

NIZAM COLLEGE(AUTONOMOUS)
DEPARTMENT OF BIOTECHNOLOGY

COURSE OUTCOME

SEMESTER I

Paper I: Fundamentals of Biotechnology

Content: Introduction to biotechnology, ultrastructure of prokaryotic and eukaryotic cell, cell division and cell cycle and their significance. Outlines of classification of microorganisms and growth requirement of bacteria, reproduction and growth kinetics, microbial techniques like media preparation, types of media, sterilisation and preservation of bacterial cultures, modes of reproduction, structure of DNA and types of RNA, forms of DNA, models of DNA replication, DNA damage and repair

Scope: This course is designed to provide fundamental knowledge of microbiology, cell biology and molecular biology. It recalls the previous knowledge of the students regarding the subject and helps them to understand the concept of the course. The microbiology aspect of this course helps the students have a thorough understanding of the microbiology and cell biology including the prevention and control of infections and diseases and also have a good opportunity in quality control in pharma industry for checking the signs of contamination. Molecular biology is the branch of biology that deals with the study of the structure and function of living system at the molecular level. Molecular and cell biologists find the employment opportunities in research labs or in R &D departments in various private drug companies.

SEMESTER II

Paper II: Fundamentals of Biotechnology II

Content: Laws of Mendal, epistasis, multiple alleles, pedigree analysis, maternal inheritance, linkage, crossing over and recombination, mechanism of sex determination in Drosophila, sex linked inheritance, measures of central values, sampling, probability, chi square test, biological data bases, bioinformatics resources, sequence analysis and phylogeny, drug discovery.

Scope: The course is oriented to offer the fundamentals of genetics, statistics and bio informatics. Genetics is the field of biology that studies genes, inheritance pattern, genetic variation. The genetics aspects of this course helps the students have a thorough understanding of genetics, statistics and bioinformatics, helps them to evaluate the test samples of DNA and diagnose the patients who have hereditary diseases, gene mutations and genetic risk, they can council the patients that have familial or personal histories of inherited diseases and the course also provides the basic knowledge of the statistics and develops the mathematical ability by making them solve the problems based on inheritance mechanism. Bioinformatics deals with the structure of biological molecules and its activity or function and helps the students to seek the job opportunities in research labs and in pharma companies for applied research on diseases and drug discovery

SEMESTER III& IV

PAPER III & PAPER IV: **BIOCHEMISTRY AND BIOPHYSICAL TECHNIQUES**

Biochemistry is a branch of science which deals with the chemistry of living organisms and that of their biological processes. Biochemistry will improve the person's ability to comprehend the chemical combinations and reactions that will take place because of the biological processes such as growth, reproduction, metabolism, heredity, etc. One arena of the science will also look into the effect that the organism has on its **environment**.

Scope:

Study the structures and functions of *enzymes, proteins, carbohydrates, fats, process of metabolism* and the molecular basis of the action of genes also form a part of biochemistry. Today the field is gaining momentum and importance because of its ability to make significant contributions towards illumination and grasping of the **DNA Structure** related research works. Biochemists can choose from a variety of specializations and almost all the specializations require good **research techniques** and the ability to combine and analyze information.

Job Prospects

With the world evolving day in and day out, there is an intense need to understand the organisms evolving with it and also the role these organisms have on the environment. A biochemist can think of working with fields in *medical, agriculture, public health care, forensic environment* etc. Because of the nature of work there is a tremendous scope of research. One can think of working with both **public and private sectors**. Companies like Medical Instrument companies, Biotechnology, Food and Drink industries, Research Companies and Laboratories, Sales and Marketing Firms, Chemical manufacturing companies, Health and Beauty Care, etc. are always in constant need of people to come work with them.

There is also another field biophysical chemistry where there is always need for experts in the field of Biochemistry and technology which is the quality control and safety section. Almost all companies in the field of food, pharmaceuticals, health and beauty care, etc required safety checks, regulations and quality control are work on various bio physical techniques.

SEMESTER V

Paper V (MOLECULAR BIOLOGY)

Content: Prokaryotic ,viral, eukaryotic, organellar genomes, chemical composition of DNA, reassociation kinetics of DNA, kinetic classes of DNA, molecular organization of chromosomes, euchromatin and heterochromatin, gene and gene numbers, gene families and clusters ,specialized chromosomes, exons, introns, promoters, terminators, transcription in prokaryotes and eukaryotes, post transcriptional modifications , translation in prokaryotes and eukaryotes, regulation of gene expression in prokaryotes and eukaryotes.

Scope: This course of molecular biology deals with the advance concepts to make the students to develop scientific temper and better understanding of the subject. The molecular biology aspect of this course helps the students have a thorough understanding of the molecular biology of the gene. This further gives the concepts of transcription and translation and expression of genes

Paper VIA (MEDICAL BIOTECHNOLOGY)

Content: Classification of chromosomes, numerical and structural chromosomal disorders, gain of function, loss of function mutations, dynamic mutations, mitochondrial diseases, immune pathology, hepatitis, HIV, autoimmune disorders, clinical management and metabolic manipulation, gene therapy, vectors used in gene therapy, stem cells, prenatal diagnosis, microarray technology, gene products in medicine and DNA based vaccines.

