

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.

Course Outcomes:

Semester 1

Course101—Fundamentals of Chemistry

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

CO1: Students will learn different fundamentals of basic chemistry of different chemistry branches like organic chemistry, Inorganic, Physical etc.

CO2: Studies includes chemical bonding i.e. formation of different molecules types of bonds, hybridization, in thermodynamic studies free energy required for chemical and biochemical reactions and chemical kinetics rates of chemical reaction.

CO3: In stereo chemistry how different molecules/ bio-molecules are presented by different methods along with their stereo aspects like chirality, etc.

CO4: They will also learn electrochemical aspects during their course.

CO5: They will also perform experimental verification of some parts of theory.

Course-Bbt102—Fundamental of Physics

CO1: Students will learn fluid mechanics by different measurement techniques

CO2: Using experimental, computational, and/or theoretical methods, students are able to understand geometrical optics and surface tension.

CO3: The students would develop their understanding of core Physics by learning Classical and Quantum Mechanics, Electricity and Electrodynamics,

Course- Bbt103- Basics of Plant and Animal Sciences

CO1: An understanding, deep knowledge about plants and the category of the living organisms as life form its features, Importance, Introduction to plants group.

CO2: Learning and getting familiar with morphology & plant cell.

CO3: Knowledge about unique, silent features and chemical compositions of cell wall. CO4: Understanding the concept of classification and construction of animal organization of no chordates and non- chordates.

CO5: Understanding the different functional aspects of various system of animals vertebrates (frog) & invertebrates (honeybee)

CO6: Understanding the importance of parasites in human health

Course- Bbt104-Mathematics & Statistical Methods for Biologist

CO1: Students should be able to solve and interpret the practical real life problem.

CO2: Problem solving skills, creative talent to convert the verbal information into mathematical form are enhanced.

CO3: Interdisciplinary approach is developed.

CO4: Theoretical concepts are strengthened by solving maximum no. of problems.

CO5: To enhance abstract thinking of students.

Course -Bb105- Fundamentals of Biological Chemistry

CO1: As Biochemistry is the branch of science concerned with the chemical and physico-chemical processes and substances that occur within living organisms, therefore students will be able to understand how biomolecules relate to a particular process (metabolism) within a living cell.

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

CO3: The course will help the students to understand the abnormalities in the metabolism their relationship to various diseases. In addition to, it will help to understand the mechanism underlying correct disorders with dietary modifications or genetic modifications.

CO4: Students will learn about enzyme kinetics and types of inhibition as enzymes are important in catalyzing various reactions in the body

Course-Bb106—Biophysics and Instrumentation

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

CO2: Students will be able to explain the behavior and interactions between, matter and energy at both the atomic and molecular levels by different atomic models.

CO3: Students will gain an understanding of interpreting spectra and will be able to explain how spectroscopic methods are used for quantitative analysis of biomolecules.

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

CO5: Students will comprehend the molecular components which constitutes the cell membrane and give its different electrical and physicochemical properties. They will understand the importance of transport in the cells.

Course Bb107-Microbiology

CO1: Student understands microorganism as a model system in life science studies and its importance in biotechnology.

CO2: Students gets knowledge of Eubacteria and Archaeobacteria and differences in structure and composition of respective cell

CO3: Student learn to design artificial nutritional media for microorganisms and methods to grow them in laboratory.

CO4: Student learn different types of microorganisms, their applications in different sector. CO5: Student gets knowledge about interaction between microorganisms and plant and animal that helps them to think about its use in Agriculture, Medical and health, Environment field.

Course-108-Computers and Applications

CO1: Students will get basic knowledge (handling devices, role of operating system etc.) of computers.

CO2: They will also familiar with how data gets stored through Database Management System.

CO3: They can distinguish between CUI and GUI operating system and handling the same. CO4: They will capable to create documentation, budgets and mathematical calculations and also make attractive presentations using ms word, excel and Power point respectively

CO5: They can easily do surfing on internet.

