B.Sc. Biotechnology

Motto

Biotech for a Healthier, Greener Planet.

Bigyan:

Vision

The department aims to reach greater heights in imparting quality education in Biotechnology by providing excellent teaching grounded in strong core science concepts.

Mission

- To provide a platform for young minds to evolve profoundly in life sciences.
- To Foster ethical and value-based education.
- To Cultivate a culture of innovation and entrepreneurship in Biotechnology.

Prelude:

The Department of Biotechnology at St. Joseph's College of Arts and Science for Women, Hosur, is committed to imparting high-quality education, hands-on skill training, and research-oriented knowledge in the exciting and ever-evolving field of biotechnology. With a vision to empower women in science and technology, the department offers a comprehensive curriculum that blends theoretical foundations with practical applications to prepare students for academic, industrial, and societal roles.

Our core curriculum includes fundamental and advanced papers such as Cell and Developmental Biology, Molecular Biology, Human Physiology, Immune Technology, Plant Biotechnology and Animal Biotechnology. These subjects help students gain deep insights into cellular mechanisms, metabolic processes, molecular interactions, and the body's immune response. In addition, courses like Genetics, Genetic Engineering, and Bioinformatics provide a strong grounding in modern genetic analysis and computational biology, which are crucial for today's research and medical biotechnology sectors.

The Supporting papers like Microbiology, Biological Chemistry, Bioinformatics, and Biostatistics papers provide a strong foundation in microbial diversity, biochemical processes, computational biology, and statistical analysis, essential for research and industrial applications. These subjects develop analytical and problem-solving skills needed for data interpretation in modern biotechnology sectors, while Bioinformatics and Biostatistics focus on using specialized software tools to analyze biological data effectively.

Hands-on practical such as Lab in Cell Biology and Biological Chemistry, Genetics and Microbiology, Immunotechnology, Bioinformatics and Biostatistics, Genetic Engineering and Bioinstrumentation, Plant and Animal Biotechnology, and Environmental and Industrial Biotechnology develop technical competence in laboratory instrumentation, experimental design, and analytical techniques. Train students in experiments, use of instruments, and real-world applications. These labs help them connect theory with practice and build confidence for industry work.

The interdisciplinary courses like Environmental Science, Digital Literacy, Women Studies, and Indian Knowledge System promote environmental awareness, digital skills, gender equity, and integration of traditional Indian knowledge into modern scientific practices. These papers foster a multidisciplinary perspective, helping students critically assess the relationship between science, society, and culture, while promoting ethical and sustainable biotechnology solutions.

The Professional Efficiency Course papers such as Essential Aptitude and Logical Thinking, develop reasoning, problem-solving, and quantitative skills necessary for career success in the biotech industry. The Health and Wellness paper emphasizes the importance of maintaining physical, mental, and social well-being.

Recognizing the importance of analytical and industry-relevant skills, the department offers specialized subjects such as Bioinstrumentation, Quality Control in Industries, and Fundamentals in Research Methodology. These courses are carefully designed to equip students with hands-on experience in laboratory instrumentation, industrial quality assurance protocols, and research-based analytical thinking. The practical knowledge and technical competencies gained through these subjects prepare students for industry-oriented roles, making them well-suited for careers in biotechnology, pharmaceuticals, food processing, and quality control laboratories.

Students are also exposed to Skill Enhancement Courses (SEC) that promote entrepreneurial, sustainable, and community-relevant skills. These include Mushroom Cultivation Technology, Vermicompost Technology, Medicinal Herbs, Cryogenics and Cryobiology, and Quality Control in Industries. These courses are designed to instill confidence in students for self-employment, start-up ventures, and community-based projects.

To ensure a multidisciplinary and socially responsive outlook, the department offers Non-Major Elective (NME) papers such as Food Nutrition, Public Health and Hygiene, Organic Farming and Health Management, and Biotechnology for Society. These electives are tailored to meet societal needs and promote public health awareness, sustainability, and eco-friendly practices.

Our Elective Papers cater to the growing interests in applied biotechnology fields and include Nano Biotechnology, Enzymology and Enzyme Technology, Pharmaceutical Biotechnology, Biofarming, Bioethics, Biosafety and IPR, Dairy Science and Technology, Marine Science and Technology, Food Science and Technology, Medical Biotechnology, Cancer Biology, Forensic Science, and Good Laboratory Practices (GLP). These electives enhance the students' exposure to current biotechnological innovations, ethical considerations, intellectual property rights, and their real-world applications.

Beyond academics, the department encourages students to actively participate in extension and outreach activities, including school visits, science awareness programs, and social campaigns. These activities help students apply their knowledge to benefit the community and promote scientific literacy. We also organize industrial visits to biotechnology labs, pharmaceutical companies, and food processing units, providing students with real-time exposure to industrial processes, instrumentation, and professional work culture.

In essence, the Department of Biotechnology stands as a centre of excellence fostering scientific knowledge, practical skill, and societal responsibility. We aim to create empowered,

knowledgeable, and skilled women biotechnologists who can contribute meaningfully to science, industry, and society.

Nature and Extent of the Programme:

The **B.Sc. Biotechnology** programme is interdisciplinary in nature, combining principles of biological sciences with technology to address challenges in health, agriculture, environment, and industry. It offers a comprehensive understanding of subjects such as molecular biology, genetics, microbiology, Biochemistry, Genetic engineering, Bioinformatics, and Immunology. The programme also integrates applied areas like **Bioprocess technology, Pharmaceutical Biotechnology, and Environmental Biotechnology**.

The extent of the programme is broad, aiming to develop both theoretical knowledge and practical skills among students. It includes **hands-on training in laboratory techniques, instrumentation, and data analysis. Industry-relevant subjects like Bioinstrumentation, Quality Control in Industries, and Research Methodology** are included to enhance employability and prepare students for roles in research, diagnostics, production, and quality assurance.

Through workshops, internships, and project work, the programme fosters critical thinking, innovation, and problem-solving skills, equipping graduates to pursue careers in academia, industry, and entrepreneurship in the expanding field of Biotechnology.

Aim of the Programme:

The aim of the Biotechnology programme is to provide a strong academic and practical foundation in the interdisciplinary field of biotechnology, combining principles from biology, chemistry, physics, and computer science.

The programme is designed to develop a comprehensive understanding of molecular biology, genetics, microbiology, genetic engineering, and bioinformatics, while also introducing students to applied areas such as pharmaceutical biotechnology, environmental biotechnology, and industrial processes.

A major objective of the programme is to equip students with hands-on training in laboratory techniques, instrumentation handling, data analysis, and modern research methodologies. By integrating theoretical knowledge with practical experience, the programme prepares students to meet the current demands of biotechnology-related industries and research institutions.

This programme sparks innovation and sharpens scientific thinking, empowering students to tackle real-world challenges in healthcare, agriculture, food processing, and environmental conservation. With hands-on subjects like Bioinstrumentation, Industrial Quality Control, and Research Methodology, it equips learners with the skills and standards demanded by today's biotech industries.

In addition, the Programme emphasizes the importance of ethics, biosafety, and sustainability in biotechnological research and applications. It nurtures a sense of social responsibility and encourages the use of biotechnology for the benefit of society and the environment.

Overall, the Biotechnology programme aims to produce skilled graduates who are capable of pursuing higher education, engaging in cutting-edge research, contributing to industrial development, and taking up entrepreneurial ventures in the fast-growing field of biotechnology.

Duration of the Programme:

The B.Sc. Biotechnology programme shall extend over a period of **three academic years** comprising **six semesters**. Each academic year shall consist of **two semesters**:

- **Odd Semester**: June to November
- **Even Semester**: December to May

Each semester shall have **a minimum of 90 working days**, exclusive of examination days.

Eligibility for Admission:

A candidate shall be eligible for admission to the B.Sc. Biotechnology programme if she has passed the **Higher Secondary Examination of the Government of Tamil Nadu** or any other equivalent examination recognized by the University, with any one of the following subjects:

- Mathematics
- Biology
- Botany
- Zoology
- Physics
- Chemistry

This includes both **Academic** and **Vocational** streams, as per the eligibility norms prescribed by the **Government of Tamil Nadu**. Those who have not studied must undergo a bridge course on Biotechnology for a minimum duration for 15 days.

Credit Requirements and Eligibility for Award of Degree

A candidate shall be eligible for the **award of the B.Sc.** Biotechnology **degree** only if she has:

- Successfully completed the prescribed **course of study** in a college affiliated to the University for a **minimum duration of three academic years (six semesters)**.
- Passed all prescribed **semester examinations**.
- **Earned a minimum of 140 credits** as distributed under the following Parts:
    - **Part I** – Language
    - **Part II** – General English / Advanced English
    - **Part III** – Discipline Specific Core, Generic Specific Elective, Discipline Specific Elective, Professional Enhancement Course and Project
    - **Part IV** – Skill Enhancement Courses, Non-Major Electives, Internship, Environmental Studies, Digital Literacy, Women Studies and Indian Knowledge System
    - **Part V** – Extension Activity

The candidate must also have fulfilled any other requirements as prescribed by the College/University regulations for the award of the degree.

PROGRAMME OUTCOMES (POs)

PO1: Apply core concepts of biological and chemical sciences to understand and solve problems related to living systems and biotechnology.
PO2: Demonstrate the ability to design experiments, analyze data, and interpret scientific results using appropriate methodologies and tools.
PO3: Develop practical skills and technical competence to perform laboratory procedures, ensuring accuracy, safety, and reliability.
PO4: Utilize modern biotechnological tools and techniques for research, diagnostics, and product development.
PO5: Understand the impact of biotechnology on health, agriculture, environment, and industry, promoting sustainable and ethical practices.
PO6: Apply ethical principles, regulatory guidelines, and professional responsibilities in scientific and industrial settings.
PO7: Exhibit critical thinking and research aptitude to identify, analyse, and address real-world problems through innovative approaches.
PO8: Demonstrate awareness of social, environmental and contribute responsibly to societal development.
PO9: Communicate scientific ideas effectively and function efficiently as an individual or in a team with leadership and collaborative skills.
PO10: Engage in lifelong learning to adapt to technological advancements and contribute to continuous professional and personal growth.

PROGRAMME SPECIFIC OUTCOMES (PSOs)

PSO1: **Disciplinary Knowledge**: Understand the fundamental principles, concepts, and theories related to biotechnology. Also, exhibit proficiency in performing experiments in the laboratory.
PSO2: **Analytical & Scientific Reasoning**: Apply scientific methods, collect and analyze data, test hypotheses, evaluate evidence, apply statistical techniques and use computational models.
PSO3: Entrepreneurial and Analytical Thinking: Demonstrate entrepreneurial skills and critical thinking necessary for biotechnology start-ups and innovation-driven careers.

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

PEO1: Graduates will develop a strong foundation in biological sciences and biotechnology, enabling them to understand, analyze, and solve complex problems in healthcare, agriculture, environment and industry.
PEO2 Graduates will demonstrate entrepreneurial skills and innovative thinking to develop biotechnology-based products or start their own ventures addressing real-world challenges.
PEO3: Graduates will be well-prepared for employment in biotechnology industries, pharmaceuticals, food technology, diagnostics, and environmental sectors with necessary technical and analytical skills.

MAPPING OF PEO WITH PO AND PSO:

PEO\ Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
PEO1	3	2	3	3	3	2	2	2	2	3	3	3	3
PEO2	3	2	2	3	3	2	2	3	2	3	3	3	3
PEO3	2	2	2	2	3	3	3	2	3	2	2	2	2

3 = Strongly Related, 2 = Moderately Related, 1 = Slightly Related

Course Components and Credit Distribution

The curriculum framework for the B.Sc Biotechnology programme under the autonomous structure is designed to ensure holistic academic development, skill enhancement, and societal contribution. The credit distribution across the various components is as follows:

Study Components	Part	Sem I		Sem II		Sem III		Sem IV		Sem V		Sem VI		No. of Hours	Total Credit
		No. of Hours	Credit	No. of Hours	Credit	No. of Hours	Credit	No. of Hours	Credit	No. of Hours	Credit	No. of Hours	Credit		
Language	I	6	3	6	3	6	3	6	3					24	12
English	II	6	3	6	3	6	3	6	3					24	12
Core Course / DSC	III	10	8	9	8	10	8	9	7	17	15	16	11	71	57
Allied / GSE	III	4	4	5	4	4	4	5	4					18	16
Elective / DSE	III									11	8	8	8	19	16
PEC	III											2	2	2	2
Project	III											2	2	2	2
SEC	IV	2	2	2	2	2	2	2	2					8	8
NME	IV	2	2	2	2									4	4
Environmental Studies / IDC	IV					2	2							2	2
Digital Literacy / IDC	IV							2	2					2	2
Women Studies	IV									2	2			2	2
Indian Knowledge System / IDC	IV											2	2	2	2
Internship	IV										2				2
Extension Activity	V												1		1
Total		**30**	**22**	**30**	**22**	**30**	**22**	**30**	**21**	**30**	**27**	**30**	**26**	**180**	**140**

Details of Course of Study for Parts I–V

PART I – Tamil and Other Languages

Students shall study Tamil or one of the other approved languages (e.g., Hindi or French), as per their choice and subject to availability. The syllabus and prescribed textbooks for these languages shall be periodically updated by the respective Boards of Studies and approved by the Academic Council of the College.

