Progressive Education Society's

Modern College of Arts, Science and Commerce (Autonomous)

Ganeshkhind, Pune 411016

www.moderncollegegk.org

2022-23

S.Y. B. Sc. Microbiology

Structure of the B. Sc. course

Choice Based Credit System

S.Y.B.Sc. Microbiology

Semester	Code	Paper	Paper title	Credit
III	23-MB-231	I	Medical Microbiology and Immunology	2
	23-MB-232	II	Bacterial Physiology and Fermentation Technology	2
	23-MB-233	III	Practical Course based on theory papers 23-MB-231 and 23-MB-232	2
IV	23-MB-241	I	Bacterial Genetics	2
	23-MB-242	II	Air, Water and Soil Microbiology	2
	23-MB-243	III	Practical Course based on theory papers 23-MB-241 and 23-MB-242	2

Semester III

23-MB-231: Medical Microbiology and Immunology

[2 Credits; 36 Lectures]

[1 credit=15 hrs x 60 mins 900mins/50mins= 18 lectures]

Course Outcomes:

Students will be able to
CO1: Describe anatomy and physiology of human systems with associated pathogens.
CO2: Explain the concept of epidemiology of infectious diseases
CO3: Explain concept of chemotherapy, antibiotics, antagonism and synergism in drug administration,antibiotic sensitivity and route of drug administration
CO4: Explain the process of Hematopoiesis, innate immunity and adaptive immunity, concept underlyingAntigens and Antibodies.
CO5: Relate genetics, biochemistry and inheritance of ABO and Rh blood group systems, medico legal applications of blood groups.
CO6: Differentiate between active and passive immunization, explain immunization schedule in India and theconcept of immunization with examples of types of vaccines.

Unit I	Medical Microbiology	18
1	**Introduction to infectious diseases of following-** (Overview of pathogens associated with different systems and common symptoms) a) Respiratory System b) Gastrointestinal System and Liver c) Urinary System d) Central Nervous System e) Skin	8

2	**1. Introduction to Epidemiology -** a) Definition of epidemiology and scope b) Definition of epidemic, endemic and pandemic diseases c) Modes of transmission of infection d) Sources and reservoirs of infection e) Disease prevention and control measures	**5**
3	**Introduction to Chemotherapy** a) Definition of antibiotic, antiseptic, disinfectant drug b) Characteristics of ideal chemotherapeutic agent c) Routes of drug administration d) Antagonism and synergism in drug administration e) Antibiotic sensitivity testing	**5**
Unit II	**Immunology**	**(18)**
1	**Immunity** Definition, Types (Innate and acquired, active and passive, humoraland cell mediated)	2
2	**Formation of blood cells (Hematopoiesis)** a) Myeloid and lymphoid lineages and differentiation process b) Cells involved in innate immunity and adaptive immunity,their structure and function.	5
3	**Antigens and antibodies: Definition and Concept** a) Antigens: Examples of different antigens b) Structure of antibody c) Introduction to cytokines and MHC molecules	2
4	**Immunohematology** a) ABO and Rh blood group systems b) Bombay blood group c) Biochemistry of blood group substances d) Inheritance of ABH antigens - Problems based on ABO andRh blood group system e) Medico legal applications of blood groups	7

5	**Active and Passive Immunization** a) Active Immunization and Passive Immunization b) Types of vaccines: whole organism, inactivated, toxoid, combined, cellular fractions, recombinant and synthetic. c) Latest Immunization schedule in India	4

References:

