



B.Sc. (Microbiology)
SEMESTER-I

SEMESTER PATTERN:

- The Course content has been designed on **Semester pattern**.
- The workload for Theory & Practicals is allotted on Semester pattern.
- There shall be **01 Theory papers 70 marks each** of 2.5 Hours duration. [70+30 marks Internal =100 marks]
- Microbiology Practical Examination shall be of 50 **marks** of 3.0 **hours duration** in University Examination.
- There shall be **Two Semesters** in an academic Year. (Semester-1 & 2)

Paper No.	Subject Code	Name Of The Paper	Total Marks Ext.+Int* = Total	Passing Standard Ext.+Int = Total	Total Teaching Hours	Exam Hours	Credits
MICCC 103	23380	Introduction of Microbial World	70+30 =100	28+12=40	15 WEEKS X 4 HOURS = 60	2.5	04
MICCC 104	23381	Microbiology practical	50	28	15 WEEKS X 4 HOURS = 60	03	02

INTERNAL MARKS : 30



B.Sc. (Microbiology)
SEMESTER-I

Paper No: Microbiology MICCC-103

Title of the Paper: Introduction of Microbial World

Credits: 04

Code: 23380

Marks: Semester End Examination: 70 Marks

Internal: 30 Marks

Unit	Detailed Syllabus	Teaching Hours	Marks/Weight
1	History and Scope of Microbiology Discovery of Microbial world: Establishment of theory of biogenesis. Development of pure culture techniques. - Establishment of Germ theory of diseases & fermentation. Work of Lister & principle of aseptic surgery. - Scope of Microbiology:- - Pure & Applied areas of Microbiology. - Introduction to Genetic engineering and Biotechnology	15	18
2	The Microbial World (a) Distribution of microorganisms in nature (b) Introduction to prokaryotic world, eukaryotic microorganisms, difference between prokaryotes and eukaryotes. (c) Types of Microorganisms: Bacteria, Viruses, Fungi, Yeasts, Actinomycetes, Protozoa	15	18
3	Microscopy, Microscope and techniques used to study microorganisms (a) Principles of microscopy, magnification and Resolving Power (b) Light microscopy: - Simple and compound microscope. - Bright field and dark field microscopy. Principles and applications of phase contrast and Fluorescence microscopy. (c) Principles and applications of Electron microscopy: SEM & TEM. - Smear Preparation and Fixation. - Use of mordant, intensifier & decolorizer. (d) Wet mounting: Vital & supravital staining.	15	17



	<ul style="list-style-type: none">- Cultivation methods of bacteria:- Use of broth & solid media		
4	<p>Introduction of Biomolecules</p> <p>(a) Carbohydrates:</p> <ul style="list-style-type: none">-Introduction and classification- Monosaccharides, Introduction, characteristics (Chiral Center, Isomerism, epimers, cyclic hemiacetal (α and β), Anomers)-Disaccharides, Maltose, fructose and sucrose, Reducing and non Reducing sugarPolysaccharide: Storage- Starch and glycogen Structural polysaccharides-Cellulose, Chitin-General functions of Carbohydrates. <p>(b) Protein:</p> <ul style="list-style-type: none">-Introduction, Properties, Essential amino acids, non-protein amino acids.- General Classification, structure (primary, secondary, tertiary and quaternary- General functions of Protein. <p>(c) Lipid:</p> <ul style="list-style-type: none">-Introduction, Properties, essential fatty acids.-Classification and structure of triacylglycerol-General function of lipids.	15	17



B.Sc. (Microbiology)
SEMESTER-I

Paper MICC-104

Code: 23381

Title of the Paper: Microbiology Practical [Based on paper MICCC-103]

Credits: 02

Marks: Semester End Examination: 50 Marks

All the topics for the practical are being taught by Models, Charts, Figures, Slides and multimedia.

Students have to prepare journals for Microbiology Practicals

Students have to submit certified journals in the University practical examination.

Students are not allowed in the laboratory without certified journal in the university practical examination.

