



Dr. N.G.P. ARTS AND SCIENCE COLLEGE

(An Autonomous Institution, Affiliated to Bharathiar University, Coimbatore)
Approved by Government of Tamil Nadu & Accredited by NAAC with A++ Grade (3rd Cycle - 3.64 CGPA)
Dr. N.G.P. - Kalapatti Road, Coimbatore - 641048, Tamil Nadu, India
Web: www.drngpasc.ac.in | Email: info@drngpasc.ac.in | Phone: +91-422-2369100

Regulations 2026-27 for Post graduate Programme

(Outcome Based Education model with Choice Based Credit System)

M.Sc Microbiology Degree

(For the students admitted during the academic year 2026-27)

Programme : Microbiology

ELIGIBILITY:

A pass in any one of the following Degree Course of B.Sc. Microbiology / Biotechnology / Biology / Botany / Zoology / Plant Science / Animal Sciences / Biochemistry / Bioinformatics / Environmental Science / Food and Nutrition / Clinical Lab Technology of any University in Tamil Nadu or an Examination accepted as equivalent thereto by the Academic Council, Course to such conditions as may be prescribed thereto are permitted to appear and qualify for the **M.Sc., Microbiology Examination** of this College after a course study of two academic years.

PROGRAMME OBJECTIVES:

The Curriculum is designed to attain the following learning goals which students shall accomplish by the time of their graduation to:

1. Present intense knowledge in areas of organization and functioning of microorganisms.
2. Familiarize with the operations of bio instruments and related techniques.
3. Enable students to understand the applications of microbiology in healthcare, agriculture, food technology and environmental protection.
4. Provide opportunities to develop skills and participate in Research Projects.



Programme Outcomes

On the successful completion of the programme, the following are the expected outcomes.

PO Number	PO Statement
PO1	To impart knowledge of various branches of Microbiology and to understand the role of microorganisms in human welfare and sustainable development.
PO2	To acquire skills in the techniques used to observe and study the nature of microorganisms and the techniques, skills, and modern tools necessary for biological practice.
PO3	To appreciate the complexities of microbiological processes for industrial and other purposes, especially the genetic manipulation of microorganisms for the production of antibiotics, hormones, etc.
PO4	To inculcate broad education necessary to understand the impact of microbiological solutions in a global and societal context; an ability to function in multi-disciplinary teams; To develop the ability to identify, formulate, and solve biological problems and to design and conduct experiments, as well as to analyze and interpret data.
PO5	To create awareness of contemporary issue and to appreciate the applications of Microbiology to become an entrepreneur.



CURRICULUM

M.SC. MICROBIOLOGY

A.Y – 2026-27

Course Code	Course Category	Course Name	L	T	P	Instruction Hours		Exam (h)	Max Marks			Credits
						Week	Total		CIA	ESE	Total	
First Semester												
26MBP1CA	Core - I	Fundamentals of Microbiology	4	-	-	4	48	3	25	75	100	4
26MBP1CB	Core - II	Microbial Physiology and Bacterial Diversity	4	-	-	4	48	3	25	75	100	4
26MBP1CC	Core - III	Mycology, Phycology and Lichenology	4	-	-	4	48	3	25	75	100	4
26MBP1CD	Core - IV	Comprehensive Biology	3	1	-	4	48	3	25	75	100	3
26MBP1CE	Core - V	Bio Analytical Techniques	3	1	-	4	48	3	25	75	100	3
26MBP1CP	Core Practical - I	Basic Techniques in Microbiology	-	-	6	6	72	9	40	60	100	3
26MBP1DA	DSE - I	Microbial Technology	3	1	-	4	48	3	25	75	100	3
26BCP1DA		Cancer Biology, Diagnosis and Therapy										
26BTP1DA		Applied Biotechnology										
Total			21	3	6	30	360				700	24



Dr.NGPASC

COIMBATORE | INDIA

M.Sc. Microbiology (Students admitted during the AY 2026-27)

Course Code	Course Category	Course Name	L	T	P	Instruction Hours		Exam (h)	Max Marks			Credits	
						Week	Total		CIA	ESE	Total		
Second Semester													
26MBP2CA	Core - VI	Microbial Genetics	4	-	-	4	48	3	25	75	100	4	
26MBP2CB	Core - VII	Immunology and Immunotechniques	4	-	-	4	48	3	25	75	100	4	
26MBP2CC	Core - VIII	Virology	4	-	-	4	48	3	25	75	100	4	
26MBP2CD	Core - IX	Medical Bacteriology	3	1	-	4	48	3	25	75	100	3	
26MBP2CE	Core - X	Recombinant DNA Technology	3	1	-	4	48	3	25	75	100	3	
26MBP2CP	Core Practical -II	Immunology and Molecular Techniques	-	-	6	6	72	9	40	60	100	3	
26MBP2DA	DSE - II	Bionanotechnology	3	1	-	4	48	3	25	75	100	3	
26BCP2DA		Biochemistry of Toxicology											
26BTP2DA		Forensic Biotechnology											
Total			21	3	6	30	360	-	-		700	24	



Course Code	Course Category	Course Name	L	T	P	Instruction Hours		Exam (h)	Max Marks			Credits
						Week	Total		CIA	ESE	Total	
Third Semester												
26MBP3CA	Core - XI	Environmental and Agricultural Microbiology	4	-	-	4	48	3	25	75	100	4
26MBP3CB	Core - XII	Medical Mycology and Parasitology	4	-	-	4	48	3	25	75	100	4
26MBP3CC	Core - XIII	Pharmaceutical Microbiology and Quality Assurance	4	-	-	4	48	3	25	75	100	4
26MBP3CD	Core - XIV	Food Microbiology and Food Quality Control	4	-	-	4	48	3	25	75	100	4
26MBP3CE	Core - XV	Research Methodology and Biostatistics	3	1	-	4	48	3	25	75	100	3
26MBP3CP	Core Practical - III	Applied Microbiological Techniques	-	-	6	6	72	9	40	60	100	3
26MBP3CT	IT	Internship	-	-	-	-	-	-	40	60	100	2
26MBP3DA	DSE - III	Medical Laboratory Techniques	3	1	-	4	48	3	25	75	100	3
26BCP3DA		Free Radicals and Antioxidant System										
26BTP3DA		Molecular Therapeutics										
Total			22	2	6	30	360	-	-	-	800	27



Course Code	Course Category	Course Name	L	T	P	Instruction Hours		Exam (h)	Max Marks			Credits
						Week	Total		CIA	ESE	Total	
Fourth Semester												
26MBP4CA	Core - XVI	Fermentation Technology	4	1	-	5	60	3	25	75	100	3
26MBP4CB	Core - XVII	Bioethics, Biosafety and IPR	4	1	-	5	60	3	25	75	100	3
26MBP4CV	Core - XVIII	Project and Viva - voce	-	-	16	16	192	-	80	120	200	8
26MBP4DA	DSE - IV	Molecular Diagnostics and Bioinformatics										
26BCP4DA		Neurobiology	3	1	-	4	48	3	25	75	100	3
26BTP4DA		Stem Cell Technology										
Total			11	3	16	30	360				500	17
*Grand Total										2700	92	



Dr.NGPASC

COIMBATORE | INDIA

M.Sc. Microbiology (Students admitted during the AY 2026-27)

