

MARUDHAR KESARI JAIN COLLEGE FOR WOMEN (AUTONOMOUS)

Vaniyambadi – 635 751

PG Department of Biotechnology

for

Undergraduate Programme

Bachelor of Science in Biotechnology

From the Academic Year 2024-25

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UNDERGRADUATE EDUCATION

1.Preamble

The emergence of Biotechnology has made a contemporary advancement in the discipline of Science, embarking the venture of revolution for the enhancement of life and nature. This multidisciplinary subject has placed its foothold in different sectors like Pharmaceuticals, Food Industries, Textile Industries, Agriculture, Environment, Vaccine development to name a few, thereby opening a broad arena to widen job opportunities. The accelerated growth in newer hazards and the pressing need to address these issues has necessitated the requisite for radical strategies and pioneering research personnel to handle it with careful consideration. Cutting-edge technologies in Biotechnology therefore offer the hope to face emerging challenges with insightful approaches. With the advent of Biotechnology, there have been several astonishing inventions both in medicine and environment that has propelled it as one of the frontline subject of the 21st century at its prima facie. As a result the demand for subject experts has seen an inclined growth in all fields of science and technology. Encompassing different streams of science, Biotechnology contemplates to integrate industry and research for a constructive growth of the nation. Therefore an education that warrants both theoretical and practical expertise becomes an indispensible element to satiate the global requisite of an intellectually skilled person.

The Department of Biotechnology began its journey in the year 2007 with a Bachelor's degree in a vision to empower students with adequate knowledge and skills on advancements in the field of science through Biotechnological concepts and principles. It then introduced its Post-graduation program in the year 2014 and thereafter added the M.Phil and Ph.D research programs in the year 2018 and 2019 respectfully. The Department is endowed with highly skilled faculty members who work towards teaching, guiding and motivating the students to become successful career oriented personnel. The Department has taken up several collaborative activities with industries and research centers to provide the students with a real-time experience of a work environment. The Department has a never failed to produce University Rank Holders and also holds a commendable record in Placement. The Department is further enriched with sophisticated laboratory that is furnished with high-end instruments and equipment to deliver in-depth practical sessions for the students.

In adherence to the current needs and expectations of the industries, the curriculum and syllabi for Biotechnology were framed meticulously such that upon completion of the program, the learner will acquire commendable knowledge and skills to meet the expectancy of the industrial, educational and research sectors. The program is envisaged to impart deeper insights into radical and empowering technologies and concepts that refurbish scientific endeavors. It also seeks to mold and develop logical reasoning and solution providing potentiality to the leaners so as to become equally competent with their peers by increasing the credentials of their knowledge. The program also perpetuates the support of laying the path for building a self-sustaining ability and independency to stand out as a remarkable personality in this scientific era. The program of Biotechnology cultivates the sense of responsibility for the well-being of all life and instigates the curiosity into seeking opportunities to become a part of an impactful society. Biotechnology embodies such an ardent principality that makes this stream of science an unrelinquishable asset for the sustenance and betterment of life on earth.

PROGRAMME OUTCOMES (PO)

Programme	B.Sc., Biotechnology
Programme Code	US05
Duration	3 years [UG]
	PO1: Disciplinary knowledge: Capable of demonstrating comprehensive knowledge and understanding of one or more disciplines that forma part of an undergraduate Programme of study.
	PO2: Communication Skills: Ability to express thoughts and ideas effectively in writing and orally; Communicate with others using appropriate media; confidently share one's views and express herself/himself; demonstrate the ability to listen carefully, read and write analytically and present complex information in a clear and concise manner to different groups
Programme Outcomes	 PO3: Critical thinking: Capability to apply analytic thought to a body of knowledge; analyses and evaluate evidence, arguments, claims, beliefs on the basis of empirical evidence; identify relevant assumptions or implications; formulate coherent arguments; critically evaluate practices, policies and theories by following scientific approach to knowledge development. PO4: Problem solving: Capacity to extrapolate from what one has learned and apply their competencies to solve different kinds of non-familiar problems, rather than replicate curriculum content knowledge; and apply one's learning to real life situations. PO5: Analytical reasoning: Ability to evaluate the reliability and relevance of evidence; identify logical flaws and holes in the arguments of others; analyze and synthesize data from a variety of sources; draw valid conclusions and support them with evidence and examples and addressing opposing viewpoints. PO6:Research-relatedskills:Asenseofinquiry and capability for asking relevant/appropriate questions, problem arising, synthesizing and articulating; Ability to recognize cause-and-effect relationships, define problems, formulate hypotheses, test hypotheses, predict cause-and-effect relationships; ability to plan, execute and report the results of an experiment or investigation. PO7: Cooperation / Teamwork: Ability to work effectively and respectfully with diverse teams; facilitate cooperative or coordinated effort on the part of a group, and act together as a group or a team in the interests of a common cause and work efficiently as a member of a team. PO8: Scientific reasoning: Ability to analyse, interpret and draw conclusions from quantitative/ qualitative data and critically evaluate ideas, evidence, and experiences from an open-minded and reasoned perspective.

Programme Specific Outcomes:	 PSO1– Placement: To prepare the students who will demonstrate respectful engagement with others' ideas, behaviors, beliefs and apply diverse frames of reference to decisions and actions. PSO2-Entrepreneur: To create effective entrepreneurs by enhancing their critical thinking, problem solving, decision making and leadership skills that will facilitate startups and high potential organizations. PSO3 –Research and Development: Design and implement HR systems and practices grounded in research that comply with employment laws, leading the organization towards Growth and development.
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Eligibility for Admission:

Candidates for admission to the first year of the Bachelor of Biotechnology course shall be required to have passed the Higher Secondary Examination with 50% marks in the aggregate in the Academic Stream of any Science group

Methods of Evaluation and Assessment

Methods of Evaluation											
Internal Evaluation	I	25 Marks									
External Evaluation	End Semester Examination	75 Marks									
	Total	100 Marks									
Methods of Assessment											
Recall (K1) Simple definitions, MCQ, Recall steps, Concept definitions											
Understand / Comprehend (K2)	MCQ, True/False, Short essays, Concept explanation overview	ons, short summary or									
Application (K3)	Suggest idea/concept with examples, suggest form Observe, Explain	nulae, solve problems,									
Analyze (K4)	Problem-solving questions, finish a procedure in ma Between various ideas, Map knowledge	any steps, Differentiate									
Evaluate (K5)	Longer essay/Evaluation essay, Critique or justify with	pros and cons									
Create (K6)	Check knowledge in specific or offbeat situations, I Presentations	Discussion, Debating or									

