



CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY(AUTONOMOUS)

DEPARTMENT OF BIOTECHNOLOGY

B.Tech. Program Outcomes(PO's)

Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals and an engineering specialization for the solution of complex engineering problems

Problem analysis: Identify, formulate, research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for public health and safety, and cultural, societal, and environmental considerations.

Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools, including prediction and modelling to complex engineering activities, with an understanding of the limitations.

The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

Communication: Communicate effectively on complex engineering activities with the engineering community and with the society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

HEAD
Dept. of Bio-Technology
Chaitanya Bharathi Institute of Technology
Gandipet, Hyderabad-500 075

Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

R20:

Department Vision

To excel in education, research and entrepreneurship in various fields of Biotechnology for contribution to the evolving needs of the society

Department Mission

The mission of the Biotechnology Department is to:

- To provide an excellent educational experience to the undergraduate students of Biotechnology through quality teaching and advanced curriculum with roots into the fundamentals, that enables students to become leaders in their chosen field of Biotechnology
- To provide vibrant learning and research environment that enables students to focus on lifelong learning to transform into entrepreneurs, and renowned researchers
- To instill the spirit of innovation and creativity in young minds through participation in International and National level conferences/hackathons combined with a deep awareness of ethical responsibilities to profession and society

PROGRAM EDUCATION OBJECTIVES (PEOs):

The Biotechnology department is dedicated to graduating engineers who,

- Will demonstrate successful careers in industry through scientific thinking, interpreting, analyzing experimental results and pursue higher education and research in reputed national and international institutes.
- will demonstrate leadership and initiative to advance professional and organizational goals with commitment to ethical standards of profession, teamwork and respect for diverse cultural background
- Will be involved in lifelong /self-learning to keep abreast with the constantly evolving technologies for establishing start-ups and becoming successful entrepreneurs.
- Will be committed to creative practice of engineering and other professions in a responsible manner contributing to the socio-economic development of the society.

PROGRAMSPECIFICOUTCOMES(PSOs):

Student should be able to

- Apply the concepts of Biotechnology in the fields of health care, agriculture, biofuels, food industry and other relevant areas
- Demonstrate adequate proficiency of good lab practices by adopting standard operating protocols and illustrate independent, safe and accurate handling of the biotechnology lab equipment

R18:

Department Vision: Imparting quality education to produce graduates as competent researchers, technologist and entrepreneurs in the field of Biotechnology.

Department Mission:

1. Imbibing adequate knowledge in principles of mathematics, physics, chemistry, biological sciences and process controls,
2. Molding the graduates effectively to serve mankind with professional competency and socioethical values.
3. Motivating graduates towards academic excellence, entrepreneurial avenues and identifying challenging areas where Biotechnology can cater to the solution.

PEOs:

- Graduates will be trained to co integrate life sciences and engineering to broaden the avenues of Biotechnology applications.
- Graduates are provided with apt academic environment for successful careers in industry, pursue higher education and research in reputed national and international institutes.
- Inculcating scientific thinking in to graduates, making them capable of conducting experiments, interpreting, analyzing results and documenting well written technical reports.
- Graduates are trained for effective oral and written communication skills, teamwork and professional ethics.
- Graduates are made to realize the importance of lifelong self-learning to be abreast with the constantly evolving field of biotechnology

PSOs:

PSO1: Graduates are able to cater the needs of biotechnology industries, academic and research Institutions.

PSO2: Graduates are able to identify needs and problems of the society and design biotechnology driven solutions.

R16:

Department Vision: Imparting quality education to produce graduates as competent researchers, technologist and entrepreneurs in the field of Biotechnology.

Department Mission:

4. Imbibing adequate knowledge in principles of mathematics, physics, chemistry, biological sciences and process controls,
5. Molding the graduates effectively to serve mankind with professional competency and socioethical values.
6. Motivating graduates towards academic excellence, entrepreneurial avenues and identifying challenging areas where Biotechnology can cater to the solution.

PEOs:

- Graduates will be trained to co integrate life sciences and engineering to broaden the avenues of Biotechnology applications.
- Graduates are provided with apt academic environment for successful careers in industry, pursue higher education and research in reputed national and international institutes.
- Inculcating scientific thinking in to graduates, making them capable of conducting experiments, interpreting, analyzing results and documenting well written technical reports.
- Graduates are trained for effective oral and written communication skills, teamwork and professional ethics.
- Graduates are made to realize the importance of lifelong self-learning to be abreast with the constantly evolving field of biotechnology

PSOs:

PSO1: Graduates are able to cater the needs of biotechnology industries, academic and research Institutions.

PSO2: Graduates are able to identify needs and problems of the society and design biotechnology driven solutions.

CHAITANYABHARATHIINSTITUTE OF TECHNOLOGY(Autonomous)

Gandipet,Hyderabad-75

Department Of Biotechnology Course Outcomes

Statements for B.Tech(Biotech)-R20

SNo	Course		CourseOutcomesStatements
	Code	Name	
1.	20MT C21	MATHEMATICS- I	<p>Explain the theories behind the origin of life and evolution studies (BL2).</p> <p>Describe the structure and functions of plant cell and its organelles (BL1)</p> <p>Relate the plants based on the habit and habitat and mechanism of seed development in plants (BL1).</p> <p>Explain the different classification, mode of reproduction, economic importance of microbes (BL2)</p> <p>Describe the basic physiological processes in plants and various methods of crop improvement (BL1).</p>
2.	20BT C01	BASICS OF BIOLOGY – I	<p>Explain the theories behind the origin of life and evolution studies (BL2).</p> <p>Describe the structure and functions of plant cell and its organelles (BL1)</p> <p>Relate the plants based on the habit and habitat and mechanism of seed development in plants (BL1).</p> <p>Explain the different classification, mode of reproduction, economic importance of microbes (BL2)</p> <p>Describe the basic physiological processes in plants and various methods of crop improvement (BL1).</p>
3.	20EG C01	ENGLISH	<p>Illustrate the nature, process and types of communication and communicate effectively without barriers.</p> <p>Construct and compose coherent paragraphs, emails and adhering to appropriate mobile etiquette.</p> <p>Apply techniques of precision to write a précis and formal letters by using acceptable grammar and appropriate vocabulary.</p> <p>Distinguish formal from informal reports and demonstrate advanced writing skills by drafting formal reports.</p> <p>Critique passages by applying effective reading techniques</p>
4.	20PY C02	PHYSICS	<p>Demonstrate the physical properties of the light.</p> <p>Find the applications of lasers and optical fibers in engineering and technology.</p> <p>Identify different types of magnetic and dielectric materials.</p> <p>Recall the fundamentals of nanomaterials.</p>
5.	20CS C01	PROGRAMMING FOR PROBLEM SOLVING	<p>Identify and understand the computing environments for scientific and mathematical problems.</p> <p>Formulate solutions to problems with alternate approaches and represent them using algorithms / Flowcharts.</p> <p>Choose data types and control structures to solve mathematical and scientific problem.</p> <p>Decompose a problem into modules and use functions to implement the modules.</p> <p>Apply arrays, pointers, structures, and unions to solve mathematical and scientific problems.</p> <p>Develop applications using file I/O.</p>

HEAD
 Dept. of Bio-Technology
 Chaitanya Bharathi Institute of Technology
 Gandipet, Hyderabad-500 075



S.No	Course		CourseOutcomesStatements
	Code	Name	
6.	20PY 04	PHYSICS LAB	Interpret the errors in the results of an experiment.
			Demonstrate the wave nature of light experimentally
			Utilize physical properties of magnetic and dielectric materials for various applications
			Make use of lasers and optical fibers for engineering applications
			Explain light induced phenomenon and motion of electrons in electric and magnetic fields
7.	20EG C02	ENGLISH LAB	Define the speech sounds in English and understand the nuances of pronunciation in English
			Apply stress correctly and speak with the proper tone, intonation and rhythm.
			Analyze IELTS and TOEFL listening comprehension texts to enhance their listening skills.
			Determine the context, speak and write appropriately in various situations.
			Design and present effective posters while working in teams, and discuss and participate in Group discussions.
8.	20CS C02	PROGRAMMING FOR PROBLEM SOLVING LAB	Identify and setup program development environment.
			Design and test programs to solve mathematical and scientific problems.
			Identify and rectify the syntax errors and debug program for semantic errors
			Implement modular programs using functions.
			Represent data in arrays, pointers, structures and manipulate them through a program.
9.	20MEC01	CAD AND DRAFTING	Become conversant with appropriate use of CAD software for drafting
			Recognize BIS, ISO Standards and conventions in Engineering Drafting
			Construct the projections of points, lines, planes, solids
			Analyze the internal details of solids through sectional views
			Create an isometric projections and views
10.	20MB C02	COMMUNITY ENGAGEMENT	Gain an understanding of Rural life, Culture and Social realities.
			Develop a sense of empathy and bonds of mutuality with Local Communities.
			Appreciate significant contributions of Local communities to Indian Society and Economy.
			Exhibit the knowledge of Rural Institutions and contributing to Community's Socio-Economic improvements.
			Utilize the opportunities provided by Rural Development Programme.
11.	20MT C22	MATHEMATICS-II	Apply the basic operations on Scalar and Vectors.
			Apply the vector differential operators to Scalars and Vector functions.
			Solve partial fractions by various methods.
			Evaluate definite and indefinite Integral.
			Solve the first order ordinary differential equations.

SNo	Course		CourseOutcomesStatements
	Code	Name	
12.	20BT C02	BASICS OF BIOLOGY-II	Identify the basic structure, function of various animal cell organelles, level of organization and types of tissues in animals (BL4).
			Explain the criteria for classification of various organisms in animal kingdom (BL2).
			Explain the lifecycles, diseases and preventive measures of human pathogens (BL2)
			Outline various biotic and abiotic interactions in nature (BL1).
			Explain the basic information on gene, alleles and its inheritance (BL2).
13	20CY C01	CHEMISTRY	Identify the microscopic chemistry in terms of molecular orbitals, intermolecular forces and rate of chemical reactions.
			Discuss the properties and processes using thermodynamic functions, electrochemical cells and their role in batteries and fuel cells.
			Illustrate the major chemical reactions that are used in the synthesis of organic molecules.
			Classify the various methods used in treatment of water for domestic and industrial use.
			Outline the synthesis of various Engineering materials & Drugs.
14.	20EEC01	BASIC ELECTRICAL ENGINEERING	Understand the concepts of Kirchhoff's laws and to apply them in superposition, Thevenin's and Norton's theorems to get the solution of simple dc circuits
			Obtain the steady state response of RLC circuits with AC input and to acquire the basics, relationship between voltage and current in three phase circuits.
			Understand the principle of operation, the emf and torque equations and classification of AC and DC machines
			Explain various tests and speed control methods to determine the characteristic of DC and AC machines.
			Acquire the knowledge of electrical wiring, types of wires, cables used and Electrical safety precautions to be followed in electrical installations.
			Recognize importance of earthing, methods of earthing and various low-tension switchgear used in electrical installations
			To analyze, interpret and solve the problems encountered in the preparation of material and energy balances of different processes.
15.	20BT C03	PROCESS PRINCIPLES AND REACTION ENGINEERING	To analyze and present experimental data in the form of graphs.
			To calculate Material balances and analyze the applications of transport phenomena in Bioprocess.
			To calculate enthalpy changes associated during various processes
			To compute and compare the basic design calculations of various reactors.
			To predict growth kinetics and analyze substrate utilization and product formation.
			To analyze and present experimental data in the form of graphs.
16.	20CY C02	CHEMISTRY LAB	Identify the basic chemical methods to analyse the substances quantitatively and qualitatively.
			Estimate the number of chemical substances by volumetric analysis.
			Determine the rate constants of reactions from concentration of reactants/ products as a function of time.
			Calculate the concentration and amount of various substances using instrumental techniques.
			Develop the basic drug molecules and polymeric compounds.

SNo	Course		CourseOutcomesStatements
	Code	Name	
17.	20EE C02	BASIC ELECTRICAL ENGINEERING LAB	<p>Get an exposure to common electrical components, their ratings and basic electrical measuring equipment.</p> <p>Make electrical connections by wires of appropriate ratings and able to measure electric power and energy.</p> <p>Comprehend the circuit analysis techniques using various circuit laws and theorems.</p> <p>Determine the parameters of the given coil and calculate the time response of RL & RC series circuits.</p> <p>Recognize the basic characteristics of transformer and components of switchgear.</p> <p>Understand the basic characteristics of dc and ac machine by conducting different types of tests on them.</p>
18.	20ME C02	WORKSHOP / MANUFACTURING PRACTICES	<p>Understand safety measures to be followed in workshop to avoid accidents</p> <p>Identify various tools used in fitting, carpentry, tin smithy, house wiring, welding, casting and machining processes</p> <p>Make a given model by using workshop trades including fitting, carpentry, tin smithy and House wiring.</p> <p>Perform various operations in welding, machining and casting processes</p> <p>Conceptualize and produce simple device/mechanism of their choice</p>
19.	20ME C03	ENGINEERING EXPLORATION	<p>Understand the role of an engineer as a problem solver (BL-2)</p> <p>Identify multi-disciplinary approaches in solving an engineering problem. (BL-4)</p> <p>Build simple systems using engineering design process (BL-3)</p> <p>Analyze engineering solutions from ethical and sustainability perspectives (BL-4)</p> <p>Use basics of engineering project management skills in doing projects (BL-3)</p>
20.	20CSC34	OOPSUSINGPYTHON	<p>Demonstrate the concepts of Object-Oriented Programming languages to solve problems.</p> <p>Apply the constructs like selection, repetition, functions and packages to modularize the programs.</p> <p>Design and build applications with classes/modules.</p> <p>Find and rectify coding errors in a program to assess and improve performance.</p> <p>Develop packages for solving simple real-world problems.</p> <p>Analyze and use appropriate library software to create mathematical software.</p>
21.	20BT C04	BIOCHEMISTRY	<p>Identify different biomolecule structures and describe the functions of various biomolecules.</p> <p>Examine the energy yield from the catabolism of carbohydrates and explain the steps in anabolism.</p> <p>Evaluate the energy yield from lipids and reconstruct lipids.</p> <p>Outline steps involved in catabolism and anabolism of proteins.</p> <p>Summarize steps involved in catabolism and anabolism of nucleic acids.</p>

HEAD
 Dept. of Bio-Technology
 Chaitanya Bharathi Institute of Technology
 Gandipet, Hyderabad-500 073

SNo	Course		CourseOutcomesStatements
	Code	Name	
22.	20BTC05	MICROBIOLOGY	Relate the contribution of various scientists in the development of microbiology
			Classify microorganisms based on their characteristics
			Apply the concept of culturing microorganisms aseptically
			Explain various ecological aspects of microorganisms like diversity, distribution, specific interactions, and the effect that they have on eco systems.
			Illustrate the mechanisms for the propagation of infectious diseases caused by microorganisms
23.	20BTC06	THERMODYNAMICS FOR BIOTECHNOLOGISTS	Calculate heat and work effects for closed systems and cyclic processes.
			Understand volumetric properties of fluids.
			Determine the coefficient of performance of heat engines and heat pump
			Predict the oxygen consumption and heat evolution for aerobic cultures
			Calculate equilibrium conversions and yields for single reactions.
24.	20BTC07	CELL AND MOLECULAR BIOLOGY	Recognize the structure and functions of cell organelles.
			Interpret the knowledge of transport of metabolites and cell cycle check points in their experimental work.
			Distinguish the organization and Replication of DNA, damages and repairs.
			Identify the structure and function of transcripts and the mechanism of transcription by RNA polymerases.
			Illustrate the mechanism of translation and post translation mechanism.
25.	20BTC08	GENETICS	Explain the laws of inheritance and gene interactions.
			Illustrate the types of chromosomes, structure, aberrations and mutations.
			Predict and map the organization of genes due to linkage and crossing over mechanism.
			Categorize sex determination, the chromosomal basis of genetic disorders and sex-linked genes.
			Predict maternal inheritance and genotypic frequencies in a population.
26.	20EGM01	INDIAN CONSTITUTION AND FUNDAMENTAL PRINCIPLES	Understand the making of the Indian Constitution and its features.
			Identify the difference among Right To equality, Right To freedom and Right to Liberty.
			Analyze the structuring of the Indian Union and differentiate the powers between Union and States.
			Distinguish between the functioning of Lok Sabha and Rajya Sabha while appreciating the importance of Judiciary.
			Differentiate between the functions underlying Municipalities, Panchayats and Co-operative Societies.

