



Telangana University

Syllabus of Bachelor of Science (B.Sc) Biotechnology – I Year

Paper I – Cell Biology and Genetics

Unit I Cell Structure, Function and Cell Division (30 hours)

- 1.1 Cells as basic units of living organisms Viral, bacterial, fungal, plant and animal cells
- 1.2 Ultra structure of prokaryotic cell (Cell membrane, plasmids)
- 1.3 Ultra structure of eukaryotic cell (Cell wall, cell membrane, mitochondria, chloroplast, endoplasmic reticulum, Golgi apparatus, vacuoles).
- 1.4 Chromosome organization in Prokaryotes and Eukaryotes
- 1.5 Structure of specialized chromosomes (Polytene and Lamp Brush)
- 1.6 Cell Division and Cell Cycle
- 1.7 Significance of mitosis and meiosis

Unit II Mendel's Laws and Mechanism of Inheritance (30 hours)

- 2.1 Mendel's experiments – Factors contributing to success of Mendel's experiments
- 2.2 Law of segregation – Monohybrid ratio
- 2.3 Law of Independent assortment – Dihybrids, Trihybrids
- 2.4 Deviation from Mendel's Laws - partial or incomplete dominance, co-dominance
- 2.5 Penetrance and expressivity, pleiotropism
- 2.6 Epistatic gene interaction – Modified dihybrid ratios (12:3:1; 9:7; 15:1; 9:3:4:, 9:6:1; 13:3)
- 2.7 Genes and environment – phenocopies
- 2.8 Linkage and recombination – Discovery of linkage, cytological proof of crossing over
Recombination frequency and map distance Interference and coincidence Mitotic crossing over in Drosophila

2.9 Mechanism of sex determination-genic balance theory - Drosophila Homogametic and Heterogametic theory (Human, Mamalian, Birds)

2.10 X – linked inheritance (eg. Haemophilia)

Unit III Structure and Function of Nucleic Acids (30 hours)

3.1 DNA as the genetic material – Griffiths experiments on transformation in Streptococcus pneumoniae. Avery, McEleod and Mc Carty’s experiments. Hershey – Chase experiments with radio-labelled T2 bacteriophage

3.2 RNA as genetic material – Tobacco Mosaic Virus

3.3 Structure of DNA – Watson and Crick Model Forms of DNA – A, B and Z forms of DNA, Super coiled and related DNA – Role of topoisomerases

3.4 DNA Replication – Models of DNA replication (Semi-conservative, non-conservative models) Mechanisms of DNA replication – Linear and circular – Rolling circle and theta mechanism of replication

3.6. DNA damage and Repair

Unit IV Concepts of Biostatistics and Bioinformatics (30 hours)

4.1 Concept of probability, basic laws and its application to Mendelian segregation. Concept of probability distribution. Binomial and Poisson distributions, Normal distribution and their application to biology

4.2 Concept of sampling and sampling distribution. Concept of test of hypothesis. Applications of t-test statistics to biological problems/data: Chi-square, statistic applications in biology

4.3 Simple Regression and Correlation. Concept of analysis of variance (one-way classification).

4.4 Introduction to Bioinformatics Biological Databases – Nucleotide sequence and Protein databases, their utilization in Biotechnology, Storage of biological data in databanks, data retrieval from databases and their utilization

Bachelor of Science (B.Sc) Biotechnology – I Year

Practicals paper- I Cell Biology and Genetics

Practicals

1. Monohybrid and dihybrid ratio in *Drosophila*/maize
2. Estimation of DNA by diphenylamine method
3. Estimation of RNA by orcinol method
4. Preparation of different stages of Mitosis and Meiosis
5. Types of chromosomes
6. Finding statistical significance of a given data using 't' test
7. Graphical representation of data (Histograms, frequency polygen, Pie diagram)
8. Fitting of binomial and Poisson distributions
9. Acquaintance with the Biological databases through Internet

Recommended Books

1. Biometry - By Sokal and Rohlf W.H. Freeman
2. Fundamentals of Biometry - By L.N. Balaram (George Allen and Unwin Ltd, London (1972))
3. Biostatistics - By N.T.J. Bailey
4. Biostatistics- Manual of biostatistical methods for use in health, nutrition and Anthropology - By K. Visweshwar Rao (Jaypee Publications).
5. Genetics - By Gardner (Macmillan Press)
6. An introduction to Genetic Analysis - By Griffith and others – Freeman and Company
7. Bioinformatics and Bioprogramming in C - By L.N. Chavali
8. Cell Biology - By S.C. Rastogi (New Age International (P) Ltd)

9. Statistical Genetics – Principles and Practice - By Prem Narain
10. Biotechnology - By K. Trehan
11. Biotechnology –1 - By R.S. Setty and G.R. Veena
12. Biotechnology – II - By R.S. Setty and V. Sreekrishna
13. Fundamentals of Genetics – By B.D. Singh, N. Pratibha, P.H. Rao and P.B. Kavi Kishor
13. Genetics - By B.D. Singh
14. Genetics - By Mohan P. Arora, Gurdarshan and S. Sandhu
15. Introduction to Bioinformatics - By V. Kothekar
16. An Introduction to Kothekar - By V. Kothekar and T. Nandi
17. Introduction to Bioinformatics - By Arthur M. Lesk
18. Cell and Molecular Biology - By De Robertis
19. Cell and Molecular Biology - By Lodish
20. Cell Biology and Genetics - By P.K. Gupta
21. Theory and Problems in Genetics- By Stransfield
22. Introduction to Bioinformatics- By T.K. Attwood, D.J. Parry-Smith, Samiron Phukan (Pearson Education)
23. Introduction to Biotechnology- By W.J. Thieman and M.A. Palladino (Pearson Education)
24. Discovering Genomics, Proteomics and Bioinformatics- By A.M. Campbell and L.J. Heyer (Pearson Education)
25. The World of the Cell- By Becker (Pearson Education)
26. Concepts of Genetics- By Klug (Pearson Education)
27. Genetics - By Strickberger (Pearson Education)
28. Fundamental Concepts of Bioinformatics- By Krane (Pearson Education)
29. Fundamentals of Biostatistics- By Khan and Khanum (Ukaaz Publications)
30. Basic Concepts of Bio informatics- By Irfan Ali Khan and Atiya Khanum (Ukaaz Publications)