Course—Bbt109-Practicals in Chemistry & Biochemistry

CO1: Ability to understand fundamental concepts of biology, chemistry and biochemistry. CO2: Ability to apply basic principles of chemistry to biological systems and molecular biology. CO3: Ability to relate various interrelated physiological and metabolic events. CO4: A general awareness of current developments at the forefront in biochemistry and allied subjects.

CO4: Ability to critically evaluate a problem and resolve to challenge blindly accepted concepts. CO5: Good experimental and quantitative skills encompassing preparation of laboratory reagents, conducting experiments, satisfactory analyses of data and interpretation of

results. CO6: Awareness of resources, and their conservation. CO7: Ability to think laterally and in an integrating manner and develop interdisciplinary approach.

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

Course -Bbt110-Techniques in Physics, Biophysics & Instrumentation CO1: Students will be able to understand the working principle and working of different instruments.

CO2: Through hands on training, students are able solve the problems by understanding the principle of pH meter, centrifuge, microscopes, thermometers and their application in analyzing different biological samples.

Course Bbt 111-Laboratory Exercises in Biosciences

CO1: Imparting practical knowledge on the importance of model system like *Drosophila*, honey bee, *Paramecium*.

CO2: In practical of microbiology, students would be able to handle microorganisms (bacteria and fungi), culture the microorganisms using different media, and observe them by staining the cells and observing under microscope.

CO3: Furthermore, the microbiology practicals would allow students to understand growth properties and functions of microorganisms *in vitro*.

CO4: In practices in biosciences, (Botany), students would be able to learn importance of morphological structure, classification, reproduction.

CO5: Students able to explain microscopic technique, Familiarize with the external and internal structure of lower and higher group organisms.

Course-112-Quantitative Methods in Biology

CO1: Students should be able to solve and interpret the practical real life problem. CO2: Problem solving skills, creative talent to convert the verbal information into mathematical form are enhanced.

CO3: Interdisciplinary approach is developed.

CO4: Theoretical concepts are strengthened by solving maximum no. of problems. CO5: To enhance abstract thinking of students.

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 handing 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.

Course outcomes
Third Year B.Sc. Biotechnology

Course: BBt 501—Industrial Microbiology

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

CO1: Students will learn about the different types of fermentation processes, Fermenter design , different types of equipment used and microbiological processes.

CO2: Students attain knowledge of equipment and design of sterilization cycle of large scale media in fermentation industry.

CO3: Application of microorganisms in technological operation, substrate preparation and control of fermentative process and isolation of products.

CO4: Students gets a brief idea about layout of a fermentation unit and various steps involved in bioprocess technology.

Course: BBt 502—R-DNA Technology

1. The students will be competent to perform genetic manipulation experiments by learning basic and advanced techniques on plasmids, expression vectors, cloning and construct of genomic libraries.
2. The recombinant DNA technology course give emphasize to make students familiar with molecular biology in the context of the application of recombinant DNA technology in basic and applied research.
3. The most fundamental outline in a genetic engineering to impart deep knowledge among students regarding mechanism of action and the use of restriction enzymes, different probes for specific genes of interest.
4. Students will get explored to various techniques like bacterial transformation, DNA sequencing technique, restriction mapping and DNA fingerprinting in relation to their application in medical and pharmaceutical field.
5. This is courses that build up student's deep knowledge towards the modern approaches for genetically modified organisms.

Course: BBt 503- Plant Tissue Culture

CO1: Students will understand the basic concepts and terminology used in plant tissue culture.

CO2- Students will understand the basic techniques to establish different types of in vitro cultures by themselves due to hand on training in the subject.

CO3- Concept and calculations for media preparation very well learnt as the media used for different types of culture were prepared by the students.

CO4: The knowledge of tissue culture techniques will help the students for designing research projects, practical and short term courses.

CO5: The knowledge of tissue culture techniques is used for designing projects, practical performance, and preparation of glassware for practical.

Course: BBt504- Animal Tissue Culture

CO1: Students will understand the basic concepts and terminology used in animal tissue culture.