SNo	Course		CourseOutcomesStatements
	Code	Name	
27.	20CSC35	OOPSUSINGPYTHON LAB	<p>Inspect and identify suitable programming environment to work with Python.</p> <p>Choose appropriate control constructs, data structures to build the solutions.</p> <p>Develop the solutions with modular approach using functions, packages to enhance the code efficiency.</p> <p>Analyze and debug the programs to verify and validate code.</p> <p>Demonstrate use of STLs and modules to build applications.</p> <p>Determine the requirements of real-world problems and use appropriate modules to develop solutions.</p>
28.	20BTC09	BIOCHEMISTRYLAB	<p>Apply the laboratory safety and standard operating procedures and prepare the solutions and biological buffers.</p> <p>Estimate and analyze carbohydrates by different methods.</p> <p>Estimate and analyze amino acids and proteins by different methods.</p> <p>Estimate and analyze lipids and compare the acid value, Saponification value and iodine value of various lipids.</p> <p>Estimate and analyze nucleic acids.</p>
29.	20BTC10	MICROBIOLOGYLAB	<p>Examine the microbial cell structures using of Bright Field microscope</p> <p>Demonstrate sterilization of equipment and various types of media</p> <p>Prepare the basic culture media for the growth of microorganisms</p> <p>Demonstrate the isolation of pure microbial culture from soil and water</p> <p>Predict nomenclature of microorganisms based on their metabolic activity</p>
30.	20MTC23	ENGINEERINGMATH EMATICSFORBIOTEC HNOLOGISTS	<p>Analyse the geometrical interpretation of Mean value theorems</p> <p>Find Laplace transform and inverse Laplace transform and can solve Linear Differential equations.</p> <p>Solve line, surface and volume integrals by Green's, Guass, Stokes's theorem</p> <p>Solve the higher order linear differential equations.</p> <p>Derive the solutions when system of equations has more than two unknowns and learn to reduce the instability of equations.</p>
31.	20BTC12	BIOPROCESSENGINE ERING	<p>Apply the knowledge fermentation processes and aseptic transfer of spore suspension in bioprocess industries.</p> <p>Design fomenters and control process parameters, media formation in bioprocesses, solid state and slung processes.</p> <p>Determine oxygen transfer ratio in aerobic fermentation used in fermentation industries.</p> <p>Apply the knowledge of scale up and scale down technique in bio process industries and able to determine power requirements in bioreactors.</p> <p>Apply knowledge of different bioreactors like air lift, fed batch, batch and continuous in</p>

HEAD
 Dept. of Bio-Technology
 Chaitanya Bharathi Institute of Technology
 Gandipet, Hyderabad-500 075

SNo	Course		Course Outcomes Statements
	Code	Name	
32.	20BTC13	IMMUNOLOGY AND IMMUNOTECHNOLOGY	<p>Identify Immune system components and how they work in a coordinated way.</p> <p>Differentiate the structure of antigen-antibody and the methods of processing of antigen</p> <p>Analyze the Immune system related underlying causes in Allergies, Asthma, and other hyper sensitive reactions.</p> <p>Acquainted with the diseases caused due to Immune system malfunctioning.</p> <p>Explain the Immune system related medical complications in transplantation and Cancers.</p> <p>Apply the principles of immunological techniques in the development of medical diagnostic kits.</p>
33.	20BTC14	INSTRUMENTAL METHODS IN BIOTECHNOLOGY	<p>Explain the instrumental errors and working of different microscopes.</p> <p>Describe various techniques to isolate cellular components and products.</p> <p>Compare various techniques in the purification of cellular products.</p> <p>Illustrate various electrophoresis techniques to isolate DNA/Protein from a mixture.</p> <p>Explain the working of various spectroscopic instruments.</p>
34.	20BTE01	ENVIRONMENTAL BIOTECHNOLOGY	<p>Describe the process of bioremediation in detail.</p> <p>Explain the use of Microorganisms for metal leaching and biofuels generation.</p> <p>Illustrate different methods of waste water treatment and green energy generation.</p> <p>Categorize different types of wastes and their degradation methods.</p> <p>Evaluate various biotechnological applications for hazardous waste management.</p>
35.	20BTE02	PROCESS DYNAMICS & CONTROL FOR BIOTECHNOLOGISTS	<p>Use the knowledge of Process dynamics to control level, temperature, flow variable etc. in bioprocess industries.</p> <p>Devise a simple feedback control strategy for a bioprocess</p> <p>Incorporate the knowledge of closed loop and open loop tuning methods to fine tune the control parameters.</p> <p>Use the knowledge of control valve sizing in the design of control valve system in bioprocess units.</p> <p>Apply the knowledge of process control to regulate the pH of bioreactors.</p>

SNo	Course		CourseOutcomesStatements
	Code	Name	
36.	20BTE03	INTELLECTUALPROPERTY RIGHTS AND BIOETHICS	<p>Demonstrate a breadth of knowledge in Intellectual property</p> <p>Understand the overview of Patents, Searching, filling and drafting of Patents</p> <p>Understand the overview of copyright, GI, trademark, and trade secret</p> <p>Understand about different national and international: Conventions and Treaties Governing the IPRs</p> <p>Understand various aspects of bioethics and its practical implications.</p>
37.	20BTE04	ENZYMETECHNOLOGY	<p>Discuss the nomenclature and classification, properties, isolation and purification of enzymes.</p> <p>Describe the catalytic strategies and mechanism of enzyme action</p> <p>Explain the kinetics of enzyme action and inhibition.</p> <p>Compare various enzyme immobilization techniques and analyze the mass transfer effect in immobilized enzyme systems.</p> <p>Outline the applications of enzymes in different fields.</p>
38.	20BTE05	INDUSTRIAL BIOTECHNOLOGY	<p>Describe the importance of Industrial Bioprocesses</p> <p>Manipulate the ideas for the production of microbial metabolites</p> <p>Apply the concept of biosynthesizing enzymes and other important products</p> <p>Explain the methodologies behind the production of modern products like recombinant vaccines and monoclonal antibodies in industries</p> <p>Apply the concept to produce commercially important</p>
39..	20EGMO3	UNIVERSAL HUMAN VALUES-II: UNDERSTANDING HARMONY	<p>Students are expected to become more aware of themselves, and their surroundings (family, society, nature)</p> <p>They would become more responsible in life, and in handling problems with sustainable solutions, while keeping human relationships and human nature in mind.</p> <p>They would have better critical ability.</p> <p>They would also become sensitive to their commitment towards what they have understood (human values, human relationship and human society).</p> <p>It is hoped that they would be able to apply what they have learnt to their own self in different day-to-day settings in real life, at least a beginning would be made in this direction.</p>

SNo	Course		CourseOutcomesStatements
	Code	Name	
40.	20CEM01	ENVIRONMENTAL SCIENCE	<p>Identify the natural resources and realize the importance of water, food, forest, mineral, energy, land resources and affects of over utilization.</p> <p>Understand the concept of ecosystems and realize the importance of interlinking of food chains.</p> <p>Contribute for the conservation of bio-diversity.</p> <p>Suggest suitable remedial measure for the problems of environmental pollution and contribute for the framing of legislation for protection of environment.</p> <p>Follow the environmental ethics and contribute to the mitigation and management of environmental disasters.</p>
41.	20BTC15	BIOPROCESS ENGINEERING LAB	<p>Describe the importance of media and other rheological parameters during fermentation process</p> <p>Analyze the difference between batch and fed batch processes</p> <p>Demonstrate the preparation of media and its optimization using statistical techniques</p> <p>Estimate the growth kinetics of microorganisms.</p> <p>Determine the mass transfer coefficient in fermentation</p>
42.	20BTC16	IMMUNOLOGY LAB	<p>Demonstrate how Antigens and Antibody interact</p> <p>Identify agglutination and precipitation reactions.</p> <p>Interprets the results based on the results of the antigen-antibody interaction.</p> <p>Analyze the importance of different Immunological techniques developed.</p> <p>Outline the importance of blood group matching in blood transfusions and other cases are practically demonstrated.</p> <p>Differentiate the B-cells and T-cells</p>
43.	20BTC17	INSTRUMENTATION LAB	<p>Apply the instrumentation techniques to their real-life applications</p> <p>Demonstrate the preliminary identification of biomolecules by partition chromatography method</p> <p>Design the experiment to find the molecular weight of an unknown protein</p> <p>Examine the analytes by using UV-Visible spectrophotometer, Conductivity meter, Nephelometer, and flame photometer</p> <p>Justify their results on the separation of biomolecules by differential centrifugation methods</p>
44.	20BT C18	FLUID MECHANICS AND HEAT TRANSFER	<p>Measure the viscosity of different fluids in bio processing.</p> <p>Derive a relation between pressure drop and viscosity.</p> <p>Compare and contrast the merits and demerits of different flow measuring devices.</p> <p>Calculate the rate of heat transfer through various geometries.</p> <p>Calculate the overall heat transfer coefficient in different evaporators and condensers.</p>

HEAD
 Dept. of Bio-Technology
 Chaitanya Bharathi Institute of Technology
 Gandipet, Hyderabad-500 075

SNo	Course		CourseOutcomesStatements
	Code	Name	
45.	20BT C19	GENETIC ENGINEERING AND rDNA TECHNOLOGY	<p>Explain the basic principles and tools used in rDNA research starting from the isolation of nucleic acid, enzymes etc.</p> <p>Compare various types of cloning vectors and expression vectors and their use in rDNA technology.</p> <p>Discuss the principle, types and applications of PCR and molecular markers.</p> <p>Describe the cloning strategies and sequencing methods.</p> <p>Summarize the high-level expression of proteins in different hosts and production of recombinant proteins for the human welfare</p>
46.	20BT C20	PLANT BIOTECHNOLOGY	<p>Describe the theoretical concepts behind the establishment of in vitro techniques.</p> <p>Explain the importance and applications of various in vitro techniques.</p> <p>Identify methods used for the production of plant secondary metabolites in in vitro at a commercial scale.</p> <p>Analyze the appropriate vectors and gene transfer methods for the production of Transgenics.</p> <p>Outline the strategies for the production of transgenics for crop improvement and environmental concerns.</p>
47.	20MTC24	BIOSTASTICS	<p>Use basic counting techniques to compute probability</p> <p>Compute conditional probabilities using Bayes Theorem</p> <p>Analyze the probability function using statistical averages</p> <p>Distinguishing the data using different methods of hypothesis</p> <p>Analyze the data using analysis of variance technique</p>
48.	20BT C21	INTRODUCTION TO ANATOMY AND PHYSIOLOGY OF HUMANS	<p>Outline the structure of Human body and explain the structure and function of endocrine glands</p> <p>Discuss the anatomical structures and the physiological functions of Skeletal, Muscular and digestive systems.</p> <p>Explain the anatomical structures and the physiological functions of excretory, circulatory and respiratory system.</p> <p>Describe the anatomical structures and the physiological functions of nervous system and other sensory systems.</p> <p>Discuss the anatomical structures and the physiological functions of reproductive system and physiology of blood</p>
49.	20EG M02	INDIAN TRADITIONAL KNOWLEDGE	<p>Understand philosophy of Indian culture</p> <p>Distinguish the Indian languages and literature</p> <p>Learn the philosophy of ancient, medieval and modern India</p> <p>Acquire the information about the fine arts in India</p> <p>Know the contribution of scientists of different eras.</p>
50.	20BT C22	FLUID MECHANICS AND HEAT TRANSFER LAB	<p>Calculate the coefficient of discharge of different flow measuring devices and Reynold's Number based on the distinction between the types of flow.</p> <p>Determine the friction losses in pipe fittings & verify Bernoulli's Theorem.</p> <p>Predict the Thermal conductivity of homogeneous wall insulating powder under steady state conditions.</p> <p>Determine the heat transfer coefficient in Natural and Forced convection using PIN FIN apparatus.</p> <p>Predict the emissivity of a non -black surface.</p> <p>Calculate the overall heat transfer coefficient for parallel flow and counter flow in a Double pipe heat exchanger.</p>

