



Sem	Part	Course	Title	Inst. Hours/Week	Credit	Exam Hours	Marks		Total
							Int	Ext	
I	I	Language Course–I (LC) – Tamil*/Other Languages ** #		6	3	3	25	75	100
	II	English Language Course - I (ELC)		6	3	3	25	75	100
	III	Core Course–I (CC)	Fundamentals of Microbiology	6	6	3	25	75	100
		Core Practical – I (CP)	Fundamentals of Microbiology & Microbial Metabolism (P)	3	-	-	-	-	-
		First Allied Course–I (AC)	Biochemistry I	4	4	3	25	75	100
		First Allied Practical–II (AP)	Biochemistry I and II (P)	3	-	-	-	-	-
	IV	Value Education	Value Education	2	2	3	25	75	100
Total				30	18				500
II	I	Language Course–II (LC)– Tamil*/Other Languages ** #		6	3	3	25	75	100
	II	English Language Course–II (ELC)		6	3	3	25	75	100
	III	Core Course–II (CC)	Microbial Metabolism	6	6	3	25	75	100
		Core Practical – I (CP)	Fundamentals of Microbiology & Microbial Metabolism (P)	3	3	3	40	60	100
		First Allied Practical–II (AP)	Biochemistry-I & II (P)	3	3	3	40	60	100
		First Allied Course–III (AC)	Biochemistry II	4	2	3	25	75	100
	IV	Environmental Studies	Environmental Studies	2	2	3	25	75	100
Total				30	22				700
III	I	Language Course – III (LC)– Tamil*/Other Languages ** #		6	3	3	25	75	100
	II	English Language Course-III (ELC)		6	3	3	25	75	100
	III	Core Course – III (CC)	Immunology	6	6	3	25	75	100
		Core Practical– II (CP)	Immunology & Introductory Virology (P)	3	-	-	-	-	-
		Second Allied Course–I (AC)	Biostatistics	4	4	3	25	75	100
		Second Allied Practical-II (AP)	Biostatistics and Bioinformatics (P)	3	-	-	-	-	-
	IV	Non Major Elective I-for those who studied Tamil under Part-I a) Basic Tamil for other language students b) Special Tamil for those who studied Tamil upto +2 but opt for other languages in degree programme	Mushroom Technology	2	2	3	25	75	100
Total				30	18				500

IV	I	Language Course –IV (LC) - Tamil*/Other Languages ** #		6	3	3	25	75	100	
	II	English Language Course – IV (ELC)		6	3	3	25	75	100	
	III	Core Course – IV (CC)	Introductory Virology		5	5	3	25	75	100
		Core Practical– II (CP)	Immunology & Introductory Virology (P)		3	3	3	40	60	100
		Second Allied Practical-II (AP)	Biostatistics and Bioinformatics (P)		3	3	3	40	60	100
		Second Allied Course - III(AC)	Bioinformatics and Computer Applications In Biology		3	2	3	25	75	100
	IV	Non Major Elective II-for those who studied Tamil under Part I a) Basic Tamil for other language students b) Special Tamil for those who studied Tamil upto +2 but opt for other languages in degree programme	Biofertilizer Technology		2	2	3	25	75	100
	Skill Based Elective - I	Skill Based Elective - I		2	2	3	25	75	100	
Total				30	23				800	
V	III	Core Course – V (CC)	Medical Microbiology		5	5	3	25	75	100
		Core Course – VI (CC)	Agricultural and Environmental Microbiology		5	5	3	25	75	100
		Core Course – VII (CC)	Molecular Biology and Microbial Genetics		6	5	3	25	75	100
		Core Practical– III (CP)	Medical Microbiology, Agricultural and Environmental Microbiology & and Molecular Biology Microbial Genetics (P)		3	3	3	40	60	100
		Major Based Elective – I	Fundamentals of Botany and Zoology		5	5	3	25	75	100
	IV	Skill Based Elective – II	Skill Based Elective – II		2	2	3	25	75	100
		Skill Based Elective – III	Skill Based Elective – III		2	2	3	25	75	100
		Soft Skills Development	Soft Skills Development		2	2	3	25	75	100
Total				30	29				800	
VI	III	Core Course – VIII (CC)	Food Microbiology		6	6	3	25	75	100
		Core Course – IX (CC)	Industrial Microbiology		6	6	3	25	75	100
		Core Practical– IV (CP)	Food and Industrial Microbiology (P)		6	5	3	40	60	100
		Major Based Elective II	Recombinant DNA Technology		6	6	3	25	75	100
		Major Based Elective III	Microbial Biotechnology and Bioethics		5	5	3	25	75	100
	V	Extension Activities	Extension Activities		-	1	-	-	-	-
		Gender Studies	Gender Studies		1	1	3	25	75	100
Total				30	30				600	
Grand Total				180	140				3900	

Language Part – I	-	4	
English Part –II	-	4	
Core Paper	-	9	
Core Practical	-	4	
Allied Paper	-	4	
Allied Practical	-	2	
Non-Major Elective	-	2	
Skill Based Elective	-	3	
Major Based Elective	-	3	
Environmental Studies	-	1	
Value Education	-	1	
Soft Skill Development	-	1	
Gender Studies	-	1	
Extension Activities	-	1	(Credit only)

* for those who studied Tamil upto 10th +2 (Regular Stream)

+ Syllabus for other Languages should be on par with Tamil at degree level

those who studied Tamil upto 10th +2 but opt for other languages in degree level under Part I should study special Tamil in Part IV

** Extension Activities shall be outside instruction hours

Non Major Elective I and II – for those who studied Tamil under Part I

- a) Basic Tamil I and II for other language students
- b) Special Tamil I and II for those who studied Tamil upto 10th or +2 but opt for other languages in degree programme

