

Panskura Banamali College (Autonomous)

Panskura R.S., Purba Medinipur, 721152

Department of Biotechnology

Programme: B.Sc. in Biotechnology

Programme Specific Outcomes (PSOs) for B.Sc. Biotechnology

Description of the PLOs will be earned by Graduate:

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| PSO1 | Think critically, identify, analyze the problems and then attempt to design solutions that meet with specified goals. Apply appropriate tools efficiently in learners, and daily Activities of academic sand communication. |
| PSO2 | Analyze with solutions to environmental issues and commit the problems to sustainable development in the environment. Understand the human in term of bioethics. |
| PSO3 | Function significantly at various problem and situations. Communicate proficiently (written or oral) as a responsible member of modern biotechnologist. |
| PSO4 | Understand the research methods and able to analyze, interpret and deriveareal conclusion. Recognize the need, and have the ability to engage in independent and life-long learning in the broadest context of domain specific changes. |
| PSO5 | Demonstrate in quantitative reasoning critically and analytically. Also, be able to use these skills to analyze and solve scaling up related problems, thus preparing the learner for a successful career globally. |
| PSO6 | Be able to realize the need of biotechnological solutions on organism to environment and vice-versa. |
| PSO7 | Weaponized with practical skills and the caliber to apply their theoretical knowledge to design, perform experiments, detach and interpret data and thus exhibit proficiency in laboratory management. |
| PSO8 | Develop an aptitude towards research through the internship in various field which promote and infuse professional ethics and code of practice among learner empowering them to work within team with a multidisciplinary perspective. |

Course Specific Outcomes (CSOs) for B.Sc. Biotechnology

C-1: BIOCHEMISTRY & METABOLISM

On the successful completion of this course the students will be able to:

CO1: Discuss the structure of atoms, biomolecules and chemical bonds.

CO2: Understand concepts of enzyme kinetics, bio-polymers, metabolic reactions in a living system.

CO3: Understand and apply general laboratory safety measures as well as calculate for preparation of various chemicals for experiments.

CO4: Prepare different solutions such as buffers, reagents and stock solutions for experiments independently.

CO5: Operate various lab instruments such as weighing balance, water bath and spectrophotometer.

C-2: CELL BIOLOGY

On the successful completion of the course, students will be able to:

- CO1: Correlate the function of each cell organelle with proper coordination.
- CO2: Demonstrate an understanding of cell communication.
- CO3: Prepare various plant and animal specimens for observation of cell structures
- CO4: Identify and analyse different biological cells using a compound microscope.

GE: GENERIC ELECTIVES

On the successful completion of the course, students will be able to:

- CO1: Understanding the role of biotechnology in mankind and environment.
- CO2: Overview on basic biology and Identify and analyses different biological cells using a compound microscope.
- CO3: Idea on entrepreneurship development and marketing
- CO4: Understanding the ethical issue to the mankind to ecology.

AECC: ABILITY ENHANCEMENT COMPULSORY COURSES

On the successful completion of the course, students will be able to:

- CO1: Enhancement of communication skill with global language
- CO2: Enriching representation skill academic, research, industry section to society
- CO3: Understanding the global impact of environment.
- CO4: Overview on environmental factors, their role in organism to ecology.

C3 & C4: MAMMALIAN PHYSIOLOGY AND PLANT PHYSIOLOGY

On the successful completion of the course, students will be able to:

- CO1: Explain classification of plant and animal kingdom.
- CO2: Distinguish between various phyla of the plant and animal kingdoms based on their characteristics.
- CO3: Compare and contrast the differences in morphology and anatomy in Angiosperms.
- CO4: Explain features of the non-chordates and chordates.
- CO5: Sketch the morphology and anatomy of selected plant and animal specimens

C-5: GENETICS

On the successful completion of the course, students will be able to:

- CO1: Outline the basic principles of Mendelian genetics and compare and analyze different inheritance patterns as well as solve problems based on genetic principles.
- CO2: Compare and contrast different mutations, their effects on cells and the application of the same to research.
- CO3: Differentiate between the structure and working of a compound and dissection microscope.
- CO4: Construct and interpret a karyotype prepared from a spread of metaphase chromosomes.

