



JAI HIND COLLEGE

Basantsing Institute of Science & J. T. Lalvani College of Commerce.

And Sheila Gopal Raheja College of Management

Affiliated to University of Mumbai

Autonomous

Bachelor of Science (B.Sc in Biotechnology)

Semester I

Course Code: SBT101	Course Title: Introduction to Biotechnology
--------------------------------	--

Learning Objective:

1. To acquaint students with the various fields in Biotechnology
2. To provide an overview of the different applications of Biotechnology
3. To offer an understanding of basics of Fermentation Techniques

Learning Outcomes:

1. List and elaborate on the various fields in Biotechnology
2. Explain the different applications of Biotechnology
3. Summarize basics of Fermentation Techniques

Semester I

Course Code: SBT102	Course Title: Genetics
--------------------------------	-------------------------------

Learning Objective:

1. To acquaint students with concepts in Genetics, structure and organization of genetic material
2. To make students understand the concept of heredity and variation
3. To impart a clear knowledge of the role of genetic material in bacteria and viruses in genetic analyses: Plasmids, cosmids, transposons

Learning Outcomes:

1. Brief on the concepts in genetics, structure and organization of genetic material
2. Explain concept of heredity and variation
3. Describe the role of genetic material in bacteria and viruses in genetic analyses: Plasmids, cosmids, transposons

Semester I

Course Code: SBT103	Course Title: Biodiversity, Experimental Models and Ecology
--------------------------------	--

Learning Objective:

1. To acquaint students with the concept of diversity in biology (plant, animal and microbial).
2. To introduce the various types of experimental models used in Biological Sciences
3. To make students understand the role of the ecosystem and the various interactions that sustain it.

Learning Outcomes:

1. Comprehend the concept of diversity in biology (plant, animal and microbial).
2. List and describe various types of experimental models used in Biological Sciences
3. Justify the role of the ecosystem and the various interactions that sustain it.

Semester I

Course Code: SBT104	Course Title: Techniques in Biological Sciences
--------------------------------	--

Learning Objective:

1. To provide a basic understanding of the need and methods of sterilization
2. To impart skill in handling and culture of Microorganisms
3. To make students understand the use of microscopes, stains and staining methods used to visualize specimens.

Learning Outcomes:

1. Justify the need and methods of sterilization
2. Describe handling and culture of Microorganisms
3. Enlist the uses of microscopes, stains and staining methods used to visualize specimens.

Semester I

Course Code: SBT105	Course Title: Fundamental Chemistry - I
-------------------------------	--

Learning Objective:

1. To provide an overview of the Periodic Table and the elements important in Biological systems.
2. To acquaint students with the basic rules of Classification and Nomenclature of organic compounds.
3. To familiarize students with the nature and role of water and buffers in relation to the biological system.

Learning Outcomes:

1. Give an overview of the Periodic Table and the elements important in Biological systems.
2. Summarize basic rules of Classification and Nomenclature of organic compounds.
3. Justify the nature and role of water and buffers in relation to the biological system.

Semester I

Course Code: SBT106	Course Title: Fundamentals in Chemistry – II
-------------------------------	---

Learning Objective:

1. To acquaint students with the concepts and fundamentals of Thermodynamics.
2. To familiarize the concepts in Stereochemistry by providing an understanding of the relative spatial arrangement of atoms in molecules.
3. To help students understand the types and significance of chemical bonds.

Learning Outcomes:

1. Explain the concepts and fundamentals of Thermodynamics.
2. Comprehend Stereochemistry with examples of the relative spatial arrangement of atoms in molecules.
3. Justify the types and significance of chemical bonds.