1. Kanungo Reba. (2017). Ananthanarayan and Paniker's Textbook of Microbiology. Tenth edition. The Orient Blackswan Publisher. ISBN-13: 978-9386235251
2. Collins C. H., Lyne P. M., Grange J. M. and Falkinham J. O. III. (Editors). (2004). Collins and Lyne's Microbiological Methods. 8th edition. Arnold, London; Oxford
3. Finch R., Greenwood D., Whitley R. and Norrby S. R. (2010) Antibiotic and Chemotherapy. 9th Edition. Elsevier. ISBN: 9780702040641
4. Dulbecco R., Eisen H. N. and Davis B. D. (1990). Microbiology. United States: Publisher -Lippincott. ISBN: 9780608072432
5. Dey N. C., Dey T. K. and Sinha D. (2013). Medical Bacteriology Including Medical Mycology and AIDS. 17th Edition. New Central Book Agency (P) Ltd (Publisher). India
6. Kindt T. J., Goldsby R. A. and Osborne B. A. (2007). Kuby Immunology. 6th Ed. W. H. Freeman and Co., New York.
7. MacFaddin J. F. (2000). Oxidation- Fermentation Test. Biochemical Tests for Identification of Medical Bacteria. 3rd ed. Philadelphia: Lippincott Wilkins and Williams. 379-387. B, III
8. Pathak S. S. and Palan V. (1997). Immunology-Essential and Fundamental, Pareen Publications Bombay.
9. Roitt Evan, Brostoff J., Male D. (1993) Immunology. 6th Edition. Mosby and Co.London.
10. Roitt I. M. (1988). Essentials of Immunology, ELBS, London.
11. Roitt M. (1984). Essentials of Immunology. P. G. Publishers Private Limited, New Delhi.
12. Roth J. A., Bolin C., Brogden K. A., Chris Minion K. F. and Wannemuehler M. J. (1995). Virulence mechanisms of bacterial pathogens. Second edition. American Society for Microbiology. ISBN-13: 978-1555810856
13. Shrivastava M., Navaid S., Peethambarakshan A., Agrawal K. and Khan A. (2015).Detection of rare blood group, Bombay (Oh) phenotype patients and management by acute normovolemic

hemodilution. Asian journal of transfusion science. **9**(1):74–77

14. Stites D. P., Stobo J. D., Fudenberg H. H. and Wells J. V. (1982). Basic and Clinical Immunology. 4th Edition. Lange Medical Publications, Maruzen Asia Pvt. Ltd., Singapore.
15. Talwar G. P. (1983). Handbook of Immunology. Vikas Publishing Pvt. Ltd. New Delhi.
16. Paul W. E. (2003): Fundamental Immunology. 5th edition. Lippincott Williams and Wilkins Publishers. ISBN: 9780781735148
17. Joklik W. K., Willett H. P., Amos D. B. and Wilfert C. M. 1995). Zinsser's Microbiology. 20th Edition. Appleton and Lange Publisher. ISBN-13: 978- 0838599839

23- MB-232: Bacterial Physiology and Fermentation Technology
[2 Credits; 36 Lectures]
[1 credit=15 hrs x 60 mins = 900mins/50mins= 18 lectures]

Course Outcomes:
Students will be able to -

CO1: Describe the components of holoenzyme, nomenclature and classification of enzymes, models of catalysis and effect of various parameters on enzymes.

CO2: Explain various glucose metabolic pathways with details such as structures and names of metabolites, names of enzymes and cofactors

CO3: Describe application of fermentation technology, screening, selection and maintenance of microbial strains, design of fermentation media and fermenters, types of fermentations, working of fermenters, consequences of contamination.

Unit I	**Bacterial Physiology**	**(18)**
1	**Enzymes** i. Introduction to Enzymes: Properties of enzymes, Nature of active site, Structure ofactive site, commonly occurring amino acids at active site. Ribozymes, coenzymes, apoenzymes, prosthetic group and cofactors. ii. Nomenclature and classification as per IUB (up to class level). iii. Models for catalysis– a) Lock and key b) Induced fit c) Transition state. iv. Effect of pH and temperature, substrate concentration and enzyme concentration,activators and inhibitors of enzyme	2 2 1 3
2	**Bacterial Physiology** i. Definitions of Metabolism, catabolism, anabolism, respiration and fermentation ii. Metabolic pathways (with structures) a) Embden-Meyerhof-Parnas pathway (Glycolysis). Entry of fructose and lactosein glycolysis. Substrate level phosphorylation. b) Hexose monophosphate pathway c) Entner-Doudoroff pathway d) Phosphoketolase pathway (Hexose) e) TCA cycle (with emphasis on amphibolism) and Glyoxylate bypass f) Glycolysis and TCA cycle as central metabolic pathways.	1 2 2 1 1 2 1

