



JAI HIND COLLEGE
BASANTSING INSTITUTE OF SCIENCE
&
J.T.LALVANI COLLEGE OF COMMERCE
(AUTONOMOUS)

"A" Road, Churchgate, Mumbai - 400 020, India.

Affiliated to
University of Mumbai

Program: B.Sc

Proposed Course: Microbiology

Semester II

Credit Based Semester and Grading System (CBGS) with effect from the
academic year 2020-21

F.Y.B.Sc. Microbiology Syllabus

Academic year 2020-2021

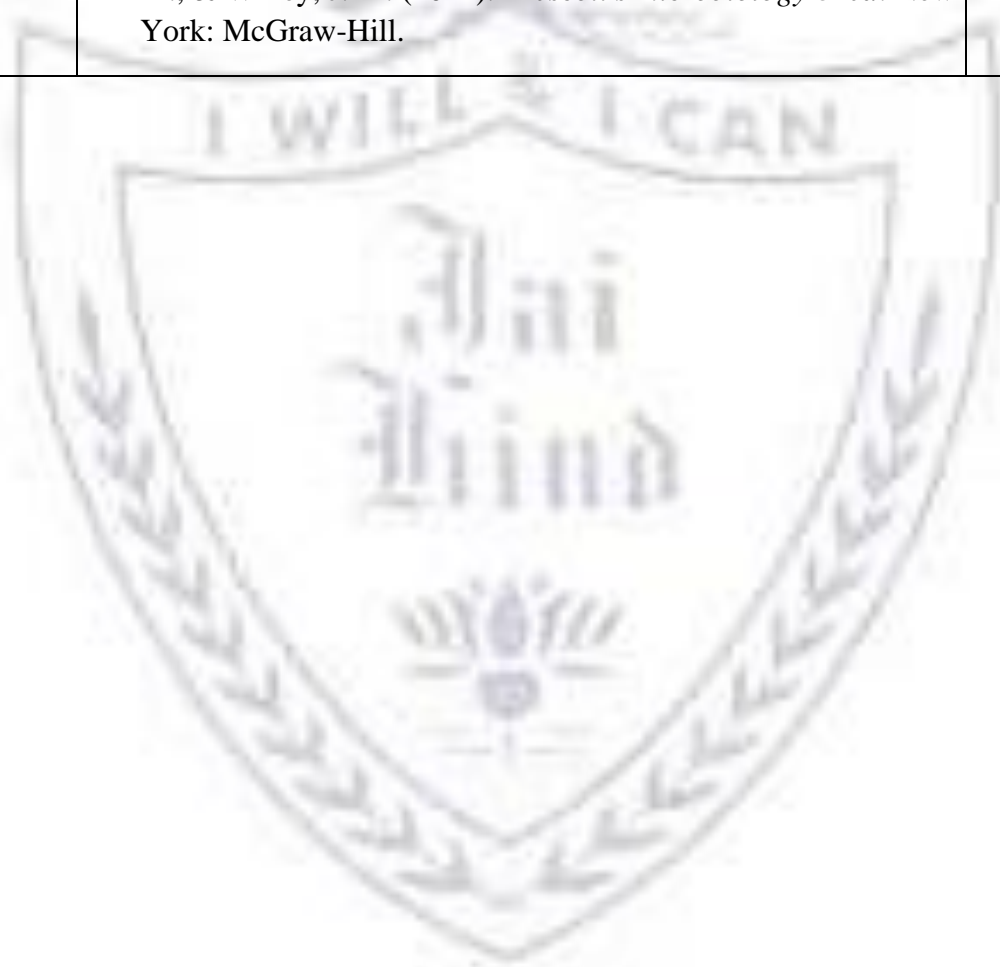
| Semester II | | | |
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| Course Code | Course Title | Credits | Lectures /Week |
| SMIC 201 | Microbial Diversity | 2 | 3 |
| Unit I | Study of Different Groups of Microbes-I | | |
| Unit II | Study of Different Groups of Microbes-II | | |
| Unit III | Microbial growth | | |
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| SMIC 202 | Exploring Microbiology | 2 | 3 |
| Unit I | Tools of the Laboratory | | |
| Unit II | Microbial Interactions | | |
| Unit III | Microbe-Human Interactions: Infection and Disease | | |
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| SMIC2PR | | 2 | 6 |