PART II – General English / Advanced English

Courses in English aim to improve students' proficiency in language, literature, communication, and critical thinking. The curriculum and instructional materials are prepared by the Board of Studies of English and approved through the academic governance structure.

PART III – Core, Allied, Project and Elective Courses

This part comprises Discipline Specific Core, Generic Specific Elective, Discipline Specific Elective, Professional Enhancement Course and a Project in the final semester. The content and structure of these courses are prescribed by the respective Board of Studies in Biotechnology and approved by the Academic Council to align with current academic and industry standards.

PART IV – Value and Skill-Oriented Courses

i. Non-Major Elective (NME):

- Students must choose **Non-Major Elective (NME)** comprising from the options offered by other departments.

ii. Additional Courses under Part IV:

- Skill Enhancement Courses (SEC)
- Environmental Studies
- Digital Literacy
- Women studies
- Indian Knowledge System
- Internship

PART V – Extension Activity

Students shall earn **a maximum of 1 credit** through participation in **Compulsory Extension Services**. Every student must enrol in **NSS, Red Ribbon Club, Youth Red Cross, Field Work, Outreach Activities or any other Clubs** recognized by the College.

Inclusion of Massive Open Online Courses (MOOCs) via SWAYAM and NPTEL

MOOC Courses for Credit Mobility

As part of the credit-based curriculum design and in alignment with the guidelines of higher education regulatory bodies, students are encouraged to enrol in Massive Open Online Courses (MOOCs) offered on SWAYAM or NPTEL platforms. These courses can be opted under Core, Elective, or Soft Skill categories. The student shall be eligible for award of the degree only upon submission of a valid certificate as proof of successful completion of the chosen MOOC course. **Two credits** will be given to candidates who successfully complete the course.

B.Sc. Biotechnology

Curriculum Design

First Year

Semester - I

S. No	Part	Nature of the Course	Course Code	Name of the Course	Hours per Week	Credits	Marks		
							CIA	ESE	Total
1	I	Language	25UTAM101 25UFRE101 25UHIN101 25UKAN101 25UTEL101 25UURD101	Tamil - I French - I Hindi - I Kannada - I Telugu - I Urdu -I	6	3	25	75	100
2	II	English	25UGEN101 25UAEN101	General English - I Advanced English - I	6	3	25	75	100
3	III	DSC I	25UBT1C01	Cell and Developmental Biology	4	4	25	75	100
4		DSC Practical I	25UBT1CP1	Lab in Cell and Molecular Developmental Biology and Biological Chemistry **(Skill Development)**	4	2	40	60	100
5		DSC II	25UBT1C02	Molecular Biology	3	3	25	75	100
6		GSE – Allied I	25UBT1A01	Biological Chemistry **(Skill Development)**	3	3	25	75	100
7	IV	SEC I	25UBT1SE1	Mushroom Cultivation Technology **(Employability)**	2	2	25	75	100
8		SEC II NME I		NME I	2	2	25	75	100
Total					**30**	**22**	**215**	**585**	**800**

Semester – II

S. No	Part	Nature of the Course	Course Code	Name of the Course	Hours per Week	Credits	Marks		
							CIA	ESE	Total
1	I	Language	25UTAM202 25UFRE202 25UHIN202 25UKAN202 25UTEL202 25UURD202	Tamil - II French - II Hindi - II Kannada - II Telugu - II Urdu -II	6	3	25	75	100
2	II	English	25UGEN202 25UAEN202	General English - II Advanced English -II	6	3	25	75	100

3	III	DSC III	25UBT2C03	Genetics	4	4	25	75	100
4		DSC Practical II	25UBT2CP2	Lab in Genetics and Microbiology **(Employability)**	4	2	40	60	100
5		DSC IV	25UBT2C04	Human Physiology	3	3	25	75	100
6		GSE – Allied II	25UBT2A02	Fundamentals of Microbiology **(Employability)**	3	3	25	75	100
7	IV	SEC III	25UBT2SE1	Vermicompost Technology **(Employability, Entrepreneurship)**	2	2	25	75	100
8		SEC IV NME II		NME II	2	2	25	75	100
Total					**30**	**22**	**215**	**585**	**800**

Second Year

Semester – III

S. No	Part	Nature of the Course	Course Code	Name of the Course	Hours per Week	Credits	Marks		
							CIA	ESE	Total
1	I	Language	25UTAM303 25UFRE303 25UHIN303 25UKAN303 25UTEL303 25UURD303	Tamil - III French - III Hindi - III Kannada - III Telugu - III Urdu - III	6	3	25	75	100
2	II	English	25UGEN303 25UAEN303	General English – III Advanced English-III	6	3	25	75	100
3	III	DSC V	25UBT3C05	Immune System and Immunotechnology **(Skill Development)**	4	4	25	75	100
4		DSC Practical III	25UBT3CP3	Lab in Immunotechnology, Bioinformatics and Biostatistics **(Skill Development)**	4	2	40	60	100
5	III	DSC VI	25UBT3C06	Clinical Biotechnology **(Skill Development)**	3	3	25	75	100
6		GSE Allied III	25UBT3A03	Bioinformatics and Biostatistics **(Employability)**	3	3	25	75	100
7	IV	SEC V		SEC V	2	2	25	75	100
8		IDC	25UEVS301	EVS	2	2	25	75	100
9				Health and Wellness*					
Total					**30**	**22**	**215**	**585**	**800**

Semester – IV

S. No	Part	Nature of the Course	Course Code	Name of the Course	Hours per Week	Credits	Marks		
							CIA	ESE	Total
1	I	Language	25UTAM404 25UFRE404 25UHIN404 25UKAN404 25UTEL404 25UURD404	Tamil - IV French - IV Hindi - IV Kannada - IV Telugu - IV Urdu - IV	6	3	25	75	100
2	II	English	25UGEN404 25UAEN404	General English -IV Advanced English-IV	6	3	25	75	100
3	III	DSC VII	25UBT4C07	Genetic Engineering **(Skill Development)**	5	5	25	75	100
4		DSC Practical IV	25UBT4CP4	Lab in Genetic Engineering and Bioinstrumentation **(Employability)**	4	2	40	60	100
5		GSE – Allied IV	25UBT4A04	Bioinstrumentation **(Industry Oriented Course)**	5	4	25	75	100
6	IV	SEC VI		SEC VI	2	2	25	75	100
7		IDC	25UDIL401	Digital Literacy	2	2	25	75	100
Total					**30**	**21**	**190**	**510**	**700**

Third Year

Semester – V

S. No	Part	Nature of the Course	Course Code	Name of the Course	Hours per Week	Credits	Marks		
							CIA	ESE	Total
1	III	DSC VIII	25UBT5C08	Plant Biotechnology **(Employability)**	6	6	25	75	100
2		DSC IX	25UBT5C09	Animal Biotechnology **(Skill Development)**	6	6	25	75	100
3		DSC Practical V	25UBT5CP5	Lab in plant and Animal Biotechnology **(Employability)**	5	3	40	60	100
4		DSE I		Elective I	6	4	25	75	100
5		DSE II		Elective II	5	4	25	75	100
6	IV	IDC	25UWOS501	Women Studies	2	2	25	75	100
7		Internship	25UBT5INT	Internship	-	2	-	-	-
Total					**30**	**27**	**165**	**435**	**600**

Semester – VI

S. No	Part	Nature of the Course	Course Code	Name of the Course	Hours per Week	Credits	Marks		
							CIA	ESE	Total
1	III	DSC X	25UBT6C10	Entrepreneurship Development in Biotechnology **(Entrepreneurship, Skill Development)**	5	5	25	75	100
2	III	DSC XI	25UBT6C11	Environmental and Industrial Biotechnology **(Employability)**	5	4	25	75	100
3		DSC Practical -VI	25UBT6CP6	Lab in Environmental and Industrial Biotechnology **(Employability)**	4	2	40	60	100
4		DSE III		Elective III	4	4	25	75	100
5		DSE IV		Elective IV	4	4	25	75	100
6		PEC	25UPEC601	Essential Aptitude and Logical Thinking **(Employability)**	2	2	25	75	100
7		Project	25UBT6PRV	Project and Viva voce	4	2	50	50	100
8	IV	IDC	25UIKS601	Indian Knowledge System	2	2	25	75	100
9	V		25UEXT601	Extension Activity	-	1	-	-	-
Total					**30**	**26**	**240**	**560**	**800**
Grand Total					**180**	**140**	**1240**	**3260**	**4500**
		Extra Credit	Mandatory	Extra Credit - Swayam/MOOC/NPTEL (Online Course)	-	2	-	-	-
			Not Mandatory	Self-Study	-	2	-	-	-
	*		Mandatory	Health and Wellness	-	1	-	-	-

DSC	Discipline Specific Core
GSE	Generic Specific Elective - Allied
DSE	Discipline Specific Elective
SEC	Skil Enhancement Course
IDC	Interdisciplinary Course
NME	Non-Major Elective
PEC	Professional Efficiency Course

Discipline Specific Elective Courses

Semester	Part	Nature of the Course	Course Code	Name of the Course
V	III	DSE – I	25UBT5E01	Nano Biotechnology **(Skill Development)**
			25UBT5E02	Enzymology and Enzyme Technology **(Industry oriented Course - Employability Skill)**
			25UBT5E03	Pharmaceutical Biotechnology **(Industry oriented Employability Skill)**
	III	DSE – II	25UBT5E04	Biofarming **(Skill Development, Employability Skill)**
			25UBT5E05	Bioethics, Biosafety and IPR **(Skill Development)**
			25UBT5E06	Dairy Science and Technology **(Industry oriented Employability Skill)**
VI	III	DSE – III	25UBT6E01	Marine Science and Technology **(Employability Skill)**
			25UBT6E02	Food Science and Technology **(Industry oriented Employability Skill)**
			25UBT6E03	Cancer Biology **(Laboratory Skill)**
	III	DSE – IV	25UBT6E04	Medical Biotechnology **(Employability Skill)**
			25UBT6E05	Forensic Science and Technology **(Professional Oriented Paper)**
			25UBT6E06	Good Laboratory Practices **(Skill Development)**

Skill Enhancement Courses

Semester	Part	Nature of the Course	Course Code	Name of the Course
I	IV	SEC - I	25UBT1SE1	Mushroom Cultivation Technology **(Employability Skill)**
II	IV	SEC - III	25UBT2SE1	Vermicompost Technology **(Employability Skill, Entrepreneurship)**
III	IV	SEC - V	25UBT3SE1	Quality Control in industries **(Industry oriented Course - Employability Skill)**
			25UBT3SE2	Medicinal Herbs **(Skill Development)**
IV	IV	SEC - VI	25UBT4SE1	Fundamentals in Research Methodology **(Skill Development)**
			25UBT4SE2	Cryogenics and Cryobiology **(Techniques Skill)**

Non-Major Elective Courses

Subjects Offered by the Department of Biotechnology

Sem	Part	Nature of the Course	Course Code	Name of the Course
I	IV	NME I	25UBT1NM1	Public health and Hygiene **(Health Education & Awareness Skill)**
			25UBT1NM2	Food Nutrition **(Employability Skill)**
II	IV	NME II	25UBT2NM1	Organic Farming and Health Management **(Employability Skill)**
			25UBT2NM2	Biotechnology for Society **(Employability Skill)**

B.Sc. Biotechnology LOCF – CBCS with effect from 2025 - 2026 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
25UBT1C01	**CELL AND DEVELOPMENTAL BIOLOGY**	**DSC THEORY**	**I**	**60**	**4**	**-**	**-**	**4**
Objective: Aim of this Subject is to have an insight of the cell as the fundamental unit of life and obtain a strong foundation and functional aspects of cell organelles. To explore the processes of cell cycle, cell division and cell signals. To learn the structure and functions of specialized cells and the processes of fertilization in mammals.								

