

B.SC. (Hons.) BIOTECHNOLOGY

PEOs

(Program Educational Objectives)

- Bachelor course in biotechnology offers the synergism of basic concepts of biology, biotechnology, molecular biology, genomics, Recombinant DNA technology, microbiology, biochemistry and bioinformatics with technological applications.
- The main objective of this degree course is to produce graduates with enhanced skills, knowledge and research aptitude to carry out higher studies, entrepreneurship or research and development in the various health, research and industrial areas.
- Develop proficiency in application of current aspects of biotechnology, molecular biology, Recombinant DNA technology, bioinformatics and genomics.
- Students will be able to use state of the art techniques relevant to academia and industry, generic skills and global competencies including knowledge and skills that enable the students to undertake further studies in the field of biotechnology, molecular biology, Recombinant DNA technology, genomics, microbiology, biochemistry or any other related field.
- 5. Imparting an education that includes communication skills, the ability to work in a team with leadership quality, devoted to societal problems with an ethical attitude

POs
(Program Outcomes)

- Prepares the students for immediate entry to the workplace with sound theoretical, experimental knowledge in the area of health and pharmaceuticals, biochemicals, biofuels, environment related, food and dairy, cosmetics, biopolymers and related multidisciplinary fields.
- Overall, the course offers basic foundation in biotechnology which enables the students to understand the concepts in biochemistry, molecular biology, microbiology, genetic engineering and related industrial technology.
- Students will be able to design, execute, record and analyse the results of experiments in field of molecular biology, genomics,, Recombinant DNA technology, biochemistry, microbiology and genetic engineering.
- Students will be able to work effectively in a group in the classroom, laboratory, industries and field-based situations.
- Become efficient in using standard operating procedures and will be well versed with the regulations for safe handling and use of chemicals as well as IPR and biosafety issues related to experiments in field of biochemistry, microbiology and genetic engineering.

PSOs
(Program Specific Outcomes)

- **Critical Thinking-** Students will demonstrate an understanding of major concepts in all disciplines of biology, biochemistry, biotechnology microbiology and bioinformatics. Understand the basic concepts, fundamental principles, and the scientific theories related to various scientific phenomena and their relevancies in the day-to-day life.
- **Effective Communication-** Development of various communication skills such as reading, listening, speaking, etc., which will help in expressing ideas and views clearly and effectively.
- **Social Interaction-** Development of scientific outlook not only with respect to science subjects but also in all aspects related to life
- **Effective Citizenship-** Imbibe moral and social values in personal and social life leading to highly cultured and civilized personality.
- **Ethics-** Follow the ethical principles and responsibilities to serve the society.
- **Environment and Sustainability-** Understand the issues of environmental contexts and sustainable development.
- **Self-directed and Lifelong learning-** Students will be capable of self-paced and self-directed learning aimed at personal development and for improving knowledge/skill development.

COURSE: Essential Professional Communication

COURSE CODE: LN104

COURSE OBJECTIVES:

Develop the basic knowledge, vocabulary, grammar and communication skills in the students-- listening, speaking, reading and writing.

COURSE OUTCOME (CO)	DESCRIPTION
CO1	To enhance all the four communication skills in the students-- listening, speaking, reading and writing.
CO2	To familiarize the students with the nature and importance of effective communication skills in their professional life.
CO3	To make the students capable of actively participating in various individual/group communications such as group discussion, debate, meeting, presentation etc.
CO4	To enrich the vocabulary of the students to make them efficient communicators.
CO5	To strengthen the Grammar of the students.

COURSE: Mathematics

COURSE CODE: MT106

Available from Maths Department

COURSE: CONCEPTS OF COMPUTERS

COURSE CODE: CS109

COURSE OBJECTIVES:

- Study of computer history and structure of computer system.
- Understanding of computer peripheral devices, operating environment and software.
- Basic knowledge of computer networking and internet working devices.
- Fundamental concepts of Internet and web technologies.
- Study of biological databases, algorithms and flowchart design.

COURSE OUTCOMES (CO):

After completion of the course, a student will be able to

COURSE OUTCOME (CO)	DESCRIPTION
CO1	Have a strong foundation of knowledge about the structure of computer system.
CO2	Utilize and configure computer peripheral devices, install and operate system and application software.
CO3	Establish a small computer network and utilize resource sharing.
CO4	Design and develop a website with limited features.
CO5	Design flowcharts, apply algorithms to solve problems and make use of biological databases.

