

GOVT. P.G. COLLEGE KHARGONE(M.P.)

DEPARTMENT OF BIOTECHNOLOGY

Programme Specific Outcomes and Course outcomes

Programme: B.Sc. Biotechnology (3YEAR)

PSO No.	Programme Specific Outcomes <i>Upon completion of the courses the student would be able to</i>
PSO-1	To gain the knowledge of advanced Biology through theory and practicals.
PSO-2	Decide and apply suitable tools and techniques in biotechnological manipulation (data analysis, soft skill, biotechnological manipulation, team work, laboratory documentation).
PSO-3	Understand and acquire knowledge on ethical legal issues, innovations in environment, health sector and agriculture; and there by implementation for finding sustainable solution to issues pertaining to environment upliftment.
PSO-4	Learn and identify the existing needs and narrow down their specific field of interest.
PSO-5	Able to equip her reading, presenting, oral, verbal and written scientific communication skills in focusing higher education.
PSO-6	Students can start their own business related to biotechnology as mushroom cultivation , plant tissue culture, food processing unit, alcohol production etc.
PSO-7	Gain knowledge on basic tools and techniques learnt for designing and performing new experiments.
PSO-8	Acquire in-depth knowledge of the process of developing new materials as well as gain expertise of well-defined area of research in Biotechnology.
PSO-9	To aquire awareness towards environment and biodiversity conservation
PSO-10	Understand the fundamental concepts in core courses such as basic science, cell biology, plant and animal biotechnology, r-DNA technology, microbiology, molecular biology and basic bioinformatics tools.

Course outcomes

B.SC. 1 YEAR (BIOTECHNOLOGY)

Course Title	BT101 – CELL STRUCTURE AND BIOLOGY
CO No.	Course Outcomes
CO-1	Differentiate between structural and functional details of prokaryotic and eukaryotic cells.
CO-2	Illustrate the detailed structural aspects of cell organelles.
CO-3	Exemplify the basic signal transduction and protein trafficking mechanism.
CO-4	Explain the ultrastructure and functions of the nucleus, mitochondria and chloroplast, ribosome, ER, etc.
CO-5	Categorize chromosomes based on their structural organization and specialized functions.
CO-6	Relate to the different stages of mitosis and meiosis.
CO-7	Explore the basis of cell cycle control mechanism and programmed cell death.
Course Title	BT102– MICROBIOLOGY
CO No.	Course Outcomes
CO-1	Explain the concept of microbial taxa, species and strains.
CO-2	Classify viruses based on their genetic material and host.
CO-3	Organize different bacterial strains based on classical and modern taxonomical methods.
CO-4	Demonstrate the methods of measuring bacterial growth and gene transfer mechanisms in bacteria.
CO-5	Distinguish antimicrobial agents based on their characteristics and mode of action and investigate drug resistance.
CO-6	Experiment with the existing applications of microbes and devise novel applications.
CO-7	Produce industrial value added products using microbial fermentation at a commercial level.

Course Title	PRACTICALS - I YEAR
CO No.	Course Outcomes
CO-1	To study basic structure of plant and animal cell.
CO-2	Classify acids, bases and buffers and explain the basic concept of pH determination.
CO-3	To study the basic staining methods as monochrome staining, negative staining, Gram staining etc.
CO-4	To prepare and study slide of stomatal cell.
CO-5	To know antibiotic sensitivity of microbes
CO-6	Isolation of microbes from water, air and soil
CO-7	Viable cell counting by using haemocytometer.
CO-8	To study microbial growth by streak plate, pour plate, and spread plate technique.
CO-9	Separation of amino acids by thin layer chromatography (TLC).

B.SC. II YEAR (BIOTECHNOLOGY)

Course Title	BT201– BIOPHYSICS AND BIOCHEMISTRY
CO No.	Course Outcomes
CO-1	Outline the chemical composition and properties of biomolecules.
CO-2	Demonstrate the structure, classification and metabolism of carbohydrates.
CO-3	Summarize and explain the structural conformations of proteins, their properties and metabolism.
CO-4	Illustrate nucleic acid metabolism and the classification and properties of vitamins and minerals.
CO-5	Classify lipids based on their structure, functions and properties and explain its metabolic pathways.
CO-6	Discuss the chemistry and functions of various vitamins and their sources.
CO-7	To study structure and function of different microscopes, spectrophotometer, and colorimeter.