	Semester - I							Semester - II								
Code	Course Title	Hours Distribut			s tion	С	Code	Course Title	E	H Distr	s tion	С				
		L	T	Р	S				L	Т	Р	S				
24UFTA11	Tamil – 1	4	1	0	0	3	24UFTA21	Tamil – 2	4	1	0	0	3			
24UFEN11	English – 1	4	1	0	0	3	24UFEN21	English – 2	4	1	0	0	3			
24UBTC11	CC – 1 – Cell and molecular Developmental Biology	3	1	2	0	5	24UBTC21	CC – 3 – Genetics and Molecular Biology	3	1	2	0	5			
24UBTC12P	CC - 2 (Practical) – Cell Biology and Biological	0	0	4	0	3	24UBT22P	CC - 4 (Practical) – Genetics and Molecular Biology	0	0	4	0	2			
	Chemistry EC - 1 AL –						24UBTA21	EC - 2 AL – Fundamentals of Microbiology	3	1	0	0	4			
24UBTA11	Biological Chemistry	3	1	0	0	3	241 IDT 4 22D	EC - 3 AL Practical –		0	2	0	2			
24UBTA11	SEC – THuman Physiology and Disease (NME)	2	0	0	0	2	24001A221	Fundamentals of Microbiology	0	0	2	0	2			
24UBTS12P	SEC – 2 – MS – Office	0	0	2	0	2	24UBTS21	SEC – 3 Good Laboratory Practice	1	0	1	0	2			
24UBTF11	Fundamentals FC – Concepts in Biotechnology	1	1	0	0	2	24UAEC21	AEC – 1 Life Skill for Yoga	1	1	0	0	2			
TOTAL	Bioteciniology				30	23	TOTAL					30	23			

T-Tutorial

P-Practical

S-Seminar

C-Credit

Students must complete at least one online course (MOOC) from platforms like SWAYAM, NPTEL, or Nanmudalvan within the fifth semester. Additionally, engaging in a specified Self-learning Course is mandatory to qualify for the degree, and successful participation will be acknowledged with an extra credit of 2*.

										Mark	S	
Cours Code	e	Course Name	Category	L	Т	Р	S	Credits	Hours	CIA	External	Total
24UBT	ГС11	CELL AND MOLECULAR DEVELOPMENTAL BIOLOGY	CC-1	3	1	2	0	5	6	25	75	100
Learning Objectives												•
LO1 To Have an insight of the cell as the fundamental unit of life and to compare the strue of the Eukaryotic cell with the primitive prokaryotic cell												tructure
LO2	To o	btain a strong foundation about	ut the fun	ctior	nal as	spect	s of	cell	organ	elles		
LO3	To S	tudy the structure and function	ns of Nuc	eleic	acid							
LO4	To u	nderstand Cell Cycle and Cell	to Cell S	Signa	lling	5						
LO5	To Understand the principles and molecular mechanisms involved in c differentiation											cellular
Unit	Content											
1	Cells-Introduction & Discovery and Diversity of cells – Cell theory - Cell death, growth and developments – Cell origin and Evolution – Basic Properties of cell – Size, shape, Composition. Types and Structure of cells – Prokaryotes , Eukaryotes.										18	
2	Cell Organelles: Structure and Function of Cell Organelles - Cell Wall & Cell Membrane, Cytoplasm, Nucleus, Chromosomes, Endoplasmic reticulum, Ribosomes, Golgi bodies, plastids, Vacuoles, lysosomes, Mitochondria, Microbodies – Flagella, Cilia, Centrosomes and Centrioles, Cytoskeleton.											18
3	Nucl DNA RNA conce	eic Acids: Structure and Pro A. Structure and Properties A.DNA and RNA as Genetic epts of Gene. Regulatory regio	operties of of RNA Material ons- UTF	of D – . Ce Rs	NA.T Type ntral	Гуре es o Do	s of f R gma	DN NA of t	A, Fu – Fu he Co	nctions nctions ell – Ba	of of asic	18
4	Cell Cycle (Prokaryotes and Eukaryotes) Cell Cycle – Cell Cycle Check points – Cell death and Senescence. Cell division – Phases- mitosis – meiosis. Cell to cell communication- signal transduction – signalling molecules – cell junction – cell adhesion and cleavage. Extracellular matrix – cell differentiation.											18
5	Gam Mam of cl organ	etogenesis- Basic Concepts mals –Oogenesis in mammal eavage – Germ layers – Bla nogenesis – parthenogenesis –	s of Ga ls – Stem stula for Invitrofe	amet cell matio	ogen s and on – zatio	esis d typ gast on	- es – rula	Sper Fert	matog iilizat – Ne	genesis ion – ty urulatio	in pes n –	18

СО	Course Outcomes
CO1	The students will be able to gain knowledge on cellular organization
CO2	The students will be able to understand the membrane system of cells
CO3	The students will gain knowledge on the genetic material
CO4	The students will be able to understand the regulation of cell cycle
CO5	The students will be able to understand the process of gametogenesis
Textbo	oks:
1	Cell and Developmental Biology Hardcover – 1 January 2020 by KarrunaSantoshasing& A K DubeyPardeshi (Author)
2	Cell and Developmental Biology Hardcover – 1 January 2022 by Dr.KapilKishor (Editor)
3	Cell and Development Biology Paperback – 1 December 2004by K.V. Sastry (Author), S. P. Singh (Author), B.S. Tomar (Author)
4	Developmental Biology by Reddy EcSurendranatha L NirmalaJyothi, SbwPublishersJanuary 2016
5	Developmental Biology Michael Barresi and Scott Gilbert; Publication Date - 01 March 2023. ISBN: 9780197574591
Referen	nce Books:
1	Karp's Cell and Molecular Biology: Concepts and Experiments. 8th Edition (2015). WileyPublications.
2	James D. Watson, 7th Edition (2014), Molecular Biology of the Gene, Pearson Publications
3	Geoffrey M. Cooper, 7th Edition (2015). The Cell: A Molecular Approach, Sinauer Associates, Qxford University Press
4	LodishHarwey, 6th Edition (2016), Molecular Cell Biology, W. H. Freeman Publications
5	Wolpert L, Tickle C, 2015. Principles of Development, 5th edition, Oxford University Press.
Web re	sources:
1	https://byjus.com/biology/cells/
2	https://ncert.nic.in/textbook/pdf/kebt102.pdf
3	https://pmc.ncbi.nlm.nih.gov/articles/PMC6822018/
4	https://www.khanacademy.org/science/ap-biology/cell-communication-and-cell-cycle/cell- cycle/a/cell-cycle-phases
5	https://byjus.com/biology/gametogenesis-spermatogenesis-oogenesis/

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
C01	3	2	2	3	3	2	3	3	3	3	2
CO2	3	3	2	3	3	2	3	3	3	3	2
CO3	3	3	3	3	3	2	3	3	3	3	2
CO4	3	2	3	3	3	2	3	3	3	3	2
CO5	3	2	3	3	3	2	3	3	3	3	2
Total	15	12	13	15	15	10	15	15	15	15	10
Average	3	2.4	2.6	3	3	2	3	3	3	3	2

Mapping with Programme Outcomes and Programme Specific Outcomes

3 – Strong, 2- Medium, 1- Low

										Mark	S		
Course Code		Course Name	Category	L	Т	Р	S	Credits	Hours	CIA	External	-	Total
24UB7	ГР12	CELL BIOLOGY AND BIOLOGICAL CHEMISTRY PRACTICAL	CC-2	0	0	4	0	3	4	25	75	100	100
	Learning Objectives												
LO1	To Demonstrate the operation of Light Microscope& to identify different cells												
LO2	To id	lentify cell & Organelles											
LO3	To u	nderstand cell division											
LO4	To understand the cell division in germ cells												
LO5	To understand staining procedure												
Unit	Content											Hou	rs
1	Components of a Light/Compound Microscope											2	
2	Measurement of cell size by ocular and stage micrometer											4	
3	Identification of animal cell and plant cells											4	
4	Cell	fractionation of organelles										4	
5	Obse	rvation of buccal cells										8	
6	Mito	sis from Onion root tip										4	
7	Meio	sis from Flower Bud										8	
8	Prepa	aration of Buffer Solution, pH	meter ca	alibra	ation							8	
9	Bloo	d Smear preparation										2	
10	Ident	ification of Bacterial Cell (Sin	mple Stai	ining	g)							4	
11	Cell embr	Types - Microbial And yo-24hrs, 48hrs, 72hrs, 96hrs	Plant Mo	orph	ome	tric	Mea	sure	ments	of Ch	nick	4	
12	Syste	ematic analysis of organic con	npounds-	Fun	ction	nal g	roup	test				4	
13	Volu •	metric analysis- Estimation of Glycine Determination of Ascorbic	acids									4	