Semester I

Course Code: SBTP101	Course Title: Introduction to Biotechnology and Genetics
---------------------------------	---

Learning Objective:

1. To familiarize students with Biotechnology lab set up and common lab glassware and the principles, applications and working of instruments like pH meter, water bath, vortex, Hot air oven Autoclave, centrifuge, micrometer, etc.
2. To make students isolate DNA and perform qualitative identification of DNA and RNA
3. To make students understand karyotype and problems in genetics

Learning Outcomes:

1. Describe the use of common lab glassware and the principles, applications and working of instruments like pH meter, water bath, vortex, Hot air oven Autoclave, centrifuge, micrometer, etc.
2. Isolate DNA and perform qualitative identification of DNA and RNA
3. Perform karyotyping and solve problems in genetics

Semester I

Course Code: SBTP102	Course Title: Biodiversity, Experimental models Ecology and Techniques in Biological Sciences
---------------------------------	--

Learning Objective:

1. To familiarize students with the microscopic characteristics of BGA , enrichment techniques for algae
2. To teach sterilization technique, preservation techniques, microbial media preparation, aseptic transfer technique, culture techniques for bacteria and slide culture technique for Nocardia and Streptomyces
3. To train students to isolate bacteria using Streak plate / T plate technique

Learning Outcomes:

1. Identify BGA and enrich algae
2. Perform sterilization technique, preservation techniques, microbial media preparation, aseptic transfer technique, culture techniques for bacteria and slide culture technique for Nocardia and Streptomyces
3. Isolate bacteria using Streak plate / T plate technique

Semester I

Course Code: SBTP103	Course Title: Fundamentals In Chemistry I &II
---------------------------------	--

Learning Objective:

1. To familiarize students with good practices for a Chemistry lab, safety measures and the principles, applications and working of pH meter
2. To teach students to calculations and preparation of buffers at a specified pH
3. To make students perform analysis of inorganic salts and organic compounds

Learning Outcomes:

1. Follow good practices for a Chemistry lab, safety measures and explain the principles, applications and working of pH meter
2. Calculate and prepare buffers at a specified pH
3. Perform analysis of inorganic salts and organic compounds

Semester II

Course Code: SBT201	Course Title: Cell Biology and Plant Physiology
--------------------------------	--

Learning Objective:

1. To provide an understanding of the ultrastructure of prokaryotic cells
2. To provide an understanding of the ultrastructure of eukaryotic cells
3. To acquaint students with Physiological Processes in Plants

Learning Outcomes:

1. Comprehend the ultrastructure of prokaryotic cells
2. Comprehend the ultrastructure of eukaryotic cells
3. Explain Physiological Processes in Plants

Semester II

Course Code: SBT202	Course Title: Molecular Biology and Genetics
--------------------------------------	---

Learning Objective:

1. To provide an understanding of the basic molecular processes of a cell at the level of its genome
2. To acquaint the student with the concept of replication of DNA in Prokaryotes and Eukaryotes
3. To offer an understanding of the concept of Population Genetics

Learning Outcomes:

1. Describe the basic molecular processes of a cell at the level of its genome
2. Give an account of the concept of replication of DNA in Prokaryotes and Eukaryotes
3. Justify the concept of Population Genetics

Semester II

Course Code: SBT203	Course Title: Enzymology, Vitamins and Immunology
--------------------------------------	--

Learning Objective:

1. To acquaint students with concepts in Enzymology such as nature of enzyme, active sites, enzyme action, regulation and inhibition
2. To enable the student to comprehend the different vitamins and coenzymes
3. To provide a basic understanding of antibodies, antigens and role of immune system

Learning Outcomes:

1. Summarize the concepts in Enzymology such as nature of enzyme, active sites, enzyme action, regulation and inhibition
2. Comprehend the different vitamins and coenzymes
3. Explain the basics of antibodies, antigens and role of immune system

Semester II

Course Code: SBT204	Course Title: Tissue Culture and Biostatistics
--------------------------------	---

Learning Objectives:

1. To acquaint students with the basic concepts in Plant and Animal Tissue Culture
2. To introduce students to the uses of statistics in Biological data analysis.
3. To make students understand the types of data, representation of data and measures of central tendency and dispersion.

Learning Outcomes:

1. Give an account of basic concepts in Plant and Animal Tissue Culture
2. List the uses of statistics in Biological data analysis.
3. Explain types of data, representation of data and measures of central tendency and dispersion.

