

B. Sc. BIOTECHNOLOGY

Program Outcomes:

Programme outcomes

PO1: Students develop global competencies in the area of basic and applied biological sciences.

PO2: Enhancing the subject knowledge of students by using traditional and modern ICT based teaching methods and learning by doing.

PO3: To enrich students' knowledge and train them in various branches of Biotechnology such as genetics, molecular biology, biochemistry, immunology, fermentation technology, environmental biotechnology and tissue culture techniques.

PO4: To groom the students to meet futuristic challenges and national interests

Programme specific outcomes

PSO1: To bestow the students with all the research skills required to work independently

PSO2: To develop scientific temperament and social responsibilities in the students.

PSO3: To inculcate nature care by imparting knowledge of advance modern techniques

PSO4: As Biotechnology is an interdisciplinary course, empower the students to acquire technological knowhow by connecting disciplinary and interdisciplinary aspects of biotechnology.

PSO5: Acquire knowledge in students of biotechnology enabling their applications in industry and research.

F.Y.BSc. (Autonomous)

Course Outcomes

22BBT101—Fundamentals of Chemistry

After successfully completing this course, the students should be able to:

CO1: learn and explore fundamentals of basic chemistry and its branches like organic, inorganic, physical and bio-chemistry

CO2: understand the chemical bonding required for chemical and biochemical reactions and chemical kinetics

- CO3: understand basics of stereo chemistry
- CO4: to understand electrochemical aspects
- CO5: to carry out experimental verification of principles

22BBT102—Fundamental of Physics

After successfully completing this course, the students should be able to:

- CO1: learn fluid mechanic by different measurement techniques
- CO2: understand geometrical optics and surface tension using experimental, computational, and/or theoretical methods, students are able to understand.
- CO3: understand the core physics issues including classical and quantum mechanics, electricity and electrodynamics

22BBT103- Basics of Plant and Animal Sciences

After successfully completing this course, the students should be able to:

- CO1: have a substantial knowledge about plants and the category of the living organisms as life form- their features, importance. Introduction to plants group
- CO2: learn plant morphology
- CO3: learn about plant cells
- CO4: have knowledge about unique, silent features and chemical compositions of cell wall.
- CO5: understand the classification and construction of animal organization of chordates and non-chordates.
- CO5: understanding the functional aspects of various system of vertebrates (frog) & invertebrates (honeybee)
- CO6: understand the importance of parasites in human health

22BBt104-Mathematics & Statistical Methods for Biologist

After successfully completing this course, the students should be able to:

- CO1: solve and interpret the practical real life problem.

CO2: develop skills and creativity to convert verbal information into mathematical forms

CO3: learn and explore interdisciplinary approaches

CO4: understand theoretical concepts via solving the problems

CO5: develop abstract thinking

22BBT105- Fundamentals of Biological Chemistry

After successfully completing this course, the students should be able to:

CO1: understand how biomolecules relate to a particular process (metabolism) within a living cell.

CO2: get acquainted with the knowledge of structures, functions, and interactions of proteins, nucleic acids, carbohydrates and lipids.

CO3: understand the abnormalities in the metabolism and their relationship to various diseases.

CO4: learn enzyme kinetics and types of inhibition

22BBT106—Biophysics and Instrumentation

After successfully completing this course, the students should be able to:

CO1: develop a conceptual understanding of connections between physics and biology

CO2: explain the behavior and interactions between, matter and energy at both the atomic and molecular levels by different atomic models

CO3: interpret the spectra and to explain how spectroscopic methods are used for quantitative analysis of biomolecules

CO4: understand and interpret the nuclear processes such as radioactivity, fission, and fusion and their use in medicine

CO5: comprehend the molecular components and the importance of transport in the cells

22BBT107-Microbiology

After successfully completing this course, the students should be able to:

CO1: understand microorganism as a model system and its importance in biotechnology

- CO2: have comprehensive knowledge of Eubacteria and Archaeobacteria and differences in structure and composition of respective cells
- CO3: understand the concept of nutritional media, their components and making them for microorganisms
- CO4: understand types of microorganisms, and their biotech applications
- CO5: learn and explore interactions between microorganisms, plants and animals that helps them.