СО	Course Outcomes
CO1	The students will be able to understand the basic components of microscope
CO2	The students will be able to understand the cell fractionation and organelle identification
CO3	The students will be able to understand the process of cell division in somatic cells
CO4	The students will be able to understand the process of cell division in germ cells
CO5	The students will be able to understand the different staining procedures
Textbo	oks:
1	Experimental Procedures in Lifescience - Dr.S.Rajan&Mrs. R. Selvi Christy, Anjana Book House
2	Analytical Techniques in Biochemistry and Molecular Biology; RajanKatoch; 2011; ISBN:9781441997852
3	Cell and Molecular Biology Lab Manual. 14 June 2011 by Cristina C Thompson &David a Thompson
4	Practical Guide Of Cell Biology & Molecular Genetics 6 February 2023by Dr.KanakSaxena
5	A Cell Biology Lab Manual Spiral-bound –2022 by Joseph Francis
Referen	nce Books:
1	Cell and Molecular Biology: A Lab Manual.30 October 2013 by K. V. Chaitanya
2	Practical Handbook Of Biochemistry : Lab Manual. 17 April 2020 by Deepak Shrivastava (Author)
3	Lab Manual of Biochemistry. 12 April 2020 by DeepikaBairagee (Author)
4	Cell and Molecular Biology Lab Manual. 14 June 2011. by Cristina C Thompson & David a Thompson
5	Lab in Cell Biology, Microbiology and Bioinstrumentation: Laboratory Manual Kindle Edition by GeethalakshmiSundararaman & AnithaArumugam; 2017
Web re	sources:
1	https://byjus.com/biology/study-of-the-parts-of-a-compound-microscope/
2	https://ncert.nic.in/pdf/publication/sciencelaboratorymanuals/classXII/biology/lelm204.pdf
3	https://egyankosh.ac.in/bitstream/123456789/101661/1/Unit-3.pdf
4	https://abhedanandamahavidyalaya.ac.in/wp- content/uploads/2019/06/Detection_of_Organic_Compounds.pdf
5	https://www.iitg.ac.in/biotech/BTechProtocols/Ascorbic.pdf

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	3	3	3	3	2	3	3	3	3	2
CO2	3	3	3	3	3	2	3	3	3	3	2
CO3	3	3	3	3	3	3	3	3	3	3	3
CO4	3	3	3	3	3	3	3	3	3	3	3
CO5	3	3	3	3	3	3	3	3	3	3	3
Total	15	15	15	15	15	13	15	15	15	15	13
Average	3	3	3	3	3	2.6	3	3	3	3	2.6

Mapping with Programme Outcomes and Programme Specific Outcomes

3 – Strong, 2- Medium, 1- Low

									Mark	S		
Course Code		Course Name	Category	L	Т	Р	S	Credits	Hours	CIA	External	Total
24UBT	CA11	BIOLOGICAL CHEMISTRY	Allied- 1	3	1	0	0	3	4	25	75	100
	Learning Objectives											
LO1	O1 To understand the acid-base concept and principle of chemical bonding											
LO2	To u	nderstand the importance and	preparati	on o	f but	ffer s	solut	ions				
LO3	To u	nderstand the importance of c	arbohydr	ate a	nd it	s bio	ologi	ical s	ignifi	cance		
LO4	To u	nderstand the importance and	functioni	ing o	of am	ino a	acid	s, vit	amins	and mi	nerals	
LO5	To u	nderstand the Biological signi	ficance o	f lip	ids a	nd n	ucle	ic ac	ids			
Unit			Conte	ent]	Hours
1	Atomic theory, Formation of molecules, Electronic configuration of atoms, s&p atomic orbitals, Perioidic table and periodic classification, valency types and chemical bonds, Organic compounds-electrophiles, neutrophils, free radicals, Types of reactions-addition, substitution, elimination, condensation and polymerization										s&p and als, and	12
2	Acid and base properties and differences, concentration of solution, Ways of expressing concentration of solution/percent/weight, normality, molarity, molality, mole fraction. pH of solution, pH scale, measurement of pH, buffer solution and properties, Henderson-Hasselbalch equation, mechanism of buffer action of acidic buffer and basic buffer										of ity, ffer ffer	12
3	Carbohydrate- Types, Classification and sub-classification, Structure, Function and Properties of carbohydrates. Metabolic pathways- Glycolysis, Glycogenesis, Glycogenolysis, Gluconeogenesis, TCA Cycle, Electron Transport Chain, Biological importance of carbohydrates											12
4	Aminoacids- Classification, Structure and Function of aminoacids, Zwitter ionic states; Biological significance of aminoacids. Proteins-Primary, Secondary and Tertiary structures; Protein classification, Physiochemical properties of protein, Isoelectric point and significance, Vitamins and Minerals- Fat and water soluble vitamins, Minerals- Macro and microelements- Cofactors and CoEnzymes- Biological importance of Vitamins and Minerals											12
5	Lipic mem Chol Nucl signi	ls- Classification- Function brane, Lipid metabolism, B esterol biosynthesis, Horn eotides- Structure and functi ficance of nucleic acids, 16s r	and Prop iological nones- ion, Bios RNA and	oertie sig fund ynth l its	es of nific ction esis signi	f lip ance ; T of M ficar	ids; ; St Frigl Nucl nce.	Lipi erols yceri eic a	ds in - Cla des- acids,	biolog ssificat Funct Biolog	ical ion, ion, ical	12