Unit II	Fermentation Technology	(18)
1	**Concept of fermentation technology** i. Microbial biomass- based fermentation (Biofertilizer, biopesticide and Probiotics) ii. Production of Primary metabolites (Organic acids, amino acids, vitamins and enzymes) iii. Production of Secondary metabolites (Antibiotics) iv. Production of recombinant products (insulin and growth hormones) v. Production of Fermented food products (Cheese, yoghurt) vi. Microbial biotransformation (Steroid transformation)	4
2	**Strains of industrially important microorganisms:** i. Desirable characteristics of industrial strain ii. Principles and methods of primary and secondary screening iii. Master, working and seed culture; development of inoculum iv. Preservation and maintenance of industrial strains.	5
3	**Design of a Fermenter (typical CSTR Continuous stirred Tank Reactor):** Different parts and their working	2
4	**Monitoring of different fermentation parameters** (Temperature, pH, aeration, agitation, foam)	2
5	**Types of fermentations: Batch, continuous and dual**	2
6	**Media for industrial fermentations:** Constituents of media (Carbon source, nitrogen source, amino acids, vitamins, minerals, water, buffers, antifoam agents, precursors, inhibitors and inducers)	2
7	**Contamination: Sources, precautions and consequences**	1

References:

1. BIOTOL Series. (1993). Biotechnology by open learning series. Defense mechanisms. Butterworth and Heinemann Ltd., Oxford
2. Casida L. E. J. R. (2016). Industrial Microbiology. New Age International Private Limited.

ISBN- 9788122438024

3. Moat A. G. and Foster J. W. (1988). Microbial Physiology. 2nd Edition. John Wiley and Sons NewYork.
4. Nelson D. L. and Cox M. M. (2005). Lehninger's Principles of Biochemistry.8th edition, W.H. Freeman and Company. ISBN: 978-1-319-22800-2
5. Conn E. E., Stumpf P. K., Bruening G., Doi R. Y. (1987). Outlines of Biochemistry. 5th Edition, John Wiley and Sons, New Delhi. (Unit I& II)
6. Madigan M. T., Martinko J. M. and Brock T. D. (2006). Brock's Biology of Microorganisms. PearsonPrentice Hall, Upper Saddle River.
7. Patel A. H. (2016). Industrial Microbiology. Trinity Press (Publisher).ISBN-13- 9789385750267
8. Peppler H. L. and Perlman D. (1979). Microbial Technology. Volume 1: Microbial Processes. Academic Press, New York. ISBN: 978-0-12-551501
9. Peppler H. L. and Perlman D. (1979). Microbial Technology. Volume II: Fermentation Technology (2nd Edition). Academic Press. ISBN: 9781483268279
10. Prescott L. M., Harley J. P. and Klein D. A. (2005). Microbiology. 6thEdition. Mac Graw Hill Companies Inc. (Unit II)
11. Reed G. (Editor). (1982). Prescott and Dunn's Industrial Microbiology. Westport, CT, AVI PublishingCo Inc.
12. Stanbury P. F., Whitaker A. and Hall S. J. (2016). Principles of FermentationTechnology.3rd Edition. Butterworth-Heinemann. ISBN: 9780080999531
13. Voet D. and Voet J. G. (1995). Biochemistry. 2nd Edition. John Wiley &sons. New York. ISBN 0-471-58651-X

23-MB-233: Practical Course based on

23-MB-231: Diagnostic Microbiology and Immunology

and

23-MB-232: Bacterial Physiology and Fermentation Technology

[2 Credits: 78 Lectures]

[1 credit=15hrs x 130 mins = 1950 mins/50 mins=39 lectures]

78 L distributed as 60 L for performing practicals and 18 L for internal evaluation

12 Practicals x 5 lectures = 60 Lectures

COURSE OUTCOMES:

Students will be able to -

CO1: Measure cell dimensions by micrometry

CO2: Identify the blood group of blood sample

CO3: Demonstrate screening of organic acid/ antibiotic and amylase producing microorganisms.. .

