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વીર નર્મદ દક્ષિણ ગુજરાત યુનિવર્સિટી
યુનિવર્સિટી કેમ્પસ, ઉધના-મગદલ્લા રોડ, સુરત - ૩૯૫ ૦૦૭, ગુજરાત, ભારત.
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–: પરિપત્ર :–

વિજ્ઞાન વિદ્યાશાખા હેઠળની સંલગ્ન સ્નાતક કોલેજોના આચાર્યશ્રીઓને જણાવવાનું કે, પેટાસમિતિએ તૈયાર કરેલ બી.એસસી.માઈક્રોબાયોલોજી (સેમેસ્ટર–૧,૨,૩,૪,૫, અને ૬) નાં પુનઃગઠિત અભ્યાસક્રમ અંગે માઈક્રોબાયોલોજી વિષયની અભ્યાસસમિતિએ તેની તા. ૨૯/૦૯/૨૦૧૬ ની સભાના ઠરાવ ક્રમાંક : ૨ અન્વયે કરેલી નીચેની ભલામણ વિજ્ઞાન વિદ્યાશાખાએ તેની તા.૧૨/૦૭/૨૦૧૭ ની સભાના ઠરાવ ક્રમાંક : ૧૨ અન્વયે સ્વીકારી તે મંજૂર કરવા એકેડેમિક કાઉન્સિલને કરેલ ભલામણ માનનીય કુલપતિશ્રીએ એકેડેમિક કાઉન્સિલવતી મંજૂર કરેલ છે. તેની જાણ સંબંધકર્તા શિક્ષકો અને વિદ્યાર્થીઓને કરવી, તદ્ઉપરાંત તેનો અમલ કરવો.

માઈક્રોબાયોલોજી વિષયની અભ્યાસસમિતિની તા. ૨૯/૦૯/૨૦૧૬ ની સભાની ભલામણ ક્રમાંક : ૨

:: આથી ઠરાવવામાં આવે છે કે, માઈક્રોબાયોલોજી વિષયની અભ્યાસસમિતિની સભામાં આ વિષયના સેમેસ્ટર ૧ થી ૬ તથા સેમેસ્ટર ૫ અને ૬ સેમેસ્ટરનાં ૪ ઈલેકટીવ પેપરો પેટાસમિતિ ધ્વારા ગઠીત થયા હતા, જેના પર ચર્ચા વિચારણા કરી તેને સર્વસંમતિથી પાસ કરવામાં આવ્યુ હતું.

આજની આ સમિતિ આ અભ્યાસક્રમનો ક્રમશઃ એટલે કે સેમે.૧ અને ૨, જૂન–૨૦૧૭, સેમે.૩ અને ૪, જૂન ૨૦૧૮ અને સેમે.૫ અને ૬ તથા ઈલેટીવ પેપરો જૂન–૨૦૧૯ થી અમલમાં આવે તે રીતે મંજૂર કરવા વિજ્ઞાન વિદ્યાશાખાને ભલામણ કરે છે.

વિજ્ઞાન વિદ્યાશાખાની તા.૧૨/૦૭/૨૦૧૭ ની સભાની ભલામણ ક્રમાંક : ૧૨

:: **આથી ઠરાવવામાં આવે છે કે, બી.એસસી. માઈક્રોબાયોલોજી (સેમેસ્ટર–૧,૨,૩,૪,૫,૬)ના પેપરો ક્રમશઃ એટલે કે સેમે.૧ અને ૨ જુન ૨૦૧૭ થી અને સેમે.૩ અને ૪ જુન ૨૦૧૮ અને સેમે.૫ અને ૬ તથા ઈલેકટીવ પેપરો જુન ૨૦૧૯ થી અમલમાં આવે તે રીતે મંજૂર કરવા એકેડેમિક કાઉન્સિલને ભલામણ કરવામાં આવે છે.**

બિડાણઃઉપર મુજબ

ક્રમાંક : એકે./પરિપત્ર/૧૩૪૪૧/૧૭
તા. ૧૭–૦૭–૨૦૧૭

ઈ.ચા.કુલસચિવ

પ્રતિ,

૧) વિજ્ઞાન વિદ્યાશાખા હેઠળની તમામ સ્નાતક કોલેજોના આચાર્યશ્રીઓ.
૨) અધ્યક્ષશ્રી, વિજ્ઞાન વિદ્યાશાખા
૩) પરીક્ષા નિયામકશ્રી, પરીક્ષા વિભાગ, વીર નર્મદ દ. ગુ. યુનિવર્સિટી, સુરત.

...તરફ જાણ તેમજ ઘટતી કાર્યવાહી સારૂ.

Title Summary for B.Sc. Microbiology Syllabus
(Effective from June 2017)

Semester	Paper	Title
I	MB 01	INTRODUCTION TO MICROBIOLOGY
	MB 02	BACTERIAL AND ARCHEAL CELL STRUCTURE AND FUNCTION
	MBP 01	PRACTICALS – SEMESTER I
II	MB 03	MICROBIAL NUTRITION AND GROWTH
	MB 04	BIOMOLECULES OF MICROORGANISMS
	MBP 02	PRACTICALS – SEMESTER II
III	MB 05	MICROBIAL CONTROL
	MB 06	ENZYMOLOGY
	MB 07	PRINCIPLES OF VIROLOGY
	MBP 03	PRACTICALS – SEMESTER III
IV	MB 08	BACTERIAL TAXONOMY
	MB 09	MICROBIAL PHYSIOLOGY
	MB 10	MICROBIOLOGY OF ECOSYSTEMS
	MBP 04	PRACTICALS – SEMESTER IV
V	MB 11	BACTERIAL GENETICS
	MB 12	EUCARYOTIC TAXONOMY
	MB 13	RECOMBINANT DNA TECHNOLOGY
	MB 14	FUNDAMENTALS OF IMMUNOLOGY
	MB 15	MICROBIAL PATHOGENICITY AND DISEASES
	MB 16	MICROBIOLOGY OF ENVIRONMENT
	MBP 05	PRACTICALS – SEMESTER V
VI	MB 17	FOOD AND DAIRY MICROBIOLOGY
	MB 18	PRINCIPLES OF FERMENTATION TECHNOLOGY
	MB 19	ECONOMIC MICROBIOLOGY
	MB 20	BIOINFORMATICS
	MB 21	CLINICAL MICROBIOLOGY
	MB 22	HAEMATOLOGY
	MBP 06	PRACTICALS – SEMESTER VI

F.Y.B.Sc. Semester I

MB: 01 INTRODUCTION TO MICROBIOLOGY

	UNIT 1	MICROBIOLOGY AND ITS ORIGIN	
	Reference: Prescott 9th	**Teaching Duration:**	**Lectures 10**
1.1	Microscopy and discovery of microorganisms		
1.2	Culture based methods of studying microorganisms		
1.3	Microorganisms and disease		
1.4	Koch's postulate		
1.5	Pure culture methods		
1.6	Immunology		
1.7	Microbial ecology		
1.8	Major fields in microbiology		

	UNIT 2	MICROBIAL DIVERSITY	
	Reference: Brock 12th	**Teaching Duration:**	**Lectures 08**
2.1	Physiological diversity of microorganisms		
2.2	Bacteria		
2.3	Archaea		
2.4	Eukaryotic microorganisms		

	UNIT 3	FUNDAMENTALS OF MICROSCOPY	
	Reference: (Prescott 9th)	**Teaching Duration:**	**Lectures 12**
3.1	Lenses and banding of light		
3.2	Light microscopes		
	3.2.1 Bright field microscope and microscope resolution		
	3.2.2 Dark field microscope		
	3.2.3 Phase contrast microscope		
	3.2.4 Differential interference contrast microscope		
	3.2.5 Fluorescence microscope		
	3.2.6 Confocal Microscopy		
	3.2.7 Preparation and staining of specimens		
3.3	Electron microscopy		
	3.3.1 Transmission Electron Microscope		
	3.3.2 Scanning Electron Microscope		
	3.3.3 Electron cryotomography		
	3.3.4 Scanning probe microscopy		

	UNIT 4	STAINS	
	Reference: (Salle)	**Teaching Duration:**	**Lectures 07**
4.1	Dyes		
4.2	Leuco compounds		
4.3	Theories of staining		

REFERENCES:

- Willey J., Sherwood I., (2011), *Prescott, Harley and Kleins Microbiology*, 9th ed., Mc Graw – Hill.
- Salle A. J., (1984), *Fundamental Principles of Bacteriology*, 7th ed., Tata Mc Graw – Hill

Further Reading:

- Pelczar, Chan and Krieg, (2001), *Microbiology-Concepts and Application*, 5th Ed., McGraw-Hill. ISBN: 9780074623206

F.Y.B.Sc. Semester I

MB: 02 BACTERIAL AND ARCHEAL CELL STRUCTURE AND FUNCTION

	UNIT 1	CELL MORPHOLOGY & CYTOPLASMIC MEMBRANE	
	Reference: Brock 12th	**Teaching Duration:**	**Lectures 09**
1.1	Major cell morphologies		
1.2	Morphology and Biology		
1.3	Cell size and significance of smallness		
1.4	Surface area to volume ratio and its significance		
1.5	Lower limits of cell size		
1.6	The cytoplasmic membrane in *Bacteria* and *Archaea*		
1.7	The functions of cytoplasmic membrane		

	UNIT 2	CELL WALL OF PROKARYOTES	
	Reference: Brock 12th	**Teaching Duration:**	**Lectures 07**
2.1	The cell wall of bacteria: Peptidoglycan		
2.2	The outer membrane of gram negative bacteria		
2.3	Cell walls of *Archaea*		

	UNIT 3	OTHER CELL SURFACE STRUCTURE AND INCLUSIONS	
	Reference: Brock 12th	**Teaching Duration:**	**Lectures 08**
3.1	Cell surface layers, Pili and Fimbrae		
3.2	Cell inclusions		
3.3	Gas Vesicles		
3.4	Endospores		
3.5	Bacterial Ribosomes & Nucleoid		

	UNIT 4	MICROBIAL LOCOMOTION	
	Reference: Brock 12th	**Teaching Duration:**	**Lectures 07**
4.1	Flagella and Motility		
4.2	Gliding Motility		
4.3	Microbial Taxes		

REFERENCES:

- Madigan, T. M., & Martinko, J. M. (2008). *Brock Biology of Microorganisms*, 12TH Ed., Benjamin Cummings.

