

Vishwavidyanilaya Karyasoudha
Crawford Hall, Mysuru- 570 005

No.AC2(S)/151/2020-21

Dated: 04.10.2023

Notification

Sub:- Modification Syllabus and Scheme of Examinations Microbiology (UG) (Ist & IInd Semester) with effect from the Academic year 2023-24.


Ref:- Decision of Board of Studies in Microbiology (UG) meeting held on 01.09.2023.

The Board of Studies in Microbiology (UG) which met on 01.09.2023 has resolved to recommended and approved the syllabus and scheme of Examinations of Microbiology Programme (Ist & IInd Semester) with effect from the Academic year 2023-24.

Pending approval of the Faculty of Science & Technology and Academic Council meetings the above said syllabus and scheme of examinations are hereby notified.

The syllabus and scheme of Examinations contents may be downloaded from the University website i.e., www.uni-mysore.ac.in.

DRAFT APPROVED BY THE REGISTRAR


Deputy Registrar (Academic)
Deputy Registrar (Academic)
University of Mysore
Mysore-570 005

To;

1. All the Principal of affiliated Colleges of University of Mysore, Mysore.
2. The Registrar (Evaluation), University of Mysore, Mysuru.
3. The Chairman, BOS/DOS in Microbiology, Manasagangothri, Mysore.
4. The Director, Distance Education Programme, Moulya Bhavan, Manasagangothri, Mysuru.
5. The Director, PMEB, University of Mysore, Mysore.
6. Director, College Development Council , Manasagangothri, Mysore.
7. The Deputy Registrar/Assistant Registrar/Superintendent, Administrative Branch and Examination Branch, University of Mysore, Mysuru.
8. The PA to Vice-Chancellor/ Registrar/ Registrar (Evaluation), University of Mysore, Mysuru.
9. Office Copy.



UNIVERSITY OF MYSORE

**Curriculum Framework for Undergraduate Programme
in Colleges at University of Mysore, Mysuru**

NATIONAL EDUCATION POLICY 2021

**1st and 2nd Semester Model Syllabus for
B. Sc. in Microbiology**

**Board of Studies in Microbiology
Department of Studies in Microbiology
University of Mysore
Manasagangotri, Mysuru – 570 006**

2023-24 onwards

B. Sc.: Curriculum and Credit Framework for Undergraduate Programme

Sem.	Discipline Specific Courses - Core (DSC), Elective (DSE)(Credits) (L+T+P)	Minor/ Multidisciplinary/Open Elective (OE) Courses(Credits) (L+T+P)	Ability Enhancement Courses (AEC) (Credits)(L+T+P) (Languages)	Skills Enhancement Courses (SEC) (Credits) (L+T+P)/ Value Added Courses (Credits) (L+T+P) (common for all UG Programs)/ Summer Internship.		Total Credits
I	DSC-A1(4), A2(2) DSC-B1(4), B2(2)	OE-1 (3)	L1-1(3), L2-1(3) (4 hrs each)	SEC-1: Digital Fluency (2) (1+0+2)/ Env. Studies (3)	Health, Wellness & Yoga (2) (1+0+2)	25/26
II	DSC-A3(4), A4(2), DSC-B3(4), B4(2)	OE-2 (3)	L1-2(3), L2-2(3) (4 hrs each)	Env. Studies (3)/ SEC-1: Digital Fluency (2)(1+0+2)	Sports/NCC/NSS/R&R(S&G) / Cultural (2) (0+0+4)	26/25
Students exiting the programme after securing 46 credits will be awarded UG Certificate in Disciplines A and B provided they secure 4 credits in work based vocational courses during summer term or internship/Apprenticeship in addition to 6 credits from skill-based courses earned during the first year.						
III	DSC-A5(4), A6(2), DSC-B5(4), B6(2)	OE-3 (3)/ India and Indian Constitution (3)	L1-3(3), L2-3(3) (4 hrs. each)	SEC-2:AI/CyberSecurity/Finan- cial Edu. & Inv. Aw. (2) (1+0+2)	Sports/NCC/NSS/R&R(S&G) /Cultural (2) (0+0+4)/ SEC(2)	25
IV	DSC-A7(4), A8(2), DSC-B7(4), B8(2)	India and Indian Constitution (3) / OE-3(3)	L1-4(3), L2-4(3) (4 hrs. each)	SEC-3: Financial Edu. &Inv. Aw. /AI/Cyber Security (2) (1+0+2)	Sports/NCC/NSS/R&R(S&G) / Cultural (2) (0+0+4)/ SEC (2)	25
Students exiting the programme after securing 92 credits will be awarded UG Diploma in Disciplines A and B provided they secure additional 4 credits in skill based vocational courses offered during first- or second-year summer term.						
V	DSC-A9(4), A10(2), A11(4), A12(2);	DSC-B9(4), B10(2), B11(4),B12(2)		SEC-4: Employability Skills/Cyber Security (3) (2+0+2)		27
VI	DSC-A13(4), A14(2), A15(4), A16(2);	DSC-B13(4), B14(2), B15(4), B16(2)		Internship (2)		26
Students exiting the programme after 3-years will be awarded UG Degree in Disciplines A and B as double majors upon securing 136 credits and satisfying the minimum credit requirements under each category of courses prescribed.						