Detailed Syllabus for Microbiology practical

1. Study of principles and working of laboratory instruments Light microscope, Autoclave, Hot air oven, Incubator, Rotary shaker, pH meter, Spectrophotometer, Centrifuge, bacteriological filters & laminar air flow.
2. Cleaning and preparation of glasswares for sterilization
3. Disposal of laboratory waste and cultures
4. Contribution of: Antony Leeuwenhook, Louis Pasteur, Robert Koch, Joseph Lister, Alexander Fleming, Edward Jenner.
5. Study of Hay infusion by hanging drop technique.
6. Staining of bacteria
 - a. Simple staining
 - i. Positive staining
 - ii. Negative staining
 - b. Differential staining: Gram staining
7. Study of permanent slides
 - a. Prokaryotes: Bacteria
Cocci, Bacilli, Spirochete, Curved Bacteria, Filamentous Bacteria (Actinomycetes)
 - b. Eukaryotes:
 - Fungi: Yeast, *Mucor*, *Rhizopus*, *Aspergillus*, *Penicillium*
 - Algae: Diatoms, Spirogyra
 - c. Protozoa: Amoeba, Paramecium, Plasmodium
8. Preparation of Standard Solutions.
9. pH adjustment of media by use of pH strip/pH meter.
10. Preparation of media: N-agar, N-broth.
11. Cultivation by liquid culture technique.
12. Cultivation by solid culture technique.
13. Qualitative analysis of Carbohydrates (Benedict's test, Barfoed test, Iodine test)
14. Qualitative analysis of Proteins (Ninhydrine test, Biuret test, Nitroprusside test)

Students have to submit certified journals in the University practical examination



TEXT BOOKS RECOMMENDED FOR PAPER MIC-CC-103 & MIC-CC-104

Microbiology: Pelczar M J, Chan E C S and Kreig N R Tata Mc Grow Hill

Suggested reading:

General Microbiology: R Y Stanier, Adelberg E A and J L Ingraham, Mac Millan Press

Inc **Introduction to microbiology:** Ingraham J L and Ingraham C A Thomson Brooks/

Cole **Principles of microbiology:** R M Atlas Wm C brown Publishers

Brock's biology of Microorganisms Madigan M T and Martinko J M Pearson

Education Inc. **Microbiology: An introduction:** Tortora G J, Funke B R and Case C L

Pearson Education Inc. **Elementary Microbiology:** H.A. Modi, volume-i&ii

General Microbiology: R.C. Dubey.

Practical Microbiology: R.J.Patel by Aditya Publications



DETAILED CURRICULUM
B.Sc. (Microbiology)
SEMESTER-II

Paper No.	Subject Code	Name of The Paper	Total Marks Ext.+Int* = Total	Passing Standard Ext.+Int = Total	Total Teaching Hours	Exam Hours	Credits
MICCC-203	22382	Basic Bacteriology	70+30 =100	28+12 =40	15 WEEKS X 4 HOURS =60	2.5	04
MICCC-204	22384	Microbiology Practical	50	28	15 WEEKS X 4 HOURS =60	03	02

INTERNAL

MARKS : 30



B.Sc. (Microbiology)
SEMESTER-I

Paper MICCC-203

Code: 23380

Title of the Paper: Basic Bacteriology

Credits: 04

Marks: 70

Marks: Semester End Examination: 70 Marks

Internal: 30 Marks

Unit	Detailed Syllabus	Teaching Hours	Marks/Weight
I	Morphology and fine structure of bacteria. a. The size, shape & arrangement of bacterial cells. b. Bacterial cell structure, composition & functions. - External :- cell wall, cell envelope, pili (fimbriae) & flagella, capsule & sheath, prosthecae. - Internal :- Cytoplasmic membrane, cytoplasm, cytoplasmic inclusions, nuclear material & Ribosomes. c. Bacterial endospore: Spore structure, sporulation and spore germination.	15	18
II	Introduction to bacterial nutrition. a. Nutritional requirements of bacteria. b. Nutritional types of bacteria. c. Culture media: Principles of media formulation, media ingredients & types of culture media. d. Physical conditions required for cultivation of bacteria (Temperature, gaseous requirement, acidity & alkalinity, osmotic pressure etc).	15	18
III	Pure culture techniques and Principles of Microbial Control a. Definition : Pure culture and axenic culture b. Principles and methods of obtaining pure culture c. Maintenance and preservation of pure culture d. Culture collection centers e. General principles of control f. Characteristics of ideal antimicrobial agents g. Chemical agents of microbial control: Major groups of antimicrobial chemical agents - Phenolics, halogens, surfactant, alcohol, dyes, heavy metals & gaseous agents.	15	17



