DEPARTMENT OF BIOTECHNOLOGY				*CLASS: II B.A. / B.Sc.*				
Sem	**Course Type**	**Course Code**	**Course Title**	**Credits**	**Contact Hours/week**	**CIA**	**Ext**	**Total**
III	NME	20U3LNM1	Introduction to Biotechnology	2	2	25	75	100

Nature of Course				
Knowledge and skill	✓		Employability oriented	
Skill oriented			Entrepreneurship oriented	

Course Objectives

1	To understand the basic concepts in frontier areas of biotechnology.
2	To provide students with a basic understanding and knowledge of biotechnology
3	To learn the applications of the biotechnology and its products.
4	To inculcate the students on current scenario in biotechnology.

Unit	Description	Hours	K-level	CLO
I	**History, importance and scope of Biotechnology** Cells – prokaryotic & eukaryotic, animal & plant cells – comparison. Central dogma – definition, Definition – Traditional and modern history of biotechnology, biotechnology in medicine and industries, biotechnology and the environment, biotechnology and agricultural	**6**	Up to K-2	**1**
II	**Tools of Cloning** Genes: definition and structure - Enzymes: restriction endonucleases and ligases. Vectors: definition and types (plasmid and cosmids). Host organisms: prokaryotic – *E.coli*and eukaryoticorganisms – yeast and mouse.	**6**	Up to K-2	**2**
III	**Transgenic Plants and Animals** Transgenic plants: gene transfer methods – particle bombardments, Btcotton and transgenic tomato, advantages and disadvantages of transgenic plants. Transgenic animal: methods of gene transfer – microinjection, advantages and disadvantages of transgenic animal - Dolly	**6**	Up to K-2	**3**
IV	**Bio-processing (Fermentation)** Definition – Bioreactors: conventional fermenter and its features – Types of fermentation process (Batch, semi-continuous and continuous process) – Downstream process: Separation, concentration, and purification	**6**	Up to K-2	**4**
V	**Bioethics and biosafety guidelines in Biotechnology** Definition - National and International level biosafety regulations - Hazardous materials used in biotechnology (handling and disposal), Intellectual Property Rights (IPR) - Implication of IPRs and agricultural technology – Patents and copyrights	**6**	Up to K-2	**5**

Books for Study

1. Satyanarayana. U. 2009. Biotechnology. Books and Allied Pvt. Ltd.
2. Kumaresan. 2015. Biotechnology. Saras Publications.

Books for Reference

1. Balasubramaniam D, CFA Bryce, K Dharmalingam, J Green, KunthalaJayaraman. Concepts in Biotechnology. University Press Reference Book.
2. Dubey RC. 2012. A textbook of Biotechnology. S. Chand Publications.

Web resources

www.nptel.ac.in

www.swayam.gov.in

Rationale for Nature of the course

The modern biotechnology, involving cloning, vaccine production, genetic engineering, genomics and its assisted techniques, is important technological revolutions in the 21st century. The theoretical knowledgehelps to understand the concepts and principles of ancient technology not only for biotechnology students but also non-biotechnology students. However the biotechnological techniques also raise much controversial debate about ethics and biosafety among the people. To address this problem and emphasis the various techniques of biotechnology for all under graduates thecourse is offering as non-major elective paper.

Activities having direct bearing on Skill development / Employability /Entrepreneurship

- Seminar
- Poster preparation
- Scientific discussion
- Critical thinking and analysis on theoretical concepts

Pedagogy

The teaching methods may include Chalk and talk, PowerPoint, demonstrations, assignments, group discussions and Problem solving

Course content designers

Dr. S. Baskaran

Dr.N. Arul MuthuKumaran

Course Learning Outcomes

On completion of this course the students will be able to

#	CLOs	K – Level
CLO-1	Summarize the historical perspectives of biotechnology	Up to K-2
CLO-2	Relate the tools of genetic engineering with its role.	Up to K-2
CLO-3	Explain the cloning strategies and their applications.	Up to K-2
CLO-4	Outline the bioprocess technology.	Up to K-2
CLO-5	Distinguish the various implications of IPR.	Up to K-2