Further Reading:

- Willey J., Sherwood I., (2011), *Prescott, Harley and Kleins Microbiology*, 9th ed., Mc Graw – Hill.

F.Y.B.Sc. Semester I Practicals

MBP 01

Time Duration: 04 Hours/Week

1. Study of Microscope
2. Examination of hay infusion by wet mount technique.
3. Study of bacterial motility by Hanging drop technique
4. Measurement of dimensions of fungal structures by Ocular and stage Micrometer
5. Types of stains & Preparation of Staining solutions.
6. Monochrome staining by acidic and basic stain
7. Gram staining by modified Hucker's method
8. Staining of Acid fast & Non-acid fast bacteria – (Cold method) – Kinyoun carbol fuchsin
9. Spirochetes staining – Fontana's method
10. Preparation of nutrient broth / agar.
11. pH adjustment by Lovibond/ Hellige's comparator.
12. Disposal of Laboratory waste and cultures

REFERENCES:

1. Patel, R. J., & Patel, R. K., (2015). Experimental Microbiology, Vol. 1, 9th ed., Aditya.
2. Patel, R. J., & Patel, R. K., (2011). Experimental Microbiology, Vol. 2, 8th ed., Aditya.
3. Cappuccino, J.G., (2016). *Microbiology: A Laboratory Manual*, 11th ed., Pearson Education (Singapore) Pvt. Ltd.
4. Aneja, K.R., (2003). *Experiments in Microbiology, Plant Pathology, Tissue Culture and Mushroom Production Technology*, 4th ed., New Age International Publishers.

F. Y. B.Sc. Semester II

MB: 03 MICROBIAL NUTRITION AND GROWTH

	UNIT 1	BACTERIAL NUTRITION	
	Reference: Prescott 7th & 9th	**Teaching Duration:**	**Lectures 12**
1.1	The common nutritional requirements		
1.2	Requriments for Carbon, Hydrogen, Oxygen and Electrons		
1.3	Nutritional types of microorganisms (9th edition)		
1.4	Requirments for Nitrogen, Phosphorus and Sulphur		
1.5	Uptake of nutrients: Getting through the barrier (9th edition)		

	UNIT 2	CULTIVATION OF BACTERIA	
	Reference: Prescott 9th	**Teaching Duration:**	**Lectures 10**
2.1	Culture media		
2.2	Chemical and physical types of culture media		
2.3	Functional types of culture media		
2.4	Cultivation of aerobic and anaerobic bacteria		
2.5	Enrichment and isolation of pure cultures		

	UNIT 3	MICROBIAL GROWTH	
	Reference: Prescott 9th	**Teaching Duration:**	**Lectures 10**
3.1	Bacterial cell cycle		
3.2	The growth curve		
3.3	Measurement of microbial population size		
3.4	Continuous culture of microorganisms		

	UNIT 4	INFLUENCES OF ENVIRONMENT ON MICROBIAL GROWTH	
	Reference: Prescott 9th	**Teaching Duration:**	**Lectures 10**
4.1	Solutes and water activity		
4.2	pH		
4.3	Temperature		
4.4	Oxygen concentration		
4.5	Pressure		
4.6	Radiation		

REFERENCES:

- Willey J., Sherwood L., (2007), *Prescott, Harley and Kleins Microbiology*, 7th ed., Mc Graw – Hill.
- Willey J., Sherwood L., (2011), *Prescott, Harley and Kleins Microbiology*, 9th ed., Mc Graw – Hill.

F.Y.B.Sc. Semester II

MB: 04 BIOMOLECULES OF MICROORGANISMS

	UNIT 1	CARBOHYDRATES	
	Reference: Satyanarayana & Chakrapani	**Teaching Duration:**	**Lectures 10**
1.1	Functions of carbohydrates		
1.2	Classification of carbohydrates		
1.3	Monosaccharides-Structural Aspects		
	1.3.1 Structure of glucose		
	1.3.2 Reactions of Monosaccharides		
1.4	Disaccharides		
1.5	Polysaccharide		
	1.5.1 Homopolysaccharides		
	1.5.2 Heteropolysaccharides		

	UNIT 2	AMINO ACIDS AND PROTEINS	
	Reference: Satyanarayana & Chakrapani	**Teaching Duration:**	**Lectures 08**
2.1	Functions & Elemental Composition of proteins		
2.2	Amino acids		
2.3	Structure of Proteins		
2.4	Properties of Proteins and Denaturation		
2.5	Classification of Proteins		
2.6	Biologically important peptides		

	UNIT 3	NUCLEIC ACIDS AND THEIR COMPONENTS	
	Reference: Satyanarayana & Chakrapani	**Teaching Duration:**	**Lectures 08**
3.1	Nucleotides		
3.2	Structure of DNA		
3.3	Organization of DNA in the cell		
3.4	Structure and types of RNA		

	UNIT 4	LIPIDS	
	Reference: Satyanarayana & Chakrapani	**Teaching Duration:**	**Lectures 10**
4.1	Classification & Functions of Lipids		
4.2	Fatty acids		
4.3	Essential Fatty acids		
4.4	Triacylglycerols		
4.5	Phospholipids		
4.6	Glycoolipids and Lipoproteins		
4.7	Steroids		
4.8	Amphipathic lipids & Soaps and detergents		

REFERENCES:

- U. Satyanarayana & U. Chakrapani (2006). *Biochemistry* 3rd Revised Edition

Further Reading:

- Conn, E. E., & Stumpf, P. K. (1987). *Outlines of Biochemistry,* 5th Edition.

F.Y.B.Sc. Semester II Practicals

MBP 02

Time Duration: 04 Hours/Week

1. Introduction to various Laboratory Apparatus viz. Laminar air flow, Incubator, Hot air oven, Autoclave, Centrifuge, Colorimeter, pH meter, Inspissator, Anaerobic jar, Bacteriological filter assembly (Membrane, Seitz)
2. Cell wall staining – Dyar's method
3. Cytoplasmic membrane staining (Ref: Aneja)
4. Endospore staining – Snyder's modification of Dorner's method
5. Observation of capsule in bacteria by Maneval's method
6. Metachromatic granules staining-Albert's method
7. Cultivation of bacteria: Broth culture, Slant culture, Stab culture
8. Isolation of bacteria by Streak, Pour and spread plate method.
9. Qualitative analysis of carbohydrates (Glucose, Maltose, Xylose, Lactose, Fructose)
10. Qualitative analysis of proteins (Casein, Albumin, Globulin and Peptones)
11. Effect of temperature on growth of microorganisms
12. Effect of pH of the medium on growth of microorganisms
13. Effect of osmotic pressure on growth of microorganisms
14. Cultivation of Anaerobic bacteria using Thioglycollate medium.

REFERENCES:

1. Patel, R. J., & Patel, R. K., (2015). Experimental Microbiology, Vol. 1, 9th ed., Aditya.
2. Patel, R. J., & Patel, R. K., (2011). Experimental Microbiology, Vol. 2, 8th ed., Aditya.
3. Cappuccino, J.G., (2016). *Microbiology: A Laboratory Manual,* 11th ed., Pearson Education (Singapore) Pvt. Ltd.
4. Aneja, K.R., (2001). *Experiments in Microbiology, Plant Pathology, Tissue Culture and Mushroom Production Technology,* 3rd Ed., New Age International Publishers.

S. Y. B. Sc. Semester III

MB 05: MICROBIAL CONTROL

	UNIT 1	PRINCIPLES OF CONTROL OF MICROORGANISMS	
	Reference: Prescott (8th , 9th Ed.)	Teaching Duration	07 Lectures
1.1	Definition of Terms (Prescott, 9th Ed.)		
1.2	Pattern of Microbial Death (Prescott, 9th Ed.)		
1.3	Conditions Influencing Antimicrobial Agent (Prescott, 8th Ed.)		
1.4	Mode of Action of Antimicrobial Agents (Cowan & Talaro / Pelczar, 5th Ed.)		

	UNIT 2	PHYSICAL METHODS FOR CONTROL OF MICROORGANISMS	
	Reference: Prescott (8th , 9th Ed.)	Teaching Duration	11 Lectures
2.1	Heat (Prescott, 9th Ed.)		
2.2	Low Temperature (Prescott, 8th Ed.)		
2.3	Filtration (Prescott, 9th Ed.)		
2.4	Radiation (Cowan & Talaro / Pelczar, 5th Ed.)		
2.5	Desiccation and Freeze Drying (Cowan & Talaro / Pelczar, 5th Ed.)		
2.6	Osmotic Pressure (Pelczar, 5th Ed.)		

