

**B.Sc MICROBIOLOGY (CBCS) SYLLABUS**  
**SECOND YEAR – SEMESTER- III**

**3-3-115**

**MBT- 301 MICROBIAL GENETICS AND MOLECULAR BIOLOGY**

**TOTAL HOURS:48**

**CREDITS: 4**

**UNIT-I**

**No. of hours: 10**

DNA and RNA as genetic material.  
Structure and organization of prokaryotic DNA.  
Extrachromosomal genetic elements – Plasmids and transposons.  
Replication of DNA – Semi conservative mechanism, Enzymes involved in replication.

**UNIT-II**

**No. of hours: 10**

Mutations – spontaneous and induced, base pair changes, frame shifts, deletions, inversions, tandem duplications, insertions.  
Mutagens - Physical and Chemical mutagens.  
Outlines of DNA damage and repair mechanisms.  
Genetic recombination in bacteria – Conjugation, Transformation and Transduction.

**UNIT-III**

**No. of hours: 10**

Concept of gene – Mutton, Recon and Cistron. One gene one enzyme and one gene one polypeptide hypotheses.  
Types of RNA and their functions.  
Genetic code.  
Structure of ribosomes.

**UNIT-IV**

**No. of hours: 8**

Types of genes – structural, constitutive, regulatory  
Protein synthesis – Transcription and translation.  
Regulation of gene expression in bacteria – *lac* operon.

**UNIT-V**

**No. of hours: 10**

Basic principles of genetic engineering.  
Restriction endonucleases, DNA polymerases and ligases.  
Vectors.  
Outlines of gene cloning methods.  
Polymerase chain reaction. Genomic and cDNA libraries.  
General account on application of genetic engineering in industry, agriculture and medicine.

## **MBP- 301 MICROBIAL GENETICS AND MOLECULAR BIOLOGY**

**TOTAL HOURS: 48**

**CREDITS: 2**

1. Study of different types of DNA and RNA using micrographs and model / schematic representations
2. Study of semi-conservative replication of DNA through micrographs / schematic representations
3. Isolation of genomic DNA from *E. coli*
4. Estimation of DNA using UV spectrophotometer.
5. Resolution and visualization of DNA by Agarose Gel Electrophoresis.
6. Resolution and visualization of proteins by Polyacrylamide Gel Electrophoresis (SDS-PAGE).
7. Problems related to DNA and RNA characteristics, Transcription and Translation.
8. Induction of mutations in bacteria by UV light.
9. Instrumentation in molecular biology – Ultra centrifuge, Transilluminator, PCR

### **SUGGESTED READING**

Crueger, W. and Crueger, A. (2000). **Biotechnology: A Text Book of Industrial Microbiology**, PrenticeHall of India Pvt. Ltd., New Delhi.

Freifelder, D. (1990). **Microbial Genetics**. Narosa Publishing House, New Delhi.

Freifelder, D. (1997). **Essentials of Molecular Biology**. Narosa Publishing House, New Delhi.

Glazer, A.N. and Nikaido, H. (1995). **Microbial Biotechnology – Fundamentals of Applied Microbiology**, W.H. Freeman and company, New York.

Glick, B.P. and Pasternack, J. (1998). **Molecular Biotechnology**, ASM Press, Washington D.C., USA.

Kannan, N. (2003). **Hand Book of Laboratory Culture Medias, Reagents, Stains and Buffers**. Panima Publishing Co., New Delhi.

Lewin, B. (2000). **Genes VIII**. Oxford University Press, England

Maloy, S.R., Cronan, J.E. and Freifelder, D. (1994). **Microbial Genetics**, Jones and Bartlett Publishers, London.

Nicholl, D.S.T. (2004). **An Introduction to Genetic Engineering**. 2 nd Edition. Cambridge University Press, London.

Old, R.W. and Primrose, S.B. (1994) **Principles of Gene Manipulation**, Blackwell Science Publication, New York.

Ram Reddy, S., Venkateswarlu, K. and Krishna Reddy, V. (2007) **A text Book of Molecular Biotechnology**. Himalaya Publishers, Hyderabad.

Sinnot E.W., L.C. Dunn and T. Dobzhansky. (1958). **Principles of Genetics**. 5 th Edition. McGraw Hill, New York.

Smith, J.E. (1996). **Biotechnology**, Cambridge University Press.

Snyder, L. and Champness, W. (1997). **Molecular Genetics of Bacteria**. ASM press,  
Strickberger, M.W. (1967). **Genetics**. Oxford & IBH, New Delhi.

Turner, P.C., McLennan, A.G., Bates, A.D. and White, M.R.H. (1998). **Instant Notes in Molecular Biology**, Viva Books Pvt., Ltd., New Delhi.

Twynan, R.M. (2003). **Advanced Molecular Biology**. Viva books Pvt. Ltd. New Delhi.

Verma, P.S. and Agarwal, V.K. (2004). **Cell Biology, Genetics, Molecular Biology, Evolution and Ecology**. S. Chand & Co. Ltd., New Delhi.  
Washington, D.C., USA.

**SUBJECT:: B.Sc., MICROBIOLOGY (CBCS) MODEL QUESTION PAPER**  
**SECOND YEAR – SEMESTER III**  
**MBT-301 : MICROBIAL GENETICS AND MOLECULAR BIOLOGY**

**Time 3 hrs Max marks -75**

**SECTION-A**

**I ANSWER ANY FIVE OF THE FOLLOWING 5 x 5 M= 25 marks**

**Draw labeled diagrams wherever necessary**

1. Z-DNA structure
2. Define plasmid
3. Tandem duplication
4. Define Transduction
5. Role of Nitrous acid
6. t-RNA structure
7. Functions of Stop codon
8. Structure of ribosome

**SECTION- B**

**II ANSWER ANY FIVE OF THE FOLLOWING 5 x 10 M= 50 marks**

**Draw labeled diagrams wherever necessary**

9. a) Write about Transposons and their function in detail.  
Or  
b) Differentiate the function of DNA and RNA.
10. a) Write the Semi conservative mechanism of DNA replication.  
Or  
b) List out the Physical mutagens and write their effect on mutagenesis.
11. a) Differentiate the mechanism of Conjugation and Transformation in genetic recombination of bacteria.  
Or  
b) Explain One gene and One enzyme hypothesis in detail.
12. a) What is Genetic code? Discuss in detail about various genetic codes in prokaryotes.  
Or  
b) Explain the mechanism of regulation of gene express in bacteria in related to *lac-operon*.
13. a) Discuss the basic principles of Genetic engineering with suitable examples.  
Or  
b) What is PCR ? Explain the principle and application of PCR in genetic engineering.