Semester II – Theory

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| Course Code SMIC201 | Course Title: MICROBIAL DIVERSITY Lectures/Week : 03 | 2 Credits |
| | <p>Learning Objectives</p> <ul style="list-style-type: none"> ➤ Open minds to the diversity of microbes in nature and to study their importance ➤ Use various methods to study growth of micro-organisms ➤ Learn how various environmental factors affect the growth of micro-organisms | |
| | <p>Learning Outcomes: On completion of this course students will learn about various groups of microorganisms, their structure, physiology and growth characteristics.</p> | |
| Unit – I | Study of Different Groups of Microbes-I | 15 lectures |
| 1. | <p>Viruses – a. Early developments of Virology, General properties of viruses, prions, viroids b. Structure of Viruses : Capsids, envelopes, genomes, c. Cultivation of Viruses : an overview d. Bacteriophages: Lytic cycle, Lysogeny, Structure and Life cycle of the T4 Bacteriophage</p> | 07 |
| 2. | <p>Rickettsia, Coxiella, Chlamydia, Mycoplasma General features and medical significance</p> | 03 |
| 3. | <p>Actinomycetes General Characteristics, Cell Wall types and importance</p> | 02 |
| 4. | <p>Archaeobacteria Characteristics of major archaeal groups</p> | 02 |
| 5. | <p>Cyanobacteria</p> | 01 |
| Unit – II | Study of Different Groups of Microbes-II | 15 lectures |
| 1. | <p>Protozoa</p> <ul style="list-style-type: none"> a. Ecology and Morphology of Protozoa b. Major categories of Protozoa based on motility, reproduction c. Medical importance of Protozoa d. Life cycle of <i>Entamoebahistolitica</i> | 05 |
| 2 | <p>Algae Characteristics of algae: morphology, pigment, reproduction</p> | 04 |

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| | <ul style="list-style-type: none"> a. Cultivation of algae b. Major groups of algae : an overview c. Biological and economic importance of algae d. Lichen symbiosis e. Differences between Algae and Cyanobacteria | |
| 3. | Fungi <ul style="list-style-type: none"> a. Characteristics: structure, reproduction b. Cultivation of fungi c. Major fungal divisions : an overview d. Life cycle of yeast e. Biological and economic importance | 05 |
| 4. | Slime Molds | 01 |
| \ Unit – III | Microbial growth | 15 lectures |
| 1. | Definition of growth, Growth curve, Mathematics of growth | 03 |
| 2. | Measurement of microbial growth <ul style="list-style-type: none"> a. Direct microscopic count :Breed’s Petroff – Hausser counting chamber, Haemocytometer, Coulter Counter, b. Viable count : Spread plate and Pour plate technique c. Measurements of cell constituents. d. Turbidity measurements : Nephelometer and spectrophotometer techniques | 05 |
| 3. | Synchronous growth, Continuous growth (Chemostat and Turbidostat) | 01 |
| 4. | Influence of environmental factors on growth. | 04 |
| 5. | Microbial growth in natural environment, Biofilms, Quorum sensing techniques. | 02 |
| CA | <ul style="list-style-type: none"> 1. Test 2. Assignment/ Poster making | |