22BBT108-Computers and Applications

After successfully completing this course, the students should be able to:

- CO1: have basic knowledge (handling devices, role of operating system etc.) of computers
- CO2: get familiar with how data get stored through Database Management System
- CO3: distinguish between CUI and GUI operating systems and their handling the same
- CO4: to create documentation, budgets and mathematical calculations and also make attractive presentations using Microsoft Word, Excel and Power Point packages, respectively

22BBT-Practicals in Chemistry & Biochemistry

After successfully completing this course, the students should be able to:

- CO1: understand fundamental concepts of biology, chemistry and biochemistry.
- CO2: apply basic principles of chemistry to biological systems and molecular biology.
- CO3: relate various interrelated physiological and metabolic events.
- CO4: know the current developments at the forefront in biochemistry and allied subjects.
- CO4: critically evaluate a problem and resolve the challenges
- CO5: have experimental and quantitative skills encompassing preparation of laboratory reagents, conducting experiments, satisfactory analyses of data and its interpretation
- CO6: understand the importance of resources, and their conservation

CO7: think laterally and in an integrating manner and develop interdisciplinary approach.

CO8: have knowledge of the avenues for research and higher academic achievements in the field of biochemistry and allied subjects.

22BBT110-Techniques in Physics, Biophysics & Instrumentation

After successfully completing this course, the students should be able to:

CO1: to understand the working principle and working of different instruments.

CO2: solve the problems by understanding the principle of pH meter, centrifuge, microscopes, thermometers and their application in analyzing different biological samples.

22BBT111-Laboratory Exercises in Biosciences

After successfully completing this course, the students should be able to:

CO1: understand the importance of model systems like Drosophila, honey bee, Paramecium.

CO2: handle microorganisms (bacteria and fungi), culturing them using different media, and observe them by staining the cells and observing under microscope.

CO3: observe and record growth properties and functions of microorganisms in vitro.

CO4: learn importance of morphological structure, classification, reproduction.

CO5: explain microscopic technique, get familiarize with the external and internal structure of lower and higher group organisms.

22BBT112-Quantitative Methods in Biology

After successfully completing this course, the students should be able to:

CO1: solve and interpret the practical real life problems

CO2: convert the verbal information into mathematical form are enhanced.

CO3: solve problems using computer based methods

CO5: understand and explore abstract thinking.

SY BSc (2019 pattern)

Course: BBt301—Cell Biology -I

The objective of this course is to deliver strong foundation on cell theories, cell types and cellular diversity. It will enable the students to acquire fundamental knowledge about cytoskeleton and organellar function.

CO1: This course introduces the students to the basics of cell and its components. This will help them to comprehend detail knowledge about cell and its different types.

CO2: This gives them a strong foundation on the basic unit of life. It will help them understand about various proposed cell theory and origin of cell.

CO3: Students will acquire the knowledge of structure and functions of various cell organelles and their interaction within cell to promote cell growth, division and development.

CO4: The Students will gain in depth knowledge about cellular architecture and cytoskeletal organization.

CO5: At the end of the course, the student has a strong foundation about cellular theories functions of diverse organelles and the significance of cellular diversity.

Course: BBt 302—Molecular Biology I

Upon successful completion of this subject student should be able to acquire a deep knowledge in:

CO1: This course introduces the students to the basics of central dogma of molecular biology and significance of its study. Students understand the chemical and molecular processes that occur in and between the cells.

CO2: This gives them a strong foundation on the basics structure and functions of nucleic acids proteins and their interaction within cell to promote cell growth, division and development.

CO3: Students can illustrate the structural organization of genes and will gain the knowledge of organization of genomes.

CO4: The student will demonstrate proficiency in understanding the concept of genetic code its features.

CO5: At the end of the course, the student has a strong foundation about replication of genetic material in prokaryotes and eukaryotes.