Unit	Course Content	Knowledge Levels	Sessions
I	Discovery and Diversity of Cells; **Classification of Cell types – Cell Theory**** – Structure of Prokaryotic (Bacteria) and Eukaryotic Cells (Plant and Animal Cells). **** SDG 4 - Quality Education.**	K1, K2	12
II	Structure and functions of Cell Organelles; Cell Wall – Cell Membrane – Cytoplasm -Nucleus – Chromosomes - Endoplasmic Reticulum – Ribosomes – Golgi bodies – Vacuoles – **Lysosomes**** – **Mitochondria** **– Centrosome and Centrioles **** SDG 7 - Affordable and Clean Energy** **** SDG 12 - Responsible Consumption and Production**	K2, K3	12
III	**Cell Cycle: Cell cycle checkpoints****- Cell division- Mitosis and Meiosis-Cellular differentiation – Cell Junctions – Cell Adhesion - Cell to Cell Communication- Signal transduction- G-Protein Coupled Receptors Signal transduction pathways. **** SDG 3 - Good Health and Well-being.**	K2, K3, K4	12
IV	Specialized Cells: Motile Cells-Amoeboid, Ciliary, Flagellar Movement, Nerve Cells and Nerve impulse conduction, **Muscle cells and Muscle contraction****. ****SDG 8 – Decent Work and Economic Growth.**	K2, K3	12
V	Gametogenesis - **Spermatogenesis and Oogenesis**** in mammals. Fertilization-Types of cleavage, blastula formation, gastrulation and formation of germ layers in animals- Organogenesis. **** SDG 5 - Gender Equality**	K3, K4	12

Course Outcome	**CO1:** Understanding the fundamental differences between prokaryotic and eukaryotic cells and relate their structural features to cellular functions.	K1, K2
	CO2: Identify and describe the structure and role of various cellular organelles in maintaining cellular integrity and activity.	K2, K3
	CO3: Analyze the phases of the cell cycle, including mitosis and	K2, K3, K4

	meiosis, and assess their significance in growth, reproduction, and cellular differentiation.	
	CO4: Compare and contrast specialized cell types and evaluate their adaptations for specific physiological roles, including motility, signal conduction, and support.	K2, K3
	CO5: Understands the Students about sequential changes from single cell organization to multicellular organisms.	K3, K4

Learning Resources	
Text Books	1. Gilbert, S.F. 2016. Developmental Biology, 11th edition. Sinauer Associates Inc. Publishers, MA. USA. 2. James D. Watson (2001), The Double Helix: A personal account of the Discovery of the Structure of DNA, Touchstone Publishers 3. Gupta, Renu & Makhija, Seema & To Teja, Ravi. (2018). Cell Biology: Practical Manual. 4. T. Devasena (2012), Cell Biology, Oxford University Press. 5. P.S. Verma &V.K. Agarwal (2016-Reprint)-Cell Biology, Genetics, Molecular Biology, Evolution and Ecology, S. Chand Publishing Company Pvt Ltd, New Delhi. 6. Pijushroy.,2010, Plant Anatomy, New Central Book Agency, Put Lit., New Delhi.
Reference Books	1. De Robertis., Cell Biology, Blaze Publishers and Distributors Pvt. Ltd.,New Delhi 2. Gerald Karp., Cell and Molecular Biology Concepts and Experiments – 4th Edition 3. Ajoy Paul., 2011. Text Book of Cell and Molecular Biology- Books and Allied(P) Ltd, Kolkata 4. Sharp. Fundamentals of Cytology-McGraw Hill Company 5. Geoffrey M. Cooper, 7th Edition (2015). The Cell: A Molecular Approach, Sinauer Associates, Oxford University Press.
Website Link	1. Cell & Developmental Biology.docx 2. https://opentextbc.ca/biology/chapter/13-2-development-and-organogenesis/ 3. Cell & Developmental Biology.docx 4. https://www.britannica.com/science/cell-biology/Gap-junctions
L – Lecture T – Tutorial P – Practical C - Credit	

Mapping of COs with PO's and PSO's

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	2	2	2	2	1	1	1	-	2	3	2	1
CO2	3	2	3	2	2	1	-	1	-	2	3	2	2
CO3	3	2	3	2	3	1	1	1	-	2	3	2	3
CO4	3	2	3	2	3	2	1	2	-	3	3	3	3
CO5	3	2	3	2	3	2	1	2	-	3	3	3	3

(Correlation: 3 – High, 2 – Medium, 1 – Low)

Course Designed By: **Mrs. Margret Kanimozhi. A**	**Verified By HOD:** **Mrs. Margret Kanimozhi. A**
Checked By CDC: Mrs. C. Magila	**Approved By: Dr. J. Caroline Rose** **Principal**

Dr. P. Indira Arulselvi Professor, Department of Biotechnology, Periyar University, salem-11	**Dr. K. A. Paari.,** Assistant Professor, Department of Life Sciences, Christ (Deemed to be University) , Bengaluru	**Dr. Salamun DE.,** Associate Professor, School of Sciences, Jain (Deemed to be University), Bengaluru
Mr. Ragunath Srinivasan Associate Director, Biosimilars Manufacturing, Biocon Biological Limited. Bengaluru	**Mrs. Deekshitha. S** Officer, Quality Control Department, Microlabs Pvt. Ltd	

B.Sc. Biotechnology LOCF – CBCS with effect from 2025 - 2026 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
25UBT1CP1	**LAB IN CELL AND MOLECULAR DEVELOPMENTAL BIOLOGY AND BIOLOGICAL CHEMISTRY**	**DSC PRACTICAL**	**I**	**60**	**-**	**-**	**4**	**2**
Objective: This syllabus aims to provide hands-on experience in microscopy, blood and buccal smear preparation, and identification of plant and animal cells, including sperm and egg observation and organelle isolation. Students will gain qualitative analysis techniques for identifying carbohydrates and amino acids. The course also includes colorimetric estimation methods for glucose, cholesterol, and proteins.								

S. No	List of Experiments	Knowledge levels.	Sessions
1	**CELL BIOLOGY** 1. Components of a **Compound / Light Microscope****. 2. Blood smear preparation and Identification of Blood cells 3. Buccal smear preparation and Identification of squamous epithelial cells. ****SDG 4-Quality Education.**	K1, K,2 K3, K4	12
2	**DEVELOPMENTAL BIOLOGY** 4. Isolation and Identification of plant cells and animal cells (Demo) 5. Observation of Sperm & Egg (Demo) 6. **Cell fractionation**** and Identification of Cell organelles (Demo) ****SDG 9- Industry, Innovation and Infrastructure.**	K2, K3, K4	12
3	**BIOLOGICAL CHEMISTRY** 7. Qualitative analysis of **carbohydrates**** - Glucose, Fructose, Lactose, maltose, sucrose, starch. ****SDG 2- Zero Hunger.**	K2, K3, K4	12
4	**QUALITATIVE ANALYSIS** 8. Qualitative analysis of **amino acids**** - Tyrosine, Tryptophan, Arginine, Proline and Cysteine. Histidine. ****SDG 1-No Poverty.**	K2, K3, K4	12
5	**Colorimetric Analysis** 9. Estimation of Glucose- Ortho toluidine method 10. Estimation of **Cholesterol****- Zak's method 11. Estimation of Proteins – Lowry's method ****SDG 3-Good Health and Well-Being.**	K3, K4, K5	12

Course Outcome	**CO1:** Demonstrate the ability to handle and operate a compound/light microscope and prepare cellular smears for the identification of different human and animal cell types.	K2, K3, K4
	CO2: Apply techniques for the isolation and identification of plant and animal cells and understand the principles of cell fractionation and organelle identification.	K2, K3, K4
	CO3: Carry out qualitative tests to identify various carbohydrates and based on their specific chemical properties.	K1, K2, K3,
	CO4: Carry out qualitative tests to identify various amino acids and based on their specific chemical properties.	K1, K2, K3,
	CO5: Estimate biomolecules such as glucose, cholesterol, and proteins using standard colorimetric methods like Ortho- toluidine, Zak's, and Lowry's methods.	K1, K2, K3, K4

Learning Resources	
Text Books	1. K.V. Chaitanya, (2013), Cell and molecular biology: Lab manual, PHI publishers, ISBN 978-81-203-800-4 2. Irwin Hegel, Biochemical calculations, Liss, Newyork,1991. 3. J. Jayaraman, Laboratory Manual in Biochemistry, New Age International Pvt Ltd Publishers, 2011. 4. S. K. Sawhney Randhir, Singh, Introductory Practical Biochemistry, Alpha Science International Ltd, 2nd edition, 2005
Reference Books	1. Dr. O P Panday, D N Bajpai, Dr. S Giri, PRACTICAL CHEMISTRY, S Chand, Revised edition 2016 2. N.S. Gnanapragasam and G. Ramamurthy, Organic chemistry Lab manual, S. Viswanathan Co. Pvt. Ltd., 1998. 3. Hands Thacher Clarke, A hand book of Organic: Qualitative and quantitative Analysis, 2007.
Website Link	1. Lab in Cell Biology and Biological Chemistry.doc 2. https://www.brainkart.com/article/ Estimation-of-Glucose-%28Orthotoluidine-method%29_26748/ 3. Lab in Cell Biology and Biological Chemistry.doc
L – Lecture	**T – Tutorial** **P – Practical** **C - Credit**

Mapping of COs with PO's and PSO's

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	2	3	2	2	2	1	2	2	2	3	2	1
CO2	3	2	3	2	3	2	2	2	2	2	3	2	2
CO3	3	2	3	2	2	1	1	1	2	2	3	2	2
CO4	3	2	3	2	2	1	1	1	2	2	3	2	2
CO5	3	3	3	2	3	2	2	2	2	3	3	3	2

(Correlation: 3 – High, 2 – Medium, 1 – Low)

Course Designed By: **Mrs. Margret Kanimozhi. A**	**Verified By HOD:** **Mrs. Margret Kanimozhi. A**
Checked By CDC: Mrs. C. Magila	**Approved By: Dr. J. Caroline Rose** **Principal**

Dr. P. Indira Arulselvi Professor, Department of Biotechnology, Periyar University, salem-11	**Dr. K. A. Paari.,** Assistant Professor, Department of Life Sciences, Christ (Deemed to be University) , Bengaluru	**Dr. Salamun DE.,** Associate Professor, School of Sciences, Jain (Deemed to be University), Bengaluru
Mr. Ragunath Srinivasan Associate Director, Biosimilars Manufacturing, Biocon Biological Limited. Bengaluru	**Mrs. Deekshitha. S** Officer, Quality Control Department, Microlabs Pvt. Ltd	

B.Sc. Biotechnology LOCF – CBCS with effect from 2025 - 2026 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
25UBT1C02	**MOLECULAR BIOLOGY**	**DSC THEORY**	**I**	**45**	**3**	**-**	**-**	**3**
Objective: Gain Knowledge on the structure and characters of Genetic materials. Explore genetic regulation, mutations, DNA repair, and genetic exchange processes. Provide foundational knowledge of molecular genetics essential for advanced studies in biotechnology and microbiology.								

