B.Sc. I

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

Paper I: Fundamental of Industrial Microbiology	45 Marks
Papers II: Biostatistics Tools and Technology	45 Marks
Papers III: Microbial Genetics and Molecular Biology	45 Marks
Practical: Including Job Training	65 Marks
	Total: 200 Marks

PAPER I

FUNDAMENTAL OF INDUSTRIAL MICROBIOLOGY

1. General Introduction, History and Development of Microbiology

- Scope of Industrial Microbiology
- Introduction
- Discovery of Microbial world
- The experiments of Pasteur, The discovery of the anaerobic life
- The era of the discovery of antibiotics
- The physiological significance of fermentation

2. Classification, Isolation, characterization and ultra structure of microbes

- Viruses
- Bacteria: Cynobacteria, Eubacteria, Myxobacteria, Rickettsias, Spirochaites, Micoplasmas, Actinomycetes, Archaebacteria
- Algae
- Protozon
- Fungi
- Criteria of identification of microorganisms
- Methods of staining of different microbes

3. Biological and Biochemical fundamentals

- Introduction
- The microorganisms and biotechnology
- Sterilization
- Preparation of media
- Isolation methods and Staining
- Preservation of Microbes
- Serial subculture, preservation with mineral oil
- Lyophilisation
- Principles of storage of microbes at very low temperature or in liquid nitrogen
- Other methods for storage of fungi
- Over production of microbial metabolites
- Preparation of inoculation

4. Fundamental of genetics

- Introduction
- Method for the selection of mutants, direct selection methods for resistant mutants, Penicillin selection technique, replica plating technique, other technique mutant selection, conditional lethality and its use in mutant selection.
- General account about the transfer of genetic information in prokaryotes
- Scope of genetic Engineering

PRACTICAL ON PAPER I

- Preparation of media, Autoclaving and sterilization of glassware, Maintenance of culture room.
- Isolation and maintenance of microbes of different groups;
  a. Bacteria
  b. Algae
  c. Bacteriophage
  d. Fungi
- Single spore culture of *Fusarium*
- Camera Lucida drawing
- Haemocytometer
- Isolation of phytopathogens

PAPER II

BIOSTATISTICS TOOLS AND TECHNIQUES

1. Biostatistics: Basic idea of probability, distribution patterns, normal, binomial and poison distribution, sampling methods mean, mode and media, chi-square statistics analysis of variance transformation, exponential, logarithmic functions.

2. Microscopy: Light microscopy, phase contrast microscopy, florescence and electron microscopy.

3. Chromatographic and Electrophoretic techniques: Basic idea of chromatography, electrophoresis, immune-electrophoresis and iso-elctrofocussing

4. Instruments, basic principles and uses: pH meter, densietometry, fluorimetry, calorimetry, spectrophotometry, manometry, centrifugation.

5. Principal types of fermentations: Fermenter design, differences between biochemical and chemical process, Classification of biochemical reaction rate process, Operational consideration, local condition within a fermenter, fermenter confugaration, the Bach fermenter, continuous stirred rank fermenter, the tubular fermenter, the condensed bed fermenter, solid state fermenter, Computer control fermentation process. Computer hardware and software, Hardware graphics, Lotus and das, Computer application in fermentation technology. Justification and Planning

PRACTICAL ON PAPER-II

1. Biostatistics: Problems on chi-square test, Problems on mean, mode and median
2. Protein estimation by colorimeter with folin ciocoltura reagent
3. Estimation of reducing sugars by colorimeter
4. Paper chromatographic separation of amino acid and pigments by one way descending
5. Paper chromatographic separation of sugars
6. Paper chromatographic separation of organic acids
7. Measurement of pH of fruits juice by pH meter
8. Demonstration of electrophoretic separation of proteins

PAPER III

MICROBIAL GENETICS AND MOLECULAR BIOLOGY

1. **Nucleic acid:**

   DNA as a genetic material, structure of DNA, RNA, DNA replication (conservative and semi-conservative replication, conformational flexibility of DNA), Replication of Eukaryotes. The Genetic codes, central dogma, reverse transcriptase, gene transcription polymerases, transcription product of DNA, t-RNA, mRNA. Synthesis of RNA in eukaryotes and prokaryotes, Catabolite effect, Operators and repressors, post transcriptional processing of RNA.

2. **Protein Synthesis:**

   Translation and protein synthesis in eukaryotes and prokaryotes, t-RNA synthetase, activation of amino acid, inhibitors of protein synthesis. Gene expression catabolite repression, regulation of gene expression, Operon concept $_{C}$AMP, catabolite activator protein (CAP), positive and negative control and gene expression in prokaryotes, Lac operon, Britten-Davidson model of gene regulation in eukaryotes.

3. **Mutagenesis and Gene Mutations:**

   Induced mutation, molecular mechanism of mutation, forward and reverse mutation, transition-transverson, Mutation frequency, applications of mutations.

4. **Genetic recombination in bacteria:**

   Transformation, transduction, Conjugation. Use of transformation, transduction and conjugation in genetic mapping.

5. **Basic idea of extra-chromosomal genetic material:**

   Plasmids, Cosmids, Transposons, Insertion sequence, Overlapping Genes, Silent genes, Exon and Intron, Evolutionary significance of silent genes, Basic of recombinant RNA and recombinant DNA Technology.

PRACTICAL ON PAPER –III

1. Isolation of antibiotics resistant bacteria
2. Replica plate technique for isolation of mutants
3. Measurement of mutation frequency in bacteria
4. Mutant isolation by gradient plate technique
5. Isolation of DNA and RNA
7. Effect of UV light on mutation frequency in bacteria.