CO4: Enrich and isolate *Azotobacter* and *Rhizobium* or Cyanobacteria and prepare biofertilizer

Expt. No.	Topics	No. of Practicals
1	Measurements of cell dimension by micrometry using 10x, 45x and 100x Objectives	**1**
2	Blood grouping: ABO, Rh and Bombay blood group (anti H Lectin test)	**1**
3	Cultural and Biochemical characteristization of bacteria Gram staining & motility Sugar utilization test, Sugar fermentation test, Enzyme detection – Gelatinase, Catalase, Oxidase	**4**
4	Staining techniques: i. Endospore staining ii. Metachromatic granules	**1**
5	**Primary screening of industrially important organisms:** Screening and isolation of antibiotic **and** organic acid producing organism from soil by Crowded plate and **Giant colony method** Microorganisms producing industrially important enzyme-amylase	**2** **1**
6	Enrichment, Isolation, Preparation and Application of Bioinoculants a) *Azotobacter* species and b) *Rhizobium* species	**2**
	Total	**12**

References:

1. Gunasekaran P. (2007). Laboratory Manual In Microbiology. New Age International (P) Limited New Delhi, India
2. Godkar D. P. (2003). Textbook of Medical Laboratory Technology. Bhalani Publishing House, New Delhi, India.
3. Mukherjee K. L. (2013). Medical Laboratory Technology. Second Edtion. Volume III. McGraw-Hill Companies, India.
4. Faddin J. F. (2000). Biochemical Tests for Identification of Medical Bacteria.United
5. Randhawa V. S., Mehta G. and Sharma K. B. (2009). Practicals and Viva in Medical Microbiology. Second Edition. Elsevier (A Division of Reed Elsevier India Pvt. Limited).
6. Verhaegen J. and Heuck C. C. (Editors). (2003). Basic Laboratory Procedures in Clinical Bacteriology. Second Edition. Switzerland: World Health Organization.
7. Aneja K. R. (2007). Experiments in Microbiology, Plant Pathology and Biotechnology. New Age International, New Delhi, India
8. Goldman E. and Green L. H. (2008). Practical Handbook of Microbiology. United States: CRC Press.
9. Leber A. L. (2020). Clinical Microbiology Procedures Handbook. United States: Wiley.
10. Aneja K. R. (2007). Experiments in Microbiology, Plant Pathology and Biotechnology. NewAge International, New Delhi, India
11. Aneja K. R. (2007). Experiments in Microbiology, Plant Pathology and Biotechnology.New Age International, New Delhi, India
12. Atlas R. M. (1986; Digitized 2007). Basic and Practical Microbiology. United Kingdom: Macmillan. Dubey R. C. and Maheshwari D. K. (2002). Practical Microbiology. S. Chand and Company Limited, New Delhi, India
13. Nollet L. M. L. and De Gelder L. S. P. (2013). Handbook of Water Analysis, Third Edition. United States: Taylor and Francis.
14. Cappuccino, J.G. and Sherman, N. (2002) Microbiology: A Laboratory Manual. 6th Edition, Pearson Education Inc., San Francisco, 15-224.
15. John Harley (2010). Prescott's Microbiology Lab Manual, 8th Edition, McGraw-Hill Education.

S. Y. B. Sc. Microbiology Syllabus (Semester IV)

23-MB-241: Bacterial Genetics

[2 Credits; 36 Lectures]

[1 credit=15 hrs x 60 mins = 900mins/50mins= 18 lectures]

Course Outcomes:

Students will be able to

CO1: Explain how the nature of genetic material was discovered and comprehend the structure of Nucleic acids

CO2: Comprehend the modes, rules and steps of DNA replication

CO3: Explain various types of mutations, types of mutagenic agents and their mechanism of action

CO4: Get an overview of gene expression and plasmid genetics

Unit I	Topics	(18)
1	**Understanding DNA:** **i. Experimental evidence for nucleic acid as genetic material.** a. Discovery of transforming material (hereditary material): b. Griffith's experiment c. Avery and MacLeod experiment d. Gierer and Schramm e. Fraenkel-Conrat and Singer experiment (TMV virus) f. Hershey and Chase experiment	7
	ii. Types of nucleic acids (DNA and RNAs)	1
	iii. Structure of DNA a. Structure of Nitrogen bases, Nucleoside, Nucleotide and polynucleotide chain b. Bonds involved in DNA structure c. Different forms of DNA	2
2	**iv. Prokaryotic DNA replication** a. Models of DNA replication (Conservative, semi-	8