Unit	Course Content	Knowledge Levels	Sessions
I	**DNA and RNA as genetic material,****Characters of a genetic material, Chemistry & Molecular structure of DNA, Topology of DNA, Structure and types of RNA. Bacterial chromosome, Organization of genes in prokaryotes. ****SDG 4- Quality Education.**	K1, K2	9
II	Replication of DNA – **Replication in prokaryotes****– Mechanism & enzymology of replication – Theta replication & Rolling circle replication. Replication in Eukaryotes. ****SDG 9- Industry, Innovation.**	K2, K3	9
III	**Transcription**** in prokaryotes and Eukaryotes, Post transcriptional modifications. – Genetic code – **Translation of proteins****, Post translational modifications. Regulation of gene expression in prokaryotes – Operon concept – lac & trp Operon. ****SDG 3- Good Health and Well-being.**	K2, K3, K4	9
IV	Mutation - spontaneous and induced, Mutagen & its types. Mutagenesis – DNA repair mechanism ****SDG 12-Responsible Consumption and Production.**	K2, K3	9
V	Genetic exchange – **Transduction**** (specialized & generalized), Transformation, Conjugation - Hfr mapping, genetic recombination ****SDG 15-Life on Land.**	K2, K3, K4	9

Course Outcome	**CO1:** Gain knowledge the structure and properties of DNA and RNA and relate their molecular characteristics to their role as the genetic material.	K1, K2
	CO2: Describe the mechanisms and enzymology of DNA replication in prokaryotes and compare different modes of replication.	K2, K3
	CO3: Analyze the process of transcription and translation in prokaryotes, including post-transcriptional and post-translational modifications, and evaluate operon-based regulation of gene expression.	K2, K3, K4
	CO4: Understand the nature of mutations and the cellular DNA repair mechanisms that preserve genomic integrity.	K2, K3
	CO5: Assess the significance of bacterial genetic exchange methods and the role of conjugation, transformation, and transduction in gene mapping and recombination.	K3, K4

Learning Resources	
Text Books	1. Gardner, E. Simmons, M J& D P Snus Tard ,1991, Principles of Genetics, 8th edition. John Wiley & Sons. NY 2. David Frei Felder. S, 1987 Microbial Genetics, Jones & Bartlett, Boston. 3. Robert H. Tamarin. Principles of Genetics, 5th edition, WMC Brown Publishers
Reference Books	1. Lewin.B, 1990. Genes, 6th edition, Oxford University Press. 2. Klug.W.S. & Cummings, MR, 1996, Essentials of Genetics, Men tics Hail. New Jersey.
Website Link	1. https://www.nature.com/scitable/topicpage/operons-and-prokaryotic-gene-regulation-992/ 2. https://en.wikipedia.org/wiki/DNA_repair 3. https://en.wikipedia.org/wiki/Genetic_code 4. https://bio.libretexts.org/Bookshelves/Microbiology/Microbiology_(OpenStax)/10:_Biochemistry_of_the_Genome/10.04:_The_Structure_and_Function_of_Cellular_Genomes
L – Lecture	**T – Tutorial** **P – Practical** **C - Credit**

Mapping of COs with PO's and PSO's

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	2	2	2	2	1	2	1	1	2	3	2	2
CO2	3	3	3	2	2	1	2	1	1	2	3	3	2
CO3	3	3	3	3	3	2	3	2	2	3	3	3	3
CO4	3	2	2	2	2	2	2	1	1	2	3	2	2
CO5	3	3	3	3	3	2	3	2	2	3	3	3	3

(Correlation: 3 – High, 2 – Medium, 1 – Low)

Course Designed By: Mrs. Sudha. N	**Verified By HOD: Mrs.Margret Kanimozhi.A**
Checked By CDC: Mrs. C. Magila	**Approved By: Dr. J. Caroline Rose Principal**

Dr. P. Indira Arulselvi Professor, Department of Biotechnology, Periyar University, salem-11	**Dr. K. A. Paari.,** Assistant Professor, Department of Life Sciences, Christ (Deemed to be University) , Bengaluru	**Dr. Salamun DE.,** Associate Professor, School of Sciences, Jain (Deemed to be University), Bengaluru
Mr. Ragunath Srinivasan Associate Director, Biosimilars Manufacturing, Biocon Biological Limited. Bengaluru	**Mrs. Deekshitha. S** Officer, Quality Control Department, Microlabs Pvt. Ltd	

B.Sc. Biotechnology LOCF – CBCS with effect from 2025 - 2026 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
25UBT1A01	**BIOLOGICAL CHEMISTRY**	**GSE THEORY**	**I**	**45**	**3**	**-**	**-**	**3**

Objective: Aims to provide a foundational understanding of acids and bases, their properties, along with the concepts of pH, buffer systems, and their mechanisms. It covers the classification and structural details of carbohydrates. Students will also learn about amino acids and proteins, their structures, classifications, and biological functions. Additionally, the course explores lipids, enzymes, their activities, and the classification, functions, and deficiency symptoms of vitamins.

Unit	Course Content	Knowledge Levels	Sessions
I	Acids & Bases properties and differences, Concepts of acids and bases-Arrhenius, Lowry-Bronsted and Lewis. Concentration of solution, ways of expressing concentrations of solutions – per cent by weight, normality, molarity, molality, mole fraction. **pH of solution, pH scale, measurement of pH. Buffer solutions****, properties of buffers, **Henderson-Hasselbalch equation****, mechanism of buffering action of acidic buffer and basic buffer. **** SDG 6 - Clean Water and Sanitation.**	K1, K2	9
II	Carbohydrates: Classification, Monosaccharides- Properties of Carbohydrates. Disaccharides- Structure and importance of sucrose, lactose, maltose, **Polysaccharides****- Structure and importance of homopolysaccharides and heteropolysaccharides. Glycogenesis, Glycogenolysis, Glycolysis, Gluconeogenesis, TCA cycle. ****SDG 2 -Zero Hunger.**	K2, K3	9
III	Amino acids And Proteins: Classification, **Essential & Non-Essential amino acids**** Structure and properties. Protein: Definition, Classification and functions -Structural levels of organization. **** SDG 3- Good Health and Well-being.**	K2, K3	9
IV	Lipids and Enzymes: Classification, Physical & and chemical properties, **saturated and unsaturated fatty acids**, ** Definition, Classification with example, active site, lock & key model, Induced Fit Hypothesis. Enzyme units-Kinetics-Factors affecting enzyme activity. ****SDG 3- Good Health and Well-being.**	K2, K3, K4	9
V	**Vitamins: Classification****, Occurrence, deficiency symptoms, biochemical functions of fat soluble and water-soluble Vitamins. ****SDG 1- No Poverty.**	K1, K2	9

Course Outcome	**CO1:** Apply the concepts of acid-base chemistry and solution concentration to calculate pH and buffer capacity in chemical and biological systems.	K3
	CO2: Demonstrate understanding of carbohydrate classification structure and function and explain their roles in biological processes.	K2
	CO3: Interpret the properties and classification of amino acids and proteins and describe the structural hierarchy of protein organization.	K3, K2
	CO4: Analyze the structural and functional aspects of lipids and enzymes, including enzyme-substrate interaction and factors affecting enzymatic activity	K4
	CO5: Identify different vitamins, relate their sources and functions, and explain the physiological of their deficiency.	K1, K2

Learning Resources	
Text Books	1.P.L. Soni, A Text-book of Inorganic Chemistry, 11th Edition, S. Chand & Sons publications 2. Abhilasha Shourie, Shilpa S, Cappadonna & Anamika Singh (2020) Textbook of Biochemistry 1st Edition 3. J.L. Jain, 2016, Fundamentals of Biochemistry, S. Chand publication, 7th edition. 4. A.C. Deb, 2016, Fundamentals of Biochemistry, New central book agencies, 7th edition 5. Satyanarayana. U, 2016, Biochemistry, MJ publisher's 3rd edition (2006).
Reference Books	1. Lehninger (2013) Principles of Biochemistry 4th edition WH Freeman and Company NY 2. Murray et al., (2003) Harper's biochemistry 26th edition Appleton and Lange Publishers Florida USA 3. Geoffrey L. Zuby, William W. Parson, Dennis E. Vance, 1995, Principles of Biochemistry, W.C. Brown Publishers, 1995, 3rd edition. 4. Lubert Stryer (2007) Biochemistry –Stanford University 5th Edition-W H Freeman and company San Francisco 5. Bahl Arun, Bahl B. S. (2016), A Textbook of Organic Chemistry, 22nd Edition, S. Chand & Sons publications
Website Link	1. https://www.zenithinstitute.co.in/IITJEE_chemistry/Biomolecules 2. https://edurev.in/t/187498/Indicators--Acids--Bases-Salts 3. https://ncert.nic.in/textbook/pdf/lech205.pdf 4. https://www.aakash.ac.in/important-concepts/chemistry/biomolecules
L – Lecture	**T – Tutorial** **P – Practical** **C - Credit**

Mapping of COs with PO's and PSO

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	2	3	1	2	2	2	1	1	2	3	3	2
CO2	3	2	2	1	2	1	2	1	1	2	3	2	1
CO3	3	2	3	2	2	1	2	1	1	2	3	2	2
CO4	3	3	3	2	3	2	3	2	2	2	3	3	3
CO5	3	2	2	1	3	2	2	3	1	2	3	2	2

(Correlation: 3 – High, 2 – Medium, 1 – Low)

Course Designed By: Mrs. Sudha. N	**Verified By HOD: Mrs.Margret Kanimozhi.A**
Checked By CDC: Mrs. C. Magila	**Approved By: Dr. J. Caroline Rose Principal**

Dr. P. Indira Arulselvi Professor, Department of Biotechnology, Periyar University, salem-11	**Dr. K. A. Paari.,** Assistant Professor, Department of Life Sciences, Christ (Deemed to be University) , Bengaluru	**Dr. Salamun DE.,** Associate Professor, School of Sciences, Jain (Deemed to be University), Bengaluru
Mr. Ragunath Srinivasan Associate Director, Biosimilars Manufacturing, Biocon Biological Limited. Bengaluru	**Mrs. Deekshitha. S** Officer, Quality Control Department, Microlabs Pvt. Ltd	

B.Sc. Biotechnology LOCF – CBCS with effect from 2025 - 2026 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
25UBT1SE1	**MUSHROOM CULTIVATION TECHNOLOGY**	**SEC THEORY**	**I**	**30**	**2**	**-**	**-**	**2**

Objective: Aim of the syllabus is to introduce students to the history, morphology, and types of mushrooms, with emphasis on identifying edible and poisonous varieties. It covers the nutritional and medicinal values of mushrooms and the basic requirements for their cultivation. Students will explore the life cycles of common edible species like *Pleurotus* and *Agaricus*, along with techniques for spawn production, harvesting, grading, and storage. The course also highlights the scope of mushroom cultivation as a small-scale industry and addresses major diseases and post-harvest management.

Unit	Course Content	Knowledge Levels	Sessions
I	Introduction, History of Mushroom Cultivation, Morphology, Types of Mushrooms, **Identification of edible and poisonous mushroom**, Nutritive values and Medicinal Values**.** ****SDG 3-Good Health and Well-being.**	K1, K2	6
II	Mushroom cultivation, **Prospects and scope of Mushroom cultivation in small scale Industry**.** ****SDG 8-Decent Work and Economic Growth.**	K2, K3	6
III	**Life cycle**** of Pleurotus spp and Agaricus spp. ****SDG 4- Quality Education.**	K2, K3	6
IV	**Spawn production****, growth media, Spawn running and harvesting. Methods of Mushroom -Grading, **Packaging and Storage**** ****SDG 9- Industry, Innovation and Infrastructure.**	K2, K3, K4	6
V	Diseases and **post-harvest technology****, Insect pests, nematodes, mites, viruses, fungal competitors and other important diseases. ****SDG 12-Responsible Consumption and Production.**	K2, K4	6

Course Outcome	**CO1:** Describe the history, types, morphology, and identification of mushrooms, and explain their nutritional and medicinal values.	K1, K2
	CO2: Discuss mushroom cultivation techniques and evaluate the potential and scope of mushroom farming as a small-scale industry.	K2, K3
	CO3: Illustrate and compare the life cycles of *Pleurotus* spp. and *Agaricus* spp.	K2, K3
	CO4: Demonstrate understanding of spawn production, media preparation, spawn running, harvesting, grading, packaging, and storage methods.	K2, K3, K4

	CO5: Identify major diseases, pests, and post-harvest issues in mushroom cultivation and describe appropriate management techniques.	K2, K4