СО	Course Outcomes
CO1	The students will gain understanding in the structure and functioning of biomolecules
CO2	The students will be able to understand the importance of biomolecules
CO3	The students will be able to understand the regulation of biomolecules
CO4	The students will be able to understand the different metabolic process
CO5	The students will be able to logically reason the coordinated functioning of biomolecules
Textbo	oks:
1	Cambell, M.K. and Farrell, S.O. (2018) Biochemistry, Ninth Edition, Cangage Learning
2	Voet, D., Voet, J.G. and Pratt, C.W. (2018) Principles of Biochemistry, John Wiley & Sons. Inc, New York.
3	Instrumental Methods of Analysis - Chatwal and Himalayan Publication
4	Principles And Techniques of Practical Biochemistry - Bryan L, Williams and Keith Wilson, Cambridge Univ, Press.
5	Medical Biochemistry (2005) 2nd ed., Baynes, J.W. And Dominiczak, M.H., Elsevier Mosby Ltd. (Philadelphia), ISBN: 0-7234-3341-0
Referen	nce Books:
1	Lehninger: Principles of Biochemistry (2013) 6th ed., Nelson, D.L. and Cox, M.M., W.H. Freeman and Company (New York), ISBN: 13:978-1-4641-0962-1 / ISBN: 10:1-4641-0962-1.
2	Principles of Biochemistry (2008) 3rd ed., Voet, D.J., Voet, J.G. and Pratt, C.W., John Wiley & Sons, Inc. (New York), ISBN:13: 978-0470-23396-2
3	Biochemistry (2010) 4th ed., Garret, R. H. and Grisham, C.M., Cengage Learning (Boston), ISBN-13:978-0-495-11464-2
4	Molecular Cell Biology (2013) 7th ed., Lodish, H., Berk, A., Kaiser, C.A., Krieger, M., Bretscher, A., Ploegh, H., Amon, A. and Scott, M.P., W.H. Freeman & Company (New York), ISBN: 13:978-1-4641-0981-2.
5	Principles And Techniques Of Practical Biochemistry- Keith Wilson And John Walker, Cambridge Press.
Web re	esources:
1	https://byjus.com/chemistry/atomic/
2	https://www.khanacademy.org/science/biology/water-acids-and-bases/acids-bases-and- ph/a/acids-bases-ph-and-bufffers
3	https://www.chem.purdue.edu/gchelp/https://pmc.ncbi.nlm.nih.gov/articles/PMC7778149/ #:~:text=Carbohydrates%20are%20divided%20into%20three,glucose%20molecules%3B% 20and%20(3)
4	https://www.britannica.com/science/lipid/Digestion-of-dietary-fatty-acids
5	https://www.ncbi.nlm.nih.gov/books/NBK525952/

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
C01	3	3	3	3	3	2	3	3	3	2	2
CO2	3	3	3	3	3	3	3	3	3	2	2
CO3	3	3	3	3	3	3	3	3	3	2	2
CO4	3	3	3	3	3	3	3	3	3	2	2
CO5	3	3	3	3	3	3	3	3	3	2	2
Total	15	15	15	15	15	14	15	15	15	10	10
Average	3	3	3	3	3	2.8	3	3	3	2	2

Mapping with Programme Outcomes and Programme Specific Outcomes

3 – Strong, 2- Medium, 1- Low

					-				Marks			
Cours Code	e	Course Name	Category	L	Т	Р	S	Credits	Hours	CIA	External	Total
24UB7	FS11	Human Physiology and Diseases	SEC-1	2	0	0	0	2	2	25	75	100
	Learning Objectives											
LO1	To u	nderstand the biological conce	ept of Phy	ysiol	ogy							
LO2	To u	nderstand the different biolog	ical syste	m								
LO3	To u	nderstand the mechanism of in	nfection a	and i	nfect	tious	dise	eases				
LO4	To u	nderstand the concepts of mos	st commo	n di	sease	es						
LO5	To understand different types of therapeutics											
Unit			Conte	ent								Hours
1	Introduction to Human Biology, Overview of human physiology, Cells and tissues: Structure and function, Composition and Function of Blood, Types of Disease in Human-Blood related diseases.								06			
2	The cardi disea disor	nervous system: Anatom ovascular system: Heart fun ses, The respiratory syste ders, The digestive system: D	y, funct action, bl em: Mec igestion,	tion lood chani abso	anc vess isms orptic	d co sels, of on, g	omm con bre astre	non nmor eathir ointes	disor n caro ng, I stinal	ders, ' liovasc Respirat disease	The ular cory s.	06
3	Com disea inher	mon endocrine disorders (e ses, allergies, and immune itance patterns, Mechanisms o	.g., diab e deficie of infectio	etes, encie on, I	thy es, C mpao	roid Gene ct of	dis tic env	eases disoi ironn	s), Au rders nent c	utoimm and ti on healti	une heir h.	06
4	Lifestyle diseases: Obesity, Diabetes: Types, treatment strategies, Cellular basis of cancer, Types of cancer, diagnostics and treatments, AIDS : Causes, Treatment and Prevention.								06			
5	Recent advances in biomedical research, Antibiotics, antivirals, antifungals, and antiparasitic Drugs, Role of surgery in treating diseases, Lifestyle modifications as a treatment approach, Ethics in medical treatment Policy and public health considerations, Vaccine development										06	

СО	Course Outcomes
CO1	The students will be able to understand the biology of diseases
CO2	The students will be able to understand the different biological systems in human
CO3	The students will be able to understand the basics of different types of infectious reactions
CO4	The student will be able to gain understanding on the most common diseases and disorders
CO5	The students will be educated in the different kind of therapeutics
Textbo	oks:
1	Textbook of Pathology for Allied Health Sciences Paperback – 1 June 2017 by Armada's (Author)
2	Textbook of Medical Physiology, 2ed Paperback – 12 July 2018 by D. Venkatesh (Author), H. H. Sudhakar (Author)
3	Textbook of Anatomy and Physiology for Health Professionals Paperback – Import, 30 January 2022 by InduKhurana (Author)
4	Ganong's Review of Medical Physiology [Paperback] Barrett Paperback – 13 August 2019 by BARRETT (Author)
5	Textbook of Pathology for Allied Health Sciences Paperback – 1 June 2017 by RamadasNavak (Author)
Refere	nce Books:
1	Basics of Medical Physiology, 5ed Paperback – 31 May 2023 by Dr Venkatesh and Sudhakar HH (Author)
2	Ganong's Review Of Medical Physiology [Paperback] Barrett Paperback – 13 August 2019 by BARRETT (Author)
3	Human Anatomy and Physiology Paperback – 1 December 2008 by Rahul Phate (Author)
4	Ross and Wilson Anatomy and Physiology in Health and Illness, International Edition, 14e Paperback – 1 July 2022 by Waugh (Author)
5	Human anatomy and physiology Paperback – 1 February 2017, by SatishMandaye (Author)
Web re	sources:
1	https://www.medicalnewstoday.com/articles/196001
2	https://www.kenhub.com/en/library/anatomy/human-body-systems
3	https://pmc.ncbi.nlm.nih.gov/articles/PMC7988207/
4	https://www.healthline.com/health/cancer#how-cancer-grows
5	https://pmc.ncbi.nlm.nih.gov/articles/PMC11434382/

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
C01	3	3	3	3	3	3	3	3	3	3	3
CO2	3	3	3	3	3	3	3	3	3	3	3
CO3	3	3	3	3	3	3	3	3	3	3	3
CO4	3	3	3	3	3	3	3	3	3	3	3
CO5	3	3	3	3	3	3	3	3	3	3	3
Total	15	15	15	15	15	15	15	15	15	15	15
Average	3	3	3	3	3	3	3	3	3	3	3

Mapping with Programme Outcomes and Programme Specific Outcomes

3 – Strong, 2- Medium, 1- Low

									Mark	S			
Cours Code	e	Course Name	Category	L	Т	Р	S	Credits	Hours	CIA	External		Total
24UB7	FS12	MS-OFFICE FUNDAMENTALS	SEC-2	0	0	2	0	2	2	25	75		100
	Learning Objectives												
LO1	To become practically expertise in MS-WORD												
LO2	To u	nderstand the advance functio	ning in V	VOR	D								
LO3	To ga	ain practical experience in MS	S-PowerP	oint									
LO4	To ga	ain practical experience in MS	S-PowerP	oint									
LO5	To gain practical experience in MS-EXCEL												
Unit			Conte	ent								He	ours
1	Basic functions of WORD; Menu bar and Tool bar; Typing and editing; Formatting text; Indent and spacing; Bullets and numbering.									06			
2	Inser Bord	ting symbols, objects and pict ers and Shading; Page setup;	tures; Inse Thesauru	ertin s, A	g tab utoco	oles a	and I t	Form	atting	tables;		06	
3	Basic and c	e functioning of PowerPoint; I colours; Adding text and form	Menu and atting; B	l too allets	ls; S s anc	lide l nur	tem _j nber	plates	s; Slid	le theme	es	06	
4	Inserting tables and images; Working with charts, Slide animation- Properties; Custom animation- Properties; Slide show and navigation								06				
5	Basics of Excel-Uses; Menus of Excel; Data entry- rows, columns; Working with charts; Working with formula, AI in MS-Office									06			