COURSE: FUNDAMENTAL OF INORGANIC

COURSE CODE: CH112

Available from Chemistry department

COURSE: PLANT SCIENCES

COURSE CODE: BS101

On completion of this course, students will be able to understand:

- The concept of origin of life and evolution.
- The understanding of diversity in plants.
- The structure and functioning of Plant Cells and tissue.
- Morphology and physiology of plants and plant growth.

COURSE OBJECTIVES:

Develop the understanding of

- The concept of origin of life and evolution.
- The structure and functioning of Plant Cells and tissue.
- Morphology and physiology of plants.

COURSE OUTCOMES (CO):

After completion of the course, a student will be able to

COURSE OUTCOME (CO)	DESCRIPTION
CO1	Have a strong foundation of basics of botany.
CO2	Develop the the concept of origin of life and evolution
CO3	Study of the structure and functioning of Plant Cells and tissue.
CO4	Study of morphology of plants
CO5	Study of physiology of plants.

COURSE: Chemistry Lab-I

COURSE CODE: CH113

Available from Chemistry department

COURSE: Plant Sciences Lab

COURSE CODE: BS102

COURSE OBJECTIVES:

Develop the understanding of

- The structure and functioning of Plant Cells and tissue.
- Morphology and physiology of plants.

COURSE OUTCOMES (CO):

After completion of the course, a student will be able to

COURSE OUTCOME (CO)	DESCRIPTION
CO1	Have a strong foundation of basics of botany.
CO2	Study of diversity of plants
CO3	Study of cells and cell organization .
CO4	Study of morphology of plants.
CO5	Develop the the understanding of growth in plants.

COURSE: Fundamentals of Environmental Studies

COURSE CODE: ES115

Available from EVS department

COURSE: Fundamental of Organic Chemistry

COURSE CODE: CH114

Available from Chemistry department

COURSE: Animal Science

COURSE CODE: BS111

COURSE OBJECTIVES:

Develop the understanding of

- To understand the inter relationships within and between anatomical and physiological systems of the human body.
- To understand the importance of economic zoology.

COURSE OUTCOMES (CO):

After completion of the course, a student will be able to

COURSE OUTCOME (CO)	DESCRIPTION
CO1	Understand Formation of urine and gain perception on the various renal function tests and renal disorders. Understand the pathophysiological processes responsible for common biochemical disorders such as jaundice, Pancreatitis, Fatty liver etc.
CO2	Understanding the enzyme patterns in diseases of various organs such as pancreas, liver, bones, heart and muscle. Examine and identify acid-base balance and the regulatory mechanisms within the body to include the analyte, physiology involved, and clinical significance.
CO3	Describe and explain the role of liver function in bilirubin metabolism and identify the tests used for bilirubin analysis, and relate laboratory results to clinical diagnosis.
CO4	Describe the general function of each organ system. Have in-depth understanding of anatomy and physiology of respiratory, digestive, and vascular system.
CO5	Understand about various animal cultures. Understand host-parasite relationship

COURSE: Fundamentals of Biochemistry

COURSE CODE: BS112

COURSE OBJECTIVES:

Develop the understanding of

- Basics of biomolecules
- Basics of carbohydrate, its classification and
- Basics of Amino acid & protein
- Basics of lipids
- Basics of Nucleic Acid
- Basics of Vitamin

COURSE OUTCOMES (CO):

After completion of the course, a student will be able to

COURSE OUTCOME (CO)	DESCRIPTION
CO1	Study of Basics of carbohydrate, its classification
CO2	Basics of Amino acid & protein
CO3	Basics of lipids
CO4	Basics of Nucleic Acid
CO5	Basics of Vitamins

COURSE: Fundamental of Microbiology

COURSE CODE: BS113

COURSE OBJECTIVES:

Develop the understanding of

- Basics of microbiology
- General Classification of microbes
- Control of Microorganisms
- Microbes in extreme environments and microbial interactions□
- Basics of Recombination in Prokaryotes

COURSE OUTCOMES (CO):

After completion of the course, a student will be able to

COURSE OUTCOME (CO)	DESCRIPTION
CO1	Study of Basics of microbiology
CO2	General Classification of microbes
CO3	Basics of Control of Microorganisms
CO4	Study of bacteriophages and microbes in extreme environments and microbial interactions
CO5	Basics of Recombination in Prokaryotes

COURSE: Chemistry Lab-II

COURSE CODE: CH115

Available from Chemistry department

COURSE: Animal Sciences lab.

