B.Sc., BIOTECHNOLOGY

SECOND SEMESTER

Course Content	Name of the Course	Ins. Hrs	Credits	Int. Marks	Ext. Marks	Total
Part – I	Language- Tamil – II	6	3	25	75	100
Part - II	English Paper – II	6	3	25	75	100
Part - III	Core Paper II - Genetics	5	5	25	75	100
	Core Practical II - Genetics	3	3	25	75	100
	Elective II Generic/ Discipline Specific - Fundamentals of Microbiology	4	3	25	75	100
	Elective II Generic/ Discipline Specific Practical - Fundamentals of Microbiology	2	2	25	75	100
Part IV	Organic Farming and Health Management	2	2	25	75	100
	Skill Enhancement - Vermitechnology	2	2	25	75	100
		30	**23**			

SEMESTER – II

CORE II GENETICS

Subject Code	L	T	P	S	Credits	Instructional Hours	Marks		
							CIA	External	Total
	4	1			5	5	25	75	100

Learning Objective	
LO1	Learn about the classical genetics and transmission of characters from one generation to the next.
LO2	Obtain a strong foundation for the advanced genetics.
LO3	Explain the properties of genetic materials and storage and processing of genetic information.
LO4	Acquire knowledge about the Mutagens, Mutations, DNA Repairs and Genetic disorders in human.
LO5	Categories Eugenics, Euphenics and Euthenics and indepth Knowledge on population Genetics.

UNIT	Contents	No. of Hours
1	Mendel's experiments, Monohybrid cross, Dihybrid cross, Backcross or Testcross, Mendel's laws. Incomplete dominance, Codominance. Interaction of Genes- Epistasis -lethal genes. Multiple alleles. Blood group inheritance in man.	15
II	Linkage - linkage in Drosophila- Morgan's experiments, factors affecting linkage. Crossing over- types, mechanism, significance of crossing over. Mapping of Chromosomes, interference and coincidence. Sex –Linked Inheritance and Sex- Determination in Man.	15
III	Fine structure of the gene and gene concept. Identification of the DNA as the genetic material- Griffith experiments, Avery, McLeod, McCarty and Hershey Chase experiment. Microbial Genetics- bacterial recombination, Conjugation, Transformation, Transduction and sex duction	15
IV	Mutation – types of mutation, mutagens, DNA damage and Repair Mechanism. Chromosomal aberrations- Numerical and Structural, Pedigree Analysis-Mendelian inheritance in human. (Cystic Fibrosis, Muscular Dystrophy), Karyotyping.	15

V	Population Genetics– Hardy Weinberg principle, gene frequency, genotype frequency and factors affecting gene frequency. Eugenics, Euphenics and Euthenics. Penetrance and Expressivity.	15
Total		75

Text Books	
1	Dr. Veer Bala Rastogi, 2020, Elements of Genetics, 11 th Revised & Enlarged Edition, Kedar Nath Ram
2	Nath Publications, Meerut, 250001. www.knrnpublications.com, ISBN-978-81-907011-2-9
3	Verma, P.S. and Agarwal, V.K., 1995. Genetics, 8th edition, S.Chand & Co., New Delhi – 10055.
4	Verma, P.S., and Agarwal, V.K., 1995. Cell and Molecular Biology, 8th edition, S.Chand and Co., New Delhi, 110055.
Reference Books	
1	Gardener E.J. Simmons M.J. Slustad D. P. 2006. Principles of Genetics
2	Lewis, R.2001. Human Genetics- Concepts and application. 4th edition. McGraw Hill.
3	Griffiths, Miller, J.H., An Introduction to Genetic Analysis W.H.Freeman. New York.
4	Winter, P.C., Hickey, G.J. and Fletcher, H.L.2000. Instant notes in Genetics. Viva books, Ltd
5	Good enough U. 1985. Genetics. Hold Saunders international.
Web Resources	
1	https://nptel.ac.in/courses/102/106/102106025/
2	http://www.ocw.mit.edu
3	http://enjoy.m.wikipedia.org
4	https://www.acpsd.net

MAPPING WITH PROGRAMME OUTCOME AND PROGRAMME SPECIFIC OUTCOME

	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
CLO1	**3**	**3**	**3**	**3**	**2**	**3**	**3**	**2**	**2**
CLO2	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**2**	**2**
CLO3	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**
CLO4	**3**	**2**	**3**	**3**	**3**	**3**	**3**	**3**	**3**
CLO5	**3**	**3**	**2**	**3**	**2**	**2**	**2**	**3**	**3**
TOTAL	**15**	**14**	**14**	**15**	**13**	**14**	**14**	**13**	**13**
AVERAGE	**3**	**2.8**	**2.8**	**3**	**2.6**	**2.8**	**2,8**	**2.6**	**2.6**

