Course Code				**23ZOMAL233**			
Title of the Course				**Animal Biotechnology**			
Offered to:				B.Sc. Hons Zoology			
L	**4**	**T**	**0**	**P**	**0**	**C**	**3**
Year of Introduction:		**2024-25**		**Semester:**			**3**
Course Category:		**MAJOR**		**Course Relates to:**		GLOBAL	
Year of Introduction:		**2024**		**Percentage:**		**NA**	
Type of the Course:				Employability and skill development			
Crosscutting Issues of the Course :				**Gender**			
Pre-requisites, if any				Introduction to recombinant DNA technology			

Course Description:

Animal biotechnology is a branch of biotechnology in which molecular biology techniques are used to genetically engineer animals in order to improve their suitability for agriculture, industrial and pharmaceutical applications.

Advances in animal biotechnology have been facilitated by recent progress in sequencing animal genomes, gene expression and metabolic profiling of animal cells. Genome editing technologies (Zinc Finger Nucleases, and CRISPR-Cas systems) have opened up new opportunities to easily create genetic variations in animals that can improve their health and well-being, agricultural production, and protection against diseases.

Course Aims and Objectives:

S.NO	COURSE OBJECTIVES
1	To provide knowledge on animal cell and tissue culture and their preservation To understand principles of animal culture, media preparation.
2	To empower students with latest biotechnology techniques like stem cell technology, genetic
3	To explain in vitro fertilization, embryo transfer technology and other reproduction manipulation methodologies.
4	To get insight in applications or recombinant DNA technology in agriculture, production of therapeutic proteins
5	To understand principles of animal culture, media preparation.

Course Outcomes

At the end of the course, the student will be able to…

CO NO	COURSE OUTCOME	BTL	PO	PSO
CO1	Get knowledge of the Vectors and Restriction enzymes used in biotechnology	**K1**	**2**	1
CO2	Describe the gene delivery mechanism and PCR technique	**K1**	**2**	1
CO3	Acquire basic knowledge on media preparation and cell culture techniques	**K1**	**2**	1
CO4	Understand the manipulation of reproduction with the application of biotechnology	**K2**	**2**	1
CO5	Understand the applications of Biotechnology in the fields of industry and agriculture including animal cell/tissue culture, stem cell technology and genetic engineering.	**K2**	**2**	1

For BTL: K1: Remember; K2: Understand; K3: Apply; K4: Analyze; K5: Evaluate; K6: Create

CO-PO MATRIX									
CO NO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PSO1**	**PSO2**
CO1		**2**						**2**	
CO2		**2**						**2**	
CO3		**2**						**2**	
CO4		**2**						**2**	
CO5		**2**						**2**	

Use the codes 3, 2, 1 for High, Moderate and Low correlation Between CO-PO-PSO respectively

Course Structure:

Unit – 1 : (12Hrs)

1.1 Over view of recombinant DNA technology Restriction enzymes modification systems: Types I, II and III.

1.2 Mode of action, nomenclature, applications of Type II restriction enzymes in genetic engineering

1.3 DNA modifying enzymes and their applications: DNA polymerases. Terminal deoxynucleotidyl transferase, kinases and phosphatases, and DNA ligases

1.4 Cloning Vectors: Plasmid vectors: pBR and pUC series, Bacteriophage lambda and M13 based vectors, Cosmids, BACs, YACs, PCR: Basics of PCR.

https://microbenotes.com/recombinant-dna-technology-steps-applications-and-limitations/

https://microbenotes.com/cloning-vectors/

Applications:

Assignment 1: Explain different types of restriction enzymes

Assignment 2: Explain different enzymes in DNA modification

Activity 1: Discussion about various cloning vectors and plasmids with examples

UNIT- II: (12Hrs)

2.1 Gene delivery: Microinjection, electroporation, biolistic method (gene gun), liposome and viral mediated delivery

2.2 Selection of recombinant DNA, Screening blue white Screening

2.3 DNA Sequencing: Sanger's method of DNA sequencing- traditional and automated sequencing

2.4 Hybridization techniques: Southern, Northern and Western blotting.

https://byjus.com/biology/difference-between-electroporation-and-microinjection/

https://microbenotes.com/pcr-principle-enzymes-steps-types-uses/

https://www.khanacademy.org/science/ap-biology/gene-expression-and-regulation/biotechnology/a/dna-sequencing

https://byjus.com/neet/difference-between-northern-southern-and-western-blotting/

