

SEMESTER - VI

BSc. (H) Zoology DSC-Animal Biotechnology Zoo-DSC-16

CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

Course title & Code	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course (if any)
		Lecture	Tutorial	Practical/ Practice		
Animal Biotechnology Zoo-DSC-16	04	02	Nil	02	Passed Class XII with Biology/ Biotechnology	NIL

Learning Objectives

The learning objectives of this course are as follows:

- to introduce students to the principle, practices and application of biotechnology.
- to familiarize the students with the basic concept of genetic engineering.
- to enable students to solve problems focusing on health, medicine, agriculture and environment etc.
- to learn scientific and engineering principles related to the processing/production of the recombinant proteins.
- to equip the students with the skills advanced tools and techniques used in biotechnology to acquire skills to pursue a career in biotechnology.
- to make the students aware of the scope of biotechnology which encompasses almost every field of science like engineering, research, commercialization and academics.

Learning Outcomes

By studying this course, students will be able to:

- Enable students to make a strategy to manipulate genetic structure of an organism for improvement of any trait.
- Comprehend the ethical and social issues regarding GMOs.
- Gain knowledge of DNA isolation, Agarose gel electrophoresis, PCR, transformation etc.
- Execute the application of recombinant DNA technology in designing research project.
- Acquire technical skills required for joining research labs/industry/institute/pharmaceutical etc. including entrepreneurship.

SYLLABUS OF DSC-16

UNIT- 1: Overview of Biotechnology

1 hr

Aim and scope; applications in biotechnology.

UNIT- 2: Basic Tools for Gene Manipulation

10 hrs

Cloning vectors: Plasmids, Cosmids, Phagemids, Lambda Bacteriophage, M13, BAC, YAC, MAC and Expression vectors (characteristics); Restriction enzymes; DNA modifying enzymes; Transformation techniques: Calcium chloride method, electroporation and biolistic methods, construction of genomic and cDNA libraries and screening by colony and plaque hybridization.

UNIT- 3: Advance Tools and Techniques

3 hrs

Gene Editing Tool: Zinc Finger, TALEN, Clustered regularly interspaced short palindromic repeats (CRISPR/Cas9) system.

UNIT- 4: Genetically Modified Animals

8 hrs

Production of cloned and transgenic animals: Nuclear Transplantation, Retroviral Method, DNA microinjection; Applications of transgenic animals; Production of pharmaceuticals, production of donor organs, knock-out mice.

UNIT- 5: Applications of Genetic Engineering

8 hrs

Molecular diagnosis of genetic diseases (Cystic fibrosis, Sickle cell anemia): RFLP based, Allele specific oligonucleotide dot blot method, PCR- Oligonucleotide ligation assay; Recombinant DNA in medicines: recombinant insulin and human growth hormone, Gene therapy.

Practical

(60 hrs)

(Laboratory periods: 15 classes of 4 hours each)

1. Isolation of genomic DNA from *E. coli*.
2. Isolation of plasmid (pUC 18/19) from *E. coli*.
3. Detection/ Visualization of DNA using Agarose gel electrophoresis.
4. Construction of circular and linear restriction map from the data provided.
5. Calculation of transformation efficiency from calcium chloride method.
6. Study of different blotting techniques: Southern, Northern and Western.
7. DNA sequencing: Sanger method, Next generation sequencing (Illumina).
8. Study of Polymerase Chain Reaction (PCR) and DNA microarrays.
9. Study and interpretation of DNA fingerprinting.
10. Submission of Project report based on any of the topics above (theory/practical)

Essential/recommended readings

1. Brown, T.A. (2010) Gene Cloning and DNA Analysis. VI Edition, Wiley-Blackwell publishing (Oxford, UK), ISBN: 978-1-4051-8173-0.
2. Glick, B.R., Pasternak, J.J. and Patten, C.L. (2010). Molecular Biotechnology- Principles and Applications of Recombinant DNA. IV Edition, ASM press, Washington, USA.
3. Primrose, S.B., and Twyman, R. M. (2006). Principles of Gene Manipulation and Genomics. VII Edition, Blackwell publishing (Oxford, UK)

Suggestive readings

1. Clark, D. P. and Pazdernik, N.J. (2012) Biotechnology, Academic Press.
2. Watson, J.D., Myers, R.M., Caudy, A. and Witkowski, J.K. (2007) Recombinant DNA Genes and Genomes- A Short Course. III Edition, Freeman and Co., N.Y., USA.

NOTE: Examination scheme and mode shall be as prescribed by the Examination Branch, University of Delhi, from time to time.