

KONGUNADU ARTS AND SCIENCE COLLEGE

(AUTONOMOUS)

COIMBATORE – 641 029

DEPARTMENT OF BIOTECHNOLOGY (Unaided)

COURSE OUTCOMES (CO)

OF

B.Sc. BIOTECHNOLOGY

For the students admitted In the Academic Year 2021-2022



DEPARTMENT OF BIOTECHNOLOGY (UG)

(2021 - 2022)

Programme code: 08		Programme name: B. Sc. Biotechnology		
Course code: 21EVS101		PART IV – ENVIRONMENTAL STUDIES		
Batch: 2021-2022	Semester I	Hours / Week 2	Total Hours 30	Credits 2

COURSE OBJECTIVES

- The course will provide students with an understanding and appreciation of the complex interactions of man, health and the environment. It will expose students to the multi-disciplinary nature of environmental health sciences
- To inculcate knowledge and create awareness about ecological and environmental concepts, issues and solutions to environmental problems.
- To shape students into good “Ecocitizens” thereby catering to global environmental needs.
- This course is designed to study about the types of pollutants including gases, chemicals petroleum, noise, light, global warming and radiation as well as pollutant flow and recycling and principles of environmental pollution such as air, water and soil
- The course will address environmental stress and pollution, their sources in natural and workplace environments, their modes of transport and transformation, their ecological and public health effects, and existing methods for environmental disease prevention and remediation.

COURSE OUTCOMES

On successful completion of the course, the students will be able to

<div style="display: flex; align-items: center;"> <div style="margin-right: 10px;"> ↑ ↓ </div> <div> K1 K5 </div> </div>	CO 1	Understand how interactions between organisms and their environments drive the dynamics of individuals, populations, communities and ecosystems
	CO2	Develop an in depth knowledge on the interdisciplinary relationship of cultural, ethical and social aspects of global environmental issues
	CO3	Acquiring values and attitudes towards complex environmental socio-economic challenges and providing participatory role in solving current environmental problems and preventing the future ones
	CO4	To gain inherent knowledge on basic concepts of biodiversity in an ecological context and about the current threats of biodiversity
	CO5	To appraise the major concepts and terminology in the field of environmental pollutants, its interconnections and direct damage to the wildlife, in addition to human communities and ecosystems

Programme code: 08		Programme name: B. Sc. Biotechnology		
Course code: 21UBT202		Core Paper 2 -Bioinstrumentation		
Batch: 2021-2022	Semester II	Hours / Week 4	Total Hours 60	Credits 4

Course Objectives

1. To understand the usage of instruments in Experimentation
2. To seed knowledge about the principles of operation of analytical instruments
3. To equip students with the working and maintenance of instruments
4. To introduce the basics of analytical interpretation

Course Outcomes (CO)

After completion of the course, the students will be able to:

K1 ↑ ↓	CO1	Appreciate the importance and application of analytical instruments
	CO2	Examine the troubleshoot methods for maintenance of instruments
	CO3	Solve the critical steps and biological calculations
K5	CO4	Analyze the data obtained from instruments
	CO5	Apply the principles in research process

Programme code: 08		Programme name: B. Sc. Biotechnology		
Course code: 21UBT203		Core Paper 3 - Microbiology		
Batch: 2021-2022	Semester II	Hours / Week 4	Total Hours 60	Credits 4

Course Objectives

1. To understand the basic concepts of the biology of microorganisms
2. To learn the general principles of microbial ,classification growth and evolution
3. To understand the role of microbes in human life
4. To study microbial pathogens, their pathogenesis and treatment.

Course Outcomes (CO)

After completion of the course, the students will be able to:

<div> <div>K1</div> <div>↑</div> <div>↓</div> <div>K5</div> </div>	CO1	Correlate the early development, physiology and evolution of microorganisms
	CO2	Employ various the methods of studying and identification of microorganisms
	CO3	Decipher microbial interactions in soil, food, human and animals
	CO4	Contribute in understanding the mechanism of diseases caused by various microorganisms
	CO5	Contribute to development of novel methods of microbial applications

Programme code: 08		Programme name: B. Sc. Biotechnology		
Course code:21UBT2CL		Core Practical 1 – Lab in Cell biology, Genetics and Microbiology		
Batch: 2021-2022	Semester I &II	Hours / Week 7	Total Hours 75	Credits 4

Course Objective (CO)

1. To understand basic aspects of Cell structure and Genetics
2. To provide a hands on exposure in identification of cells and examine the stages of cell divisions.
3. To learn about the cell fractionation and basic Genetic experiments
4. To provide training on microbiological media preparation, isolation and characterization of microbes.

