

B.Sc. MICROBIOLOGY SYLLABUS
DDU GORAKHPUR UNIVERSITY, GORAKHPUR

Industrial Microbiology
D. D. U. Gorakhpur University, Gorakhpur
B.Sc. III

B.Sc. II: Three papers and a practical examination as follows:

Paper I: Food Microbiology 50 Marks

Papers II: Fermentation Technology 50 Marks

Papers III: Bio-fertilizers 50 Marks

Paper IV: Immuno-biotechnology, Tissue Culture
and Government regulations 50 Marks

Practical: 100 Marks

Total: 300 Marks

The distribution of marks in practical shall be as follows:

1. Laboratory Practical 75 Marks

2. Entrepreneurship with project report 25 Marks

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PAPER I

FOOD MICROBIOLOGY

1. Food Spoilage:

Representative spoilage process, spoilage of fruits and vegetables, spoilage of meats, spoilage of other foods, Indicators of Human pathogens associated with food

2. Food Preservation Methods:

Asepsis, Filtration and Centrifugation, High temperature, Pasteurization, Canning, Radiation, Low temperature, Desiccation, Anaerobiosis, Controlled atmosphere, Chemical Preservation, Salt and Sugar, Organic acids, Nitrates and Nitrites, Sulphure dioxides, Ethylene oxide, Propenyle oxide, Wood smoke, Antibiotics,.

3. Microbiological Production of Food:

Fermented dairy products, Buttermilk, Sour cream, Indian Foods, Fermented meats, Leavening of Breads, Alcoholic beverages, Vinegar, Beer, Distilled liquor and wines, Fermented vegetables, Pickles, Soya sauce, Single cell protein, Bacterial examination of food.

PRACTICAL ON PAPER I

1. Isolation and identification of microorganisms of spoiled food, fungi and bacteria.
2. Isolation of *Aspergillus flavus* from spoiled food.
3. Identification of mycotoxins from spoiled food.
4. *In vitro* production of aflatoxin by *Aspergillus flavus*.
5. Inhibitory effect of low temperature on microbial growth.
6. Litmus milk reaction
7. Methylene blue test for microbial contamination of milk.
8. Isolation of *Lactobacilli* and *Streptococcus* from curd.

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PAPER II

FERMENTATION TECHNOLOGY

- 1. The Fermentation Industry:**
Selection of industrial microorganisms, Production Process, Fermentation Media, Aeration Agitation, pH, Temperature, Batch versus Continuous culture, Immobilized enzymes, Downstream processing and product recovery.
- 2. Quality Control of Industrial Products**
- 3. Production of Pharmaceuticals:**
Antibiotics, Steroids, Human Proteins, Vaccines, Vitamins.
- 4. Production of organic acids:**
Acetic acid, Citric acid, Lactic acid, Gibberelic acid, Oxalic acid.
- 5. Production of Amino acids:** Lysine, Glutamic acid.
- 6. Production of Enzymes:** Protease, Amylase, Other enzymes, Production of Solvents.
- 7. Production of Fuels:** Ethanol, Methanol, Other Fuels.
- 8. Microbially enhanced recovery of mineral resources:** Bioleaching of metals, Oil recovery.
- 9. Bio-deterioration:** Papers, Woods, Paints, Textiles, Metal corrosion.
- 10. Mushroom Cultivation**

PRACTICAL ON PAPER II

1. Isolation of *Aspergillus niger* from soil.
2. Measurement of production of Citric acid by *Aspergillus niger* by descending paper chromatography.
3. Measurement of microbial production of ethanol.
4. Demonstration of IAA production by soil fungi.
5. Demonstration of cultivation of mushroom.
6. Demonstration for the identification of mushrooms by spore print methods.
7. Demonstration of production of amino acids by soil fungi.

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PAPER III

BIO-FERTILIZERS

1. Symbiotic association:

General accounts about the microbes us as bio-fertilizers, *Rhizobium*-taxonomy, physiology, host-*Rhizobium* interaction, mass cultivation, carrier and base inoculants and serology, *Frankea*.

2. Symbiotic and Non-Symbiotic association:

Azospirillum-rhizosphere competence and host plant interaction, taxonomy, physiology, carrier base inoculants and effect of different microorganisms on plant, crop response to *Azotobactor* inoculums, maintenance and mass cultivation. Cyanobacteria (Blue green algae), *Azolla* and *Anabaena azolli* association, nitrogen fixation, factor affecting growth, blue green algae and *Azolla* in rice cultivation. Types of mycorrhizal associations, VAM mycorrhizal association: taxonomy, occurrence and distribution, phosphorus nutrition, growth and yield, collection of VAM, isolation, stock plants and inoculums production of VAM.

3. Production and quality control in Bio-fertilizers:

Isolation and identification of different nitrogen fixing ability of different strains under controlled and field conditions, direct and indirect methods, culture production, fermenter, storage of culture, carrier, packing, quality control, ISI Standards, inoculums requirements, packing, marketing and storage, inoculums requirements methods of application.

PRACTICAL ON PAPER III

1. Nodulation by *Rhizobium*.
2. Counting of vital number of nodules from legume plant.
3. Isolation of VAM spores from soil sample.
4. Demonstration for the identification of VAM spores.
5. Demonstration for the nitrogen fixing ability of bacteria in different nitrogen medium.
6. Demonstration of cyanobacterial growth for nitrogen fixation and measurement of heterocyst frequency.

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PAPER IV

**IMMUNO-BIOTECHNOLOGY, TISSUE CULTURE AND GOVERNMENT
REGULATION**

1. History and scope of Immunology:

Type of immunity, Physiology of immune response, Antigen-antibody reaction, Immunoglobulins-structure, distribution and function.

2. Production of Vaccines, monoclonal antibodies (Hybridoma Technology), siderophores.

3. Process and products of culture of animal and plant cell: Nature of cell culture, cell growth system, products from cell culture.

4. Biotechnological programmes and regulations:

Role of International organization in Biotechnology, Govt. Programmes for Biotechnology development, Government regulations on recombinant DNA research, Regulation for disposal of bio-hazards materials, patenting biotechnological process and products, Mycotoxins, hazards in the production of microbial products, Health hazards during microbial spoilage: Carcinogenic, mutagenic and teratogenic biological.

PRACTICAL ON PAPER IV

1. Detection of blood groups.
2. Callus formation by root organ culture from egg plant.
3. Estimation of antigen and antibody.
4. Precipitation reaction of antigen and antibody.
5. Effect of physical and chemical mutagens on given microorganism.
6. Change of physiological properties of wild and mutant types.
7. Demonstration of immunity response in animals.