	UNIT 3	CHEMICAL METHODS FOR CONTROL OF MICROORGANISMS	
	Reference: Cowan & Talaro / Pelczar, 5th Ed.	Teaching Duration	11 Lectures
3.1	Choosing a Microbicidal Chemical Agent		
3.2	Factors Affecting Germicidal Activity of Chemicals		
3.3	Halogens		
3.4	Phenols		
3.5	Dyes and Detergents		
3.6	Acids and Alkalies		

	UNIT 4	CHEMICAL METHODS FOR CONTROL OF MICROORGANISMS II	
	Reference: Cowan & Talaro / Pelczar, 5th Ed.	Teaching Duration	09 Lectures
4.1	Alcohols		
4.2	Hydrogen Peroxide		
4.3	Heavy Metals and their Compounds		

4.4	Aldehydes
4.5	Quaternary Ammonium Compounds
4.6	Gaseous Sterilants and Disinfectants

REFERENCES:

- Wiley, J., & Sherwood, L. (2015). *Prescott, Harley, and Klein's Microbiology*, 9th Ed., McGraw-Hill Science/Engineering/Math, ISBN: 9780073402406
- Wiley, J., & Sherwood, L. (2013). *Prescott, Harley, and Klein's Microbiology*, 8th Ed., McGraw-Hill Science/Engineering/Math, ISBN: 9780071313674
- Cowan M. K. and Talaro K. P., (2014), *Microbiology-A systems Approach*, 4th edition Mc Graw Hill Higher Education. ISBN: 978-0073402437
- Pelczar, Chan and Krieg, (2001), *Microbiology-Concepts and Application*, 5th Ed., McGraw-Hill. ISBN: 9780074623206

Further reading :

- Tortora G.J., and Funke B.R. (2016), *Microbiology an Introduction*, 12th Ed., Benjamin Cummings, ISBN: 9780321929150

S. Y. B. Sc. Semester III
MB 06: ENZYMOLOGY

	UNIT 1	**NOMENCLATURE AND CLASSIFICATION OF ENZYME**	
	Reference: U. Satyanarayan (4th Ed.)	**Teaching Duration**	**11 Lectures**
1.1	Historical background		
1.2	Nomenclature and classification		
1.3	Isoenzymes		
1.4	Coenzymes		

	UNIT 2	**ENZYME CHARACTERISTICS**	
	Reference: U. Satyanarayan (4th Ed.)	**Teaching Duration**	**11 Lectures**
2.1	Chemical nature and characteristics of enzymes (**Jain & Jain, 6th Ed.**)		
2.2	Factors affecting enzyme activity		
2.3	Enzyme specificity		
2.4	Units of enzyme activity		

	UNIT 3	MECHANISM OF ENZYME ACTION	
	Reference: U. Satyanarayan (4th Ed.)	**Teaching Duration**	09 Lectures
3.1	Mechanism of enzyme action		
3.2	Active site		
3.3	MM equation, LB plot, *Vmax & Km* **(Jain & Jain, 6th Ed.)**		
3.4	Enzyme inhibition		

	UNIT 4	REGULATION AND PURIFICATION	
	Reference: Jain & Jain, 6th Ed.	**Teaching Duration**	09 Lectures
4.1	Regulation of enzyme activity in living system		
4.2	Purification of enzymes (Ref: **Jain & Jain, 6th Ed.Pg. No 238)**		
4.3	Biological role of enzymes **(Jain & Jain, 6th Ed.)**		

REFERENCES:

- Satyanarayan U. and Chakrapani U., (2013), Biochemistry, 4th ed., Upala Autor-Publisher Interlinks. ISBN: 9788187134800
- Jain J. L. and Jain N., (2006), Fundamentals of Biochemistry, 6th ed., S. Chand Publications. ISBN: 9788121924535

Further reading :

- Berg and Stryer, (2015) Biochemistry, 8th edition. W H Freeman pub.,
- Voet and Voet, (2010) Fundamentals of biochemistry, 4th edition, Johns wiley & sons, Asia .

S. Y. B. Sc. Semester III
MB 07: PRINCIPLES OF VIROLOGY

	UNIT 1	GENERAL CHARACTERISTICS OF VIRUSES	
	Reference: J. Black (9th Ed.)	**Teaching Duration**	09 Lectures
1.1	What are Viruses?		
1.2	Components of viruses: Virion Structure **(Prescott, 9th Ed.)**		
1.3	Size and Shapes		
1.4	Host range and specificity of viruses		
1.5	Origins of viruses		

	UNIT 2	CLASSIFICATION AND CULTIVATION OF VIRUSES	
	Reference: J. Black (9th Ed.)	**Teaching Duration**	**09 Lectures**
2.1	Nucleic Acid classification		
2.2	RNA Viruses: General properties and important Groups		
2.3	DNA Viruses: General properties and important Groups		
2.4	Cultivation and Enumeration of Viruses (**Pelczar, 5th Ed.**)		

	UNIT 3	VIRAL REPLICATION	
	Reference: J. Black (9th Ed.)	**Teaching Duration**	11 Lectures
3.1	General characteristics of Replication		
3.2	Properties and Replication of Bacteriophage		
3.3	Replication of T-Even phage		
3.4	Lysogeny		
3.5	Replication of Animal viruses		
3.6	Latent viral infections		

	UNIT 4	VIRUSES AND VIRUS LIKE AGENTS	
	Reference: J. Black (9th Ed.)	**Teaching Duration**	11 Lectures
4.1	Emerging viruses		
4.2	Satellites, Viroids and Prions		
4.3	Viruses and cancer		
4.4	Human cancer viruses		
4.5	Plant viruses (**Prescott 7th Ed.**)		
4.6	Viruses of Fungi and Protists (**Prescott 7th Ed.**)		
4.7	Insect viruses (**Prescott 7th Ed.**)		

REFERENCES:

- Wiley, J., & Sherwood, L. (2013). *Prescott, Harley, and Klein's Microbiology*, 9th Ed., McGraw-Hill Science/Engineering/Math, ISBN: 9780073402406
- Black, J. G., (2014). *Microbiology*, 9th edition, Wiley, John Wiley and Sons., Inc.
- Wiley, J., & Sherwood, L. (2007). *Prescott, Harley, and Klein's Microbiology*, 7th Ed., McGraw-Hill Science/Engineering/Math, ISBN: 9780073302089
- Pelczar, Chan and Krieg, (2001), *Microbiology-Concepts and Application*, 5th Ed., McGraw-Hill. ISBN: 9780074623206

Further reading :

- Tortora G.J., and Funke B.R. (2016), *Microbiology an Introduction*, 12th Ed., Benjamin Cummings,

S.Y.B.Sc. Semester III Practicals

MBP 03

Time Duration: 06 Hours/Week

1. Enumeration of bacteria by Heterotrophic plate count method (HPC)
2. Action of antiseptics and disinfectants on bacteria.
3. Effect of hand sanitizer on skin flora.
4. Evaluation of disinfectant by Phenol coefficient method.
5. Lethal action of U.V. rays on bacteria
6. Lethal action of heavy metals on bacteria
7. Demonstration of lysis of bacteria by bacteriophage.
8. Study of extracellular enzymatic activity : Amylase, Caseinase, Gelatinase, Lipase, DNAase
9. Study of intracellular enzymatic activity : Deaminase, Ornithine Decarboxylase, Catalase, Dehydrogenase (Resazurin indicator), Oxidase.
10. Determination of *Km* Value of Invertase/Amylase.
11. Determination of TDP & TDT.

REFERENCES:

- Patel, R. J., & Patel, R. K., (2015). Experimental Microbiology, Vol. 1, 9th ed., Aditya.
- Patel, R. J., & Patel, R. K., (2011). Experimental Microbiology, Vol. 2, 8th ed., Aditya.
- Cappuccino, J.G., (2016). *Microbiology: A Laboratory Manual,* 11th ed., Pearson Education (Singapore) Pvt. Ltd.
- Aneja, K.R., (2003). *Experiments in Microbiology, Plant Pathology, Tissue Culture and Mushroom Production Technology,* 4th edition., New Age International Publishers.

S. Y. B. Sc. Semester IV

MB 08: BACTERIAL TAXONOMY

	UNIT 1	MICROBIAL EVOLUTION, TAXONOMY AND DIVERSITY	
	Reference: Prescott (9th Ed.)	**Teaching Duration**	**11 Lectures**
1.1	Introduction to Microbial Taxonomy		
1.2	Taxonomic ranks		
1.3	Exploring microbial taxonomy and phylogeny		
	1.3.1 Classical Characteristics		
	1.3.2 Molecular Characteristics		
1.4	Evolutionary process and the concept of microbial species.		

	UNIT 2	ARCHAEA	
	Reference: Prescott (9th Ed.)	**Teaching Duration**	**09 Lectures**
2.1	Archaeal taxonomy		
2.2	Archael metabolism		
2.3	Characteristics of the major archael physiological groups (Table 20.1)		

	UNIT 3	IMPORTANT GROUPS OF BACTERIA	
	Reference: Prescott (9th Ed.)	**Teaching Duration**	**10 Lectures**
3.1	Bergey's Manual of Systematic Bacteriology		
3.2	Order *Bacillales*		
3.3	Properties of some members of class *Mollicutes* (Table 21.1)		
3.4	Characteristics of the major groups of gram negative Photosynthetic bacteria (Table 21.2)		
3.5	Characteristics of the Cynobacterial Subsections (Table 21.3)		
3.6	Phylum: *Spirochetes*		

	UNIT 4	PHYLUM: PROTEOBACTERIA	
	Reference: Prescott (9th Ed.)	**Teaching Duration**	**10 Lectures**
4.1	Introduction to Alpha Proteobacteria : Order *Rhizobiales*		
4.2	Introduction to Beta Proteobacteria : Order *Hydrogenophiales*		
4.3	Introduction to Gamma Proteobacteria :Order *Enterobacteriales*		
4.4	Introduction to Delta Proteobacteria : Order *Bdellovibrionales*		
4.5	Class *Epsiloneproteobacteria*		

REFERENCES:

- Wiley, J., & Sherwood, L. (2013). *Prescott, Harley, and Klein's Microbiology*, 9th Ed., McGraw-Hill Science/Engineering/Math, ISBN: 9780073402406

Further reading :

- Pelczar, Chan and Krieg, (1993), *Microbiology-Concepts and Application,* International Edition, McGraw-Hill. ISBN: 9780071129145
- Tortora G.J., and Funke B.R. (2016), *Microbiology an Introduction*, 12th Ed., Pearson, ISBN: 9781292099149

S. Y. B. Sc. Semester IV
MB 09: MICROBIAL PHYSIOLOGY

	UNIT 1	**INTRODUCTION TO METABOLISM**	
	Reference: Prescott (9th Ed.)	**Teaching Duration**	**09 Lectures**
1.1	Metabolism: Important principles and concepts		
1.2	ATP the major energy currency of cells.		
1.3	Redox reactions		
1.4	Electron transport chain		