Learning Resources	
Text Books	1. Marimuthu, T., Krishnamoorthy, A.S., Sivaprakasam, K. and Jayarajan. R. (1991). Oyster Mushrooms, Department of Plant Pathology, Tamil Nadu Agricultural University, Coimbatore 2. Handbook of Mushroom Cultivation. 1999. TNAU publication 3. Nita Bahl. 2002. Handbook on Mushroom 4th edition Vijayprimlani for oxford & IBH publishing co., Pvt., Ltd., New Delhi. 5. Dr.C. Sebastian Rajasekhara Reader in Botany Bishop Heber College, Trichy – 17 4. Swaminathan, M. 1990. Food and Nutrition.Bappco, The Bangalore Printing and Publishing Co. Ltd., No. 88, Mysore Road, Bangalore - 560018 5. Bahl, N. (1984-1988). Hand book of Mushrooms, II Edition, Vol. I & Vol. II
Reference Books	1. Sing. 2005. Modern Mushroom Cultivation, International Book Distributors, Dehradun 2.Tewari, P and Kapoor, S.C.1988. Mushroom cultivation, Mittal Publications New Delhi. 3. Suman. 2005. Mushroom Cultivation Processing and Uses, M/s. IBD Publishers and Distributors, New Delhi. 4. Sharma V.P. 2006. Diseases and Pests of Mushrooms, M/s. IBD Publishers and Distributors, New Delhi. 5.Handbook of Edible Mushroom Today and Tomorrows printers and publishers
Website	1. Agriculturеinindia.net/vegetables-2/mushroom-vegetables-2/mushroom-history-and-morphology-agriculture/18080 2. https://biologynotesonline.com/wp-content/uploads/2024/09/Mushroom-Culture-Technology-Biologynotesonline.pdf
L – Lecture T – Tutorial P – Practical C - Credit	

Mapping of COs with PO's and PSO's

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	2	2	1	3	2	1	2	2	2	3	2	2
CO2	3	2	2	2	3	2	2	3	2	3	3	3	3
CO3	3	2	2	2	2	1	1	1	1	2	3	2	2
CO4	3	3	3	2	3	2	2	2	2	3	3	3	3
CO5	3	2	2	2	3	2	2	3	2	3	3	3	3

(Correlation: 3 – High, 2 – Medium, 1 – Low)

Course Designed By: **Ms. G. N. Neeraja Shree**	**Verified By HOD:** **Mrs. Margret Kanimozhi. A**
Checked By CDC: Mrs. C. Magila	**Approved By: Dr. J. Caroline Rose** **Principal**

Dr. P. Indira Arulselvi Professor, Department of Biotechnology, Periyar University, salem-11	**Dr. K. A. Paari.,** Assistant Professor, Department of Life Sciences, Christ (Deemed to be University) , Bengaluru	**Dr. Salamun DE.,** Associate Professor, School of Sciences, Jain (Deemed to be University), Bengaluru
Mr. Ragunath Srinivasan Associate Director, Biosimilars Manufacturing, Biocon Biological Limited. Bengaluru	**Mrs. Deekshitha. S** Officer, Quality Control Department, Microlabs Pvt. Ltd	

B.Sc. Biotechnology LOCF – CBCS with effect from 2025 - 2026 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
25UBT2C03	**GENETICS**	**DSC THEORY**	**II**	**60**	**4**	**-**	**-**	**4**

Objective: This unit aims to provide a foundational understanding of Mendelian genetics, including monohybrid and dihybrid crosses, gene interactions, and multiple alleles. It explores linkage, crossing over, chromosome mapping, and cytoplasmic inheritance along with sex determination. Students will gain insights into gene structure, operon models, DNA as the genetic material, mutations, and chromosomal aberrations. The course also covers population genetics, Hardy-Weinberg principle, and the social relevance of eugenics and euthenics.

Unit	Course Content	Knowledge Levels	Sessions
I	Mendel's experiments, Monohybrid cross, Dihybrid cross, Backcross or Testcross, Mendel's laws. Dominance (complete and incomplete). **Interaction of Genes**** - Epistasis and lethal genes. Multiple alleles in Drosophila and Blood group inheritance in man. ****SDG 2- Zero Hunger.**	K1, K2	12
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. Pedigree analysis. ****SDG 15- Life on Land.**	K2, K3	12
III	**Fine structure of the gene**** and gene concepts. Cistron, Recon and Muton concepts; split genes and Interrupted genes; Overlapping genes and Pseudogenes: Gene families and Multigene organization: Transposable genetic elements. ****SDG 11-Sustainable Cities and Communities.**	K2, K3, K4	12
IV	**Chromosomal aberrations**** - Numerical and Structural, Mitochondrial Inheritance, Cytoplasmic Inheritance – Linked Inheritance and Sex Determination in Drosophila. Mendelian inheritance in human. (Cystic Fibrosis, Muscular Dystrophy). ****SDG 3-Good Health and Well-Being.**	K3, K4, K5	12
V	**Population Genetics**** – Hardy Weinberg principle, gene frequency, genotype frequency and factors affecting gene frequency. **Eugenics and Euthenics****. ****SDG 4-Quality Education.**	K3, K4, K5	12

Course Outcome	**CO1:** Understand Mendel's experiments, laws of inheritance, and gene interactions such as dominance, epistasis, and lethality.	K1, K2
	CO2: Explain concepts of linkage, crossing over, and chromosomal mapping, including sex determination and cytoplasmic inheritance.	K2, K3
	CO3: Analyze gene structure and function, operon models, and classic experiments identifying DNA as genetic material.	K2, K3, K4
	CO4: Classify and evaluate different types of mutations, chromosomal aberrations, and mechanisms of DNA repair.	K3, K4, K5
	CO5: Apply Hardy-Weinberg principle to population genetics and evaluate concepts of gene and genotype frequency, eugenics, and euthenics.	K3, K4 K5

Learning Resources	
Text Books	1. Nath Publications, Meerut, 250001. www.knrnpublications.com, ISBN-978- 81- 907011-2-9 2. Verma, P.S. and Agarwal, V.K., 1995. Genetics, 8th edition, S. Chand & Co., New Delhi – 10055. 3. Dr. Veer Bala Rastogi, 2020, Elements of Genetics, 11 th Revised & Enlarged Edition, Kedar Nath Ram 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. Good enough U. 1985. Genetics. Hold Saunders international. 2. Griffiths, Miller, J.H., An Introduction to Genetic Analysis W.H. Freeman. New York. 3. Winter, P.C., Hickey, G.J. and Fletcher, H.L.2000. Instant notes in Genetics. Viva books, Ltd 4. Lewis, R.2001. Human Genetics- Concepts and application. 4th edition. McGraw Hill 5. Gardener E.J. Simmons M.J. Slustad D. P. 2006. Principles of Genetics
Website Link	1. https://openstax.org/books/biology-ap-courses/pages/12-3-laws-of-inheritance 2. https://www.nature.com/scitable/topicpage/isolating-hereditary-material-frederick-griffith-oswald-avery-336/ 3. https://en.wikipedia.org/wiki/Griffith%27s_experiment 4. https://exploreanthro.com/human-population-genetics/mendels-experiments-monohybrid-dihybrid-crosses/
L – Lecture T – Tutorial P – Practical C – Credit	

Mapping of Cos with P's and PSO's

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	2	1	–	2	2	2	–	–	2	3	2	1
CO2	3	2	2	–	2	2	3	1	–	2	3	3	2
CO3	3	3	2	2	2	2	3	–	–	2	3	3	3
CO4	3	3	2	2	3	3	3	–	–	2	3	3	3
CO5	3	2	1	1	2	2	3	2	–	3	3	3	3

(Correlation: 3 – High, 2 – Medium, 1 – Low)

Course Designed By: Mrs. Sudha. N	**Verified By HOD:** **Mrs. Margret Kanimozhi. A**
Checked By CDC: Mrs. C. Magila	**Approved By: Dr. J. Caroline Rose** **Principal**

Dr. P. Indira Arulselvi Professor, Department of Biotechnology, Periyar University, salem-11	**Dr. K. A. Paari.,** Assistant Professor, Department of Life Sciences, Christ (Deemed to be University) , Bengaluru	**Dr. Salamun DE.,** Associate Professor, School of Sciences, Jain (Deemed to be University), Bengaluru
Mr. Ragunath Srinivasan Associate Director, Biosimilars Manufacturing, Biocon Biological Limited. Bengaluru	**Mrs. Deekshitha. S** Officer, Quality Control Department, Microlabs Pvt. Ltd	

B.Sc. Biotechnology LOCF – CBCS with effect from 2025 - 2026 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
25UBT2CP2	**LAB IN GENETICS AND MICROBIOLOGY**	**DSC PRACTICAL**	**II**	**60**	**-**	**-**	**4**	**2**

Objective: The practical exercises aim to provide a comprehensive understanding of fundamental techniques in cytology, microbiology, and genetics. Students will develop hands-on skills in slide preparation, microbial culture, staining methods, and identification of mitotic, meiotic, and genetic traits. Emphasis is placed on aseptic techniques, media preparation, isolation of microorganisms from various sources, and observation of motility. Additionally, students will gain experience in biochemical characterization and antibiotic sensitivity testing, fostering analytical thinking and laboratory competence.

S. No	List of Experiments	Knowledge levels	Sessions
1	1. **Mitotic stages**** of onion (Allium cepa) root tip. 2. **Meiotic stages**** of cockroach testes/ Flower bud. 3. Identification of **Barr bodies**** from Buccal smear. ****SDG 4-Quality Education**.	K1, K2, K3	12
2	4. Preparations of culture medium and **culture of Drosophila**** –methods of maintenance. 5. Identifications of **mutants**** of Drosophila Human **karyotyping**** (Demo). ****SDG 3-Good Health and Well-Being.**	K2, K3, K4	12
3	6. **Sterilization**** techniques – Preparation of Media. 7. **Inoculation**** techniques- Pour plate, spread plate and streak plate (simple, continuous, T" streak and quadrant streak methods). 8. **Isolation of bacteria**** from soil and water. Serial dilution method. ****SDG 6- Clean Water and Sanitation.**	K2, K3, K4	12
4	9. **Staining**** techniques: Simple, Gram's, Capsule Spores. 10. Preparation of temporary **mounts****- Lacto phenol Cotton blue staining. 11. **Motility test****: Hanging drop technique. ****SDG 8- Decent Work and Economic Growth.**	K2, K3	12
5	12. **Biochemical characterization**** - catalase, oxidase, and TSI. 13. **Antibiotic sensitivity test**** by Kirby-Bauer method (demonstration). ****SDG 12-Responsible Consumption and Production.**	K3, K4, K5	12

Course Outcome	**CO1:** Demonstrate practical knowledge of cytological techniques, including slide preparation and identification of mitotic and meiotic stages.	K1, K2, K3
	CO2: Apply staining techniques for the identification of bacterial structures and genetic features such as Barr bodies and Drosophila mutants.	K2, K3, K4
	CO3: Perform aseptic and sterilization techniques, and prepare culture media for the maintenance and growth of microorganisms and model organisms.	K2, K3, K4
	CO4: Isolate and identify microorganisms from environmental samples using standard microbiological methods, including plating and motility tests.	K2, K3
	CO5: Conduct biochemical tests and antibiotic sensitivity assays to characterize microbial species and interpret experimental results effectively.	K3, K4, K5

Learning Resources	
Text Books	1. Practical Manual on "Fundamentals of Genetics" (PBG-121). 2019, Edition: First Publisher: Odisha University of Agriculture & Technology. Editor: Kaushik Kumar Panigrahi 2. Kannan. N (1996). Laboratory manual in General Microbiology. Palani Publications. 3. James G Cappuccino and N. Sherman MB (1996). A lab manual Benjamin Cummins, New York 1996. 4. Sundararaj T (2005). Microbiology Lab Manual (1st 4 edition) publications. 5. Gunasekaran, P. (1996). Laboratory manual in Microbiology. New Age International Ltd., Publishers, New Delhi. 6. 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. (1stEdition). 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.
Website Link	1. https://www.microscopemaster.com/onion-root-tip-mitosis.html
L – Lecture T – Tutorial P – Practical C - Credit	

Mapping of COs with PO's and PSO's

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	2	2	2	2	2	1	1	1	2	3	2	1
CO2	3	2	3	2	2	2	1	1	2	2	3	2	2
CO3	3	3	3	2	3	2	1	2	1	2	3	3	2
CO4	3	3	3	3	3	2	2	2	2	3	3	3	3
CO5	3	3	3	3	3	3	2	2	2	3	3	3	3

(Correlation: 3 – High, 2 – Medium, 1 – Low)

Course Designed By: Mrs. N. Sudha	**Verified By HOD:** **Mrs. Margret Kanimozhi. A**
Checked By CDC: Mrs. C. Magila	**Approved By: Dr. J. Caroline Rose** **Principal**

Dr. P. Indira Arulselvi Professor, Department of Biotechnology, Periyar University, salem-11	**Dr. K. A. Paari.,** Assistant Professor, Department of Life Sciences, Christ (Deemed to be University) , Bengaluru	**Dr. Salamun DE.,** Associate Professor, School of Sciences, Jain (Deemed to be University), Bengaluru
Mr. Ragunath Srinivasan Associate Director, Biosimilars Manufacturing, Biocon Biological Limited. Bengaluru	**Mrs. Deekshitha. S** Officer, Quality Control Department, Microlabs Pvt. Ltd	

B.Sc. Biotechnology LOCF – CBCS with effect from 2025 - 2026 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
25UBT2C04	**HUMAN PHYSIOLOGY**	**DSC THEORY**	**II**	**45**	**3**	**-**	**-**	**3**

Objective: This unit provides an understanding of major human physiological systems, including digestion, respiration, circulation, excretion, reproduction, and neural control. It covers the processes of digestion, gas exchange, muscle contraction, cardiac cycle, urine formation, and reproductive functions. The role of hormones, neurotransmitters, and special senses like vision and hearing are also explored.

