



COURSE CURRICULUM

Course Title: Microbiology

Course Code: LS204

Credit Units: 04

L	T	P/S	SW/F W	TOTAL CREDIT UNITS
3	0	2	0	04

Course Objectives:

Theory: To introduce the students to the basic aspects of microbiology.

Practical: To develop basic microbiological laboratory skills.

Pre-requisites: Life Sciences

Student Learning Outcomes: students will be able to:

- Define basic principles of microbiology.
- Develop knowledge of microbial cell structure, growth and metabolism
- Explain the role of microorganisms in diseases.
- develop proficiency in laboratory skills and safety protocols.
- describe microbial systematics and genetics

Course Contents/Syllabus- Theory:

	Weightage (%)
Module I: Introduction, History and Basic Principles of Microbiology	15
Descriptors/Topics: Introduction to Microbiology. Impact of microorganisms on humans. Historical perspective: Contributions of Antony van Leeuwenhoek, Louis Pasteur, Robert Koch, Martinus Beijerinck, Sergei Winogradsky. Microbial nutrition. Culture	

media, pure culture techniques, culture preservation. Sterilization.	
Module II: Microbial Cell Structure and Diversity	20
<p>Descriptors/Topics: Bacteria: Prokaryotic cell structure and function overview, cytoplasmic membrane, cell wall, cell surface structures, surface appendages (flagella, pili and fimbriae), cytoplasmic inclusions, nucleoid, endospores.</p> <p>Archaea: Cell wall, cell membrane, characteristics of major archaeal groups.</p> <p>Algae, Protozoa and Fungi: Structure and general characteristics. Viruses: Bacteriophage T4 and lambda (structure and life cycle), Retroviruses, Viroids, Prions.</p>	
Module III: Microbial Growth and Metabolism	20
<p>Descriptors/Topics: Microbial growth: Concept of microbial growth, mathematical expression of growth, growth curve, measurement of growth, batch and continuous culture, environmental factors affecting growth, synchronous cultures.</p> <p>Microbial metabolism: Phototrophy, chemolithotrophy (hydrogen oxidation and nitrification), anaerobic respiration (nitrate reduction), fermentation (lactic and ethanolic), methanogenesis, nitrogen fixation.</p>	
Module IV: Microbial Systematics and Genetics	15
<p>Descriptors/Topics: Microbial taxonomy: Overview of polyphasic taxonomy, classical and molecular approaches to taxonomy, importance of 16S rRNA gene sequence in taxonomy.</p> <p>Gene transfer in bacteria: Conjugation, transformation and transduction. Plasmids, Hfr Strains.</p>	
Module V: Medical Microbiology	20
<p>Descriptors/Topics: Normal microbiota of humans, mechanism of microbial pathogenesis (bacteria), microbial toxins, epidemiology: disease reservoirs and transmission. Microbial diseases: Food and water borne diseases, Anthrax, Tuberculosis, AIDS, Influenza, Cutaneous and systemic mycoses, Malaria.</p> <p>Antimicrobial drugs: General characteristics, Antibacterial (classification and mode of action), antifungal and antiviral</p>	

drugs. Antibiotic resistance and multi-drug resistance.	
Module VI: Industrial Microbiology	10
Descriptors/Topics: Fermentation process and products, production of antibiotics (penicillin), dairy products (fermented milks and cheese), fermented beverages (wine), Single cell proteins	

Pedagogy for Course Delivery:

Lectures: 39
 Tutorial: 0
 Presentation/ Seminar: 4
 Class Test: 2
 Total: 45

Lab/ Practical details, if applicable:

Tutorial: 00
 Practical: 26
 Class Test: 4

 Total: 30

List of Experiments:

- Laboratory safety and instrumentation, aseptic techniques, preparation of culture media.
- Isolation of microorganisms from air, water and soil: Streak plate method, Spread plate method, Serial dilution and pour plate method.
- Staining techniques: Simple staining, Gram staining, endospore staining, lactophenol cotton blue staining for fungi, negative staining.
- Biochemical tests –Indole test. Methyl red test. Voges proskaeur test, Citrate utilization test (IMViC), starch hydrolysis test, catalase test.
- Generation of bacterial growth curve.
- Antibiotic susceptibility testing.

Assessment/ Examination Scheme:

Theory L/T (%)	Lab/Practical/Studio (%)	Total (%)
75	25	100

Theory Assessment (L&T):

Continuous Assessment/Internal Assessment					End Term Examination
Components (Drop down)	Class Test	Home Assignment	Presentation/ Seminar	Attendance	
Weightage (%)	15	5	5	5	70

Lab/ Practical/ Studio Assessment:

Components (Drop down)	Continuous Assessment/Internal Assessment				End Term Examination			
	Performance	Lab record	viva	Attendance	Lab record	Performance	Viva	Total
Weightage (%)	10	5	10	5	10	40	20	100

Text & References:*Text*

- Prescott, Harley and Klien's Microbiology, Willey, Sherwood, Woolverton, 7th edition, 2011, McGraw Hill Higher Education, ISBN-13: **978-0073302089**
- Brock Biology of Microorganisms, Madigan, Martinko, Stahl, Clark, 13th edition, 2011, Benjamin Cummings, ISBN-13: **978-0321649638**

References

- Microbiology An Introduction, Tortora, Funke and Chase, 9th edition, 2006, Benjamin Cummings, ISBN 13: **9780321733603**
- General Microbiology, Stanier, Ingraham, Wheelis, 5th edition, 1987, MacMillan, ISBN-13: **978-0333417683**
- Ananthanarayan and Paniker's Textbook of Microbiology, Ananthanarayan and Paniker, 8th edition, 2009, Universities Press ISBN 13: **9788173716744**
- Biotechnology A textbook of Industrial Microbiology, Crueger and Crueger, 2nd edition, 1990 Sinauer Associates Inc.,U.S., ISBN 13: **9780878931316**

Text & References (Lab):

- Experiments in Microbiology, Plant Pathology and Biotechnology, Aneja KR, 4th edition, 2003, New Age International, ISBN: **9788122414943**

- Microbiology: A laboratory Manual, Cappuccino and Sherman, 7th Edition, 2004, Benjamin Cummings, ISBN 13: **9780805328363**

Any other Study Material:

- Research Papers