List of Courses from I to VI Semesters for Undergraduate Program in MICROBIOLOGY

Sem. No.	Course Category	Course Code	Course Title	Credits Assigned	Instructional hours per week		Duration of Exam (Hrs.)	Exam/ Evaluation Pattern (Marks)		
					Theory	Practical		IA	Exam	Total
I	DSC	DSC-1T	General Microbiology	4	4		2 ¹ / ₂	40	60	100
		DSC-2P	General Microbiology	2		4	3	25	25	50
	OEC	OE-1T	Microbial Technology for Human Welfare	3	3		2 ¹ / ₂	40	60	100
II	DSC	DSC-3T	Microbial Biochemistry and Physiology	4	4		2 ¹ / ₂	40	60	100
		DSC-4P	Microbial Biochemistry and Physiology	2		4	3	25	25	50
	OEC	OE-2T	Environmental and Sanitary Microbiology	3	3		2 ¹ / ₂	40	60	100

UNDERGRADUATE DEPARTMENT OF MICROBIOLOGY

2023-24 ONWARDS

MODEL CURRICULUM

Name of the Degree Program: B. Sc. (Basic/Hons.)

Discipline Core: Microbiology

Total Credits for the Program: B. Sc. Basic - 136 and B. Sc. Hons. - 176

Starting year of implementation: 2021-22

Program Outcomes: Competencies need to be acquired by the candidate securing B. Sc. (Basic) or B. Sc. (Hons.)

By the end of the program the students will be able to:

1. Knowledge and understanding of concepts of microbiology and its application in pharma, food, agriculture, beverages, nutraceutical industries.
2. Understand the distribution, morphology and physiology of microorganisms and demonstrate the skills in aseptic handling of microbes including isolation, identification and maintenance.
3. Competent to apply the knowledge gained for conserving the environment and resolving the environmental related issues.
4. Learning and practicing professional skills in handling microbes and contaminants in laboratories and production sectors.
5. Exploring the microbial world and analysing the specific benefits and challenges.
6. Applying the knowledge acquired to undertake studies and identify specific remedial measures for the challenges in health, agriculture, and food sectors.
7. Thorough knowledge and application of good laboratory and good manufacturing practices in microbial quality control.
8. Understanding biochemical and physiological aspects of microbes and developing broader perspective to identify innovative solutions for present and future challenges posed by microbes.
9. Understanding and application of microbial principles in forensic and working knowledge about clinical microbiology.
10. Demonstrate the ability to identify ethical issues related to recombinant DNA technology, GMOs, intellectual property rights, biosafety and biohazards.
11. Demonstrate the ability to identify key questions in microbiological research, optimize research methods, and analyse outcomes by adopting scientific methods, thereby improving the employability.
12. Enhance and demonstrate analytical skills and apply basic computational and statistical techniques in the field of microbiology.