C6: MICROBIOLOGY

On the successful completion of the course, students will be able to:

- CO1: Understand the scope and importance of Microbiology, classification schemes, cultivation, preservation and maintenance of microbial cultures.
- CO2: Discriminate between various groups of microorganisms and also comprehend the beneficial and harmful effects of each group of microorganisms.
- CO3: Compare, analyses and apply the concepts of the principle and working of various types of microscopes.
- CO4: Adhere to strict laboratory safety measures to be followed in a microbiology laboratory.
- CO5: Master skills in aseptic techniques as well comprehend the importance of cleaning and decontamination.

C7: CHEMISTRY

On the successful completion of the course, students will be able to:

CO1: Understand the structure, synthesis and application of inorganic molecules.

CO2: Overview on role of chemistry in biology.

CO3: Compare, analyses and apply the concepts of the pure chemistry in biotechnology and biochemistry.

CO4: Idea on chemicals as therapeutic agent.

SEC: SKILL ENHANCEMENT COURSES

On the successful completion of the course, students will be able to:

CO1: Understand the basis and detection of disease.

CO2: Overview on modern techniques for disease detection qualitative and quantitative manner.

CO3: Idea on advance molecular biology like forensic science.

CO4: Understand regarding cyber-crime and role of IPR to the mankind.

C-8: MOLECULAR BIOLOGY

On the successful completion of the course, students will be able to:

CO1: Explain the structure of DNA and RNA.

CO2: Understand basic concepts in molecular biology.

CO3: Compare differences between replication, transcription and translation processes in prokaryotes and eukaryotes.

CO4: Describe the mechanism of gene transfer and regulation.

CO5: Isolate and purify genomic DNA.

C-9: IMMUNOLOGY

On the successful completion of the course, students will be able to:

CO1: Compare and contrast primary and secondary immune response.

CO2: Gain knowledge of the structure and function of the cells and organs of immune systems.

CO3: Describe the mechanisms of Ag-Ab reaction, hypersensitivity reactions and importance Complement system.

CO4: Understand the importance of MonoClonal Ab and various immunodeficiency diseases.

CO5: Familiarize with various techniques involved in Immunology.

C-10: CHEMISTRY-2

On the successful completion of the course, students will be able to:

CO1: Understand the structure, synthesis and application of organic molecules.

CO2: Overview on role of organic chemistry in biology.

CO3: Compare, analyses and apply the concepts of the pure organic chemistry in biotechnology and biochemistry.

CO4: Idea on organic chemicals as therapeutic agent.

C-11: BIOPROCESS TECHNOLOGY

On the successful completion of the course, students will be able to:

CO1: Understand and explain various parts of a fermenter.

CO2: Comprehend various concepts of Upstream and Downstream processes.

CO3: Describe the production processes of fermentation products like wine or vinegar at the industrial level.

CO4: Design small scale experiments to produce common enzymes like amylase.

CO5: Prepare basic fermentation products like wine, vinegar, etc.

C-12: RECOMBINANT DNA TECHNOLOGY

On the successful completion of the course, students will be able to:

- CO1: Understand the functions of several enzymes and vectors used in genetic engineering.
- CO2: Acquaint to the versatile tools and techniques employed in recombinant DNA technology.
- CO3: Explain the construction of DNA & c DNA library.
- CO4: Acquire skills on techniques of plasmid isolation.
- CO5: Develop skills for transformation and selection of recombinants.

C13: BIOANALYTICAL TOOLS

On the successful completion of the course, students will be able to:

- CO1: Explain the principle, types of centrifugation and their functions in biological sciences.
- CO2: Understand the basic differences between agarose electrophoresis, SDS and native PAGE.
- CO3: Explain the principle and applications of various spectroscopic and chromatographic techniques.
- CO4: Discuss radioactivity, radioactivity techniques used in biomedical research.
- CO5: Perform purification and separation of proteins.

