

**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 10: BASICS OF ANIMAL BIOTECHNOLOGY

Theory

Credits: 3

3 hrs/week

Course Objectives:

1. To provide knowledge about the scope, importance, and laboratory requirements for animal cell culture.
2. To introduce students to various animal cell culture techniques and their applications.
3. To understand the role of stem cells and tissue engineering in regenerative medicine and organ culture.
4. To study transgenic animal production methods, cloning, and reproductive biotechnologies.
5. To explore applications of animal biotechnology in molecular farming, pharmaceuticals, and disease models, while addressing ethical and biosafety issues.

Learning Outcomes:

After completing this course, students will be able to:

1. Explain the principles of animal cell culture, media composition, and growth requirements.
2. Perform and differentiate between primary, secondary, continuous, and suspension cell cultures, including preservation and contamination control.
3. Analyze the applications of stem cells, scaffolds, and bioreactors in tissue engineering.
4. Describe the production of transgenic animals, animal cloning techniques, and reproductive biotechnology methods.
5. Evaluate the applications of animal biotechnology in health, pharmaceuticals, livestock improvement, and discuss related ethical and biosafety concerns.

Syllabus

Unit I

Animal Cell Culture: Scope and importance of animal biotechnology. Laboratory organization, and Equipment required. Composition and Types of Animal Cell Culture Media (BSS, RPMI-1640). Role of carbon dioxide, serum, and growth factors in cell culture. Application of antibiotics and growth supplements

Unit II

Cell Culture Techniques: Primary culture, secondary culture, continuous cell lines, and suspension cultures. Sub-culturing, cytotoxicity and cell viability assays. Contamination in cell culture and control measures, cryopreservation methods

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Unit III

Stem Cells and Tissue Engineering: Embryonic and adult stem cell culture and its application. Biocompatible Materials and their applications for Scaffolds preparation used in Organ culture and 3D culture models. Bioreactors for large-scale animal cell culture

Unit IV

Transgenic Technology: Transgenic animal production methods – microinjection, viral vectors. Animal cloning techniques – nuclear transfer, case studies (e.g., Dolly). Invitro fertilization in livestock. Gene targeting, gene silencing, and knock-out techniques

Unit V

Applications of Animal Biotechnology: Molecular Farming: Hormone production in livestock, Production of vaccines and pharmaceutical compounds. Role of animal models in disease diagnosis and treatment. Ethical, regulatory and biosafety issues in animal biotechnology

Reference books:

1. Freshney, R.I. (2015). *Culture of Animal Cells: A Manual of Basic Technique and Specialized Applications*. 7th Edition, Wiley-Blackwell.
2. Masters, J.R.W. (2000). *Animal Cell Culture: Practical Approach*. 3rd Edition, Oxford University Press.
3. Butler, M. (2004). *Animal Cell Culture and Technology*. 2nd Edition, Taylor & Francis.
4. Davis, J.M. (2011). *Animal Cell Culture: Essential Methods*. Wiley-Blackwell.
5. Glick, B.R., Pasternak, J.J. & Patten, C.L. (2010). *Molecular Biotechnology: Principles and Applications of Recombinant DNA*. 4th Edition, ASM Press.
6. Singh, B.D. (2015). *Biotechnology: Expanding Horizons*. Kalyani Publishers.
7. Portner, R. (2007). *Animal Cell Biotechnology: Methods and Protocols*. Humana Press.

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SEMESTER - IV

COURSE 10: BASICS OF ANIMAL BIOTECHNOLOGY

Practical

Credits: 3

3 hrs/week

Practical Component:

1. Cell count by haemocytometer.
2. Establishing primary cell culture of chicken embryo fibroblasts.
3. Animal tissue culture– maintenance of established cell lines.
4. Animal tissue culture– virus cultivation.
5. Estimation of cell viability by dye exclusion (Trypan blue).

Chiranjeev

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