Course Outcomes (CO)

After completion of the course, the students will be able to:

<div style="display: flex; align-items: center; justify-content: center;"> <div style="text-align: center; margin-right: 10px;"> K3 ↑ ↓ K5 </div> </div>	CO1	Examine and appraise the cell types and different stages of cell divisions
	CO2	Examine the techniques involved in and molecular biology and genetics
	CO3	Distinguish the blood cells and obtaining the skill of blood cell counting and analyzing the amino acids pattern using chromatography techniques.
	CO4	Demonstrate the relationship between phenotype and genotype in human genetic traits.
	CO5	Apply the various in microbiological techniques in an appropriate research and Industrial areas

Programme code: 08		Programme name: B. Sc. Biotechnology		
Course code: 21VED201		Value Education- Moral and Ethics		
Batch: 2021-2022	Semester III	Hours / Week 2	Total Hours 30	Credits 2

Course Objectives

1. To impart Value Education in every walk of life.
2. To help the students to reach excellence and reap success.
3. To impart the right attitude by practicing self introspection.
4. To portray the life and messages of Great Leaders.
5. To insist the need for universal brotherhood, patience and tolerance.
6. To help the students to keep them fit.
7. To educate the importance of Yoga and Meditation.

Course Outcomes (CO)

After completion of the course, the students will be able to:

K1 ↑ ↓ K5	CO1	will be able to recognize Moral values, Ethics, contribution of leaders, Yoga and its practice
	CO2	will be able to differentiate and relate the day to day applications of Yoga and Ethics in real life situations
	CO3	can emulate the principled life of great warriors and take it forward as a message to self and the society
	CO4	will be able to Analyse the Practical outcome of practicing Moral values in real life situation
	CO5	could Evaluate and Rank the outcome of the pragmatic approach to further develop the skills

Programme code: 08		Programme name: B. Sc. Biotechnology		
Course code: 21UBT304		Core Paper 4 - Enzymology and Metabolism		
Batch: 2021-2022	Semester III	Hours / Week 3	Total Hours 55	Credits 4

Course objectives

1. To provide a basic understanding of biological catalysis, and Mechanism of action of enzymes.
2. To describe the structure and functional relationship of enzyme
3. To understand the enzyme kinetics.
4. To Study the Metabolism of Carbohydrates, Amino acids and Lipids.

Course Outcomes

After completion of the course, the students will be able to:

<div> <div>K1</div> <div>↑</div> <div>↓</div> <div>K5</div> </div>	CO1	Distinguish the fundamentals of enzyme properties, nomenclatures, characteristics and mechanisms.
	CO2	Describe the concepts of co-operative behavior, enzyme inhibition and allosteric regulation and the factors affecting enzymatic reactions
	CO3	Apply glucose homeostasis (pathways and hormonal regulation) and the pentose phosphate pathway
	CO4	Describe the metabolism, biosynthesis of fatty acids.
	CO5	Employ the concepts in deciphering metabolic defects and to study enzyme kinetics for novel systems

Programme code: 08		Programme name: B. Sc. Biotechnology		
Course code: 21UBT305		Core Paper 5 - Molecular Biology		
Batch: 2021-2022	Semester III	Hours / Week 3	Total Hours 55	Credits 4

Course Objectives

1. To provide basic information about DNA, RNA and Protein biology
2. To understand the role of regulatory elements and its mechanism of operation in prokaryotes
3. To study the repair mechanism to overcome DNA damage
4. To provide an outline on transposons and molecular biology of Lambda

Course Outcomes (CO)

After completion of the course, the students will be able to:

<div> <div>K1</div> <div>↑</div> <div>↓</div> <div>K5</div> </div>	CO1	Describe the molecular aspects of cell function
	CO2	Discuss the molecular damage and its repair systems
	CO3	Investigate the gene regulation machinery in prokaryotes
	CO4	Compare and contrast the importance of recombination and genetics of lambda phage
	CO5	Define and execute experiments using transposons and phages

Programme code: 08		Programme name: B. Sc. Biotechnology		
Course code: 21UBT406		Core Paper 4 - Core Paper 6 – rDNA Technology		
Batch: 2021-2022	Semester IV	Hours / Week 4	Total Hours 60	Credits 4

Course Objectives:

1. To acquaint the students to versatile tools and techniques employed in Recombinant DNA technology
2. To provide theoretical base to properties and applications of DNA modifying enzymes and cloning strategies
3. To enable students to understand vector types, host genotype specificities for selection and screening of recombinants and/or recombinant transformants
4. To help students comprehend the various strategies for studying recombinant DNA molecules and its application in myriad fields
5. To sensitize on the various commercial recombinant Products

Course Outcomes (CO)

After completion of the course, the students will be able to:

