

Department of Biotechnology
Dr L B College of Arts & Sciences (PG)
Visakhapatnam

1. PROGRAM OBJECTIVES

1. To provide knowledge based education as per academic curriculum
2. To implement the basic understanding of the conceptual biology to succeed in AU exams as well as in prestigious competitive exams such as CSIR (NET), APSET, DBT GATE, ICAR, ICMR to name few.
3. To emphasize the use of advanced learning techniques in biology and computer through internet tools.
4. To inculcate the culture of scientific quest through journal reading and pursuit a career in research and upgrade knowledge with reference to current developments in Science & Technology
5. To develop independent learning skills ie from cell, microbiology, tissue culture to production technology, in vitro fertilization (IVF) technology to Bioinformatics, as included in biotechnology curriculum.
6. To inculcate the lab skills in students to acquire jobs in food, pharmaceutical industries, medical diagnosis and in research and development, to match the needs of the the flourishing industries.
7. To impart an atmosphere of competence to excel in career (events conduct), students are mentored to participate and present research papers at National Seminars and Models in Academic Exhibitions.
8. To inculcate the skill of advanced lab techniques, the training is mandatory. (PCR and Bioinformatics).
9. To impart the zeal and enthusiasm towards job, R & D programmes various academic extension programs are included. (Guest lecture, seminar, poster presentation, Quiz competition, CSIR orientation)
10. To provide students the career opportunities and future placements.
11. To train the minds in applying knowledge in day to day life and its implementation in problem solving in industries

2.PROGRAMME OUTCOMES/ EXPECTATIONS

A student of MSc Biotechnology is expected to .. /has been successful in.. above objective

1. Gain essential knowledge and concepts of biotechnology and related areas. The results of the students have been in the range of 79-100 %
2. Students have been able to qualify APSET and other PhD program entrance exam. Library source and materials for the competitive exams are supplied to aspirants.
3. Acquire MS excel, power point presentation as trained in SDC. Few students are selected in campus interviews. They attain proficiency in Bioinformatics tools and molecular techniques through workshops, practical lab work and projects.
4. Actively participated in national and international conferences, presented poster as well as scientific research paper. Students have volunteered in organizing ESMEB national Seminar.
5. Students visit PCR diagnostic labs in various academic and research institutes. They acquire robust lab skills in cytology, cell culture, microbial culturing, Biochemical analysis, plant tissue culture, environment monitoring, enzymology, immunological techniques, molecular and genetic engineering and fermentation technologies.
6. Acquired jobs in various PCR diagnosis (CoViD Labs), QC labs in various pharmaceutical industries in Hyderabad and Visakhapatnam.
7. Students Participated and volunteered in Intercollege competition programs conducted (Biosolutions 2016, Biomanagers-2017, Workshop and training program in Mushroom cultivation 2018-19 Biofest 2020).
8. Students attends Academic projects training in industries/labs for a period of 45 days and submit project at the end of 4th semester.
9. Students attended nearly **10 Guest lectures, Cancer** awareness program, **one Two day-national seminar**, 2 national webinar (CHOBiCP 2020, WDD-2020 and WED-2021), two poster presentation, 1 E-Quiz competition (WDD-2020) that have been organized in the department.
10. Students acquired jobs through placement cell as well as open campus interviews in Pfizer, Shanta biotech, MSN pharma company, Bio-Pharma, chaitanya techno school proving their competence.
11. Add on programs in form of “hands on training” and “DIY program are in progress throughout the year. Production of viable ecofriendly Bio-products such as flower are standardized. The innovative ideas with an entrepreneurship orientation and latest demand technologies are given priority.

3. Course Objectives Summary

The biotechnology program includes in depth study of various key areas in biology and upcoming technologies that included cell biology, microbiology and genetics, biomolecules and analytical techniques in first semester. Followed by Enzymology, molecular biology, genetic engineering and immunology in the second semester. The third semester course includes applied areas relevant to industrial application i.e., Cell culture technology and tissue engineering, plant and animal biotechnology, medical and environmental biotechnology has. The Fourth semester course is designed with an objective to inculcate the direct implication of biotechnologies based on the foundation of previous semester i.e., heterologous gene expression, biostatistics and bioinformatics.

OUTCOMES of the courses in biotechnology-Summary.

1. To prepare students for careers of constructive service to society in academia (UGC, DST), government (DBT), industry (BARC, TIFR, CCMB, Bharat Biotech etc) and health related fields (NIN, NCCS, NII, NIV etc.)
2. To engage committed students in areas not experienced in their previous academic lives and to bring them to a baseline that will allow them to conduct translational research.
3. To provide interdisciplinary research and educational opportunities to solve problems that will improve the quality of life for those suffering from health-related diseases and disorders.
4. The main objective is to offer a broad view of biotechnology, integrating historical, global current and future applications in such a way that its global applications and expected developments could be discussed based on sound knowledge.
5. Learn about the Interaction of Computer and Biology and its application in bioscience.

