Isoelectric focusing, Centrifugation and ultracentrifugation, Chromatographic techniques, GC, HPLC etc., Radioisotopes, X-ray crystallography, NMR spectroscopy etc.				
REFERENCES					
1.Lehninger Principles of Biochemistry- D.L. Nelson & M.M. Cox 7 th ed. 2017, W. H. Freeman and co.					
2.Biochemistry - J. M. Berg, J.Tymoczko & L. Stryer, 7 th ed. 2010, W.H.Freeman and co.					
3.Biochemistry- G.L. Zubay 4 th ed. 1998, McGraw-Hill.					
4.Principles and Techniques of biochemistry and Molecular Biology- K. Wilson & J. Walker 7 th ed. 2010, Cambridge University press.					
5.Biophysical Techniques- I. D. Campbell 2012, Oxford University Press.					
6.Bacterial Metabolism-G. Gottschalk 2 nd ed. 2012, Springer-Verlag.					

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M.Sc. Microbiology : Regular					
YEAR	I	CORE MBY2204C04-Molecular Biology I		CREDIT	3
SEMESTER	II			HOURS	45
OBJECTIVES		To introduce the students with concepts of DNA replication, transcription, its regulation and translation processes.			
COURSE CONTENT / SYLLABUS					
UNIT-I	Structure of DNA, genetic code and DNA replication				15 hrs.
	DNA as the genetic material – history; The Watson-Crick model, structure and properties of B-form DNA; Alternative DNA structures; DNA denaturation and hybridization; DNA supercoiling. The Genetic Code - General features; Elucidation of the genetic code; The genetic code table and organization of the code; Deviations from the standard code. DNA replication in prokaryotes: <i>E. coli</i> and phages; and eukaryotes.				
UNIT-II	Transcription and Regulation of transcription in bacteria				15 hrs.
	Transcription in bacteria, General features; Structure & function of RNA polymerase, promoters properties and diversities. The operon concept; Positive and negative regulation; Operon models: <i>lac</i> , <i>ara</i> , <i>trp</i> and <i>gal</i> operons; Transcription Attenuation in diverse operons.				
UNIT-III	Translation				15 hrs.
	Translation in prokaryotes and eukaryotes; The translational machinery; ribosomal organization; structure and functions of tRNA, rRNA and ribosomal proteins; Translational regulation. Post translational modification.				
REFERENCES					
1.Molecular Biology of Cell- H. Lodish, A. Berk, C. A. Kaiser, M. Krieger, A. Bretscher, H. Ploegh, A. Amon, M.P. Scott & K. Martin, 6 th ed. 2007, W.H.Freeman and Co.					
2.Molecular Biology of the Gene- J.D. Watson,T.A.Baker,S.P.Bell,A.Gann,M.Levine &R.Losick 5 th edition; 2004, Benjamin Cummings.					
3.Genes X- B. Lewin, Benjamin Lewin, Jocelyn Krebs, Stephen Kilpatrick & Elliott Goldstein international ed.2011, Jones and Bartlett.					
4.Molecular Biology of Cell- B. Alberts, A. Johnson, J. Lewis, M. Raff, K.Roberts & P. Walter 5 th ed. 2008, Garland Science.					
5.Molecular Biology, Genes to Proteins- B. E. Tropp, 3 rd ed. 2008, Jones and Bartlett.					

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M.Sc. Microbiology : Regular					
YEAR	I	CORE MBY2205C05-Microbial Ecology, Food and Dairy Microbiology		CREDIT	3
SEMESTER	II			HOURS	45
OBJECTIVES		To introduce the students to Microbial ecology and techniques used therein; Dairy and Food Microbiology.			
COURSE CONTENT / SYLLABUS					
UNIT-I	Microbial Ecology and Plant pathology				15 hrs.
	Microbial interactions, techniques to study microbial community structure, activity and diversity. Plant defense - Plant Disease and Resistance, Plant Pathogens: Sneak Attack versus Brute Force, Surveillance and Detection of Microbial Pathogens, Detection of Insect Herbivores, Structural Defenses, Chemical Defenses. Biofertilisers-PGPR and their mechanisms of plant growth promotion.				
UNIT-II	Microbial ecology contd.				15 hrs.
	Geochemical cycling: C, N, S, P, Fe cycles. Microbes involved and their physiology. Culture dependent analysis of microbial communities: Enrichment, Winogradsky's column, development and Microbiology and isolation of diverse physiological groups of bacteria. K and r reproductive strategies in microbes. General and specific strategies for coping with low nutrient availability in environment.				
UNIT-III	Dairy and Food Microbiology				15 hrs.
	Microbiology of milk and milk products, types of cheeses and cheese making.Lactic acid bacteria and their physiology, Probiotics. Enumeration of microorganisms in food, preservation and spoilage, fermented foods, food borne, Infections, food intoxications,,Food flavors, Genetically modified foods, GRAS microbes used in food.				
REFERENCES					
1.Microbial Ecology Fundamentals and Applications -R.M.Atlas,R.Bartha & D.Atlas 1st ed.1998, Benjamin Cummings.					
2.Brock Biology of Microorganisms - M.T. Madigan, K. S. Bender & D. H. Buckley,W. Sattley &D. Stahl 15 th Global ed. 2018, Pearson.					
3.Encyclopedia of Biotechnology in Agriculture and Food – Eds. D. R. Heldman, M. B. Wheeler & D.G. Hoover. 2011, CRC Press Taylor and Francis.					
4.Modern Food Microbiology - J.M Jay, M.J.Loessner & D.A. Golden 7 th ed. 2005, Springer.					