Semester II

Course Code: SBT205	Course Title: Macromolecular Chemistry
--------------------------------	---

Learning Objective:

1. To familiarize students with Bioorganic Molecules
2. To provide a clear understanding of Classification, Structure and Characterization of Biomolecules
3. To impart knowledge related to biological role of all major biomolecules

Learning Outcomes:

1. Summarize Bioorganic Molecules
2. Give Classification, Structure and Characterization of Biomolecules
3. Describe and Justify the biological role of all major biomolecules

Semester II

Course Code: SBT206	Course Title: Physical and Analytical Chemistry
--------------------------------	--

Learning Objectives:

1. To provide an understanding of chemical kinetics mainly in terms of reaction rates, effect of variables and mechanism of reactions
2. To acquaint students with fundamentals in Oxidation and Reduction Reactions
3. To train the student in the principal, working and applications of basic Analytical Techniques like Chromatography and Colorimetry

Learning Outcomes:

1. Give an account of chemical kinetics mainly in terms of reaction rates, effect of variables and mechanism of reactions
2. Explain fundamentals in Oxidation and Reduction Reactions
3. Describe the principal, working and applications of basic Analytical Techniques like Chromatography and Colorimetry

Semester II

Course Code: SBTP201	Course Title: Cell biology and Plant Physiology Molecular Biology and Genetics
---------------------------------	---

Learning Objectives:

1. To familiarize students with cell organelles of plants and animals and analysis of the plant physiology
2. To teach special staining techniques, enumeration of bacteria and fungi, techniques to study mitosis
3. To make students isolate genomic DNA

Learning Outcomes:

1. Identify cell organelles of plants and animals microscopically and analyze plant physiology
2. Perform special staining techniques, enumeration of bacteria and fungi and techniques to study mitosis
3. Isolate genomic DNA

Semester II

Course Code: SBTP202	Course Title: Enzymology, Vitamins and Coenzymes and Immunology Tissue culture and Biostatistics
---------------------------------	---

Learning Objectives:

1. To familiarize students with techniques for qualitative detection of enzyme and factors affecting enzyme activity
2. To teach Media preparation for PTC
3. To make perform biostatistics on biological data

Learning Objectives:

1. Qualitatively detect enzyme and study factors affecting enzyme activity
2. Prepare media for and perform PTC
3. Apply biostatistics on biological data

Semester II

Course Code: SBTP203	Course Title: Bioorganic Chemistry, Physical and Analytical chemistry
---------------------------------	--

Learning Objective:

1. To familiarize students with techniques for qualitative detection of biomolecules
2. To teach redox titrations
3. To make perform chromatography for separation and identification of sugars and amino acids

Learning Outcomes:

1. Perform techniques for qualitative detection of biomolecules
2. Titrate reducing and oxidizing agents to study transfer of electrons
3. Separate amino acids and sugars and identify them using chromatography techniques

Semester III

Course Code: SBT301	Course Title: Cell Biology and Immunology
--------------------------------	--

Learning Objectives:

1. To provide an understanding of the structure, organization, role, and significance of the eukaryotic cell membrane.
2. To acquaint students with effectors of immune system, cells and organs of immune system
3. To enable student understand newer avenues of diagnostics and therapeutics using immunological techniques

Learning Outcomes:

1. Describe the structure, organization, role, and significance of the eukaryotic cell membrane.
2. Justify the concept of effectors of immune system, cells and organs of immune system
3. Enlist and elaborate on the newer avenues of diagnostics and therapeutics using immunological techniques

Semester III

Course Code: SBT302	Course Title: Molecular Biology
--------------------------------	--

Learning Objective:

1. To provide an understanding of the process of gene expression, and translation of the genetic code in prokaryotes
2. To provide an understanding of the process of gene expression, and translation of the genetic code in eukaryotes.
3. To acquaint the student with the concept of mutation in DNA and the repair processes involved.

Learning Outcomes:

1. Explain the process of gene expression, and translation of the genetic code in prokaryotes
2. Explain the process of gene expression, and translation of the genetic code in eukaryotes.
3. Justify the concept of mutation in DNA and the repair processes involved.

Semester III

Course Code: SBT303	Course Title: Food and Fermentation Technology
--------------------------------------	---

Learning Objective:

1. To acquaint students with the role of microorganisms in food and fermentation industry
2. To familiarize students with the packaging techniques and preservation techniques followed in food industry
3. To teach student the concept of upstream and downstream in the biotech industry

Learning Outcomes:

1. Describe role of microorganisms in food and fermentation industry
2. Justify the packaging techniques and preservation techniques followed in food industry
3. Elaborate on concept of upstream and downstream in the biotech industry

Semester III

Course Code: SBT304	Course Title: Environmental Biotechnology
--------------------------------------	--

Learning Objective:

1. To acquaint students with basic concepts in water potability and assessment of water quality using various laboratory methods.
2. To enable the student to understand significance and methods of effluent, solid waste and industrial waste management.
3. To provide a basic understanding of environmental biotechnology.