Unit	Course Content	Knowledge Levels	Sessions
I	**Digestive System****: Overview of the digestive system, secretions of digestive tract, digestive hormones, process of digestion, absorption, assimilation of carbohydrates, proteins, fats, nucleic acids. ****SDG 3- Good Health and Well-Being**	K1, K2, K3	9
II	**Respiratory System****: Overview of the respiratory system, pulmonary ventilation, Alveolar ventilation, composition and partial pressure of inspired air, alveolar air and expired air, exchange and transport of respiratory gases. ****SDG 11- Sustainable Cities and Communities.**	K1, K2, K3, K4	9
III	**Muscle physiology and Cardiovascular System****: overview of muscle tissue, contraction and relaxation of skeletal muscle, cardiac muscle tissue and cardiac conduction system, cardiac cycle, blood pressure. ****SDG 8-Decent Work and Economic Growth.**	K1, K2, K3, K4	9
IV	**Excretory System****: Overview of Renal system, Renal physiology: - Glomerular filtration, tubular reabsorption and secretion, production of dilute and concentrated urine. **Reproductive System****: Overview of male and female reproductive system, menstrual cycle, fertilization process, physiology of pregnancy, (fetal development), parturition and lactation. ****SDG 12-Responsible Consumption and Production.**	K1, K2, K3, K4, K5	9
V	**Nervous System****: Overview of nervous system, Classification of nervous system, Signal transmission at synapse, Neurotransmitters. ****SDG 16-Peace, Justice and Strong Institutions.**	K1, K2, K3, K4, K5	9

Course Outcome	**CO1:** Explain the structure and functions of the human digestive system, including the roles of secretions, digestive hormones, and the processes of digestion, absorption, and assimilation of biomolecules.	K1, K2, K3
	CO2: Describe the anatomy and physiology of the respiratory system, and explain the mechanisms of pulmonary and alveolar ventilation, and the exchange and transport of respiratory gases.	K1, K2, K3, K4
	CO3: Illustrate the physiological mechanisms of muscle contraction and relaxation, and explain the structure and function of the cardiovascular system including the cardiac cycle and regulation of blood pressure.	K1, K2, K3, K4
	CO4: Interpret the functional anatomy and physiology of the renal and reproductive systems, including urine formation, menstrual cycle, fertilization, pregnancy, parturition, and lactation.	K1, K2, K3, K4, K5
	CO5: Describe the organization of the nervous system and explain the mechanisms of nerve signal transmission, synaptic communication, and the role of neurotransmitters.	K1, K2, K3, K4, K5

Learning Resources	
Text Books	1. Essentials of Medical Physiology, K. Sembulingam and Prema Sembulingam, 6th Edition, 2012. 2. Principles of Anatomy and Physiology, Tortora and Grabowski, 2003, John Wiley & Sons, Inc. 3. Human Physiology, Chatterjee.C. 11th edition medical agency allied, Calcutta.
Reference Books	1. Textbook of medical physiology, A.C. Guyton 10th edition. 2. Human body, Atlas, Publication Garden cheers. 3. A Text Book of Human physiology, Sarada Subrahmanyam et al., 2010, S Chand & Company.
Website Link	1. https://www.khanacademy.org/science/biology/human-biology/circulatory-pulmonary/v/the-lungs-and-pulmonary-system 2. https://medlineplus.gov/ency/article/002364.htm 3. https://www.britannica.com/science/human-body
L – Lecture T – Tutorial P – Practical C - Credit	

Mapping of COs with PO's and PSO's

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	2	2	2	3	2	1	1	2	2	3	2	1
CO2	3	2	2	2	3	2	1	1	2	2	3	2	2
CO3	3	3	3	3	3	2	2	1	2	3	3	3	3
CO4	3	2	2	2	3	2	1	2	2	3	3	2	3
CO5	3	3	2	2	3	2	2	2	3	3	3	3	2

(Correlation: 3 – High, 2 – Medium, 1 – Low)

Course Designed By: Mrs. N. Sudha	**Verified By HOD:** **Mrs. Margret Kanimozhi. A**
Checked By CDC: Mrs. C. Magila	**Approved By: Dr. J. Caroline Rose** **Principal**

Dr. P. Indira Arulselvi Professor, Department of Biotechnology, Periyar University, salem-11	**Dr. K. A. Paari.,** Assistant Professor, Department of Life Sciences, Christ (Deemed to be University) , Bengaluru	**Dr. Salamun DE.,** Associate Professor, School of Sciences, Jain (Deemed to be University), Bengaluru
Mr. Ragunath Srinivasan Associate Director, Biosimilars Manufacturing, Biocon Biological Limited. Bengaluru	**Mrs. Deekshitha. S** Officer, Quality Control Department, Microlabs Pvt. Ltd	

B.Sc. Biotechnology LOCF – CBCS with effect from 2025 - 2026 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
25UBT2A02	**FUNDAMENTALS OF MICROBIOLOGY**	**GSE THEORY**	**II**	**45**	**3**	**-**	**-**	**3**

Objective: This unit provides a comprehensive overview of microbiology, covering its history, classification of microorganisms, and contributions of pioneering scientists. It explores bacterial structure, growth, staining, cultivation techniques, and methods of sterilization. Students will also learn about antibiotics, antimicrobial resistance, bioinsecticides, biofertilizers, and microbial applications in food and agriculture. The unit concludes with microscopy techniques and the study of microbial diseases, including their diagnosis and treatment.

Unit	Course Content	Knowledge Levels	Sessions
I	**History of Microbiology**** (Biogenesis and abiogenesis, spontaneous generation), Classification of bacteria, fungi, virus, protozoa and algae. Scope and application of microbiology –Contributions of scientists in the field of microbiology. ****SDG 4-Quality Education.**	K1, K2	9
II	Structure of bacteria (Gram positive and Gram negative) - Bacterial growth and measurement of growth, **Media and its types**** - Staining methods (Gram's, capsule, Spore, LCB mount). Methods of preservation of microorganisms. Invitro cultivation of virus and algae. ****SDG 9-Industry, Innovation, and Infrastructure.**	K2, K3, K4	9
III	Sterilization methods - physical and chemical methods. Definition and classification of **antibiotics****. Mode of action of different groups of antibiotics. – **Antimicrobial resistance**** and its mechanism. MRSA, ESBL ****SDG 3-Good Health and Well-Being.**	K2, K4, K5	9
IV	**Bioinsecticides**** - Bacillus thuringiensis, Baculoviruses- **Biofertilizers**** - Azospirillum and blue green algae - single cell protein – Prebiotics and probiotics - Dairy products (Cheese and Yoghurt). Types of microscopy – Definitions, light, dark field, fluorescence, and electron microscopes. ****SDG 12-Responsible Consumption and Production.**	K1, K2, K3	9
V	Microbial Disease- host -pathogen interaction, clinical features, lab diagnosis and treatment of Airborne disease (Pneumonia, Chicken pox), food borne disease (Typhoid, Aspergillosis), **Water borne disease**** (Cholera, Amoebiasis), Sexually transmitted disease (AIDS, Trichomoniasis), Vector borne disease (Dengue, Malaria). ****SDG 6-Clean Water and Sanitation.**	K2, K4, K5	9

Course Outcome	**CO1:** Describe the historical development, major theories, and classification of microorganisms including bacteria, fungi, viruses, protozoa, and algae.	K1, K2
	CO2: Explain the structural features of bacteria, staining methods, cultivation techniques, and preservation of microorganisms.	K2, K3
	CO3: Understand the principles of sterilization, classification and action of antibiotics, and mechanisms of antimicrobial resistance.	K2, K3, K4
	CO4: Illustrate the applications of microbiology in agriculture, food, and industry through the use of bioinsecticides, biofertilizers, probiotics, and microscopy techniques.	K3, K4, K5
	CO5: Analyze the clinical features, diagnosis, and treatment of microbial diseases transmitted through air, food, water, vectors, and sexual contact.	K3, K4 K5

Learning Resources	
Text Books	1. Practical Manual on "Fundamentals of Genetics" (PBG-121). 2019, Edition: First Publisher: 2. Odisha University of Agriculture & Technology. Editor: Kaushik Kumar Panigrahi 3. Kannan. N (1996). Laboratory manual in General Microbiology. Palani Publications. 4. James G Cappucino and N. Sherman MB (1996). A lab manual Benjamin Cummins, New York 1996. 5. Sundararaj T (2005). Microbiology Lab Manual (1st 4 edition) publications. 6. Gunasekaran, P. (1996). Laboratory manual in Microbiology. New Age International Ld., Publishers, New Delhi. 7. 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.
Website Link	1. https://microbenotes.com/history-of-microbiology/ 2. https://www.britannica.com/science/microbiology/Types-of-microorganisms 3. https://biologynotesonline.com/courses/introduction-to-microbiology-and-microbial-diversity/ 4. https://www.sciencenewstoday.org/the-five-major-types-of-microorganisms
L – Lecture	**T – Tutorial** **P – Practical** **C - Credit**

Mapping of COs with PO's and PSO's

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	2	1	–	2	2	1	–	–	2	3	2	1
CO2	3	2	3	–	2	2	2	–	1	2	3	3	2
CO3	3	2	2	–	3	3	2	–	–	2	3	3	2
CO4	3	2	2	2	3	2	2	2	–	2	3	3	3
CO5	3	2	2	1	3	3	3	2	1	3	3	3	3

(Correlation: 3 – High, 2 – Medium, 1 – Low)

Course Designed By: Mrs. Shinuja. S	**Verified By HOD: Mrs. Margret Kanimozhi.A**
Checked By CDC: Mrs. C. Magila	**Approved By: Dr. J. Caroline Rose Principal**

Dr. P. Indira Arulselvi Professor, Department of Biotechnology, Periyar University, salem-11	**Dr. K. A. Paari.,** Assistant Professor, Department of Life Sciences, Christ (Deemed to be University) , Bengaluru	**Dr. Salamun DE.,** Associate Professor, School of Sciences, Jain (Deemed to be University), Bengaluru
Mr. Ragunath Srinivasan Associate Director, Biosimilars Manufacturing, Biocon Biological Limited. Bengaluru	**Mrs. Deekshitha. S** Officer, Quality Control Department, Microlabs Pvt. Ltd	

B.Sc. Biotechnology LOCF – CBCS with effect from 2025 - 2026 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
25UBT2SE1	**VERMICOMPOST TECHNOLOGY**	**SEC THEORY**	**II**	**30**	**2**	**-**	**-**	**2**

Objective: This course introduces students to the types, collection, and preservation of earthworms, especially species suitable for vermicomposting and their role in soil fertility. It covers culturing techniques, composting materials, and small to large-scale vermicomposting methods. Students will learn about the chemical, physical, and biological properties of vermicompost, as well as the production and composition of vermiwash.