Course Title	BT-202 BIOINSTRUMENTATION
CO No.	Course Outcomes
CO-1	Identify the underlying working principle of various lab instruments with their specific applications.
CO-2	Interpret the role of centrifugal and frictional force and the biological applications of centrifugation.
CO-3	Integrate the use of spectrophotometry for studying Lambert- Beer's law.
CO-4	Compare the principles and applications of various electrophoretic techniques as agar gel , agarose gel, SDS-PAGE etc.
CO-5	Integrate spectroscopic techniques in their research projects and utilize them to discover the structure of novel compounds.

Course Title	BT202- BIOINFORMATICS
CO No.	Course Outcomes
CO-1	Understand the history and basic concepts in Bioinformatics.
CO-2	Knowledge on the informative databases available for all the biological macromolecules.
CO-3	The global and local sequence alignment tools and their importance were conceptualized.
CO-4	Study of various protein structure prediction methods through computational approaches.
CO-5	Understanding the significance of gene prediction methods.
CO-6	Apply the tools and software in the analysis of nucleic acid and protein.

Course Title	BT-202 BIOSTATISTICS
CO No.	Course Outcomes
CO-1	Study on data collection, analysis, interpretation and documentation.
CO-2	Basics of calculating mean ,median and mode.
CO-3	Familiarize in the concepts of measures of central tendencies.
CO-4	Analysis of correlation and regression between two variables and perform hypothesis testing.
CO-5	Study the basic concepts and laws in probability distribution.
CO-6	Apply statistical hypothesis testing including Chi-square, F ^{cc} test, ANOVA in identification of significant relationship between two or multiple variables.
CO-7	Investigate the software packages in data analysis and evaluations.

Course Title	PRACTICAL -2 YEAR
CO No.	Course Outcomes
CO-1	Identify the underlying working principle of various lab instruments with their specific applications in research.
CO-2	Integrate spectroscopic techniques in their research projects and utilize them to discover the structure of novel compounds.
CO-3	Interpret the role of centrifugal and frictional force and the biological applications of centrifugation.
CO-4	Integrate the use of centrifugation principle for developing new instruments.
CO-5	Compare the principles and applications of various electrophoretic techniques and invent new applications for electrophoresis.
CO-6	Interpret and determine the relationship between data's by correlation and regression analysis in application with biomedical research.
CO-7	To study the effect of PH on enzyme activity.
CO-8	To learn Exercise based on standard deviation.
CO-9	To study the principle of R.B.C. -counting, W.B.C. -counting and differential counting.

B.SC. III YEAR(BIOTECHNOLOGY)

Course Title	BT 301-MOLECULAR BIOLOGY
CO No.	Course Outcomes
CO-1	Predict the structural and functional details of various cell organelles and their properties.
CO-2	Construct a model depicting the cell cycle and its regulatory mechanism.
CO-3	Illustrate the major components and pathways of cell signalling.
CO-4	Compare and contrast the signalling pathways of bacterial and plant systems.
CO-5	Differentiate the structure, function and numerical alterations of chromosomes in prokaryotes and eukaryotes.
CO-6	Reason out the mechanism of construction, damage and repair of DNA and interactions.
CO-7	Examine in detail the factors affecting the regulation of RNA and protein synthesis and their properties.
CO-8	Present an elaborate account on operons, insertional elements and transposons involved in recombination and interpret the mechanism of tumour formation.

Course Title	BT-301 GENETIC ENGINEERING
CO No.	Course Outcomes
CO-1	Examine the methods for the isolation, screening and preservation of industrially important microbial strains.
CO-2	Develop methods for improving increased yield and desirable characteristics of those strains.
CO-3	Explain the importance of fermentation and illustrate the various types of fermenters and their working principle.
CO-4	Investigate the mechanics involved in bioreactor design and operation and the role of computers in bioprocess control.
CO-5	Produce commercially valued fermentation products by manipulating and enhancing their recovery and purification methods.
CO-6	Demonstrate the process and applications of immobilized cells and enzymes
CO-7	Categorize the industrial scale production and therapeutic applications of enzymes and deconstruct the design of immobilized enzyme reactors.
CO-8	Criticize the distinct forms of IPR and their applications.