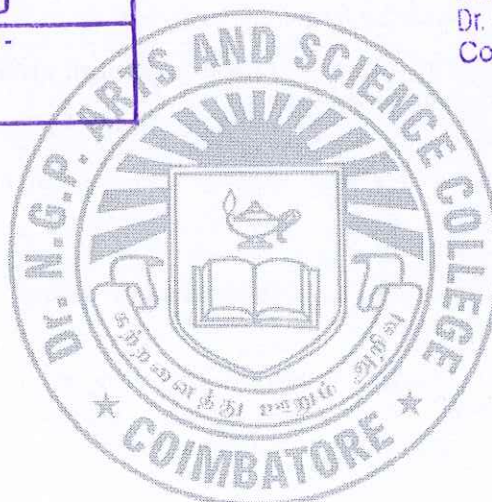
EXTRA CREDITS COURSES

Self study paper offered by the Department of Microbiology

S. No.	Semester	Course Code	Course Title
1.	III	26MBPSSA	Good Laboratory Practices
2.		26MBPSSB	Introduction to Human Anatomy

 Dr.N.G.P. Arts and Science College		
APPROVED		
BoS- 2101 02/09/2026	AC -	GB -

[Signature]
 BoS Chairman/HOD
 Department of Microbiology
 Dr. N. G. P. Arts and Science College
 Coimbatore - 641 048



Dr.NGPASC
 COIMBATORE | INDIA

M.Sc. Microbiology (Students admitted during the AY 2026-27)

Semester -I CORE I: FUNDAMENTALS OF MICROBIOLOGY							
Semester	Course Code	Course Name	Category	L	T	P	Credits
I	26MBP1CA	FUNDAMENTALS OF MICROBIOLOGY	CORE	48	-	-	4

Preamble	This course has been designed for students to learn and understand - History of Microorganisms - Basic techniques in Microbiology - Characteristics of algae, fungi, protozoa and viruses.
Prerequisite	Knowledge on general characteristics and classification of microorganisms.

Course Outcomes (Cos)		
CO Number	Course Outcomes (COs) Statement	Bloom's Taxonomy Knowledge Level
CO1	Analyze historical scientific developments, and apply this knowledge to real-world microbiology contexts.	K2
CO2	Handle and maintain cultures relevant to clinical, industrial, and environmental microbiology.	K3
CO3	Adopt microscopy and staining methods to differentiate microbial cell structures and support accurate laboratory identification.	K4
CO4	Identify prokaryotic cell structures and relate them to their roles in clinical, industrial, and environmental microbiology practices.	K5
CO5	Plan, perform, and interpret experiments on protozoa, viruses, algae, and fungi, and apply these techniques in biotechnological, agricultural, and industrial contexts.	K6

Mapping with Program Outcomes:					
Cos / POs	PO1	PO2	PO3	PO4	PO5
CO1	S	S	S	S	M
CO2	S	S	M	S	S
CO3	S	M	S	S	S
CO4	S	S	S	M	S
CO5	S	S	S	S	S



26MBP1CA	FUNDAMENTALS OF MICROBIOLOGY
----------	------------------------------

Syllabus

Unit	Content	Hrs	Resources
I	History of Microbiology The Historic foundations and development of Microbiology - Spontaneous generation- Germ theory of diseases - Cell theory - Contributions of Antony van Leuwenhoek - Joseph Lister - Robert Koch - Louis Pasteur - Edward Jenner - John Tyndall - Sergei N. Winogradsky - Salmon A. Waksman - Alexander Flemming - Paul Erlich - Fannie Hessie - Elie Metchnikoff, Lederberg and Zinder, Lwoff, Arber and Smith, Temin and Baltimore - Scope of microbiology	10	Text Book and Reference book
II	Sterilization and culturing methods Sterilization and disinfection - Physical and chemical methods. Culturing of Bacteria - Isolation, purification and Cultivation of different types of Microorganisms -Aerobes and Anaerobes - Culture maintenance and Preservation - Culture Collection centres -ATCC, MTCC and NFMCC.	10	Text Book
III	Microscopy and Staining Principles of Microscopy- Light microscope, Inverted microscope, Electron microscope - TEM and SEM, Polarization microscope, Confocal, Perifocal, Atomic force microscope. Stains and staining principles: Simple, Gram, Negative, Capsule, Spore, Flagellar and Acid fast staining	10	Reference Book
IV	Prokaryotes Characteristics of Prokaryotic cells - Basic cell types: Prokaryotic cells - Size, shape and Arrangement - Overview of structure - Cell membrane. Internal membrane structure - Cytoplasm- Nucleoid - Inclusions - chlorosomes - carboxysomes - magnetosomes - phycobilisomes -Endospores. External structure - Cell Wall - Flagella and its function - Glycocalyx - Slime layer.	9	Text Book
V	Protozoa, Viruses, Fungi and Algae General Characteristics of Protozoa. Structure and Reproduction of <i>Paramecium</i> sp. General Properties of Viruses. Cultivation of Plant and Animal Viruses. Characterization and Enumeration of Viruses- Plant Viruses- CaMV and RNA containing Plant Viruses- TMV. General characteristics of algae- Structure and reproduction of <i>Chlamydomonas</i> sp. General characteristics of fungi Structure and reproduction of <i>Aspergillus niger</i> . Case Study: A biotech company develops antibiotics from soil microorganisms. Which scientist's work does this relate to? How does this reflect the scope of microbiology in industry? What are other applications of microbiology in modern science?	9	Reference Book
Total		48	

Note: Case studies related to the above topics to be discussed (Examined Internal only)



Dr.NGPASC

COIMBATORE | INDIA

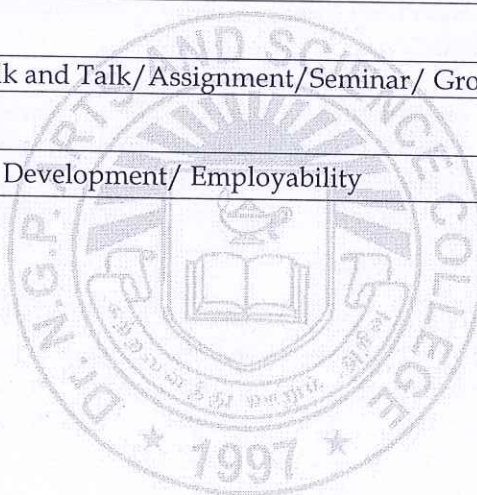
M.Sc. Microbiology (Students admitted during the AY 2026-27)

Text book	1.	Black J G, 2015, Microbiology, 9th Edition, John Wiley and Sons, New Jersey, United States.
	2.	Joanne Wiley, Linda Sherwood, Christopher J and Woolverton, 2020, Prescott's Microbiology, 11th Edition, McGraw Hill Company, New York, United States.
Reference Books	1.	Micheal T Madigan, 2018, Brock Biology of Microorganisms, 14 th Edition, Pearson Education, New Delhi
	2.	Jeffrey C Pommerville, 2010, Alcamo's Fundamentals of Microbiology, 9th Edition, Jones and Bartlett Publishers, Massachusetts, United States
	3.	Salle A J, 2014, Fundamental Principles of Bacteriology, 7th Edition, Tata Mc Hill Publishing Company Ltd., New Delhi.
	4.	Michael Pelczar, 2021, Microbiology, 5th Edition, Tata Mc Hill Publishing Company Ltd., New Delhi

Journal and Magazines	https://agrimoon.com/wp-content/uploads/Fundamentals-of-Microbiology.pdf
E-Resources and Website	https://www.basu.org.in/wpcontent/uploads/2020/03/Fundamentals-of-Microbiology-1.pdf