	UNIT 2	**PHOTOTROPHY AND CHEMOLITHOTROPHY**	
	Reference: Prescott (9th Ed.)	**Teaching Duration**	**09 Lectures**
2.1	Chemolithotrophy		
2.2	Phototrophy		

	UNIT 3	**ENERGY RELEASE AND CONSERVATION**	
	Reference: Prescott (9th Ed.)	**Teaching Duration**	**11 Lectures**
3.1	Aerobic respiration		
3.2	From Glucose to pyruvate		
3.3	TCA		
3.4	ETC-Oxidative phosphorylation		
3.5	Anaerobic respiration		
3.6	Fermentation		

	UNIT 4	CATABOLISM OF ORGANIC MOLECULES: OTHER THAN GLUCOSE	
	Reference: Prescott (9th Ed.)	**Teaching Duration**	**11 Lectures**
4.1	Carbohydrates		
4.2	Lipid catabolism		
4.3	Protein and aminoacids catabolism		

REFERENCES:

- Wiley, J., & Sherwood, L. (2013). *Prescott, Harley, and Klein's Microbiology*, 9th Ed., McGraw-Hill Science/Engineering/Math, ISBN: 9780073402406

Further reading :

- Berg and Stryer, (2007) *Biochemistry*, 6th Ed . W H Freeman pub., ISBN: 9780716746843
- Voet and Voet, (2008) *Fundamentals of biochemistry*, 3rd Ed, Johns wiley & sons, Asia ISBN: 978-0470129302
- S.C.Rastogi, Biochemistry (2015), 2nd Edi. ISBN:9788171339389
- Murray, R. K., Granner, D. K., Mayes, P. A., & Rodwell, V. W. (2015). Harper'Biochemistry, 30th Edi.Appleton and Lange.

S. Y. B. Sc. Semester IV

MB 10: MICROBIOLOGY OF ECOSYSTEMS

	UNIT 1	BIOGEOCHEMICAL CYCLING	
	Reference: Prescott (9th Ed.)	**Teaching Duration**	**09 Lectures**
1.1	Carbon cycle		
1.2	Nitrogen cycle		
1.3	Phosphorous cycle		
1.4	Sulfur cycle		
1.5	Interactions between elemental cycles		

	UNIT 2	MICROBIAL INTERACTIONS	
	Reference: Prescott (9th Ed.)	**Teaching Duration**	**12 Lectures**
2.1	Mutualism		
	2.1.1 Microorganisms- insects interaction mutualism		
	2.1.2 The Rumen ecosystem		
2.2	Cooperation		
2.3	Commensalism		
2.4	Predation		
2.5	Parasitism		
2.6	Amensalism		
2.7	Competition		

	UNIT 3	MICROORGANISMS IN TERRESTRIAL ENVIRONMENTS	
	Reference: Prescott (9th Ed.)	**Teaching Duration**	08 Lectures
3.1	Soils as a microbial habitat		
3.2	Microorganisms in the soil environment		
3.3	Microbe-plant interactions		

	UNIT 4	MICROORGANISMS IN MARINE AND FRESHWATER ECOSYSTEMS	
	Reference: Prescott (9th Ed.)	**Teaching Duration**	11 Lectures
4.1	Water as microbial habitat		
4.2	Microorganisms in marine ecosystems		
4.3	Microorganisms in freshwater ecosystems		

REFERENCES:

- Wiley, J., & Sherwood, L. (2013). *Prescott, Harley, and Klein's Microbiology*, 9th Ed., McGraw-Hill Science/Engineering/Math, ISBN: 9780073402406

Further reading :

- Pelczar, Chan and Krieg, (1993), Microbiology-Concepts and Application, International Edition, McGraw-Hill.
- Tortora G.J., and Funke B.R. (2016), Microbiology an Introduction, 12 Ed., Benjamin Cummings

S.Y.B.Sc. Semester IV Practicals

MBP 04

Time Duration: 06 Hours/Week

1. Preparation of Bacteriological and mycological media.
2. Study of various biochemical tests performed for the characterization of pure culture of bacteria.
3. Pure culture study of *Escherichia. coli* and *Klebseilla mobillis* (formerly *Enterobacter aerogenes)*
4. Pure culture study of *Proteus vulgaris, Serratia marcescens* and *Pseudomonas aeruginosa.*
5. Pure culture study of *Bacillus megaterium, Bacillus. subtilis, Bacillus. cereus.*
6. Pure culture study of *Staphylococcus aureus, Staphylococcus. epidermidis.*
7. Identification of economical important fungi. (9 genera) (*Aspergillus, Penicillium, Mucor, Rhizopus, Curvularia, Helminthosporium, Cunninghaemela, Fusarium, Alternaria*)
8. Study of permanent slides of algae (*Volvox, Spirogyra,* Diatoms), Cyanobacteria (*Nostoc, Anabena*) and Protozoa (*Amoeba, Paramoecium, Euglena*).
9. Isolation of nonsymbiotic nitrogen fixing aerobic bacteria- *Azotobacter* spp.
10. Isolation of *Rhizobium* spp. from root nodules of legume plants.
11. Isolation and identification of actinomycetes from soil.
12. Isolation of halophilic bacteria.

REFERENCES:

- Patel, R. J., & Patel, R. K., (2015). Experimental Microbiology, Vol. 1, 9th ed., Aditya.
- Patel, R. J., & Patel, R. K., (2011). Experimental Microbiology, Vol. 2, 8th ed., Aditya.
- Cappuccino, J.G., (2016). *Microbiology: A Laboratory Manual,* 11th ed., Pearson Education (Singapore) Pvt. Ltd.
- Aneja, K.R., (2003). *Experiments in Microbiology, Plant Pathology, Tissue Culture and Mushroom Production Technology,* 4th edition., New Age International Publishers.

T. Y. B. Sc. Semester V

MB 11: BACTERIAL GENETICS

	UNIT 1	GENOME: STRUCTURE AND REPLICATION	
	Reference: 9th Prescott	**Teaching Duration**	**10 Lectures**
1.1	DNA as genetic material		
1.2	DNA Structure		
1.3	The organization of DNA in cells		
1.4	Replication of DNA		
	1.4.1 Semi-conservative DNA replication	**Ref: Russell**	
	1.4.2 Patterns of DNA synthesis		
	1.4.3 The replication machinery		
	1.4.4 Events at the replication fork		
	1.4.5 Termination of replication		

	UNIT 2	GENE EXPRESSION AND REGULATION	
	Reference: 9th Prescott	**Teaching Duration**	**10 Lectures**
2.1	The flow of genetic information		
2.2	Gene structure		
2.3	Transcription		
	2.3.1 Transcription in *Bacteria*		
2.4	The Genetic code		
2.5	Translation		
2.6	The Lactose operon: Negative control of inducible genes		

	UNIT 3	GENETIC RECOMBINATION AND EXTRACHROMOSOMAL INHERITANCE	
	Reference: 9th Prescott	**Teaching Duration**	**10 Lectures**
3.1	Horizontal gene transfer in Prokaryotes		
3.2	Recombination at the molecular level		
3.3	Transposable elements		
3.4	Bacterial plasmids		
3.5	Bacterial Conjugation		
3.6	DNA Transformation		
3.7	Transduction		

	UNIT 4	MUTATIONS AND THEIR REPAIR	
	Reference: Russell	**Teaching Duration**	**10 Lectures**
4.1	Mutations definition		
4.2	Types of point mutation		
4.3	Spontaneous and induced mutations		
4.4	Reverse mutations and suppressor mutations		
4.5	Repair of damaged DNA		

REFERENCES:

- Wiley,J., and Sherwood, L. (2014). Prescott, Harley and Klein's Microbiology, 9 Ed., McGraw-Hill Science/Engineering/Maths.
- Russell, P. J. (2005). *iGenetics: A Molecular Approach*, 2Ed., Benjamin Cummings.

Further Reading:

- Klug, W. S., & Cummings M. R. (2008). *Concepts of Genetics*, 9Ed., Benjamin Cummings.
- Hartl D. L. and Jones E. W., (2009), Genetics: Analysis of genes and genomes, 7th ed., Jones and Bartlett publishers.

T. Y. B. Sc. Semester V

MB 12: EUCARYOTIC TAXONOMY

	UNIT 1	EUCARYOTIC CELL STRUCTURE	
	Reference: 9th Prescott	**Teaching Duration**	**10 Lectures**
1.1	Typical eukaryotic cells		
1.2	Eukaryotic cell envelopes		
1.3	Cytoplasm of Eucaryotes		
1.4	Endoplasmic reticulum		
1.5	Golgi apparatus		
1.6	Lysosomes		
1.7	Nucleus		
1.8	Ribosomes		
1.9	Mitochondria		
1.10	Hydrogenosomes		
1.11	Chloroplasts		
1.12	External cell structures		

	UNIT 2	THE FUNGI (EUMYCOTA)	
	Reference: 9th Prescott	**Teaching Duration**	**10 Lectures**
2.1	Fungal Distribution & Importance		
2.2	Fungal Structure		
2.3	Fungal Reproduction		
2.4	Zygomycota-Rhizopus		
2.5	Ascomycota-Saccharomyces		

	UNIT 3	THE PROTISTS	
	Reference: 9th Prescott	**Teaching Duration**	**10 Lectures**
3.1	Overview of protest		
3.2	Protist Morphology		
3.3	Encystment and excystment		
3.4	Reproductive cells and structure		

3.5	Supergroup- Amoebozoa
3.6	Supergroup- Archaeplastida

	UNIT 4	MULTICELLULAR PARASITES AND ARTHROPOD VECTORS	
	Reference: Nester	**Teaching Duration**	**10 Lectures**
4.1	Introduction		
4.2	Arthropods		
	4.2.1 Mosquitoes		
	4.2.2 Fleas		
	4.2.3 Lice		
	4.2.4 Tick		
	4.2.5 Mites		
4.3	Helminths		
	4.3.1 Nematodes (Roundworms)		
	4.3.2 Cestodes (Tapeworms)		
	4.3.3 Trematodes (Flukes)		

REFERENCES:

- Wiley,J., and Sherwood, L. (2014). Prescott, Harley and Klein's Microbiology, 9 Ed., McGraw-Hill Science/Engineering/M
- Nester E. W., Anderson D. J., Roberts C. E., Piveearsall N. N. and Nester M. T., (2004), Microbiology: A human perspective, McGraw-Hill

Further Reading:

- Pelczar M. J. and Chan E. C. S., (1998), Microbiology, 5th ed., Tata-Mc Graw Hill
- Cowan M. K. and Talaro K. P., (2006), Microbiology-A systems Approach, Mc Graw Hill Higher Education.