COURSE CODE: BS114

COURSE OBJECTIVES:

Develop the understanding of

- Basics of biomolecules
- Basics of cell structure
- Assay of enzymes
- Study of Transportation and Osmosis

COURSE OUTCOMES (CO):

After completion of the course, a student will be able to

COURSE OUTCOME (CO)	DESCRIPTION
CO1	Assay of carbohydrate, Amino acid & protein and Cholesterol
CO2	Study of Cell structure-prokaryotes Study of Cell structure-eukaryotes and Isolation of nuclei from goat liver
CO3	Cell harvesting–methodology and Cell lysis–methodology
CO4	Assay of enzymes as Salivary amylase
CO5	Study of Transportation and Osmosis

COURSE: Fundamentals of Physical Chemistry

COURSE CODE: CH215

Available from Chemistry department

COURSE: Metabolism

COURSE CODE: BS201

COURSE OBJECTIVES:

Develop the understanding of

Characteristic of Enzymes, enzyme inhibition and kinetics

- Carbohydrate metabolism, significance of glycolysis and ETC, untreated diabetes
- Lipid metabolism and production of ketone bodies
- Protein metabolism, role of urea cycle and errors of protein metabolism
- Biosynthesis and degradation of purine and pyrimidine

COURSE OUTCOMES (CO):

After completion of the course, a student will be able to

COURSE OUTCOME (CO)	DESCRIPTION
CO1	Characteristic of Enzymes, enzyme inhibition and kinetics
CO2	Carbohydrate metabolism, significance of glycolysis and ETC, untreated diabetes
CO3	Lipid metabolism and production of ketone bodies
CO4	Protein metabolism, role of urea cycle and errors of protein metabolism
CO5	Biosynthesis and degradation of purine and pyrimidine

COURSE: Biophysical Chemistry

COURSE CODE: BS202

COURSE OBJECTIVES:

Develop the understanding of

- Concept of electromagnetic radiation, absorption spectrum, Beer's law and Lamberts law
- Principle, working and applications of spectrophotometer and AAS
- Concepts of chromatography and concept of partition coefficient
- Principle, methodology and application of various chromatographic techniques
- Centrifugation and Electrophoresis-Principles and applications
- Importance of radioactivity in biological studies, GM counters and Scintillation counting.

COURSE OUTCOMES (CO):

After completion of the course, a student will be able to

COURSE OUTCOME (CO)	DESCRIPTION
CO1	Concept of electromagnetic radiation, absorption spectrum, Beer's law and Lamberts law, Principle, working and applications of spectrophotometer and AAS
CO2	Concepts of chromatography and concept of partition coefficient
CO3	Principle, methodology and application of various chromatographic techniques
CO4	Centrifugation and Electrophoresis-Principles and applications
CO5	Importance of radioactivity in biological studies, GM counters and Scintillation counting.

COURSE: Cell Biology and Genetics

COURSE CODE: BS203

COURSE OBJECTIVES:

Develop the understanding of

- Develop an understanding of the Cytoskeleton and Cell Membrane.
- Discuss the structure of Microtubules, microfilaments.
- Distinguish between the cellular organization of prokaryotic and eukaryotic cells
- Would have deeper understanding of cell at structural and functional level.
- Would have broad knowledge on the molecular interaction between cells.
- Would demonstrate a clear understanding of the signal transduction, secondary messengers.

COURSE OUTCOMES (CO):

After completion of the course, a student will be able to

COURSE OUTCOME (CO)	DESCRIPTION
CO1	Develop an understanding of the Cytoskeleton, Microtubules, microfilaments and Cell Membrane.
CO2	Distinguish between the cellular organization of prokaryotic and eukaryotic cells
CO3	Would have deeper understanding of cell at structural and functional level.
CO4	Would have broad knowledge on the molecular interaction between cells.
CO5	Would demonstrate a clear understanding of the signal transduction, secondary messengers.