Learning Method	Chalk and Talk/ Assignment/Seminar/ Group Discussion/Case Study
------------------------	---

Focus of the Course	Skill Development/ Employability
----------------------------	----------------------------------



Semester – I							
CORE II: MICROBIAL PHYSIOLOGY AND BACTERIAL DIVERSITY							
Semester	Course Code	Course Name	Category	L	T	P	Credits
I	26MBP1CB	MICROBIAL PHYSIOLOGY AND BACTERIAL DIVERSITY	CORE	48	-	-	4

Preamble	This course has been designed for students to learn and understand • The physiological, biochemical and metabolic properties of Microorganisms. • The respiratory and nutritional pathways of microorganisms. • The significance of Bacterial diversity.
Prerequisite	Basic characteristic features and diversification among microorganisms

Course Outcomes (Cos)		
CO Number	Course Outcomes (COs) Statement	Bloom's Taxonomy Knowledge Level
CO1	Measure and interpret microbial growth under various factors, applying these observations in laboratory and industrial contexts.	K3
CO2	Interpret enzyme kinetics and apply these analyses in research and biotechnology applications.	K4
CO3	Analyse the microbial energy yields in experimental and industrial systems.	K4
CO4	Evaluate nucleotide synthesis pathways, and apply it to design experiments in microbial or cellular metabolism studies.	K5
CO5	Formulate approaches for identifying and characterizing microbial communities in different environments.	K6

Mapping with Program Outcomes:

Cos / POs	PO1	PO2	PO3	PO4	PO5
CO1	S	S	S	M	S
CO2	S	S	M	S	S
CO3	S	S	S	M	S
CO4	S	S	S	S	S
CO5	S	S	S	M	S



26MBP1CB	MICROBIAL PHYSIOLOGY AND BACTERIAL DIVERSITY
----------	--

Syllabus

Unit	Content	Hrs	Resources
I	Nutrition and Growth: Nutritional types of microorganisms - Phototrophs, Autotrophs, Lithotrophs, Organotrophs. Nutritional requirements -Macro, Micro nutrients and trace elements. Membrane transport - passive, facilitated diffusion, active transport (Proton Motive force, PTS, role of permeases), group translocation and ion uptake. Factors affecting Microbial growth - Temperature, pH, Osmosis, Oxygen and Radiation. Physiology of Growth - Growth curve. Growth measurements - batch, continuous and synchronous. Quorum Sensing.	10	Text book Reference Book Journal
II	Enzymes and co-enzymes: IUBMB classification and nomenclature of enzymes, active site, Lock and key Mechanism and induced fit hypothesis, Enzyme kinetics - positive. Enzyme inhibition: Reversible - Competitive, Non-competitive, uncompetitive and irreversible inhibition - Feedback inhibition. Regulatory and Allosteric enzymes, Ribozymes (RNA enzymes).	9	Text book Reference Book
III	Energy Production pathways: EMP pathway - Substrate level Phosphorylation - HMP Pathway - Entner Doudroff pathway - Glyoxalate pathway - Krebs cycle. Energy production: Electron transport chain and Oxidative phosphorylation, Pasteur Effect, Bioluminescence. Fermentations of Carbohydrates: Acidic: Homolactic, Mixed acid, Butanediol and Propionic acid fermentation. Alcoholic fermentation: Ethanol. β - Oxidation of Fatty acids.	10	Text book Reference Book Journals
IV	Biosynthesis of Biomolecules: Biosynthesis of Aspartate, pyruvate, histidine and serine amino acid families - Purine and pyrimidine nucleotides - Denovo and salvage pathway. Regulation of biosynthetic pathways. Biosynthesis of fatty acids and lipids. Biosynthesis of gram positive and gram-negative cell wall.	9	Text book Reference Book
V	Bacterial Diversity: Introduction to Archaea - Ecology, Cell walls and membranes, Genetics and molecular biology, metabolism. Archaeal taxonomy - Outline characteristics - Crenarchaeota and Euryarchaeota. Methylophs - Methanogens. Eubacteria - Photosynthetic bacteria, Cyanobacteria - Spirochaetes - Bacteroidetes. Characteristics of Proteobacteria: Alpha (Rickettsia), Beta (Neisseria), Gamma (Pseudomonas), Delta (Desulfovibrio) and Epsilon (Helicobacter). Low G+C gram positive (Staphylococcus) and High G+C gram positive (Mycobacterium). Case study on Profiling of Microbial Community from different soil.	10	Text book Reference Book Journals
	Total	48	

Note: Case studies related to the above topics to be discussed (Examined Internal only)



Dr. NGPASC

COIMBATORE | INDIA

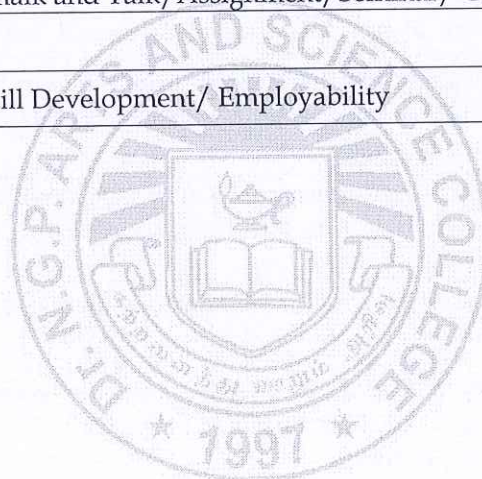
M.Sc. Microbiology (Students admitted during the AY 2026-27)

Text book	1.	Willey J.M., Sherwood L.M., Woolverton C.J. (2023). <i>Prescott's Microbiology</i> . 12th ed., McGraw-Hill Education.
Reference Books	1.	David White and George D. Hageman, 2000, <i>Microbial Physiology and Biochemistry Laboratory</i> , Oxford University Press, India.
	2.	Moat. A.G, J.W.Foster, 2002. <i>Microbial physiology</i> . 4th edition. John Wiley & sons: Australia.
	3.	Baltz R.H., Davies J.E., Demain A.L. (2010). <i>Manual of Industrial Microbiology and Biotechnology</i> . 3rd ed., ASM Press, USA.
	4.	Geoffrey Michael Gadd, 2008, <i>Bacterial Physiology and Metabolism</i> , Cambridge University Press, UK.

Journal and Magazines	https://www.frontiersin.org/journals/microbiology/sections/microbial-physiology-and-metabolism https://journals.plos.org/plosone/
E-Resources and Website	https://onlinecourses.swayam2.ac.in/cec21_bt17/preview

Learning Method	Chalk and Talk/ Assignment/Seminar/ Group Discussion/Case Study
-----------------	---

Focus of the Course	Skill Development/ Employability
---------------------	----------------------------------



Semester – I CORE: MYCOLOGY, PHYCOLOGY AND LICHENOLOGY							
Semester	Course Code	Course Name	Category	L	T	P	Credits
I	26MBP1CC	MYCOLOGY, PHYCOLOGY AND LICHENOLOGY	CORE	48	-	-	4

Preamble	This course has been designed for students to learn and understand • To acquire knowledge of the diversity of Fungi, Algae, and Lichens • To gain knowledge on the structural organization and reproduction • To obtain knowledge on the importance of Fungi, Algae, and Lichens.
Prerequisite	Fundamentals of Microbiology and Microbial physiology