Course: BBt 303- Genetics

Upon successful completion of this subject student should be able to acquire a deep knowledge in:

CO1: Students are able to understand the basic concept of transmission of genetics.

CO2: Students enrich with the knowledge of Mendelian and Non-Mendelian genetics.

CO3: Understanding the concepts of gene interactions and its applications in knowing genetic disorders.

CO4: They learn about chromosomal aberrations and structure of chromosomes.

Course: BBt304- Metabolism

Upon successful completion of this subject student should be able to acquire a deep knowledge in

CO1: To understand the relevance, basic concepts and theories of chemistry as relevant to a biological system.

CO2: To understand the properties of biomolecules and their nature of existence in the living system.

CO3: To understand the relevance and basic concepts of experimental biochemistry.

CO4: To understand the nature and commonly used types of biochemical experiments.

CO5: To understand integration of metabolism with the help of different cycles.

Course: BBt305-Environmental Biotechnology

Upon successful completion of this subject student should be able to acquire a deep knowledge in techniques and biotechnological methods in environment approach as:

CO1: They would understand and analyze environmental relationships with a better assessment of the mechanisms of environmental components like atmosphere, hydrosphere and lithosphere.

CO2: Students will become skilled at basic theoretical concepts highlighting in the field of ecology, and how these are applied to different ecological approaches.

CO3: The studies of ecology, biogeography and ecosystem structure will provide the awareness on ecological and historical foundations for understanding the distribution and abundance of species and the changes in their distribution and abundance over time and climatic impact.

CO4: Student understood the concept of environmental pollution, types of pollutants and related hazards. Acquire knowledge of bioremediation and its applications in environmental clean-up

and various waste and disaster management methods and policies.

CO5: Build awareness about environment conservation, environment protection acts. Studies on current global environmental issues will make aware to students about their causes and effect measure should be consider.

Course: BBt-306- Bioanalytical Techniques

Upon successful completion of this subject student should be able to acquire a deep knowledge in:

CO1: Students will be able to diagnose a specific biochemical genetic disorder. CO2: Students will be able to develop technical aspects of analyses for a diagnostic biochemical laboratory.

CO3: Students will be able to handle various equipment's used in biochemical analysis and troubleshoot them.

CO4: Students will be able develop competence in handling various chromatographic techniques and apply them in isolating and characterizing different biological molecules.

CO5: Understanding the applications of centrifugation and chromatography in biological investigations.

Course: EVS231-AECC-I Environment science theory paper 1

Upon successful completion of this subject student should be able to acquire a deep knowledge in:

CO1: Build awareness about environment, scope, and importance for sustainable development.

CO2: Students will understand ecology, biogeography, and ecosystem structure. This will provide the awareness on ecological and historical foundations for understanding the distribution and abundance of species and the changes in their distribution and abundance over time and climatic impact.

CO3: Learn importance of Natural resources i.e renewable and non-renewable.

CO4: Gaining knowledge to assess the conditions and trends of biodiversity either globally or sub globally and to understand it's necessity to measure the abundance of all organisms over space and time.

Course: LA231- AECC-II Language theory paper 1

Upon successful completion of this subject student should be able to acquire:

CO1: To enable speaking and writing grammatically correct sentences in English.

CO2: To develop effective writing skills.

CO3: To build fluency in English.

CO4: Students would build spoken and written competency in English.

Course: BBt 309-Practicals in Cell Biology and genetics

The objective of this course is to demonstrate significant cell biological principles, quantitative and analytical approaches that enable the students to translate the theoretical foundation in cell biology and genetics into practical understanding. The student will demonstrate proficiency in understanding mendelian and post mendelian inheritance problems.

CO1: The students get familiarized with basic principles of working of Microscopy. The students acquire practical skills in preparation and observation of slides of all prokaryotes and eukaryotes.

CO2: The course gives them a strong practical skill on use of density gradient, differential centrifugation on separation of cellular organelle's.

CO3: The student will demonstrate proficiency in understanding the basic structure of gene and interpret the inheritance of characters by using linkage and crossing over. Students will acquire the knowledge of and familiarize about pedigree and karyotyping .