COURSE: IPR and Biosafety

COURSE CODE: BS204

COURSE OBJECTIVES:

Develop the understanding of Intellectual property, IPR, Biosafety, GMO and biethics.

COURSE OUTCOMES (CO):

After completion of the course, a student will be able to understand

COURSE OUTCOME (CO)	DESCRIPTION
CO1	Develop an understanding of concept of Intellectual Property and its types
CO2	Would have broad knowledge on of various types of IPRs, its protection and infringement
CO3	Would demonstrate the understanding of International treaties and case studies
CO4	Would have a knowledge of Biosafety, GMOs and various Institutional committees
CO5	Would demonstrate a clear understanding of Bioethics and its legal implications

COURSE: Microbiology Lab

COURSE CODE: BS205

COURSE OBJECTIVES:

After completion of the course, a student will be able to develop the understanding of:

- basic microbiology and microbial processes.
- Instruments: Compound microscope, Autoclave, Hot air oven, pH meter, Laminar airflow and centrifuge
- Staining Techniques: Simple, Negative staining, Gram staining, Endospore staining, fungal staining.
- Enzyme assay and Biochemical tests–starch hydrolysis, gelatin liquefaction.
- Cleaning and sterilization of glass ware.
- Media preparation: Nutrients agar, Nutrient broth and LB. and Isolation of bacteria and fungi from soil/ air/water and other sources as *Rhizobium* from root nodules of legumes– dilution and pour plate methods
- Growth curve of bacteria
- Isolation and purification and estimation of DNA and RNA

COURSE OUTCOME (CO)	DESCRIPTION
CO1	Develop an understanding of Instruments: Compound microscope, Autoclave, Hot air oven, pH meter, Laminar airflow and centrifuge and Staining Techniques as Simple, Negative staining, Gram staining, Endospore staining, fungal staining.
CO2	Have knowledge of enzyme assay and Biochemical tests–starch hydrolysis, gelatin liquefaction. the cellular organization of prokaryotic and eukaryotic cells
CO3	Would have deeper understanding of processes involved in culturing of microbes as Cleaning and sterilization of glass ware, Media preparation: Nutrients agar, Nutrient broth and LB. and Isolation of bacteria and fungi from soil/ air/water and other sources as <i>Rhizobium</i> from root nodules of legumes– dilution and pour plate methods
CO4	Would have knowledge of Growth curve of bacteria
CO5	Would demonstrate a clear understanding experimental processes involved in Isolation and purification and estimation of DNA and RNA

COURSE: Cell Biology & Genetics Lab

COURSE CODE: BS206

COURSE OBJECTIVES:

Develop the understanding of

- Use of Micrometer and calibration, measurement of onion epidermal cells and yeast.
- Cell division processes : Mitotic and meiotic studies in grasshopper testes, onion root tips and flower bud
- Chromosomes: Mounting of polytene chromosomes, , Study of polytene chromosomes by slides
- Karyotype analysis – with the help of slides and how to make Blood smear – differential staining and Buccal smear – Barr bodies

COURSE OUTCOMES (CO):

After completion of the course, a student will be able to

Course Outcome (CO)	DESCRIPTION
CO1	Comprehend the use of Micrometer and calibration, measurement of cells.
CO2	Have knowledge and can evaluate Cell division: Mitosis and meiosis as in grasshopper testes, onion root tips and flower bud
CO3	Analyze Chromosomes.
CO4	Have knowledge of types of chromosomes as polytene chromosomes
CO5	How to make and analyze Blood smear – differential staining, Buccal smear – Barr bodies

COURSE: Immunology

COURSE CODE: BS 211

COURSE OBJECTIVES:

Develop the understanding of

- Basics of Immunology
- Types of Immune Responses:
- Antigens and Antibodies
- Histocompatibility
- Vaccines and Immunization

COURSE OUTCOMES (CO):

After completion of the course, a student will be able to

COURSE OUTCOME (CO)	DESCRIPTION
CO1	Know the history and scope of Immunology.
CO2	Understand the types of Immunity: Passive, Active, Innate and Acquired immunity, Humoral and Cell Mediated Immunity and the cell and organs of immune responses and their functions, B & T cells.
CO3	Have basic knowledge of Antigens as haptens, epitopes and Factors influencing immunogenicity, and Antibodies as their Structure, types, production and functions of immunoglobulins also about Clonal selection theory and Antigen Antibody reactions as Precipitation, Immunoelectrophoresis, Haem-agglutination, RIA and ELISA.
CO4	Comprehend Histocompatibility, structure of MHC class I, II & III antigens and their mode of antigen presentation, MHC restriction Complement system: Components, Classical and alternate pathways of complement activation, Hypersensitivity, Autoimmunity
CO5	Understand Passive and Active immunization, Types of Vaccines: Inactivated, Attenuated, Recombinant and Sub Unit Vaccines, Peptide and DNA Vaccines.