Course Outcomes (Cos)		
CO Number	Course Outcomes (COs) Statement	Bloom's Taxonomy Knowledge Level
CO1	Exploit interrelationships among major fungal groups and relate them to practical applications in research and industry.	K2
CO2	Analyse spore dispersal mechanisms and their role in fungal genetics, and apply this knowledge to experimental studies in mycology and biotechnology.	K3
CO3	Examine and analyze the differences between prokaryotic and eukaryotic algal cell structures, and interpret their functional significance in applied microbiology.	K4
CO4	Critically analyze phylogenetic relationships in algae, and interpret their relevance in ecological and evolutionary studies.	K5
CO5	Create investigative approaches to explore the economic potential of lichens in pharmaceuticals, dyes, and other biotechnological applications.	K6

Mapping with Program Outcomes:					
Cos / POs	PO1	PO2	PO3	PO4	PO5
CO1	S	S	M	S	S
CO2	S	M	S	S	S
CO3	S	S	S	M	S
CO4	M	S	S	S	M
CO5	S	S	S	M	S



26MBP1CC	MYCOLOGY, PHYCOLOGY AND LICHENOLOGY
----------	-------------------------------------

Syllabus

Unit	Content	Hrs	Resources
I	Classification and Characteristics of Fungi Classification of fungi (Alexopoulos and Mims, 1979). Recent trends in classification of fungi. General characters of major classes: Mastigomycotina, Schizomycotina, Ascomycotina, Basidiomycotina and Deuteromycotina. Phylogeny and interrelationships of major groups of fungi. Economic importance of fungi.	10	Text Book
II	Organization and Reproductions of Fungi Thallus organization - reproduction, life cycle types, parasexual cycles, reduction in sexuality in fungi - physiological races in fungi - spore dispersal mechanisms and fungal genetics, study of fossil fungi.	10	Reference Book
III	Classification and Characteristics of Algae Classification of algae (Fritsch, 1945). Salient features of major classes: Chlorophyta, Cyanophyta, Charophyta, Xanthophyta, Phaeophyta and Rhodophyta. Ultrastructure of prokaryotic and eukaryotic algal cells and their components. Economic importance of algae.	8	Text Book
IV	Ecology, Cultivation and Life Cycle Patterns of Algae Ecology of algae - algae as pollution indicators, algal blooms, algicides - culture and cultivation of fresh water and marine algae - Knop's solution and Chu-10 medium (1972). Origin and evolution of sex in algae, phylogeny and interrelationships of algae. Lifecycle patterns in algae. Study of fossil algae. Case Study : Study on Algal Bloom in Local Water Bodies	10	Text Book
V	Classification and characteristics of Lichens Classification of Lichens (Hale, 1969). Occurrence and interrelationship of phycobionts and mycobionts, structure and reproduction in Ascolichens, Basidiolichens, and Deuterolichens. Lichens as indicators of pollution. Economic importance of Lichens. Case Study- Algal diversity and algal bloom in water bodies of your native city or state.	10	Text Book and Reference Book
Total		48	

Note: Case studies related to the above topics to be discussed (Examined Internal only)

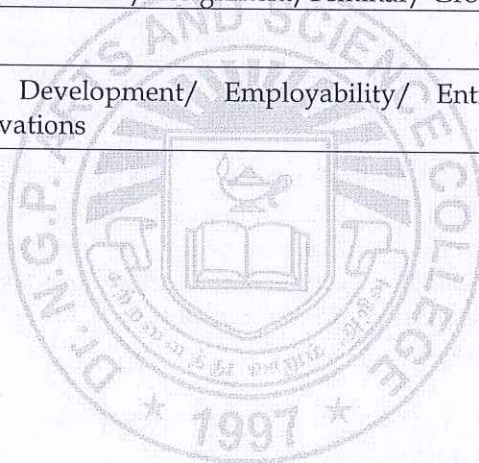


Text book	1.	Michael Madigan, 2015, Brock Biology of Microorganisms, 14th Edition, Pearson Publishers, New Delhi.
	2.	Vashishta BR, Sinha AK, Singh VP, 2010, Botany for Degree students Algae, 1st Edition, S Chand & Company Ltd. India
Reference Books	1.	Alexopoulos CJ, Mims CW, Blackwell M, 2002, Introductory Mycology, 4 th Edition, Wiley India Pvt. Ltd, India.
	2.	Moore D, Robson GD, Anthony P, Trinci J, 2011, 21st Century Guidebook to Fungi, Cambridge University Press, United Kingdom
	3.	Thomas H. Nash, 2008, Lichen Biology, 2nd Edition Cambridge University Press, India.
	4.	Ernst Athearn Bessey, 2020, Morphology and taxonomy of fungi, 1st Edition, Alpha Edition Publishers, India

Journal and Magazines	archive.bio.ed.ac.uk/jdeacon/microbes/fungalwe.html)
E-Resources and Website	https://gclambathach.in/lms/Algae.pdf

Learning Method	Chalk and Talk/Assignment/Seminar/ Group Discussion/Case Study
------------------------	--

Focus of the Course	Skill Development/ Employability/ Entrepreneurial Development/ Innovations
----------------------------	--



Semester – I CORE IV: COMPREHENSIVE BIOLOGY							
Semester	Course Code	Course Name	Category	L	T	P	Credits
I	26MBP1CD	COMPREHENSIVE BIOLOGY	CORE	36	12	-	3

Preamble	This course has been designed for students to learn and understand • The structure and function of biomolecules • The basic concepts of developmental biology and cell signaling • The evolution of living cells.
Prerequisite	Basic biology, Molecular Biology, Chemistry

Course Outcomes (Cos)		
CO Number	Course Outcomes (COs) Statement	Bloom's Taxonomy Knowledge Level
CO1	Evaluate biomolecular stability and interactions to support biochemical and pharmaceutical laboratory analysis.	K3
CO2	Interpret developmental processes to analyze cell differentiation and embryological changes in research settings.	K4
CO3	Apply cell signaling concepts to analyze receptor pathways and quorum sensing for research in disease mechanisms, microbial virulence, and biotechnology.	K4
CO4	Apply genetic mapping and inheritance principles to assist in genetic analysis and breeding research programs.	K5
CO5	Analyze evolutionary concepts to interpret phylogenetic relationships and biodiversity patterns in research contexts.	K6

Mapping with Program Outcomes:

