UNIVERSITY OF MADRAS

B.Sc. DEGREE PROGRAMME IN ADVANCED ZOOLOGY AND BIOTECHNOLOGY

SYLLABUS WITH EFFECT FROM 2023-2024

SEMESTER - VI

Course Code	Course Name	Category	L	T	P	S	Credits	Inst. Hours	Marks		
									CIA	External	Total
321C6C	**ANIMAL BIOTECHNOLOGY AND BIOINFORMATICS**	Core	Y	-	-	-	5	6	25	75	100

Learning Objectives	
CO1	To impart the skills required to explain the scope and protocols of animal tissue culture
CO2	To encourage the use of the apt molecular techniques in cell culture
CO3	To study methods and maintenance of embryo culture
CO4	To motivate students to gain knowledge on stem cell therapy
CO5	To help students to gain knowledge about databases and applications of bioinformatics.

UNIT	Details	No. of Hours	Course Objectives
I	Biotechnology-Definition and scope - Achievements of Biotechnology - Biotechnology in India- rDNA technology- Enzymes in rDNA technology –Cloning vectors- properties of vectors-Types- plasmid (pBR 322,pBR 327, pUC8), phage, cosmid, phagemids, yeast - Gene transfer-direct and indirect methods.	18	CO1
II	Tools and techniques for selecting viable recombinant – Identification of clone from gene libraries – nucleic acid hybridization – PCR – types – applications - blotting types – applications – DNA finger printing – RAPD – SNPS – FISH – DNA sequencing – Sanger method – Maxam Gilbert method – Human genome project.	18	CO2
III	Applications of biotechnology in agriculture - Terminator gene technology, Biofertilizer – Rhizobium – phosphate biofertilizer Bio pesticides (Bacillus thuringiensis). Biofertilizers – Rhizobium and	18	CO3

	Azotobacter. Single Cell Protein (SCP). Applications of Biotechnology in medicine and human health – gene therapy.		
IV	Biotechnology and Environmental management – Bioremediation – types of bioremediation – sewage and waste treatment – pollution monitoring – Biomass from waste. Current issues in biotechnology- GMO and Transgenic Animals. IPR - Patent, Copyright and Trade mark, TRIPS and GATT, Ethical issues related to Biotechnology	18	CO4
V	Overview of Bioinformatics- Definition, Scope, Development and Major tasks- Databases- Characteristics- Categories of databases-Nucleotide sequence database-EMBL, GenBank and DDBJ-Protein sequence database- SWISS-PROT, UniProt-Structure database- PDB, SCOP- Introduction to sequence analysis tool- Sequence alignment-BLAST-Applications of bioinformatics.	18	CO5
	Total	**90**	

Course Outcomes		
Course Outcomes	On completion of this course, students will;	
CO1	Describe the methodologies for handling animal cell cultures	PO1
CO2	Develop knowledge on techniques in cell culture	PO1, PO4
CO3	Know the methods and maintenance of embryo culture	PO4, PO6
CO4	Gain knowledge on stem cell therapy	PO4, PO5, PO6
CO5	Understand the databases and applications of bioinformatics.	PO3, PO8

Text Books (Latest Editions)	
1.	Singh B. D., 2015. Biotechnology: Expanding horizon, Kalyani publishers.
2.	Sasidhara, R., 2015. Animal biotechnology, MJP publishers.
3.	Dubey R. C., 2014. A text Book of Biotechnology, S. Chand & Co Ltd, Ram

	Nagar, New Delhi.
4.	Dubey S. K., Bandana Ghosh, 2012. Fish biotechnology, Wisdom Press.
5.	Dubey R.C., 2014. Advanced Biotechnology, S. Chand Publication.
6.	Ruby, R.C., 2012. A text book of biotechnology, S. Chand Company, New Delhi.
7.	Sambamurthy K., Ashutosh Kar., 2009. Pharmaceutical Biotechnology, New Age International (P) Ltd.
8.	Ramdoss P.,2009. AnimalBiotechnology- Recent concepts and developments, MJP publishers.
9.	Sathyanarayran U., 2008. Biotechnology, Books and Allied, Kolkata.
10.	Ignacimuthu, S., 2008. Basic Biotechnology, Tata McGraw hill, New Delhi.
11.	Rastogi S. C., 2007. Biotechnology: Principles and applications, Alpha Science publishers. Ranga, M.M., 2003. Animal biotechnology, Agrobios, New Delhi.
12.	Bioinformatics : Methods and Applications: genomics, proteomics and drug discovery By S.C. Rastogi
References Books (Latest editions, and the style as given below must be strictly adhered to)	
1.	Veer Bala Rastogi, 2016. Principles of Molecular biology, Medtech, Maine, USA.
2.	Michael Crichton, 2014. Essentials of Biotechnology, Medtech, Maine, USA.
3.	Godbey W.T., 2014. An Introduction to Biotechnology, Academic press, New York, USA.
4.	Peters, P., 2009. Biotechnology – A guide to genetic engineering, WMC brown publisher, UK.
5.	Ramawat, K.G and Shailey Goyal, 2009. Comprehensive biotechnology, S.Chand company, New Delhi, India.
6.	Primrose S.B., R. M. Twyman and R. W. Old, 2001. Principles of gene manipulation, Wiley- Blackwell, UK.
7.	Primrose S. B., 2001. Molecular Biotechnology, Panima Publishing Corporation, New Delhi, India.
8.	Hames B.D. and Higgins S.J. 1995. Gene Probes: A Practical Approach, Oxford University Press, UK.
9	Bioinformatics Data Skills: R Cookbook
Web Resources	
1.	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3612824/
2.	https://www.isaaa.org/resources/publications/pocketk/40/default.asp

3.	https://www.ncbi.nlm.nih.gov/books/NBK207574/	
4.	https://iopscience.iop.org/article/10.1088/1755-1315/492/1/012035/pdf	
5.	https://go.nature.com/3zAZmO9	
6	https://www.biostars.org	
Methods of Evaluation		
Internal Evaluation	Continuous Internal Assessment Test	25 Marks
	Assignments	
	Seminars	
	Attendance and Class Participation	
External Evaluation	End Semester Examination	75 Marks
	Total	100 Marks
Methods of Assessment		
Recall (K1)	Simple definitions, MCQ, Recall steps, Concept definitions	
Understand/ Comprehend (K2)	MCQ, True/False, Short essays, Concept explanations, Short summary or overview	
Application (K3)	Suggest idea/concept with examples, Suggest formulae, Solve problems, Observe, Explain	
Analyze (K4)	Problem-solving questions, Finish a procedure in many steps, Differentiate between various ideas, Map knowledge	
Evaluate (K5)	Longer essay/ Evaluation essay, Critique or justify with pros and cons	
Create (K6)	Check knowledge in specific or offbeat situations, Discussion, Debating or Presentations	

Mapping with Programme Outcomes:

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**
CO 1	S							
CO 2	M	M						
CO 3				S		S		
CO 4				S	S	M		
CO 5			S					S

S-Strong(3) **M-Medium (2)** **L-Low (1)**