SNo	Course		CourseOutcomesStatements
	Code	Name	
51.	20BT C23	GENETIC ENGINEERING LAB	<p>Demonstrate the isolation and visualization of nucleic acids. (Expt. 1,2,3)</p> <p>Characterize the DNA by restriction digestion and restriction mapping. (Expt. 4,5)</p> <p>Plan different steps involved in cloning strategies of DNA (Expt. 6,7,8,9,10)</p> <p>Perform the polymerase chain reaction. (Expt. 11)</p> <p>Analyze the DNA Sequencing and recombinant protein by using SDS PAGE (Expt. 12,13)</p>
52.	20BT C24	PLANT BIOTECHNOLOGY LAB	<p>Prepare plant tissue culture medium for in vitro studies. (Expt 1,2)</p> <p>Execute the protocols for Surface sterilization, Organ culture, and Callus induction using various explants. (Expt 3,4,5,10)</p> <p>Develop in vitro techniques for micropropagation of meristem/nodal explants of horticulture and medicinal plants. (Expt. 6,7,8,9)</p> <p>Demonstrate the Protoplast isolation from various plant tissues using enzymatic methods. (Exp.11)</p> <p>Develop a system for genetic transformation in plants using Agrobacterium strains (Expt 12)</p>
53.	20BT C25	BIOSEPARATION ENGINEERING	<p>Outline the key aspects of downstream processing of biotechnological process and develop process design for bio products.</p> <p>Distinguish the various techniques of cell disruption and unit operations for separation of bio products.</p> <p>Compare and contrast various membrane separation processes.</p> <p>Interpret application of various chromatographic process for separation of bio products.</p> <p>Analyze various product finishing techniques and case studies of important bio products</p>
54	20BT C26	BIOINFORMATICS AND COMPUTATIONAL BIOLOGY	<p>Explain various types of biological databases used for the retrieval and analysis of the information</p> <p>Identify the methods used for sequence alignment and construction of the phylogenetic tree</p> <p>Discuss genome sequencing and gene prediction tools.</p> <p>Describe biochemical databases and protein structure prediction tools</p> <p>Demonstrate docking methods for Identification of lead molecules</p>
55.	20MBC01	ENGINEERING ECONOMICS AND ACCOUNTANCY	<p>Apply fundamental knowledge of Managerial Economics concepts and tools.</p> <p>Analyze various aspects of Demand Analysis, Supply and Demand Forecasting.</p> <p>Understand Production and Cost relationships to make best use of resources available.</p> <p>Apply Accountancy Concepts and Conventions and preparation of Final Accounts.</p> <p>Evaluate Capital and Capital Budgeting decision based on any technique.</p>

HEAD
 Dept. of Bio-Technology
 Chaitanya Bharathi Institute of Technology
 Gandipet, Hyderabad-500 075



SNo	Course		CourseOutcomesStatements
	Code	Name	
56.	20BT C27	ANIMAL BIOTECHNOLOGY	<p>Explain the animal cell culture requirements and techniques.</p> <p>Outline the establishment maintenance and scale-up of animal cell culture.</p> <p>Discuss Stem cells and their applications and procedure for measurement of cell viability and cytotoxicity and cell death.</p> <p>Explain various methods for IVF and embryo transfer, cloning and generation of transgenic animals and their applications.</p> <p>Outline various applications of animal biotechnology.</p>
57.	20BT C28	MASS TRANSFER OPERATIONS	<p>Predict the rate of molecular diffusion in solids, liquids and gases.</p> <p>Determine the number of trays needed for separation by Distillation.</p> <p>Determine the number of trays needed for separation by Extraction and Leaching.</p> <p>Calculate the rate and time of drying in constant head and falling rate methods.</p> <p>Write the principles and application of membrane separation processes and understand the types of adsorbents.</p>
58.	20BT E06	VIROLOGY	<p>Explain classification, morphology of viruses.</p> <p>Compare the techniques for cultivation of plant & animal viruses.</p> <p>Outline various characterization techniques for detection of viruses.</p> <p>Illustrate the structural, functional and disease control measures of plant viruses.</p> <p>Describe the classification, pathogenesis of animal viruses and therapeutic strategy for vaccine development.</p>
59.	20BT E07	MEDICAL BIOTECHNOLOGY	<p>Outline the various diagnosis and treatment of Cancer.</p> <p>Explain the concepts of Stem cell therapy and Tissue engineering.</p> <p>Discuss the principle and applications of biomedical devices and molecular diagnostics.</p> <p>Classify the molecular therapies and bioethical issues.</p> <p>Classify the molecular therapies and bioethical issues.</p>
60.	20BT E08	PHARMACEUTICAL BIOTECHNOLOGY	<p>Summarize the fundamentals of biopharmaceuticals.</p> <p>Explain the ADME properties of drugs, pharmacokinetics, pharmacodynamics, and drug delivery systems.</p> <p>Outline the different manufacturing procedures of drugs.</p> <p>Discuss the blood and plasma substitutes.</p> <p>Describe the therapeutic activity of drugs used for treating diseases</p>
61.	20BT E09	CANCER BIOLOGY	<p>Summarize the etiology of cancer.</p> <p>Explain the principles and mode of action of physical and chemical carcinogens.</p> <p>Discuss the molecular genetics of cancer.</p> <p>Outline the cancer metastasis, diagnosis and different forms of therapy</p> <p>Describe the principles of cancer pharmacology.</p>
62.	20BT C29	BIOSEPARATION ENGINEERING LAB	<p>Evaluate various techniques for cell disruption, filtration and separation of bioproducts. (Expt: 1-8,13)</p> <p>Analyze the optimum protein precipitation technique. (Expt: 9)</p> <p>Demonstrate chromatographic separation process for a given compound. (Expt: 10,11,12)</p> <p>Apply a strategy for final product purification/ polishing of a bioproduct. (Expt: 14)</p> <p>Develop methods for determining enzyme activity. (Expt: 15)</p>

HEAD
 Dept. of Bio-Technology
 Chaitanya Bharathi Institute of Technology
 Gandipet, Hyderabad-500 075

SNo	Course		CourseOutcomesStatements
	Code	Name	
63.	20BT C30	BIOINFORMATICS AND COMPUTATIONAL BIOLOGY LAB	Retrieve the information from biological databases (Expt. 1,2) Utilize BLAST, FASTA and other online tools (Expt. 3, 4) Use online sequence alignment tools and construction of evolutionary tree by phylogenetic analysis (Expt. 5,6,7) Predict gene and protein structure and design primers and construct restriction map. (Expt. 8, 9, 10, 11) Retrieve macromolecular structures and perform docking of a ligand to its target (Expt 12, 13)
64.	20BT C31	ANIMAL BIOTECHNOLOGY LAB	Demonstrate aseptic culture techniques and preparation of animal cell culture media. (Expt. 1, 3, 4) Identify and enumerate animal cells by using microscopic techniques. (Expt. 2, 8) Apply animal cell culture techniques to the establishment of primary culture. (Expt. 5, 6, 7) Evaluate cell viability and cytotoxicity of animal cell culture. (Expt. 9, 10) Perform the maintenance and preservation of animal cells. (Expt.11, 12, 13)
65.	EMPLOYABILITY SKILLS	20EG CO3	Become effective communicators, participate in group discussions with confidence and be able to make presentations in a professional context. Write resumes, prepare and face interviews confidently. Be assertive and set short term and long-term goals, learn to manage time effectively and deal with stress. Make the transition smoothly from campus to work, use media with etiquette and understand the academic ethics. Enrich their vocabulary, frame accurate sentences and comprehend passages confidently.
66.	20BT E10	TISSUE ENGINEERING	Outline the concepts of tissue engineering, ethical issues, and future prospects Illustrate the molecular mechanisms at the tissue level and in cell-matrix in tissue engineering. Identify in vitro culturing techniques and scale-up designs. Classify the compatible biomaterials used for the fabrication of scaffolds in Tissue engineering. Summarize the therapeutic applications of tissue engineering.
67.	20BT E11	GENOME EDITING	Outline the Genome editing and its tools for genome engineering Describe the genome editing strategy and target site Explain the Genome editing in Plants for crop improvement Discuss the Genome editing in animals and for human welfare Summarize the application genome editing and emergent challenges for CRISPR technologies
68.	20BT E12	PHYTOCHEMICALS AND HERBAL PRODUCTS	Classify the sources of various crude drugs and their medicinal values. Outline the procedures involved in the detection, extraction, and analysis of crude drugs and adulterants. Interpret the structure, types and extraction procedure of different plant secondary products. Outline the applications of phytochemicals. Discuss the various aspects of herbal products and licensing of herbal drugs

HEAD
Dept. of Bio-Technology
Chaitanya Bharathi Institute of Technology
Gandipet, Hyderabad-500 075

S.No	Course		CourseOutcomesStatements
	Code	Name	
69.	20BT E13	DEVELOPMENTAL BIOLOGY	<p>Discuss basic concepts of Developmental Biology.</p> <p>Describe the anatomy of gametes and biochemistry involved in gamete recognition</p> <p>Analyze the role of genes in the body axis formation of drosophila.</p> <p>Outline the importance and differentiation of germinal layers into different organs and compare the role of genes in the sex determination of Drosophila and Mammals.</p> <p>Explain the genetic anomalies that lead to diseases.</p>
70.	20BT E14	FOOD BIOTECHNOLOGY	<p>Apply the fundamentals of food biotechnology to their real-life situation</p> <p>Differentiate types of food and explain their nutritive value</p> <p>Examine the types of pathogens and their effect on food</p> <p>Demonstrate the physical and chemical methods of food processing.</p> <p>Apply the techniques to preserve the food material to avoid food spoilage.</p>
71.	20BT E15	NANO BIOTECHNOLOGY	<p>Discuss the multidisciplinary nature of nanotechnology and Nano scale paradigm in terms of properties at the nano scale dimension.</p> <p>Describe different methods used for the synthesis and characterization of nanomaterials.</p> <p>Interpret various types of nanostructures.</p> <p>Summarize general applications of Nanobiotechnology.</p> <p>Outline the current applications of Nanobiotechnology</p>
72.	20BT E16	GOOD MANUFACTURING LABORATORY PRACTICE	<p>Learn and adopt quickly in a GMP environment and understand the principles and applications of the GMP.</p> <p>Evaluate the criteria for drug approval related documentation and quality systems Importance of GMP and GLP for drug regulation</p> <p>Describe quality assurance, design of quality systems, risk analysis and risk assessment</p> <p>Able to apply knowledge of laws related to drug development approval process and regulations related to clinical trials</p> <p>Safely practice basic laboratory procedures and protocols, maintain laboratory records compliant with current industry standards.</p>
73.	20BT E17	REGULATORY AFFAIRS AND CLINICAL TRIALS	<p>Classify the role of regulatory committees in controlling the risk and information on ethical issues linked to research on animal models, transgenics.</p> <p>Summarize the Government of India rules and regulations about the ICH, GCP, FDA guidelines.</p> <p>Discuss the role of regulatory affairs and their significance globally.</p> <p>Outline the criteria for drug approval related documentation.</p> <p>Discuss the various phases of clinical trials and the basis of approval of new drugs, their outcome in new drug discovery.</p>
74.	20BT E18	RATIONAL DRUG DISCOVERY	<p>Describe drug discovery process, CADD, molecular modeling etc.</p> <p>Explain the quantum Mechanics and molecular mechanism.</p> <p>Identify various molecular dynamics simulation methods.</p> <p>Discuss the methods for Molecular Docking and lead optimization, ADMET properties of the drug.</p> <p>Summarize about the Pharmacophore and QSAR.</p>



SNo	Course		CourseOutcomesStatements
	Code	Name	
75.	20BT E19	MOLECULAR MODELING & DRUG DESIGN	<p>Calculate the total energy of the molecule by using force field potentials.</p> <p>Calculate Internal energy, Heat capacity, Temperature, and pressure.</p> <p>Hard sphere potential, Continuous potential by Finite differential method.</p> <p>Choosing the initial configuration and analyzing the results of computer simulation.</p> <p>Simulation of polymers by Random walk method, Self-avoiding walk method.</p> <p>Classification of Drug Design. CADD to treat Alzheimer's and Tuberculosis diseases</p>
76.	20BT E20	STRUCTURAL BIOLOGY	<p>Demonstrates the hierarchy in protein organization and structure-function relationship</p> <p>Outlines the mechanisms, dynamics, and physical interactions that maintain protein structure.</p> <p>Demonstrate the basic techniques involved in determining the structure of a biomolecules</p> <p>Assess conceptual basics of structural dynamics of other macromolecules DNA, RNA & enzyme</p> <p>Illustrates the computer-based visualizations and molecular simulations</p>
77.	20BT E21	GENOMICS AND PROTEOMICS	<p>Describe genomes, types of genomes and the advanced techniques used for analyzing the genome.</p> <p>Explain the methods of functional genomics.</p> <p>Discuss the various sequencing technology in genomics.</p> <p>Describe the tools used for the characterization of proteins</p> <p>Explain about personalized medicines their uptake, action and metabolism</p>
78.	20EG MO4	GENDER SENSITIZATION	<p>Understand the difference between "Sex" and "Gender" and be able to explain socially constructed theories of identity.</p> <p>Recognize shifting definitions of "Man" and "Women" in relation to evolving notions of "Masculinity" and "Femininity".</p> <p>Appreciate women's contributions to society historically, culturally and politically.</p> <p>Analyze the contemporary system of privilege and oppressions, with special attention to the ways gender intersects with race, class, sexuality, ethnicity, ability, religion, and nationality.</p> <p>Demonstrate an understanding of personal life, the workplace, the community and active civic engagement through classroom learning.</p>
79.	20BT C33	PROJECT PART-I	<p>Survey and study of published literature on the assigned topic;</p> <p>Working out a preliminary Approach to the Problem relating to the assigned topic;</p> <p>Conducting preliminary Analysis/Modelling/Simulation/Experiment/Design/Feasibility;</p> <p>Preparing a Written Report on the Study conducted for Presentation to the Department;</p> <p>Final Seminar, as oral Presentation before a departmental Committee.</p>

SNo	Course		CourseOutcomesStatements
	Code	Name	
80.	20BT E22	IMMUNODIAGNOSTICS	<p>Outline the principle, importance, scope, classification of immunodiagnostic tests and antigen-antibody reaction</p> <p>Explain the principles and application of immunodiagnosics tests for diagnosing various diseases</p> <p>Discuss the production of monoclonal antibodies for diagnosis, treatment, and prevention of disease.</p> <p>Describe various methods used for vaccine development.</p> <p>Summarize the various novel techniques used in immunodiagnosics.</p>
81.	20BT E23	BIOMATERIALS	<p>Explain types and properties of Biomaterials.</p> <p>Compare the techniques for manufacture of metallic Biomaterials and their use in health care industry.</p> <p>Outline the physiological properties and various techniques for manufacture of ceramic biomaterials.</p> <p>Illustrate the preparation of polymer and composite Biomaterials.</p> <p>Apply the different type of Biomaterials in health industry.</p>
82.	20BT E24	METABOLIC ENGINEERING	<p>Summarize the basic concepts of metabolic engineering.</p> <p>Describe the various biosynthesis of secondary metabolites & their applications in various fields.</p> <p>Discuss the factors influence the bioconversions and genetic manipulations of metabolic pathways.</p> <p>Explain the analysis & applications of metabolic flux.</p> <p>Outline the metabolic pathway modeling synthesis using bioinformatics tools and its applications.</p>
83.	20BT E25	BIOSIMILAR TECHNOLOGY	<p>Outline the biologics, biosimilars and super biologics.</p> <p>Distinguish the various biosimilar drugs</p> <p>Compare and contrast various biosimilar characterization methods.</p> <p>Interpret various bioequivalence studies.</p> <p>Analyze various case studies of biosimilar products of Indian companies</p>
84.	20BT C35	PROJECT PART-II	<p>In depth study of the topic assigned;</p> <p>Review and finalization of the Approach to the Problem relating to the assigned topic;</p> <p>Preparing an Action Plan for conducting the investigation, including teamwork;</p> <p>Detailed Analysis/Modeling/Simulation/Design/Problem Solving/Experiment as needed;</p> <p>Final development of product/process, testing, results, conclusions and future directions;</p> <p>Preparing a paper for Conference presentation/ Publication in Journals, if possible;</p> <p>Preparing a Dissertation in the standard format for being evaluated by the Department.</p> <p>Final Seminar presentation before Departmental Committee.</p>