COURSE: Molecular Biology

COURSE CODE: BS 212

COURSE OBJECTIVES:

Develop the understanding of

- Concept of gene, pseudogene, cryptic gene and split gene
- DNA replication and regulation in prokaryotes and eukaryotes
- Transcription in prokaryotes and eukaryotes
- Translation in prokaryotes and eukaryotes
- Post translation and transcriptional mechanism
- Gene expression in prokaryotes using Lap operon and in Eukaryotes by Trp operon.

COURSE OUTCOMES (CO):

After completion of the course, a student will be able to have knowledge of

COURSE OUTCOME (CO)	DESCRIPTION
CO1	Concept of gene, pseudogene, cryptic gene and split gene
CO2	DNA replication and regulation in prokaryotes and eukaryotes
CO3	Transcription in prokaryotes and eukaryotes, Translation in prokaryotes and eukaryotes
CO4	Post translation and transcriptional mechanism.
CO5	Gene expression in prokaryotes using Lap operon and in Eukaryotes by Trp operon.

COURSE: Fundamentals of Environmental Biotechnology

COURSE CODE: BS 213

COURSE OBJECTIVES:

Develop the understanding of Environmental Biotechnology

- Bioremediation
- Waste Management
- Bioleaching
- Conventional and modern fuels

COURSE OUTCOMES (CO):

After completion of the course, a student will be able to

Course Outcome (CO)	DESCRIPTION
CO1	Have knowledge of the Modern fuels and their environmental impact – Methanogenic bacteria, Biogas, Microbial hydrogen Production, Conversion of sugar to alcohol Gasohol.
CO2	Comprehend the Structural and Functional dynamics of microbes, their diversity, activity and growth, community profiling their uses as biosensors, bioreporters, Microchips. Also know about Methanogenesis: methonogenic, acetogenic and fermentive bacteria- technical processes and conditions
CO3	Gain insight on Bioremediation and Phytoremediation of soil & water contaminated with oil spills, heavy metals and detergents and use of microbes in degradation of lignin and cellulose using and of pesticides and other toxic chemicals by micro-organisms, Degradation of aromatic and chlorinated hydrocarbons and petroleum products.
CO4	Have knowledge of treatment of municipal waste and Industrial effluents, Biofertilizers: Role of symbiotic and asymbiotic nitrogen fixing bacteria in the enrichment of soil, algal and fungal biofertilizers (VAM).
CO5	Have basic understanding of Enrichment of ores by microorganisms (gold, copper, and Uranium), Environmental significance of Genetically modified microbes, plants and animals.

COURSE: Industrial Biotechnology

COURSE CODE: BS 214

COURSE OBJECTIVES:

Develop the understanding of industrial aspects of biotechnology.

COURSE OUTCOMES (CO):

After completion of the course, a student will be able to

COURSE OUTCOME (CO)	DESCRIPTION
CO1	Understand the basics of industrial fermentation technology
CO2	Have knowledge of fermentation medium and sterilization techniques
CO3	Have knowledge of Industrial fermentation process, types of fermentation
CO4	Know the process development, upstream and downstream processing
CO5	Understand the production of Industrial fermented products

Course: Food Biotechnology

Code: BS215

COURSE OBJECTIVES

- This course aims to impart an insight into the classification, ingredients and additives of food.
- Importance of studying this paper is highlighted reflecting on the current changing needs of the students by providing latest information of food processing and preservation techniques.
- The students will acquire knowledge about the production of fermented food and beverages.
- The course also extends comprehensive knowledge about international and national food laws and standards.