Unit	Course Content	Knowledge Levels	Sessions
I	**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. ****SDG 15- Life on Land.**	K1, K2	6
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. ****SDG 8- Decent Work & Economic Growth.**	K2, K3	6
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. ****SDG 9- Industry, Innovation, and Infrastructure.**	K3, K4	6
IV	**Large scale techniques of Vermicomposting**** Outdoor dual bin; Raised cage; Dual pit; Commercial model; Trickling filter vermicomposting; Keep it simple and save plan. ****SDG 7 - Affordable & Clean Energy.**	K4, K5	6
V	**Vermiwash and Economics**** - Chemical composition of vermiwash; Techniques of vermiwash production: Advantages of Vermicomposting; Prospects of vermi-culture as self-employment venture. ****SDG 3 - Good Health & Well-being.**	K2, K5	6

Course Outcome	**CO1:** Identify and describe different types of earthworms, their characteristics, and their role in soil fertility and vermitechnology.	K1, K2
	CO2: Explain the culturing techniques of earthworms and apply methods for composting materials in controlled environments.	K2, K3
	CO3: Demonstrate small-scale vermicomposting methods and analyze the physical, chemical, and biological properties of vermicompost.	K3, K4
	CO4: Compare and evaluate large-scale vermicomposting techniques for commercial and sustainable agricultural practices.	K4, K5
	CO5: Understand vermiwash production, assess its composition, and evaluate the economic and entrepreneurial potential of vermiculture.	K2, K5

Learning Resources	
Text 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. 4. Ranganathan, L.S. 2006. Vermibiotechnology from soil health to human health – Agrobios, India.
Website Link	1. https://www.youtube.com/watch?v=G9sgbbbATm8 2. https://www.youtube.com/watch?v=991qDFd-uaI&t=2s 3. https://www.ctahr.hawaii.edu/oc/freepubs/pdf/HG-45.pdf
L – Lecture T – Tutorial P – Practical C - Credit	

Mapping of COs with PO's and PSO's

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	2	2	–	3	2	2	2	–	2	3	2	1
CO2	3	3	3	–	3	2	2	–	–	2	3	3	2
CO3	3	3	3	–	3	2	3	2	1	2	3	3	3
CO4	3	2	2	–	3	3	3	2	1	3	3	3	3
CO5	3	2	2	–	3	3	3	2	1	3	3	3	3

(Correlation: 3 – High, 2 – Medium, 1 – Low)

Course Designed By: **Mrs. Margret Kanimozhi. A**	**Verified By HOD:** **Mrs. Margret Kanimozhi. A**
Checked By CDC: Mrs. C. Magila	**Approved By: Dr. J. Caroline Rose** **Principal**

Dr. P. Indira Arulselvi Professor, Department of Biotechnology, Periyar University, salem-11	**Dr. K. A. Paari.,** Assistant Professor, Department of Life Sciences, Christ (Deemed to be University) , Bengaluru	**Dr. Salamun DE.,** Associate Professor, School of Sciences, Jain (Deemed to be University), Bengaluru
Mr. Ragunath Srinivasan Associate Director, Biosimilars Manufacturing, Biocon Biological Limited. Bengaluru	**Mrs. Deekshitha. S** Officer, Quality Control Department, Microlabs Pvt. Ltd	

B.Sc. Biotechnology LOCF – CBCS with effect from 2025 - 2026 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
25UBT1NM1	**PUBLIC HEALTH AND HYGIENE**	**SEC/ NME THEORY**	**I**	**30**	**2**	**-**	**-**	**2**

Objective: This syllabus provides an understanding of health, hygiene and the role of health education in disease prevention and environmental improvement. It covers nutrition, balanced diets, breastfeeding, and malnutrition-related disorders. Students will study communicable and non-communicable diseases, their causes, symptoms, precautions, and treatments, including mental and gastrointestinal disorders. The course also introduces major health service organizations like WHO, UNICEF, and the Indian Red Cross and their roles in promoting public health.

Unit	Course Content	Knowledge Levels	Sessions
I	**Scope health and hygiene**** – Concept of health and disease - Pollution and health hazards; water and airborne diseases. **Radiation hazards****: Mobile Cell tower and electronic. Role of **health education**** in environment improvement and prevention of diseases. Personal hygiene. ****SDG 3-Good Health and Well-being.**	K1, K2	6
II	**Classification of food into micro and macro nutrients** - Balanced diet, Importance of dietary fibers. Significance of breast feeding. **Malnutrition anomalies**** – Anemia, Kwashiorkor, Marasmus, Rickets, Goiter (cause, symptoms, precaution and treatment). ****SDG 2-Zero Hunger.**	K2, K3	6
III	**Communicable viral diseases****- measles, poliomyelitis, dengue, Chikungunya, rabies, leprosy and hepatitis, COVID. Communicable bacterial diseases- tuberculosis, typhoid, cholera, tetanus, plague. Health education and **preventive measures for communicable diseases. **** ****SDG 6-Clean Water and Sanitation.**	K2, K3, K4	6
IV	Non-communicable diseases such as hypertension, stroke, coronary heart disease, myocardial infarction. Osteoporosis and rheumatoid arthritis-cause, symptom, precautions. **Diabetes-types and their effect on human health****. Gastrointestinal disorders- acidity, (Gastro intestinal reflex disorder-GIRD), peptic ulcer, constipation. (cause, symptoms, precaution and treatment) Obesity (Definition and consequences). Mental illness (depression and anxiety). Oral cancer and their preventive measures. ****SDG 12-Responsible Consumption and Production.**	K2, K3	6
V	Health Services Organizations: World Health Organization (WHO), United Nations International Children's Emergency Fund (UNICEF) and Indian Red Cross (IRC). ****SDG 17-Partnerships for the Goals.**	K3, K4	6

Course Outcome	**CO1**: Demonstrate knowledge of health and hygiene practices, and explain the environmental and radiation factors affecting health.	K1, K2
	CO2: Apply the concepts of nutrition to identify and prevent dietary deficiency disorders and promote healthy dietary habits.	K2, K3
	CO3: Recognize symptoms and modes of transmission of communicable diseases and recommend suitable preventive and control measures.	K2, K3, K4
	CO4: Evaluate major non-communicable diseases and propose strategies for lifestyle modification and disease prevention.	K2, K3
	CO5: Identify the contributions of key health organizations and assess their role in health promotion and emergency health services.	K3, K4

Learning Resources	
Text Books	1. Mary Jane Schneider (2011) Introduction to Public Health. 2. Muthu, V.K. (2014) A Short Book of Public Health 3. Detels, R. (2017) Oxford Textbook of Public Health (6th edition). 4. Gibney, M.J. (2013) Public Health Nutrition. 5. Wong, K.V. (2017) Nutrition, Health and Disease.
Reference Books	1. S. Lal, (2018), Vikas. Public Health Management Principles and Practice, 2nd Edition, CBS Publishers and Distributors Pvt Ltd, ISBN: 978-93-87742-93-2. 2. Mary-Jane Schneider (2016), Introduction to Public Health, (5th Edition), Jones & Bartlett Learning, ISBN-13: 978-1284197594 3. Carolyn D. Berdanier, Johanna T. Dwyer, David Heber (2013), Handbook of Nutrition and Food, (3rd Edition), CRC Press, ISBN 9781466505711 4. Sue Reed, Dino Pisaniello, GezaBenke, Kerrie Burton. (2013), Principles of Occupational Health and Hygiene: An Introduction, (2nd Revised ed. Edition), Allen &Unwin 5. V. Kumaresan, R. Sorna Raj, (2012) Public Health and Hygiene, (1st Edition), Saras Publication.
L – Lecture T – Tutorial P – Practical C - Credit	

Mapping of COs with PO's and PSO's

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	2	2	1	3	2	2	3	1	2	3	2	2
CO2	3	2	2	2	3	2	2	2	1	2	3	3	2
CO3	3	2	2	1	3	2	3	2	1	2	3	2	2
CO4	3	2	2	1	3	2	3	3	2	3	3	3	3
CO5	2	1	1	1	3	2	2	3	2	2	2	2	2

(Correlation: 3 – High, 2 – Medium, 1 – Low)

Course Designed By: Mrs. Shinuja. S	**Verified By HOD: Mrs.Margret Kanimozhi.A**
Checked By CDC: Mrs. C. Magila	**Approved By: Dr. J. Caroline Rose Principal**

Dr. P. Indira Arulselvi Professor, Department of Biotechnology, Periyar University, salem-11	**Dr. K. A. Paari.,** Assistant Professor, Department of Life Sciences, Christ (Deemed to be University) , Bengaluru	**Dr. Salamun DE.,** Associate Professor, School of Sciences, Jain (Deemed to be University), Bengaluru
Mr. Ragunath Srinivasan Associate Director, Biosimilars Manufacturing, Biocon Biological Limited. Bengaluru	**Mrs. Deekshitha. S** Officer, Quality Control Department, Microlabs Pvt. Ltd	

B.Sc. Biotechnology LOCF – CBCS with effect from 2025 - 2026 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
25UBT1NM2	**FOOD NUTRITION**	**SEC/NME THEORY**	**I**	**30**	**2**	**-**	**-**	**2**

Objective: This syllabus aims to provide foundational knowledge on food, nutrition, nutrients, balanced diet, malnutrition, and energy concepts, including BMR and total energy needs. It emphasizes the sources, functions, classification, and deficiencies of carbohydrates, proteins, fats, vitamins, minerals, water, and dietary fiber. Students will understand the nutritional significance of various food groups, additives, toxins, adulteration, and packaging. The course also focuses on the principles of meal planning and diet formulation across different age groups.

Unit	Course Content	Knowledge Levels	Sessions
I	Definition of food, Nutrition, Nutrient, Nutritional status, Dietetics, **Balance diet****, **Malnutrition****, Energy (Unit of energy-Joule, Kilocalorie). Health, **Immunity by food**** and function of food. ****SDG 2-Zero Hunger.**	K1, K2	6
II	Carbohydrate, Protein, Fat, **Vitamin and Minerals**** (Calcium, Phosphorous, Sodium, Potassium, Iron, Iodine, Fluorine) -Sources, Classification, Function and Deficiencies of these nutrients. Function of water and **dietary fiber.** ** ****SDG 3-Good Health and Well-Being.**	K2, K3	6
III	**BMR****: Definition, factors affecting BMR and total energy requirements (Calculation of energy of individuals) ****SDG 4-Quality Education.**	K2, K3	6
IV	Basic five food groups, nutritional significance of cereals, pulses, milk, meat, fish, vegetables, egg, nuts, oils and sugars. Food toxins, Food additives, **Food quality****, **Safety**** measures in food handling, **Food adulteration****, food Preservatives and **food Packaging****. ****SDG 12-Responsible Consumption and Production.**	K2, K3, K4	6
V	Principles and Objectives of meal planning. **Diet planning for different age groups**** (infant, school children, adults and old age) ****SDG 8-Decent Work and Economic Growth.**	K3, K4	6

Course Outcome	**CO1**: Define and explain the fundamental concepts of food, nutrition, energy, and diet, and relate them to health and immunity.	K1, K2
	CO2: Describe the classification, sources, physiological functions, and deficiency symptoms of macro- and micronutrients essential for human health.	K2, K3
	CO3: Calculate Basal Metabolic Rate (BMR) and evaluate total energy requirements based on age, sex, and activity level.	K2, K3
	CO4: Identify the nutritional significance of various food groups and analyze issues related to food safety, quality, additives, and adulteration.	K2, K3, K4
	CO5: Apply the principles of meal planning to formulate balanced diets for different age groups, addressing nutritional needs across the lifespan.	K3, K4

Learning Resources	
Text Books	1. Food science and Nutrition, Oxford publication by Sunetra Raday 2. Handbook of Nutrition & Food, third edition, CRC Press (Taylor and Francis group) by Carolyn D. Berdanier 3. Vidya & D.B. Rao, 2010. A textbook of nutrition by, Discovery Publishing house, 4. Janet D Ward & Larry T Ward, Principles of food science by, good heart-Wilcox publishing 5. Dr. M. Swaminathan, 2018. Hand Book of Food & Nutrition, Second edition Bangalore press
Reference Books	1. Joshi, V.K. and Singh, R.S., A. (2013), Food Biotechnology- Principles and practices, I.K. International Publishing House Pvt. Ltd., New Delhi, 2. Foster, G.N., (2020), Food Biotechnology, (First edition), CBS Publishers & Distributors Pvt Ltd, ISBN 9789389396348 3. Anthony Pometto, Kalidas Shetty, Gopinadhan Paliyath, Robert E. Levin (2005), Food Biotechnology, (2nd edition), CRC Press, ISBN 9780824753290 4. Perry Johnson-Green (2018), Introduction to Food Biotechnology, Special Indian Edition, CRC Press, ISBN 9781315275703 5. Ravishankar Rai, V, (2015), Advances in Food Biotechnology, (First edition), John Wiley & Sons, Inc, ISBN 9781118864555
Website Link	1. https://egyankosh.ac.in/bitstream/123456789/31103/1/Unit-1.pdf 2. https://en.wikipedia.org/wiki/Nutrition 3. https://en.wikipedia.org/wiki/Malnutrition
L – Lecture T – Tutorial P – Practical C - Credit	