СО	Course Outcomes
CO1	The students will be able to understand and gain practical knowledge in MS-WORD
CO2	The students gain practical skills in preparing documents professionally
CO3	The students will become practically skilled in the concepts of PowerPoint
CO4	The students will become skilled in preparing professional presentations
CO5	The students will gain practically experience in analysing research data
Textbo	oks:
1	Microsoft Office 2003: The Complete Reference by Jennifer Kettell
2	Office 2010 Visual Quick Tips (Paperback)by Sherry Willard Kinkoph Gunter
3	Microsoft Office PowerPoint 2007 QuickSteps (Paperback)by Carole Boggs Matthews
4	Microsoft Excel 2010 In Depth (Paperback)by Bill Jelen
5	Learn Microsoft Office for Windows 95: Comprehensive Tutorials for Word 7.0, Excel 7.0, Access 7.0, Powerpoint 7.0, Schedule 7.0, Shortcut Bar, Binder, and Much More (Paperback)by Russell A. Stultz
Refere	nce Books:
1	Microsoft Office 365 All-In-One For Beginners & Power Users: The Concise Microsoft Office 365 A-Z Mastery Guide for All Users (Word, Excel, PowerPoint, (Office 365 Mastery Guide 2022 Book 1) Kindle Edition by Tech Demystified
2	MS-Office, <u>Dr. S.S. Srivastava</u>
3	Microsoft Office Reference Guide by Tom Bunzel
4	Computer MS Office Book by Prof. Satish Jain, M.Geetha, Kratika
5	MS Office 2013 (Revised Edition), VISHNU P. SINGH, ISBN: 978-81-7317-705-7
Web re	sources:
1	https://www.egyankosh.ac.in/bitstream/123456789/28486/1/Unit-3.pdf
2	https://support.microsoft.com/en-us/office/format-a-table-e6e77bc6-1f4e-467e-b818-
3	https://support.microsoft.com/en-us/office/basic-tasks-for-creating-a-powerpoint- presentation-efbbc1cd-c5f1-4264-b48e-c8a7b0334e36
4	https://opentextbc.ca/learningpowerpoint/chapter/slide-transitions-and-animations/
5	https://support.microsoft.com/en-us/office/present-your-data-in-a-column-chart-d89050ba- e6b6-47de-b090-e9ab353c4c00

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
C01	2	3	3	2	3	3	3	3	2	2	3
CO2	2	3	3	2	3	3	3	3	2	2	3
CO3	2	3	3	2	3	3	3	3	2	2	3
CO4	2	3	3	2	3	3	3	3	2	2	3
CO5	2	3	3	3	3	3	3	3	2	2	3
Total	10	15	15	11	15	15	15	15	10	10	15
Average	2	3	3	2.2	3	3	3	3	2	2	3

Mapping with Programme Outcomes and Programme Specific Outcomes

3 – Strong, 2- Medium, 1- Low

										Mark	s	
Cours Code	e	Course Name	Category	L	Т	Р	S	Credits	Hours	CIA	External	Total
24UB7	FF11	CONCEPTS IN BIOTECHNOLOGY	FC	1	1	0	0	2	2	25	<i>5L</i>	100
	Learning Objectives											
LO1	To understand the scope of Biotechnology											
LO2	To u	nderstand the diverse applicat	ions of B	iotec	chno	logy						
LO3	To u	nderstand the importance of b	iotechnol	logy	in da	aily l	ife					
LO4	To understand the basic principles of biotechnology											
LO5	To understand the advanced application of Biotechnology											
Unit			Conte	ent								Hours
1	Biote Histo in Ine	echnology – Introduction, O ory of Biotechnology, Biotech dia and Job Opportunities.	verview, mology i	Imp n Ind	oorta dia a	nce, nd C	Sco Globa	ope a al, B	and A iotech	pplicati Indust	ion, ries	6
2	Gree Biote Biote Indus Biote appli	n Biotechnology - Agric echnology – Pharmaceutical echnology – Food and nutritie stry and manufacturing appli echnology and application, Bl cation Gold Biotechnology –	ultural Biotech on and i cations, ue Biotec Computa	biote nolo ts ap Grey chno tion	echno gy a oplica / Bio logy Biol	blogy and ation otech r = N logy	y ar its a, W anolo Iarin and	nd a appli hite ogy - ne Bi Nano	pplica cation Bioteo - Env otechnotechn	ation, I ns, Yell chnolog ironme nology nology	Red low y – ntal and	6
3	Dairy Modi	y Products, Bakery Products, ified Crops, Antibiotics, Vacc	Beverag ines, Bio	ges, (-fuel	Cosn ls.	netic	s, D	eterg	gent, (Genetic	ally	6
4	Diversity of Plant and Animal cell size and shape, Cellular organelles, Chloroplast; Nucleus, DNA, Overview of Recombinant DNA Technology, restriction enzymes, plasmids, vectors								6			
5	Adva organ produ	Advancements of Biotechnology- Applied Biotechnology, Genetically modified organisms, BT cotton, BT-brinjal, Golden Rice, Cloning, Pharmaceutical products										6

СО	Course Outcomes
CO1	The students will be able to understand the scope and opportunities in Biotechnology
CO2	The students will be able to understand the organization of cells and cell components
CO3	The students will be able to understand the different fields of biotechnology
CO4	The students will be able to understand the applications of biotechnology in daily life
CO5	The students will be able to understand the basic principle of biotechnological application
Textbo	oks:
1	Basic Biotechnology International Student Edition Paperback – Student Edition, 31 January 2007, by Colin Ratledge (Editor), Bjorn Kristiansen (Editor)
2	Basics of Biotechnology Paperback – 1 January 2004; by A.J. Nair
3	Textbook of Basic Biotechnology Hardcover – 1 January 2012, by BirendraBahadur Singh (Author), Vinod Singh (Author)
4	Textbook of Biotechnology, 4ed Paperback – 1 January 2010 by H.K.Das (Author)
5	A Textbook of Biotechnology Paperback – 1 January 2009 by RashmiTyagi (Author)
Refere	nce Books:
1	Cell Biology Paperback – 1 January 2020 by Dr. Tripurari Mishra (Author), Dr. B.D. Singh
2	A Text Book of Biotechnology Paperback – 1 January 2007 by PradeepParihar (Author)
3	Molecular Biotechnology: Principles and Applications of Recombinant DNA Hardcover – Import, 1 December 2002 by Bernard R. Glick (Editor), Jack J. Pasternak (Editor)
4	A Textbook of Biotechnology 4th Rev. Edn. 2006 Edition, Kindle Edition by R C Dubey (Author)
5	Textbook of Biotechnology Paperback – 27 February 2012 by Patnaik (Author)
Web re	sources:
1	https://www.techtarget.com/whatis/definition/biotechnology
2	https://www.upscprep.com/biotechnology-blue-green-red-grey-applications-upsc/
2	https://www.pics.ag.in/modia/documents/8rScc214NewE/Lesson 20.pdf
5	https://www.mos.ac.m/media/documents/SrSec514NewE/Lesson-50.pdf
4	https://bio.libretexts.org/Bookshelves/Genetics/Genetics_Agriculture_and_Biotechnology_
	(Suza_and_Lee)/01%3A_Chapters/1.11%3A_Recombinant_DNA_Technology
5	https://www.drishtiias.com/to-the-points/paper3/genetically-modified-organism-gmo