Course Outcomes: After completion of the course, a student will be able to achieve these outcomes

COURSE OUTCOMES (CO)	DESCRIPTION
CO1	After the end of the course, the students will be able to recognize sources of microorganisms and food borne illness.
CO2	To learn food processing and preservation techniques.
CO3	Comprehend the interrelationships among different components of beverages technology
CO4	To learn about culture, microscopic, and sampling methods including membrane filters, microscope colony counts, most probable numbers, Direct microscopic count, Microbiological examination of surfaces and Air sampling
CO5	Understand the food laws and standards, Quality and safety assurance in food and dairy industry, BIS product certification and licensing quality systems.

COURSE: Immunology Lab

COURSE CODE: BS 216

COURSE OBJECTIVES:

Develop the understanding of

- basics of immunology
- Types of Blood grouping, cell counts
- Elisa, Ouchterlouny Double diffusion (ODD) and Separation of serum from blood & precipitation of Immunoglobulins

COURSE OUTCOMES (CO):

After completion of the course, a student will be able to

COURSE OUTCOME (CO)	DESCRIPTION
CO1	Analyze Blood grouping
CO2	Perform and analyze Differential Count of WBC, Detergent lysis of RBC
CO3	Perform and analyze Dot Elisa, ELISA
CO4	Have knowledge of and can perform Ouchterlouny Double diffusion (ODD) assay.
CO5	Perform and analyze separation of serum from blood & precipitation of Immunoglobulin.

COURSE: Industrial and Environmental Biotechnology Lab

COURSE CODE: BS 217

COURSE OBJECTIVES:

Develop the understanding of

- basics of Algal and fungal culture
- Estimation of Nitrogen, citric acid, lactic acid, heavy metals, BOD and COD
- Examination of bacteria by MPN Count Method

COURSE OUTCOMES (CO):

After completion of the course, a student will be able to

COURSE OUTCOME (CO)	DESCRIPTION
CO1	Culture Alge and fungi
CO2	Perform and analyze estimation of citric acid and lactic acid.
CO3	Perform and analyze estimation of Total Nitrogen by Kjeldahl method.
CO4	Have knowledge of and can perform Bacterial Examination of Water by MPN Count Method and estimate of BOD and COD (2 Samples)
CO5	Estimate heavy metals (Iron, chromium and arsenic) in water sample..

COURSE: Animal Biotechnology

COURSE CODE: BS301

COURSE OBJECTIVES:

The course has been designed to make students aware of

- basic animal biotechnology techniques
- their applications in Cell culture,
- Production of transgenic
- Expression of Cloned proteins and vaccines

COURSE OUTCOMES (CO):

After completion of the course, a student will be able to

COURSE OUTCOME (CO)	DESCRIPTION
CO1	get proper knowledge about the history and Scope of Animal Tissue Culture, Culture Media, Simulating natural conditions for growth of animal cells.
CO2	gain knowledge about Primary Culture, cell lines and Secondary Culture, transformed animal cells and continuous cell lines. Monolayer formation, Synchronization.
CO3	learn about transfection of animal cell lines, Selectable markers and Transplantation of Cultural Cells. Microinjection, In vitro fertilization and Stem cell technology.
CO4	learn about the basics of expression of Cloned proteins in animal cell and Production of Vaccines in animal Cells.
CO 5	have knowledge of Production and Applications of monoclonal antibodies, and Transgenic Animals

COURSE:Plant Biotechnology

COURSE CODE: BS302

COURSE OBJECTIVES:

The course has been designed to make students aware of basic plant biotechnology techniques and their applications in plant growth and development, and large scale production of natural products from plant source.

COURSE OUTCOMES (CO):

After completion of the course, a student will be able to

COURSE OUTCOME (CO)	DESCRIPTION
CO1	The students will get proper knowledge about the media preparation for In-vitro propagation of plants and different aseptic techniques used during preparation.
CO2	The students will learn the role of techniques haploid plant production and its significance.
CO3	The students will learn about the protoplast isolation and somatic hybridization of protoplast and its application.
CO4	The students will learn about the role of plant tissue culture in agriculture, horticulture and forestry
CO5	The students will learn about the transgenic plants and different strategies to make recombinant and its application.

