

Solapur University, Solapur

**B.Sc. II Microbiology
(Semester III&IV)**

Syllabus w.e.f. 2011-2012

SOLAPUR UNIVERSITY, SOLAPUR

B.sc. II Microbiology Syllabus Semester III - Paper V

Bacterial Cytology, Virology and Metabolism

- Unit I Ultra structure and Functions** (12)
- 1.1 Bacterial Cell wall: Composition, structure of Gram Positive and Gram Negative Cell Wall.
 - 1.2 Cell Membrane: Chemical Composition and functions transport across cell membrane – simple diffusion, facilitated diffusion, active transport, group translocation.
 - 1.3 Flagella : Structure, Mechanism of movement, Tactic behaviour
 - 1.4 Pili : Structure and functions
 - 1.5 Cytoplasmic inclusions: Chlorobium vesicles. Gas vacuoles, Magnetosomes, and carboxysomes
 - 1.6 Reserve Food Materials : Nitrogenous and Non nitrogenous
 - 1.7 Bacterial Endospore : Ultrastructure, sporulation as an example of cell differentiation, Germination of endospore
- Unit II Bacterial Growth** (4)
- Measurement of growth, generation time and growth rate, batch culture, continuous culture, Synchronous culture and diauxic growth.
- Unit III Effect of Environment on Bacterial growth** (6)
- Temperature, pH, O₂ , osmotic pressure, Hydrostatic Pressure, Surface Tension, Heavy metals, UV light, Antibiotics
- Unit IV Virology** (6)
- a) Structural properties of - T₄, TMV, HIV and Hepatitis virus
 - b) Cultivation of viruses –Animal viruses and bacteriophages
- Unit V: 1.1Enzymes and Metabolism** (12)
- Classification of Enzymes, Effect of Environmental factors on Enzyme Activity.
- 1.2 Metabolism**
- A. Modes of ATP generation.
 - B. Substrate Level Phosphorylation,
Fermentation - Homolactic and Heterolactic.
 - C. Oxidative Phosphorylation: Respiratory electron transport chain, components of ETC ,aerobic and anaerobic respiration.
 - D. Bacterial Photosynthesis- Basic concepts of photosynthesis,
Photosynthesis in Cyanobacteria

Semester – III
Paper-VI
Microbial Genetics & Biostatistics

Unit – I Bacterial Genetics (10)

1.1 Chemical Nature & Structure of Genetic Material. Forms of DNA

1.2 Gene – Basic concept of Genome, genotype, phenotype, Recon, Muton, Cistron & interrupted genes.

1.3 Genetic code – Basic concept & properties of genetic code.

Unit – II Bacterial Mutation (10)

2.1 Basic concepts

2.2 Spontaneous mutations

2.3 Induced Mutations – Mechanism of Mutagenesis by

5 Bromouracil, 2- aminopurine, Hydroxylamine, Nitrous acid, Alkylating agents, Acridine dyes and U.V. rays.

2.4 DNA repair – i) Photoreactivation ii) Dark Repair Mechanism.

2.5 Fluctuation Test, Replica Plate Technique

Unit – III Genetic Recombination in Bacteria (10)

3.1 Fate of Exogenote

3.2 Transformation and Transfection

3.3 Conjugation

3.4 Transduction

Unit – IV Plasmids: Properties, Types and Applications. (4)

Unit – V Biostatistics (6)