COURSE OBJECTIVES AND OUTCOMES PAPER WISE

BT1.1.Cell biology

To understand the basic unit of the organism.
To differentiate the organisms by its cell structure.

To know Components of the Cell and their division.

OUTCOMES

Students can apply the knowledge in area of cytogenetics and research.
Understand the biological significance of every cell with the evolution.
The knowledge of cell division helps learning the growth behaviour of a normal and abnormal cells

BT1.2 Biomolecules

OBJECTIVES

- To explain the properties of Biomolecules
- To describe the conversion of Biomolecules into Energy.

To understand the significance of carbohydrates and lipids in function of energy reservoir of cell and structural components proteins and nucleic acids as building block.

Understand the role of vitamins, hormones in efficient functioning of metabolic reactions.

The interaction of all the biomolecules is understood in a Biosignalling.

OUTCOMES

The knowledge of biomolecules can be applied in clinical evaluation of the body fluid

The subject has immense application in clinical and molecular diagnosis.

BT1.3 Microbial physiology and Genetics

OBJECTIVES

To gain knowledge about principle and application of various types of Microscopy.

To Classify and explain the structure and general characteristics of Microorganisms.

To prepare various Bacteriological, Algal, and Fungal Media and culture microbes.

To explain the arrangement of Genes and their interaction.

To describe the influence of environment on gene expression.

To understand extra nuclear inheritance, linkage & crossing over.

OUTCOMES

Finds application in quality control of food, water, drugs and the environment in a health care related labs.

Biosafety labs have an immense application

The knowledge gain will enable student to understand the genetic diseases diagnosis and therapeutics designing in research

BT1.4. Analytical techniques:

To describe the biophysical techniques for the Isolation, Identification and Quantification of Biomolecules.

To understand the use of various instruments such as automated balance, incubator, spectroscopy, pH meter, microscope, chromatographs and electrophoresis units.

OUTCOMES

Students can apply the knowledge to operate the instruments used in clinical labs and in research labs.

BT2.1 Enzymology and metabolism

To learn the role of enzymes as biocatalyst and its behavior in changing physiochemical environment

To study the enzyme kinetics and its interpretation in terms of metabolic reactions

To learn about the catabolic reaction. The house keeping energy generation reaction cycles in aerobic and anerobic conditions by means of Glycolysis, TCA cycle, Beta oxidation

To learn about the pathways involved in Anabolic reaction of aminoacids, vitamins, nucleic acid and carbohydrates

OUTCOMES

Can apply the knowledge in industrial enzyme production and its optimization.

Can use the enzymes as tools to catalyse biochemical reaction, therapies and textile industries etc

BT 2.2: MOLECULAR BIOLOGY OBJECTIVES

To know the structure of nucleic acid, types of Nucleic acid and its Forms.

To describe Nucleic acids Replication, Recombination and its Repair Mechanisms.

Familiarize students with the cell and molecular biology of both Prokaryotes and Eukaryotes and their genome organization.

To understand the molecular mechanism of DNA replication, transcription, protein synthesis and gene regulation in all organisms.

OUTCOME

This will be needed for any project work in modern biotechnology.

By doing this course students will acquire basic fundamental knowledge and explore skills in molecular biology and become aware of the complexity and harmony of the cells

BT 2.3: GENETIC ENGINEERING

OBJECTIVES:

1) To provide the knowledge of enzyme technology in cutting and manipulation of DNA, the steps involved in recombinant DNA technology.

2) To give an account of biological sources that are used broadly as host for transformation, the construction of DNA & c DNA library and their **applications.**

3) To understand how the significant features of vectors(carrier DNA molecules) are considered to design recombinant vectors that are compatible with diverse host species.

4) To get an insight of the automated technology of sequencing genomes (DNA) to understand complete biology of a species and the strategies used Ex: Human genome project.

BT2.5: MOLECULAR BIOLOGY and GENETIC ENGINEERING LABORATORY

OBJECTIVES:

- Provide hands-on experience in performing basic molecular biology techniques. Introduce students to the theory behind in each technique and to describe common applications of each methodology in biological research. This will facilitate the students to take up specialized project in Molecular biology and will be a pre-requisite for research work.

- Provide hands-on experience in performing basic recombinant DNA techniques . Introduce students to the theory behind in each techniques and to describe common applications of each methodology in biological research.