Mapping of COs with PO's and PSO's

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	2	1	1	3	2	2	3	1	2	3	2	2
CO2	3	2	2	1	3	2	2	2	1	2	3	3	2
CO3	3	3	2	1	2	1	2	2	1	2	3	3	2
CO4	3	3	3	1	3	2	3	3	2	2	3	3	3
CO5	3	3	2	1	3	2	3	3	2	3	3	3	3

(Correlation: 3 – High, 2 – Medium, 1 – Low)

Course Designed By: **Mrs. Margret Kanimozhi. A**	**Verified By HOD:** **Mrs. Margret Kanimozhi. A**
Checked By CDC: Mrs. C. Magila	**Approved By: Dr. J. Caroline Rose** **Principal**

Dr. P. Indira Arulselvi Professor, Department of Biotechnology, Periyar University, salem-11	**Dr. K. A. Paari.,** Assistant Professor, Department of Life Sciences, Christ (Deemed to be University) , Bengaluru	**Dr. Salamun DE.,** Associate Professor, School of Sciences, Jain (Deemed to be University), Bengaluru
Mr. Ragunath Srinivasan Associate Director, Biosimilars Manufacturing, Biocon Biological Limited. Bengaluru	**Mrs. Deekshitha. S** Officer, Quality Control Department, Microlabs Pvt. Ltd	

B.Sc. Biotechnology LOCF – CBCS with effect from 2025 - 2026 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
25UBT2NM1	**ORGANIC FARMING AND HEALTH MANAGEMENT**	**SEC/NME THEORY**	**II**	**30**	**2**	**-**	**-**	**2**

Objective: This course introduces the principles of ecology, ecosystem interactions, biodiversity, and sustainable practices. It covers composting methods, organic farming, cultivation of vegetables and medicinal herbs, and the setup of eco-friendly gardens. Students will also learn about health concepts and the ecological factors influencing well-being. The role of physical activity, fitness, and nutrition in maintaining health and enhancing sports performance is emphasized.

Unit	Course Content	Knowledge Levels	Sessions
I	**Ecology and Environment**** – Principles of ecology – Ecosystem - Biotic and abiotic components and interaction – Energy flow –Nutrient cycle – Biodiversity – Endemic– Exotic - Interrelationships. ****SDG 15- Life on Land**	K1, K2	6
II	**Composting**** – Microbial Compost – Vermicompost – Setup for vermicompost unit **-Nutrition Garden**** – Ring Garden – Double digging – Cultivating vegetables–Common medicinal herbs – Identification and Cultivation. ****SDG 2- Zero Hunger.**	K2, K3	6
III	**Organic farming**** – Principles and Policies – Certification agencies – AGMARK, FSSAI, Halal certification - Storage – Packing– Transportation – Marketing. **Micro-enterprises**** – Self Help Groups – Economics of cultivations – Sustainability. ****SDG 8- Decent Work and Economic Growth**	K2, K3, K4	6
IV	Health: **Concept of Health****, changing concepts definitions of health, dimensions of health, concept of well-being, spectrum of health, ecology of health, right to health, responsibility for health, indicators of health. ****SDG 3- Good Health and Well-being**	K3, K4, K5	6
V	**Exercise and Health related fitness****: Health related fitness, health promotion and physical activity for health benefits. Sports related fitness: **Role of nutrition**** in sports, nutrition to athletic performance. ****SDG 4- Quality Education.**	K3, K4, K5	6

Course Outcome	**CO1:** Understand the basic principles of ecology, ecosystem dynamics, and biodiversity, and evaluate the interrelationships between biotic and abiotic components.	K1, K2
	CO2: Apply composting techniques, including vermicomposting, and cultivate vegetables and medicinal herbs using sustainable gardening methods.	K2, K3
	CO3: Demonstrate knowledge of organic farming principles, certification processes, and develop strategies for sustainable agricultural micro-enterprises.	K2, K3,
	CO4: Explain the evolving concepts of health and well-being, and analyze various health indicators and ecological factors influencing health.	K3, K4, K5
	CO4: Explain the evolving concepts of health and well-being, and analyze various health indicators and ecological factors influencing health.	K3, K4, K5

Learning Resources	
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
Reference Books	1. Farmers of Forty Centuries: Permanent Organic Farming in China, Korea, and 2. Japan Hardcover – 10 June 2011 by F. H. King (Author) 3. Organic Farming: Components and Management Edition: 1 Author/Gehlot D, Publisher: M/s AGROBIOS (INDIA) ISBN: 9788177544008
Website Link	1. https://en.wikipedia.org/wiki/Ecosystem 2. https://www.beyondforest.org/post/vermiculture-and-vermicomposting 3. https://en.wikipedia.org/wiki/Energy_flow_%28ecology%29
L – Lecture T – Tutorial P – Practical C – Credit	

Mapping of COs with PO's and PSO's

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	2	1	-	3	1	2	3	-	2	3	3	2
CO2	3	2	2	-	3	2	2	3	-	2	3	2	3
CO3	3	2	2	2	3	3	3	3	2	2	3	2	3
CO4	3	2	1	-	3	3	2	3	1	2	3	3	2
CO5	3	2	1	-	3	2	3	3	2	3	3	3	3

(Correlation: 3 – High, 2 – Medium, 1 – Low)

Course Designed By: Mrs. Shinuja. S	**Verified By HOD: Mrs.Margret Kanimozhi.A**
Checked By CDC: Mrs. C. Magila	**Approved By: Dr. J. Caroline Rose Principal**

Dr. P. Indira Arulselvi Professor, Department of Biotechnology, Periyar University, salem-11	**Dr. K. A. Paari.,** Assistant Professor, Department of Life Sciences, Christ (Deemed to be University) , Bengaluru	**Dr. Salamun DE.,** Associate Professor, School of Sciences, Jain (Deemed to be University), Bengaluru
Mr. Ragunath Srinivasan Associate Director, Biosimilars Manufacturing, Biocon Biological Limited. Bengaluru	**Mrs. Deekshitha. S** Officer, Quality Control Department, Microlabs Pvt. Ltd	

B.Sc. Biotechnology LOCF – CBCS with effect from 2025 - 2026 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
25UBT2NM2	**BIOTECHNOLOGY FOR SOCIETY**	**SEC/NME THEORY**	**II**	**30**	**2**	**-**	**-**	**2**

Objective: This course introduces students to the fundamental applications of biotechnology in agriculture and environmental sustainability. It aims to develop knowledge on biotechnological interventions in sericulture, apiculture, mushroom cultivation, and the use of biofertilizers, biopesticides, and single cell proteins. The course also explores modern environmental solutions like biodegradation and biodegradable plastics. Through this, students will gain awareness of sustainable practices and ethical considerations in biotechnology.

Unit	Course Content	Knowledge Levels	Sessions
I	Introduction to Biotechnology- Role of Biotechnology in **sericulture****-Rearing of silkworms- Importance and applications- Role of Biotechnology in **apiculture****- Bee hive hierarchy- Bee keeping process- Products Obtained-**Mushroom farming**** stages- Cultivation of paddy straw mushroom- Importance of mushroom cultivation. ****SDG 8-Decent Work and Economic Growth.**	K1, K2, K3	6
II	**Biofertilizer****- Definition- Mass production of Rhizobium Advantages and disadvantages- **Biopesticides****- Definition- Microbial biopesticides- Bacillus thuringiensis- Single cell protein- Introduction- history- production of Spirulina SCP- Applications- Advantages & disadvantages. ****SDG 3-Good Health and Well-being.**	K1, K2, K3	6
III	**Biodegradation**** - Definition- Process-role of microorganisms in biodegradation - biodegradable plastics-advantages- **Bio weapons**** -introduction- history- potential agents- delivery methods- harmful effects ****SDG 11-Sustainable Cities and Communities.**	K1, K2, K4	6
IV	**Antibiotics****- Definition- Introduction and history of antibiotics- sources- classification- spectrum- production of penicillin- definition of antibiotic resistance. ****SDG 12- Responsible Consumption and Production.**	K1, K2, K4	6
V	**Transgenic plants**** – Definition of transgene and transgenesis - BT Cotton, Flavr-Savr tomato and Golden rice- history – importance, applications, advantages and disadvantages. ****SDG 2- Zero Hunger.**	K1, K2, K5	6

Course Outcome	**CO1:** Understand the fundamentals of biotechnology and explain its applications in sericulture, apiculture, and mushroom farming.	K1, K2
	CO2: Describe the production, applications, and limitations of biofertilizers, biopesticides, and single cell proteins like Spirulina.	K2, K3
	CO3: Explain the process of biodegradation, the role of microorganisms, and evaluate the impacts of biodegradable plastics and bioweapons.	K2, K3, K4
	CO4: Summarize the classification, history and production of antibiotics, and analyze the causes and implications of antibiotic resistance.	K3, K4, K5
	CO5: Define transgenic plants and assess the significance, benefits, and risks associated with examples such as BT Cotton, Flavr-Savr tomato, and Golden Rice.	K3, K4 K5

Learning Resources	
Text Books	1. Sathyanarayana, U., Chakrapani, U., (2008). Biotechnology, First edition, Books and allied (P) Ltd, Kolkata. 2. A.K. Chatterji, (2011). Introduction to Environmental Biotechnology, Third edition, PHI Learning Pvt Ltd. New Delhi. ISBN-978-81-203-4298-9 3. R.C. Dubey, (2014). A text book of Biotechnology, S. Chand& Company, New Delhi. ISBN 9788121926089 4. H. Patel, (2011). Industrial Microbiology, (2^{nd} edition), MacMillan Publishers Thakur, I.S., (2019). Environmental Biotechnology- Basic principles and applications- (2^{nd} edition)- Dreamtech Press, ISBN 978-93-89307-55-9
Reference Books	1. Basics of Biotechnology Paperback – 1 January 2004by A.J. Nair (Author) Publisher Laxmi Publications 2. Basic Biotechnology Paperback – 2 February 2008 by Ratledge Colin (Author) Publisher Cambridge University Press
Website Link	1. https://link.springer.com/article/10.1007/s13237-021-00355-2 2. https://microbenotes.com/single-cell-protein/ 3. https://biotechforenvironment.biomedcentral.com/articles/10.1186/s44314-024-00007-0 4. https://microbiologynotes.org/penicillin-history-structure-production-and-recovery/
L – Lecture T – Tutorial P – Practical C - Credit	

Mapping of COs with PO's and PSO's

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	2	2	2	3	2	2	2	1	2	3	2	2
CO2	3	2	2	2	3	2	2	2	-	2	3	2	2
CO3	3	2	2	2	3	3	3	3	1	2	3	3	3
CO4	3	2	3	2	3	3	2	2	1	2	3	2	2
CO5	3	2	2	2	3	3	3	3	2	2	3	2	3

(Correlation: 3 – High, 2 – Medium, 1 – Low)

Course Designed By: **Mrs. Margret Kanimozhi.A**	**Verified By HOD:** **Mrs. Margret Kanimozhi.A**
Checked By CDC: Mrs. C. Magila	**Approved By: Dr. J. Caroline Rose** **Principal**

Dr. P. Indira Arulselvi Professor, Department of Biotechnology, Periyar University, salem-11	**Dr. K. A. Paari.,** Assistant Professor, Department of Life Sciences, Christ (Deemed to be University) , Bengaluru	**Dr. Salamun DE.,** Associate Professor, School of Sciences, Jain (Deemed to be University), Bengaluru
Mr. Ragunath Srinivasan Associate Director, Biosimilars Manufacturing, Biocon Biological Limited. Bengaluru	**Mrs. Deekshitha. S** Officer, Quality Control Department, Microlabs Pvt. Ltd	