Cos / POs	PO1	PO2	PO3	PO4	PO5
CO1	S	S	S	S	S
CO2	S	S	S	S	S
CO3	S	S	S	S	S
CO4	S	S	S	S	S
CO5	S	S	S	S	S



26MBP1CD	COMPREHENSIVE BIOLOGY
----------	-----------------------

Syllabus

Unit	Content	Hrs	Resources
I	Structure of atoms, molecules and chemical bonds Composition, structure and function of bio-molecules (carbohydrates, lipids, proteins, nucleic acids and vitamins). Interactions (Van der Waals, electrostatic, hydrogen bonding, hydrophobic interaction etc.). Principles of biophysical chemistry (pH, buffer, thermodynamics, colligative properties). Conformation of proteins (Ramachandran plot, secondary structure, domains, motif and folds). Case study: In a laboratory, a protein loses its function when exposed to high temperature and acidic pH. Explain how changes in intermolecular interactions and thermodynamic stability affect protein conformation and biomolecular structure.	10	Text Book
II	Basic concepts of developmental biology Potency, commitment, specification, induction, competence, determination and differentiation; morphogenetic gradients; cell fate and cell lineages; stem cells; genomic equivalence and the cytoplasmic determinants; imprinting; fertilization and early development. Case study: In an early embryo, cells exposed to different morphogen concentrations develop into distinct tissues, while a mutation in cytoplasmic determinants alters normal development. Explain how potency, induction, and cell fate determination regulate this process.	10	Text Book
III	Cell Signaling Hormones and their receptors, cell surface receptor, signaling through G-protein coupled receptors, signal transduction pathways, second messengers, regulation of signaling pathways, bacterial and plant two component systems, light signaling in plants, bacterial chemotaxis and quorum sensing. Case study: In a bacterial culture, cells begin expressing virulence genes only after reaching a high population density. Explain how quorum sensing, signal transduction, and receptor-mediated signaling regulate this coordinated response.	10	Text Book
IV	Inheritance biology Gene mapping methods: Linkage maps, tetrad analysis, mapping with molecular markers, mapping by using somatic cell hybrids, development of mapping population in plants. Extra chromosomal inheritance: Inheritance of Mitochondrial and chloroplast genes, maternal inheritance. Human genetics: Pedigree analysis, lod score for linkage testing, karyotypes, genetic disorders. Case study: In a family pedigree, a genetic disorder is transmitted only through the mother, while linkage analysis using molecular markers shows close association with a mitochondrial gene. Explain the inheritance pattern and how gene mapping supports this observation.	9	Text Book
V	Evolution Emergence of evolutionary thoughts Lamarck; Darwin-concepts of	9	Text Book



Dr. NGPASC

COIMBATORE | INDIA

M.Sc. Microbiology (Students admitted during the AY 2026-27)

	variation, adaptation, struggle, fitness and natural selection; Origin of cells and unicellular evolution: Origin of basic biological molecules; Abiotic synthesis of organic monomers and polymers; Concept of Oparin and Haldane; Experiment of Miller; The first cell; Evolution of prokaryotes; Origin of eukaryotic cells; Evolution of unicellular eukaryotes; Paleontology and Evolutionary History: The evolutionary time scale; Eras, periods and epoch. Case Study: Is there a scenario, where, within the earth, there are locations mimicking the ancient timelines with regards to temperatures. If so, are we still witnessing abiotic synthesis even today?		
	Total	48	

Note: Case studies related to the above topics to be discussed (Examined Internal only)

Text book	1.	Dr. A. P. Singh & Kumar Pushkar, 2021, Upkar CSIR-UGC NET/JRF/SET Life Sciences, 1st Edition, Upkar Prakashan publishers, India.
	2.	Quaisher J. Hossain, Prashant Kumar, Ashish Nagesh, 2018, UGC CSIR NET / SLET (JRF & LS) Life Sciences, 4th Edition, Arihang Publications.
Reference Books	1.	Pranav Kumar & Usha Mina, 2020, Pathfinder Academy: CSIR-JRF- NET Life Sciences Book Combo Set with Ecology, 1st Edition, Pathfinder Publication.
	2.	De Robertis, E. D. P, 2017, Cell and Molecular Biology, 8th Edition, Lea & Febiger, New York.
	3.	Van De Graaff, R. Ward Rhees, Sidney L. Palmer, 2013, Schaum's Outline of Human Anatomy and Physiology, 4th Edition, Mcgraw-Hill Companies, New York.
	4.	Michael Pelczar, 2021, Microbiology, 5th Edition, Tata Mc Hill Publishing Company Ltd., New Delhi..

Journal and Magazines	<u>PLOS Biology; Molecular Cell; Developmental Cell; Molecular Biology and Evolution; Nature Ecology & Evolution</u>
E-Resources and Website	<u>CSIR: The Biomix; Easy Biology Class</u>

Learning Method	Chalk and Talk/ Assignment/Seminar/ Group Discussion/Case Study
------------------------	---

Focus of the Course	Skill Development/ Employability/ Entrepreneurial Development/ Innovations
----------------------------	--



Semester – I CORE V: BIO ANALYTICAL TECHNIQUES							
Semester	Course Code	Course Name	Category	L	T	P	Credits
I	26MBP1CE	BIO ANALYTICAL TECHNIQUES	CORE	36	12	-	3

Preamble	This course has been designed for students to learn and understand - To comprehend the principle and instrumentation of diverse instruments for Microbiology - To procure knowledge on the working methods of different instruments - To appreciate its application in diverse fields
Prerequisite	Knowledge on bioinstrumentation

Course Outcomes (Cos)		
CO Number	Course Outcomes (COs) Statement	Bloom's Taxonomy Knowledge Level
CO1	Apply and differentiate centrifugation and chromatographic techniques to separate, purify, and analyze biomolecules based on their physical and chemical properties.	K3
CO2	Analyze and interpret data obtained from colorimetric and spectroscopic techniques to quantify and characterize biomolecules.	K4
CO3	Analyse and differentiate nucleic acid and protein separation using agarose gel electrophoresis and SDS-PAGE and interpret the biomolecules effectively.	K4
CO4	Assess radiometric and biosensor-based methods to detect, measure, and analyze radioactivity and its biological applications safely.	K5
CO5	Interpret analytical results for determining concentration, purity, and molecular characteristics.	K6

Mapping with Program Outcomes:					
Cos / POs	PO1	PO2	PO3	PO4	PO5
CO1	M	M	M	S	S
CO2	M	M	S	S	M
CO3	S	S	S	S	M
CO4	M	M	M	M	S
CO5	S	S	S	S	S



26MBP1CE	BIO ANALYTICAL TECHNIQUES
----------	---------------------------

Syllabus

Unit	Content	Hrs	Resources
I	Centrifugation and Chromatography Centrifugation: Principles and types - Low speed, High speed and Ultra centrifuge. Applications of Analytical Ultra Centrifugation - Determination of Molecular weight and purity of macromolecules. Chromatography: Instrumentation, detection methods and Applications of TLC, Column, Gas, Ion Exchange, HPLC, Gel Filtration, GCMS and LCMS..	10	Text book Reference Book Journals
II	Colorimetry and Spectrometry Colorimetry: Principles, Instrumentation, Application and Analysis - Qualitative and Quantitative. Spectrophotometry: Principles, Instrumentation and Applications of UV, Visible, IR, NMR, FTIR, Atomic absorption, Mass Spectroscopy and MALDI - TOF, Spectrofluorometry and Flame Photometry	9	Text book Reference Book Journals
III	Electrophoresis Principles and Instrumentation - Separation of Nucleic acids - Agarose Gel Electrophoresis, Electrophoresis of RNA, Capillary Electrophoresis and Microchip Electrophoresis. Separation of Proteins - SDS - PAGE, Native Gel, Gradient Gel, Iso Electric Focusing, 2D Page, Cellulose Acetate Electrophoresis, Western Blotting - Detection, Estimation and Recovery of Proteins in gel.	10	Text book Reference Book
IV	Radiometry Introduction - Detection and Measurement of Radioactivity - Detection based on gas ionization - Autoradiography and its applications - Scintillation Counting - Safety Aspects - Biosensors and its applications (DNA and Immunosensors).	9	Text Book Reference Book
V	Quantification Methods for Biomolecules Quantitative determination of Macromolecules: Carbohydrates (DNSA and Anthrone method), Lipids (Gravimetric), Protein (Lowry and Bradford method). Determination of Molecular weight of protein (MS and SDS-PAGE) and DNA (Agarose gel). Estimation of Microbial pigments: Chlorophylls and Carotenoids. Case Study: Analyze the biomolecules present in various flowers available in the college campus and submit a report.)	10	Text Book Reference Book
	Total	48	