Note:

	Internal Marks	External Marks
1. Theory	25	75
2. Practical	40	60
3. Separate passing minimum is prescribed for Internal and External marks		

FOR THEORY

The passing minimum for CIA shall be 40% out of 25 marks [i.e. 10 marks]

The passing minimum for University Examinations shall be 40% out of 75 marks [i.e. 30 marks]

FOR PRACTICAL

The passing minimum for CIA shall be 40% out of 40 marks [i.e. 16 marks]

The passing minimum for University Examinations shall be 40% out of 60 marks [i.e. 24 marks]

MAJOR BASED ELECTIVE III

MICROBIAL BIOTECHNOLOGY AND BIOETHICS

OBJECTIVES

To provide the first- line knowledge of utilizing microbes for the industrial production of an array of economically viable products possessing a variety of human applications.

UNIT I

Biotechnology: Definition – Milestones in History - Scope of microbial biotechnology and its applications - Microbial production of pharmaceuticals – antibiotics, hormones (insulin), enzymes (streptokinase), recombinant vaccines (Hepatitis B vaccine) - Edible vaccine, Monoclonal antibodies.

UNIT II

Microbial production of biofertilizers – (*Rhizobia*, *Azospirillum*, *Frankia* and VAM). Microbial production of bio-pesticides (*Bacillus thuriangiensis*). Microbial production of bioplastics. Microorganisms in bioremediation: Degradation of xenobiotics.

UNIT III

Single cell protein (algae and yeast). Microalgal technology – Industrial cultivation methods of *Spirulina* – biotechnological potentials of *Spirulina* as: food and feed – fuel production from microalgae – pharmaceutically valuable compounds from microalgae. Commercial production of bio-ethanol and bio-diesel using lignocellulosic waste.

UNIT IV

Genetic engineering of plants: Ti plasmid vectors and gene transfer in plants – Development of insect, virus and herbicide resistant plants. Transgenic animals: methods of creating transgenic mice and sheep. Human gene therapy – *in vivo* and *ex vivo* gene therapy.

UNIT V

Intellectual Property Rights (IPR) - different types of IPRs - **Principles of Bioethics (IB)** - Definition of Ethics and Bioethics. - Ethics committee - Brief account on risks and ethics of modern biotechnology - Ethical concerns in human gene therapy - Ethical limits of animal use. **Ethical issues at the beginning of life (abortion)** – Ethical issues at the end of life (withholding and withdrawing medical treatment and euthanasia).

REFERENCES

1. Desmond ST Nicholl. An Introduction to Genetic Engineering, 2nd edition, Cambridge university press. 2002.
2. Eric's Grace. Biotechnology unzipped-promises and realities. Joseph Henry press,

- Washington. 1997.
3. Glick BR. and Pasternak JJ. Molecular Biotechnology, ASM press, Washington DC. 2001.
 4. Glick BR, Pasternak JJ and Patten CL. Molecular Biotechnology 4th edition, ASM Press. 2010.
 5. Satyanarayana U. Biotechnology. Books and Allied Pvt. Ltd. 2012.
 6. Dubey RC. A textbook of Biotechnology. S. Chand and Company Ltd. 2013.
 7. Ramawat KG and Shaily Goyal. Comprehensive Biotechnology. S. Chand and Company Ltd. 4th edition. 2009.
 8. Rema LP. 2006. Applied Biotechnology. MJP Publishers, Chennai.2006.
 9. Mukesh Pasupuleti. Molecular Biotechnology. MJP Publishers, Chennai.2006.
 10. Helen Kreuzer and Adrienne Massey. Recombinant DNA and Biotechnology, American Society for Microbiology, Washington. 1996.
 11. Old RW and Primrose SB. Principles of Gene Manipulation, 4th edition, Blackwell Scientific Publications, London. 1994.
 12. Prave P, Paust V, Sitting W and Sukatasch D. Fundamentals of Biotechnology. VCH verlasgesellschafr - mbH, Weinhkeim. 2000.
 13. Trevan MD, Boffey S, Coulding KH and Stanbury P. Biotechnology – The basic principles – Tata McGraw Hill edition. 1990.
 14. Watson JD, Gilman M, Witkowski J, Zoller M. Recombinant DNA- 2nd edition, Scientific American Books. 1992.
 15. Ratledge C and Kristiansen B. Basic Biotechnology, 2nd Edition, Cambridge University Press. 2001.
 16. Demain AL and Davies JE. Manual of Industrial Microbiology and Biotechnology, 2nd Edition, ASM Press. 1999.
 17. Swartz JR. Advances in Escherichia coli production of therapeutic proteins. Current Opinion in Biotechnology, 12, 195–201. 2001.
 18. Willey JM, Sherwood LM, Woolverton CJ. Prescott, Harley and Klein's Microbiology, 9th edition, Mc Graw Hill Publishers. 2014.
 19. Gupta PK. Elements of Biotechnology 2nd edition, Rastogi Publications.2009.
 20. Glazer AN and Nikaido H. Microbial Biotechnology, 2nd edition, Cambridge University Press. 2007.
 21. Stanbury PF, Whitaker A and Hall SJ. Principles of Fermentation Technology 2nd edition, Elsevier Science. 1995.
 22. Crueger W and Crueger A. Biotechnology: A text Book of Industrial Microbiology 2nd edition Sinauer associates, Inc. 1990.
 23. Nancy S Jecker, Albert R Jonsen and Robert A Pearlman. Bioethics- An introduction the history, methods and practice, 2nd edition. Jones and BartlettPublishers. 2010.