COURSE: Genetic Engineering

COURSE CODE: BS303

COURSE OBJECTIVES:

The course has been designed to make students aware of

- DNA manipulative enzymes and Gene cloning vectors
- Screening and selection of recombinants
- Techniques used as Polymerase chain reaction (PCR), Site directed mutagenesis (SDM), Nucleic acid sequencing
- Application of r-DNA techniques

COURSE OUTCOMES (CO):

After completion of the course, a student will be able to

COURSE OUTCOME (CO)	DESCRIPTION
CO1	get proper knowledge about the DNA manipulative enzymes: Restriction enzymes and DNA ligases, and Gene cloning vectors.
CO2	gain knowledge about In vitro construction of recombinant DNA molecules, passenger and vector DNA, and Transformation
CO3	learn about screening and selection of recombinant host cells, Gene Libraries, cloning techniques, Expression of cloned DNA
CO4	Learn about the basics of Electrophoretic techniques, Polymerase chain reaction (PCR), Site directed mutagenesis (SDM), Nucleic acid sequencing: Blotting techniques.
CO 5	have knowledge of Application of r-DNA technique in human health, Production of Insulin, Production of recombinant vaccines: Hepatitis B, Production of human growth hormone.

COURSE: Medical Biotechnology

COURSE CODE: BS304

COURSE OBJECTIVES:

The course has been designed to make students aware of

- Zoonoses, Fungi and viruses,
- Pathology of diseases
- Therapies
- Medico-legal aspects

COURSE OUTCOMES (CO):

After completion of the course, a student will be able to

COURSE OUTCOME (CO)	DESCRIPTION
CO1	Get knowledge about classification of pathogenic microbes, protozoal parasites, and medical bacteriology.
CO2	Get to know about viral diseases and medical mycology and preventive measures.
CO3	To understand how blood cell are formed, blood cancer, about brain as well as brain tumour. Pathology of AIDS, Japanese encephalitis, yellow fever, dengue and TB.
CO4	To understand various therapeutics measures including antibiotics.
CO 5	To get knowledge about medico-legal aspects of medical biotechnology.

COURSE: Genomics, Proteomics & Metabolomics

COURSE CODE: BS305

COURSE OBJECTIVES:

The course has been designed to make students aware of

- Genome sequencing
- genome databases, Genome analysis
- Proteomics and Metabolomics

COURSE OUTCOMES (CO):

After completion of the course, a student will be able to

COURSE OUTCOME (CO)	DESCRIPTION
CO1	get knowledge of Genome sequencing and Sequencing technology.
CO2	gain knowledge about Major genome databases, Genome analysis and Comparative genomics Functional genomics
CO3	learn about basic proteomics technology
CO4	Learn about the basics of Technologies in metabolomics
CO 5	have knowledge of Applications of genomics and proteomics

Course: Applied Biotechnology**Course Code: BS306****Course objective:**

The objective of this course is to make students familiar with principle, methodology and application of

- Drug and target identification, target validation
- Bioprospecting and conservation: importance of biodiversity
- General theory of free radical and antioxidants
- Significance of IPR; Requirement of a patentable novelty and Detailed, information on
- patenting biological products and biodiversity

Course outcome:

COURSE OUTCOMES (CO):

After completion of the course, a student will be able to

COURSE OUTCOME (CO)	DESCRIPTION
CO1	get proper knowledge about Genomics and Proteomics and gene expression.
CO2	gain knowledge about Drug Discovery and Designing: Drug and target identification, target validation
CO3	learn about Bioprospecting and conservation: importance of biodiversity
CO4	Learn about the basics of Free Radical Biology: General theory of free radical and antioxidants
CO 5	have knowledge of Significance of IPR; Requirement of a patentable novelty and Detailed, information on patenting biological products and biodiversity.

COURSE: Tissue Culture Lab**COURSE CODE: BS307****COURSE OBJECTIVES:**

- Develop the understanding of Basics of Tissue and cell culture

COURSE OUTCOMES (CO):

After completion of the course, a student will be able to

COURSE OUTCOME (CO)	DESCRIPTION
CO1	Preparation of plant culture media and its sterilization

CO2	Initiation and maintenance of Callus and suspension Culture, cell culture
CO3	Plant propagation through axillary bud culture and adventitious bud culture.
CO4	Isolation of lymphocytes from blood samples. In vitro maintenance of helminth parasites.
CO5	In vitro germination of seeds.