CO2- Students will understand and evaluate cell cultures constraints and possibilities as an in vitro model .

CO3: This course demonstrates knowledge of basic cell culture techniques

CO 4: Students will get the knowledge of how to establish a cell lines and its maintenance.

CO5: This course demonstrates knowledge on design and how to use the cell culture facilities.

CO6: Students will know the advantages and limitations of primary cell culture compared to immortalized or transformed cell lines.

Course: BBT505-Applied Biotechnology I

CO1: The primary goal of this course is to give students the opportunity to learn and apply basic knowledge of various techniques they have learned in the last two years.

CO2: During this course, students have gained gist knowledge about the use of Biotechnology in agriculture waste management and recycling using various techniques like composting and biomass briquetting.

CO3: This course has benefited students in various scientific fields, applying different Biotechnological techniques in the Molecular Diagnostics field, including some crucial methods viz. Immunodiagnostic techniques, Polymerase Chain Reaction (PCR), Cellular and functional genomics in diagnostics.

CO4: Another important outcome of this subject is the introduction of students to marine resources and their applications in various fields, including pharmaceutical (secondary and Actinobacterial metabolites) use of reporter proteins (GFP and RFP) in vivo studies.

CO5: The most important outcome of this subject is introducing students to a new and advanced branch of applied science, i.e., introduction to Nanotechnology and synthesis of nanoparticles.

CO6: This course will be equally beneficial to various scientific areas, including basic science, medical microbiology, diagnostic, marine resource, and Nanotechnology, as students get explored with multiple techniques and applications.

CO7: This is a course that develops students' skills required for a competitive world in pursuing advanced degrees in biotechnology and pharmaceutical fields.

Course: BBT-506- Biodiversity & Systematics

CO1: On successful completion of this course the students will be able to illustrate the importance of biodiversity for upcoming science and economy.

CO2: The main objective of this course is to provide the students with possibilities of acquiring information on biodiversity, its main principles to know measurement of biodiversity richness and abundance.

CO3: The most important outcome is that they would gain knowledge on the tools for policies, acts and laws used in nature conservation and management. Conceptual insight on protected areas management – Management Institutions, legislation and their problems, perspective biodiversity strategy.

CO4: Students will develop an understanding of biodiversity with respect to biome (terrestrial) and aquatic ecosystem.

CO5: Studies on taxonomy and systematics will provide foundation to study the diversity of living world and its evolutionary perspective to biodiversity.

CO6: Systematics provides how to study biotic and abiotic part of environment in specific way.

Course: BBT507-SEC I Summer Industrial Internship/Review writing/Startup design or Case study Report

CO1 :This study aims to evaluate the impact of internship programs on the professional as well as on personal development and skills.

CO2:By integrating conceptual knowledge and training through academic internship programs, students can be facilitated to better implement their concepts at the workplace.

CO3: Academic internships are a bridge to link the theory and practice by taking part in supervised and scheduled work.

CO4: These internship programs not only improve students personal skills but also polish their professional growth and experience.

CO5: To determine the impact of internship programs on professional as well as personal growth and skills of the undergraduating students.

Course: BBT508- SEC-II Project formulation& presentation

CO1: The scoping and exploring possibilities define broad parameters of project and provide the foundation for subsequent analysis. A clear scope sets boundaries for what the project will attempt to do.

CO2: The planning and organizing of project framework in the Logframe through the analysis of inputs, activities, results, purpose or outcome, and overall objective or goal as a result of strategy analysis and selection.

CO3: Formulate a project that is capable of achieving its intended purpose/objective, of addressing identified problems, of managing potential risks, of designing activities and realistic time frame.

CO4: Designing a project framework that responds to particular problem with clear objectives, expected results and activities

CO5: Project formulation helps to prepare students with clear understanding of outline of research work.

Course: BBT 509-Practicals in Industrial Microbiology

CO1. Student practically learn technique of isolation, screening of microbial strain for fermentation process.

CO2. Students practices various techniques in fermentation process such as inoculum production, fermentation and purification of product.