T. Y. B. Sc. Semester V

MB 13: RECOMBINANT DNA TECHNOLOGY

	UNIT 1	AIMS OF GENETIC ENGINEERING	
	Reference: Trevan	**Teaching Duration**	**10 Lectures**
1.1	Techniques for gene manipulation		
	1.1.1 Conventional Breeding		
	1.1.2 Protoplast and cell cloning		
	1.1.3 Potential products of genetic Engineering		
1.2	Outline of gene cloning		

	UNIT 2	TOOLS AND TECHNIQUES OF GENETIC ENGINEERING-I	
	Reference: Singh	**Teaching Duration**	**10 Lectures**
2.1	Restriction endonucleases		
2.2	Modification of cut ends		
2.3	Generation of DNA fragments for cloning		
2.4	Construction of c-DNA library		
2.5	Genomic library		
2.6	Comparison between c-DNA and genomic library		
2.7	Gel electrophoresis: Separation of DNA Molecules		**(Madigan)**
2.8	Nucleic acid hybridization and southern blot		**(Madigan)**

	UNIT 3	TOOLS AND TECHNIQUES OF GENETIC ENGINEERING-II	
	Reference: Singh	**Teaching Duration**	**10 Lectures**
3.1	Vector		
	3.1.1 Properties of good vector		
	3.1.2 Cloning and Expression vectors		
	3.1.3 Plasmid vectors-pBR322		
	3.1.4 Bacteriophage vectors- λ phage.		
	3.1.5 Cosmid vectors		
	3.1.6 Phagemid vectors and Phasmid vectors		
	3.1.7 Artificial chromosome vectors:BAC		
	3.1.8 Shuttle Vectors		
3.2	Gene fusion and reporter gene		**(Madigan)**
3.3	Hosts for cloning vectors		**(Madigan)**
3.4	Finding the right clone		**(Madigan)**

	UNIT 4	APPLICATIONS OF rDNA TECHNOLOGY	
	Reference: Rastogi	**Teaching Duration**	**10 Lectures**
4.1	Production of recombinant therapeutic proteins		
4.2	Production of recombinant vaccines		
4.3	Bacillus thuringiensis based biopesticides		
4.4	Development of Fungal, Bacterial and viral disease resistant plant.		

REFERENCES:

- Rastogi, S., & Pathak, N. (2009). Genetic Engineering, Oxford University Press. (ISBN: 978-0-19-569657-8)
- Trevan, M.D. (1987). Biotechnology: The Biological Principles, Tata-McGraw-Hill. (ISBN: 0-07-099391-2)
- Madigan, T. M. and Martinko, J. M. (2008). Brock Biology of Microorganisms, 12TH Ed.,Benjamin Cummings.
- Singh, B.D.,(2011). Biotechnology: Expanding Horizons, Kalyani Publishers.

Further Reading:

➢ Tortora G. J., Funke B. R. and Case C. L., (1997), Microbiology: An Inroduction, 6th ed., Addison Wesley LongmanInc.

T. Y. B. Sc. Semester V
MB 14: FUNDAMENTALS OF IMMUNOLOGY

	UNIT 1	INNATE HOST RESISTANCE	
	Reference: 9th Prescott	**Teaching Duration**	**10 Lectures**
1.1	Innate resistance overview		
1.2	Physical and chemical barrier: Defence of innate resistance		
1.3	Chemical mediator in innate resistance		
1.4	Cell tissues and organs of the immune system		
1.5	Phagocytosis		
1.6	Inflammation		

	UNIT 2	ADAPTIVE IMMUNITY	
	Reference: 9th Prescott	**Teaching Duration**	**10 Lectures**
2.1	Overview of Adaptive Immunity		
2.2	Antigen		
2.3	Types of adaptive immunity		
2.4	Recognition of foreignness		
2.5	T-Cell biology		
2.6	B-Cell biology		
2.7	Antibodies and monoclonal antibody		

	UNIT 3	CLINICAL IMMUNOLOGY	
	Reference: 9th Prescott	**Teaching Duration**	**10 Lectures**
3.1	Serotyping		
3.2	Agglutination		
3.3	Complement fixation		
3.4	Immunoblotting, Immunoprecipitant		
3.5	Immunodiffusion, Immunoelectrophoresis		
3.6	Radioimmunoassay		
3.7	ELISA		

	UNIT 4	IMMUNE TOLERANCE AND IMMUNE DISORDERS	
	Reference: 9th Prescott	**Teaching Duration**	**10 Lectures**
4.1	Acquired immune tolerance		
4.2	Immunodeficiency		
4.3	Autoimmunity and Autoimmune diseases		
4.4	Hypersensitivity		

REFERENCES:

➢ Wiley,J., and Sherwood, L. (2014). Prescott, Harley and Klein's Microbiology, 9 Ed., McGraw-Hill Science/Engineering/Maths.

Further Reading:

- Tortora G. J., Funke B. R. and Case C. L., (1997), Microbiology: An Inroduction, 6th ed., Addison Wesley LongmanInc.
- Pommerville J. C., (2014), Alcamo's fundamentals of microbiology, 10th ed., Jones and Bartlett learning
- Pelczar, Chan and Krieg, (1993), Microbiology-Concepts and Application, International Edition, McGraw-Hill

T. Y. B. Sc. Semester V

MB 15: MICROBIAL PATHOGENICITY AND DISEASES

	UNIT 1	PATHOGENICITY AND INFECTION	
	Reference: 9th Prescott	**Teaching Duration**	**10 Lectures**
1.1	Pathogenicity and Infectious disease		
1.2	Virulence		
	1.2.1 Pathogenicity islands		
	1.2.2 Virulence factors		
1.3	Exposure and transmission		

	UNIT 2	AIR BORNE DISEASES	
	Reference: Greenwood	**Teaching Duration**	**10 Lectures**
2.1	Tuberculosis		
2.2	Diptheria		
2.3	Bacterial and Viral Pneumonia		
2.4	Influenza		
2.5	Common Cold		
2.6	Aspergillosis		

	UNIT 3.	CONTACT AND VECTOR BORNE DISEASES	
	Reference: Greenwood	**Teaching Duration**	**10 Lectures**
3.1	Staphylococcal Infections		
3.2	Syphilis		
3.3	Leptospirosis		
3.4	AIDS		
3.5	Typhus		
3.6	Plague		
3.7	Malaria		
3.8	Filaria		
3.9	Dengue		

	UNIT 4	FOOD AND WATER BORNE DISEASES	
	Reference: Greenwood and 9th Prescott	**Teaching Duration**	10 Lectures
4.1	Gastroentritis – Bacterial and Rota Virus		
4.2	Salmonellosis		
4.3	Typhoid		
4.4	Cholera		
4.5	Bacterial and Amoebic Dysentery		

REFERENCES:

- Wiley,J., and Sherwood, L. (2014). Prescott, Harley and Klein's Microbiology, 9 Ed., McGraw-Hill Science/Engineering/Maths.
- Greenwood.D., and Black, R.C. (2012). Medical Microbiology, 6th Ed., Churchill Livingstone.

Further reading :

- Pelczar, Chan and Krieg, (1993), Microbiology-Concepts and Application, International Edition, McGraw-Hill.
- Tortora G.J., and Funke B.R. (2016), Microbiology an Introduction, 12th Ed., Benjamin Cummings

T. Y. B. Sc. Semester V

MB 16: MICROBIOLOGY OF ENVIRONMENT

	UNIT 1	BACTERIOLOGY OF AIR	
	Reference: Salle	**Teaching Duration**	10 Lectures
1.1	Introduction		
1.2	Number and kinds of organisms in air		
1.3	Enumeration of bacteria in air		
1.4	Effect of atmospheric temperature and humidity		
1.5	Air sanitation		

	UNIT 2	PLANT PATHOLOGY	
	Reference: Purohit	**Teaching Duration**	**10 Lectures**
2.1	Disease: Definitions		
2.2	Nature of plant diseases and Symptoms		
2.3	Plant and pathogen relationship & proof of pathogenicity		
2.4	Transmission of plant viruses		
2.5	Citrus canker		
2.6	Tobacco mosaic disease		
2.7	Black stem rust of wheat		
2.8	Red rot of sugar cane		

	UNIT 3	MICROBIOLOGY OF DRINKING WATER AND WASTE WATER TREATMENT	
	Reference: 9th Prescott	**Teaching Duration**	10 Lectures
3.1	Water Purification and Sanitary analysis of drinking water.		
3.2	Wastewater treatment		

	UNIT 4	EXTREMOPHILES	
	Reference: Schaechter, Dubey and Maheshwari	**Teaching Duration**	**10 Lectures**
4.1	Physiology, Molecular adaptations and Applications of 4.1.1 Hyperthermophiles 4.1.2 Extreme Acidophiles 4.1.3 Psychrophiles 4.1.4 Barophiles 4.1.5 Halophiles 4.1.6 Alkaliphiles		
4.2	Applications of Extremozymes in Biotechnology **(Desk encyclopedia)**		

REFERENCES:

- Wiley, J.,& Sherwood, L. (2014). Prescott, Harley, and Klein's Microbiology, 9th Ed., McGraw-Hill Science/Engineering/Math.
- Purohit, S. S., (2006). Microbiology: Fundamentals and Applications, 7th Ed.,Agrobios
- Schaechter. M., (2004) The Desk Encyclopedia of Microbiology, Elsevier.Academic Press.
- Salle, A. J., (1993). Fundamental Principles of Bacteriology, 7th Ed., Tata-McGraw-Hill (ISBN: 0-07-099562-1)
- Dubey R.C.and Maheshwari D.K. A textbook of Microbiology. Revised Edition 2010.S.Chand & Company.ISBN-81-219-2559-2

Further Reading:

- Pelczar, M. J., & Chan, E. C. S. (1998). Microbiology, 5Ed., Tata-McGraw-Hill
- R. M. Maier (2006) Environmental microbiology, Elsevier.
- Soli Arceivala & Asolker Shyam R.(2007), Waste water treatment for pollution control & reuse. 3rd Ed.,Tata -McGraw-Hill.

