Saurashtra University, Rajkot

B.Sc. (Honours) / B.Sc. (Honours with Research) MICROBIOLOGY PROGRAMME

Syllabus for A.Y. 2023-2024 & Onwards

Semester - I

23-MBTH101	Fundamentals of Microbiology (Theory)	3hrs/week	3 Credits

10. Course Outcomes દરેક વિષયની શરૂઆતમાં દર્શાવેલ છે?: **હા**

11. Employability/Entrepreneurship/Skill Developmentપર કેન્દ્રિત થયેલ છે કે નહિ?: **હા**

12. Value added Courses Imparting Transferable and Life Skills ના ગુણો ધરાવે છે?: **હા**

13. Major [√] Minor [ ] Skill Enhancement Courses [ ]
Ability Enhancement Courses [ ] Value Added Courses [ ] Exit/ Vocational Courses [ ]

14. Holistic Education [ ] Multidisciplinary [ ] Interdisciplinary [ ]

15. દિવ્યાંગ માટે વિષય અંતર્ગત આનુસાંગિક જોગવાઈ કરાયેલ છે ?: **હા**

16. New India Literacy Programme (NILP) મુજબનો વિષય છે?: **હા**

17. Swayam પ્લેટફોર્મ પરના MOOC વિષય પર આધારિત આ વિષય છે ?: **હા**

18. ઇન્ડીયન નોલેજ સીસ્ટમ (IKS) પર આધારિત વિષય છે ?: **હા**

Course Description:

Microbiology is a branch of science that deals with the study of microorganisms. The course will discuss microbiology's basic concepts, including the scope, history, groups, and places of microorganisms in the living world. Techniques such as the use of microscopy and staining for observation are also a component of the course. Morphology, nutritional requirement, and growth pattern of bacteria have also been covered in the course.

Course objectives:

After completing this course, the student should be able to:

1. Identify the significant contributions of the early scientists and the historical milestones that laid the groundwork for modern microbiology.
2. Understand the characteristics of major groups of microorganisms.
3. Explain the fundamentals of microscopy and staining technique.
4. Understand the characteristics of prokaryotic cells and eukaryotic cells.
5. Identify, discuss, and illustrate morphological features of the bacterial cell and its organelles.
6. Understand the nutritional requirements of microbes.
7. Explain the principle and the techniques of microbial cultivation.
8. Comprehend various phases of the bacterial lifecycle and the techniques of its measurement.
9. Know the methods of pure culture.

Course Content	Hours
Unit 1: Scope and History of Microbiology	**9 hrs**
• Microbiology as a field of Biology • Mile stones of Microbiology • The Place of Microorganisms in the living world; Distribution of Microorganisms in Nature • Applied areas of Microbiology	
Unit 2: Major Groups of Microorganisms	**9 hrs**
• Difference between Eukaryotes, Prokaryotes and Archaea • Major groups of Microorganisms: Structure and types of Prokaryotic microbes • Eukaryotic Microorganisms: Structure and types of Fungi, Algae, Protozoa • Akaryotic microbe: Structure and types of Viruses	
Unit 3: Microscopy	**9 hrs**
• Microscopy: Introduction and Types • Principle, and working of : Bright field Microscopy, Dark field Microscopy • Principle, and working of : Fluorescent Microscopy, Phase Contrast Microscopy • Electron Microscopy – Types, working and Limitations	
Unit 4: Staining	**9 hrs**
• Stains and staining solutions • Types of Stains: Natural, Acidic & Basic Stains • Chromophore & Auxochrome groups, Leuco compounds • Types of Staining	
Unit 5: Morphology of Microorganisms	**9 hrs**
• Size, Shape, and Arrangement of Bacteria • Bacterial Structures – External to Cell Wall: Capsule, Flagella, Pili, Prostheca, Sheath & Stalk • The cell wall of Bacteria – Structure and chemical composition of Gram-negative and Gram-positive Bacterial cell wall • Bacterial Structures – Internal to Cell Wall: Cell Membrane, Cytoplasm, Cytoplasmic inclusions, Endospores, Cyst and Nuclear Material.	

Text Books:

- Pelczar, M.J., Chan, E.C.S., Kreig, N.R. (2003). Microbiology 5th Edition, Tata McGraw-Hill Publication Company (UNIT-1,5)
- Presscott, M.J., Harley, J.P., Klein, D.A. (2002). Microbiology 5th edition, New York: WCB Mc GrawHill publication

Reference Books:

- Tortora, Funke & Case. Microbiology-An Introduction, 8 Edition, Pearson Education, Delhi.
- Powar and Daginawala, General Microbiology Vol-II. Himalaya Publishing House, Mumbai.
- Modi, H.A. Elementary Microbiology - Vol –I & II, Akta Prakashan, Nadiyad.
- Atlas. R.M., Principles of Microbiology- 2nd Edition
- Purohit, S.S., Microbiology-Fundamentals and Applications-6th Edition, Agrobios Publications, Delhi.