Mapping of Course outcomes with Program Outcomes

CO/PO	PO-1	PO-2	PO-3	PO-4	PO-5
CLO-1	3	1	2	2	2
CLO-2	3	1	1	1	2
CLO-3	3	2	2	3	1
CLO-4	3	1	3	2	1
CLO-5	3	3	3	3	1

Advance application-3; Intermediate level-2 & Basic level-1

Mapping of Course outcomes with Program specific Outcomes

CLO/PSO	PSO-1	PSO-2	PSO-3	PSO-4	PSO-5
CLO-1	3	2	1	2	1
CLO-2	3	2	1	2	2
CLO-3	3	2	3	3	3
CLO-4	3	2	2	3	2
CLO-5	3	2	3	3	3

Advance application-3; Intermediate level-2 & Basic level-1

LESSON PLAN

Unit	Description	Hours	Mode
UNIT - I	Definition – Traditional and modern history of biotechnology – biotechnology tree.	3	Chalk and talk
	-Biotechnology in medicine and industries, biotechnology and the environment, biotechnology and agricultural	3	Chalk and talk Problem solving
UNIT - II	Genes: definition and structure - Enzymes: restriction endonucleases and ligases.	2	Chalk and talk
	Vectors: definition and types (plasmid and cosmids).	2	Chalk and talk
	Host organisms: prokaryotic – *E.coli*andeukaryoticorganisms– yeast and mouse. Methods of gene transfer - transformation and electroporation	2	Chalk and talk PPT
UNIT - III	Transgenic plants: gene transfer methods – particle bombardments, Btcotton and transgenic tomato, advantages and disadvantages of transgenic plants.	3	Chalk and talk
	Transgenic animal: methods of gene transfer – microinjection, advantages and disadvantages of transgenic animal - Dolly	3	Chalk and talk
UNIT-IV	Definition – Bioreactors: conventional fermenter and its features – Types of fermentation process	3	Chalk and talk PPT
	Downstream process: Separation, concentration, and purification	3	Chalk and talk

UNIT - V	Definition - National and International level biosafety regulations - Hazardous materials used in biotechnology (handling and disposal)	3	Chalk and talk
	Intellectual Property Rights (IPR) - Implication of IPRs and agricultural technology – Patents and copyrights	3	Chalk and talk

Learning Outcome Based Education & Assessment (LOBE)
Blue Print – Introduction to BiotechnologyCourse (CIA-I & II)
Articulation Mapping – K Levels with Courses Learning Outcomes (CLOs)

CLOs	**K- Level**	**Section A**		**Section B**		**Section C**	
		Short Answers		**(Either/or Choice)**		**(Open Choice)**	
		No. of Questions	**K- Level**	**No. of Questions**	**K- Level**	**No. of Questions**	**K- Level**
CLO x	Up to K2	1	K1	1	K2/K2	1	K1
CLO y	Up to K2	2	K1	1	K2/K2	2	K1
No. of Questions to be asked		3		2		3	
No. of Questions to be answered		3		2		2	
Marks for each question		2		7		10	
Total Marks for each section		**6**		**14**		**20**	

Distribution of Section-wise Marks with K Levels (CIA I & II)

K Levels	**Section A (No Choice)**	**Section B (No Choice)**	**Section C (Either/or)**	**Section D (Open Choice)**	**Total Marks**	**% of Marks without choice**	**Consolidated %**
K1	6	-	30	-	**36**	56.25	**100**
K2	-	28	-	-	**28**	43.75	
K3	-	-	-	-	**-**	-	**-**
K4	-	-	-	-	**-**	-	**-**
Total Marks	**6**	**14**	**30**	**-**	**64**	**100.00**	**100%**

Learning Outcome Based Education & Assessment (LOBE)
Blue Print – Introduction to BiotechnologyCourse
Articulation Mapping – K Levels with Courses Learning Outcomes (CLOs)

Units	CLOs	K-Level	Section – A		Section – B		Section – C	
			Short Answers		(Either / or Choice)		(Open Choice)	
			No. of Questions	K-Level	No. of Questions	K-Level	No. of Questions	K-Level
1	CLO 1	Up to K2	1	K1	1	K2/K2	1	K1
2	CLO 2	Up to K2	1	K1	1	K2/K2	1	K1
3	CLO 3	Up to K2	1	K1	1	K2/K2	1	K1
4	CLO 4	Up to K2	1	K1	1	K2/K2	1	K1
5	CLO 5	Up to K2	1	K1	1	K2/K2	1	K1
No. of Questions to be asked			5		5		5	
No. of Questions to be answered			5		5		3	
Marks for each question			2		7		10	
Total Marks for each section			10		35		30	

Distribution of Section-Wise Marks with K Levels

K Levels	Section A (No Choice)	Section B (No Choice)	Section C (No Choice)	Section D (No Choice)	Total Marks	% of Marks (without choice)	Consolidated
K1	10	-	50	-	60	46.15	100
K2	-	70	-	-	70	53.85	
K3	-	-	-	-	-	-	-
K4	-	-	-	-	-	-	-
Total Marks	**10**	**35**	**50**	**-**	**130**	**100.00**	**100**

K1 –Remembering and recalling facts with specific answers

K2 – Basic understanding of facts and stating main ideas with general answers