T. Y. B. Sc. Semester V
MBP 05
PRACTICALS
Time Duration: 12 Hours/Week

1. Extraction of genomic bacterial DNA and separation by gel electrophoresis
2. Observation of morphological characteristics of fungi/Protozoa by Dark field microscopy.
3. Observation of morphological characteristics of yeast/Protozoa by Phase Contrast microscopy.
4. Isolation of antibiotic resistant mutant by gradient plate technique
5. Isolation of pigmentation mutants by ultraviolet rays
6. Estimation of reducing sugars: Cole's method
7. Estimation of protein: Folin – Lowry's method
8. Widal test – Dreyer's Double Dilution
9. RPR test – Qualitative
10. Determination of blood groups
11. Detection of coliforms (Presumptive, Confirmed and Completed test)
12. Presence-Absence test for sanitary examination of drinking water
13. Enumerations of Coliform by MPN method
14. Isolation of faecal indicator bacteria (*Enterococcus faecalis*) by membrane filter technique from sewage
15. Isolation of Coliphage from Sewage.
16. Isolation of plant pathogenic bacteria from citrus canker.
17. Study of plant pathogenic fungi. (Permanent slides of various stages of life cycle of *Puccinia graminis*)
18. Study of permanent slides of four arthropod vectors (*Aedes* and *Anopheles* mosquitoes, Rat flea, Mite)

REFERENCES:

1. Patel, R. J., & Patel, R. K., (2015). Experimental Microbiology, Vol. 1, 9th ed., Aditya.
2. Patel, R. J., & Patel, R. K., (2015). Experimental Microbiology, Vol. 2, 9th ed., Aditya.
3. Cappuccino, J.G., (2005). Microbiology: A Laboratory Manual, 6th Ed., Pearson Education (Singapore) Pte. Ltd.
4. Aneja, K.R., (2003). Experiments in Microbiology 4th ed., Experiments in microbiology, Plant Pathology, Tissue Culture and Mushroom Production Technology, New Age International Publishers

T. Y. B. Sc. Semester VI

MB: 17 FOOD AND DAIRY MICROBIOLOGY

	UNIT 1	INTRODUCTION TO FOOD MICROBIOLOGY	
	Reference: 4th Frazier	**Teaching Duration:**	**10 Lectures**
1.1	Food as a substrate for microorganisms		
1.2	Principles of food preservation:		
	1.2.1 Asepsis		
	1.2.2 Removal of microorganisms		
	1.2.3 Heat treatments employed in processing foods		
	1.2.4 Temperatures employed in low-temperature storage		
	1.2.5 Methods of drying		
	1.2.6 Added preservatives		
	1.2.7 Developed preservatives		
	1.2.8 Preservation by radiation		

	UNIT 2	FOOD SPOILAGE	
	Reference: 4th Frazier	**Teaching Duration:**	**10 Lectures**
2.1	Contamination and Spoilage of food:		
	2.1.1 Bread		
	2.1.2 Vegetables and fruits		
	2.1.3 Heated canned foods		
2.2	Food borne diseases		**(Prescott)**
2.3	Detection of food-borne pathogens		**(Prescott)**
2.4	The HACCP System and Food safety : Outline		**(James Jay)**

	UNIT 3	DAIRY MICROBIOLOGY	
	Reference: Sukumar De	**Teaching Duration:**	**10 Lectures**
3.1	Definition		
3.2	Indian standards		
3.3	Composition and nutritive value of milk		
3.4	Contamination and Spoilage of milk and milk products		**(Frazier)**
3.5	Preservation of milk and milk products		**(Frazier)**
3.6	Fermented milks		**(Prescott)**
3.7	Cheese production		**(Prescott)**
3.8	Probiotics		**(Prescott)**

	UNIT 4	MICROORGANISMS AS FOOD AND FERMENTED FOODS	
	Reference: 9th Prescott	**Teaching Duration:**	**10 Lectures**
4.1	Single cell protein		**(Purohit)**
4.2	Mushroom Culture		**(R.C.Dubey)**

Shirkhedkar

4.3	List of fermented foods
4.4	Production of alcoholic beverages
4.5	Production of breads

REFERENCES:

- Frazier, W. C. and Westhoff, D. C., (2006). Food Microbiology, 4Ed., Tata Mc-Graw Hill, India.
- Sukumar De. (2013). Outlines of Dairy Technology, Oxford university. (ISBN:978-0-19561194-6
- .Wiley, J., & Sherwood, L. (2007). Prescott, Harley, and Klein's Microbiology, 9Ed., McGraw-Hill Science/Engineering/Math.
- Dubey, R.C. (2010). Textbook of Biotechnology, S. Chand. Multicolor 1Ed.
- James M. Jay (2000) Modern Food Microbiology.Sixth edition
  AN ASPEN PUBLICATION® Aspen Publishers, Inc.
  Gaithersburg, Maryland.

Further Reading:

- Purohit, S. S., (2006). *Microbiology: Fundamentals and Applications*, 7Ed., Agrobios (India).
- Pelczar, M. J., & Chan, E. C. S. (1998). *Microbiology,* 5Ed., Tata-McGraw-Hill.

MB: 18 PRINCIPLES OF FERMENTATION TECHNOLOGY

	UNIT 1	HISTORY AND BASIS FOR THE DEVELOPMENT OF THE FERMENTATION PROCESSES	
	Reference: A. H. Patel	**Teaching Duration:**	**10 Lectures**
1.1	Historical developments in fermentation technology		
1.2	Screening for new metabolites		(Cruger)
1.3	Screening techniques: Primary and secondary screening		
1.4	Fermentation Processes		(Cruger)
1.5	Fermentation media		(Waites)

	UNIT 2	STRAIN DEVELOPMENT	
	Reference: Creuger	**Teaching Duration:**	**10 Lectures**
2.1	General aspects		
2.2	Mutations		
2.3	Selection of mutants		
2.4	Recombination		
2.5	Regulation		
2.6	Gene technology		
2.7	Use of genetic methods		

	UNIT 3	DESIGN OF FERMENTOR AND INDUSTRIAL STERILIZATION	
	Reference: Stanbury	**Teaching Duration:**	**10 Lectures**
3.1	Introduction		
3.2	Aseptic operation		
3.3	Body construction		
3.4	Temperature control		
3.5	Aeration and agitation		
3.6	Maintenance of aseptic condition		
3.7	Monitoring and control of various parameters		
3.8	Types of fermentors		

	UNIT 4	DOWNSTREAM PROCESSESING	
	Reference: Waites	**Teaching Duration:**	**10 Lectures**
4.1	Introduction		
4.2	Cell harvesting		
4.3	Cell disruption		
4.4	Product recovery		
4.5	Finishing step		

REFERENCES:

- Patel, A.H., (2012). Industrial Microbiology, 2 Ed. Macmillan, India.
- Stanbury, P.F., (2006). Principles of Fermentation Technology, 2 Ed., Elsevier Science Ltd.

- Creuger, W., (2005). Biotechnology: A textbook of industrial microbiology, 2 Ed.,Panima, New Delhi.
- Waites, M.J., et al., (2001), Industrial microbiology: An Introduction, 1st ed., Blackwell publishing

Further Reading:

- Sivakumaar P.K., Joe M. M. and Sukesh K., (2010), An introduction to industrial microbiology, 1st ed., S. Chand publication
- Srivastva M. L., (2008), Fermentation technology, 1st ed., Narosa pub. house

MB 19: ECONOMIC MICROBIOLOGY

	UNIT 1	TYPICAL FERMENTATION PROCESSES	
	Reference: Cruger	**Teaching Duration**	**10 Lectures**
1.1	L-Glutamic acid		
1.2	Acetic acid		
1.3	Acetone/Butanol Fermentation		
1.4	Amylases		
1.5	Penicillins		
1.6	Riboflavin		

	UNIT 2	AGRICULTURAL MICROBIOLOGY AND ENZYME TECHNOLOGY	
	Reference: Dubey	**Teaching Duration**	**10 Lectures**
2.1	Biosensor		
2.2	Extracellular Polysaccharides		**(Cruger)**
2.3	Biofertilizers: Bacterial Innoculants		
	2.3.1 Rhizobium		
	2.3.2 Azobacter		
	2.3.3 Phosphate Solubilizer		
2.4	Bacterial Insecticides (Production and Formulation)		**(A. H. Patel)**
2.5	Stabilization of Enzymes by means of Immobilization		**(Cruger)**

	UNIT 3	BIO ENERGY	
	Reference: Dubey	**Teaching Duration**	**10 Lectures**
3.1	Gaseous Fuels: Biogas and Hydrogen		
3.2	Alcohols: The Liquid Fuel		
3.3	Recovery of Petroleum		**(Bartha)**

	UNIT 4	MICROBIAL LEACHING AND BIOREMEDIATION	
	Reference: Dubey	Teaching Duration	10 Lectures
4.1	Leaching		(Cruger)
4.2	Bioremediation: General Aspects		
4.3	Bioremediation of Hydrocarbons		
4.4	Bioremediation of Xenobiotics		
4.5	Bioremediation of Industrial Wastes		

REFERENCES:

- Cruger,W. (2005) Biotechnology: A textbook of Industrial Microbiology,2 Ed. Panima, New Delhi
- Dubey, R.C. (2010) Textbook of Biotechnology, S. Chand, Multicolor 1 Ed.
- Patel,A.H. (2012) Industrial Microbiology. 2 Ed. Macmillan, India.
- Atlas,R.M. and Bartha,R. (1998) Microbial Ecology, 4Ed.