<div style="display: flex; align-items: center;"> <div style="writing-mode: vertical-rl; transform: rotate(180deg); margin-right: 5px;">↑</div> <div style="writing-mode: vertical-rl; transform: rotate(180deg); margin-right: 5px;">↓</div> </div>	K1	CO1	Have atechanical knowhow on manipulating genes and genomes
		CO2	have knowledge to construct recombinant DNA and use them for cloning
		CO3	be competent in handling PCR and related molecular methods
		CO4	be proficient in conducting and intrepreting genetic engineering experiments using various types of vectors and hosts
	K5	CO5	be competent enough to handle recombinant strains at an industrial scale

Programme code: 08		Programme name: B. Sc. Biotechnology		
Course code: 21UBT4CM		Core Practical 2 - Lab in Enzymology ,Molecular Biology and rDNA Technology		
Batch: 2021-2022	Semester III & IV	Hours / Week 4	Total Hours 55	Credits 3

Course Objectives

1. To Provide an opportunity to experimentally verify the theoretical principles of genetic Engineering in a more explicit and concentrated manner.
2. Students will gain a sound technical knowledge and have hands on exposure in various aspects of molecular biology and Biochemistry.
3. To provide knowledge about various isolation techniques and separation of Macromolecules

Course Outcomes (CO)

After completion of the course, the students will be able to:

<div> <div>K3</div> <div>↑</div> <div>↓</div> <div>K5</div> </div>	CO1	Isolate plasmid, clone genes and transformation to a suitable host
	CO2	Apply techniques like PCR for identification of genes
	CO3	Apply chromatographic techniques for several applications
	CO4	Be compatible in use of vectors and hosts
	CO5	Become competent in handling libraries and gene cassettes

Programme code: 08		Programme name: B. Sc. Biotechnology		
Course code: 21UBT507		Core Paper 7 - Immunology		
Batch: 2021-2022	Semester V	Hours / Week 5	Total Hours 65	Credits 4

Course Objectives

1. To understand the definition and concepts of immunity
2. To familiarize about the structural features and components of the immune system as well as their functions
3. To comprehend how the immune system recognizes self from non-self
4. To provide insights into Monoclonal antibody and its Applications

Course Outcomes:

After completion of the course, students should be able to:

<div style="display: flex; align-items: center;"> <div style="writing-mode: vertical-rl; transform: rotate(180deg);">K1</div> <div style="margin: 0 5px;">↑</div> </div> <div style="display: flex; align-items: center;"> <div style="writing-mode: vertical-rl; transform: rotate(180deg);">K5</div> <div style="margin: 0 5px;">↓</div> </div>	CO1	Recall the innate and adaptive immune responses and to understand their role in protection against invading pathogens
	CO2	Demonstrate the strategies used to enhance immune responses
	CO3	Investigate hypersensitivity reactions, transplantations or autoimmune diseases.
	CO4	Apply key immunological concepts and methods to diagnose immune disorders
	CO5	Analyze the strategies to improve existing vaccines

Programme code: 08		Programme name: B. Sc. Biotechnology		
Course code: 21UBT508		Core Paper 8 – Plant and Animal Biotechnology		
Batch: 2021-2022	Semester V	Hours / Week 5	Total Hours 65	Credits 4

Course Objectives

1. To familiarize on plant genetic engineering and gene transfer techniques
2. To introduce methods of various viral vector mediated gene transfer somatic cell nuclear transfer.
3. To teach the concepts on emerging technologies like genome engineering etc.,
4. To sensitize on ethical concerns over the use of animal and plant transgenics.

Course Outcomes (CO)

After completion of the course, the students will be able to:

<div> <div>K1</div> <div>↑</div> <div>↓</div> <div>K5</div> </div>	CO1	Explain various types of vector system and gene delivery in plants.
	CO2	Categorize biotic and abiotic profiles
	CO3	Investigate and apply antisense and gene silencing for combating diseases.
	CO4	Discuss the applications of plant and animal transgenics in human welfare.
	CO5	Apply techniques for plant and animal improvements

Programme code: 08		Programme name: B. Sc. Biotechnology		
Course code: 21UBT509		Core Paper 9 – Genomics and Proteomics		
Batch: 2021-2022	Semester V	Hours / Week 5	Total Hours 65	Credits 4

Course Objectives

1. To acquaint the genome organization, gene identification, expression and applications of genomics analysis
2. To disseminate the fundamentals of proteomics, analysis and its applications
3. To interpret the data obtained from high through-put technologies
4. To classify the complexity of genome/ proteome structural and functional organization

Course Outcomes (CO)

After completion of the course, the students will be able to:

<div style="display: flex; align-items: center; justify-content: center;"> <div style="writing-mode: vertical-rl; transform: rotate(180deg);">K1</div> <div style="margin: 0 10px;">↑</div> </div> <div style="display: flex; align-items: center; justify-content: center;"> <div style="writing-mode: vertical-rl; transform: rotate(180deg);">K5</div> <div style="margin: 0 10px;">↓</div> </div>	CO1	Discern the crucial concepts and techniques applied in genomics, and proteomics
	CO2	Communicate on the recent developments in the genomics and proteomics, and its application in human disease biology
	CO3	Apply the tools available in the open source to specific research problems and projects
	CO4	Apply functional genomics techniques to analyse data for biological system
	CO5	Apply proteomic tools in structure - function predictions

Programme code: 08		Programme name: B. Sc. Biotechnology		
Course code: 21 UBT5CN		Core Practical 3 – Lab in Immunology, Plant and Animal Biotechnology		
Batch: 2021-2022	Semester V	Hours / Week 6	Total Hours 70	Credits 3

Course Objectives

1. To provide hands on experience and to learn the principles behind immunological techniques
2. To make the students skilled in plant tissue culture techniques
3. To teach students the latest techniques and principles in animal biotechnology
4. To provide hands on training on animal cell culture techniques

Course Outcomes

After completion of the course, the students will be able to:

<div style="display: flex; align-items: center; justify-content: center;"> <div style="text-align: center; margin-right: 10px;"> K3 ↑ ↓ K5 </div> </div>	CO1	Apply basic techniques for identifying antigen and antibody molecules
	CO2	Devise conservation methods important plant species through <i>in vitro</i> tissue culture
	CO3	Analyse the bioactive natural compounds from plants
	CO4	Conduct experimental studies relating to animal biotechnology
	C05	Devise and execute experiments using cell lines

Programme code: 08		Programme name: B. Sc. Biotechnology		
Course code: 21UBT5IT		Internship Training		
Batch: 2021-2022	Semester -	Hours / Week -	Total Hours -	Grade

Course objective

- To provide an opportunity to work in industry/institute under the mentorship of an industrial personnel
- To develop key skill sets that are industry relevant for future placements
- To have a flavour of corporate life in an industry sector
- To built strength, sprit of team work and self confidence
- To prepare the students to comprehend industrial problem

Programme code: 08		Programme name: B. Sc. Biotechnology		
Course code: 21UBT610		Core Paper 10 – Bioprocess Technology		
Batch: 2021-2022	Semester VI	Hours / Week 5	Total Hours 65	Credits 3

Course Objectives

1. To introduce the principles and techniques of bioprocess engineering and down stream processing.
2. To understand the basics of fermentation techniques
3. To enable the students to learn about the design of fermentors.
4. To decipher techniques for genetic improvements of micro-organisms to improve yield of bioproducts.

Course Outcomes (CO)

After completion of the course, the students will be able to:

<div> <div>K1</div> <div>↑</div> <div>↓</div> </div>	CO1	Recognize and apply the basic principles of bioprocess technology and different types of bioreactors.
	CO2	Design and use selectable and optimized media for maximum production of microbial metabolites
	CO3	Explain designing of protocols for strain improvement and separation of molecules after fermentation process.
	CO4	Apply the process for commercial production of metabolites
K5	CO5	Apply the principles of bioprocessing in product development and products

Programme code: 08		Programme name: B. Sc. Biotechnology		
Course code: 21UBT611		Core Paper 11 – Biopharmaceuticals		
Batch: 2021-2022	Semester VI	Hours / Week 5	Total Hours 65	Credits 3

Course Objectives:

1. To enable the students to learn Indian system of medicine.
2. To understand the basic facts in pharmaceutical technology
3. To give them the knowledge on drug development process
4. To teach them to evaluate on the biological-efficacy of drugs.
5. To provide students a foundation on clinical research.

Course Outcomes:

After completion of the course, students should be able to:

K1 ↑	CO1	Apply the knowledge on drug use, dose and dosage
	CO2	Prepare the drug and test the same
	CO3	Use classical treatment processes and relate it to the novel methods of drug development
K5 ↓	CO4	Integrate the use of past and present drug treatment regimes for health benefits
	CO5	Distinguish conventional lab and proficient lab with good GLP

Programme code: 08		Programme name: B. Sc. Biotechnology		
Course code: 21UBT612		Core Paper 12 - Bioinformatics		
Batch: 2021-2022	Semester VI	Hours / Week 5	Total Hours 65	Credits 4

Course Objectives

1. To impart the challenges and importance of bioinformatics in the biological research field
2. To describe the different sequence types and the specific databases available for biological data.
3. To outline the usage of specialized database and their significance
4. To explain the various applications of bioinformatics in the field of biological sciences

Course Outcomes (CO)

After completion of the course, the students will be able to:

<div> <div>K1</div> <div>↑</div> <div>↓</div> <div>K5</div> </div>	CO1	Outline the importance and basics of bioinformatics as a tool in biological sciences
	CO2	Use knowledge on different types of biological databases for solving real time problems
	CO3	Employ the nucleotide and protein sequences using specialized databases
	CO4	Analyze the different applications of bioinformatics in biological research field
	CO5	Apply computational tools in myriad areas of research

Programme code: 08		Programme name: B. Sc. Biotechnology		
Course code: 21 UBT6CO		Core Practical 4 - Lab in Bioprocess Technology & Biopharmaceuticals		
Batch: 2021-2022	Semester VI	Hours / Week 6	Total Hours 70	Credits 3

Course Objectives

1. To provide an opportunity to experimentally verify the theoretical concepts already studied.
2. To provide an exposure to design and run batch fermentation experiments for production of microbial enzymes
3. To introduce basics of herbal drug preparation and testing.