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| References: | <ol style="list-style-type: none"> 1. Willey, J. M., Sherwood, L. & Woolverton, C. J. (2011). <i>Prescott, Harley and Klein's Microbiology</i> 7th ed. New York: McGraw-Hill 2. Pelczar, M., Reid, R. and Chan, E. (1986). <i>Microbiology</i> 5th ed. New York: McGraw-Hill 3. Madigan, M. T., Martinko, J. M. (2009). <i>Brock biology of microorganisms</i> 12th ed. Upper Saddle River, NJ: Prentice Hall/Pearson Education 4. Bauman, R. W., Machunis-Masuoka, E., & Montgomery, J. E. (2015). <i>Microbiology: With diseases by body system</i> 4th ed. Boston: Benjamin Cummings 5. Willey, J. M., Sherwood, L., Woolverton, C. J., Prescott, L. M., & Willey, J. M. (2011). <i>Prescott's microbiology</i> 8th ed. New York: McGraw-Hill. | |
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| Course Code SMC202 | Course Title: EXPLORING MICROBIOLOGY Lectures/Week:03 | 2 Credits |
| | <p>Learning Objectives</p> <ul style="list-style-type: none"> ➤ Learn and understand the principle and applications of electron, confocal and fluorescent microscopes. ➤ Acquire competency in using Colorimeter and Spectrophotometer. ➤ Understand the concept of using buffers and to determine the pH of a solution using indicators and a pH meter ➤ Have basic knowledge in preparing solutions of different types ➤ Enlist different types of microbial interactions and study the impact on human health <p>Learning Outcomes: On completion of this course students will be able to understand the microbial interactions and impact of microorganisms on human health. They will also develop skills in the use of basic instruments common to a biologist.</p> | |
| Unit I | Tools of the Laboratory | 15 lectures |
| 1. | <p>Advances in Microscopy</p> <ul style="list-style-type: none"> a. Electron Microscopy: Construction, Principle & Application <ul style="list-style-type: none"> i. The Transmission Electron Microscope ii. The Scanning Electron Microscope iii. Specimen preparation in TEM: Staining, Shadowing with metals, Freeze Etching b. Confocal Microscopy: Construction, Principle & Application c. Fluorescence Microscopy: Construction, Principle & Application | 07 |
| 2. | <p>Colorimetry & Spectrophotometry</p> <ul style="list-style-type: none"> a. Instrument construction, b. Principle- Beer and Lambert's Law, c. UV-Vis Spectrophotometer d. Application | 04 |
| 3. | <p>pH, Buffers & Solutions</p> <ul style="list-style-type: none"> a. Concept of pH b. Ion product of pKa & pKb | 04 |

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| | <ul style="list-style-type: none"> c. Henderson & Hasselbalch Equation d. Buffers e. Buffer capacity f. Physiological buffers (Bicarbonate, Phosphate and protein buffers) g. Determination of pH using indicator & pH meter h. Construction, Principle and Working of pH meter i. Solutions: Concepts of %, mg/l, ppm, w/w, w/v solutions j. Problems based on the above | |
| Unit – II | Microbial Interactions | 15 lectures |
| 1. | Types of Microbial Interactions: <ul style="list-style-type: none"> a. Mutualism b. Cooperation c. Commensalism d. Predation e. Parasitism f. Amensalism g. Competition | 07 |
| 2. | Microbial associations with vascular plants <ul style="list-style-type: none"> a. Phyllosphere b. Rhizosphere & Rhizoplane c. Mycorrhizae d. Nitrogen fixation: Rhizobia, Actinorhizae, Stem Nodulating rhizobia e. Fungal & Bacterial endophytes f. Agrobacterium & other plant pathogens | 08 |
| Unit – III | Microbe-Human Interactions: Infection and Disease | 15 lectures |
| 1. | The Human Host <ul style="list-style-type: none"> a. Contact, Infection, Disease b. Resident Flora: The Human as a habitat c. Gnotobiotic animals d. Indigenous flora of a specific region | 04 |
| 2. | The Progress of an infection <ul style="list-style-type: none"> a. The Portal of entry b. The Size of the Inoculum | 05 |