CO4: Student acquire knowledge about the gene mapping methods, correlation between linkage and recombination. They learn how phenotypes are observed based on the genotypes of the organism.

CO5: Upon successful completion of practical course, students will be able to differentiate the cells of various living organisms. Students will be able to observe and correctly identify different cell types, cellular structures using different microscopic techniques.

Course Code: BBt-310 Practical in Bioanalytical Techniques

At the end of the course the student will be able to understand

CO1: The basics of conventional spectroscopic and separative analytical techniques, as well as the main bioanalytical methods.

CO2: To select the most appropriate analytical method to solve a given analytical question.

CO3: To apply an analytical protocol and to analyze and interpret analytical results.

CO4: To bridge the gap between academics, research and industry as the course begins with a review of basic bio analytical technique and an introduction to general terminologies.

CO5: Students will be exposed to various biological techniques and their applications in identification, isolation of different biological molecules.

Course: BBt311 Practical in Molecular Biology and Environmental Biotechnology

Upon successful completion of this subject student should be able:

CO1: Be able to understand functional significance of DNA technology.

CO2: To acquire the required laboratory skills to perform, interpret and analyze core/widely used molecular biology techniques.

CO3: Be able to apply the techniques for research applications.

CO4: To gain a hands-on experience in techniques used in molecular biology & their applications.

CO5: By studying pollution indicator plants students well understood and make aware about biomonitoring of air pollutants with plant.

CO6: Hands on training how to do sampling, collect the data to measure biodiversity index in a community. Enhance the skill techniques among the students for the study of ecosystem structure.

CO7: To understand physical and chemical properties of polluted and non-polluted soil. Students are able to relate with agricultural practices.

CO8: Imparting practical knowledge on microbial community estimation by studying different methods.

CO9: Students understood the basic concepts of testing genotoxicity of water sample. They will acquire knowledge on how to find contamination before consuming water to prevent human exposure to potential genotoxic compounds.

SEMESTER-IV

Course: BBt401- Cell BiologyII

Upon successful completion of this subject student should be able to understand:

CO1: Understanding concepts of cell biology.

CO2: Understanding the structural and functional aspects of cell.

CO3: Understanding about concepts on cell death and concept of ageing.

CO4: Understanding about cell division and its mechanism in plants and animals.

CO5: Understanding the concept of cell signaling and communication.

Course: BBt402- Molecular BiologyII

Upon completion of the unit the student shall be able to understand:

CO1: Molecular Events of Transcription and processing of transcripts, RNA editing.

CO2: Understanding the regulation of gene expression in prokaryotes using operon concept and Eukaryotes.

CO3: Molecular Events of Translation leading to protein synthesis and Post translational modification.

Course: BBt 403- Immunology

CO1: Upon completion of this course's students will be able to understand and demonstrate the basic knowledge of immunological processes at a cellular and molecular level.

CO2: The students will be able to demonstrate a capacity for problem-solving about immune responsiveness.

CO3: Students will be able to apply basic techniques for identifying antigen-antibody interactions.

CO3: The students will be able to identify the cellular and molecular basis of immune responsiveness.

CO4: Students will be able to elucidate the reasons for immunization and aware of different vaccination.

CO5: The students will be able to describe the roles of the immune system in both maintaining health and contributing to disease.

CO6: The students will be able to transfer knowledge of immunology into clinical decision-making through case studies presented in class.

Course: BBt-404-Animal Development

Upon successful completion of this subject student should be able to acquire a deep knowledge in:

CO1: Gaining knowledge about model organisms to understand the concepts of embryology.

CO2: Understanding the basic concepts of steps in the development of an organisms.

CO3: Students will understand about patterning in few models' organism (Drosophila).

CO4: Understanding about role of teratogens on abnormal development of an embryo.

CO5: Understanding the mechanisms on limb regeneration with gaining knowledge on few important concepts like differentiation, trans differentiation, commitment., developmental plasticity with reference to apoptosis.