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
C01	3	3	3	3	3	3	3	3	3	3	3
CO2	3	3	3	3	3	3	3	3	3	3	3
CO3	3	3	3	3	3	3	3	3	3	3	3
CO4	3	3	3	3	3	3	3	3	3	3	3
CO5	3	3	3	3	3	3	3	3	3	3	3
Total	15	15	15	15	15	15	15	15	15	15	15
Average	3	3	3	3	3	3	3	3	3	3	3

Mapping with Programme Outcomes and Programme Specific Outcomes

3 – Strong, 2- Medium, 1- Low

									Marks			
Cours Code	e	Course Name	Category	L	Τ	Р	S	Credits	Hours	CIA	External	Total
24UBT	ГС21	Genetics and Molecular Biology	CC-3	3	1	2	0	5	6	25	75	100
		Lea	rning O	bjec	tives	5						
LO1	Explain the properties of genetic materials and storage and processing of information.									g of	genetic	
LO2	Learn about the classical genetics and transmission of characters from one generation next.								n to the			
LO3	Obta	in a strong foundation for the	advanced	l ger	netics	8						
LO4	Acqu huma	iire knowledge about the Mut	agens, M	utati	ons,	DN.	A R	epair	s and	Genetic	c disor	ders in
LO5	Categories Eugenics, Euphenics and Euthenics and indepth Knowledge on pop Genetics.										ulation	
Unit			Conte	ent								Hours
1	 Basic Concept – Gene, Chromosome, DNA and RNA. DNA as the Genetic Material: Griffith's experiment, Hershey-Chase Experiment, Experimental Proof by Avery, McLeod and McCarty. RNA as genetic material. DNA Replication: Semi conservative, Rolling circle. Mechanism of replication. Genetics of Bacteria and viruses: Transformation, Conjugation, F+, Hfr, Transduction- generalized and specialized. Viral DNA Replication- lytic and luce and specialized. 									18		
2	Mene expe Mene Epist	delian Inheritance- Birth or riments, Monohybrid cross del's laws. Incomplete dom casis -lethal genes. Multiple al	f Geneti , Dihyb inance, (leles. Blo	cs, rid Co-d ood g	Men cros omii grouț	delia s, E nanco inh	un p Back e. Ii erita	orinci cross ntera nce i	iples s or ction in mar	–Mend Testcr of Gen n.	el's oss, nes-	18
3	Linka Cross Chro Deter	age - linkage in Drosophila- N sing over- types, mechanisn mosomes, interference and c rmination in Man.	Morgan's n, signifi oincidend	exp canc ce. S	erim e of bex -	ents, f cro -Linl	fact ssin ked	ors a g ov Inhe	affecti ver. N ritanco	ng linka Iapping e and S	age. of Sex-	18
4	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.									18		
5	Population Genetics– Hardy Weinberg principle, gene frequency, genotype frequency and factors affecting gene frequency. Eugenics, Euphenics and Euthenics. Penetrance and Expressivity. Allelic variation, Genetic diversity									18		

СО	Course Outcomes
CO1	Students will Explore DNA as the genetic material through experiments like Griffith's, Hershey-Chase, and Avery's proof
CO2	Students will Apply Mendelian principles to inheritance, including monohybrid and dihybrid crosses.
CO3	Students will Understand linkage, crossing over, chromosome mapping, and sex- linked inheritance
CO4	Students will Understand chromosomal aberrations, pedigree analysis, and their inheritance patterns.
CO5	Students will Study population genetics, including Hardy-Weinberg equilibrium and factors affecting gene frequency
Textbo	oks:
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, 8 th edition, S.Chand & Co., New Delhi – 10055.
4	Molecular Biology of Genes. 4th edition by Watson, Hopkins, Roberts, Steitz, Weiner.
5	Dr. Veer Bala Rastogi, 2020, Elements of Genetics, 11 th Revised & Enlarged Edition, Kedar Nath Ram
Referen	nce Books:
1	TalaroK.P.andChessB.(2012)FoundationsinMicrobiology,8 th Edn.TheMcGrawHill Companies
2	TortoraG.J.,FunkeB.R.andChaseC.L.(2013)Microbiology:AnIntroduction,11 th Edn. Pearson-Benjamin Cummings
3	Brown A. and Smith H. (2015) Benson's Microbiological Applications: Laboratory Manualin General Microbiology, 13 th Edn. McGraw-Hill Companies
Web re	sources:
1	https://byjus.com/biology/griffith-experiment-genetic-material/
2	https://www.khanacademy.org/science/ap-biology/heredity/mendelian-genetics-ap/a/the- law-of-segregation
3	https://byjus.com/biology/linkage-recombination/
4	https://bio.libretexts.org/Bookshelves/Biochemistry/Fundamentals_of_Biochemistry_(Jaku bowski_and_Flatt)/03%3A_Unit_III- Information_Pathway/24%3A_DNA_Metabolism/24.02%3A_DNA_Mutations_Damage_ and_Repair

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	2	2	-	3	-	3	3	3	3	-
CO2	3	3	2	-	3	2	3	3	3	3	2
CO3	3	3	2	1	3	-	3	3	3	3	-
CO4	3	3	2	3	3	2	3	3	3	3	2
CO5	3	2	2	3	3	-	3	3	3	3	-
Total	15	13	10	7	15	4	15	15	15	15	4
Average	3	2.6	2	1.4	3	0.8	3	3	3	3	0.8

Mapping with Programme Outcomes and Programme Specific Outcomes

3 – Strong, 2- Medium, 1- Low

										Mark	S					
Cours Code	e	Course Name	Category	L	Т	Р	S	Credits	Hours	CIA	External	Total				
24UBT	C22P	Genetics and Molecular Biology Practicals	CC-4	0	0	4	0	2	2 4 52 52							
	Learning Objectives															
LO1	To ol	bserve the cell division stages	in plant	cells												
LO2	To id	lentify and observe barr bodie	s for sex	dete	rmin	atio	n									
LO3	To is	olate DNA from plant materia	al													
LO4	To qu	uantify the amount of DNA pa	resent in	the s	amp	le										
LO5	To understand practical concepts in human karyotyping															
Unit			Cont	ent								Hours				
1	Verif Verif	fication of Monohybrid ratio b fication of Dihybrid ratio by b	y beads/ eads/ Co	Coii in to	n tos ssing	sing g Exj	Exp perir	erim nent	ent			12				
2	Bacte Obse Inher	erial Transformation rvation of Blood Group Inh ritance in Man	eritance	in N	ſan ,	/ Ob	oserv	atior	n of S	Sex Lin	ked	12				
3	Isola	tion of plant DNA by CTAB	method									12				
4	Estimation of DNA by diphenylamine method								12							
5	Hum	an karyotyping (Demo)										12				

