

B.Sc. Biotechnology

Program Specific Outcomes

PSO1 Students will be able to design, conduct experiments, analyze and interpret data for investigating problems in Biotechnology and allied fields.

PSO 2 Demonstrate proficiency in basic science and foundation biotechnology course.

PSO 3 Demonstrate a working knowledge of advanced biological sciences.

PSO 4 Demonstrate competence in application of engineering principles to biological systems.

PSO 5 Higher education preparedness: Demonstrate an ability to appear for National level examination to pursue higher studies. Demonstrate practical and theoretical knowledge essential for pursuing higher studies. Several career opportunities are available for students with a biotechnology background abroad especially in countries like Germany, Australia, Canada, USA and many more where biotechnology is a rapidly developing field after perusing their higher education.

PSO 6 Biotechnology industry-oriented preparedness: Demonstrate an ability to identify careers in biotechnology, domain like Pharmaceutical, Food Industry etc, and skills required to work in a biotechnology laboratory or manufacturing facility.

PSO 7 Some of the major pharmaceutical and drug companies' hiring biotechnological professionals include Dabur, Ranbaxy, Hindustan Lever and Dr Reddy's Labs, food processing industries, chemical industry and textile industry as well. Beside this industries also employ bio- technological professionals in their marketing divisions to boostup business in sectors where their products would be required.

PSO 8 Association activities Genes association of our department will carry out active research with illustrations from different spectrums in the field of Biotechnology. The association will also organize special guest lectures regularly with eminent resource persons from industry and academia.

PSO 9 Entrepreneurship ventures such as consultancy and training centers can be opened

Course Outcomes of B.Sc. Biotechnology

B.Sc. Biotechnology is a 6-semester program conducted by Dr. Ambedkar College, Deekshabhoomi, Nagpur as per the syllabus provided by Rashtrasant Tukadoji Maharaj Nagpur University, Nagpur. Each semester students have to take two theory papers and one Practicum based on two theory papers.

B.Sc. Biotechnology

Semester I

PAPER 1-MICROBIOLOGY

Course objectives: To give students a generalized idea about microbiology its basic aspects so that they can be able to relate them with their upcoming research projects in BSC and can use microbes in their research purposes. Students will gain awareness about the microbes present in the environment and their impact. Course will provide practical knowledge about different types of bacteria, virus and fungi found in environment.

Course outcomes: On completion of this course students will be able to

CO1 Recognise the contribution of major scientist in the development of microbiology and will be understand and apply the principle of various types of Microscope and staining techniques.

CO2 Identify and describe bacterial morphology and subcellular structure including genetic material and its endospore generation.

CO3 Understand the classification of microorganisms through Bergey's manual and describe general characteristics and classification of viruses.

CO4 Students can and apply basic knowledge of nutrients required by different microorganisms for their growth

PAPER 2-MACROMOLECULES

Course objectives: To make students aware and to give them the basic knowledge of different macromolecules like nucleic acids protein which are the basis of existence of the cell.

Course outcomes: On completion of this course students will be able to

CO1 Describe the structure and function of DNA and RNA in the cell

CO2 Understand the concept of Gene and describe the structure and function of chromatin.

CO3 Recognize the structure of amino acid and classifies them on the basis of physicochemical properties and comprehends the primary structure of the protein.

CO4 Describe the three-dimensional structure of proteins, including the significance of amino acid R-groups and their impact on the three-dimensional structure of proteins.

Semester II

PAPER 1-MICROBIOLOGY AND CELL BIOLOGY

Course objectives: The objective of this course is to have a firm foundation in the fundamentals of Cell Biology. Deep understanding of the advantages and hazards of the microbial world. Advanced knowledge of growth and control microorganisms for wealth production. This course will aid students to acquire skills and competency in microbiological laboratory practices applicable to microbiological research or clinical methods, including accurately reporting observations and analysis.

Course outcomes: On completion of this course students will be able to

CO1 Understanding of the different aspects of microbial growth and the concept of pure culture

CO2 Understand and apply the concept of microbial control and the mechanism of cell injury.

CO3 Identify and summarize the structure and function of eukaryotic sub-cellular structures.

CO4 Understand the structure and function of Plant cell walls and cytoskeleton and can reflect on the process in cell division. And the activity of muscle and nerve cell structure.

PAPER 2-CELL CONSTITUENTS AND ENZYMOLOGY

Course objectives: The objective of this course is to familiarize students with the Biomolecules, enzymes, and related mechanisms through which they work. Upon successful completion of this course, the student will learn, the major classes of enzymes and their functions in the cell. The course also provides information pertaining to the role of the co-enzyme cofactor in enzyme-catalysed reactions, properties of enzymes, and regulation of biochemical pathways. Differentiate between equilibrium and steady-state kinetics and analysed simple kinetic data and estimate important parameters (K_m , V_{max} , etc).

Course outcomes: On completion of this course students will be able to

CO1 Define and classify carbohydrates and understand the structure and function of different polysaccharides.

CO2 Understand and illustrate the structure of lipids and their function in biology.

CO3 Understand and describe the terminology and concepts related to enzymology.

CO4 Explain the phenomenon behind enzyme assay and derive the kinetic equations related to enzymes.

Semester III

PAPER 1- METABOLISM

Course objectives: To acquaint students with the concept of bioenergetics and various metabolic processes taking place inside the human body.