Course: BBt-405 - Plant Development

Upon successful completion of this subject student should be able to acquire a deep knowledge in techniques, mechanisms and biotechnological methods in plant development as:

CO1: Students well understood the principals and unique feature of development as they are able to describe the developmental process in plants.

CO2: Students will become skilled at basic theoretical concepts about pattern formation in plants at vegetative and reproductive phases. Gained knowledge of all the stages of development and are able to identify specimen easily.

CO3: The basic development pathway understood and depicted with diagrams by studying the various model system.

CO4: Student understood the concept of microsporogenesis, Megasporogenesis, double fertilization, Endosperm development by performing various practical, identified the stages

CO5: Students are able to co-relate the knowledge of developmental biology with other subjects like Molecular biology, Biochemistry, physiology and Genetics.

Course: BBt-406 Microbial Biotechnology

Upon successful completion of this subject student should be able to acquire a deep understanding of:

CO1: Understands importance of microorganisms in various milk and food processing. CO2: Understand the significance and activities of microorganisms in various food and factors affecting on microbial growth in food leading to spoilage and understand the principles underlying the preservation methods.

CO3: Recognize and describe the characteristics of important food borne pathogens, pathogenesis and prevention.

CO4: Know the conceptual basis for understanding pathogenic microorganisms and mechanism of their pathogenesis, treatment and prevention.

CO5: Explains various aspects of wastewater treatment, also know various test to determine potability of water.

CO6: Acquire knowledge about application of microorganisms in bioleaching of metals, agriculture, biosynthetic and biosynthetic material production.

CO7: understands norms and regulations of GMO and its responsible use.

Course: EVS-241: AECC-III Environment science theory paper 2

Upon successful completion of this subject student should be able to acquire:

CO1: Student understood the concept of environmental pollution, types of pollutants and related hazards.

CO2: Acquire knowledge on environment protection acts and understand the need to conserve environment by implementing policies with the help of different organizations. CO3: Students will understand the structure, growth and the interactions of populations in the environment. Build awareness on disaster management, environmental movements and ethics.

CO4: Field visit enhance the skill techniques among the students to document assets, study local polluted site and ecosystem structure and environmental impact.

Course : LA-241 AECC- IV Language theory paper 2

CO1: The main purpose of this course is to equip the students with the nuances of the English language which includes proficiency in grammar and its effective usage in speaking and writing.

CO2: It further helps them to prepare for various competitive exams and to keep up with the increasing demand for English in Indian society and at the global level.

CO3: It will also help in developing their overall confidence and personality.

Course: BBt-409 Practicals in Molecular Biotechnology and microbial Biotechnology

CO1: Students learn technique for isolation and identification of spoilage causing microorganisms.

CO2: Students can determine microbiological quality of milk and milk product.

CO3: Students get hands on experience of various test used to determine potability of water. CO4: Students get live experience of observing wastewater treatment processing stepwise in field visit, also gets knowledge of milk processing in field visit to a dairy plant.

Course: BBt-410: Practical in Animal and Plant Development

Upon successful completion of this subject student should be able to:

CO1: Hands on training on different methods like dissection, sectioning and staining. Students well understood and depicted basic plant developmental diagrams.

CO2: Gained knowledge of RAM, SAM and florally induced meristem by learnings various staining techniques.

CO3: Students will understand how to perform various practical on microsporogenesis and female development by employing suitable technique.

CO4: Students understood the basic concepts of embryogenesis and well able to differential in dicots and monocot plants at embryo development stage.

CO5: Hands on training how to do seed dissection and excision of embryo and endosperm.

Course: BBt-411: Practical in Cell biology and immunology

Upon successful completion of this subject student should be able to:

CO1: To acquire the required laboratory skills to perform, interpret and analyze core/ widely used immunotechniques.

CO2: Be able to perform the techniques and relate to health care.

CO3: Be able to integrate the skill into to research and development.

CO4: Observing and learning to prepare slides to study cell division from onion root tip.

CO5: Hands on training to prepare slides to study role of colchine on mitosis.