Course Title	BT 302- IMMUNOLOGY
CO No.	Course Outcomes
CO-1	Outline and classify the types and major components involved in immune response at the cellular and molecular levels.
CO-2	Differentiate the mechanism of cell mediated and humoral immune response.
CO-3	Examine the structure and function of complements and MHC molecules and investigate the role of HLA complex in human.
CO-4	Delineate the role of immunosuppression in organ transplantation and the importance of tissue typing tests.
CO-5	Outline the basic mechanism of immune tolerance and distinguish between autoimmunity and hypersensitivity reactions.
CO-6	Associate with the various players involved in immune response to viral, bacterial, parasitic and acquired infectious diseases.
CO-7	Discuss in detail the concept of immune surveillance and the pattern of response to tumours, their immunodiagnostic and therapy.
CO-8	Formulate new diagnostic and therapeutic techniques by developing a thorough knowledge of antigen –antibody interactions and their applications.
CO-9	Types of immune cells and their structure as T-CELL, B-CELL etc.

Course Title	BT-302– PLANT BIOTECHNOLOGY
CO No.	Course Outcomes
CO-1	Explain in detail the organization of plant genome and demonstrate the basic practices and techniques of plant tissue culture.
CO-2	Preparation of plant tissue culture media. (M.S.- media, Gamborg's B-5 media)
CO-3	Outline the methodology and the wide applications of transgenic plants for various purposes.
CO-4	Produce transformants by employing ssed culture, pollen culture,ovary culture,etc.
CO-5	Generate stress and pathogen resistant varieties of plants for enhanced agricultural benefits.
CO-6	Appraise the industrial applications of plant biotechnology in the production of value added agroindustrial products.
CO-7	Critically evaluate the hazards of plant biotechnology and the threats to biosafety and propose strategies to address those issues.
CO-8	Relate to the various regulatory frameworks involved in marketing hybrids.
CO-9	Experiment with the concept of somatic hybridization and investigate its applications.

Course Title	BT302– ANIMAL BIOTECHNOLOGY
CO No.	Course Outcomes
CO-1	Implement the basic tools and techniques of animal cell culture for the development and maintenance of lab based and large scale culture of animal cell lines.
CO-2	Identify the methods used for the construction of vectors and investigate the methods used for producing recombinant vaccines.
CO-3	Outline the basic gene transfer techniques and produce transgenic animals.
CO-4	Examine the role of gene transfer techniques in artificial reproductive techniques.
CO-5	Compare and contrast the types, preparation and application of different types of stem cells and integrate them in research.
CO-6	Interpret the basic concept a key players involved in gene therapy and analyze the targeted gene knockout and delivery mechanisms for producing novel engineered genes.

Course Title	BT302– APPLIED BIOTECHNOLOGY
CO No.	Course Outcomes
CO-1	Produce industrial value added products using microbial fermentation at a commercial level.
CO-2	Implement the basic tools and techniques of animal cell culture for the development and maintenance of lab based and large scale culture of animal cell lines.
CO-3	Interpret and produce transformants by employing the various gene transfer techniques and plant viral vectors.
CO-4	Design an experiment to produce recombinant proteins, vaccines and pharmaceutical compounds.
CO-5	Investigate the mechanics involved in bioreactor design and operation, the role of computers in bioprocess control, fermentation technology and expand their industrial applications for the production of novel products
CO-6	Discuss the basic concept of obtaining Patents and Copyrights and their underlying regulations.

Course Title	PRACTICAL -3 YEAR
CO No.	Course Outcomes
CO-1	Demonstration of basic fermentor design and PCR
CO-2	Differentiate various types of cloning and expression vectors and integrate them in research.
CO-3	Chromosomal DNA isolation from plant, animal and bacterial cell
CO-4	Estimation of DNA by DPA method and RNA by orcinol method.
CO-5	Design an experiment to produce recombinant proteins, vaccines and pharmaceutical compounds.
CO-6	Construct novel engineered proteins used in medicine and agriculture using transgenic animal models.
CO-7	Experiment with new molecular tools employed in rDNA technology.
CO-8	To study types of blood cells and blood groups.
CO-9	To learn the basic principle and technique of Gradient plate technique.
CO-10	Preparation of M.S. – media and its uses in plant tissue culture technique.