Course outcomes: On completion of this course students will be able to

CO1 Comprehend the concept of bioenergetics, various terminologies related to it and the concept of high-energy molecules and bonds

CO2 Develop an understanding of various metabolisms in cell

CO3 They will know the formation and the breakdown of different biomolecules and the places where it took place

CO4 Various physiological and pathological aspects of byproducts of metabolic pathways and their regulations relate with various industrial processes.

PAPER II –BIOPHYSICAL TECHNIQUES

Course objectives: The objective is to enrich students' knowledge about various techniques used in biological research and also their implementation in various fields of research.

Course outcomes: On completion of this course students will be able to

CO1 Understand and illustrate the principle and functioning behind spectrophotometry.

CO2 Enumerate the application of UV -Vis spectrophotometry and comprehend principles of other spectrometric methods.

CO3 Understand and illustrate the principle and functioning behind Chromatography.

CO4 Distinguish between different types of chromatography techniques.

Semester IV

PAPER I – IMMUNOLOGY

Course objectives: The objective of this course is to familiarize students with the Immune system, hypersensitivity and vaccination, Immune Effector Mechanisms, hybridoma technology, and various Immunotechniques and immunodiagnosis. The course will provide technical knowledge as to how different diseases are caused and various responses mediated by living cells to combat pathogen attacks. The course will provide a sound knowledge of how the immune system deals with various pathogens, different processes and cell types involved in prevention of disease. Along with this the students will become aware about concept, synthesis and action mechanism of vaccines.

Course outcomes: On completion of this course students will be able to

CO1 Understand and explain immune system, properties of immune system, types of immunity, pathways of complement systems

CO2 Know the concept of antigen, antigenic determinants, haptens, and factors affecting antigenicity in various diseases.

CO3 Know immunoglobulin, structure, types, and functions and can apply the concept of Hypersensitivity and vaccination while observing the different diseased situations

CO4 Perform various immunological techniques.

PAPER II –BIOSTATISTICS AND BIOPHYSICAL TECHNIQUES

Course objectives: The objective is to enrich students' knowledge about various techniques used in biological research and also their implementation in various fields of research. At the end of this course, students would be able to understand the principle, working, maintenance, and calibrations of bioanalytical tools and techniques for industrial and research purposes.

Course outcomes: On completion of this course students will be able to

CO1 Students will know and apply the concept of electrophoretic mobility, migration of ions in an electric field various type of electrophoretic techniques, their procedure, principle, and applications

CO2 Students will use detection and recovery methods of various macromolecules by electrophoretic methods by knowing their advantages and limitations.

CO3 Students will have an insight into the isotopic tracer technique and centrifugation their uses, different isotopes and their use in radiology, limitations and principle of tracer technique, limitations and application part of it, scintillation counters and can relate them with various tests performed during diagnosis of various disease like cancer.

CO4 Students will apply the basic concept of biostatistics for various research purposes.

Semester V

PAPER I - MOLECULAR BIOLOGY

Course objectives: To acquaint the students with basic and advanced knowledge of molecular biology.

Course outcomes: On completion of this course students will be able to

CO1 Understand and comprehend molecular biological processes like DNA replication and summarize the experiment proving its semiconservative nature.\

CO2 Illustrate the concept of mutation and DNA repair

CO3 Recall the steps and factors involved in the enzymatic synthesis of RNA

CO4 Describe the details of transcription termination, the concept of reverse transcription and regulation of prokaryotic transcription.

PAPER I - MOLECULAR BIOLOGY rDNA TECHNOLOGY

Course objectives: To make the students familiar with the translation machinery and concept of rDNA technology and their application in advanced research.

Course outcomes: On completion of this course students will be able to

CO1 Explain the concept of genetic code, decoding system, codon-anticodon interactions, selection of initiation codons,

CO2 Explain the concept of Initiation, elongation, termination, and also the regulation of translation

CO3 Students can give an introduction to rDNA technology, the basics of genetic engineering, various enzymes, the concept of different vectors and their applications and can apply them further.

CO4 Apply the concept of PCR, its applications, general features of expression vectors- advantages and problems, and various applications of r-DNA technology while performing experiments in r-DNA technology.

Semester V

PAPER I - APPLICATIONS OF BIOTECHNOLOGY

Course objectives: To give insight and advanced learning of the application of Biotechnology in research development in various fields.

Course outcomes: On completion of this course students will be able to

CO1 Understand the process of water and waste water treatment process and able to define and describe the concept of biodegradation, biodeterioration and biotransformation.

CO2 Understand the concept of Xenobiotic and recalcitrant compounds and reflect on assessment of water and wastewater quality.

CO3 Comprehend the basic principles of Industrial Biotechnology

CO4 Comprehend the basic principles of Food Biotechnology

PAPER II-PLANT AND ANIMAL BIOTECHNOLOGY

Course objectives: To make students aware of various tissue culture techniques and their application in biotechnology for commercial purposes. To acquaint students with applications of genetic engineering like transgenic plants, animals. The course will provide complete exposure to how plant and animal cells are isolated, cultured, and genetically manipulated in the laboratory. Also, the course will provide information how cell suspension cultures can be utilized for molecular farming for commercially synthesizing products such as vaccines, hormones, proteins, enzymes, etc

Course outcomes: On completion of this course students will be able to

CO1 Describe and compare different plant tissue culture techniques.

CO2 Describe different plant biotechnology techniques and justify their application.

CO3 Describe and compare different Animal Cell culture techniques and laboratory management.

CO4 Describe different Animal biotechnology techniques and justify their application.