	conservative and Dispersive) b. Meselson and Stahl's experiment (semi-conservative) c. Basic mechanism of DNA replication d. Enzymes, proteins and other factors involved in DNA replication. e. Modes of DNA replication Rolling circle mechanism, theta and linear DNA replication	
Unit II	**Topics**	**(18)**
1	**i. Gene expression** a. Concept of Genetic code and its properties b. Concept of transcription and translation c. Levels of genome organization in prokaryotes d. Levels of genome organization in eukaryotes	**4**
2	**ii. Mutations and reversions** Concept of Mutation and Types of mutations: Nonsense, Missense, Silent, Conditional lethal-temperature sensitive, Amber, Reverse, suppressor a. Spontaneous Mutation • Mechanism of spontaneous mutation b. Concept of Induced Mutations • Base pair substitution (Transitions, Transversions), Insertions and deletions-Frame / Phase shift mutations • Physical Mutagenic agent: UV and X-ray • Chemical mutagenic agents • Base analogues (2 amino purine, 5 bromouracil) –Keto and Enol forms of Nitrogen bases. • HNO_2, Alkylating agents • Intercalating agents (EtBr, acridine orange)	**9**
3	**Plasmid genetics** a. Types and properties of plasmids. b. Concept of plasmid incompatibility, plasmid curing and amplification. c. Plasmid replication Importance of plasmids in recombinant DNA Technology and other fields.	**5**

References:

1. Brooker R. J. (2012). Genetics: Analysis and Principles. 4th edition. McGraw- Hill- Publication
2. Alberts B., Johnson A., Lewis J., Raff M., Roberts K. and Walter P. (2008). Molecular Biology of the Cell. 5th Edition. Garland Science. Taylor and Francis. ISBN: 978-0-8153-4105-5. .
3. Malacinski G. M. (2005). Freidfelder's Essentials of Molecular Biology. 4th Edition. Jones and Bartlett Publishers, Inc.
4. Gardner E. J., Simmons M. J. and Snustad D. P. (2006). Principles of Genetics. 8th edition. John Wiley and Sons Publication. ISBN-13: 9788126510436
5. Hayes W. (2nd Edition). (1968). Genetics of Bacteria and their Viruses. Oxford-Edinburgh: Blackwcll Scientific Publications.
6. Watson J.D., Baker, T.A., Bell, S.P., Gann A., Levine M. and Losick R. (2014). Molecular Biology of the gene. 7th edition. Pearson. ISBN: 9780321762436
7. Krebs J., Kilpatrick S. T., Goldstein E. S. (Editors). Lewin's GENES X (2011). 10th Edition.Sudbury, Mass: Jones and Bartlett, c2011
8. Lodish H., Berk A., Kaiser C. A., Krieger M., Bretscher A., Ploegh H., Martin K. C., Yaffe M. and Amon A. (2021). Molecular Cell Biology, 9th Edn. Macmillan Learning. ISBN: 9781319208523
9. Pawar and Daginawala. General Microbiology. Vol. I and vol II. 1st Edition. Himalaya Publishing House, Mumbai
10. Primrose S. B. (2002) .Principles of Gene Manipulation. 6th Edition. Oxford: Blackwell Scientific Publications
11. Russel P. J. (2000). Fundamentals of Genetics. Publisher: Benjamin/Cummings. ISBN:9780321036261
12. Russel P. J. (2010). iGenetics: A Molecular Approach. 3rd Edition. Benjamin Cummings. ISBN: 9780321569769
13. Stanier R. Y. (2003). General Microbiology. United Kingdom: Palgrave Macmillan Limited.
14. Strickberger M. W. (2012). Genetics. 3rdEdition. New Delhi: PHI Learning Gardne

S. Y. B. Sc. Microbiology Syllabus (Semester IV)

23-MB-242: Air, Water and Soil Microbiology

[2 Credits; 36 Lectures]

[1 credit=15 hrs x 60 mins = 900mins/50mins= 18 lectures]

Course Outcomes:

CO1: The course will help them to get knowledge of the Air Microbiology, methods of air sampling,different types of air samplers, air sanitation and airborne infections.
CO2: Deals with water microbiology including bacteriological analysis of water, methods of waterpurification, water borne infections and bacteriological standards of water quality.
CO3: Understand Soil Microbiology, rhizosphere, composting and humus formation, biofertilizers,biocontrol agents and microbial interactions.
CO4: Acquire knowledge of carbon and nitrogen cycles with role of microorganisms.