Further Reading:

- Sivakumaar P.K., Joe M. M. and Sukesh K., (2010), An introduction to industrial microbiology, 1st ed., S. Chand publication
- Srivastva M. L., (2008), Fermentation technology, 1st ed., Narosa pub. house

MB 20: BIOINFORMATICS

	UNIT 1	MICROBIAL GENOMICS AND PROTEOMICS	
	Reference: 9th Prescott	Teaching Duration:	10 Lectures
1.1	Determining DNA Sequences		
1.2	Whole Genome Shotgun Sequencing		
1.3	Single Cell Genomic Sequence		
1.4	Functional genomics		
1.5	Proteomics		
1.6	Comparative genomics		

	UNIT 2	DATABASES IN BIOINFORMATICS	
	Reference: Orpita Bosu	Teaching Duration:	10 Lectures
2.1	Introduction to bioinformatics		
2.2	Applications and research in bioinformatics		
2.3	Present bioinformatics scenario		
2.4	Characteristics of bioinformatics database		
2.5	Categories of bioinformatics database - Types of data		
2.6	Sequence database		
	2.6.1 Nucleotide – EMBL		
	2.6.2 Protein – DDBJ		
2.7	Structural database – PDB, CATH		
2.8	Other database –Enzyme database		

	UNIT 3	BIOALGORITHMS AND TOOLS	
	Reference: Ghosh	**Teaching Duration:**	**10 Lectures**
3.1	Introduction And Concepts of Alignment (except gap penalty) (Ghosh)		
3.2	Introduction to scoring matrices		
3.3	Pairwise Alignment (only methods – Global And Local		
3.4	Multiple Sequence Alignment		

	UNIT 4	STRUCTURE PREDICTION AND PHYLOGENETICS	
	Reference: Xiong	**Teaching Duration:**	**10 Lectures**
4.1	Molecular evolution and molecular phylogenetics		
4.2	Terminology		
4.3	Forms of tree representation		
4.4	Phylogenetic tree evaluation		

REFERENCES:

- Willey J., Sherwood I., (2011), Prescott, Harley and Kleins Microbiology, 8th ed., Mc Graw – Hill science.
- Xiong, J.,(2009). Essential Bioinformatics , Cambridge University press.
- Ghosh Z. and Mallick B.,(2009),Bioinformatics: Principles and Applications, Oxford University press
- Orpita Bosu and Thukral S. K., (2008), Bioinformatics: Databases, Tools and Algorithms. Oxford university Press. (ISBN: 978-0-19-567683-9).

Further Reading:

- Primrose S. and Twyman R. (2006). Principles of Gene Manipulation & Genomics, 7th edition. Black well Publishing, Malden.

MB 21: CLINICAL MICROBIOLOGY

	UNIT 1	EPIDEMIOLOGY AND PUBLIC HEALTH MICROBIOLOGY	
	Reference: 9th Prescott	**Teaching Duration:**	**Lectures**
1.1	Epidemiology		
1.2	Epidemiological Methods		
1.3	Measuring infectious Disease frequency		
1.4	Patterns of infectious disease in a population		
1.5	Emerging and re-emerging infectious diseases and pathways		
1.6	Health-care associated infections		
1.7	Prevention and control of epidemics		
1.8	Bioterrorism preparedness		

	UNIT 2	CLINICAL MICROBIOLOGY-I	
	Reference: Cheesebrough	**Teaching Duration:**	**Lectures**
2.1	Possible pathogens, collection, transport and laboratory examination of... 2.1.1 Sputum 2.1.2 Throat and mouth specimen 2.1.3 CSF 2.1.4 Blood		

	UNIT 3	CLINICAL MICROBIOLOGY-II	
	Reference: Cheesebrough	**Teaching Duration:**	**Lectures**
3.1	Possible pathogens, collection, transport and laboratory examination of: 3.1.1 Pus 3.1.2 Semen 3.1.3 Urine 3.1.4 Faecal Specimens		

	UNIT 4	ANTIMICROBIAL CHEMOTHERAPY	
	Reference: 9th Prescott	**Teaching Duration:**	**Lectures**
4.1	Development of Chemotherapy		
4.2	General Characteristics of antimicrobial drugs		
4.3	Determining the level of antimicrobial activity		
4.4	Antibacterial drugs		
4.5	Antifungal drugs		
4.6	Antiviral drugs		
4.7	Antiprotozoan drugs		
4.8	Factors affecting antimicrobial drug effectiveness		

REFERENCES:

- Wiley, J., & Sherwood, L., (2007). Prescott, Harley, and Klein's Microbiology, 9Ed., McGraw-Hill Science/Engineering/Math.
- Cheesbrough, M., (2005).District laboratory practice in tropical countries Part 1&2, Cambridge University press.

Further Reading:

- Pelczar, M. J., & Chan, E. C. S. (1998). Microbiology, 5Ed., Tata McGraw-Hill.
- Bauman, R., (2004). Microbiology, Pearson.
- Mukherjee K. L., (1988). Medical Laboratory Technology, Vol 1, 2 & 3, Tata McGrawHill Publishing.
- Ochei J. and Kolhatkar A., (2000). Medical Laboratory Science – Theory and Practice, Tata McGrawHill.
- Godkar P. B., (2003). Textbook of Medical Laboratory Technology, 2 Ed., Bhalani Publishing House

MB 22: HAEMATOLOGY

	UNIT 1	INTRODUCTION TO HAEMATOLOGY	
	Reference: Mukherjee	**Teaching Duration:**	**10 Lectures**
1.1	Blood: Defination and functions		
1.2	Components of blood and their function		
1.3	Haemopoietic system of the body		
1.4	Collection and processing of blood		**(Ochei)**
1.5	Use and types of anticoagulants		**(Godkar)**
1.6	haemostasis and mechanism of blood coagulation		
1.7	Anaemia, leukmia and polycythaemia vera		

	UNIT 2	PRACTICAL HAEMATOLOGY	
	Reference: Mukherjee	**Teaching Duration:**	**10 Lectures**
2.1	Determination of haemoglobin concentration		
	2.1.1 Cyanmethaemoglobin method		
2.2	Determination of haematocrit - PCV		
2.3	Enumeration of formed elements		**(Ochei)**
2.4	Laboratory investigations of bleeding disorders		
	2.4.1 Bleeding time-Ivy method		
	2.4.2 Whole blood clotting time-Lee and White method		
	2.4.3 Prothrombin time		

	UNIT 3	IMMUNOHAEMATOLOGY	
	Reference: Ochei	**Teaching Duration:**	**10 Lectures**
3.1	Blood group antigens and antibodies		
3.2	ABO blood grouping system		
3.3	ABO grouping		
3.4	ABO grouping methods		
3.5	Rh grouping system		
3.6	Methods for Rh typing		

	UNIT 4	BLOOD BANKING	
	Reference: Mukherjee	**Teaching Duration:**	**10 Lectures**
4.1	Selection of blood donor		
4.2	Methods of blood collection –preparation of blood drawing		
4.3	Adverse reaction of donor		
4.4	Preparation and use of blood components		
4.5	Basic laboratory tests-Cross matching.		

REFERENCES:

- Mukherjee K. L., (1988). Medical Laboratory Technology, Vol 1, 2 & 3, Tata McGrawHill Publishing.
- Ochei J. and Kolhatkar A.,

(2000). Medical Laboratory Science – Theory and Practice, Tata McGrawHill.
- Godkar P. B., (2003). Textbook of Medical Laboratory Technology, 2 Ed., Bhalani Publishing House

Further Reading:

- Professional guide to diagnostic tests, (2004), 1st ed. Lippincott Williams & Wilkins (no author)

T. Y. B. Sc. Semester VI
PRACTICALS
MBP 06
Time Duration: 12 Hours/Week

1. Bacteriological investigation of diagnostic problems related to blood
2. Bacteriological investigation of diagnostic problems related to urine
3. Bacteriological investigation of diagnostic problems related to stool
4. Bacteriological investigation of diagnostic problems related to purulent exudates, wound, abscess
5. Determination of Antibiotic Susceptibility: Agar Disc Method
6. Determination of MIC of antibiotic
7. Bacteriological analysis of food.
8. Bacteriological analysis of milk (MBRT, qualitative, quantitative, AFB)
9. Sterility testing
10. Fermentative production of amylase and its estimation
11. Bioassay of penicillin
12. Total count of RBC
13. Total count of WBC
14. Haemoglobin estimation by Sahli's method
15. Differential count of Leucocytes
16. Seperation of amino acids by paper chromatography
17. Physical, chemical and microscopic examination of urine

REFERENCES:

1. Patel, R. J., & Patel, R. K., (2015). Experimental Microbiology, Vol. 1, 9th ed., Aditya.
2. Patel, R. J., & Patel, R. K., (2015). Experimental Microbiology, Vol. 2, 9th ed., Aditya.
3. Cappuccino, J.G., (2005). Microbiology: A Laboratory Manual, 6th Ed., Pearson Education (Singapore) Pte. Ltd.
4. Aneja, K.R., (2003). Experiments in Microbiology 4th ed., Experiments in microbiology, Plant Pathology, Tissue Culture and Mushroom Production Technology, New Age International Publishers

CAN Sem V:

ANALYTICAL INSTRUMENTATION AND TECHNIQUES

	UNIT 1	FUNDAMENTALS OF ANALYTICAL INSTRUMENTS	
	Reference: Khandpur, 2nd Ed.	**Teaching Duration**	**10 Lectures**
1.1	Elements of an analytical instruments		
1.2	Signal conditioning in analytical instruments		
1.3	Read-out (Display) Systems		
1.4	Intelligent analytical instrumentation systems		

	UNIT 2	PERFORMANCE PARAMETERS OF ANALYTICAL INSTRUMENTS	
	Reference: Khandpur, 2nd Ed.	**Teaching Duration**	**10 Lectures**
2.1	Errors in chemical analysis		
2.2	Accuracy and precision		
2.3	Significant figures		
2.4	Application of statistics methods		
2.5	Other performance parameters		
2.6	Instrument calibration techniques		
2.7	Validation		