Assessment:

Weightage for assessments (in percentage)

Type of Course	Formative Assessment / IA	Summative Assessment
Theory	40%	60%
Practical	50%	50%
Projects	40%	60%
Experiential Learning (Internships/MOOC/Swayam etc.)	30%	70%

Formative Assessment : 40%	
Assessment Occasion/ type	Weightage in Marks
C1 = IA -1 + Assignments / Visits	10% + 10% = 20% : 20 Marks
C2 = IA -2 + Seminars / Group Discussion	10% + 10 = 20% : 20 Marks
Total	40% : 40 Marks

Total Marks for each course = 100%**Formative Assessment (C1 + C2) = 40%****Semester End Examination (C3) = 60% marks**

B. Sc. Microbiology 1st Semester

Program name	B. Sc. in MICROBIOLOGY	Semester	I
Course Title	GENERAL MICROBIOLOGY (Theory)		
Course Code	DSC-1T	No. of Credits	04
Contact Hours	60 (4 Hrs. per week)	Duration of SEA/Exam (Hrs.)	2 1/2
Formative Assessment Marks	40	Summative Assessment Marks	60

Course Outcomes (COs):

At the end of the course the student should be able to: (Write 3-7 course outcomes. Course outcomes are statements of observable student actions that serve as evidence of knowledge, skills and values acquired in this course)

1. Thorough knowledge and understanding of concepts of microbiology.
2. Learning and practicing professional skills in handling microbes.
3. Thorough knowledge and application of good laboratory and good manufacturing practices in microbial quality control.

Content of Course 1: Theory: DSC-1T, General Microbiology	60 Hrs.
Unit 1: Historical development, origin of microorganisms, major contributions and microscopy	15 Hrs.
Historical development of microbiology -Theory of spontaneous generation, Biogenesis and Abiogenesis. Evolution of microorganisms. Fossil evidences of microorganisms. Contributions of Anton Von Leeuwenhoek, Louis Pasteur, Robert Koch, Joseph Lister and Edward Jenner, Alexander Fleming, Martinus Beijerinck, Sergei Winogradsky, Elei Metchnikoff. Contributions of Indian scientists in the field of Microbiology. Microscopy: working principle, construction and operation of simple and compound microscopes. Phase contrast, Dark Field, Fluorescent, Confocal, Scanning and Transmission Electron Microscopy.	
Unit 2: Staining, sterilization, culturing and preservation of microorganisms	15 Hrs.
Staining: Nature of strains, principles, mechanism, methods and types of staining: Simple (Positive and Negative), Differential (Gram staining and Acid fast staining) and Structural (capsule, cell wall, endospore). Sterilization: Principles, types and techniques, Physical and chemical methods. Culture media and their types. Pure culture techniques and colony characteristics. Preservation of microorganisms: Methods of preservation of microorganisms; slant culture, stab culture, soil culture, mineral oil overlaying, glycerol preservation.	
Unit 3: Types, structure, organisation and reproduction of prokaryotic microorganism	15 Hrs.
Overview of Prokaryotic Cell Structure: Size, shape, arrangement. Diagram of Prokaryotic cell organisation, cell wall structure of Gram positive and negative bacteria, cell membrane; Bacterial and Archaeal, Cytoplasmic matrix- Composition and function of Cytoskeleton, ribosome and inclusion granules. Nuclear Materials: Bacterial chromosomes structure (its differences with the Eukaryotic chromosome); Extra Chromosomal materials. Components external to cell wall- capsule,	

slime, S layer, pilli, fimbriae, flagella-structure, motility, chemotaxis. Bacterial endospore: formation and function and types with example. Reproduction in bacteria and bacterial cell cycle.