Scope: This course is framed based on necessity of knowing the human genetic disorders has the genetic disorders are not curable, thus prevention is the only option to make a perfect human race. The management of the disorders, risk and preventive measures with sophisticated gene therapy techniques are dealt in this course. It leads to the application of previous knowledge in advance studies.

Paper VIB (BIOPROCESS TECHNOLOGY)

Content: Introduction to fermentation, historical perspectives of fermentation technology and its applications, design of fermentor, an overview of upstream and downstream processing, types of bioreactors, media composition and formulation, bioprocess control and instrumentation. Downstream processing and its steps like foam separation, cell disruption, product isolation, purification techniques and product polishing.

Scope: This course is framed based on necessity of knowing the basics of fermentation technology and its design and their function. This course also gives the basic knowledge on product development by learning different separation, isolation, purification techniques and product polishing. It helps in making the students to gain the entrepreneur skills at the industrial level.

SEMESTER VI

Paper VII (GENETIC ENGINEERING AND IMMUNOLOGY)

Content: Enzymes used in gene cloning, properties of cloning vectors, plasmid vectors, phage vectors, cosmids, shuttle vectors, construction of genomic and c DNA libraries, selection of recombinant clones, principles and applications of PCR technology, DNA finger printing technique and its applications, applications of genetic engineering, innate and acquired immunity, introduction to immune system, antigens, structure and function of different immunoglobulins, antigen-antibody reactions, the MHC complex, hypersensitivity, autoimmune diseases.

Scope: This course is framed based on necessity of knowing the basics of genetic engineering and immunological techniques. It gives the basic knowledge on designing the transgenic plants and its application in agriculture and in therapeutics for the production of vaccines. It also helps in knowing the different immunological techniques for the diagnosis of different diseases.

Paper VIIIA (ANIMAL AND INDUSTRIAL BIOTECHNOLOGY)

Content: Introduction and scope of animal biotechnology, animal cell culture, primary cell culture techniques, establishment and preservation of cell lines, methods of gene transfer in animal in animal cells, production of transgenic animals and molecular pharming, transgenic models for studying diseases, introduction and scope of industrial biotechnology, primary and secondary metabolic products of microorganisms, screening, types of fermentation, methods of immobilization and application of immobilized cells, production of alcoholic beverages, chemicals, therapeutic proteins and enzymes.

Scope: This course is framed based on necessity of knowing the basics of animal and industrial biotechnology. It gives the basics of fermentation technology and its applications. It helps in making the students to gain the entrepreneur skills at the industrial level. It gives the basic knowledge on designing.

Paper VIIIB (PLANT AND ENVIRONMENTAL BIOTECHNOLOGY)

Content:

Composition, preparation and sterilisation of media, role of micronutrients and plant growth regulators in differentiation, induction of callus, meristem culture and production of virus free plants, clonal propagation plants on a commercial scale, mass cultivation of cell cultures and process engineering, production of useful compounds by plant cell cultures, bioreactors, application of recombinant DNA technology in agriculture, renewable and non renewable energy resources, conventional and non conventional energy sources and their impact on environment, microbiological quality of milk, food and water, microbial treatment of municipal and industrial effluents, biopesticides, biofertilisers and bioremediation.

Scope: This course is designed to provide the basic knowledge of propagating plants by using tissue culture techniques for the production of hybrid varieties and maintaining extinct plants species viable. It also helps in knowing the production of different secondary metabolite products by plant cells which has

a lot of applications in therapeutics for different biological functions. It also helps in gaining the skills for the entry into the industrial sector. Environmental biotechnology has a wide application in gaining the skills for maintaining the biotic and a biotic environment ecofriendly and it also helps in estimating the and knowing the different adulterants that causes milk, food, water contamination.

INTERDISCIPLINARY PAPER (CBCS)-BIOTECHNOLOGY

SEMESTER-IV (SKILL ENHANCEMENT COURSE)

Content:

UNIT I: FUNDAMENTALS OF BIOTECHNOLOGY

UNIT II: MOLECULAR BIOLOGY

UNIT III: RECOBINANT DNA TECHNOLOGY

UNIT IV: APPLICATIONS OF BIOTECHNOLOGY

Scope: The ID paper designed keeping in view the students belonging to arts and commerce to create awareness of Biotechnology. This course provides basic knowledge of microbiology, molecular biology, rDNA technology and environmental biotechnology. It also helps the students to have a thorough understanding of molecular biology of gene and its functions and effects of gene mutations for the development of different inherited diseases. The r DNA technology creates the awareness to the students of how we produce different Novel products useful to the human society.