CO3. Students gets idea of large scale production, preparation of instruments etc. by visiting to fermentation industry.

Course Code: BBT-510 Practical in Plant Tissue Culture & Animal Tissue Culture

CO1: : The course will focus on practical aspects of cell culture, like design and layout of the laboratory, aseptic technique, contamination, methods for measuring viability.

CO2:Students will get the knowledge and hands on training on design and how to use the cell culture facilities.

CO3: Students will get practical hands on how to establish a cell lines and its maintenance.

Course: BBT511- Practical in R-DNA Technology & Biodiversity

CO1. Students practically learn technique Plasmid isolation and agarose gel electrophoresis

CO2. Students practices various techniques in recombinant DNA technology like restriction digestion , ligation.

CO3. Students gets idea about transformation in bacterial cells and screening of transformants.

Course: BBt601- Enzyme and Enzyme Technology

CO1: The subject is of relevance to students from a wide range of disciplines such as health, environment and medical sciences.

CO2: Students will be able to proceed towards various concepts in biotechnology, the knowledge on enzyme and enzyme reactions.

CO3: Enzyme kinetics will provide the importance and utility of enzyme kinetics in research.

CO4: Students will learn critical analysis of scientific phenomena involving enzymes and will be able to competently work with enzyme systems in both academia and industry.

CO5: Students will get an understanding of procedures involved in purification of enzymes, enzymes assays and quantitative evaluation of the influencing parameters such as concentrations of substrate / enzyme, pH, temperature and effects of inhibitors on enzyme activity.

Course: BBt602- Agriculture Biotechnology

CO1: Students will learn introduction to agricultural biotechnology, its scope, role of it in india, world, concept of urban agriculture

CO2: Students will learn classical way of agriculture

CO3: Students will learn concept and application of e-agriculture , use of ICT in agriculture.

CO4: Student will learn hoe to make draught and herbicide tolerant varities

CO5: Students will how to use greenhouse technology and computer controlled environment

CO6: Students will learn how to produce biofertilizer and biopesticide

CO7: Students will learn how to use molecular markers in plant breeding

CO8: Students will learn how to develop transgenic plants for disease resistance using different techniques.

BBt603- Applied Biotechnology II

CO1: This course will help students learn about applying environmental raw materials to generations of biofuels that are renewable, sustainable, and feasible sources of fuel energy.

CO2: These things will allow students to understand current energy demand and their excessive use is the primary cause of air pollution.

CO3: The most important outcome of this subject is introducing students to new and advanced techniques in forensic science used for DNA fingerprinting.

CO4: This course will help students learn about the technical subject, which combines biological science and engineering, allowing students to understand how this work was designed and performed.

CO5: The most important outcome of this subject is introducing students to a new and advanced branch of stem cell biology, i.e., applying stem cell technologies in various life-threatening disease treatments (Neurodegenerative diseases).

Course: BBT604- Food and Pharmaceutical Biotechnology

CO 1: The students will understand the basics of food science and nutrition, food spoilage, and preservation, nutraceuticals also students will be able to apply the knowledge in food technology.

CO2: students will be get information about food safety laws and regulations as well as importance of packaging in food industry.

CO3: Students understands concept and methods of drug discovery and dose

designing clinical trials.

CO4: Students acquire knowledge of regulatory aspects in pharmaceutical industry, concept and importance of GMP, GLP.

.

Course: BBT605- Bioinformatics

CO1: Introduction to bioinformatics and its role in biotechnology

CO2: Students will learn different biological databases present in bioinformatics

CO3: Students will how to generate data, tools for generation of data, classify data, manipulate data, quality analysis.

CO4: Different file formats uses in bioinformatics

CO5: Students will learn metadata concept

CO6: How to align sequence, types of alignment based on sequence length and number of sequence involved in it.

CO7: Students will learn how to search, visualize protein using different visualization tool.

Course: BBT606- Biosafety and Bioethics

CO1: At the end of this course, students will learn about the diverse world of Intellectual Property rights and Biosafety and Bioethics.