Unit 4: Types, structure, organisation , reproduction and nomenclature of eukaryotic microorganisms	15 Hrs.
--	----------------

Over view of eukaryotic cell structure: General structure and types of cells; External cell coverings and cell membrane. Structure and function of Cytoplasmic matrix-cytoskeleton. Single membrane organelles: Endoplasmic reticulum, Golgi complex, Lysosomes, Vesicles and Ribosomes.
 Double Membrane organelles: Nucleus, Mitochondrion and Chloroplast: Structure and Functions; Peroxisomes;
 Organelles of motility- Structure and movement of flagella and cilia.

Pedagogy: Lectures, Seminars, Industry/Institute Visits, Debates, Quiz, Project and Assignments

Formative Assessment for Theory	
Assessment Occasion/ type	Marks
Attendance	10
Seminar	10
Debate/Quiz/Assignment	10
Class test	10
Total	40
Formative Assessment as per guidelines are compulsory	

Course Title	GENERAL MICROBIOLOGY (Practical)		
Course Code	DSC-2P	No. of Credits	02
Contact Hours	60 (4 Hrs. per session)	Duration of SEA/Exam (Hrs.)	03
Formative Assessment Marks	25	Summative Assessment Marks	25

Course 1: Practical: DSC-2P, General Microbiology

1. Microbiological laboratory standards and safety protocols.
2. Standard aseptic conditions of Microbiological laboratory.
3. Operation and working principles of Simple and Compound microscope.
4. Working principles and operations of basic equipments of microbiological laboratory (Autoclave, Hot air Oven, Incubator, pH meter, Spectrophotometer, Colorimeter, Vortex, Magnetic stirrer).
5. Applications of basic microbiological tools (Pipettes, Micropipette, Bunsen burner, Inoculation loop and needle, Spreader).
6. Demonstration and observations of microorganisms from natural sources under light microscope (Algae, Yeast and Protozoa).
7. Demonstration of bacterial motility by hanging drop method.
8. Simple (Direct and Indirect) staining of bacteria.
9. Differential staining- Gram staining and Acid-fast staining.
10. Structural staining- Bacterial endospore and Capsule.
11. Staining of fungi by Lactophenol cotton blue.
12. Cleaning and sterilization of glassware. Preparation of media-nutrient broth, nutrient agar, potato dextrose agar and Mac Conkey's agar.
13. Cultivation of microorganisms on agar plate (point inoculation), broth and anaerobic cultivation (gaspak method).
14. Study of colony characteristics. Isolation of pure cultures of bacteria by streak plate method.
15. Maintenance and preservation of bacterial cultures on agar slants, overlaying with mineral oil and stab culture.

Pedagogy: Experiential learning, Problem solving, Project

Formative Assessment for Practical	
Assessment Occasion/ type	Marks
Class Records	05
Test	10
Attendance	05
Performance	05
Total	25
Formative Assessment as per guidelines are compulsory	

Text Books / References

1. Alexopoulos, C. J., Mims, C.W., and Blackwell, M. (2002). *Introductory Mycology*. John Wiley and Sons (Asia) Pvt. Ltd. Singapore. 869 pp.
2. Atlas, R. M. (1984). *Basic and practical microbiology*. Mc Millan Publishers, USA. 987pp.
3. Black, J. G. (2008). *Microbiology principles and explorations*. 7th ed., John Wiley and Sons Inc., New Jersey 846 pp.
4. Dubey, R. C. and Maheshwari, D. K. (1999). *A Textbook of Microbiology*. 1st ed., S. Chand & Company Ltd.
5. Jeffrey C .Pommerville (2011). *Alcamo's Fundamentals of Microbiology*, 9th Ed. Jones and Bartlett publishers.
6. Lansing, M. Prescott, John, P. Harley, Donald A. Klein. (2002). *Microbiology*, 5th ed., WCB Mc Graw Hill, New york.
7. Linda Bruslind, (2020). *General Microbiology*. 1st ed., Oregon State University
8. Madigan, M. T. Martinko, J. M. Dunlap, P. V. and Clark, D. P. (2009). *Brock Biology of Microorganisms*. 12th ed., Pearson International edition Pearson Benjamin Cummings.
9. Pelczar, M. J., Chan, E. C. S. and Krieg, N. R. (1993). *Microbiology*. 5th edition. McGraw Hill Book Company.
10. Schlegel, H.G. (1995). *General Microbiology*. Cambridge University Press, Cambridge, 655 pp.
11. Seeley, H. W. and Demark, J. V. (1962) *Microbes in Action-A laboratory Manual of Microbiology* , Freeman Publisher.
12. Stanier and Ingraham et al, (1987). *General Microbiology*, 4th and 5th ed., Mc Millan education limited.
13. Sullia, S. B and Shantharam, S. (1998). *General Microbiology*. Oxford and IBM Publishing Company Pvt Ltd, New Delhi.
14. Talaro, K. P. (2009). *Foundations in Microbiology*, 7th International edition, McGraw Hill.
15. Tortora, G. J. Funke, B. R. and Case, C. L. (2008). *Microbiology-An Introduction*, 10th ed. 2008, Pearson Education.