CHAITANYABHARATHIINSTITUTE OF TECHNOLOGY(Autonomous)

Gandipet,Hyderabad-75

Department Of Biotechnology Course Outcomes

Course Outcomes Statements for R18

SNo	Course		Course Outcomes Statements
	Code	Name	
1.	18MT C02	ENGINEERING MATHEMATICS-I (for BiPC Stream of Bio-Tech)	Basics of elementary trigonometry is very essential to solve Engineering problems.
			Very useful to find out Slopes, Heights and Distances.
			Basics of limits, continuity and differentiability are must to develop the mathematical modelling.
			Applications of matrices are abundantly used in Industry as well as Research and Development.
			It is very useful to find constant co-efficient of straight line and curved equations by curve fitting methods and it uses are plenty at surveying agricultural fields.
			It is for Research and Development.
2.	18BT C01	BASICS OF BIOLOGY-I (for MPC Stream of Bio-Tech)	Explain the theories behind the origin of life and evolution studies.
			Classify plants based on the habit and habitat of plants.
			Compare the mechanism of reproduction and development of seed in plants.
			Outline and identify the basic structure and function of various organelles of plant cell.
			Identify and classify microbes and compile the their economic importance.
			Analyse basic physiological processes in plants.
3.	18PY C05	PHYSICS (for Chemical and Bio-Tech)	Demonstrate the wave nature of the light and describe the types of lasers. and optical fibres and their applications.
			Develop the concepts related to electromagnetic behavior.
			Demonstrate the important concepts of Quantum Mechanics
4.	18CS C01	PROGRAMMING FOR PROBLEM SOLVING (Common to All Programs)	Identify the computing environments.
			Formulate solutions to problems and represent them using algorithms/ Flowcharts.
			Choose proper control statements and data structures to implement the algorithms.
			Decompose a problem into modules and use functions to implement the modules.
			Develop applications using file I/O.

HEAD
 Dept. of Bio-Technology
 Chaitanya Bharathi Institute of Technology
 Gandipet, Hyderabad-500 075



SNo	Course		CourseOutcomesStatements
	Code	Name	
5.	18EG C01	ENGLISH	The students will understand the nature, process and types of communication and will communicate effectively without barriers.
			The students will write correct sentences and coherent paragraphs.
			The students will know how to condense passages by writing précis and write essays by using accurate grammar and appropriate vocabulary.
			The students will demonstrate advanced writing skills by drafting formal reports.
			The students will apply their reading techniques and analyze reading comprehension passages.
6.	18 PY C08	PHYSICS LABORATORY (for Chemical and Bio-Tech)	Understand the concept of errors and find the ways to minimize the errors.
			Demonstrate interference and diffraction phenomena experimentally.
			Understand the applications of magnetic and dielectric materials.
			Know the working of lasers and optical fibres.
			Distinguish between polarized and unpolarized light.
7.	18CS C02	PROGRAMMING FOR PROBLEM SOLVING LAB (Common to All Programs)	Identify and setup program development environment.
			Implement the algorithms using C programming language constructs.
			Identify and rectify the syntax errors and debug program for semantic errors.
			Solve problems in a modular approach using functions.
			Implement file operations with simple text data.
8.	18ME C02	WORKSHOP/ MANUFACTURING PRACTICE	Fabricate components with their own hands.
			Get practical knowledge of the dimensional accuracies and dimensional tolerances possible with different manufacturing processes.
			Assembling different components, student will be able to produce small mechanisms/devices of their interest.
			Gain practical skills of carpentry, tinsmithy, fitting, house wiring.
			Gain knowledge of different Engineering Materials and Manufacturing Methods and Understand trades and techniques used in Workshop and chooses the best material/ manufacturing process for the application.
9.	18EG C02	ENGLISH LAB	The students will differentiate the speech sounds in English.
			The students will interact with the software and understand the nuances of pronunciation in English.
			The students will speak with the proper tone, intonation and rhythm and apply stress correctly. The students will demonstrate their listening skills by analyzing the IELTS and TOEFL listening comprehension texts
			The students will speak with clarity and confidence.
			The students will work in teams and discuss various topics and demonstrate their presentation skills through posters.


SNo	Course		CourseOutcomesStatements
	Code	Name	
10.	18MT C04	ENGINEERING MATHEMATICS-II (for BiPC Stream of Bio-Tech)	To find out Areas, Surface Areas, Volumes can be obtained by definite integrals.
			Any complicated fraction can be decomposed by using partial fractions, then it makes integrable.
			Model the First-Order Differential Equations and solve it for various Engineering Branches applications, etc.
			Model the Higher Order Linear Differential Equations and solve it for various Engineering branches physical problems.
			To learn how to find out approximate values of Multivariable Algebraic Equations by various methods.
			It is very useful for Research and Development.
11.	18BT C02	BASICS OF BIOLOGY-II (for MPC Stream of Bio-Tech)	Explain the criteria for classification of various organisms in animal kingdom.
			Identify the basic structure and function of various organelles of animal cell.
			Discuss the organization symmetry and tissue types in animal system.
			Outline various biotic interactions in nature.
			Demonstrate the basic information on gene, alleles and its inheritance.
			Compare the gene regulation system in prokaryotes and eukaryotes
12.	18 CY C01	CHEMISTRY	Analyse microscopic chemistry in terms of atomic and molecular orbitals and intermolecular forces.
			Rationalize bulk properties and processes using thermodynamic considerations & Ionic Equilibria.
			List major chemical reactions that are used in the synthesis of molecules.
			Apply the various methods used in treatment of water for domestic and industrial use.
			Discuss the various Engineering materials & Drug synthesis & their applications.
13.	18CEC01	ENGINEERINGMECHANICS	Solve problems dealing with forces in plane and space force systems, draw free body diagrams to analyze various problems in equilibrium, for smooth and frictional surface.
			Determine centroid and moment of inertia for elementary, composite areas and bodies.
			Analyze simple trusses for forces in various members of a truss.
			Solve problem in kinematics and kinetics of particles and rigid bodies.
			Analyze body motion using work energy principles, impulse and momentum approach and able to apply the concepts of simple harmonic motion and free vibrations in dynamics.

S.No	Course		CourseOutcomesStatements
	Code	Name	
14.	18MEC01	ENGINEERING GRAPHICS AND DESIGN	<p>Introduction to engineering design and its place in society</p> <p>Exposure to the visual aspects of engineering design.</p> <p>To become familiar with engineering graphics standards.</p> <p>Exposure to solid modelling.</p> <p>Exposure to computer-aided geometric design.</p> <p>Exposure to creating working drawings.</p> <p>Exposure to engineering communication.</p>
15.	18EE C01	BASIC ELECTRICAL ENGINEERING	<p>Acquire the concepts of Kirchoff's laws and network theorems and able to get the solution of simple dc circuits.</p> <p>Obtain the steady state response of RLC circuits and also determine the different powers in AC circuits.</p> <p>Acquire the concepts of principle of operation of Transformers and DC machines.</p> <p>Acquire the concepts of principle of operation of DC machines and AC machines.</p> <p>Acquire the knowledge of electrical wiring and cables and electrical safety precautions.</p> <p>Recognize importance of earthing and methods of earthing and electrical installations.</p>
16.	18EE C02	BASIC ELECTRICAL ENGINEERING LAB	<p>Get an exposure to common electrical components and their ratings.</p> <p>Make electrical connections by wires of appropriate ratings.</p> <p>Understand the circuit analysis techniques.</p> <p>Determine the parameters of the given coil.</p> <p>Understand the basic characteristics of transformer.</p> <p>Understand the basic characteristics of dc and ac machines.</p>
17.	18CY C02	CHEMISTRY LAB (Common to all branches)	<p>Estimate rate constants of reactions from concentration of reactants/products as a function of time.</p> <p>Measure molecular/system properties such as surface tension, viscosity, conductance of solutions, redox potentials, chloride content of water, etc.</p> <p>Synthesize a small drug molecule and Identify the organic compounds.</p> <p>Understand importance of analytical instrumentation for different chemical analysis.</p> <p>Perform interdisciplinary research such that the findings benefit the common man</p>
18.	18MTC06	ENGINEERING MATHEMATICS-III	<p>Solve system of linear equations and identify the Eigen values and Eigen vectors in engineering problems.</p> <p>Solve the problems based on Mean value theorems</p> <p>Solve maxima and minima problems.</p> <p>Solve vector and scalar triple product related problems.</p> <p>Solve divergence and curl related problems.</p>

SNo	Course		CourseOutcomesStatements
	Code	Name	
19.	18BT C03	CELL AND MOLECULAR BIOLOGY	Recognize the structure and functions of cell organelles.
			Interpret the knowledge of transport of metabolites and cell cycle checkpoints in their experimental work.
			Distinguish the organization and Replication of DNA, damages and repairs
			Identify the structure and function of transcripts and mechanism of transcription by RNA polymerases.
			Illustrate the mechanism of translation and post translation mechanism
20.	18BT C04	BIOCHEMISTRY	Recognize different biomolecule's structure and describe the functions of various biomolecules.
			Evaluate the energy yield from the catabolism of carbohydrates and explain the steps in anabolism.
			Evaluate the energy yield from lipids and reconstruct lipids.
			Outline steps involved in catabolism and anabolism of proteins.
			Summarize steps involved in catabolism and anabolism of nucleic acids.
21.	18BT C05	MICROBIOLOGY AND INDUSTRIAL BIOTECHNOLOGY	Outline the historical aspects of microbiology and structure of prokaryotic cell.
			Identify major characteristics and classification of microorganisms.
			Describe importance of culture media and microbial growth.
			Compare physical and chemical sterilization methods.
			Apply theoretical knowledge for production of microbial metabolites.
22.	18BT C06	PROCESS PRINCIPLES AND REACTION ENGINEERING	To analyze, interpret and solve the problems encountered in the preparation of material and energy balances of the process.
			To predict the flue gas composition from fuel composition and vice versa.
			To design and use the generalized flow sheets for different chemical processes.
			To evaluate and assess the rate equations for any given chemical reaction
			To compute and compare the basic design calculations of various reactors.
23.	18BT C07	GENETICS	Apply to real life situations, the principles of human heredity.
			Be able to describe the chromosomal basis of inheritance arised due to aberrations in chromosomal structure and number.
			Be able to map understand the organization of genes due to linkage and crossing over mechanism.
			Be able to predict the chromosomal basis of mendelism, in sex linked genes and sex determination.
			Able to analyze concept of non mendelian maternal inheritance and population level genetic processes.

SNo	Course		CourseOutcomesStatements
	Code	Name	
24.	18EG M01	INDIAN CONSTITUTION	Understand the making of the Indian Constitution and its features.
			Have an insight into various Organs of Governance - composition and functions.
			Understand powers and functions of Municipalities, Panchayats and Co-operative Societies.
			Be aware of the Emergency Provisions in India.
			Understand the Right To equality, the Right To freedom and the Right to Liberty.
25.	18EE M01	INDIAN TRADITIONAL KNOWELDGE	Understand philosophy of Indian culture
			Distinguish the Indian languages and literature
			Learn the philosophy of ancient, medieval and modern India
			Acquire the information about the fine arts in India
			Know the contribution of scientists of different eras.
26.	18BT C08	BIOCHEMISTRY LAB	Apply the laboratory safety and standard operating procedures and prepare the solutions and biological buffers
			Estimate and analyze carbohydrate by different methods
			Estimate and analyze amino acids and proteins by different methods
			Estimate and analyze lipids and compare the acid value, Saponification value and iodine valve of various lipids.
			Estimate and analyze nucleic acids
27.	18BT C09	MICROBIOLOGY LAB	Outline of Magnification, Resolution, Refractive index of Microscope
			Operate the physical sterilization equipment's
			Prepare the basic culture media for the growth of microorganisms
			Perform streak plate, spread plate and pour plate techniques.
			Identify type of bacteria (Gram positive or Gram negative)
28.	18BTC10	IMMUNOLOGY	Identify Immune system components and how they work in a coordinated way.
			Apply the application of antigen-antibody interactions in development of medical diagnostic kits.
			Analyze the Immune system related underlying causes in Allergies, Asthma and other hypersensitive reactions.
			Acquainted with the diseases caused due to Immune system malfunctioning.
			Explain the Immune system related medical complications in transplantation and Cancers

HEAD
 Dept. of Bio-Technology
 Chaitanya Bharathi Institute of Technology
 Gandipet, Hyderabad-500 095



SNo	Course		CourseOutcomesStatements
	Code	Name	
29.	18BTC11	INSTRUMENTALMETHODSINBIOTECHNOLOGY	Solve the Analytical problems in instruments by Detection & sensitivity limits.
			Assess the merits and demerits of instruments
			Discuss Principle, procedure and applications of different types of centrifugations
			Summarize Principle, Procedure and applications of chromatography's like TLC, paper
30.	18BTC12	CHEMICALANDBIOCHEMICALTHERMODYNAMICS	Measure heat and work increments for closed systems and cyclic processes.
			Evaluate nozzle, turbine and compressors based on the principles of I-law of thermodynamics.
			Calculate the coefficient of performance of heat engines and heat pump
			Predict the extent of various reactions by Gibbs and Duhem equation.
			Calculate separation processes like distillation based on vapour liquid equilibrium for binary systems and calculate equilibrium conversions.
31.	18MEC09	PRINCIPLESOFMANAGEMENT	Identify and evaluate the principles of management
			Demonstrate the ability to have an effective and realistic planning
			Identify the nature and the type of organization
			Apply the tools and techniques of directing
			Explain and evaluate the necessity for controlling and further refinement of an organization.
32.	18CEM01	ENVIRONMENTAL SCIENCE (MANDATORY COURSE)	To define environment, identify the natural resources and ecosystems and contribute for the conservation of bio-diversity.
			To suggest suitable remedial measure for the problems of environmental pollution and contribute for the framing of legislation for protection of environment.
			To relate the social issues and the environment and contribute for the sustainable development.
			To follow the environmental ethics.