	UNIT 3	ANALYTICAL LAB INSTRUMENTS	
	Reference: Khandpur, 2nd Ed.	**Teaching Duration**	**10 Lectures**
3.1	pH meter		
	3.1.1 What is pH?		
	3.1.2 Principle of pH measurement		
	3.1.3 Electrodes for pH measurement: Glass and Calomal electrode		
3.2	Centrifuge		
3.3	Chromatography		
3.4	Electrophoresis		
3.5	PCR		

	UNIT 4	COLORIMETERS AND SPECTROPHOTOMETERS	
	Reference: Khandpur, 2nd Ed.	**Teaching Duration**	**10 Lectures**
4.1	Electromagnetic radiation		
4.2	Laws relating to absorption of radiation		
4.3	Colorimeters/Photometers		
	4.3.1 Single beam filter photometer (Components and working principle)		

4.4	4.3.2 Double beam filter photometer(Components and working principle) Spectrophotometer (Components and working principle)

REFERENCES:

- Khandpur R. S., (2006), *Handbook of Analytical Instrument*, 2nd Ed., McGraw Hill Education, ISBN: 9780070604605

Further reading :

- Keith Wilson, John Walker, (2010), *Principles and Techniques of Biochemistry and Molecular Biology*, Cambridge University Press, ISBN: 9780521516358

CAN Sem VI

QUALITY ASSURANCE IN MICROBIOLOGY

	UNIT 1	BIOSAFETY GUIDELINES	
	Reference: WHO, 3rd Ed.	Teaching Duration	10 Lectures
1.1	Microbiological Risk Assessments		
1.2	Biosafty level 1 and 2		
	1.2.1 Code of practice		
	1.2.2 Laboratory design facilities		
	1.2.3 Laboratory equipment		
	1.2.4 Health and medical surveillance		
	1.2.5 Training and waste handling		
	1.2.6 Chemical, fire, electrical, radiation and equipment safety		
1.3	Biosafty level 3 and 4		
	1.3.1. Code of practice		
	1.3.2. Laboratory design facilities		
	1.3.3. Laboratory equipment		
	1.3.4. Health and medical surveillance		
1.4	Laboratory biosecurity concept		
1.5	Biological safety cabinet		

	UNIT 2	QUALITY ASSURANCE IN MICROBIOLOGY AND SEROLOGY	
	Reference: Tambwekar	Teaching Duration	10 Lectures
2.1	Introduction		
2.2	Stages of quality Assurance		
	2.2.1 Pre analytical stage		
	2.2.2 Analytical stage		
	2.2.3 Post analytical stage		
2.3	QC in serology		

	UNIT 3	THE ACCREDITATION PROCESS	
	Reference: Tambwekar	Teaching Duration	10 Lectures
3.1	Benefits of Accreditation		
3.2	Criteria for Accreditation		
3.3	Audit		
3.4	Process of Accreditation		
3.5	List of Accreditation agency		

	UNIT 4	MICROBIOLOGICAL ASSAY	
	Reference: Hewitt	**Teaching Duration**	**10 Lectures**
4.1	Standard reference materials 4.1.1 Official Reference Materials 4.1.2 National and regional reference materials 4.1.3 Inhouse standards		
4.2	Microbiological Assay 4.2.1 . Inoculum 4.2.2 Test solutions 4.2.3 Assay medium 4.2.4 Aseptic techniques 4.2.5 Measurement of response		

REFERENCES:

- William Hewitt (2003), *Microbiological Assay for Pharmaceutical Analysis: A Rational Approach*. CRC Press ISBN: 9780203503973
- Tambwekar Shubhangi, *Handbook of Quality Assurance in Laboratory Medicines*, B. I. Publication, ISBN: 9788172253158
- WHO, (2004), *Laboratory safety Manual*, 3rd Ed., World Health Organization, ISBN 9241546506.

Further reading :

- Baird Rosamun, Hodges N. A., Denyer S. P.,(2000); *Handbook of Microbiological Quality Control in Pharmaceuticals and Medical Devices*, CRC Press. ISBN: 9780748406142

T. Y. B. Sc. SEMESTER V (CAN)

MICROBIOLOGY LABORATORY HAZARDS AND PRECAUTIONS

	UNIT 1	LABORATORY HAZARDS AND PRECAUTIONS	
	Reference: Cheesbrough, 2nd Ed. Vol II /Sood	Teaching Duration	10 Lectures
1.1	Common Hazards in Laboratory		
1.2	Microbial Hazards (Cheesbrough, 2nd Ed.)		
1.3	Hazard Warning Symbols		
1.4	Laboratory First Aid		

	UNIT 2	EQUIPMENT RELATED HAZARDS	
	Reference: Cheesbrough, 2nd Ed. Vol II	Teaching Duration	10 Lectures
2.1	Equipment and their Operation Borne Hazards		
2.2	Equipment and Glassware Related Hazards		
2.3	Equipment Designed to Eliminate or Reduce Hazards		

	UNIT 3	HAZARDOUS CHEMICALS IN LABORATORY, FIRE AND ELECTRICAL HAZARDS	
	Reference: Cheesbrough, 2nd Ed. Vol II	Teaching Duration	10 Lectures
3.1	Various Dangerous Chemicals 3.1.1 Flammable Chemicals 3.1.2 Corrosive Chemicals 3.1.3 Toxic and Irritative Chemicals 3.1.4 Carcinogenic Chemicals 3.1.5 Explosive Chemicals 3.1.6 Radioactive Chemicals 3.1.7 Incompatible Chemicals		
3.2	Toxic Effect of Chemicals		
3.3	Compressed and Liquefied Gases		
3.4	Fire in Laboratory, Cause and Extinguishers		
3.5	Electrical Hazards		

	UNIT 4	SAFE LABORATORY TECHNIQUES

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	Reference: WHO 3Ed./Sood	Teaching Duration	10 Lectures
4.1	Various Safe Techniques Used in Laboratory		
	4.1.1 Technique for Pipettes and Pipetting Aids 4.1.2 Technique for Avoiding The Dispersal Of Infectious Material 4.1.3 Technique for the Use of Biological Safety Cabinets 4.1.4 Technique for Avoiding Ingestion of Infectious Material and Their Contact with Skin and Eyes 4.1.5 Technique for Avoiding Infectious Material 4.1.6 Technique for Separation Of Serum		
4.2	Safe Technique for the use of Instruments , Organisms and Materials		
4.3	Safe Technique for Opening and Storage of Ampoules		
4.4	Special Precautions with Blood and Body Fluids		

REFERENCES:

- WHO, (2004), *Laboratory safety Manual*, 3nd Ed., World Health Organization, ISBN 9789241544504
- Ochei & Kolhatkar, (2000), *Medical Laboratory Science- Theory and Practice*, Tata McGraw-Hill Publishing Company Ltd., ISBN: 9780074632239
- Monica Cheesbrough, (2006), *District Laboratory Practice in Tropical Countries – Pal & 2*. 2nd Ed., CambridgUniversity Press, ISBN No. 9780521665469

Further reading :

- Sood R., (2006), *Textbook of Medical Laboratory Technology*, Jaypee Brothers, ISBN: 9788180615917
- P.B.Godkar,(2014)Textbook of Medical Laboratory Technology, 3rd edition, Bhalani Publishers.

T. Y. B. Sc. SEMESTER VI (CAN)

BIO-SAFETY

	UNIT 1	Introduction to Bio-safety in Clinical Laboratory	
	Reference: Cheesbrough, 2nd Ed.	Teaching Duration	10 Lectures
1.1	Implementation of Laboratory Health and Safety Program (Cheesbrough, 2nd Ed.)		
1.2	Safe Laboratory Premises and Personal Safety Measures (Cheesbrough, 2nd Ed.)		
1.3	Importance of CDC and NIH		
1.4	Universal Precautions for Laboratories by CDC		
1.5	Special Precautions Against HBV and HIV		

	UNIT 2	SAFE METHODS FOR MANAGING INFECTIOUS AGENTS IN LABORATORY ENVIRONMENT	
	Reference: WHO 3Ed./Kolhatkar	Teaching Duration	10 Lectures
2.1	Safety Precaution Against Infection		
2.2	Containment		
2.3	Bio-safety Levels		
2.4	Bio-safety Levels of Infectious Agents Recommended by CDC		
2.5	Biological Safety Cabinets		

	UNIT 3	BIO-SAFETY PROGRAM	
	Reference: Cheesbrough, 2nd Ed.	Teaching Duration	10 Lectures
3.1	Responsibility for Safety		
3.2	Responsibility of the Management		
3.3	Responsibility of the Employee		

	UNIT 4	DISPOSAL OF MEDICAL WASTE	
	Reference: Singh & Kaur, 1st Ed.	Teaching Duration	10 Lectures
4.1	Types of Bio-medical Waste		
4.2	Major and Minor Sources of Bio-medical Waste		
4.3	Hazards of Bio-medical Waste		
4.4	Need for Disposal of Bio-medical Waste		
4.5	Treatment and Disposal of Bio-medical Waste		

REFERENCES:

- Ochei & Kolhatkar, (2000); *Medical Laboratory Science- Theory and Practice*, Tata McGraw-Hill Publishing Company Ltd., ISBN: 9780074632239
- Monica Cheesbrough (2006), *District Laboratory Practice in Tropical Countries – Part 1 & 2*. 2nd Ed., Cambridge University Press, ISBN No. 9780521665469
- Anantpreet Singh & Sukhjit Kaur (2012), *Biomedical Waste Disposal, JayPee Publication*, 1st Ed., ISBN No. 9789350255544
- WHO, (2004), *Laboratory safety Manual*, 3rd Ed., World Health Organization, ISBN 9789241544504

Further reading :

- Sood R., (2015), *Concise Book of Medical Laboratory: Technology Methods & Interpretations*, Jaypee Brothers, ISBN: 9789351523338