Course 2: Theory: OE 1T, Microbial Technology for Human Welfare

Course 2 : OE 1T, Microbial Technology for Human Welfare	42 Hrs.
Unit 1: Food and Fermentation Microbial Technology	14 Hrs.
Fermented Foods– Types, Nutritional Values, Advantages and Health Benefits Prebiotics, Probiotics, Symbiotics and Nutraceutical Foods Fermented Products– Alcoholic and non-alcoholic beverages, fermented dairy products, Fruit fermented drinks	
Unit 2: Agricultural Microbial Technology	14 Hrs.
Microbial Fertilizers Microbial Pesticides Mushroom Cultivation Biogas Production	
Unit 3: Pharmaceutical Microbial Technology	14 Hrs.
Microbial Drugs– Types and Development of Drug Resistance Antibiotics– Types, Functions and Antibiotic Therapy Vaccines– Types, Properties, Functions and Schedules	

Text Books / References

1. Adams, M. R. and Moss, M. O.(1995). Food Microbiology. Royal Society of Chemistry, Cambridge University Press.
2. Ananthanarayan, R. and Paniker, C. K. J. (2009). Textbook of Microbiology. 8th ed., University Press Publication.
3. Frazier and Westhoff, D. C. (1995). Food Microbiology. Tata McGraw Hill Pub. Company Ltd., New Dehli.
4. Nandini Shetty (1993). Immunology: Introductory Textbook. NewAge International Ltd.
5. Rangaswamy, G. and Bagyaraj, D. J. (2001). Agricultural Microbiology, 2nd ed., Prentice hall of India Pvt. Ltd., New Delhi.
6. Stanbury, P. T. and Whitaker, (1984). Principles of Fermentation Technology, Pergamon Press, Newyork.
7. Subba Rao, N. S. (1988). Biofertilizers in Agricultural 2nd ed., Oxford and IBH Pub.Co., New Delhi.
8. Wiley, J. M., Sherwood, L. M. and Woolverton, C. J. (2013) Prescott, Harley and Klein's Microbiology. 9th edition. McGraw Hill Higher Education.

B. Sc. Microbiology 2nd Semester

Program name	B. Sc. in MICROBIOLOGY	Semester	II
Course Title	MICROBIAL BIOCHEMISTRY AND PHYSIOLOGY (Theory)		
Course Code	DSC-3T	No. of Credits	04
Contact Hours	60 (4 Hrs. per week)	Duration of SEA/Exam (Hrs.)	2 1/2
Formative Assessment Marks	40	Summative Assessment Marks	60