Learning Outcomes:

1. Elaborate the basic concepts in water potability and assessment of water quality using various laboratory methods.
2. Justify the methods of effluent treatment, solid waste and industrial waste management.
3. Explain the various facets of environmental biotechnology.

Semester III

Course Code: SBT305	Course Title: Bio-organic Chemistry
--------------------------------	--

Learning Objective:

1. To familiarize students with pathways leading to breakdown of Bioorganic Molecules in cellular environment
2. To provide a clear understanding of energy transactions involved in bio molecular catabolism
3. To impart knowledge related to Enzyme kinetics

Learning Outcomes:

1. Depict the pathways leading to breakdown of Bioorganic Molecules in cellular environment
2. Write and explain the energy transactions involved in bio molecular catabolism
3. Comprehend the concept of Enzyme kinetics

Semester III

Course Code: SBT306	Course Title: Methods in Analytical Chemistry
--------------------------------	--

Learning Objective:

1. To provide an understanding of spectroscopic techniques
2. To acquaint students with fundamentals in techniques used in understanding and studying biomolecules like nucleic acids and proteins using electrophoresis
3. To train the student in the principles and applications of Centrifugation technique.

Learning Outcomes:

1. Explain the spectroscopic techniques
2. Describe the techniques used in understanding and studying biomolecules like nucleic acids and proteins using electrophoresis
3. Elaborate the principles and applications of Centrifugation technique.

Semester III

Course Code: SBT307	Course Title: Scientific Research Methodology
--------------------------------------	--

Learning Objective:

1. To inculcate research aptitude and to provide basic understanding of Research
2. To acquaint students with basic principles and scope of Research Methodology through actual process
3. To enable student understand the application of computational tools in Scientific research and presentation

Learning Outcomes:

1. Exhibit research aptitude and to provide basic understanding of Research
2. Enlist basic principles and scope of Research Methodology through actual process
3. Use the computational tools in Scientific research and presentation

Semester III

Course Code: SBTP301	Course Title: Cell Biology, Immunology, Molecular Biology, Food and Fermentation Biotechnology
---------------------------------------	---

Learning Objectives:

1. To teach microscopic techniques to enumerate Whole Blood cells
2. To train students to access quality of milk
3. To acquaint students with various immunological assay techniques

Learning Outcomes:

1. Enumerate Whole Blood cells
2. Perform techniques to access quality of milk
3. Carry out immunological assay techniques

Semester III

Course Code: SBTP302	Course Title: Environmental Biotechnology, Bio-organic and Analytical Chemistry
---------------------------------------	--

Learning Objectives:

1. To teach analytical techniques to analyze drinking water and sewage water
2. To train students to study effect of various parameters on enzyme activity
3. To acquaint students with various molecular biology techniques for separation of protein, nucleic acids, cellular components, etc.

Learning Outcomes:

1. Analyze drinking water and sewage water
2. Perform experiments to study effect of various parameters on enzyme activity
3. Carry out molecular biology techniques for separation of protein, nucleic acids, cellular components, etc.

Semester IV

Course Code: SBT401	Course Title: Molecular Immunology and Cytoskeleton
--------------------------------------	--

Learning Objective:

1. To provide insight of role of MHC and Complement in immune response and to develop understanding of the process of Antigen presentation
2. To provide details of the structure and activation process of T cell receptors and B cell receptors and their interactions.
3. To present an understanding of the structure, organization, role, and significance of the cytoskeleton in the functioning of a cell.

Learning Outcomes:

1. Explain role of MHC and Complement in immune response and the process of Antigen presentation
2. Depict structure and activation process of T cell receptors and B cell receptors and their interactions.
3. Justify the structure, organization, role, and significance of the cytoskeleton in the functioning of a cell.