Unit I	**Air Microbiology and Water Microbiology**	**18**
1	**i. Air Microbiology**	
	a. Air flora • Transient nature of air flora • Droplet, droplet nuclei and aerosols	1
	b. Methods of Air sampling and types of air samplers • Impaction on solids • Impingement in liquid • Sedimentation • Centrifugation	3
	c. Air sanitation: Physical and chemical methods	2
	d. Airborne infections	1
	ii. Water Microbiology	
	a. Types of water: surface, ground, stored, distilled, mineral andde-mineralized water	1

2	b. Recommended Bacteriological standards of Water Quality • Maharashtra Pollution Control Board (MPCB) Main Functions of MPCB Water quality standards for best designated usages • Central Pollution Control Board (CPCB) Main Functions of CPCB Designated Best Use Water Quality Criteria	1
	c. Water purification methods	2
	d. Water borne Infections	1
	e. Indicators of faecal pollution: *Escherichia coli*, *Bifidobacterium*, *Streptococcus faecalis*, *Clostridium perfringens*, New indicators: *Campylobacter* and *Pseudomonas*	2
	f. **Bacteriological analysis of water for potability** i. Bacteriological standards of potable water: Bureau of Indian standards (BIS) ii. World Health Organization (WHO) iii. Presumptive coliform count iv. Confirmed test v. Completed test vi. Eijkman test vii. Membrane filter technique	4
Unit II	**Soil Microbiology**	**18**
	a. Rhizosphere microflora and its role in the rhizosphere	1
	b. Role of microorganisms in composting and humus formation	2
	c. Biofertilizers: Bacterial, Cyanobacterial, fungal and their large-scale production	3
	d. Biocontrol agents: Bacterial, Viral, Fungal and their large-scale production	3
	e. Brief account of microbial interactions: Symbiosis, Neutralism, Commensalism, Competition, Ammensalism, Synergism, Parasitism and Predation	5

	f. Role of microorganisms in elemental cycles in nature: Carbon, Nitrogen	4

References:

1. Aithal S. C. and Kulkarni N. S. (2015). Water microbiology ~ an Indian perspective. Published by Himalaya Publishing House, IstEdition. ISBN: No.: 978-93-5202-129-1.
2. Dube H. C. and Bilgrami K. S. (1976). Textbook of modern pathology. Vikas publishing house. New Delhi.
3. Dubey R. C. and Maheswari D.K. Textbook of Microbiology. S. Chand Publishing. ISBN: 9788121926201
4. Frobisher M. (1974). Fundamentals of Microbiology. 9th Edition. Saunders, Michigan University Press. ISBN: 9780721639222
5. Ingraham C. A. and Ingraham J. L. (2000). Introduction to Microbiology. United Kingdom: Brooks/Cole.
6. Lim D. V. (1989). Microbiology. 2nd Edition. West Publishing Company. ISBN: 9780314262066
7. Madigan M. T., Thomas Brock T., Martinko J., Clark D. P. and Paul D. P. (2009). Brock's Biology of Microorganisms. Pearson/Benjamin Cummings. ISBN: 9780132324601
8. Martin A. (1977). An Introduction to Soil Microbiology. 2nd edition. John Wiley & Sons Inc. NewYork & London.
9. Martin A. Introduction to Soil Microbiology. (1961). John Wiley &Sons, New York and London publication
10. MPCB, CPCB, BIS and WHO websites guidelines for drinking water quality
11. Pawar C. B. and Daginawala H.F. (1982). General Microbiology. Vol. I and II. 1st Edition. Himalaya Publishing House, Mumbai. ISBN: 9789350240892and ISBN9789350240908
12. Pelzar M. J., Chan E. C. S. and KriegN. R. (1986). Microbiology. 5th Edition. McGraw-Hill Publication
13. Prescott L. M., Harley J. P. and Klein D. A. (2006). Microbiology. 6th Edition. McGraw Hill Higher Education. ISBN-13: 978-0-07-295175-2
14. Rangaswami G. (1979) Recent advances in biological nitrogen fixation. Oxford and IBH. New Delhi.
15. Salle A. J. (1971). Fundamental Principles of Bacteriology.7th Edition. Tata MacGraw

Publishing Co.