Note: Case studies related to the above topics to be discussed (Examined Internal only)

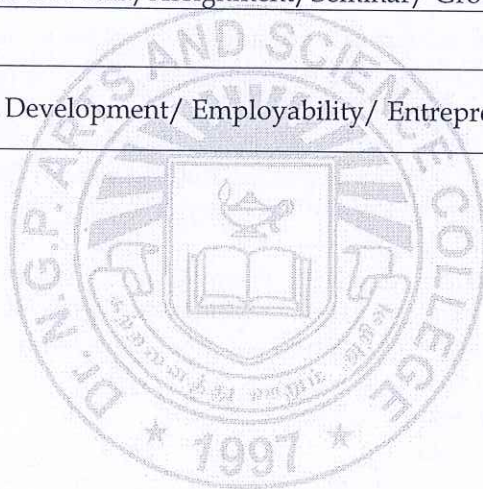


Text book	1.	L Veerakumari, 2011, Bioinstrumentation, First Edition, MJB Publishers.
	2.	Keith Wilson and John Walker, 2010, Principles and Techniques of Biochemistry and Molecular Biology, Seventh edition, Cambridge University Press
Reference Books	1.	Swahney S K and Singh R, 2014, Introductory Practical Biochemistry, Narosa Publishing House .
	2.	Rodney Boyer, 2000, Modern Experimental Biochemistry, Third Edition, Pearson education Publishers
	3.	Plummer.T David, 2004, An Introduction to Practical Biochemistry, Third Edition, TMH Publishers.

Journal and Magazines	http://www.omicsonline.org/analytical-bioanalytical-techniques.php
E-Resources and Website	https://www.aminotes.com/2017/09/bioanalytical-techniques-study-material.html

Learning Method	Chalk and Talk/ Assignment/Seminar/ Group Discussion
------------------------	--

Focus of the Course	Skill Development/ Employability/ Entrepreneurial Development
----------------------------	---



Semester - I CORE PRACTICAL I: BASIC TECHNIQUES IN MICROBIOLOGY							
Semester	Course Code	Course Name	Category	L	T	P	Credits
I	26MBP1CP	CORE PRACTICAL: BASIC TECHNIQUES IN MICROBIOLOGY	CORE		-	72	3

Preamble	This course has been designed for students to learn and understand
	• Microbiological techniques for the identification, observation, and characterization of microorganisms • Biochemical tests, growth studies and environmental factor analysis. • Quantitative methods and separation enable accurate measurement, analysis, and differentiation of microbial components.
Prerequisite	Knowledge on Basic Microbiological Techniques

Course Outcomes (Cos)		
CO Number	Course Outcomes (COs) Statement	Bloom's Taxonomy Knowledge Level
CO1	Apply various microbiological techniques such as staining, microscopy, and motility tests for identification and observation of microorganisms.	K3
CO2	Interpret microbial growth patterns and the influence of intrinsic factors like pH and temperature on bacterial growth.	K4
CO3	Compare biochemical characteristics of microorganisms using tests such as IMViC, catalase, oxidase, urease, and carbohydrate utilization.	K4
CO4	Evaluate quantitative estimation methods (DNSA and Lowry) and microbial enumeration techniques for accuracy and reliability.	K5
CO5	Design and perform experiments involving chromatographic separation and microscopic observation of algae and lichens for advanced analysis.	K6

Mapping with Program Outcomes:

Cos / POs	PO1	PO2	PO3	PO4	PO5
CO1	M	S	S	S	S
CO2	S	M	M	S	M
CO3	M	M	S	M	S
CO4	S	M	S	M	S
CO5	M	S	M	M	M



26MBP1CP	CORE PRACTICAL I: BASIC TECHNIQUES IN MICROBIOLOGY
----------	--

S.No	List of Practicals
1	Bacterial Staining techniques - Gram, Acid-fast, Spore, Capsule and Negative Staining
2	Morphological observation of Fungi -LPCB Mount.
3	Micrometry – Measurement of Microorganisms.
4	Motility determination- Hanging drop and soft agar inoculation.
5	Enumeration of Microorganisms from soil: Bacteria, Fungi and Actinomycetes.
6	Determination of Bacterial generation time - Direct microscopic method and turbidity method
7	Effect of various intrinsic factors on the growth of bacterium – pH, Temperature
8	IMViC test, Hydrogen sulphide test, Oxidase test, Calalase test, Urease test
9	Preferential utilization of sugar - Carbohydrate fermentation & TSI; Polymer degradation – Starch, Casein
10	Quantitative determination of Sugar by DNSA method and Protein by Lowry et al method
11	Separation techniques: Chromatography- TLC and Column.
12	Microscopic observation of Algae and Lichen thallus

Text Books	1.	James Cappuccino, Natalie Sherman, 2019, Microbiology: A Laboratory Manual, 12th Edition, Pearson Publishers.
	2.	Aneja. K.R, 2012. Experiments in Microbiology, Plant Pathology and Biotechnology, 2nd edition. New age publisher.
	3.	Rajan S. Selvi Christy.R, 2018, Experimental Procedures in Lifesciences, 1 st Edition, CBS Publishers & Distributors Pvt Ltd
	4.	Kannan, N, 1997, Laboratory Manual of General Microbiology, 1st Edition, Panima Publishing house

Learning Method	Demonstration/ Hands on Experiments
Focus of the Course	Skill Development/ Employability



Semester – I DSE: MICROBIAL TECHNOLOGY							
Semester	Course Code	Course Name	Category	L	T	P	Credits
I	26MBP1DA	MICROBIAL TECHNOLOGY	DSE	36	12	-	3

Preamble	This course has been designed for students to learn and understand • The production and applications of microbial products in food, agriculture, and pharmaceutical industries. • Microbial products of pharmaceutical importance along with bioentrepreneurship opportunities and funding sources. • The sustainable technologies, industrial relevance, and real-world applications of microbial biotechnology.
Prerequisite	Fundamentals of Microbiology and Fermentation technology

Course Outcomes (Cos)		
CO Number	Course Outcomes (COs) Statement	Bloom's Taxonomy Knowledge Level
CO1	Perform analysis of microbial and algal protein products and interpret their applications in nutrition, functional foods, and industrial biotechnology.	K2
CO2	Cultivate and optimize microorganisms for biofuel and biofertilizer production in research and industry	K3
CO3	Utilize microbial strains for production of biopolymers, and analyze their suitability for industrial and biomedical applications.	K4
CO4	Immobilize cells and enzyme for industrial and research applications.	K5
CO5	Design innovative approaches for vaccine development and evaluate their applicability in pharmaceutical production and bio entrepreneurship ventures.	K6

Mapping with Program Outcomes:

