

**Model Syllabus for 4-Year UG Honours in B.Sc. (Biotechnology) as Major
in consonance with Curriculum framework w.e.f. AY 2026-27**

COURSE STRUCTURE (for Semester IV)

Year	Semester	Course	Title of the Course	No. of Hrs /Week	No. of Credits
II	IV	8	Bioinformatics, Biostatistics & Bioethics	3	3
			Bioinformatics, Biostatistics & Bioethics- Practical	2	1
		9	Basics of Plant Biotechnology	3	3
			Basics of Plant Biotechnology-Practical	2	1
		10	Basics of Animal Biotechnology	3	3
			Basics of Animal Biotechnology-Practical	2	1

SEMESTER - IV

COURSE 8: BIOINFORMATICS, BIOSTATISTICS & BIOETHICS

Theory

Credits: 3

3 hrs/week

Course Objectives:

1. To introduce the scope of bioinformatics and its role in biological research.
2. To provide knowledge of genomics, proteomics, and systems biology concepts.
3. To familiarize students with databases, BLAST, drug design, and phylogenetic tools.
4. To train students in statistical methods for data collection, analysis, and interpretation.
5. To create awareness about bioethics, biosafety, and intellectual property rights in biotechnology.

Learning Outcomes:

After successful completion of this course, students will be able to:

1. Explain the fundamentals of bioinformatics and its applications.
2. Use biological databases, BLAST, and computational methods in biotechnology research.
3. Apply statistical tools like central tendency, probability, and hypothesis testing.
4. Perform tests such as t-test, ANOVA, chi-square, correlation, and regression for biological data.
5. Demonstrate understanding of bioethical issues, biosafety practices, and intellectual property rights.

Syllabus

Unit – I

Scope of computers in biological research. Introduction to Bioinformatics: definition, nature and scope of bioinformatics. Bioinformatics versus computational biology. Concept of genomics and proteomics. Branches of Bioinformatics.

Unit – II

Basic concepts of systems biology. Types of databases and their applications in biotechnology. Sequence similarity search using BLAST. Overview of computer-aided drug design. Computational phylogenetics (PHYlip) and its applications.

Unit – III

Data collection and measurement of central tendency (mean, median and mode). Dispersion (standard error and standard deviation). Probability and distribution (Poisson and binomial distributions. Normal distribution).

U. Jayasir

Unit – IV

Population and sampling, test of significance, and test of hypothesis. Student t-test for small samples. ANOVA and chi-square test for analysis. Correlation and regression.

Unit – V

Bioethics in human and animal experimentation, cloning and stem cell research. Animal rights and welfare. Biosafety -Introduction to biological safety cabinets and biosafety levels. Primary containment for biohazards and strategies for their management (GLP, GMP). Intellectual Property Rights (IPRs).

Reference Books

1. Mount, D.W. (2004). *Bioinformatics: Sequence and Genome Analysis*. 2nd Edition, Cold Spring Harbor Laboratory Press.
2. Lesk, A.M. (2017). *Introduction to Bioinformatics*. 5th Edition, Oxford University Press.
3. Rastogi, S.C., Mendiratta, N. & Rastogi, P. (2019). *Bioinformatics: Methods and Applications*. 5th Edition, PHI Learning Pvt. Ltd.
4. Gupta, S.P. (2012). *Statistical Methods*. 43rd Edition, Sultan Chand & Sons.
5. Bailey, N.T.J. (1995). *Statistical Methods in Biology*. 3rd Edition, Cambridge University Press.
6. Beauchamp, T.L. & Walters, L. (2008). *Contemporary Issues in Bioethics*. 7th Edition, Cengage Learning.
7. Singh, B.D. (2012). *Biotechnology: Expanding Horizons*. Kalyani Publishers.

Ch. Jan Jasishu

SEMESTER - IV

COURSE 8: BIOINFORMATICS, BIOSTATISTICS & BIOETHICS

Practical

Credits: 1

2 hrs/week

Practical Component:

1. Mean, Median, Mode
2. Standard deviation, Standard error
3. Testing of hypotheses regarding population mean
4. Testing of hypotheses about the difference between population means
5. Chi-square test
6. Testing of Correlation Coefficient
7. Fitting of simple linear regression
8. ANOVA
9. Sequence retrieval (protein and gene) from NCBI
10. Similarity search using BLASTN, BLASTP
11. Structure download (protein and DNA) from PDB

Ch. Jayarash

4- Year UG Honours, Major
Syllabus
(2026-27)
Semester-IV

Model Question Paper

Time : 3hrs

Marks:75

Part-A

Answer any Five Questions. Each Question carries 3 Marks.

5x3=15

- 1.
- 2.
- 3.
- 4.
- 5.
- 6.
- 7.
- 8.
- 9.
- 10.

Answer the following questions. Each question carries 12 Marks

5x12=60

11. a) Unit-I
(Or)
b) Unit-I

12. a) Unit-II
(Or)
b) Unit-II

13. a) Unit-III
(Or)
b) Unit-III

14. a) Unit-IV
(Or)
b) Unit-IV

15. a) Unit-V
(Or)
b) Unit-V