SNo	Course		Course Outcomes Statements
	Code	Name	
33.	18CSC06	BASICS OF DATA STRUCTURES LAB (Common for other Programmes)	Implement the abstract data type.
			Implement linear data structures such as stacks, queues using array and linked list.
			Understand and implement non-linear data structures such as trees, graphs and its traversal techniques.
			Implement various kinds of searching, sorting techniques.
			Develop the suitable data structure for real world problem.
34.	18BTC13	IMMUNOLOGY LAB	Demonstrate how Antigens and Antibody interact.
			Identify agglutination and precipitation reactions.
			Interprets the results based on the results of the antigen-antibody interaction.
			Analyze the importance of different Immunological techniques developed.
			Outline the importance of blood group matching in blood transfusions and other cases are practically demonstrated.
35.	18BT C14	INSTRUMENTATION LAB	Relate the instrumentation techniques to their real-life applications.
			Demonstrate their knowledge on different Spectrophotometers.
			Identify and solve the problems associated with determination of molecular weights by chromatography and electrophoresis techniques.
			Compare and analyze different biomolecules by using flame photometry and fluorometry.
			Justify their results on separation of biomolecules by differential centrifugation methods.
36.	18EG C03	SOFT SKILLS LAB	Be assertive and set short term and long-term goals. Also learn to manage time effectively and deal with stress.
			Win in professional communication situations and participate in group discussions with confidence. Write abstracts.
			Write effective resumes. Plan, prepare and face interviews confidently.
			Adapt to corporate culture by being sensitive - personally and sensible professionally. Draft an SOP.
			Apply the soft skills learnt in the mini-live project, by collecting and analyzing data and making oral and written presentations on the same.
37.	18BTC15	FLUID MECHANICS AND HEAT TRANSFER	Measure the viscosity of different fluids in bio processing.
			Derive a relation between pressure drop and viscosity.
			Compare and contrast the merits and demerits of different flow measuring devices.

SNo	Course		CourseOutcomesStatements
	Code	Name	
			Explain the concepts of heat transfer with and without phase change.
			Calculate the heat transfer area, overall heat transfer co-efficient required for various processes and explain the operation of various evaporators, condensers and heat exchange equipment.
38.	18BTC16	ENZYMETECHNOLOGY	Discuss the nomenclature and classification, properties, isolation and purification of enzymes.
			Describe the catalytic strategies and mechanism of enzyme action
			Explain the kinetics of enzyme action and inhibition.
			Compare various enzyme immobilization techniques and analyze the mass transfer effects in immobilized enzyme systems.
			Outline the applications of enzymes in different fields.
39.	18BT C17	GENETIC ENGINEERING AND rDNA TECHNOLOGY	Explain the basic principles and tools used in rDNA research starting from the isolation of nucleic acid, enzymes etc.
			Compare various types of cloning vectors and expression vectors and their use in rDNA technology.
			Discuss the principle, types and applications of PCR and molecular markers.
			Describe the cloning strategies and sequencing methods.
			Summarize the high-level expression of proteins in different hosts and production of recombinant proteins for the human welfare
40.	18BT E01	VIROLOGY (Core Elective - I)	Explain classification, morphology, and disease prevention measures of viruses.
			Compare the techniques for cultivation of plant & animal viruses.
			Outline various characterization techniques for detection of viruses.
			Illustrate the structural, functional and disease control measures of plant viruses.
			Describe the classification, pathogenesis of animal viruses and therapeutic strategy for vaccine development.
41.	18BT E02	PHYTOCHEMICALS AND HERBAL PRODUCTS (Core Elective - I)	List the classification and pertinent utilization of important crude drugs.
			Outline the evaluation and estimation procedures of crude drugs and adulterants.
			Classify various types and extraction procedures of different plant secondary products.



SNo	Course		CourseOutcomesStatements
	Code	Name	
			Categorize the applications of phytochemicals.
			Evaluate the precise extract preparations of herbal products and its licensing issues.
42.	18BT E03	INTRODUCTION TO ANATOMY AND PHYSIOLOGY OF HUMANS (Core Elective - I)	Outline the structure of the Human body, structure & function of endocrine glands.
			Discuss the anatomical structures and the physiological functions of Skeletal, digestive and excretory systems.
			Explain the anatomical structures and the physiological functions of circulatory and respiratory system.
			Describe the anatomical structures and the physiological functions of nervous system and other sensory systems.
			Discuss the anatomical structures and the physiological functions of reproductive system and physiology of blood.
43.	18BT E04	ENVIRONMENTAL BIOTECHNOLOGY (Core Elective – II)	Describe the process of bioremediation in detail.
			Explain the use of Microorganisms for metal leaching and biofuels generation.
			Illustrate different methods of waste water treatment and green energy generation.
			Categorize different types of wastes and their degradation methods.
			Evaluate various biotechnological applications for hazardous waste management.
44.	18BT E05	DEVELOPMENTAL BIOLOGY (Core Elective - II)	Relate the overview of developmental biology and mechanism of developmental organization
			Discuss the structure of gametes, events of fertilization and stages of early embryonic development
			Explain the developmental stages and the role of genes in body axis formation in drosophila
			Outline the organogenesis process and sex determination in mammals during development process
			Relate the medical complications of developmental biology
45.	18BT E06	METABOLIC ENGINEERING (Core Elective - II)	Summarize the basic concepts of metabolic engineering.
			Describe the various biosynthesis of secondary metabolites & their applications in various fields.
			Discuss the factors influence the bioconversions and genetic manipulations of metabolic pathways.

HEAD
Dept. of Bio-Technology
Chaitanya Bharathi Institute of Technology
Gandipet, Hyderabad-500 075

SNo	Course		Course Outcomes Statements
	Code	Name	
			Explain the analysis & applications of metabolic flux.
			Outline the metabolic pathway modeling synthesis using bioinformatics tools and its applications.
46.	18MB C01	ENGINEERING ECONOMICS AND ACCOUNTANCY	Apply fundamental knowledge of Managerial Economics concepts and tools.
			Analyze various aspects of Demand Analysis, Supply and Demand Forecasting.
			Understand Production and Cost relationships to make best use of resources available.
			Apply Accountancy Concepts and Conventions and preparation of Final Accounts.
			Evaluate Capital and Capital Budgeting decision based on any technique.
47.	18BT C18	FLUID MECHANICS AND HEAT TRANSFER LAB	Evaluate the coefficient of discharge for different flow measuring devices.
			Determine thermal conductivity of homogeneous wall.
			Calculate heat transfer coefficient in unsteady state heat transfer.
			Predict overall heat transfer coefficient in unsteady state heat transfer.
			Determine friction losses in pipe fittings.
48.	18BT C19	ENZYME TECHNOLOGY LAB	Select the suitable buffers for isolation and extraction of enzymes from various sources.
			Evaluate the optimum enzyme activity at various process parameters.
			Evaluate Michaelis-Menten kinetic parameters and enzyme inhibition kinetics.
			Demonstrate the growth curve for the determination of substrate utilization.
			Compare the methods of immobilization of enzyme and its activity.
49.	18BT C20	GENETIC ENGINEERING LAB	Demonstrate the isolation of nucleic acids.
			Characterize the DNA by restriction digestion and restriction mapping.
			Perform the polymerase chain reaction.
			Plan different steps involved in cloning strategies of DNA
			Analyze the DNA Sequencing and recombinant protein by using SDS PAGE

HEAD
 Dept. of Bio-Technology
 Chaitanya Bharathi Institute of Technology
 Gandipet, Hyderabad-500 075

SNo	Course		CourseOutcomesStatements
	Code	Name	
50.	18BT C21	FERMENTATION TECHNOLOGY	Apply the knowledge of fermentation processes and aseptic transfer of spore suspension in bioprocess industries.
			Outline the construction of fermenters, control process parameters and media formulation in bioprocesses.
			Discuss the concepts of solid state and slurry fermentation processes in bioprocess.
			Determine the steps involved in oxygen transfer during aerobic fermentation.
			Assess the power requirements for bioreactors with and without agitation.
			Interpret the working principles of different bioreactors.
51.	18BT C22	BIOINFORMATICS	Explain the need of bioinformatics and biological databases are used for the retrieval of information
			Demonstrate the methods of sequence alignment and its use
			Discuss about genome sequencing and Human genome project
			Predict gene sequences and protein structure
			Describe an evolutionary tree and different methods and software tools used for phylogenetic analysis
52.	18BT C23	MASS TRANSFER OPERATIONS	Distinguish between molecular diffusion in solids, liquids and gases.
			Determine the number of trays needed for the separation.
			Solve material balance problems for different unit operations.
			Explain the principles of the various separation processes involved in the downstream processing of products, especially those of biological origin.
			Explain the principles and application of membrane separation processes and understand the types of adsorbents.
53.	18BT E07	MEDICAL BIOTECHNOLOGY (Core Elective - III)	Outline the various types of genetic disorders.
			Compare etiology, diagnosis and treatment of Cancer.
			Explain the concepts of Stem cell therapy and Tissue engineering.
			Discuss the principle and applications of biomedical devices and molecular diagnostics.
			Classify the molecular therapies and bioethical issues.
56.	18BT E08	FOOD BIOTECHNOLOGY (Core Elective – III)	Apply the fundamentals of food biotechnology to their real-life situation.
			Explain the types of food, their consumption value and production process.

SNo	Course		CourseOutcomesStatements
	Code	Name	
			Outline the types of pathogens and their effect on food.
			Discuss about the physical and chemical methods of food processing.
			Describe the methods to preserve the food material to avoid food spoilage.
57.	18BT E09	BIOPROCESS DYNAMICS AND CONTROL (Core Elective - III)	Explain the response of interacting and non-interacting systems by applying the concepts of transfer function.
			Develop block diagrams with set point and load variable changes.
			Apply the knowledge of closed loop and open loop tuning methods to fine tune the control parameters.
			Interpret the knowledge of control valve sizing in the design of control valve system in bioprocess units.
			Assess the advanced control strategies and perform a case study in Bioprocess.
58.	18BT E10	PHARMACEUTICAL BIOTECHNOLOGY (Core Elective - IV)	Summarize the fundamentals of biopharmaceuticals.
			Explain the ADME properties of drugs, pharmacokinetics, pharmacodynamics and drug delivery systems.
			Outline the different manufacturing procedures of drugs.
			Discuss about blood and plasma substitutes.
			Describe the therapeutic activity of drugs used for treating diseases
59.	18BT E12	INTELLECTUAL PROPERTY RIGHTS REGULATORY AFFAIRS AND CLINICAL TRIALS (Core Elective - IV)	Explain about the IPR, methods of filing patents and legal implications.
			Summarize the Government of India rules and regulations about the ICH, GCP, FDA guidelines.
			Discuss the role of regulatory affairs and their significance globally.
			Outline the criteria for drug approval related documentation.
			Discuss the various phases of clinical trials and the basis of approval of new drugs, their outcome in new drug discovery.

SNo	Course		CourseOutcomesStatements
	Code	Name	
60.	18BT E13	NANOBIOTECHNOLOGY (Core Elective - IV)	Discuss the multidisciplinary nature of nanotechnology and nanoscale paradigm in terms of properties at the nanoscale dimension.
			Describe different methods used for the synthesis and characterization of nanomaterials.
			Explain various types of nanostructures.
			Summarize general applications of Nanobiotechnology.
			Outline the current applications of Nanobiotechnology.
61.	18MT 001B	NUMERICAL METHODS (For Bio-Technology only)	Compute the interpolation and extrapolation techniques to fit the numerical tabulated data.
			Apply the numerical integration of given data using Simpson's 1/3 rd, 3/8th Weddle's rules
			Evaluate numerical differentiation to get an approximate solution of ODE using Taylor,
			Picard's, Euler's, modified Euler's, Rungakutta methods.
			Solve algebraic and transcendental equations.
			Solve initial value problems by using Numerical Differential Equations.
62.	18EC 002	BIOMEDICAL INSTRUMENTATION (Open Elective - I)	Describe the physiological, physical and chemical background of the most common bioelectrical phenomena.
			Understand the electrode theory, different types of electrodes and transducers required to detect bioelectric signals.
			Elucidate cardiovascular system, human assist devices and other physiological measurements.
			Analyze and compare the different medical imaging systems using computers.
			Explain patient monitoring systems through bio-telemetry and realize safety requirements of biomedical instrumentation.

HEAD
 Dept. of Bio-Technology
 Chaitanya Bharathi Institute of Technology
 Gandioet, Hyderabad-500 075



SNo	Course		CourseOutcomesStatements
	Code	Name	
63.	18ME O03	RESEARCH METHODOLOGIES (Open Elective - I)	Define research problem.
			Review and assess the quality of literature from various sources.
			Understand and develop various research designs.
			Analyze problem by statistical techniques: ANOVA, F-test, Chi-square.
			Improve the style and format of writing a report for technical paper/ Journal report.
64.	18BT C24	FERMENTATION LAB	Demonstrate the working and ancillaries of bioreactor.
			Examine the favorable conditions for growth of microorganism.
			Analyze the batch vs fed batch culture techniques.
			Evaluate the growth kinetics of microorganisms.
			Develop and design a statistical method for production process.
65.	18BT C25	BIOINFORMATICS LAB	Retrieve the information from biological databases
			Utilize BLAST, FASTA and some online tools
			Use and compare the online sequence alignment tools
			Construction evolutionary tree by phylogenetic analysis
			Predict gene and protein structure and design primers and construct restriction map.
66.	18BT E07	MEDICAL BIOTECHNOLOGY (Core Elective - III)	Outline the various types of genetic disorders.
			Compare etiology, diagnosis and treatment of Cancer.
			Explain the concepts of Stem cell therapy and Tissue engineering.

HEAD
 Dept. of Bio-Technology
 Chaitanya Bharathi Institute of Technology
 Gandipet, Hyderabad-500 075.



