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THIRUVALLUVAR UNIVERSITY

SERKKADU, VELLORE–632115

B.Sc. BIO TECHNOLOGY

SEMESTER - II

SYLLABUS

FROM THE ACADEMIC YEAR

2023 – 2024

SECOND SEMESTER

S.No.	Part	Study Components Course Title		Ins. Hrs /week	Credit	Title of the Paper	Maximum Marks		
SEMESTER II							**CIA**	**Uni. Exam**	**Total**
1.	I	Language	Paper-2	6	3	Tamil/Other Languages	25	75	100
2.	II	English	Paper-2	4	3	English	25	75	100
3.	II	NMSDC: Language Proficiency for Employability	Paper-1	2	2	Overview of English Communication	25	75	100
4.	III	Core Course –CC III	Paper-2	5	5	Genetics	25	75	100
5.	III	Core Course –CC IV	Paper -3	5	5	Genetics - Practical	25	75	100
6.	III	Elective II Generic/ Discipline Specific	Elective II	6	3	Fundamentals of Microbiology / Fundamentals of Microbiology - Practical	25	75	100
7.	IV	Skill Enhancement Course SEC-2	Paper2	2	2	Organic Farming and Health Management	25	75	100
8.	IV	Skill Enhancement Course SEC-3 (Discipline Specific)	Paper 1	2	2	Vermitechnology	25	75	100
		Sem. Total		**32**	**25**		**200**	**600**	**800**

SEMESTER – II

COURSE CORE III - 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	15

	Inheritance and Sex- Determination in Man.	
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**

CORE COURSE IV – Genetics - Practical

Subject Code	L	T	P	S	Credits	Instructional Hours	Marks		
							CIA	External	Total
			3		5	5	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	30
II	Giant chromosomes from Chironomus larvae/ Drosophila salivary glands	15
III	Identification of Barr bodies from Buccal smear	10
IV	Preparations of culture medium and culture of Drosophila – methods of maintenance Identifications of mutants of Drosophila	15
V	Human karyotyping (Demo)	5
Total		**75**

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 - FUNDAMENTALS OF MICROBIOLOGY

Subject Code	L	T	P	S	Credits	Instructional Hours	Marks		
							CIA	External	Total
	3	1			2	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

ELECTIVE II -FUNDAMENTALS OF MICROBIOLOGY - Practical

Subject Code	L	T	P	S	Credits	Instructional Hours	Marks		
							CIA	External	Total
			2		1	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

SKILL ENHANCEMETN COURSE II -

ORGANIC FARMING AND HEALTH MANAGEMENT

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

Learning Objective	
LO1	The student will value the concepts of ecology and environment
LO2	To know the techniques of Vermicomposting and enjoying the cultivation of common Medicinal Herbs
LO3	To gain the knowledge about Principles and Policies in Organic forming and Certification agencies
LO4	To realize the Concept of Health and importance of well being
LO5	To appreciate the Role of exercise and nutrition in Health related fitness

UNIT	**Contents**	**No. of Hours**
1	Ecology and Environment – Principles of ecology – Ecosystem - Biotic and abiotic components and interaction – Energy flow –Nutrient cycle – Biodiversity – Endemic – Exotic - Interrelationships.	5
II	Composting – Microbial Compost – Vermicompost – Setup for vermicompost unit - Nutrition garden – Ring garden – Double digging – Cultivating vegetables – Common medicinal herbs – Identification and Cultivation.	5
III	Organic farming – Principles and Policies – Certification agencies – AGMARK, fssai, Halal certification – Participatory grading system (PGS) – Storage – Packing – Transportation – Marketing. Micro-enterprises – Self Help Groups – Economics of cultivations – Sustainability.	5
IV	Health: Concept of Health, changing concepts definitions of health, dimensions of health, concept of well being, spectrum of health, determinants of health, ecology of health, right to health, responsibility for health, indicators of health.	10
V	Exercise and Health related fitness: Health related fitness, health promotion, physical activity for health benefits. Sports related fitness: Role of nutrition in sports, nutrition to athletic performance.	5
Total		**30**

Text Books	
1	G.K. Veeresh, 2006. Organic farming , First edition, New Delhi, India Foundation Books in association with Centre for Environment Education.
2	Mangala rai, 2012.Hand Book of Agriculture, Sixth Edition, ICAR New Delhi.
3	B.B. Sharma , 2007. A Guide to Home Gardening, Second Edition, MIB India, New Delhi.
4	Adrianne E. Hardman, 2009. Physical Activity and Health – The evidence explained, Second edition, Taylor and Francis Group.
5	
Reference Books	
1	Farmers of Forty Centuries: Permanent Organic Farming in China, Korea, and Japan Hardcover – 10 June 2011 by F. H. King (Author)
2	Organic Farming: Components And Management Edition: 1 Author/s:Gehlot D , Publisher: M/s AGROBIOS (INDIA) ISBN: 978817754400

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**	**3**	**3**	**3**	**3**	**3**
CLO4	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**
CLO5	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**
TOTAL	**15**	**15**	**15**	**15**	**15**	**15**	**15**	**15**	**15**
Average	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**

SKILL ENHANCEMENT COURSE III - VERMITECHNOLOGY

Course outcome:

Students will gain knowledge on types of the earthworm culture methods, vermicomposting and its economical benefits.

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

Learning Objective		
LO1	To know the techniques of Vermicomposting and role of earthworms in soil fertility.	
LO2	To practice the culturing techniques of earthworms and composting materials	
LO3	To gain the knowledge about Small scale techniques of Vermicomposting	
LO4	To realize the Concept of Large scale techniques of Vermicomposting	
LO5	To appreciate the impact of Vermiwash and Economics	
UNIT	**Contents**	**No. of Hours**
1	Types, Collection and Preservation of earthworms - Types and basic characteristics of species suitable for vermicomposting; Role of earth worms in soil fertility, Biology of *Lampito maruitti*; Collection and Preservation of Earthworms; Flow sheet for vermi technology	5
II	Culturing techniques of earthworms and composting materials General method; Pot method; Wooden box method; Propagation; Factor affecting culturing of earthworm; Vermicomposting materials; Preliminary treatment of composting materials	5
III	Small scale techniques of Vermicomposting - Indoor dual bin method; Bed method; Pit method; Heap method; Expandable worm tower assembly method; Hanging basket method; Physical, chemical and biological properties of vermicompost	5
IV	Large scale techniques of Vermicomposting Outdoor dual bin; Raised cage; Dual pit; Commercial model; Trickling filter vermicomposting; Keep it simple and save plan	10
V	Vermiwash and Economics - Chemical composition of vermiwash; Techniques of vermiwash production: Advantages of Vermicomposting; Prospects of vermi-culture as self employment venture	5
Total		**30**

Reference Books	
1	The Earthworm book, Ismail,S.A.,other India Press,Goa
2	Somani, L.L. 2008. Vermicomposting and vermiwash. Agrotech Publishing Academy, Udaipur
3	Talashilkar and Dosani, 2005. Earthworm in Agriculture. Agrobios (India), Jodhpur
3	Ranganathan, L.S. 2006. Vermibiotechnology from soil health to human health – Agrobios, India

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