5.1 Introduction.

5.2 Central Tendency – Mean, Median, Mode.

5.3 Applications of Biostatistics in Biology

Semester – IV
Paper-VII
Immunology & Medical Microbiology

- Unit I Immunity** (8)
- 1.1 Immunity – Definition & concept
 - 1.1.1 Innate immunity – Definition, Levels of innate immunity
 - 1.1.2 Acquired immunity – Active & passive
 - 1.2 Defense Mechanism of body
 - 1.2.1 First Line defense and Second Line defense: Role of fever, inflammation, & phagocytic cells
 - 1.2.2 Third Line defense: Components of immune system
 - a. cells – Types & functions
 - b. Organs – primary & secondary & their functions.
 - 1.2.3 Immune response
 - a) Primary & Secondary immune response
 - b) Theories of antibody formation
- Unit II Antigen & Antibodies** (10)
- 2.1 Antigen – Types & factors affecting antigenicity
 - 2.2 Antibody – Basic structure, types, biological properties and functions of Immunoglobulins.
 - 2.3 Antigen antibody reactions: general features and mechanism.
 Types of antigen – antibody reactions: Agglutination test, Precipitation test, Flocculation test, Complement fixation test and ELISA test
- Unit III Clinical Microbiology** (4)
- 3.1 Collection, handling & transportation of specimen.
 - 3.2 Examination of specimen: Microscopic Methods, Cultural Methods, Biochemical Methods & Serological Methods
- Unit IV Pathogenicity –Definition & Concept** (8)
- 4.1 Basic principles of Microbial adhesion
 - 4.2 Mechanism Bacterial invasion
 - 4.3 Bacterial toxins – Types & mechanism of action
- Unit V – Microbial Diseases** (10)
- 5.1 Bacterial Infections - Enteric fever, Staphylococcal Wound infections, urinary tract infections (*P. vulgaris*)
 - 5.2 Fungal infections: Candidiasis
 - 5.3 Viral infection: Dengue fever

Semester – IV
Paper VIII
Applied Microbiology – II

- Unit I – Industrial Microbiology** (12)
1. Definition and scope of Industrial microbiology
 2. Fermentations: Basic concept, Types- Surface culture, submerged culture, Batch, Continuous, Dual and Multiple
 - 3 Design of typical fermentor: Parts & their functions
- Unit II – Industrially important Microorganisms** (9)
- 1 Screening: Primary and Secondary
 2. Strain improvement
 3. Preservation of industrially important microorganisms
- Unit III-1 Specific fermentations** (11)
- Penicillin (*P.chrysogenium*)
 - Alcohol (*S.cerevisiae*)
 - SCP (*S. cerevisiae*)
- 2. Utilization & Recycling of Industrial waste**
- Molasses and Dairy waste
- Unit IV –Biofertilizers: Production & applications – *Azotobactor*, *Rhizobium*** (5)
and Phosphate Solubilising Bacteria
- Unit V - Biopesticides: Production & applications: *B. thuringenes* as an example** (3)

B.Sc.II Microbiology Practical Course

1. Micrometry
2. Stains and Staining Procedures
 - i. Spore Staining
 - ii. Flagella Staining
 - iii. Nuclear material Staining
 - iv. Lipid Staining
3. Preparation of culture media
 - a. Minimal medium
 - b. Wilson and Blairs medium
 - c. MacConkey's Agar
 - d. Gelatin Agar
 - e. Amino Acid Decarboxylation Medium
 - f. Mannitol Salt Agar
 - g. Peptone Nitrate Broth
 - h. Huge and Leifsons Medium
 - i. Amino Acid Deamination medium
 - j. Christensen s agar
4. Biochemical Tests
 - a. Gelatin Hydrolysis
 - b. Amino Acid Decarboxylation
 - c. Amino Acid Deamination
 - d. Urea Hydrolysis
 - e. Nitrate Reduction
 - f. Oxidase
 - g. Huge and Leifsons
5. Effect of environmental factors on microorganisms
 - a. UV light
 - b. Heavy Metals
 - c. Salt Concentration (NaCl)
 - d. pH
 - e. Temperature
 - f. Antibiotics
6. **Primary Screening :**
 - a. Antibiotic Producers – Crowded Plate Technique
 - b. Amylase Producers – Replica Plate Technique
 - c. Protease Producers – Replica Plate Technique

7. Identification of Pathogenic Microorganisms from Clinical Samples
 - a. *Salmonella* spp.
 - b. *Staphylococcus aureus*.
 - c. *Proteus* spp.
8. Determination of Blood Groups – ABO & Rh
9. Widal test (Qualitative)
10. VDRL Test (Qualitative)
11. Glucose Estimation (Benedicts Method).
12. Protein Estimation (Biuret Method).
13. Study of Growth phases of *E.coli* by optical density method.
14. Demonstration of Preparation of Azo-Rhizo Biofertilizers
15. Practicals on Biostatistics –Mean, Mode and Median

Practical Question Paper

Q.1 Identification of Pathogen	20
Q.2 Staining / Micrometry	10
Q.3 Protein / Growth Curve/ Screening	15
Q.4 Screening/ Effects/ Biochemical Tests	15
Q.5 Serology/ Blood Groups	10
Q.6 Spotting	05
Q.7 Biostatistics/ Glucose	05
Q.8 Journal	10
Q.9 Tour Report	10

The practical Examination will be conducted for two (2) successive days for 6 hours.

There will be one batch of maximum 20 students each day.