SNo	Course		CourseOutcomesStatements
	Code	Name	
			Discuss the principle and applications of biomedical devices and molecular diagnostics.
			Classify the molecular therapies and bioethical issues.
67.	18BTE08	FOOD BIOTECHNOLOGY (Core Elective - III)	Apply the fundamentals of food biotechnology to their real-life situation.
			Explain the types of food, their consumption value and production process.
			Outline the types of pathogens and their effect on food.
			Discuss about the physical and chemical methods of food processing.
			Describe the methods to preserve the food material to avoid food spoilage.
68.	18BTE09	BIOPROCESS DYNAMICS AND CONTROL (Core Elective - III)	Explain the response of interacting and non-interacting systems by applying the concepts of transfer function.
			Develop block diagrams with set point and load variable changes.
			Apply the knowledge of closed loop and open loop tuning methods to fine tune the control parameters.
			Interpret the knowledge of control valve sizing in the design of control valve system in bioprocess units.
			Assess the advanced control strategies and perform a case study in Bioprocess.
69.	18BTE11	PHARMACEUTICAL BIOTECHNOLOGY (Core Elective - IV)	Summarize the fundamentals of biopharmaceuticals.
			Explain the ADME properties of drugs, pharmacokinetics, and pharmacodynamics and drug delivery systems.
			Outline the different manufacturing procedures of drugs.
			Discuss about blood and plasma substitutes.
			Describe the therapeutic activity of drugs used for treating diseases

HEAD
 Dept. of Bio-Technology
 Chaitanya Bharathi Institute of Technology
 Gandipet, Hyderabad 500 075

SNo	Course		CourseOutcomesStatements
	Code	Name	
70.	18BTE12	INTELLECTUAL PROPERTY RIGHTS REGULATORY AFFAIRS AND CLINICAL TRIALS (Core Elective - IV)	Explain about the IPR, methods of filing patents and legal implications.
			Summarize the Government of India rules and regulations about the ICH, GCP, FDA guidelines.
			Discuss the role of regulatory affairs and their significance globally.
			Outline the criteria for drug approval related documentation.
			Discuss the various phases of clinical trials and the basis of approval of new drugs, their outcome in new drug discovery.
71.	18BTE13	NANOBIOTECHNOLOGY (Core Elective - IV)	Discuss the multidisciplinary nature of nanotechnology and nanoscale paradigm in terms of properties at the nanoscale dimension.
			Describe different methods used for the synthesis and characterization of nanomaterials.
			Explain various types of nanostructures.
			Summarize general applications of Nanobiotechnology.
			Outline the current applications of Nanobiotechnology.
72.	18BTC26	DOWNSTREAM PROCESSING	Explain the key aspects of downstream processing from both a technical and economic perspective.
			Describe the various techniques of cell disruption and unit operations for separation of insoluble.
			Compare and contrast various membrane separation processes.
			Interpret application of various chromatographic process for separation of bioproducts.
			Analyze various case studies involving high throughput and low value, Low throughput and high value products
73.	18BTC27	PLANT BIOTECHNOLOGY	Describe the theoretical concepts behind establishment of in vitro techniques.
			Explain the importance and applications of various in vitro techniques.
			Identify methods used for the production of plant secondary metabolites in in vitro at commercial scale.
			Analyze the appropriate vectors and gene transfer methods for production of Transgenics.

SNo	Course		CourseOutcomesStatements
	Code	Name	
			Outline the strategies for the production of transgenics for crop improvement and safety regulations.
74.	18MTCO8	BIO-STATISTICS (For Bio-Technology only)	<p>Compute counting techniques to Statistical Methods</p> <p>Recite conditional probabilities using Bayes Theorem</p> <p>Define and classify discrete and continuous Random Variables and Probability Distributions</p> <p>Calculate confidence intervals and illustrate parameter estimation</p> <p>Test the classification for analyzing the data</p>
75.	18BTE14	ANIMAL BIOTECHNOLOGY (Core Elective - V)	<p>Explain the animal cell culture requirements and techniques.</p> <p>Outline the establishment maintenance and scale up of animal cell culture.</p> <p>Discuss about Stem cells and their applications and procedure for measurement of cell viability and cytotoxicity and cell death.</p> <p>Explain various methods for IVF and embryo transfer, cloning and generation of transgenic animals and their applications.</p> <p>Outline various applications of animal biotechnology.</p>
76.	18BTE15	CANCER BIOLOGY (Core Elective - V)	<p>Summarize the etiology of cancer.</p> <p>Explain the principles and mode of action of physical and chemical carcinogens.</p> <p>Discuss the molecular genetics of cancer.</p> <p>Outline the cancer metastasis, diagnosis and different forms of therapy</p> <p>Describe the principles of cancer pharmacology.</p>

HEAD
 Dept. of Bio-Technology
 Chaitanya Bharathi Institute of Technology
 Gandhinagar, Hyderabad-500 076



SNo	Course		CourseOutcomesStatements
	Code	Name	
77.	18BTE16	COMPUTER APPLICATIONS IN BIOPROCESS (Core Elective - V)	<p>Compare AI with human intelligence and traditional information processing and discuss its strengths and limitations.</p> <p>Apply the basic principle, models and algorithms of AI to recognize, model and solve problems in the analysis and design of information systems and also to solve molecular biology problems.</p> <p>Relate language processing to address the questions related to DNA.</p> <p>Explain the neural networks in biology especially in protein characterization etc.</p> <p>Outline an expert system to for the identification of optimized solutions.</p>
78.	18BT E17	PRINCIPLES OF DATA ANALYTICS (Core Elective-V)	<p>Students gain knowledge how to collect data and also apply appropriate method for statistical analysis.</p> <p>Students would learn how to make proper decisions by understanding the results derived out of the statistical analysis performed.</p> <p>Students would learn how to build relationships between the parameters in the given data and also would learn how to predict the future outcomes.</p> <p>Students would learn the basic differences between the obtained data and can judge about the possible causative factors responsible for the given cause.</p> <p>Students can use these concepts such as clustering and PCA in handling the data obtained from next generation sequencing and can learn about the genotypes and phenotypes.</p>
79.	18CS O13	BLOCKCHAIN TECHNOLOGIES (Open Elective - II)	<p>Student is made to understand about the concept of distributed systems, block chain technology</p> <p>Student will understand about the what is crypto currency, its components and use</p> <p>Student will understand the importance of bit coin as an alternate for real currency, about its nature of transfer and other concepts</p> <p>Student will understand the way to use Hyper ledger and its importance</p> <p>Student will understand how implementation of block chain technology will improve science and health sector</p>
80.	18CS O04	BASICS OF DATA SCIENCE USING R (Open Elective - II)	<p>Summarize the basics of R and in-built data visualization packages.</p> <p>Describe the data analysis using Bayesian and stochastic modeling.</p> <p>Relate Gibbs, Z- sampling distributions and compare the binomial, chi-square, Wilcoxon and Fisher's exact tests in hypothesis testing.</p> <p>Explore the ANOVA in Regression analysis and classify the multivariate data.</p>

SNo	Course		CourseOutcomesStatements
	Code	Name	
			Experiment with the biological data using R tool and apply clustering algorithms to biological data.
			Identify R commands for data manipulation and database technologies for datasets of bioinformatics.
81.	18EG 001	TECHNICAL WRITING SKILLS (Open Elective - II)	Understand the channels of communication and define nature and aspects of technical communication Compare and contrast technical communication to that of general communication while constructing error free sentences applying features of technical writing. Analyze data, draw inferences to write Journal articles and conference papers and to compose business letters. Evaluate data to draft technical reports and technical proposals. Design a technical presentation by understanding the nuances of presentation skills and also transfer data from verbal to graphic and vice versa.
82.	18EE 005	WASTE MANAGEMENT (Open Elective - II)	Understand the various processes involved in allied disciplines of engineering Infer the regulations of governance in managing the waste Distinguish the nature of waste materials concerned to the particular branch of engineering Explore the ways and means of disposal of waste material Identify the remedies for the disposal of a selected hazardous waste material
83.	18BTC28	DOWNSTREAM PROCESSING LAB	Demonstrate chromatographic separation process for a given compound. Apply a strategy for final product purification/ polishing of a bioproduct. Analyze the optimum protein precipitation technique. Evaluate various techniques for cell disruption and filtration. Develop methods for determining enzyme activity.
84.	18BTC29	TISSUE CULTURE LAB	Prepare plant tissue culture medium for in vitro studies.


HEAD
 Dept. of Bio-Technology
 Chaitanya Bharathi Institute of Technology
 Gandipet, Hyderabad-500 075

SNo	Course		CourseOutcomesStatements
	Code	Name	
			<p>Execute the protocols for various plant tissue culture applications using cell suspension cultures.</p> <p>Develop in vitro techniques for micropropagation of horticulture and medicinal plants.</p> <p>Demonstrate the Protoplast isolation from various plant tissues using enzymatic method.</p> <p>Develop a system for genetic transformation in plants using Agrobacterium strains</p>
85.	18BTC30	PROJECT:PART-1	<p>Survey and study of published literature on the assigned topic;</p> <p>Working out a preliminary Approach to the Problem relating to the assigned topic;</p> <p>Conducting preliminary Analysis/Modelling/Simulation/Experiment/Design/Feasibility;</p> <p>Preparing a Written Report on the Study conducted for Presentation to the Department;</p> <p>Final Seminar, as oral Presentation before a departmental Committee.</p>
86.	18BT E18	TISSUEENGINEERING (CoreElective-VI)	<p>Outline the concepts of tissue engineering, ethical issues, and future prospects</p> <p>Illustrate the molecular mechanisms at tissue level and in cell matrix in tissue engineering.</p> <p>Identify in vitro culturing techniques and scale up designs.</p> <p>Classify the compatible biomaterials used for fabrication of scaffolds in Tissue engineering.</p> <p>Summarize the therapeutic applications of tissue engineering.</p>
87.	18BTE19	IMMUNODIAGNOSTICS (Core Elective - VI)	<p>Outline the principle, importance, scope, classification of immunodiagnostic tests and antigen antibody reaction</p> <p>Explain the principles and application of immunodiagnostics tests for diagnosing various diseases</p> <p>Discuss about the production of monoclonal antibodies for diagnosis, treatment and prevention of disease.</p> <p>Describe various methods used for vaccine development.</p> <p>Summarize the various novel techniques used in immunodiagnostics.</p>
88.	18BTE20	GENOMICS AND PROTEOMICS (Core Elective - VI)	<p>Describe about genomes, types of genomes and the advanced techniques used for analyzing genome.</p>

SNo	Course		CourseOutcomesStatements
	Code	Name	
			Explain about the methods of functional genomics.
			Discuss about the various sequencing technology in genomics.
			Describe the tools used for the characterization of proteins
			Explain the about personalized medicines their uptake, action and metabolism.
89.	18ME 004	ENTREPRENEURSHIP (Open Elective - III)	Understand the concept and essence of entrepreneurship.
			Identify business opportunities and nature of enterprise.
			Analyze the feasibility of new business plan.
			Apply project management techniques like PERT and CPM for effective planning and execution of projects.
			Use behavioral, leadership and time management aspects in entrepreneurial journey.
90.	18CS 008	OPEN-SOURCE TECHNOLOGIES (Open Elective - III)	Able to differentiate between Open Source and Proprietary software and Licensing.
			Recognize the applications, benefits and features of Open-Source Technologies.
			Understand and demonstrate Version Control System along with its commands.
			Gain knowledge to start, manage open-source projects.
			Understand and practice the Open-Source Ethics.
91.	18CS 001	PYTHON FOR BIOINFORMATICS (Open Elective - III)	Understand the basics of Python Programming.
			Develop applications using Python to solve problems.
			Identify and use Python modules related to Biology.
			Analyze biological and gene sequences using Python.
			Understand advanced analysis techniques.
			Formulate step-wise implementation of a python script for a given problem in bioinformatics

SNo	Course		CourseOutcomesStatements
	Code	Name	
92.	18BTC32	PROJECT: PART-II	In depth study of the topic assigned;
			Review and finalization of the Approach to the Problem relating to the assigned topic;
			Preparing an Action Plan for conducting the investigation, including teamwork;
			Detailed Analysis/Modelling/Simulation/Design/Problem Solving/Experiment as needed;
			Final development of product/process, testing, results, conclusions and future directions;
			Preparing a paper for Conference presentation/ Publication in Journals, if possible;
			Preparing a Dissertation in the standard format for being evaluated by the Department.
			Final Seminar presentation before Departmental Committee.

HEAD
 Dept. of Bio-Technology
 Chaitanya Bharathi Institute of Technology
 Gandipet, Hyderabad 500 082

4

CHAITANYABHARATHIINSTITUTE OF TECHNOLOGY(Autonomous)

Gandipet,Hyderabad-75

Department Of Biotechnology Course Outcomes

Course Outcomes Statements for R16

S.No	Course		Course Outcomes Statements
	Name	Code	
1	16MT C02	MATHEMATICS-I (forBPCStream)	Basics of elementary trigonometry are very essential to solve Engineering problems.
			Very useful to find out Slopes, Heights and Distances.
			Basics of limits, continuity and differentiability are must to develop the mathematical modeling.
			Applications of matrices are abundantly used in Industry as well as Research and Development.
			It is very useful to find constant co-efficient of straight line and curved equations by curve fitting methods and it uses are plenty at surveying agricultural fields.
2	16BTC01	BASICS OF BIOLOGY-I (forMPCStream)	It is a live wire for Research and Development.
			Be able to understand the theories behind the origin of life and evolution studies.
			Be able to classify plants based on the habit and habitat of plants.
			The study can understand the mechanism of reproduction and development of seed in plants.
			Be able to understand the basic structure and function of various organelles of plant cell.
3	16PY C01	ENGINEERING PHYSICS	Be able to have a basic knowledge of various microbes and their economic importance.
			Be able to follow basic physiological aspects in plants.
			Describe the types of oscillations and analyze them
			Demonstrate the wave nature of the light
			Develop the concepts related to electromagnetic behavior
4	16CY C01	ENGINEERING CHEMISTRY	Identify the various crystal systems and defects
			Explain the origin of magnetism and dielectric polarization and applications of these materials in the field of engineering & technology
			This syllabus gives necessary theoretical aspects required for understanding intricacies of the subject and also gives sufficient exposure to the chemistry aspects in different disciplines of engineering
			The above knowledge also helps students to carry out inter disciplinary research such that the findings benefit the common man.
			This syllabus imparts a sound knowledge on the principles of chemistry involving the different application oriented topics required for all engineering branches.
5	16EE C 01	ELEMENTS OF ELECTRICAL ENGINEERING	Acquire the knowledge of basic concepts of electrical circuits such as Ohm's law, Kirchhoff's laws etc.
			Acquire the knowledge of basic Faraday's laws of electromagnetic induction.
			Acquire the knowledge to solve the problem of AC circuits.
			Acquire the knowledge of specifications of batteries, types of cells and sources of renewable energy.
			Acquire the knowledge of electrical wiring and cables and their types and electrical equipment and their specification.
Acquire the knowledge of safety precautions in handling electrical appliances, importance of grounding and methods of earthing.			