СО	Course Outcomes
CO1	Students will gain knowledge of proper handling techniques for laboratory instruments and safety protocols
CO2	Students will acquire an understanding of how to handle and maintain a compound microscope
CO3	Students will learn various staining techniques used in laboratory practices
CO4	Students will develop skills in the proper handling of laboratory instruments
CO5	Students will understand the procedures for preparing different types of media in the laboratory
Textbo	oks:
1	Practical Manual on "Fundamentals of Genetics" (PBG-121). 2019, Edition: First Publisher: Odisha University of Agriculture & Technology. Editor: Kaushik Kumar Panigrahi
2	Cell And Molecular Biology-A Lab Manual, K. V. Chaitanya, 2013, PHI Learning
3	Practical Manual on Plant Cytogenetics, Ram J. Singh, 2017, CRC Press
Refere	nce Books:
1	Molecular Biology Techniques, A Classroom Laboratory Manual, Heather B. Miller, D. Scott Witherow, Sue Carson, 2011, Academic Press
2	Essential Practical Handbook Of Cell Biology & Genetics, Biometry & Microbiology- A Laboratory Manual, Debarati Das, 2017, Academic Publishers
3	Laboratory Manual of Genetics, A. M. Winchester, Peter J. Wejksnora,2010 McGraw-Hill Higher Education
Web re	esources:
1	https://www.hrmrajgurunagar.ac.in/uploads/student_corner/Practical_1.pdf
2	https://www.ncbi.nlm.nih.gov/books/NBK2267/
3	https://opsdiagnostics.com/notes/protocols/ctab_protocol_for_plants.htm

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	3	3	3	3	2	3	3	3	3	2
CO2	3	2	3	3	3	2	3	3	3	3	2
CO3	3	2	3	3	3	3	3	3	3	3	3
CO4	3	2	3	3	3	3	3	3	3	3	3
CO5	3	2	3	3	3	3	3	3	3	3	3
Total	15	12	15	15	15	13	15	15	15	15	13
Average	3	2.4	3	3	3	2.6	3	3	3	3	2.6

Mapping with Programme Outcomes and Programme Specific Outcomes

3 – Strong, 2- Medium, 1- Low

										Mark	s	
Cours Code	e	Course Name	Category	L	Т	Р	S	Credits	Hours	CIA	External	Total
24UBT	TA21	FUNDAMENTALS OF MICROBIOLOGY	EC-2	3	1	0	0	4	4	25	75	100
		Lea	rning O	bjec	tives		•					·
LO1	LO1 To understand the historical development of microbiology and the contributions figures like Leeuwenhoek, Pasteur, Koch, Jenner, Ehrlich, and Fleming.											of key
LO2	2 To apply staining techniques to visualize different bacterial structures and characteris										stics.	
LO3	To describe the components and functions of the bacterial cell envelope (cell cytoplasmic membrane, periplasmic space).										l wall,	
LO4	To u	nderstand the mode of action	of differe	nt cl	nemi	cal a	gent	s.				
LO5	To classify media based on their composition (synthetic, semi-synthetic, end enrichment, selective, differential)											riched,
Unit			Conte	ent]	Hours
1	History and scope of microbiology, spontaneous generation – biogenesis theory – contributions of Leeuwenhoek, Louis Pasteur, Robert Koch, Edward Jenner, Paul Ehrlich and Fleming.									12		
2	Micr field- simp LPC	oscope–principles and applic - phase contrast, fluorescent r le, differential (Gram's, AFB B, KOH mount.	cation–sir nicroscop), specia	nple pe, S l – c	and EM apsu	con and ' lar s	npot TEN taini	ind 1 1. Ty ing (micros pes o negati	scope–d f stainin ive), sp	lark 1g – ore,	12
3	Ultra posit	structure and Classification ive and Gram negative bacter	of bacte ial cell w	eria, all, s	cell lime	enve , flag	elope gella	e, ce I, cap	ll wal osule,	ll – Gra pili.	ım	12
4	Sterilization and disinfection – principles – methods of sterilization – physical methods – dryheat–moistheat–radiation–filtration(membraneandHEPA)– chemicalsterilization – chemical agents – mode of action. Preservation and maintenance of culture								12			
5	Culture and media preparation – solid and liquid. Types of media – semi synthetic, synthetic, enriched, enrichment, selective and differential media.Pure culture techniques – tube dilution, pour, spread, streak plate. Serial Dilution Technique. Anaerobic cultivation of bacteria.									12		

СО	Course Outcomes
CO1	Students will gain an understanding of the historical development of microbiology and the contributions of prominent figures in the field.
CO2	Students will learn the principles and applications of various types of microscopes
CO3	Students will acquire knowledge of the components and functions of the bacterial cell envelope.
CO4	Students will understand different sterilization methods, both physical and chemical
CO5	Students will learn about the various types of culture media used to support microbial growth
Textbo	ooks:
1	Willey J.M., Sherwood L.M. and Woolverton C.J. (2013) Prescott's Microbiology, 9th
	Edn.McGraw-Hill Higher Education.
2	MadiganM.T.,BenderK.S.,BuckleyD.H.,SattleyW.M.andStahlD.A.(2017)Brock Biology of
	Microorganisms, 15 th Edn. (Global Edn.) Pearson Education.
Refere	nce Books:
1	TalaroK.P.andChessB.(2012)FoundationsinMicrobiology,8 th Edn.TheMcGrawHill Companies
2	TortoraG.J.,FunkeB.R.andChaseC.L.(2013)Microbiology:AnIntroduction,11 th Edn.
	Pearson-Benjamin Cummings
3	Brown A. and Smith H. (2015) Benson's Microbiological Applications: LaboratoryManual
XX7 I	in General Microbiology, 15 th Edn. McGraw-Hill Companies
web re	esources:
1	https://egyankosh.ac.in/bitstream/123456789/93476/1/Unit-1.pdf
2	https://www.ncbi.nlm.nih.gov/books/NBK8477/
3	https://byjus.com/biology/classification-of-culture-media/

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	-	2	-	2	-	2	3	3	2	-
CO2	3	-	2	-	3	-	3	3	3	3	-
CO3	3	-	2	-	2	-	3	3	3	3	-
CO4	3	-	3	-	3	-	3	3	3	3	-
CO5	3	-	3	-	3	-	3	3	3	3	-
Total	15	-	12	-	13	-	14	15	15	14	-
Average	3	-	2.4	-	2.6	-	2.8	3	3	2.8	-