Cos / POs	PO1	PO2	PO3	PO4	PO5
CO1	S	M	M	S	M
CO2	S	S	S	S	S
CO3	S	S	S	S	M
CO4	S	S	S	S	S
CO5	M	S	S	S	S



26MBP1DA MICROBIAL TECHNOLOGY

Syllabus

Unit	Content	Hrs	Resources
I	Single Cell Protein and its Economic Aspects Bacterial, Yeast, Fungal and Algal Proteins -Brewer's and Baker's yeast - Food and Fodder yeast - Mushroom (<i>Agaricus</i> , <i>Oyster</i>) and Products from Higher fungi (<i>Ganoderma lucidum</i>).	9	Text Book
II	Production of Biofuel & Biofertilizer Production, Methods and Uses of Bioethanol (<i>S. cerevisiae</i>) - Biodiesel (<i>Chlorella</i>) - Biohydrogen (<i>Chlamydomonas</i>) - Biogas (<i>Methanobacteria</i>). Biofertilizer - N ₂ fixing, Phosphate Solubilizing, Phosphate Mobilizing, Plant Growth Promoting Rhizobacteria - Mass production and Applications.	9	Text Book
III	Biopolymer production Production and Uses of Polyhydroxybutyrate (<i>Cupriavidus necator</i>) - Xanthan (<i>Xanthomonas campestris</i>) - Alginate (<i>Azotobacter vinelandii</i>) - Cellulose (<i>Komagataeibacter xylinus</i>) -Cyanophycin (<i>Anabaena</i> sp.) - Levan (<i>Bacillus subtilis</i>) - Melanin (<i>Aspergillus niger</i>) - Welan (<i>Sphingomonas</i> sp.) - Succinoglucan (<i>Agrobacterium tumefaciens</i>)- Chitosan (<i>Mucor rouxii</i>) -Polyhydroxyalkanoates (<i>Pseudomonas putida</i>)- Hyaluronic acid (<i>Streptococcus zooepidemicus</i>).	9	Reference Book
IV	Immobilization of Cells & Enzymes Cells - Surface attachment of cells - Entrapment - Hydrogel method, Preformed support materials - Containment behind a barrier: Microencapsulation, Immobilization using membranes - Self aggregation of cells -Methods for Enzyme immobilization - Carrier binding method, Intermolecular cross linking - Applications of Immobilized cells and Enzymes.	10	Text Book
V	Microbial products with pharmaceutical importance Vaccines - Steps of Manufacturing - Growing the microbes and separation - Preparation of Live and killed vaccine - Preparation of Toxoid and uses - BCG Vaccine - Cholera vaccine - Rabies vaccine - Diptheria toxoid. Pharmaceutical industry - certification & accreditation required. Bioentrepreneurship opportunities and Funding sources - Government funds, Venture capital, NGOs, Crowd funding and Incubation centers. Case study- Antimicrobial compounds from soil microbes: Discovery and Applications.	11	Reference Book
	Total	48	

Note: Case studies related to the above topics to be discussed (Examined Internal only)



Dr.NGPASC

COIMBATORE | INDIA

M.Sc. Microbiology (Students admitted during the AY 2026-27)

Text book	1.	Patel A H, 2016, Industrial Microbiology, 2nd Edition, Trinity Press, New Delhi.
	2.	Casida J R, 2015, Industrial Microbiology, 3rd Edition, New Age International
Reference Books	1.	El-Mansi E M T, Bryce C F A, Dahhou B, Sanchez S, Demain A L and Allman A R, 2018, Fermentation Microbiology and Biotechnology, 4th Edition, CRC Press, USA.
	2.	Bernard R Glick, Jack J Pasternek and Cheryl L Patten, 2022, Molecular Biotechnology -Principles and Applications of Recombinant DNA, 6th Edition, ASM Publishers, USA
	3.	Nidhi Goel, 2013, Pharmaceutical Microbiology, 1st Edition, Narosa Publishing House, New Delhi.
	4.	Puvanakrishnan R, Sivasubramanian S and Hemalatha T, 2019, Microbial Technology -Concepts and Applications, 1st Edition, MJP Publishers, New Delhi.

Journal and Magazines	Industrial Microbiology
E-Resources and Website	Modern Industrial Microbiology and Biotechnology

Learning Method	Chalk and Talk/ Assignment/Seminar/ Group Discussion/Case Study
-----------------	---

Focus of the Course	Skill Development/ Employability/ Entrepreneurial Development/ Innovations
---------------------	--



Semester - I DSE I: CANCER BIOLOGY, DIAGNOSIS AND THERAPY							
Semester	Course Code	Course Name	Category	L	T	P	Credits
I	26BCP1DA	CANCER BIOLOGY,DIAGNOSIS AND THERAPY	DSE	36	12	-	3

Preamble	This course has been designed for students to learn and understand • Molecular basis of cancer, mutations causing cancer, and repair mechanisms • The basic principles of cancer development and available therapeutic options • The different diagnostic and treatment methods for cancer.
Prerequisite	Knowledge on Cancer Biology

Course Outcomes (Cos)		
CO Number	Course Outcomes (COs) Statement	Bloom's Taxonomy Knowledge Level
CO1	Compare and contrast benign and malignant tumors and the morphological characteristics of cancer cells.	K4
CO2	Justify the molecular basis of cancer. Distinguish interdisciplinary areas in cancer biology.	K5
CO3	Evaluate the molecular mechanism of oncogenesis, tumor biology and the role of cell cycle in cancer	K5
CO4	Validate the role of tumor suppressor genes and apoptosis. Explain about epigenetics.	K5
CO5	Elaborate on the choice of diagnosis and therapy available for cancer patients.	K6

Mapping with Program Outcomes:					
Cos / POs	PO1	PO2	PO3	PO4	PO5
CO1	✓	✓	✓	✓	✓
CO2	✓	✓	✓	✓	✓
CO3	✓	✓	✓	✓	✓
CO4	✓	✓	✓	✓	✓
CO5	✓	✓	✓	✓	✓



26BCP1DA	CANCER BIOLOGY, DIAGNOSIS AND THERAPY
----------	---------------------------------------

Syllabus

Unit	Content	Hrs	Resources
I	Introduction: Cancer cell-morphology and growth characteristics. Metastasis and cytoskeleton. Types and prevalence of cancer. Nomenclature of neoplasms, classification based on origin/organ. Differences between benign and malignant tumors. IKS Conceptual Framework for Cancer Biology	9	Text Book and E-resources
II	Carcinogenesis: Cancer epidemiology and endocrinology. Cancer causing agents-radiation, viruses, chemicals. Multistep carcinogenesis: Initiation, Promotion, Progression. Para-neoplastic syndromes. Mutation-definition, significance, rates and frequency. Mutagenic agents. Molecular basis of mutagenesis: induced and spontaneous mutations, crossing over and segregation. Cancer genetics. Chemical carcinogenesis- genetic and epigenetic carcinogens, pro- carcinogens and co- carcinogens, promoters and initiators, testing for carcinogenicity, Ames test. Aberrant metabolism during cancer development.	9	Text Book and You tube Video
III	Tumor Markers and Signal Transduction Oncogenes - RNA and DNA tumor viruses, retroviruses and viral oncogenes and abrupt activation. Src and Ras gene, mechanism and characteristic of cell transformation. Molecular mechanism of oncogenesis- protooncogenesis, oncoproteins, tumor suppressor genes involved in cancer. Radiation- effect of ionizing radiations on DNA, chromosomal aberrations. Cancer Markers: Genetic basis of cancer, use of tumor markers in detection and monitoring of cancer. Signal transduction in cancer: cell-cell interactions, cell adhesion, invasion and metastasis, VEGF signaling and angiogenesis; role of transcription factors. Growth factors- EGF, TNF- α and TGF- β and growth factor receptors. Free radicals and antioxidants in cancer. Diet and cancer.	10	Text Book and NPTEL
IV	Cell Cycle, Cell Death and Cancer Cell Cycle Regulation cancer: control of the cell cycle - cyclins and CDKs, and tumor suppressor genes p53, p21Rb, BRAC1 and BRAC2. Telomeres, and Immortality; Apoptosis. Epigenetics- role of DNA methylation in gene silencing- epigenetic silencing of tumor - suppressor genes.	10	Text Book and Reference books