HEAD
 Dept. of Bio-Technology
 Chaitanya Bharathi Institute of Technology
 Gandipet, Hyderabad-75



6	16EGC01	PROFESSIONAL COMMUNICATION IN ENGLISH	<p>Understand the nature, process and types of communication and will communicate effectively without barriers.</p> <p>Understand the nuances of listening and will learn to make notes</p> <p>Read different texts, comprehend and draw inferences and conclusions.</p> <p>Write effective paragraphs, letters and reports</p> <p>Critically analyze texts and write book reviews</p>
7	16ME C02	ENGINEERING GRAPHICS	<p>To understand theory of projections</p> <p>Ability to improve visualization skills</p> <p>Ability to sketch Engineering Objects</p>
8	16PY C03	ENGINEERING PHYSICS LABORATORY	<p>Understand the concept of errors and find the ways to minimize the errors</p> <p>Demonstrate interference and diffraction phenomena experimentally</p> <p>Distinguish between polarized and unpolarized light</p> <p>Determine the loss of energy of a ferromagnetic material and its uses in electrical engineering</p> <p>Understand the suitability of dielectric materials in engineering applications</p>
9	16CYC03	ENGINEERING CHEMISTRY LABORATORY	<p>This syllabus helps the student to understand importance of analytical instrumentation for different chemical analysis.</p> <p>The above knowledge also helps students to carry out interdisciplinary research such that the findings benefit the common man.</p>
10	16EG C02	PROFESSIONAL COMMUNICATION LABORATORY	<p>The students will understand the speech sounds in English and the nuances of pronunciation.</p> <p>The students will understand tone, intonation and rhythm and apply stress correctly.</p> <p>The students will be able to participate in group discussions with clarity and confidence.</p> <p>The students will speak confidently on stage with appropriate body language.</p> <p>The students will debate on various issues and learn to work in teams.</p>
11	16 MT C03	MATHEMATICS-II (for BPC Stream)	<p>To find out Areas, Surface Areas, Volumes can be obtained by definite integrals.</p> <p>Any complicated fraction can be decomposed by using partial fractions, then it makes integrable.</p> <p>Model the First-Order Differential Equations and solve it for various Engineering Branches ECE, EEE, etc. (Such as L-R, L-R-C, Newton's laws of delay and growth problems)</p> <p>Model the Higher Order Linear Differential Equations and solve it for various Engineering branches Mech, Civil, ECE, EEE and etc.</p> <p>To learn how to find out approximate values of Multivariable Algebraic Equations by various methods.</p> <p>All above serial numbers are live wire of Research and Development.</p>
12	16BTC03	BASICS OF BIOLOGY-II (for MPC Stream)	<p>Explain the criteria for classification of various organisms in animal kingdom.</p> <p>Identify the basic structure and function of various organelles of animal cell</p> <p>Discuss the organization symmetry and tissue types in animal system.</p> <p>Outline various biotic interactions in nature.</p> <p>Demonstrate the basic information on gene, alleles and its inheritance.</p> <p>Compare the gene regulation system in prokaryotes and eukaryotes.</p>
13	16CYC05	BIOORGANIC CHEMISTRY	<p>To prepare graduates for employments as chemists and have mastered a broad range of basic lab skills applicable to biochemistry and biotechnology.</p>

HEAD
 Dept. of Bio-Technology
 Chaitanya Bharathi Institute of Technology
 Gandipet, Hyderabad-500 075

			<p>Bio-Organic Chemistry majors will have a firm foundation in chemical principles as well as higher level of understanding in each of the chemistry sub disciplines: analytical, biochemistry, organic etc.</p> <p>Understand the mechanism involved in various chemical reactions.</p> <p>Understand the structure and functions of bio-molecules like carbohydrates, lipids, amino acids etc.</p> <p>Understand a broad range of basic Bio-Organic and biological concepts, and can apply and analyze these in at least one specialty area</p> <p>Be aware of the role of bio-molecules in Biotechnology</p>
14	16PY C05	BIOPHYSICS	<p>Make use of appropriate microscope for the analysis of bio sample based on their nature. They also understand electrical properties of cell.</p> <p>Understand Biophysics of sound and light in ear and eye.</p> <p>Understand damages by ionizing radiation to different bio molecules such as proteins, nucleic acids, chromosomes, cells and tissues and to measure radiation.</p> <p>Apply different imaging and diagnostic techniques of human body.</p> <p>Describe transport phenomenon osmosis and its effect in blood.</p>
15	16CS C01	PROGRAMMING AND PROBLEM SOLVING	<p>Develop algorithms for scientific problems.</p> <p>Explore algorithmic approaches to problem solving.</p> <p>Understand the components of computing systems.</p> <p>Choose data types and structure to solve mathematical problem.</p> <p>Develop modular programs using control structure, arrays and structures.</p> <p>Write programs to solve real world problems using structured features.</p>
16	16 BT C04	INTRODUCTION TO ANATOMY AND PHYSIOLOGY OF HUMANS	<p>Outline the structure of Human body.</p> <p>Explain the appropriate terminology related to anatomy and physiology.</p> <p>Discuss the anatomical structures and the physiological functions of body's main systems.</p> <p>Apply the interrelationships within and between anatomical and physiological systems of the human body.</p> <p>Identify the importance of homeostasis and the use of feedback loops to control physiological systems in the human body.</p> <p>Apply the knowledge of monitoring vital parameters for proper body functioning.</p>
17	16CE C03	PROFESSIONAL ETHICS AND HUMAN VALUES	<p>Students develop the capability of shaping themselves into outstanding personalities, through a value-based life.</p> <p>Students turn themselves into champions of their lives.</p> <p>Students take things positively, convert everything into happiness and contribute for the happiness of others.</p> <p>Students become potential sources for contributing to the development of the society around them and institutions/ organizations they work in.</p> <p>Students shape themselves into valuable professionals, follow professional ethics and are able to solve their ethical dilemmas.</p>
18	16CEC02	ENVIRONMENTAL STUDIES	<p>To understand the scope and importance of environmental studies, identify the natural resources and ecosystems and contribute for their conservation.</p> <p>To understand the ecological services of biodiversity and contribute for their conservation.</p> <p>To develop skills to solve the problems of environmental pollution and contribute for the framing of legislation for protection of environment.</p> <p>To relate the social issues and the environment and contribute for the sustainable development.</p> <p>To understand the essence of the ethical values of the environment for conserving depletable resources and pollution control.</p>

19	16PYCO6	BIO PHYSICS LABORATORY	Apply the techniques for the measurement of some physical properties of biomaterials
			Measure radiation absorption measurements
			Study physical properties of blood
			Measure absorption wavelengths in photosynthesis
			Assess BP and physical state of the lungs
20	16CYC06	BIOORGANICCHEMIS TRYLABORATORY	An ability to think critically and to analyze chemical analysis.
			An ability to work effectively in a laboratory environment and to use modern chemical/biochemical instrumentation and procedures
			Understand the basics of laboratory safety
21	16MT C06	MATHEMATICS-III	Solve the limit problems by using L-Hospital rule.
			Solve the problems based on Mean value theorems.
			Solve maxima and minima problems.
			Solve vector and scalar triple product related problems.
			Solve divergence and curl related problems.
22	16BT C05	PROCESSPRINCIPLESAN D REACTION ENGINEERING	At the end of the course student should be able to solve the problems encountered in the preparation of material and energy balances of the process.
			Be able to determine the flue gas composition from fuel composition and vice versa.
			Be able to develop generalized flow sheets for different chemical processes.
			Be able to write rate equations for any given chemical reaction.
			Be able to perform basic design calculations of various reactors. Be able to identify the reasons for non-ideality.
23	16BT C06	BIOCHEMISTRY	Recognize different biomolecules structures.
			Describe the functions of various biomolecules.
			Evaluate the energy yield from the catabolism of carbohydrates and lipids.
			Reconstruct the anabolism of carbohydrates and lipids.
			Outline steps involved in catabolism and anabolism of proteins. Summarize steps involved in catabolism and anabolism of nucleic acids.
24	16BT C07	CELLBIOLOGY	Students able to understand the structure & functions of cell organelles.
			Students enlightened about the transport of metabolites.
			Explain the regulation of cell cycle and its control.
			Analyze the importance of growth factors/ Receptors and their role in causing cancer.
			Recognize the mechanisms in transport of proteins to destination.
			Explain the advances in cell biology, protein degradation.
25	16BTC08	MICROBIOLOGY	Explain contributions made by different scientists in microbiology.
			Identify General characteristics of microorganisms and types of Taxonomy.
			Select Physical and chemical methods of sterilization.
			Demonstrate the preparation and functions of different types of media.
			List classification of nutrients and types of assimilation methods in microorganisms.
			Outline the Life cycle of pathogens causing diseases in humans.
26	16BT C09	GENETICS	Apply to real life situations, the principles of human heredity.
			Incorporate the fundamentals of gene in order to understand how they impact humans.

HEAD
Dept. of Bio-Technology
Chaitanya Bharathi Institute of Technology
Gandipet, Hyderabad-500 075

			<p>Be able to describe the chromosomal basis of inheritance and how alterations in chromosome number or structure may arise during mitosis and meiosis.</p> <p>Be able to describe the main modes of Mendelian and non-Mendelian inheritance.</p> <p>Be aware of the role of both genetic and environmental factors in multifactorial Conditions such as, cancer, diabetes and psychiatric disorders.</p> <p>Be able to take a family history and construct and interpret a pedigree.</p>
27	16BT C10	BIOCHEMISTRYLAB	<p>Outline of Magnification, Resolution, Refractive index of Microscope.</p> <p>Operate the physical sterilization equipment's.</p> <p>Prepare the basic culture media for the growth of microorganisms.</p> <p>Perform streak plate, spread plate and pour plate techniques.</p> <p>Identify type of bacteria (Gram positive or Gram negative).</p>
28	16BTC11	MICROBIOLOGYLAB	<p>Outline of Magnification, Resolution, Refractive index of Microscope.</p> <p>Operate the physical sterilization equipment.</p> <p>Prepare the basic culture media for the growth of microorganisms.</p> <p>Perform streak plate, spread plate and pour plate techniques.</p> <p>Identify type of bacteria (Gram positive or Gram negative).</p> <p>Evaluate sensitivity of microorganisms against different organisms.</p>
29	16EGCO3	SOFTSKILLSANDEMPLOYABILITYENHANCEMENTLAB	<p>Be effective communicators and participate in group discussions and case studies with confidence. Also be able to make presentations in a professional context.</p> <p>Write resumes, prepare and face interviews confidently.</p> <p>Be assertive and set short term and long-term goals. Also learn to manage time effectively and deal with stress.</p> <p>Make the transition smoothly from Campus to Corporate. Also use media with etiquette and know what academic ethics are.</p> <p>To do a live, mini project by collecting and analyzing data and making oral and written presentation of the same.</p>
30	16BT C12	CHEMICAL AND BIOCHEMICAL THERMODYNAMICS	<p>Students will be able to measure heat and work increments for closed systems and cyclic processes.</p> <p>Students will be able evaluate nozzle, turbine and compressors based on the principles of 1-law of thermodynamics.</p> <p>Students will be able to calculate coefficient of performance of heat engines and heat pump.</p> <p>Students will be able predict the extent of various reactions by Gibbs and Duhem equation.</p> <p>Students will be able to calculate separation processes like distillation based on vapour liquid equilibrium for binary systems.</p> <p>Students will be able to calculate equilibrium conversions and yields of bio reactions.</p>
31	16BT C13	MOLECULARBIOLOGY	<p>Be able to describe the structure & functions of genetic material.</p> <p>Be able to explain the how the DNA is packaged into chromosomes.</p> <p>Be able to correlate the types of DNA damage & repair.</p> <p>Be able to describe the mechanism of transcription and maturation of RNA to initiate translation.</p> <p>Be able to describe the translation of genetic information into polypeptide.</p> <p>Be able to describe the regulation of gene expression.</p>

32	16BT C14	IMMUNOLOGY	<p>Identify Immune system components and how they work in a coordinated way.</p> <p>Graduates apply the application of antigen-antibody interactions in development of medical diagnostic kits.</p> <p>Analyze the Immune system related underlying causes in Allergies, Asthma and other hypersensitive reactions.</p> <p>Graduate is acquainted with the diseases caused due to Immune system malfunctioning.</p> <p>Explain to the Students, the Immune system related medical complications in transplantation and Cancers.</p> <p>Graduates identify the role of immunology in vaccines development.</p>
33	16BT C15	INSTRUMENTALMETHODS IN BIOTECHNOLOGY	<p>Solve the Analytical problems in instruments by Detection & sensitivity limits.</p> <p>Assess the merits and demerits of instruments.</p> <p>Discuss Principle, procedure and applications of different types of centrifugations.</p> <p>Summarize Principle, Procedure and applications of chromatography's like TLC, paper.</p> <p>Explain Principle procedure and applications of different electrophoresis like SDS, Agarose.</p> <p>State the basic concepts of spectroscopy, Beers Lamberts law, Colorimeter, Nephelometry.</p>
34	16BT C16	INDUSTRIAL BIOTECHNOLOGY	<p>Student will be able to analyze the scope and evaluate development of biotechnology and its products.</p> <p>Student will be able to use the concepts, tools and techniques for designing the solutions for complex biological problems.</p> <p>Be able to use fermenter for the production of bioproducts.</p> <p>Be able to apply the theoretical knowledge of production procedures for producing the bioproducts practically.</p>

HEAD
 Dept. of Bio-Technology
 Chaitanya Bharathi Institute of Technology
 Gandipet, Hyderabad-500 075



			Be able explain the applications of different bioproducts.
			Be able to apply the knowledge to face the challenges when placed in industry.
35	16MB C01	ENGINEERINGECONOMICS AND ACCOUNTANCY	apply fundamental knowledge of Managerial economics concepts and tools.
			understand various aspects of demand analysis and forecasting.
			understand price determination for different markets.
			Study production theory and analyze various costs & benefits involved in it so as to make best use of resources available.
			analyze different opportunities and come out with best feasible capital investment decisions.
			apply accountancy concepts and conventions, Final accounts and financial analysis.
36	16BT C17	IMMUNOLOGY LAB	Students are demonstrated how Antigens and Antibody interact.
			The practical aspects of agglutination and precipitation are identified.
			Student interprets the results based on the results of the antigen- antibody interaction.
			Students analyze the importance of different Immunological techniques developed.
			The importance of blood group matching in blood transfusions and other cases are practically demonstrated.
			Graduates apply the practical implications of immunological based diagnostic kits.
37	16BT C18	INSTRUMENTAL METHODS IN BIOTECHNOLOGY LAB	Adjust the pH of any analytical sample solution by using pH meter.
			verify Beers Lamberts law using potassium di chromate solution.
			Determine the concentration of unknown protein sample using visible spectrophotometer.
			Separate and identify amino acids present in a sample mixture.
			Demonstrate random blood glucose levels by using Accu-check Active Glucometer.
			Separate the proteins present in sample mixture based on molecular weight
38	16MT C08	BIOSTATISTICS	Demonstrate the ability to apply fundamental concepts in exploratory data analysis.
			Understand the concept of the sampling distribution of a statistic, and in particular describe the behavior of the sample mean.
			Understand the foundations for classical inference involving. confidence intervals and hypothesis testing.
			Apply inferential methods relating to the means of Normal distributions.
			Demonstrate an appreciation of one-way analysis of variance (ANOVA).
39	16BT C19	FLUID MECHANICS AND HEAT TRANSFER	Be able to measure viscosity of different fluids.
			Explain the functions of different flow measuring and monitoring devices.
			Enable to calculate friction in flow process.
			Enable to calculate pressure drop in flow process.
			Calculate the heat transfer area, overall heat transfer co-efficient required for various processes.
			Explain the operation of various, evaporators, condensers, heat exchange equipment.
40	16BT C20	PROTEIN ENGINEERING AND ENZYME TECHNOLOGY	Explain structure properties and functions of proteins.
			Outline protein isolation and analytical techniques.
			Identify engineered proteins and its applications.
			Discuss the applications of enzymes in different fields.
			Explain the kinetics of enzyme action.