Semester IV

Course Code: SBT402	Course Title: Gene Regulation and Cloning Tools
--------------------------------------	--

Learning Objective:

1. To provide an understanding of the process of gene regulation in prokaryotes
2. To provide an understanding of the process of gene regulation in viral system
3. To acquaint the student with the concept of gene cloning as a molecular technique.

Learning Outcomes:

1. Describe the process of gene regulation in prokaryotes
2. Describe the process of gene regulation in viral system
3. Comprehend the concept of gene cloning as a molecular technique.

Semester IV

Course Code: SBT403	Course Title: Medical Microbiology
--------------------------------------	---

Learning Objective:

1. To familiarize students with the basic principles of medical microbiology
2. To teach students the distribution pattern of diseases in a defined population
3. To make them understand the concept of pathogenicity of an etiological agent for a disease

Learning Outcome:

1. Summarize the basic principles of medical microbiology
2. Comprehend distribution pattern of diseases in a defined population
3. Explain the concept of pathogenicity of an etiological agent for a disease

Semester IV

Course Code: SBT404	Course Title: Eukaryotic Genetics and Biostatistics.
--------------------------------------	---

Learning Objective:

1. To provide an understanding about the concept of chromosomal inheritance and genetic recombination.
2. To give the students the basic understanding of Eukaryotic gene mapping and frame different ways of mapping.
3. To equip the student with the tools used in analyzing biological data.

Learning Outcome:

1. Explain the concept of chromosomal inheritance and genetic recombination.
2. Depict the Eukaryotic gene mapping and frame different ways of mapping.
3. Use tools to analyse biological data.

Semester IV

Course Code: SBT405	Course Title: Applied Chemistry - I
--------------------------------------	--

Learning Objective:

1. To familiarize students with reactions of amino acids and urea cycle.
2. To provide an understanding of Nanotechnology techniques
3. To acquaint students with fundamentals in Nanobiotechnology used in understanding their application in different branches of biotechnology.

Learning Outcome:

1. Write reactions of amino acids and urea cycle.
2. Comprehend Nanotechnology techniques
3. Summarize the fundamentals in Nanobiotechnology and their applications in different branches of biotechnology.

Semester IV

Course Code: SBT406	Course Title: Applied Chemistry-II
-------------------------------	---

Learning Objectives:

1. To make students understand the concept and usefulness of Tracer Techniques.
2. To acquaint students with the concepts and applications of Polymer Chemistry
3. To train the student in the principles, significance and applications of Green chemistry.

Learning Outcomes

1. Explain the concept and usefulness of Tracer Techniques.
2. Elaborate the concepts and applications of Polymer Chemistry
3. Summarize the principles, significance and applications of Green chemistry.

Semester IV

Course Code: SBT407	Course Title: Entrepreneurship and IPR
-------------------------------	---

Learning Objective:

1. To familiarize students with basic entrepreneurial concept in biotechnology
2. To inculcate an interest in Entrepreneurial approach to situations.
3. To enable the student to understand the importance and application of IPR particularly with respect to innovations.

Learning Outcomes:

1. Elaborate on the basic entrepreneurial concept in biotechnology
2. Appreciate Entrepreneurial approach to situations.
3. Justify the importance and application of IPR particularly with respect to innovations.

Semester IV

Course Code: SBTP401	Course Title: Molecular Immunology and Cytoskeleton, Gene Regulation and Cloning Tools, Medical Microbiology
---------------------------------	---

Learning Objective:

1. To train students to diagnose the etiological agent for various microbial diseases
2. To make students extract genomic material from biological samples
3. To guide students to perform different immunodiagnostic techniques

Learning Outcomes:

1. Perform microbiological techniques to diagnose the etiological agent for various microbial diseases
2. Extract genomic material from biological samples
3. Carry out different immunodiagnostic techniques

Semester IV

Course Code: SBTP402	Course Title: Eukaryotic Genetics and Biostatistics, Applied Chemistry – I, Applied Chemistry - II
---------------------------------	---

Learning Objective:

1. To make students perform diagnose enzymatic detection techniques to diagnose disorders
2. To train students to carry out phage assay, replica plating, gradient plate to study microbial genetics
3. To guide students to apply principles of biostatistics and green chemistry to the given situation

Learning Outcomes:

1. Perform diagnose enzymatic detection techniques to diagnose disorders
2. Carry out phage assay, replica plating, gradient plate to study microbial genetics
3. Apply principles of biostatistics and green chemistry to the given situation

Semester V

Course Code: SBT501	Course Title: Advanced Immunology and Cell Biology
--------------------------------	---

Learning Objectives:

1. To provide insight on the role of Cytokines, Interferons and Chemokines in cellular immune response.
2. To develop a comprehensive understanding of cancer immunology and immunology of immune-deficiency diseases.
3. To provide the basic understanding regarding prerequisites for any cell signaling process.