V	Cancer Diagnosis and Cancer Therapy, Stem Cells and Cancer Principles and methods of cancer diagnosis - biochemical, genetic, cytotoxic, cell growth and viability tests. Diagnosis of cancer by histopathology, MRI scans, PET scan, cytogenetics test, karyotype, FISH. Strategies of anticancer drug therapy- chemotherapy, gene therapy, immuno therapy, radiotherapy, surgical therapy and molecular therapy- CART T-cell therapy. Principles of cancer biomarkers and their applications. AI in Cancer Diagnosis & Therapy	10	Text Book and Reference book
Total		48	

Note: Case studies related to the above topics to be discussed (Examined Internal only)

Text book	1.	Mc Kinnell R.G et al, 2012, "The Biological Basis of Cancer", Second edition, Cambridge University Press, London.
	2.	Weinberg R.A, 2014, "The Biology of Cancer", Second edition, Garland Science, New York & London.
Reference Books	1	Vincent T. De Vita M. D et al, 2020, "Principles and Practice of Oncology: Primer of Molecular Biology in Cancer", Third edition, Lippincott Williams and Wilkins, Philadelphia.
	2.	Pelengaris S and Khan M, 2010, "The Molecular Biology of Cancer - A bridge from bench to bed side", Second edition, Wiley Black well, London
	3.	Hesketh R, 2013, "Introduction to Cancer Biology", First edition, Cambridge University Press, London.
	4.	Pezzella F et al, 2019, "Oxford textbook of Cancer Biology", First edition, Oxford University Press, London.

Journal and Magazines	https://www.tandfonline.com/toc/kcvt20/current https://journals.lww.com/amjclinicaloncology/pages/default.aspx
E-Resources and Website	https://www.cancer.gov/research/resources ; https://nptel.ac.in

Learning Method	Chalk and Talk/Assignment/Seminar/ Group Discussion/Case Study
------------------------	--

Focus of the Course	Skill Development/ Employability/ Entrepreneurial Development/ Innovations
----------------------------	--



Semester - I
DSE: APPLIED BIOTECHNOLOGY

Semester	Course Code	Course Name	Category	L	T	P	Credits
I	26BTP1DA	APPLIED BIOTECHNOLOGY	DSE	36	12	-	3

Preamble	This course has been designed for students to learn and understand • The applications of biotechnology in plant, animal and Environmental field the basic concept of sequence and series • The applications of biotechnology in health care sector • The products obtained from fermentation and its applications
-----------------	--

Prerequisite	Knowledge on Applied Biotechnology
---------------------	------------------------------------

Course Outcomes (COs)

CO Number	Course Outcomes (COs) Statement	Bloom's Taxonomy Knowledge Level
CO1	Analyze the fundamental applications of biotechnology.	K4
CO2	Examine the basic principles and applications of biotechnology in environmental contexts.	K4
CO3	Evaluate diseases and strategies for disease prevention using biotechnological approaches.	K5
CO4	Assess the applications of enzymes across various industrial and medical fields.	K5
CO5	Design production and application strategies for products obtained through fermentation technology.	K6

Mapping with Program Outcomes:

COs / POs	PO1	PO2	PO3	PO4	PO5
CO1	S	S	M	S	M
CO2	S	M	S	S	S
CO3	M	M	S	S	S
CO4	S	S	S	S	S
CO5	S	S	S	S	S



Syllabus

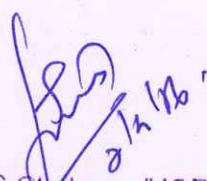
Unit	Content	Hours	E-Contents / Resources
I	Introduction to Recombinant DNA Technology: Strategies of cloning, Cutting and Joining of DNA – Linker and Adapters, enzyme involved in cloning. Selectable markers and reporter genes. Cloning vectors: Bacterial vectors - pBR322 and pUC vectors. Animal Viral vectors - SV-40, retroviral vectors. Plant vectors -Ti and Ri Plasmids. Yeast Vectors - YAC. Shuttle vectors and expression vectors. Introduction of cloned genes into cell: transformation, particle bombardment, liposome mediation and Electroporation, microinjection.	10	Text Book - 1
II	Enzyme Biotechnology: Enzymes used for diagnostic purpose- (acid phosphatase, alanine aminotransferase and alkaline phosphatase). Cardiac Biomarkers. Enzymes used for screening liver and kidney diseases. Enzymes used in food industry, leather industry, wool industry, dairy industry and textile industry.	08	Reference Book - 2 and NPTEL
III	Fermentation Biotechnology: Production, harvest, recovery and uses – enzymes, antibiotics (Tetracycline), vitamins (B ₂), aminoacids (glutamic acid), organic solvents (ethanol); organic acids (lactic acid). Single cell protein (algae), beverages (Wine). Formulation of Biofertilizer (<i>Rhizobium</i>), Biopesticides.	10	You Tube Videos and Reference Book - 4
IV	Health Care Biotechnology: Disease prevention – vaccines: conventional vaccines, purified antigen vaccines, recombinant vaccines, DNA vaccines, synthetic vaccines. Disease Diagnosis – Probes, monoclonal antibodies and detection of genetic diseases. Disease treatment – interferons, monoclonal antibodies. Gene therapy, enzyme therapy and replacement. Forensic medicine.	10	Referece Book – 3
V	Agricultural, Plant Biotechnology and Animal Biotechnology: Applications of transgenic crop technology: Herbicide resistance (Glyphosate Resistance plants), Pest resistance (Bt Cotton) and Virus Resistance. Enhancement of micro-nutrients (Vitamin A). Delayed Fruit Ripening. Molecular pharming in plants. Transgenic animals (Transgenic mice and Transgenic cattle). Production and recovery of products from animal tissue cultures (Blood clotting factors, Growth hormones, insulin.	10	Text Book - 1
	Total	48	



Text Book	1.	Bernard R Glick and Jack J Pasternak, 2010, "Molecular Biotechnology: Principles and Applications of recombinant DNA", 4 th Edition, ASM Press
Reference Books	1.	Marwaha S S & Arora K, 2000, "Food processing: Biotechnological application", Asiatech Publishers INC, New Delhi.
	2.	Palmer T, Bonner PLR, 2014, "Enzymes: Biochemistry, Biotechnology and Clinical Chemistry", 2 nd Edition, Woodhead Publishing Limited, Oxford.
	3.	Owen, Jenni Punt and Sharon a Stranford, 2013, "Kuby Immunology", 7 th Edition, W.H. Freeman and Company, New York.
	4.	Stanbury PF and Whitaker A, 2007, "Fermentation microbiology and Biotechnology", 2 nd Edition, Taylor and Francis.

Journal and Magazines	https://www.macrothink.org/journal/index.php/jab , https://link.springer.com/journal/12010
E-Resources and Website	https://www.keaipublishing.com/en/journals/biotechnology-notes/ https://www.drishtias.com/to-the-points/paper3/biotechnology-and-its-applications https://nptel.ac.in

Learning Methods	Chalk and Talk/ Assignment/Seminar
Focus of the Course	Entrepreneurial Development / Employability


 BoS Chairman/HOD
 Department of Microbiology
 Dr N G P Arts and Science College
 Coimbatore - 641 048

 Dr.N.G.P. Arts and Science College		
APPROVED		
BoS - 21/24 02/04/2026	AC -	GB -



Dr.NGPASC

COIMBATORE | INDIA

M.Sc. Microbiology (Students admitted during the AY 2026-27)