C14: GENOMICS & PROTEOMICS

On the successful completion of the course, students will be able to:

- CO1: Explain the genome and proteome and their role on organism.
- CO2: Understand the basic concept of biological databases, various types and applications of biological databases.
- CO3: Describe the various computer tools for genetic disease and divergence.
- CO4: Assess mutations, genetic disorders and understand the importance of drug design in silico.
- CO5: Will be able to construct evolution tree, cladogram, retrieve the biological information accessed through various information resources.

DSE: PLANT BIOTECHNOLOGY

On the successful completion of the course, students will be able to:

- CO1: Understand that various parts of the plant that can be cultured, with each type of culture having specific applications.
- CO2: Comprehend concepts of protoplast culture, somatic hybridization and production of secondary metabolites.
- CO3: Describe genetic engineering methods for production of transgenic plants.
- CO4: Understand aspects of plant biotechnology like set up of laboratory, culture of explants.
- CO5: Perform techniques of root/shoot callus production and cell suspension culture.

DSE: BIOINFORMATICS

On the successful completion of the course, students will be able to:

- CO1: Explain the scope of Bioinformatics.
- CO2: Understand the basic concept of biological databases, various types and applications of biological databases.
- CO3: Describe the various applications of BLAST and FASTA in understanding differences in evolutionary patterns.
- CO4: Assess mutations, genetic disorders and understand the importance of drug design in silico.
- CO5: Will be able to construct evolution tree, cladogram, retrieve the biological information accessed through various information resources.

DSE: ANIMAL BIOTECHNOLOGY

On the successful completion of the course, students will be able to:

- CO1: Understand the basic concepts of animal cell culture.
- CO2: Comprehend the various requirements and techniques for animal cell culture and importance of the same.

CO3: Understand the importance of primary and established cell lines for biotechnological applications.

CO4: Appreciate the various methods of characterization and growth assessment techniques in culturing animal cells.

CO5: Understand the applications of animal cells in the development of disease diagnostics and therapeutics.

DSE: ENVIRONMENTAL BIOTECHNOLOGY

On the successful completion of the course, students will be able to:

CO1: Explain the scope of Environmental Biotechnology.

CO2: Understand basic ecological concepts, various pollution, its measurements & remediation.

CO3: Describe the various eco-friendly bio-products.

CO4: Assess quality of water sample through various parameters - MPN test, dissolved oxygen concentration, biological oxygen demand, chemical oxygen demand nitrates of water sample.

CO5: Understand the working of sewage treatment plant.

DSE: BIOSTATISTICS

On the successful completion of the course, students will be able to:

CO1: Explain the importance of Biostatistics in biology.

CO2: Understand the concepts of Sampling.

CO3: Represent and interpret the data using graphical method and MS Excel

CO4: Solve problems on measures of central tendency, dispersion and hypothesis testing.

CO5: Apply appropriate statistical tools in their project work.

DSE: EVOLUTIONARY BIOLOGY

On the successful completion of the course, students will be able to:

CO1: Understand basic concepts of evolution and anthropology and importance in biotechnology.

CO2: Explain the evolutionary history and describe the historical development of anthropology.

CO3: Explain past and present cultures including ecological adaptations with scientific approach.

CO4: Describe quantitative and qualitative methods in the analysis of anthropological data.

CO5: Critically evaluate the logic of anthropological research and apply anthropological research to contemporary environmental, social, or health issues worldwide.

GE: BIOETHICS AND BIOSAFETY

On the successful completion of the course, students will be able to:

CO1: Understand importance of general safety measures in laboratories and biosafety guidelines.

CO2: Justify the design of confinement facilities at different Biosafety levels.

CO3: Implement good laboratory practices.

CO4: Discuss the relevance of intellectual property rights to biotechnological innovations.

CO5: Describe the standard operating procedures for disposal of various types of wastes from the Biotechnology laboratory.