Content of Course 1: DSC-2T, Microbial Biochemistry and Physiology	60 Hrs.
Unit 1: Biochemical Concepts	15 Hrs.
<p>Basic Biochemical Concepts: Major elements of life and their primary characteristics, atomic bonds and molecules-bonding properties of carbon, chemical bonds- covalent and non-covalent, Hydrogen bonds and Vander Waal Forces.</p> <p>Biological Solvents: Structure and properties of water molecule, Water as an universal solvent, polarity, hydrophilic and hydrophobic interactions, properties of water, Acids, bases, electrolytes, hydrogen ion concentration, pH, buffers and physiological buffer system.</p>	
Unit 2: Macromolecules and Microbial nutrients	15 Hrs.
<p>Definition, properties, classification and importance of carbohydrates, Amino acids, proteins, Lipids and Fats, Porphyrins and Vitamins.</p> <p>Microbial Nutrition: Microbial nutrients- Macro and micronutrients, Classification of organisms based on carbon source, energy source and electron source, Major nutritional classification of microorganisms. Cellular transport: Passive, Facilitated, Active, Group Translocation, Uptake of iron, Membrane bound and binding protein transport system-ATPase.</p>	
Unit 3: Microbial Growth	15 Hrs.
<p>Microbial Growth: Definition of growth, Mathematical expression, Growth curve, phases of growth, calculation of generation time and specific growth rate. Synchronous growth, Continuous growth (chemostat and turbidostat), Diauxic growth.</p> <p>Measurement of Growth: Direct Microscopic count - Haemocytometer; Viable count, Membrane filtration; Electronic Counting; Measurement of cell mass; Turbidity measurements- Nephelometer and spectrophotometer techniques; Measurements of cell constituents. Growth Yield (definition of terms). Influence of environmental factors on growth. Microbial growth in natural environments. Viable non-culturable organisms. Quorum sensing.</p>	
Unit 4: Bioenergetics, Microbial Respiration, Microbial Photosynthesis	15 Hrs.
<p>Bioenergetics: Free energy, Enthalpy, Entropy, Classification of high energy compounds, Oxidation reduction reactions, equilibrium constant, Redox potential, Laws of thermodynamics.</p> <p>Microbial Respiration: Structure, types and function of cytochrome, Respiratory electron transport chain in bacteria, oxidative and substrate level phosphorylation-inhibitors and mechanism, chemiosmotic coupling. Fermentation reactions (homo and hetero).</p> <p>Microbial Photosynthesis: Light reaction: Light harvesting pigments, structure of bacterial chlorophyll, Photophosphorylation, CO₂ fixation pathways: Calvin cycle and Reductive TCA pathway.</p>	

Pedagogy: Lectures, Seminars, Industry/Institute Visits, Debates, Quiz, Project and Assignments

Formative Assessment for Theory	
Assessment Occasion/ type	Marks
Attendance	10
Seminar	10
Debate/Quiz/Assignment	10
Class test	10
Total	40
Formative Assessment as per guidelines are compulsory	

Course Title	MICROBIAL BIOCHEMISTRY AND PHYSIOLOGY (Practical)		
Course Code	DSC-4P	No. of Credits	02
Contact Hours	60 (4 Hrs. per session)	Duration of SEA/Exam (Hrs.)	03
Formative Assessment Marks	25	Summative Assessment Marks	25

Course 1: Practical: DSC-2P, Microbial Biochemistry and Physiology

1. Preparation of Solution: Normal and Molar solutions.
2. Calibration of pH meter and determination of pH of natural samples.
3. Preparation of Buffer Solutions- Phosphate and Citrate buffer.
4. Qualitative determination and identification of Carbohydrates.
5. Qualitative determination and identification of Proteins.
6. Qualitative determination and identification of Amino Acids.
7. Qualitative determination and identification of Fatty Acids.
8. Quantitative estimation of Reducing Sugar by DNS method.
9. Quantitative estimation of Proteins by Biuret and Lowry's method.
10. Determination of bacterial growth by spectrophotometric method & calculation of generation time.
11. Measurement of cell number using Haemocytometer.
12. Effect of pH and Temperature on bacterial growth.
13. Effect of salt concentration on bacterial growth.
14. Effect of carbon source on microbial growth.
15. Demonstration of aerobic (catalase) and anaerobic respiration (Kuhne's fermentation) in microbes.