Elective II Generic/ Discipline Specific

FUNDAMENTALS OF MICROBIOLOGY

Subject Code	L	T	P	S	Credits	Instructional Hours	Marks		
							CIA	External	Total
	3	1			3	4	25	75	100

Learning Objective	
LO1	Understand the classification of Microorganisms and structure of bacteria
LO2	Understand the various microbiological techniques, different types of media, and techniques involved in culturing microorganisms.
LO3	Categorize the methods of sterilization and identify the significance of culture media in the growth of different microbes.
LO4	Exhibit knowledge in analyzing the importance of Bio insecticides, Bio fertilizers prebiotics and probiotics.
LO5	Distinguish between normal flora and pathogens and describe the role of microbes in food intoxications.

UNIT	Contents	No. of Hours
I	History of Microbiology, Classification of bacteria, fungi, virus, protozoa and algae – classical and molecular approaches. Scope of microbiology – Role of microbes in biotechnology.	10
II	Structure of bacteria - Bacterial growth and measurement of growth, Factors affecting growth. Media – types and preparation- plating methods - staining methods (Gram's, capsule, spore, LCB mount)- methods of preservation and storage of microbes. Culture of fungi, virus and algae.	15
III	Sterilization methods - physical and chemical methods- Mode of action – Antibiotic in clinical use - Resistance to antibacterial agents - MRSA, ESBL.	10
IV	Bioinsecticides - *Bacillus thuringiensis*, Baculoviruses- Biofertilizers - *Azospirillum* and blue green algae - single cell protein – prebiotics and probiotics - Dairy products (Cheese and Yoghurt).	10
V	Microbial Disease- host -pathogen interaction, clinical features, lab diagnosis and treatment of Airborne disease (Pneumonia, Influenza), food borne disease (Shigellosis, Aspergillosis), Water borne disease (Cholera, Amoebiasis), Sexually transmitted disease (HPV, Trichomoniasis), Vector borne disease (Dengue, Malaria).	15

Total	**60**

Text Books	
1	Pelczar.M. J., Chan E.C.S. and Noel. R.K. (2007). Microbiology. 7th Edition.,McGraw – Hill, New York.
2	Dubey R.C. and Maheswari, S. (2003). A textbook of Microbiology, New Delhi: S. Chand & Co.
3	Ananthanarayanan, Paniker, Kapil, Textbook book of Microbiology, 9th edition, Orient BlackSwan, 2013.
4	Prescott, Harley, Klein, Microbiology, 10th Edition, McGraw – Hill, 2016.
5	Gerhardt, P., Murray, R.G., Wood, W.A. and Kreig, N.R. (Editions) (1994) Methods for General and Molecular Bacteriology. ASM Press, Washington, DC

Reference Books	
1	Madigan, Martinko, Bender, Buckley, Stahl, Brock Biology of Microorganisms, 14th edition, 2017.
2	Gillespie, Bamford, Medical Microbiology and Infection at a Glance, 4th edition, 2012.
3	Boyd, R.F. (1998). General Microbiology,2nd Edition., Times Mirror, Mosby CollegePublishing, St Louis.
4	Tortora, G.J., Funke, B.R., Case,C.L. (2013). Microbiology. An Introduction 11th Edition., A La Carte Pearson.
5	Salle. A.J (1992). Fundamental Principles of Bacteriology. 7th Edition., McGraw Hill Inc.New York.

Web Resources	
1	Horst W. Doelle (2004). Microbial Metabolism and Biotechnology. Proceedings of an E-seminar organized by the International organization for Biotechnology and Bioengineering (IOBB)
2	http://www ejb.org/content.
3	www. Biotech.kth.se Electronic Journal of biotechnology
4	https://www.cliffsnotes.com/study guides/biology/microbiology/introduction-to-microbiology/a-brief-history-of-microbiology
5	https://bio.libretexts.org/@go/page/9188

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOME

	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
CLO1	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**
CLO2	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**
CLO3	**3**	**3**	**3**	**3**	**2**	**3**	**3**	**3**	**3**
CLO4	**3**	**3**	**3**	**2**	**3**	**2**	**3**	**3**	**2**
CLO5	**3**	**3**	**2**	**3**	**3**	**3**	**3**	**2**	**3**
TOTAL	**15**	**15**	**14**	**14**	**14**	**14**	**15**	**14**	**14**
AVERAGE	**3**	**3**	**2.8**	**2.8**	**2.8**	**2.8**	**3**	**2.8**	**2.8**

Core Practical II - Genetics

Subject Code	L	T	P	S	Credits	Instructional Hours	Marks		
							CIA	External	Total
			3		3	3	25	75	100