OUTCOME:

- Students acquire skill of gene cloning methods, PCR techniques and can apply it for genome analysis and genomics research.
- Apply the knowledge in the heterologous expression of cloned genes in different hosts, for production of recombinant proteins.

2.4: IMMUNOLOGY

OBJECTIVES:

- ◆ To discuss the structure, functions and integration of immune system
- ◆ To explain the antigen-antibody interactions and how the immune system is protecting the body from foreign pathogens/germs.
- ◆ To explain various techniques of monoclonal and engineered antibodies (important therapeutic molecules) production, for treating most of the human diseases.
- ◆ To get insight in Primary and Secondary organs of Immune system.

OUTCOMES

- ◆ There is Knowledge dispensed help students to apply in field of serology, vaccine developments, understanding diseases and pathogenesis
- ◆ Can apply the concepts in developing immunity in person and in designing Cell based therapies, transplantation technologies in translation research.
- ◆ Students acquire valuable inputs, for the area of immunology and vaccine development for antibody engineering.

3.1: CELL CULTURE TECHNOLOGY AND TISSUE ENGINEERING

OBJECTIVES:

- ◆ To understand principles of Plant cell and animal culture, media preparation
- ◆ Get an insight of application of plant tissue culture in agriculture biotechnology for micro propagation of medicinal and field recalcitrant and antique varieties of ornamental plants at a rapid rate
- ◆ The application of animal tissue culture in stem cells. And gene banking, transplantation, cell degeneration disease is understood
- ◆ Stem cell culture technology in IVF, developments of reproductive biology tecnique in regenerative medicine and therapeutic application are learnt.

OUTCOMES

- ◆ Students acquire skills to apply in IVF labs
- ◆ Enable students developing technique for stem cell banks
- ◆ preservation of various cell lines for clinical application

3.2: PLANT BIOTECHNOLOGY

OBJECTIVES:

To give the details of plant cells and its functions
To provide the basics of agrobacterium and applications of plant biotechnology
To provide the need of gene transfer and cloning strategy to develop transgenic plants.

OUTCOMES:

Upon completion of the course, the student would be able

To understand the fundamentals of plant cells, structure and functions.
To learn the nitrogen fixation mechanism and significance of viral vectors.
To gain the knowledge about the plant tissue culture and transgenic plants.
To use of the gained knowledge for the development of therapeutic products.

BT 3.3: ANIMAL BIOTECHNOLOGY

OBJECTIVES:

To provide the fundamentals of animal cell culture, details of the diseases and therapy
To offer the knowledge about the micro-manipulation and transgenic animals.
To explain In-vitro fertilization and embryo transfer technology.

OUTCOMES:

- ◆ Upon completion of this subject the student will be able to Understand the animal cell culture, animal diseases and its diagnosis
- ◆ Gain the knowledge for therapy of animal infections
- ◆ Know the concepts of micro-manipulation technology and transgenic animal technology
- ◆ Use the knowledge gained in this section to apply in the field of clinical research.

BT 3.4: MEDICAL AND ENVIRONMENTAL BIOTECHNOLOGY

◆ OBJECTIVES:

To understand the processes involved in therapeutic proteins and vaccine developments

To learn the application of recombinant DNA technology to develop customized therapeutic proteins.

To learn about the impact of environmental pollution on climate and the human life .

To learn about the technology involved in conversion of biomass and energy generation from vegetation and natural resources.

OUTCOMES

Students acquire the knowledge of bioremediation, monitoring and pollution control methods.

The climate disparities control strategies and efficient fuel conversion utilization technique is understood.

BT 4.1:HETEROLOGOUS GENE EXPRESSION

OBJECTIVES:

- 1) To provide the knowledge of basic fermentation
- 2) To understand the key problems in each step of production technology and working of the basic instruments and its components of a bioreactor.
- 3) To give an in-depth knowledge of enzyme technology, antibiotics, growth factor production and their purification. Biproducts products such as SCP and the limitation
- 4) To give an overview of the production technology of genetic engineered products.

OUTCOME:

Students learn optimization of industrial processes

Acquire the skill of strain improvement and can perform most of quality control experiment.

BT4.2: BIOINFORMATICS AND COMPUTATIONAL BIOLOGY

OBJECTIVES:

To improve the programming skills of the student and learning about the tools to apply for making research and clinical application more accurate and rapid.

To let the students know the recent evolution in biological science and its application in various fields of life sciences.

◆ OUTCOMES:

Upon completion of this course, students will be able to Develop
bioinformatics
tools with programming skills.
Apply computational based solutions for biological perspectives.
Pursue higher education in this field.