Course Outcomes (CO)

After completion of the course, the students will be able to:

<div> <div>K3</div> <div>↑</div> <div>↓</div> <div>K5</div> </div>	CO1	Apply the principles of industrially important microorganisms for large yield of products
	CO2	Explain the basic design and types of bioreactors and its working principles
	CO3	Demonstrate various techniques like media formulation, strain improvement and inocula development and product recovery to improve processing
	CO4	Use various bioseparation processes such as cell disruption techniques, product enrichment techniques and product purification methods
	CO5	Able to design and execute modules for drug preparation and testing

Programme code: 08		Programme name: B. Sc. Biotechnology		
Course code: 21UBT5E1		Major Elective 1 -Stem cell and Neuroscience		
Batch: 2021-2022	Semester VI	Hours / Week 4	Total Hours 60	Credits 5

Course Objectives

1. To familiarize the students with stem cell technology and basics of neuroscience
2. To discuss various chemical and biological neural signals and its types.
3. To explain the importance of artificial intelligence in neural network
4. To familiarize the use of stem cells in the treatment of genetic and human diseases

Course Outcomes (CO)

After completion of the course, the students will be able to:

<div> <div>K1</div> <div>↑</div> <div>↓</div> <div>K5</div> </div>	CO1	Relate various stem cells and their characteristic features.
	CO2	Explain neuronal signaling pathways and neurotransmitters in action potential
	CO3	Investigate the role of Artificial intelligence in neural network.
	CO4	Investigate the applications of stem cell and neuroscience in the treatment of various diseases.
	CO5	Use stem cells in design of therapeutic regimes

Programme code: 08		Programme name: B. Sc., Biotechnology		
Course code: 21UBT5E1		Major Elective 1 -Nanotechnology		
Batch: 2021-2022	Semester VI	Hours / Week 4	Total Hours 60	Credits 5

Course Objectives

- 1.To understand the influence of dimensionality of the object at nanoscale on their properties;
2. To outline size and shape-controlled synthesis of nanomaterials and their applications
3. To comprehend the principle behind nanoparticle characterization methods

To familiarize with nanotechnology and its myriad applications

Course Outcomes

After completion of the course, the students will be able to:

<div> <div>K1</div> <div>↑</div> <div>↓</div> <div>K5</div> </div>	CO1	Distinguish between the functional aspects of various nano materials
	CO2	Use the appropriate method of synthesis and characterisation
	CO3	Employ nanoparticles in diagnosis and therapy
	CO4	Design novel materials for high end applications
	CO5	Appraise the toxicity and environmental safety of nanoparticles

Programme code: 08		Programme name: B. Sc. Biotechnology		
Course code: 21UBT5E1		Major Elective 1 - IPR, Biosafety and Bioethics		
Batch: 2021-2022	Semester VI	Hours / Week 4	Total Hours 60	Credits 5

Course Objectives

1. To disseminate fundamentals of Intellectual Property Rights to students
2. To impart the importance of IPR laws and to encourage students in the novel creation to meet the biotechnological demands.
3. To educate students about the principles and conflicts in bioethics
4. To understand the basics of bioethics in biotechnology research and biosafety measures to protect the ecology and human health

Course Outcomes (CO)

After completion of the course, the students will be able to:

<div style="display: flex; align-items: center;"> <div style="margin-right: 10px;"> K1 ↑ ↓ K5 </div> </div>	CO1	Apply intellectual property law principles (including copyright, patents, designs and trademarks) to real problems and analyze the social impact of intellectual
	CO2	Identify and analyze Patent law, the legislative provisions regulating patents, principles and procedure for obtaining patent
	CO3	Demonstrate and develop awareness of relevance and impact of intellectual property law on academic and professional live
	CO4	Demonstrate knowledge and understanding of the specific aspect(s) of intellectual property law that is/are relevant to their legal careers
	CO5	Draft and apply Design/Process/Product patent

Programme code: 08		Programme name: B. Sc. Biotechnology		
Course code: 21UBT6E2		Major Elective 2 - Research Methodology		
Batch: 2021-2022	Semester VI	Hours / Week 5	Total Hours 65	Credits 5

Course Objectives

- 1) To inculcate the basic framework of a typical research process
- 2) To understand a general definition of research design and experimentation
- 3) To disseminate the various information for literature review and data collection
- 4) To identify the primary characteristics of quantitative research and qualitative research.