Learning Objective	
LO1	Demonstrate the basic principles of important techniques in Molecular biology and Genetics.
LO2	Analyze the Polytene chromosome of the organisms
LO3	Identify Barr bodies from Buccal smear
LO4	Demonstrate the Preparations and maintenance of culture medium
LO5	Demonstrate Human karyotyping

UNIT	Contents	No. of Hours
1	Mitotic stages of onion (*Allium cepa*) root tip Meiotic stages of cockroach testes/ Flower bud	9
II	Giant chromosomes from Chironomus larvae/ Drosophila salivary glands	9
III	Identification of Barr bodies from Buccal smear	9
IV	Preparations of culture medium and culture of Drosophila – methods of maintenance Identifications of mutants of Drosophila	9
V	Human karyotyping (Demo)	9
Total		**45**

Text Books	
1	Practical Manual on "Fundamentals of Genetics" (PBG-121). 2019, Edition: First Publisher: Odisha University of Agriculture & Technology. Editor: Kaushik Kumar Panigrahi

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOME

	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
CLO1	3	3	3	3	3	3	3	3	3
CLO2	3	3	3	3	3	3	3	3	3
CLO3	3	3	3	3	2	3	3	3	3
CLO4	3	3	3	2	3	2	3	3	2
CLO5	3	3	2	3	3	3	3	2	3
TOTAL	15	15	14	14	14	14	15	14	14
AVERAGE	3	3	2.8	2.8	2.8	2.8	3	2.8	2.8

ELECTIVE II GENERIC/ DISCIPLINE SPECIFIC PRACTICAL – FUNDAMENTALS OF MICROBIOLOGY

Subject Code	L	T	P	S	Credits	Instructional Hours	Marks		
							CIA	External	Total
			2		2	2	25	75	100

Learning Objective	
LO1	Describe the general Laboratory safety & Sterilization Techniques
LO2	Develop Skills in Media Preparation, Isolation & Serial Dilution Techniques and Pure Culture Techniques
LO3	Microscopically analyze the morphological features of Bacteria and fungi and define various Staining Techniques.
LO4	Perform the Motility of organisms.
LO5	Able to characterize and identify bacteria using Biochemical tests.

UNIT	Contents	No. of Hours
I	Sterilization techniques – Preparation of Media	5
II	Inoculation techniques- Pour plate, spread plate and streaking plate. Isolation of bacteria from water by dilution technique.	10
III	Staining techniques: Simple positive, simple negative, Gram's staining. Lacto phenol cotton blue staining.	5
IV	Motility tests: Hanging drop technique.	5
V	Biochemical characterization - IMVIC test and TSI. Antibiotic sensitivity test (demonstration).	5
Total		**30**

Text Books

1	James G Cappucino and N. Sherman MB(1996). A lab manual Benjamin Cummins, New York 1996.
2	Kannan. N (1996). Laboratory manual in General Microbiology. Palani Publications.
3	Sundararaj T (2005). Microbiology Lab Manual (1st edition) publications.
4	Gunasekaran, P. (1996). Laboratory manual in Microbiology. New Age International Ld., Publishers, New Delhi.

5	R C Dubey and D K Maheswari (2002). Practical Microbiology. S. Chand Publishing.
Reference Books	
1	Atlas.R (1997). Principles of Microbiology, 2nd Edition, Wm.C.Brown publishers.
2	Amita J, Jyotsna A and Vimala V (2018). Microbiology Practical Manual. (1st Edition). Elsevier India.
3	Talib VH (2019). Handbook Medical Laboratory Technology. (2nd Edition). CBS.
4	Wheelis M, (2010). Principles of Modern Microbiology, 1st Edition. Jones and Bartlett Publication.
5	Lim D. (1998). Microbiology, 2nd Edition, WCB McGraw Hill Publications.
Web Resources	
1	http://www.biologydiscussion.com/micro-biology/sterilisation-and-disinfection-methods-and-principles-microbiology/24403.
2	https://www.ebooks.cambridge.org/ebook.jsf?bid=CBO9781139170635
3	https://www.grsmu.by/files/file/university/cafedry//files/essential_microbiology.pdf
4	https://www.cliffsnotes.com/studyguides/biology/microbiology/introduction-to-microbiology/a-brief-history-of-microbiology

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOME

	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
CLO1	3	2	2	2	1	2	3	3	3
CLO2	3	2	2	2	1	1	3	3	3
CLO3	3	2	1	1	-	1	3	3	3
CLO4	3	2	1	2	3	2	3	3	2
CLO5	3	3	2	3	3	2	3	2	3
TOTAL	15	11	8	10	8	8	15	14	14
AVERAGE	3	2.2	1.6	2	1.6	1.6	3	2.8	2.8