Applications:

Assignment 1: Prepare PPT on PCR and it's applications

Assignment 2: seminar on Blotting techniques

UNIT-III: (12Hrs)

3.1 Natural and Synthetic Cell cultures: primary culture, secondary culture, continuous cell lines

3.2 Organ culture; Cryopreservation of cultures.

3.3 Hybridoma Technology: Cell fusion, Production of Monoclonal antibodies (mAb), Applications of mAb

3.4 Stem cells: Types of stem cells, applications

https://microbenotes.com/animal-cell-culture/

https://www.geeksforgeeks.org/cryopreservation/

https://www.news-medical.net/life-sciences/Monoclonal-Antibodies.aspx

https://byjus.com/biology/stem-cells

Applications:

Assignment 1: Prepare PPT on Cryopreservation techniques

Assignment 2: prepare PPT on Hybridoma technology

UNIT-IV: **(12Hrs)**

4.1 Manipulation of reproduction in animals: Artificial Insemination, In vitro fertilization

4.2 Manipulation of reproduction in animals: Super ovulation, Embryo transfer, Embryo cloning

4.3 Transgenic Animals: Strategies of Gene transfer;

4.4 Transgenic - sheep, - fish; applications

https://www.biologydiscussion.com/reproductive-technology/artificial-breeding-of-animals-4-approaches/10049

https://www.davuniversity.org/images/files/study-material/transgenic%20animal.pdf

UNIT-V: (12Hrs)

5.1 DNA fingerprinting

5.2 Application of biotechnology in fisheries – monoculture in fishes, polyploidy in fishes

5.3 Gene therapy-application

https://bio.libretexts.org/Bookshelves/Microbiology/Microbiology_Laboratory_Manual_(Hartline)/01%3A_Labs/1.32%3A_DNA_Fingerprinting

https://ecoursesonline.iasri.res.in/mod/page/view.php?id=90604

Applications

Assignment 1: Prepare PPT on DNA finger printing

Assignment 2: Prepare PPT on applications of Biotechnology in various disciplines

Text Books:

1. P.K. Gupta: Biotechnology and Genomics, Rastogi publishers (2003).

References:

1. Sambrook J and Russell D. (2001). Molecular Cloning-A Laboratory Manual. 3rd edition. Cold Spring Harbor Laboratory Press
2. Wiley JM, Sherwood LM and Woolverton CJ. (2008). Prescott, Harley and Klein's Microbiology. McGraw Hill Higher Education

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SEMESTER -END MODEL QUESTION PAPER

Course Code & Title of the Course:	**23ZOMAL233**
Title:	**Animal Biotechnology**
Offered to:	**B.Sc. Honours Zoology**
Category: Major	**SEMESTER: 3**
Max. Marks	**70**
Max.Time	**3 Hrs**

Section A: Short Answer Questions

Answer the following questions.**Each question carries 4 Marks. Marks: 20**

1. (a) write a short note on restriction enzymes. K1

OR

(b) write a short note on Bacteriophage vectors. K1

2. (a) write a short note on Western Blotting technique K1

OR

(b) Describe about electroporation K1

3. (a) write about cell line cultures K1

OR

(b) what is Cryopreservation K1

4. (a) write a short note on Artificial insemination K2

OR

(b) Explain about super ovulation K2

5. (a) write a short note on DNA fingerprinting K2

OR

(b) Explain Gene therapy K2

Section B: Long Answer Questions

Answer All the questions. Each question carries 10 Marks. Marks: 50

6 (a) Explain different enzymes used in modifying DNA in detail. K2

OR

(b) what are cloning vectors? Explain plasmid vectors with examples. K2

7 (a) Define PCR. Explain different steps in PCR. K1

OR

(b) Write a note on DNA sequencing and explain Sangers method in detail. K1

8 (a) What is Hybridoma technology and explain a detail note on production of MAbs with applications. K2

OR

(b) Define stem cells and explain various types of stem cells with applications. K2

9 (a) write a detail note on Transgenic Sleep and various strategies of gene therapy. K1

OR

(b) write about manipulation of reproduction in animals with examplesK1

10 (a) Explain different cultures in fishes and write it's application in biotechnology.K4

OR

(b) Define Bioinformatics. explain different types of Databases with examples.K4