Pedagogy: Experiential learning, Problem solving, Project

Formative Assessment for Practical	
Assessment Occasion/ type	Marks
Class Records	05
Test	10
Attendance	05
Performance	05
Total	25
Formative Assessment as per guidelines are compulsory	

Text Books / References

1. Boyer, R. (2002), Concepts in Biochemistry 2nd Edition, Brook/ Cole, Australia.
2. Caldwell, D. R. (1995). Microbial Physiology and Metabolism. Brown Publishers.
3. Cohen and Georges, N. (2014). Microbial Biochemistry. Springer, Netherlands.
4. Felix Franks, (1993). Protein Biotechnology. Humana Press, New Jersey.
5. Harper (1999). Biochemistry, McGraw Hill, New York.
6. Lodish H, T. Baltimore, A. Berck B.L. Zipursky, P. Mastysdaire and Darnell, J. (2004). Molecular Cell Biology. Scientific American Books, Inc. Newyork.
7. Moat A. G., Foster J.W. Spector, (2004). Microbial Physiology. 4th ed., Panama Book Distributors.
8. Nelson and Cox, (2000). Lehninger Principles of Biochemistry, Elsevier Publ.
9. Palmer, T. (2001), Biochemistry, Biotechnology and Clinical Chemistry. Harwood Publication, Chichester.
10. Stryer, L. (1995). Biochemistry. Freeman and Company, New York.
11. Voet and Voet, (1995). Biochemistry. John Wiley and Sons, New York.

Course 2: Theory: OE- 2T, Environmental and Sanitary Microbiology

Course 2: Theory: OE- 2T, Environmental and Sanitary Microbiology	42 Hrs.
Unit 1: Soil and Air Microbiology	14 Hrs.
Soil and Air as a major component of environment. Types, properties and uses of soil and air. Distribution of microorganisms in soil and air. Major types of beneficial microorganisms in soil. Major types of harmful microorganisms in soil	
Unit 2: Water Microbiology	14 Hrs.
Water as a major component of environment. Types, properties and uses of water. Microorganisms of different water bodies. Standard qualities of drinking water	
Unit 3: Sanitary Microbiology	14 Hrs.
Public health hygiene and communicable diseases. Survey and surveillance of microbial infections. Airborne microbial infections, waterborne microbial infections, Food borne microbial infections. Epidemiology of microbial infections, their detection and control.	

Text Books / References

1. Dubey, R. C. and Maheshwari, D. K. (1999). A Textbook of Microbiology. 1st ed., S. Chand & Company Ltd.
2. Jeffrey C. Pommerville (2011). Alcamo's Fundamentals of Microbiology, 9th Ed. Jones and Bartlett publishers.
3. Lansing, M. Prescott, John, P. Harley, Donald A. Klein. (2002). Microbiology, 5th ed., WCB Mc Graw Hill, New York.
4. Madigan, M. T. Martinko, J. M. Dunlap, P. V. and Clark, D. P. (2009). Brock Biology of Microorganisms. 12th ed., Pearson International edition Pearson Benjamin Cummings.
5. Pelczar, M. J., Chan, E. C. S. and Krieg, N. R. (1993). Microbiology. 5th edition. McGraw Hill Book Company.
6. Seeley, H. W. and Demark, J. V. (1962) Microbes in Action-A laboratory Manual of Microbiology, Freeman Publisher.
7. Stanier and Ingraham et al, (1987). General Microbiology, 4th and 5th ed., Mc Millan education limited.
8. Sullia, S. B and Shantharam, S. (1998). General Microbiology. Oxford and IBM Publishing Company Pvt Ltd, New Delhi.
9. Tortora, G. J. Funke, B. R. and Case, C. L. (2008). Microbiology-An Introduction, 10th ed. 2008, Pearson Education.
10. Gregory, P. H. (1961). The Microbiology of the atmosphere. Interscience Publishers, New York.
11. Subba Rao, N. S. (2002). Soil Microorganisms and Plant Growth 4th ed., Oxford and IBH Pub. Co. Pvt. Ltd., New Delhi.