Learning Outcomes:

1. Justify the role of Cytokines, Interferons and Chemokines in cellular immune response.
2. Comprehend cancer immunology and immunology of immune-deficiency diseases.
3. Explain the prerequisites for any cell signaling process.

Semester V

Course Code: SBT502	Course Code: SBT502
--------------------------------	----------------------------

Learning Objective:

1. To introduce the concept of developmental biology and provide insight into the organism's level of development.
2. To enable students to understand concepts of endocrinology with an emphasis on synthesis, Physiological role , related disorders, diagnostic measures and available therapy related to group II hormones.
3. To enable students to develop understanding of basics of tissue engineering, Neurobiology, types of stem cells and their properties, ethics, safety and regulatory issues underlying stem cell research and application.

Learning Outcomes

1. Explain the concept of developmental biology and provide insight into the organism's level of development.
2. Describe endocrinology with an emphasis on synthesis, Physiological role , related disorders, diagnostic measures and available therapy related to group II hormones.

3. Justify the basics of tissue engineering, Neurobiology, types of stem cells and their properties, ethics, safety and regulatory issues underlying stem cell research and application.

Semester V

Course Code: SBT503	Course Title: Biochemistry, Bioinformatics and Advanced Bioanalytical Techniques - I
--------------------------------	---

Learning Objective:

1. To enable students to understand various metabolic, regulatory mechanisms involved in cellular carbohydrate anabolism.
2. To acquaint students with modern techniques of In-silico analysis through various platforms that are offered by bioinformatics, various databases and their applications in modern biotechnology.
3. To study the basic principle, applications and types of advanced electrophoretic, chromatographic and mass spectrometric techniques with emphasis on working of the entire instrument.

Learning Outcome:

1. Summarize various metabolic, regulatory mechanisms involved in cellular carbohydrate anabolism.
2. Explain modern techniques of In-silico analysis through various platforms that is offered by bioinformatics, various databases and their applications in modern biotechnology.
3. Elaborate the basic principle, applications and types of advanced electrophoretic, chromatographic and mass spectrometric techniques with emphasis on working of the entire instrument.

Semester V

Course Code: SBT504	Course Title: Applied Biotechnology
--------------------------------	--

Learning Objective:

1. To provide an understanding of genomic and cDNA libraries and rDNA technology
2. To familiarize students with a deeper understanding of animal cell culture techniques and familiarization with concepts of safety, and bioethics involved.
3. To make students study upstream technologies with fermentation economics as well as study applications of genetic engineering using plant and animal systems

Learning Outcomes:

1. Elaborate on genomic and cDNA libraries and rDNA technology
2. Explain animal cell culture techniques and familiarization with concepts of safety, and bioethics involved.
3. Summarize the upstream technologies with fermentation economics as well as give an account on the applications of genetic engineering using plant and animal systems

Semester V

Course Code: SBTP501	Course Title: Practical of SBT501 and SBT502
---------------------------------	---

Learning Objective:

1. To make students identify and enumerate different types of WBCs, study nervous system using microscopy
2. To impart students an understanding of Ag and Ab interactions in an immuno-diffusion techniques which is used for diagnosis and prognosis
3. To make students apply statistical tools for conducting survey and analyze endocrine health parameters

Learning Outcomes:

1. Identify and enumerate different types of WBCs and explain nervous system using microscopy
2. Perform Ag and Ab interactions in an immuno- diffusion techniques which is used for diagnosis and prognosis
3. Apply statistical tools for conducting survey and analyze endocrine health parameters

Semester V

Course Code: SBTP502	Course Title: Practical of SBT503 and SBT504
---------------------------------------	---