Course Outcomes (CO)

After completion of the course, the students will be able to:

<div> <div>K1</div> <div>↑</div> <div>↓</div> <div>K5</div> </div>	CO1	Design a good quantitative purpose statement and good quantitative research questions and hypotheses
	CO2	Identify various types of quantitative sampling and which presents the most rigorous approach to use.
	CO3	Distinguish and apply methods for a population and a sample, design
	CO4	Analyze the link between quantitative research questions and data collection and how research questions are operation
	CO5	Present the findings of research in an organised and non-plagiarized forms

Programme code: 08		Programme name: B. Sc. Biotechnology		
Course code: 21UBT6E2		Major Elective 2 -Molecular Diagnostics		
Batch: 2021-2022	Semester VI	Hours / Week 5	Total Hours 65	Credits 5

Course Objectives

1. To State the fundamental principles of clinical molecular diagnostics and explores the use of molecular techniques in the diagnosis of disease
2. To explain the required quality assurance and quality control measures required in a molecular laboratory.
3. To sensitize on the application of monoclonal antibodies
4. To introduce basic of Neonatal and Prenatal diagnostics

Course Outcomes (CO)

After completion of the course, the students will be able to:

<div style="display: flex; align-items: center; justify-content: center;"> <div style="margin-right: 10px;"> ↑ ↓ </div> <div style="margin-right: 10px;">↕</div> </div>	K1	CO1	Clarity about the molecular diagnostic aspects, its significance and goal
		CO2	Categorize various techniques used in the clinical diagnostic laboratory for the diagnosis of various pathogenic situations
		CO3	Explain how these methods are applied in current research and diagnostics
	K5	CO4	Asses the need of quality assurance that needs to be followed in the molecular diagnostic lab.
		CO5	Apply basic diagnostic principles for design of novel tools for diagnosis

Programme code: 08		Programme name: B. Sc. Biotechnology		
Course code: 21UBT6E2		Major Elective 2 - Food and Dairy Technology		
Batch: 2021-2022	Semester VI	Hours / Week 5	Total Hours 65	Credits 5

Course Objectives

1. To familiarize students with advances in food processing techniques
2. To acquaint students with the industrial techniques
3. To introduce the various methods to preserve and process foods and extend their shelf-life
4. To sensitise the methods to improve their palatability characteristics.

Course Outcomes (CO)

After completion of the course, the students will be able to:

<div> <div>K1</div> <div>↑</div> <div>↓</div> <div>K5</div> </div>	CO1	To provide an overview of basic principles and methods of food processing, preservation and quality.
	CO2	To predict processing and to standardize methods of preservation in relation to food composition.
	CO3	To review quality standards and ethics in processed foods.
	CO4	To invent and develop novel food processing and preservation technologies to manufacture and preserve food in an effective manner
	CO5	To design smart packaging systems from local resources

Programme code: 08		Programme name: B. Sc. Biotechnology		
Course code: 21UHR3N1		PART IV -NON MAJOR ELECTIVE – IHUMAN RIGHTS		
Batch: 2021-2022	Semester III	Hours / Week 2	Total Hours 30	Credits 2

Course Objectives

1. To prepare for responsible citizenship with awareness of the relationship between Human Rights, democracy and development.
2. To impart education on national and international regime on Human Rights.
3. To sensitive students to human suffering and promotion of human life with dignity.
4. To develop skills on human rights advocacy
5. To appreciate the relationship between rights and duties
6. To foster respect for tolerance and compassion for all living creature.

Course Outcomes (CO)

After completion of the course, the students will be able to:

<div style="display: flex; align-items: center; justify-content: center;"> <div style="writing-mode: vertical-rl; transform: rotate(180deg);">K1</div> <div style="margin: 0 10px;">↑</div> </div> <div style="display: flex; align-items: center; justify-content: center;"> <div style="writing-mode: vertical-rl; transform: rotate(180deg);">K5</div> <div style="margin: 0 10px;">↓</div> </div>	CO1	To understand the hidden truth of Human Rights by studying various theories.
	CO2	To acquire overall knowledge regarding Human Rights given by United Nation Commission. (UNO)
	CO3	To gain knowledge about various organs responsible for Human Rights such as National Human Rights Commission and state Human Right commission (UNHCR)
	CO4	To get habits of how to treat aged person, others and positive social responsibilities
	CO5	To treat and confirm, child, refugees and minorities with positive social justice.