CO2: The course makes student understand the Regulatory bodies for Bioethics in India and International considerations.

CO3: Students will become aware of Institutional Ethical Committee and International laws on Biosafety

CO4: This course will help students acquire knowledge of containment level and Good Laboratory Practices (GLP) and Biosafety containment levels.

CO5: Students will analyse and imbibe the Objectives and role of WIPO which will also help in interpreting impact of Intellectual property and its legal protection in research

CO6: The course is designed to have applications of research in innovation and entrepreneurship by involving the significance of patents and copyrights to have sustenance at global level.

Course: BBT607 &608- SEC-III & SECIV: Project

CO1: projects is crucial for setting realistic expectations and laying out a clear vision for a project life cycle. A project definition is a document that establishes the key objectives and terms of a project.

CO2: Project-based learning has proven to be one of the most effective ways to engage students and provide a practical application for what they're learning

CO3: Project-based learning not only provides opportunities for students to collaborate or drive their own learning, but it also teaches them skills such as problem solving, and helps to develop additional skills integral to their future, such as critical thinking and time management

CO4: Project is big process in which you can do some innovative ideas to implement particular research on suitable specimen.

CO5: Project signifies your efforts to show your exact potential whether you are handling problems in an effective way.

Course: BBT609: Practical in Enzyme Technology

CO 1: The students will able to assay the enzyme and their kinetics and also apply to this in the industry and other technological field.

CO2: The students estimate enzyme technology for the commercialization purpose of biotechnological products.

CO3: Students will be able to learn fundamentals of enzyme properties.

CO4: Students will be able to understand the enzyme kinetics, various factors regulating catalysis, and different models for analyzing the enzyme kinetics.

Course: BBT610: Practical in Agriculture Biotechnology & Bioinformatics

CO1: student will learn Production of Spirulina/Azolla culture

CO2: Estimation of chlorophyll and protein from Spirulina/Azolla culture

CO3: Isolation of Rhizobium from root nodules of leguminous crop and development of Rhizobium or Azotobacter Biofertilizer

CO4: Demonstration of effect of Biofertilizer (above prepared Rhizobium or Azotobacter) on plant growth using pot culture

CO5: Demonstration of effect of herbicide (anyone) on plant growth using pot culture

CO6: Visit to functional greenhouse/ Composting Unit/Mushroom cultivation unit and report writing.

Course Code: BBT-610 Practical in Bioinformatics

CO7: Introduction to biological databases and retrieving the information

CO8: Literature search using PubMed and Medline

CO9: Introduction of sequence alignment using tools like blast and fasta.

CO10: Introduction to multiple sequence alignment using tool like ClustalW

Course Code: BBT-610 Practical in Agriculture Biotechnology

CO1: student will learn Production of Spirulina/Azolla culture

CO2: Estimation of chlorophyll and protein from Spirulina/Azolla culture

CO3: Isolation of Rhizobium from root nodules of leguminous crop and development of Rhizobium or Azotobacter Biofertilizer

CO4: Demonstration of effect of Biofertilizer (above prepared Rhizobium or Azotobacter) on plant growth using pot culture

CO5: Demonstration of effect of herbicide (anyone) on plant growth using pot culture

CO6: Visit to functional greenhouse/ Composting Unit/Mushroom cultivation unit and report writing.

Course Code: BBT-610 Practical in Bioinformatics

CO7: Introduction to biological databases and retrieving the information

CO8: Literature search using PubMed and Medline

CO9: Introduction of sequence alignment using tools like blast and fasta.

CO10: Introduction to multiple sequence alignment using tool like ClustalW.

Course: BBT611: Practical in Food and Pharmaceutical Biotechnology

CO 1: Students will able to isolate and identify microorganisms involved in food fermentation.

CO2: Students learn to determine various quality parameter of processed and unprocessed food.

CO3: Student will be able to learn methods of extraction of and fractionation of bioactive components from plants by chromatographic technique.

CO4: student learn technique to check potency of antibiotic and antimicrobial activity of bioactive compounds
