

**VEER NARMAD SOUTH GUJARAT UNIVERSITY,
SURAT**

DEPARTMENT OF BIOSCENCES

**SYLLABUS FOR
M.SC.-I & II (MICROBIAL SCIENCE)**

Paper V Advanced Cytology and Taxonomy of Microbes
Paper VI Medical Microbiology & Immunology
Paper VII Environmental Microbiology
Paper VIII Industrial Microbiology and Biotechnology

VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT.

MICROBIOLOGY

M.Sc.-II

PAPER - V

Advanced Cytology and Taxonomy of Microbes

Unit I (15 hrs)

- i. Classification of bacteria- various criteria used for classifying bacteria, use of modern technology in classification.
- ii. Salient features of important groups of bacteria viz. Azospirillum, Azotobacter, Rhizobium, Pseudomonas, Enterobacteriaceae, Actinomycetes, Streptomyces, Rickettsiae, Chlamydia, Mycoplasma and Archaeobacteria.

Unit II (15 hrs)

- i. Ultrastructure of a bacterial cell- structure, composition and function of
Cell wall-
 - Gram positive eubacteria
 - Gram negative eubacteria.
 - Archaeobacteria.
- ii. Cell membrane- Eubacteria and Archaeobacteria.
- iii. Capsule, Flagella, Pili, Gas vesicles, Chromosomes, Carboxysomes, Magnetosomes, Polyhydroxybutyrate, Polyphosphate granules.

Unit III (15hrs)

- i. Classification of fungi – General characteristics of major groups of fungi.
Life cycles of selected fungi (Aspergillus, Penicillium, Yeasts)

Unit IV (15 hrs)

- i. Ultrastructure of fungal cell.
- ii. Structure, composition and function of cell organelles.
- iii. Growth of fungi.
- iv. Study of thermophilic fungi Mycorrhiza

Unit V (15 hrs)

- i. Nomenclature and classification of viruses
- ii. Purification and titration of viruses
- iii. Structure of viruses
- iv. Virions and Prions

Unit VI (15hrs)

- i. Modes of viral replication
- ii. Lifecycles of bacterial viruses viz. lambda (λ), M13, Mu, T4 and T7 ϕ X-174.
- iii. Study of plant viruses viz. TMV, Potato virus.
- iv. Study of animal viruses viz SV40, Picorna, Rota, Herpes

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MICROBIOLOGY

M.Sc.-II

PAPER - VI

Medical Microbiology & Immunology

Unit I (15 hrs)

- i. Introduction to immune response
- ii. Antigen characteristics and type
- iii. Immunoglobulin Structure, types and their functions
- iv. Lymphoid organs: primary and secondary organs, their structure and functions.

Unit II (15hrs)

- i. Cells of immune response
- ii. Macrophages, Natural killer cell, granulocytes lymphocytes, T cells and B cells, Accessory cells, properties of cells in terms of surface receptors, surface antigens
- iii. Structure and function of TCR, MHC molecules.

Unit 3 (15hrs)

- i. Role of Interleukins
- ii. Development and differentiation of B-cells
- iii. Theories of antibody synthesis and mechanism of antibody diversity.
- iv. Role of B cells in other type of immune response.

Unit IV (15 hrs)

- i. Development and differentiation of T cells
- ii. Various types of T cells and their functions
- iii. T cell interaction with B cell and its role in antibody synthesis
- iv. Immune tolerance

Unit V (15 hrs)

- i. Immuno regulation
- ii. Transplantation, HLA typing, MHC complex
- iii. Blood group antigens
- iv. Tumor antigens
- v. Interferon
- vi. Monoclonal antibody: Production and application.

Unit VI (15 hrs)

Detail study of some diseases caused by microorganism

- i. Viral diseases: Polio, Hepatitis. AIDS
- ii. Bacterial diseases: Cholera, Typhoid, STD (any one), Tuberculosis
- iii. Fungal diseases: Skin diseases
- iv. Protozoan disease: Malaria

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MICROBIOLOGY

M.Sc.-II

PAPER - VII

Environmental Microbiology

Unit I (12hrs)

- i. Milk microbiology
- ii. Cheese production: Microbiology and biochemistry
- iii. Fermented milk products

Unit II (18hrs)

- i. Recent advances in sewage treatment
- ii. Waste water treatment: Ecology of polluted waters, microbiology of treatment processes.
- iii. Effects of acid deposition on microbial processes in natural waters
- iv. Microbial processes in coastal pollution.

Unit III (15 hrs)

- i. Microbial cells as food (SCP)
- ii. Fermented beverages, beer and wine
- iii. Mushroom cultivation (Edible)
- iv. Genetically modified foods.

Unit IV (15hrs)

- i. Rhizosphere microbiology: Role of microorganism in plant growth, plant disease
- ii. Biological Nitrogen fixation
- iii. Effect of acid rain on soil microbial processes
- iv. Microbial leaching: Mechanism and application
- v. Biofertilizers and Biopesticides

Unit V (15 hrs)

- i. Biological warfare
- ii. Siderophores : Microbial production and its significance
- iii. Biodegradation of cellulose, Hemi cellulose, lignin and pesticides
- iv. Bioremediation of organic contaminants in the subsurface
- v. The importance of genetic exchange in degradation of xenobiotic compounds.

Unit VI (15hrs)

- i. Environmental techniques:
Sampling and enumeration, signature lipid biomarker analysis, isolation of nucleic acids from environmental samples, molecular techniques.

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MICROBIOLOGY

M.Sc.-II

PAPER - VIII

Industrial Microbiology and Biotechnology

Unit I (15hrs)

- i. Screening of biochemically important microorganisms
- ii. Importance of non conventional sources in screening
- iii. Strain improvement ; its importance and strategies
- iv. Maintenance and containment of recombinant organisms
- v. Large scale production using recombinant microorganisms

Unit II (10 hrs)

- i. Raw materials and media formulation
- ii. Sterilization kinetics
- iii. Media and air sterilization
- iv. Batch and continuous sterilization

Unit III (18 hrs)

- i. Batch and continuous fermentation
- ii. Fermentation design
- iii. Types of fermenters
- iv. Aeration and agitation: power number, Reynolds number, mass transfer oxygen transfer kinetics.
- v. Newtonian and non Newtonian fluids
- vi. Scale up

Unit 4 (16 hrs)

- i. Microbial process : screening, strain improvement, production and factors affecting production of penicillin or tetracycline, alkaloid, ethanol and xanthan gum

Unit 5 (16 hrs)

- i. Microbial process : screening, strain improvement, production and factors affecting production of amino acid, vitamins, citric acid

Unit 6 (15 hrs)

- i. Enzyme technology: production, recovery, stability and formulation of amylase, lipase and penicillin acylase.
- ii. Immobilization of enzymes and cells and their applications.