Programme code: 08		Programme name: B. Sc. Biotechnology		
Course code: 21UWR4N2		Part IV -Non- Major Elective – Women’s Rights		
Batch: 2021-2022	Semester IV	Hours / Week 2	Total Hours 30	Credits 2

Objectives

1. To know about the laws enacted to protect Women against violence.
2. To impart awareness about the hurdles faced by Women.
3. To develop a knowledge about the status of all forms of Women to access to justice.
4. To create awareness about Women’s rights.
5. To know about laws and norms pertaining to protection of Women.
6. To understand the articles which enables the Women’s rights.
7. To understand the Special Women Welfare laws.
8. To realize how the violence against Women puts an undue burden on healthcare services.

Course Outcomes (CO)

After Completion of the Course the student will be able to

<div style="display: flex; align-items: center;"> <div style="margin-right: 5px;">K1</div> <div style="flex-grow: 1; border-left: 1px solid black; position: relative;"> <div style="position: absolute; top: -10px; left: 50%; transform: translateX(-50%);">↑</div> <div style="position: absolute; bottom: -10px; left: 50%; transform: translateX(-50%);">↓</div> </div> </div>	CO1	Appraise the importance of Women’s Studies and incorporate Women’s Studies with other fields.
	CO2	Analyze the realities of Women Empowerment, Portrayal of Women in Media, Development and Communication.
	CO3	Interpret the laws pertaining to violence against Women and legal consequences.
	CO4	Contribute to the study of the important elements in the Indian Constitution, Indian Laws for Protection of Women.
	CO5	Spell out and implement Government Developmental schemes for women and create awareness on modernization and impact of technology on Women.
K5		

Programme code: 08		Programme name: B. Sc. Biotechnology		
		Non- Major Elective – Consumer Affairs		
Batch: 2021-2022	Semester VI	Hours / Week 2	Total Hours 30	Credits 2

Course Objectives

1. To familiarize the students with their rights and responsibilities as a consumer.
2. To understand the procedure of redress of consumer complaints.
3. To know more about decisions on Leading Cases by Consumer Protection Act.
4. To get more knowledge about Organizational set-up under the Consumer Protection Act
5. To impart awareness about the Role of Industry Regulators in Consumer Protection
6. To understand Contemporary Issues in Consumer Affairs

Course Outcomes (CO)

After Completion of the Course the student will be able to

<div style="display: flex; align-items: center; justify-content: center;"> <div style="text-align: center; margin-right: 10px;"> K1 ↑ ↓ K5 </div> </div>	CO1	Able to know the rights and responsibility of consumers.
	CO2	Understand the importance and benefits of Consumer Protection Act.
	CO3	Applying the role of different agencies in establishing product and service standards.
	CO4	Analyse to handle the business firms' interface with consumers.
	CO5	Assess Quality and Standardization of consumer affairs

Programme code: 08		Programme name: B. Sc. Biotechnology		
Course code: 21UBT3S1		Skill Based subject 1- Plant Tissue Culture and Hydroponics		
Batch: 2021-2022	Semester III	Hours / Week 2	Total Hours 30	Credits 3

Course Objectives

1. To make students understand about the basics of plant science
2. To equip students with culture techniques and scope of plant biotechnology
3. To make the students to be skilled in hydroponics and also to use the technology in developing commercial ornamental species

Course Outcomes (CO)

After completion of the course, the students will be able to:

<div style="display: flex; align-items: center; justify-content: center;"> <div style="text-align: center; margin-right: 10px;"> K1 ↑ ↓ K5 </div> </div>	CO1	Set up a plant tissue culture laboratory
	CO2	Apply Plant tissue culture methods for commercial products
	CO3	Develop entrepreneurship ventures like nursery and herbal gardens
	CO4	Offer services with regard to hydroponics
	CO5	Be compatible in plant propagation and authentication methods

Programme code: 08		Programme name: B. Sc. Biotechnology		
Course code: 21UBT4S2		Skill Based subject 2- Herbal Technology		
Batch: 2021-2022	Semester IV	Hours / Week 2	Total Hours 30	Credits 3

Course Objectives

1. To educate students about our Indian systems of medicine and explain methods for identification and authentication of herbal drugs.
2. To discuss various extraction procedure and interpret the importance of nutraceuticals.
3. To explain methods of good agricultural practices like wild seed collections, cultivation of medicinal plants.

