**M.Sc. Microbiology**
**Semester-II**
**Paper: Molecular Biology and Recombinant DNA Technology**

**Code: MMB 201**

**Unit-I:** Genetic code, Universality of codons, Central dogma, transcription, reverse transcriptase exo and endo nucleases, RNA polymerases, synthesis of RNA in eukaryotes and prokaryotes, operators, exon and introns, post transcriptional processing of RNA.

**Unit-II:** Translation (protein synthesis) in eukaryotes and prokaryotes, t-RNA synthetase, activation in amino-acids, inhibitors of protein synthesis. Protein folding, Proof reading, wobble effect.

**Unit-III:** Gene expression, regulation of gene expression, Operon concept, catabolite activator protein (CAP), positive and negative control and gene expression in prokaryotes, Lac Operon and Tryptophan Operon, Britton-Davidson model of gene regulation.

**Unit-IV:** Extra chromosomal genetic material, types of plasmids, overlapping genes, Transposons and Silent genes, evolutionary significance of Silent genes, Ribonucleoprotein.

**Unit-V:** Basics of recombinant DNA technology- Vectors used in recombinant technology (Plasmids, phages, cosmids, phagemids, BAC YAC), Genomic and c-DNA Library, Applications of recombinant DNA technology.

**REFERENCE BOOKS**

MOLECULAR BIOLOGY: DAVID FREIFELDER

**M.Sc. Microbiology**
**Semester-II**
**Paper Biostatistics and Computer Application**

**Code: MMB 202**

**UNIT-I**
Importance and scope of statistics in biochemical experimentation; Elements of Probability- Mathematical and Statistical definitions; Addition and Multiplication theorems; Probability Distribution Functions – Binomial, Poisson and Normal; Area under normal distribution curve.

**UNIT-II**
Measures of central tendency: Arithmetic, geometric & harmonic means; Measures of dispersion: range, quartile deviation, variance, standard deviation, coefficient of variation, confidence limits of population mean. Tests of significance hypotheses and errors; student t statistics- population mean equals a specified value; equality of 2 independent means ( equal & unequal variance), equality of 2 means ( paired samples).

**UNIT-III**
Analysis of variance: one-way analysis (sample sizes equal and unequal), completely randomized design; two-way analysis (one observation per cell), randomized block design; multiple comparisons: least significant difference, Duncan's new multiple range test.

**UNIT-IV**
Linear regression: regression diagram and equation, regression coefficient, standard error, significant tests, prediction of dependent variable from the independent variable; linear correlation- scatter diagram, correlation coefficient, standard error, significance tests; relationship between regression and correlation coefficients; Non parametric tests: Chi-square statistics, test of goodness of fit, test of independence of attributes; standard line interpolation.

**UNIT-V**
Introduction to Computers: Basic architecture, generations of computer hardware and software; operating systems-WINDOWS and UNIX; system and application software; introduction to internet- LAN, MAN, WAN, Concept of bioinformatics; application of bioinformatics in microbiology.

**Reference Books**


| | | |
|---|---|---|
| Biostatistics | : | BL Agarwal |
| Principle of Statistics | : | SM Shukla and Sahai |

**M.Sc. Microbiology**
**Semester-II**
**Paper: Microbial Genetics**
**Code: MMB 203**

**Unit-I:** DNA as genetic material, Structure of DNA and RNA, DNA replication (Conservative and semi conservative replication), DNA polymerases, conformational flexibility of DNA, structure of chromosome of eukaryotes, giant chromosomes, satellite chromosomes.

**Unit-II:** Genetic recombination in bacteria transformation, transduction and conjugation. Use of transformation, transduction and conjugation in genetic mapping, Preparation of genetic maps.

**Unit-III:** Sequencing of nucleic acid (Sanger's and Maxam and Gilbert's Method), Genetic recombination and its prospects.

**Unit-IV:** Mutation: Molecular mechanism of mutation, forward and reverse mutation, transition, transversion, Spontaneous and induced mutation through physical, chemical and radiations, base analogs, Conditional, permissive, lethal mutations, mutation frequency, application of mutagenesis.

**Unit-V:** Repair mechanisms, Enzymology of repair mechanism dark repair, post-transcriptional repair, photoreactivation repair and SOS repair.

**REFERENCE BOOKS**

A TEXT BOOK OF MICROBIOLOGY: RC Dubey and DK Maheshwari
PRINCIPLES OF GENETICS: M. J. Gardner

**M.Sc. Microbiology**
**Semester-II**
**Paper: Microbial Metabolism**
**Code: MMB 204**

**UNIT-I**
Microbial growth: mathematical expression of growth, growth measurement, efficient growth curve, synchronous growth and continuous culture, effect of environmental factors on microbial growth, nutrients diffusion, active transport, group translocation, solutes, temperature, oxygen relations.

**UNIT-II**
Chaemolithotrophy: Sulphur, iron, hydrogen, carbon monoxide, nitrogen oxidations.
Methanogenesis, luminescence. Brief account of photosynthetic and accessory pigmentschlorophyll, bacteriochlorophyll, carotenoids, oxygenic, anoxygenic photosynthesis. Electron transport- photoautotrophic generation of ATP, fixation of CO2- Calvin cycle, reverse TCA, carbohydrate anabolism.

**UNIT-III**
Respiratory metabolism: Embden Mayer Hoff pathway, Entner Doudroff pathway, glyoxalate pathway, Krebs cycle, oxidative and substrate level phosphorylation, Pasteur effect, fermentation of carbohydrates-homo and heterolactic fermentations. Synthesis of polysaccharides-gluconeogenesis and other pathways.

**UNIT-IV**
Assimilation of nitrogen: Dinitrogen - nitrate nitrogen-ammonia- denitrification, synthesis of major amino-acids, polyamines; peptidoglycan-biopolymers as cell components.

**UNIT-V**
Microbial development, sporulation and morphogenesis, hyphae vs. yeast forms and their significance. Multicellular organization of selected microbes. Dormancy. Endospore-structure, properties and germination.

**Reference Books**

A TEXT BOOK OF MICROBIOLOGY: RC DUBEY AND DK MAHESHWARI