Pedagogic tools:

- Chalk and Board
- PPT and Videos.
- Assignment
- Class Activity: Think-Pair-Share / Class Test

Suggested reading / E-resources

1. https://www.youtube.com/watch?v=qCn92mbWxd4
2. https://www.youtube.com/watch?v=AZS2wb7pMo4

Suggested MOOCs

1. https://onlinecourses.swayam2.ac.in/cec23_bt14/preview

23-MBPR101	Fundamentals of Microbiology (Practical)	2hrs/week	1 Credits

1. Course Outcomes દરેક વિષયની શરૂઆતમાં દર્શાવેલ છે?: હા
2. Employability/Entrepreneurship/Skill Developmentપર કેન્દ્રિત થયેલ છે કે નહિ?: હા
3. Value added Courses Imparting Transferable and Life Skills ના ગુણો ધરાવે છે?: હા
4. Major [√] Minor [ ] Skill Enhancement Courses [ ]
   Ability Enhancement Courses [ ] Value Added Courses [ ] Exit/ Vocational Courses [ ]
5. Holistic Education [ ] Multidisciplinary [ ] Interdisciplinary [ ]
6. દિવ્યાંગ માટે વિષય અંતર્ગત આનુસાંગિક જોગવાઈ કરાયેલ છે ?: હા
7. New India Literacy Programme (NILP) મુજબનો વિષય છે?: હા
8. Swayam પ્લેટફોર્મ પરના MOOC વિષય પર આધારિત આ વિષય છે ?: હા
9. ઇન્ડીયન નોલેજ સીસ્ટમ (IKS) પર આધારિત વિષય છે ?: હા

Course Description:

This course covers the study of basic skills in the subject of Microbiology. The course is designed to make students aware about the Good microbiology Laboratory Practices, basic introduction about sterilization of media and glassware and observation of Microbes under the microscope using appropriate staining techniques.

Course Objective:

This course aims to provide the students with a basic understanding of microbial techniques and instrument operation. The course is designed so that learners can understand the Good laboratory practices, basic instrumentation needed for conducting experiments in a Microbiology laboratory, simple techniques of observation and study of microbial morphology and cellular structure, methods of microbial control, etc., in detail.

Sr. No.	Experiments
1	Principles, working, and uses of the following laboratory instruments: a) Microscope b) Incubator c) pH meter d) Refrigerator e) Colorimeter f) Colony counter
2	Principles, working, and uses of the following sterilizers: a) Autoclave b)Hot air oven

	c) Steam sterilizer d) Inspissator e) Bacteriological filters.
3	Preparation of glassware for sterilization and disposal of laboratory media and cultures.
4	Preparation of Stains and Staining Reagents.
5	Study of Permanent Slides of Bacteria, Fungi, Algae, and Protozoa.
6	Study of bacterial motility by hanging drop method.(Demonstration)
7	Monochrome Staining: a) Negative Staining b) Positive Staining
8	Differential Staining: Gram's Staining
9	Special staining of bacteria: a) Capsule staining – Hiss's method, b) Cell wall staining – Webb's method c) Spore staining – Schaeffer's method d) Metachromatic granule staining – Albert's method e) Spirochete staining – Harrie's method

Reference Books ;

1. Patel. R.J., Patel. K.R., Experimental Microbiology, Vol-I, Aditya Publications, Ahmedabad, India.
2. Patel. R.J., Patel. K.R., Experimental Microbiology, Vol-II, Aditya Publications, Ahmedabad, India.
3. Dubey. R.C., Maheshwari. D.K., Practical Microbiology, S.Chand& Company Ltd., New Delhi
4. Konika Sharma, Manual of Microbiology – Tools and Techniques, Ane books, Delhi

Pedagogic tools:

- Chalk and Board
- Power point presentation
- Video

Suggested reading / E-resources

- https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7757301/
- https://biochemden.com/download-biochemistry-protocols/
- https://www.youtube.com/watch?v=1iYAC6KlSMk
- https://www.youtube.com/watch?v=YO244P1e9QM

Suggested MOOCs

1. https://www.my-mooc.com/en/mooc/biochemistry-biomolecules-methods-and-mechanisms/