Course Outcomes (CO)

After completion of the course, the students will be able to:

<div> <div>K1</div> <div>↑</div> <div>↓</div> <div>K5</div> </div>	CO1	Recognize the basic principles of Identification, authentication and validation of herbs.
	CO2	Categorize organized and unorganized drugs according to WHO standard
	CO3	Investigate the importance of nutraceuticals in combating diseases.
	CO4	Assess the Quality Assurance and Ethno medical documentation in a herbal drug industry
	CO5	Explore and use local resources for medicinal preparations

Programme code: 08		Programme name: B. Sc. Biotechnology		
Course code: 21UBT6S3		Skill Based Subject 3 -Bio Business and Project Management		
Batch: 2021-2022	Semester VI	Hours / Week 2	Total Hours 30	Credits 3

Course Objectives:

1. To impart the knowledge of various aspects of Creativity, Innovation and New Product Development
2. To describe the important factors for harnessing scientific creativity into a commercial enterprise
3. To develop knowledge and skills to master the future challenges of the biotechnology industries
4. To study and develop product launch and marketing strategies for a highly regulated industry
5. To help students build-up a progressive and successful career

Course Outcomes:

After completion of the course, students should be able to:

<div> <div>K1</div> <div>↑</div> <div>↓</div> <div>K5</div> </div>	CO1	Be a responsible biotechnologists who can work in an interdisciplinary framework of related fields
	CO2	Conduct thyself in a professional and ethical fashion
	CO3	Imbibe self management, interpersonal and team work skills
	CO4	Effectively manage time with prudent decision making approach
	CO4	Set up a rewarding business ventures
	CO5	Offer a consultancy service for an entrepreneur establishment

Programme code: 08		Programme name: B. Sc. Biotechnology		
Course code: 21UBT5X1		EDC -Bio-Entrepreneurship		
Batch: 2021-2022	Semester VI	Hours / Week 2	Total Hours 30	Credits 3

Course Objectives:

1. To provide an insight into the field of Bioentrepreneurship, i.e. innovation and entrepreneurship in the life sciences
2. To motivate students for entrepreneurship and the need for technological innovation
3. To familiarize students with the scope of issues and decisions that managers in biotechnology face as their company progresses from its earliest stages to self-sustainability
4. To give students the vocabulary to participate and contribute to the business side of scientific enterprises

Course Outcomes:

After completion of the course, the students will be able to:

K1 ↑ ↓ K5	CO1	Develop an understanding of Bio entrepreneurship
	CO2	Apply basic Business tools
	CO3	Compose and write a business plan offering a convincing presentation of a biotech venture
	CO4	Setup enterprise for new biotechnology product
	CO4	Assess the national and international market for product launch
	CO5	Apply for funding from Government/non Government agencies

Programme code: 08		Programme name: B. Sc. Biotechnology		
Course code: 21UBT6Z1		Case Study analysis, Report and Viva Voce		
Batch: 2021-2022	Semester V &VI	Hours / Week 5	Total Hours 65	Credits 5

Course objectives

- To comprehend the problem that needs a viable solution
- To describe an individual/collective situation in industry/society
- To identify the key issues/factors that govern the problem
- Analyse the problem using extensive review and theory
- Recommend an action plan to alleviate the problem

Programme code: 08	Programme name: B. Sc. Biotechnology		
Course code: 21UBT0J1	JOC1 – Clinical Research & Medical Coding		
Batch	Hours / Week	Total Hours	Credits
2021-2022	2	30	2

Course Objectives

1. To learn the various medical terminology and treatment strategies used for medical coding
2. To Interpret and understand healthcare documentation and billing
3. To assign and understand diagnostic and procedure codes using ICD and HCPCS/CPT coding systems

Course Outcomes (CO)

After completion of the course, the students will be able to:

<div style="display: flex; align-items: center; justify-content: center;"> <div style="text-align: center;"> K1 ↑ ↓ K4 </div> </div>	CO1	Remembering the various medical terminology and treatment strategies used for medical coding
	CO2	Conceiving the different procedures involved in medical documentation and billing
	CO3	Applying the standard coding resources for accurate insurance billing
	CO4	Estimating the accurately and maintain medical records using codes

Programme code: 08	Programme name: B. Sc. Biotechnology		
Course code : 21UBT0J2	JOC 2 – Agroindustrial biotechnology		
Batch	Hours / Week	Total Hours	Credits
2019-2020	2	30	2

Course Objectives

1. To provide knowledge on Indian agriculture, biomass, biofertilizer and biocontrol agents
2. To develop students technical skills on bio fertilizer and Biocontrol agents production
3. To encourage natural ways of crop disease management

Course Outcomes (CO)

After completion of the course, the students will be able to:

<div style="display: flex; align-items: center; justify-content: center;"> <div style="text-align: center; margin-right: 10px;"> K1 ↑ ↓ K4 </div> </div>	CO1	Defining and to impart training of ecofriendly agricultural inputs so as to nullify the ill effects of chemical fertilizers.
	CO2	Illustrating the production and use of biopesticides, bio-control agents etc as alternative inputs in organic farming
	CO3	Demonstrating the effectiveness of biofertilizer cultural practices in the farmers fields for enhanced crop productivity through bioreclamation of waste land
	CO4	Analyzing and promoting disease management in the country