16. Schlegel H. G. (1993). General Microbiology. 8thEdition. Cambridge University Press
17. Stanier R. Y. (2003). General Microbiology. United Kingdom: Palgrave Macmillan Limited.
18. Subba Rao N. S. (1977). Soil Microbiology. 4thEdition. Oxford and IBH Publishing Co. Pvt. Ltd.
19. Tortora G. J., Funke B. R. and Case C. L. (2016). Microbiology: An introduction 12th Edition, Pearson. ISBN-13: 9780321929150

S.Y. B. Sc. Microbiology Syllabus(Semester IV)

23- MB-243: Practical Course based on 23-MB-241: Bacterial Genetics and MB-242: Air, Water and Soil Microbiology

[2 Credits: 78 Lectures]

[1 credit=15hrs x 130 mins = 1950 mins/50 mins=39 lectures]

78 L distributed as 60 L for performing practicals and 18 L for internal evaluation

12 Practicals x 5 lectures = 60 Lectures

Course Outcomes:

Students will be able to

CO1: Estimate the diversity of microorganism by statistical analysis
CO2: Determine potability of drinking water using MPN test and membrane filtration technique.
CO3: Isolate and identify pathogens E. coli, Staphylococcus aureus and Candida from clinicalsample and characterize them by Gram staining, motility, cultural and biochemical tests Demonstrate the use of physical and chemical mutagen to isolate mutants.

Expt.No	Topics	No. of Practicals
1	Air Flora: a. Diversity determination Simpson index. b. Determination of sedimentation rate	2
2	Bacteriological tests for potability of water a. MPN, Confirmed and Completed test. b. Membrane filter technique (Demonstration) c. Identification of *E. coli* from water sample as fecal indicator	3
3	Tests for Biochemical characterization of bacteria i. Triple Sugar iron agar ii. IMViC test	4

	iii. Oxidative-fermentative test [Baird Parker's modification of Hugh and Leifson's oxidative- fermentative (OF) basal medium for Gram Positive and Hugh and Leifson's oxidative- fermentative (OF) basal medium for Gram negative; Public Health England, 2019]	
4	i. UV- survival curve ii. Induction of mutation by using physical mutagen (e.g. U V rays) iii. Isolation of auxotrophic mutants by Replica Plate	2
5	i. Visit to Industry/ Drinking Water treatment plant	1
	Total	**12**

References:

1. Robert Cruickshank, Duguid J.P., Marmilon B.P. and Swain R.H.A. (1975). Medical Microbiology, the Practice of Medical Microbiology. Churchill Livingstone, Edinburgh London and New York.
2. Nakatsu C. H., Yates M. V., Miller R. V. and Pillai S. D. (2020). Manual of Environmental Microbiology. United States: Wiley.
3. Pepper I. L., Brendecke J. W. and Gerba C. P. (2011). Environmental Microbiology: ALaboratory Manual. Netherlands: Elsevier Science.
4. WHO Guidelines for Indoor Air Quality: Dampness and Mould. (2009). Philippines: WHO.
5. Aneja K. R. (2007). Experiments in Microbiology, Plant Pathology and Biotechnology.New Age International, New Delhi, India
6. Cox C. C. and Wathes C. M. (2020). Bioaerosols Handbook. United States: CRC Press.
7. Bisen P. S. (2014). Laboratory Protocols in Applied Life Sciences. United Kingdom: CRCPress.
8. Gunasekaran P. (2007). Laboratory Manual In Microbiology. New Age International (P)Limited New Delhi, India
9. Cappuccino, J.G. and Sherman, N. (2002) Microbiology: A Laboratory Manual. 6th Edition, Pearson Education Inc., San Francisco, 15-224.
10. John Harley (2010). Prescott's Microbiology Lab Manual, 8th Edition, McGraw-Hill Education