DEPARTMENT OF BIOTECHNOLOGY				*CLASS: II B.A. / B.Sc.*				
Sem	**Course Type**	**Course Code**	**Course Title**	**Credits**	**Contact Hours/week**	**CIA**	**Ext**	**Total**
IV	NME-II	20U4LNM2	Applied Biotechnology	2	2	25	75	100

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

Course Objectives

1.	To understand the applications in areas of biotechnology.
2.	To provide students with a basic understanding the advancement in 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	CLOs
I	**Food technology** Single cell proteins: *Spirullina*and *Chlorella* - sources, nutritive values and uses. Fermented foods – definition, advantages of fermented foods, production of cheese and yoghurt	3	Up to K-2	**1**
II	**Fisheries technology** Integrated fish farming types - paddy cum fish culture, fish cum poultry culture.Methods of breeding-Natural, artificial – Stripping method, induced breeding - Hypophysation, Stages of hypophysation –Genetic manipulation - Transgenic fish production. Shrimp culture	3	Up to K-2	**2**
III	**Immunotechnology** ELISA – principle and applications, Vaccine-Active and passive immunization, attenuated, heat-killed, subunit vaccines, Vaccination schedule, route of administration, advantages and disadvantages of vaccines	3	Up to K-2	**3**
IV	**Assisted reproductive technology** Animal propagation - In vitro fertilization, artificial insemination in cattle, embryo transfer technique and superovulation (MOET) in farm animals.Cryopreservation, Negative aspects of ART.	3	Up to K-2	**4**
V	**Bioethics and Biosafety** Benefits of Biotechnology, ELSI Biotechnology, ICSI, Risks and ethics of Biotechnology, Genetically engineered Organisms – risks and benefits, Biological warfare. Biosafety guidelines and regulations.	3	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

A wide range of young graduatesare required for modern biotechnology to explore hidden wonders in the field of Biotechnology particularly traditional technology. This course is offering as non-major elective forall streams of undergraduate students to provide basic knowledge on biomass production, integrated fish technology, insight into various immunotechnology like attenuated, heat killed vaccine and monoclonal antibodies, and help to understand the concepts of bioethics and biosafety.

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. P. Vimal

Course Learning Outcomes

On completion of this course the students will be able to

#	CLOs	K – Level
CLO-1	Summarize the advancements in food technology.	Up to K-2
CLO-2	Outline the technology used for fish breeding & cultivation	Up to K-2
CLO-3	Understand the principle behind the diseases diagnosis &prevention	Up to K-2
CLO-4	Explain the methods of production offarm animal	Up to K-2
CLO-5	Distinguish the various bioremediation processes.	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	2	2	2	1
CLO-2	3	1	2	2	1
CLO-3	3	2	2	2	1
CLO-4	3	1	2	2	1
CLO-5	3	2	2	2	2

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	--	--	--	1
CLO-2	3	2	1	--	--
CLO-3	3	2	3	3	3
CLO-4	3	2	--	3	-
CLO-5	3	2	3	3	3

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

LESSON PLAN

Unit	Description	Hours	Mode
UNIT - I	Single cell proteins: *Spirullina*and*Chlorella* - sources, nutritive values and uses.	3	Chalk and talk
	Fermented foods – definition, advantages of fermented foods, production of cheese and yoghurt.	3	Chalk and talk Problem solving
UNIT - II	Integrated fish farming types - paddy cum fish culture, fish cum poultry culture.Methods of breeding-Natural, artificial – Stripping method	3	Chalk and talk
	Induced breeding - Hypophysation, Stages of hypophysation - Genetic manipulation - Transgenic fish production	3	Chalk and talk
UNIT - III	ELISA – principle and applications, Vaccine-Active and passive immunization, attenuated, heat-killed, subunit vaccines	3	Chalk and talk
	Vaccination schedule, route of administration,	3	Chalk and talk
UNIT-IV	Animal propagation - In vitro fertilization, artificial insemination in cattle, embryo transfer technique	3	Chalk and talk PPT
	Superovulation (MOET) in farm animals. Cryopreservation, Negative aspects of ART.	3	Chalk and talk
UNIT - V	Benefits of Biotechnology, ELSI Biotechnology, Risks and ethics of Biotechnology	3	Chalk and talk
	Genetically engineered Organisms – risks and benefits, Biological warfare. Biosafety guidelines and regulations.	3	Chalk and talk

Learning Outcome Based Education & Assessment (LOBE)
Blue Print – Applied 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 – Applied 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