Learning Objective:

1. To teach students to use colorimetry technique for estimation of blood sugar
2. To impart knowledge of industrial biotechnology research (medium optimization, chromatography, invertase assay, immobilization techniques, etc)
3. To make students perform molecular biology techniques like Extraction of plasmid DNA, quantification, visualization, etc as well as make students perform in-silico analysis like NCBI and tools like Phylogenetic analysis

Learning Outcome:

1. Use colorimetry technique for estimation of blood sugar
2. Perform industrial biotechnology research (medium optimization, chromatography, invertase assay, immobilization techniques, etc)
3. Carry out molecular biology techniques like Extraction of plasmid DNA, quantification, visualization, etc as well as perform in-silico analysis like NCBI and tools like Phylogenetic analysis

Semester V

Course Code: SBT5AC	Course Title: Nutrition and Dietetics
--------------------------------------	--

Learning Objective:

1. To equip students with basic knowledge in the subjects of food science and its relation to health and well-being.
2. To enable students to understand basic concepts related to various food groups, BMI, BMR, Balanced diets and fitness regimes.
3. To familiarize students with requirements for types of diet planning for different age groups and meal planning in special conditions like pregnancy, diabetes, cancer and other such health conditions.

Learning Outcomes:

1. Summarize basic knowledge in the subjects of food science and its relation to health and well-being.
2. Elaborate on basic concepts related to various food groups, BMI, BMR, Balanced diets and fitness regimes.
3. Justify requirements for types of diet planning for different age groups and meal planning in special conditions like pregnancy, diabetes, cancer and other such health conditions.

Semester V

Course Code: SBT5ACPR	Course Title: Practical in Nutrition and Dietetics
----------------------------------	---

Learning Objective:

1. To make students calculate fitness parameters BMR and BMI, cultivate micro-greens in home garden and bake using easy and healthy recipes
2. To teach students to separate and estimate casein from milk as well as glucose in table sugar
3. To train students to read nutritional labels and acquire sensory evaluation skills

Learning Outcomes:

1. Calculate fitness parameters BMR and BMI and Cultivate micro-greens in home garden and Bake using easy and healthy recipes
2. Separate and estimate casein from milk as well as glucose in table sugar
3. Read nutritional labels and acquire sensory evaluation skills

Semester VI

Course Code: SBT601	Course Title: Medical Immunology and Antimicrobial Drugs
--------------------------------	---

Learning Objective:

1. To enable students to understand the concept of cell mediated cytotoxicity responses, T cell, NK cell mediated immune responses in its fight against invading pathogens or diseases like cancer, hypersensitivity responses and its types
2. To enable students, develop deeper insight about tolerance, autoimmunity and transplantation biology.
3. To help students understand the basic concept of chemotherapy against infectious agents and emergence of multiple resistance strains due to misuse of antibiotic in generation

Learning Outcomes

1. Elaborate on the concept of cell mediated cytotoxicity responses, T cell, NK cell mediated immune responses in its fight against invading pathogens or diseases like cancer, hypersensitivity responses and its types
2. Describe tolerance, autoimmunity and transplantation biology.
3. Justify the basic concept of chemotherapy against infectious agents and emergence of multiple resistance strains due to misuse of antibiotic in generation

Semester VI

Course Code: SBT602	Course Title: Mammalian Physiology - II
--------------------------------	--

Learning Objectives:

1. To make students understand the process of developmental biology and endocrinology.
2. To teach students the concept of motor and sensory neuroscience, cognitive neuroscience with a knowledge of behavioral biology and brain function
3. To familiarize students with the topic of pharmacology, drugs affect a biological system and the response of the body to the drug, adverse, or toxic, effects of drugs and chemical agents.

Learning Outcomes:

1. Summarize the process of developmental biology and endocrinology.

2. Justify the concept of motor and sensory neuroscience, cognitive neuroscience with a knowledge of behavioral biology and brain function
3. Explain the topic of pharmacology, drug effects on a biological system and the response of the body to the drug, adverse, or toxic, effects of drugs and chemical agents.