IV	Introduction to bacterial taxonomy and nomenclature : a. Introduction and concept of species, taxa and strain b. Principles of binomial system of nomenclature c. Classification systems d. Major characteristics e. Evolutionary chronometers and phylogenetic trees f. Whittaker's classification, The three domain concept. g. Difference between Bacteria, Archaea and Eucarya h. Introduction to Bergey's Manual of systematic bacteriology – Ed. II (Overview)	15	17
----	--	----	----



Paper MICCC-204

Code: 23381

Title of the Paper: Microbiology Practical

Credits: 02

Marks: Semester End Examination: 50 Marks

DETAILED CURRICULUM FOR PRACTICAL

[Based on paper MICCC-203]

All the topics for the practical are being taught by Models, Charts, Figures, Slides and multimedia.

Students have to prepare journals for Microbiology Practicals.

Students have to submit certified journals in the University practical examination.

Students are not allowed in the laboratory without certified journal in the university practical examination.

Detailed Syllabus for Microbiology

1. Preparation and study of different types of culture media: Nutrient agar, MacConkeys's agar medium, Glucose yeast agar medium, Thioglycollate broth medium, Potato dextrose agar medium, Rose Bengal agar medium, Robertson's cooked meat medium.
2. Isolation of bacteria from soil/ water:
 - a. Streak plate method
 - b. Pour plate method
 - c. Spread plate method
3. Cultivation of anaerobic bacteria by use of
 - a. Robertson's cooked meat medium/ Thioglycollate broth/ Litmus milk medium
 - b. Anaerobic Jar (Demonstration only)
4. Preservation of microbial cultures
 - a. Periodic subculturing and storage at Refrigeration temperature
 - b. Soil culture method for fungi.
 - c. Sealing with paraffin oil / wax
5. Study of pigmented bacteria
 - a. *Staphylococcus aureus*
 - b. *Serratia marcescens*
 - c. *Pseudomonas aeruginosa*
6. Study of bacterial structure by use of structural staining
 - a. Endospore by use of Dorner's method
 - b. Cell wall by use of Dyer's method/ Ringer's method
 - c. Capsule staining by use of Hiss's method/ Maneval's method
7. Use of special staining technique to study bacteria
 - a. Spirochete by Fontana's staining method
8. Study of effect of various physical and chemical agents on growth of microorganisms
 - a. Study of effect of temperature , pH and osmotic pressure on growth of microorganisms
 - b. Study of effect of chemicals on microbial growth
 - i. Study of effect of Heavy metals ions and their oligodynamic action on *E.coli*.
 - ii. Use of agar cup method to study effect of chemicals: Phenol, HgCl₂ and Crystal violet.
 - iii. effect of UV on *Serratia marcescens*
9. Study of presence of microorganisms in different habitat- Air, water, milk, curd and skin.



Students have to submit certified journals in the University practical examination.

TEXT BOOKS RECOMMENDED FOR PAPER MIC-CC-203 & MIC-CC-204

Microbiology:

Pelczar M J, Chan E C S and Kreig N R Tata Mc Grow Hill

Suggested reading:

General Microbiology: R Y Stanier, Adelberg E A and J L Ingraham, Mac Millan Press

Inc. **Introduction to microbiology:** Ingraham J L and Ingraham C A Thomson

Brooks/ Cole **Principles of microbiology** R M Atlas Wm C brown Publishers

Brock's biology of Microorganisms Madigan M T and Martinko J M Pearson

Education Inc

Elementary Microbiology H.A.Modi(volume1&2)

General Microbiology R.C.Dube

Microbiology: An introduction: Tortora G J, Funke B R and Case C L Pearson

Education Inc

Practical Microbiology: R.J.Patel by Aditya publication.