COURSE: Genetic Engineering Lab

COURSE CODE: BS308

COURSE OBJECTIVES:

- Develop the understanding of Basics of RDT and PCR

COURSE OUTCOMES (CO):

After completion of the course, a student will be able to

COURSE OUTCOME (CO)	DESCRIPTION
CO1	Isolation of genomic DNA from bacteria, plant and animal tissue
CO2	Isolation of plasmid DNA (E. coli)
CO3	Restriction digestion of DNA
CO4	Agarose Gel Electrophoresis
CO5	Understand basics of PCR

COURSE: Bioinformatics

COURSE CODE: BS311

COURSE OBJECTIVES:

Develop the understanding of

- Basics of Application of Bioinformatics
- Sequence Formats
- Sequence Alignment
- Data mining
- Application of Bioinformatics

COURSE OUTCOMES (CO):

After completion of the course, a student will be able to

COURSE OUTCOME (CO)	DESCRIPTION
CO1	Know basics of Bioinformatics
CO2	Have knowledge of GenBanks, EMBL, DDBJ, Swissprot, PIR/NBRF, IG, GCG, FAST
CO3	Know about basics of Sequence Alignment
CO4	Get insight to to data mining, modeling and Data visualization,
CO5	Understand basics of Gene finding tools, Phylogenetic tree, Protein structure visualization, Protein structure prediction, homology modeling.

COURSE: Bionanotechnology

COURSE CODE: BS312

COURSE OBJECTIVES:

Develop the understanding of Basics of nanotechnology and overview of nanoscale materials, Nanomaterials: Biosensors: Biophotonics and Bioimaging and Principles of toxicology;

COURSE OUTCOMES (CO):

After completion of the course, a student will be able to

COURSE OUTCOME (CO)	DESCRIPTION
CO1	Basics of nanotechnology and overview of nanoscale materials,
CO2	Study of Nanomaterials:
CO3	Study of Biosensors:
CO4	Study of Biophotonics and Bioimaging
CO5	Study of Principles of toxicology;

COURSE: Entrepreneurship Development

COURSE CODE: BM337

Available from BM department

COURSE: Bioinformatics Lab

COURSE CODE: BS314

COURSE OBJECTIVES:

Develop the understanding of

- sequence databases, Retrieving sequences
- Simple sequence comparison using DOTPLOT
- Pair wise Sequence Alignment , FASTA & BLAST search, Multiple Sequence Alignment (ClustalX & Treeview)
- Protein Structure Visualization (RASMOL, Swiss-PDB Viewer)
- Gene Finding tools (Grail or Genscan)

COURSE OUTCOMES (CO):

After completion of the course, a student will be able to

COURSE OUTCOME (CO)	DESCRIPTION
CO1	Learn about types of sequence databases (Nucleotide & Protein)
CO2	Know about Retrieving sequences from the databases and simple sequence comparison using DOTPLOT
CO3	Have knowledge of Pair wise Sequence Alignment (NW and SW approach), FASTA & BLAST search and Multiple Sequence Alignment (ClustalX & Treeview)
CO4	Have basic knowledge of Protein Structure Visualization (RASMOL, Swiss-PDB Viewer)
CO5	Have basic knowledge about Gene Finding tools (Grail or Genscan)

COURSE: PROJECT WORK**COURSE CODE BS315**

COURSE OBJECTIVES: The main objective of this course is to acquaint the student with various techniques used in contemporary research in microbiology/biotechnology that will be useful in successful completion of their project work in the fourth semester.

Course Outcomes (CO):

After completion of the course, a student will be able to achieve these outcomes:

COURSE OUTCOME (CO)	DESCRIPTION
CO1	To develop synopsis of a defined research problem.
CO2	To conduct the bench work.
CO3	To prepare the research report and its oral demonstrations.

COURSE: Educational Tour

COURSE CODE BS316

COURSE OBJECTIVES:

The main objective of this course is to provide the students an exposure to various research activities and acquaint the student with state of the art technique/instruments used in various reputed research institutions and industries.

Course Outcomes (CO):

After completion of the course, a student will be able to achieve these outcomes:

COURSE OUTCOME (CO)	DESCRIPTION
CO1	To develop understanding of state of the art technique/instruments used in various reputed research institutions.
CO2	To develop understanding of state of the art technique/instruments used in various reputed research institutions. and industries
CO3	To prepare the tour report.