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| | <p>c. Mechanism of Invasion and Establishment of the Pathogen</p> <p>d. Signs and Symptoms</p> <p>e. The Portal of Exit</p> <p>f. The persistence of microbes and pathologic conditions</p> | |
| 3. | <p>Epidemiology: The Study of Disease in Populations</p> <p>a. Tracking Disease in the population</p> <p>b. Reservoir: where pathogens persist</p> <p>c. The acquisition and transmission of infectious agents</p> <p>d. Nosocomial Infections</p> <p>e. Using Koch's Postulates to determine etiology</p> | 05 |
| 4. | Biological Warfare and Bioterrorism | 01 |
| CA | <p>1. Test</p> <p>2. Presentation/ Case study</p> | |
| References: | <p>1. Willey, J. M., Sherwood, L., Woolverton, C. J., Prescott, L. M., & Willey, J. M. (2011). <i>Prescott's microbiology 8thed.</i> New York: McGraw-Hill</p> <p>2. Plummer, D.T. (1997). <i>An introduction to practical biochemistry 3rded</i> .New Delhi :Tata McGaw-Hill</p> <p>3. Williams, B.L. & Wilson, K. (1981). <i>A Biologist's guide to Principles and techniques of practical biochemistry 2nd ed.</i> London : Edward Arnold</p> <p>4. Garrett, R. H., & Grisham, C. M. (2010). <i>Biochemistry 5th ed.</i> Belmont, CA: Brooks/Cole, Cengage Learning</p> <p>5. Boyer, R. F. (2012). <i>Modern Experimental Biochemistry. 3rded.</i> New Delhi : Pearson</p> <p>6. Sawhney, S.K.& Singh, R. (2001). <i>Introductory Practical biochemistry.</i> New Delhi :Narosa</p> <p>7. Talaro, K. P., &Talaro, A. (2009). <i>Foundations in microbiology: Basic principles 7th ed.</i> Boston: WCB/McGraw-Hill.</p> <p>8. Bauman, R. W., Machunis-Masuoka, E., & Montgomery, J. E. (2015). <i>Microbiology: With diseases by body system 4th ed.</i> Boston: Benjamin Cummings</p> | |

Semester II – Practical

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| Course: SMIC2PR | 2 Credits : Practicals /Week: 6 Lectures PRACTICAL – I <ol style="list-style-type: none">1 Study of Bacteriophages: Spot assay and (plaque assay of Bacteriophage -Demonstration)2 Isolation of Yeasts and Fungi on Sabouraud's agar3 Study of Fungi (Slide culture and Wet Mount - Study of Morphological Characteristics: Mucor, Rhizopus, Aspergillus, Penicillium)4 Isolation of Actinomycetes from soil and slide culture of Actinomycetes5 Enrichment and Isolation of algae6 Wet mount of Hay Infusion and Pond water for observing bacterial, algal and protozoan forms7 Study of growth of organisms under static and shaker conditions8 Growth curve of <i>E.coli</i>9 Direct microscopic count by Breed's Count and Haemocytometer10 Viable count: Spread plate and pour plate11 Mc Farlands Standard opacity tubes12 Effect of pH, temperature and osmotic pressure on growth13 Cultivation of anaerobes PRACTICAL – II <ol style="list-style-type: none">1 Normal flora of the Skin & Saliva2 Wet Mount of Lichen (Demonstration)3 Bacteroid Staining & Isolation of Rhizobium4 Study of virulence factors – Enzyme Coagulase5 Study of virulence factors – Enzyme Hemolysin6 Study of virulence factors – Enzyme Lecithinase7 Demonstration of microbes in air, table surface, finger tips8 Use of standard buffers for calibration and determination of pH of a given solution9 Preparation of buffers and solutions10 Determination of λ max & Verification of Beer Lambert's law11 Visit to a Microbiology Laboratory in a Research Institute |
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Evaluation Scheme

[A] Evaluation scheme for Theory courses

I. Continuous Assessment (C.A.) - 40 Marks

- (i) C.A.-I : Test – 20 Marks of 40 mins. duration**
- (ii) C.A.-II : Assignment/Project etc.**

II. Semester End Examination (SEE)- 60 Marks

[B] Evaluation scheme for Practical courses-

Practical Exam at the end of the Semester- 100 Marks