Mapping with Programme Outcomes and Programme Specific Outcomes

3 – Strong, 2- Medium, 1- Low

										Mark	S		
Cours Code	e	Course Name	Category	L	Т	Р	S	Credits	Hours	CIA	External		Total
24UBT	A22P	FUNDAMENTALS OF MICROBIOLOGY PRACTICALS	EC-2 AL	0	0	2	0	2	2	25	75		100
	Learning Objectives												
LO1	1 To understand Laboratory safety and Instrument Operation												
LO2	To understand Sterilization techniques												
LO3	To u	nderstand Media Preparation											
LO4	To u	nderstand Staining Technique	S										
LO5	To understand Culture Techniques												
Unit			Conte	ent								He	ours
1	Hand Hand Hand flow	lling of instruments and laborating and maintenance of com dling of laboratory instrument d. pH meter	atory safe pound mi nts a. au	ety n icros tocla	neasu cope .ve b	ores.	ot air	c ove	en c. I	laminar	air	(06
2	Clear	ning of glasswares and prepar	ation of c	elean	ing s	solut	ions					(04
3	Medi	a preparation: a. liquid media – peptone wat b. solid media – nutrient agar c. enriched medium – blood a d. differential medium – M selenite F broth; f. selective medium – EMB,	er, nutrie (agar sla gar; Iac Conl MSA	nt br nt, aş key	oth; gar p agar	olate) ; e.); enr	ichm	ent n	nedium	_	(08
4	Staining techniques a. simple, b. differential staining (Gram's and Ziehl-Neelsen), c. special staining (spore and capsular staining methods) and wet-mount. Hangingdrop technique– motility									(06		
5	Cultu Tech	ure Techniques – Streak Plat nique	e, Pour	Plate	e &	Spre	ad]	Plate	. Seri	al Dilut	tion	(06

СО	Course Outcomes
CO1	Students will acquire knowledge of laboratory safety protocols and proper instrument operation
CO2	Students will gain an understanding of various sterilization techniques
CO3	Students will learn the procedures for preparing different types of media
CO4	Students will understand the principles and applications of staining techniques
CO5	Students will develop an understanding of culture techniques used in microbiology
Textbo	oks:
1	Laboratory Methods in Microbiology by Gerald E. Carter and Patricia E. Carter
2	Bailey & Scott's Diagnostic Microbiology (15th edition) by Patricia M. Murray, Ken S.
	Rosenthal, Michael A. Pfaller, and Linda S. Kobayashi
3	Manual of Clinical Microbiology (12th edition) edited by Patrick R. Murray, Ellen J.
	Baron, James H. Jorgensen, Michael A. Pfaller, and Roger P. Gilbert
Referen	nce Books:
1	Prescott, Harley, and Klein's Microbiology (9th edition) by Joanne M. Willey, Linda
	Sherwood, and Christopher J. Woolverton
2	Brock Biology of Microorganisms (15th edition) by Michael T. Madigan, John M.
	Martinko, Kelly B. Bender, Brock A. Stahl, and David H. Boone
3	Tortora, Funke, and Case's Microbiology: An Introduction (14th edition) by Gerard J.
	Tortora, Berdell R. Funke, and Christine L. Case
Web re	esources:
1	https://microbenotes.com/instruments-used-in-microbiology-lab/
2	https://milnepublishing.geneseo.edu/suny-microbiology-lab/chapter/differential-staining-
	techniques/
3	https://pmc.ncbi.nlm.nih.gov/articles/PMC4846335/

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
C01	3	-	3	-	3	3	3	3	3	3	3
CO2	3	-	3	-	3	3	3	3	3	3	3
CO3	3	-	3	-	3	3	3	3	3	3	3
CO4	3	-	3	-	3	3	3	3	3	3	3
CO5	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

Mapping with Programme Outcomes and Programme Specific Outcomes

3 – Strong, 2- Medium, 1- Low

										Mark	S	
Cours Code	e	Course Name	Category	L	Т	Р	S	Credits	Hours	CIA	External	Total
24UB7	Г S 21	Good Laboratory Practices (GLP)	SEC-3	1	0	1	0	2	2	25	75	100
	Learning Objectives											
LO1	To know the types of labs associated with Biotechnology											
LO2	To understand how to use and maintain lab Instruments											
LO3	To u	nderstand basic calculations n	eeded in	a lat	orat	ory e	expe	rime	nts.			
LO4	To be	ecome aware of good lab Gui	delines									
LO5	To know and practice safety disposal of bio waste											
Unit	Content 1											Hours
1	Types of labs associated with Biotechnology (General lab, microbial culture lab, plant tissue culture lab, Fermentation lab, computational stimulation lab), Types of Chemicals (Analytical grade, molecular grade) and its various arrangement (Arrangement of basic chemicals, solvent, acid and base, fine chemicals like dyes, protein and angume storage units). Health bagende Eumigetion technique								06			
2	Meth repor diluti	ods and types of documentati t: interpretation of result), D ion of concentrated solution, r	on (pre-l ilution fa netric un	ab w ctor its (k	rites calc g to	s, res ulati gms	ult r on, 1 and	ecoro Mola l vice	ling a rity, j -vers	nd post percenta sa).	lab 1ge,	06
3	Princ oven Haen	tiples, use and maintenance , Incubators, Water ba nocytometer, Electronic balan	of labora th, Cen ices.	tory trifu	inst ge,	crum Co	ents olorii	- Au meter	utocla r, p	ve, hot H me	air eter,	06
4	Good Laboratory guidelines, Elements of GLP, Standard Operating Procedures and its importance, Quality Assurance & Quality control									06		
5	Defin Safe Bron conta waste	nition of waste, types of was Disposal of biological and c nide solutions, Electrophores aining sodium azide, Silver s es, Spill management.	te: Biolo hemical is Gels, taining so	gical waste Cont olutie	l and e: tre tamin ons,	l che eatm nateo Perc	emic ent d Gl hlor	al warmeth oves ic ac	aste, 1 ods o , debr id, N	methods f Ethidi ris, Wa anopart	s of ium stes icle	06

СО	Course Outcomes									
CO1	Students will gain knowledge about the various types of laboratories used in biotechnology and the associated chemicals									
CO2	Students will develop practical skills in fundamental laboratory calculations and proper documentation of results									
CO3	Students will understand the functionality and proper handling of laboratory instruments									
CO4	Students will acquire theoretical knowledge about the guidelines and protocols to be followed in research laboratories									
CO5	Students will recognize the importance of safely disposing of different types of laboratory waste and practice safe disposal methods.									
Textbo	Textbooks:									
1	WHO training manual on Good Laboratory Practices, 2 nd Edition.									
2	Milton A. Anderson GLP Essentials: A Concise Guide to Good Laboratory Practice,									
	Second Edition 2nd Edition, Published by CRC press.									
Referen	eference Books:									
1	"Handbook of Laboratory Safety" by A. Keith Furr									
2	"Practical Skills in Biomolecular Sciences" by Allan Jones, Jonathan Weyers, and Reed Holmes									
3	"Laboratory Instrumentation" by Leslie Cromwell, Fred J. Weibell, and Erich A. Pfeiffer									
4	"Handbook of Chemical Health and Safety" by Robert J. Alaimo									
Web re	sources:									
1	https://pmc.ncbi.nlm.nih.gov/articles/PMC10982607/									
2	https://bio.libretexts.org/Bookshelves/Biotechnology/Lab_Manual%3A_Introduction_to_B iotechnology/01%3A_Techniques/1.08%3A_Serial_Dilutions_and_Standard_Curve									
3	https://smartfoodsafe.com/good-laboratory-practices/									
4	https://ehs.yale.edu/sites/default/files/files/hazardous-waste-management.pdf									

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
C01	3	3	3	3	2	3	3	3	3	3	3
CO2	3	3	3	-	2	-	3	3	3	3	-
CO3	3	3	3	-	2	-	3	3	3	3	-
CO4	3	3	3	-	2	-	3	3	3	3	-
CO5	3	2	3	3	3	-	3	3	3	3	-
Total	15	14	15	6	10	3	15	15	15	15	3
Average	3	2.8	3	1.2	2	0.6	3	3	3	3	0.6

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