Semester VI

Course Code: SBT603	Course Title: Biochemistry, Bioinformatics and Advanced Bioanalytical Techniques II
--------------------------------	--

Learning Objectives:

1. To make students understand reactions and pathways involved in lipid biosynthesis and its regulatory aspects.
2. To teach students the concept of data annotation, sequence alignment and tools used for in-silico sequence analysis, Proteomics and Genomics.
3. To familiarize students with theoretical principles of various advanced imaging techniques with their working and to promote students to understand their applications in medical sciences, diagnostics and research

Learning Outcomes:

1. Write reactions and pathways involved in lipid biosynthesis and its regulatory aspects.
2. Annotate data, align sequence and use tools for in-silico sequence analysis, Proteomics and Genomics.
3. Explain theoretical principles of various advanced imaging techniques with their working and to promote students to understand their applications in medical sciences, diagnostics and research

Semester VI

Course Code: SBT604	Course Title: Applied Biotechnology II
--------------------------------	---

Learning Objectives:

1. To provide an understanding of the various types of molecular techniques available in the field of Biology.
2. To teach the concept of maintaining tissue culture and commercial plant tissue culture products.
3. To equip students with knowledge of downstream processes which are herewith exemplified for production of finished/ purified commodity used in biotech industry, biosafety and its role in Biotechnology.

Learning Outcomes:

1. Summarize the various types of molecular techniques available in the field of Biology.
2. Comprehend the concept of maintaining tissue culture and commercial plant tissue culture products.
3. Describe the downstream processes which are herewith exemplified for production of finished/ purified commodity used in biotech industry, biosafety and its role in Biotechnology.

Semester VI

Course Code: SBTP601	Course Title: Practical of SBT601 and SBT602
---------------------------------	---

Learning Objective:

1. To make students study few of the parameters that gets affected by drug interactions in the body, concepts of TDT and TDP, types of vaccine and make one in the laboratory, sterility of vaccine and to learn sterility testing methods
2. To teach students different types of ELISA in Immunodiagnosics, principles and applications of Radio immune Assays used for immunodiagnosis
3. To guide students to perform antimicrobial activities of antibiotics using Disc diffusion method, MIC of antibiotics, relationship between two drugs when used together

Learning Objective:

1. Appreciate the parameters that gets affected by drug interactions in the body, perform TDT and TDP, types of vaccine and make one in the laboratory, sterility of vaccine and to learn sterility testing methods
2. Perform different types of ELISA in Immunodiagnosics and elaborate on principles and applications of Radio immune Assays used for immunodiagnosis
3. Carry out antimicrobial activities of antibiotics using Disc diffusion method, MIC of antibiotics, relationship between two drugs when used together

Semester VI

Course Code: SBTP602	Course Title: Practical of SBT603 and SBT604
---------------------------------	---

Learning Objective:

1. To make students use Bioinformatics tools
2. To guide students perform SGOT and SGPT tests as diagnostic measures, serum cholesterol, sterility testing of a drug sample
3. To make students isolate novel antibiotic producers from soil and learn the principle and working of the polymerase chain reaction.

Learning Outcomes:

1. Use Bioinformatics tools
2. Perform SGOT and SGPT tests as diagnostic measures, serum cholesterol, sterility testing of a drug sample
3. Isolate novel antibiotic producers from soil and learn the principle and working of the polymerase chain reaction.

Semester VI

Course Code: SBTP6AC	Course Title: Research Project
---------------------------------	---------------------------------------

Learning Objective

1. To develop research inclination and aptitude amongst students
2. To provide the students with an opportunity to carry out an investigation in the form of a research project
3. To enable students to carry out scientific literature surveys on suitable topics.

Learning Outcome:

1. Carry out scientific literature surveys on suitable topics and propose a hypothesis
2. Design experiments to perform research to prove the hypothesis
3. Analyze the data and conclude

Semester VI

Course Code: SBTP6ACPR	Course Title: Research Project
-----------------------------------	---------------------------------------

Learning Objective:

1. To develop research inclination and aptitude amongst students
2. To provide the students with an opportunity to carry out an investigation in the form of a research project
3. To enable students to carry out scientific literature surveys on suitable topics.

Learning Outcome:

1. Carry out scientific literature surveys on suitable topics and propose a hypothesis
2. Design experiments to perform research to prove the hypothesis
3. Analyze the data and conclude