			Compare various enzyme immobilization techniques and its mass transfer effects.
41	16BT C21	GENETIC ENGINEERING AND rDNA TECHNOLOGY	<p>Explain the basic principles and tools used in rDNA research starting from isolation of nucleic acid, enzymes etc.</p> <p>Compare various types of cloning vectors and expression vectors and their use in rDNA technology.</p> <p>Discuss about PCR, and its applications and molecular markers.</p> <p>Predict various cloning strategies used in rDNA technology.</p> <p>Identify high level expression of protein in different host systems</p> <p>Apply gene cloning and rDNA technology in various fields.</p>
42	16BT E22	ENVIRONMENTAL BIOTECHNOLOGY (Elective -I)	<p>Discuss bioremediation in detail.</p> <p>Use of Microorganisms for metal leaching and biofuels.</p> <p>Outline the different methods for waste water treatment.</p> <p>Explain the importance of Xenobiotics in nature.</p> <p>Analyze hazardous waste disposal.</p> <p>Demonstrate the role of biotechnology in dealing with environmental problems.</p>
43	16BT E23	FOOD BIOTECHNOLOGY (Elective-I)	<p>Apply the fundamentals of food biotechnology to their real-life situation.</p> <p>Differentiate types of food and explain their consumption value.</p> <p>Describe the types of pathogens and their effect on food.</p> <p>Describe the physical and chemical methods of food processing.</p> <p>Be in a position to preserve the food material to avoid food spoilage.</p> <p>By understanding the principles of biotechnology able to work in a suitable food industry.</p>
44	16MT E02	COMPUTATIONAL NUMERICAL METHODS (Elective-I)	<p>Learn interpolation and extrapolation techniques to fit the numerical tabulated data.</p> <p>Solve numerical integration of given data using Simpson's 1/3 rd, 3/8th Weddle's rules.</p> <p>Solve numerical differentiation to get approximate solution of ODE using Taylor, Picard's, Euler's, modified Euler's, Rungakutta methods.</p> <p>Solve algebraic and transcendental equations.</p> <p>Derive the solutions when system of equations has more than two unknowns and learn to reduce the instability of equations.</p>
45	18CS E02	PYTHON FOR BIOINFORMATICS (ELECTIVE-II)	<p>Understand the basics of Python Programming.</p> <p>Develop applications using Python to solve problems.</p> <p>Identify and use Python modules related to Biology.</p> <p>Analyze biological sequences using Python.</p> <p>Understand advanced analysis techniques.</p> <p>Analyze gene expressions using Python.</p>
46	16BT E24	VIROLOGY (Elective-II)	<p>Students understand the basic structure of viruses.</p> <p>Students compare the techniques for cultivation of plant & animal viruses.</p> <p>Students explain the pros & cons of characterization techniques of viruses.</p> <p>Students illustrate the structure of different phages.</p> <p>Student recognizes the differences between replication of plant & animal viruses.</p> <p>Be able to understand the procedures in preparation of vaccines</p>

47	16BT E25	METABOLIC ENGINEERING	<p>Revise the regulations & requirements of metabolic engineering.</p> <p>Analyze and design various pathways of biosynthesis of secondary metabolites & their applications in various fields.</p> <p>Assess the criteria & factors necessary for bio concessions- and outline their applications.</p> <p>Discuss the analysis & applications of metabolic.</p> <p>Design algorithms metabolic pathway modeling synthesis using bioinformatics tools.</p> <p>Assess and compute various applications of metabolic engineering different fields.</p>
48	16BT E26	FLUID MECHANICS AND HEAT TRANSFER LAB	<p>Course outcomes are based on a continuous evaluation basis, like viva voce, calculations etc., and a final exam.</p> <p>Demonstrate various experimentation methods with skill and precision.</p> <p>Determine Thermal conductivity of homogeneous wall.</p> <p>Determine calculate heat transfer coefficient in unsteady state heat transfer.</p> <p>Determine overall heat transfer coefficient in unsteady state heat transfer.</p> <p>Determine friction losses in pipe fittings.</p>
49	16BT C27	ENZYME TECHNOLOGY LAB	<p>Preparation of buffers.</p> <p>Demonstrate the isolation of enzymes.</p> <p>Predict the optimum ranges of parameters on enzyme activity.</p> <p>Analyze the effect of various physical parameters and Michelis-Menten kinetics (K_s, V_{max}) activity of enzyme.</p> <p>Choose the suitable methods for immobilization of enzymes.</p>
50	16BT C28	GENETIC ENGINEERING LAB	<p>Demonstrate isolation of nucleic acids.</p> <p>Characterize the DNA by restriction digestion and restriction mapping.</p> <p>Design polymerase chain reaction.</p> <p>Plan different steps involved in cloning strategies.</p> <p>Analyze and compute DNA Sequencing.</p> <p>Analyze the recombinant protein by using SDS PAGE.</p>
51	16BT C29	FERMENTATION TECHNOLOGY	<p>Interpret the Fermentation process.</p> <p>Explain the types of fermentation media design and development of inoculum.</p> <p>Hypothesize the control of fermentation by various physical and chemical process parameters.</p> <p>Summarize the scale up of fermenters and working principles.</p> <p>To know the Differentiation between various fermentation systems.</p> <p>Evaluate rheological properties of fermented broths.</p>
52	16BT C30	MASS TRANSFER OPERATIONS	<p>Molecular diffusion in solids, liquids and gases</p> <p>Determine the number of trays needed for the separation</p> <p>Carry out material balances accurately.</p> <p>Explain the principles of the various separation processes involved in the downstream processing of products, especially those of biological origin</p> <p>Explain the principles and application of membrane separation processes.</p> <p>Understand the types of adsorbents.</p>
53	16BT C31	BIOINFORMATICS	<p>Explain the basics of bioinformatics and its scope.</p> <p>Identify how biological databases are used for the retrieval of information.</p> <p>Demonstrate the methods of sequence alignment and its use.</p>



			Create an evolutionary tree, evaluate and different software tools used for phylogenetic analysis.
			Discuss about genome sequencing and genome sequencing projects.
			Predict gene and protein structure and explain about biochemical databases
54	18CS E02	JAVA Programming and Bio-Java (Elective-III)	Understand fundamental concepts in object-oriented programming.
			Design and develop computer-based solutions to solve real world problems.
			Handle file I/O and exceptions.
			Create Windows, Containers, GUI components in Java.
			Create GUI-based applications.
			Develop programs related to Biotechnology problems.
55	16BT E32	MEDICAL BIOTECHNOLOGY (Elective-III)	Use the tools for the diagnosis of diseases.
			Be in a position to design the prototype of medical instruments.
			Explain the potentiality of stem cells and purpose of banking.
			Explain about the uses of molecular therapies and how which led to controversy in society.
			Explain about the advances in vaccines in production.
			Analyze the socio ethical issues in medicine.
56	16BT E33	PHYTO CHEMICALS AND HERBAL PRODUCTS (Elective-III)	The undergraduates will know the sources of various crude drugs and their medicinal values.
			The students will understand the procedures involved in the detection, extraction and analysis of crude drugs and adulterants.
			The undergraduates will be able to implement their theoretical concepts and knowledge of extraction and their applications in herbal preparation for implementing the same practically.
			Understand the preparation of adulterants.
			Apply the different types of phyto chemicals in the real world.
			Recognize the applications of herbal products.
57	16BT E34	DEVELOPMENTAL BIOLOGY (Elective-IV)	Students understand the basic concepts of Developmental Biology.
			Students understand the Anatomy of gametes and Biochemistry in its recognition.
			Analyze the role of genes in the body axis formation of Drosophila and Mammals.
			Understand the importance and differentiation of germinal layers in to different organs.
			Compare the role of genes in the sex determination of Drosophila and Mammals.
			Explain the genetic anomalies leads to diseases.
58	16BT 35	PHARMACEUTICAL BIOTECHNOLOGY (Elective-IV)	Identify different microorganisms for the production of secondary metabolites used as drugs.
			Explain drug delivery systems like oral, parenteral, transdermal etc.
			Outline the manufacture, Labeling, preservation and release of drugs in to the market.
			Discuss fractionation of human RBC, dried human plasma, HPPF, from whole human blood.
			Plan the procedures for the production of blood transfusion products to avoid infectious diseases.
			Select the therapeutic activity and dosage of drugs to treat the diseases.
59	16BT E36	BIOPROCESS ECONOMICS & PLANT DESIGN (Elective-IV)	Carry out interest calculations and prepare balance sheets for business transactions.
			Determine the economic analysis of bioprocesses.
			Carry out cost estimations for different industrial productions.

			Develop process design, flow diagrams.
			Carry out material and energy balances accurately
			Design filters for air sterilization, batch and continuous sterilizers, valves etc.
60	16BT C37	BIOPROCESS LAB	Outline the sterilization techniques.
			Discuss about bioreactor instrumentation and control.
			Compare the parameters to find optimum value where the microbial activity is higher.
			To predict the KLa value.
			Analyze the stability of immobilized enzyme.
			Evaluate the flow characteristics of fluids.
61	16BT C38	MASS TRANSFER OPERATIONS LAB	Determine the diffusion coefficient of liquids in air.
			Verify the Rayleigh equation.
			Calculate the theoretical and actual steam consumption.
			Construct T-x-y diagram using VLE.
			Determine equilibrium constant using Batch, CSTR and PFR reactors.
			Calculate activation energy.
62	16BT C39	BIOINFORMATICS LAB	Retrieve the information from biological databases.
			Utilize BLAST, FASTA and some online tools.
			Use and compare the online sequence alignment tools.
			Construction evolutionary tree by phylogenetic analysis.
			Predict gene and protein structure.
			Design primers and construct restriction map.
63	16BT C41	DOWN STREAM PROCESSING	Explain the key aspects of Downstream Processing from both a technical and economic perspective.
			Learn the various techniques of cell disruption and unit operations for separation of insoluble
			Design mineral water plant
			Design and select chromatographic separation process for different bioproducts and scale up
			Learn various techniques of product polishing and formulation.
64	16BT C42	PLANT BIOTECHNOLOGY	Describe the theoretical concepts behind establishment of in vitro techniques.
			Explain the importance and applications of various in vitro techniques
			Exploit plant tissues for production of biologics at commercial scale.
			Interpret the knowledge of how the transgenes are utilized in the production of transgenics resistant to biotic, abiotic stress resistant and improved quality etc.
			Analyse and use the appropriate vectors for production of transgenics.
65	16BT C43	ANIMAL BIOTECHNOLOGY	Explain the animal cell culture requirements and procedure.
			Outline the establishment and maintenance of animal cell culture.
			Discuss about Stem cells and their applications and describe the procedure for measurement of cell viability and cytotoxicity, cell death.
			Explain various methods for IVF and embryo transfer, cloning and generation of transgenic animals and their applications.
			Outline various applications of animal biotechnology.
66	16BT C44	BIOPROCESS DYNAMICS & CONTROL	Use the knowledge of Process dynamics to control level, temperature, flow variable etc in bioprocess industries.
			Devise simple feedback control strategy for a bioprocess
			Incorporate the knowledge of closed loop and open loop tuning methods to fine tune the control parameters.
			Use the knowledge of control valve sizing in the design of control valve system in bioprocess units.

			Apply the knowledge of process control to regulate the pH of bioreactors and apply the knowledge of process control to regulate the pH of bioreactors.
67	16BT C45	COMPUTER APPLICATIONS IN BIOPROCESS INDUSTRIES	<p>Distinguish between different process models</p> <p>Formulate process models leading to set of ordinary differential equations and solution procedures numerical methods.</p> <p>Formulate process models leading to set of linear simultaneous equations and solution procedures.</p> <p>Formulate process models leading to transcendental and polynomial equations and solution procedures.</p> <p>Understand the steps involved in optimization that are a prerequisite for the development of process flow sheets and optimize biochemical process.</p>
68	16BT E46	GENOMICS & PROTEOMICS Elective-V (Core)	<p>Be able to know about genomes, types of genomes and the advanced techniques used for analyzing genome.</p> <p>Be able to construct cDNA libraries and explain the importance of cDNA libraries in the identification of functional genes in the genome.</p> <p>Understanding the advancements in the field of modern genomics from classical genomics.</p> <p>To have basics of how proteins are determined and about the function of proteins</p> <p>Be able to design personalized medicines and explain their uptake, action and metabolism.</p>
69	16BT E47	CANCER BIOLOGY Elective-V (Core)	<p>Apply to real life situations, the concept of diet and cell cycle.</p> <p>Incorporate the fundamentals of cell biology and Molecular biology to understand how they are responsible for cancer.</p> <p>Explain the types of carcinogens and the effect of mutagens on cell cycle.</p> <p>Describe the structure of retrovirus and how they led to discover the oncogenes.</p> <p>Outline the No. of stages of cancer, detection of cancer and treatment of cancer and explain the ADME properties of anti-cancer drugs.</p>
70	16BT E48	INTELLECTUAL PROPERTY RIGHTS REGULATORY AFFAIRS AND CLINICAL TRIALS Elective-V (Core)	<p>Understand the fundamentals of downstream processing for biochemical product recovery.</p> <p>Calculate operating parameters for a given downstream processing unit operation.</p> <p>Develop their skills in the purification of bioproducts from fermentation broths.</p> <p>Design chromatographic separation process for a given compound.</p> <p>Arrange unit operations into an appropriate sequence for the purification of a given type of biological product.</p>
71	16BT C50	TISSUE CULTURE LAB	<p>Provides an opportunity to experimentally verify the theoretical concepts studied.</p> <p>Gain hands on training in developing protocols for various in vitro techniques: callus cultures, cell and suspension cultures etc.</p> <p>Establish in vitro techniques of micropropagation of crop/horticulture and medicinal plants.</p> <p>Establish a system of genetic transformation using Agrobacterium strains.</p> <p>Handle and experience the Protoplast isolation and culture that helps them to produce somatic hybrids.</p>
72	16BT E52	TISSUE ENGINEERING Elective-VII (Core)	<p>Provides an opportunity to experimentally verify the theoretical concepts studied.</p> <p>Gain hands on training in developing protocols for various in vitro techniques: callus cultures, cell and suspension cultures etc.</p> <p>Establish in vitro techniques of micropropagation of crop/horticulture and medicinal plants.</p> <p>Establish a system of genetic transformation using Agrobacterium strains.</p> <p>Handle and experience the Protoplast isolation and culture that helps them to produce somatic hybrids.</p>

73	16BT E53	IMMUNODIAGNOSTICS Elective-VII (Core)	<p>Outline the principle, importance, scope, and classification of immunodiagnostic tests.</p> <p>Demonstrate the antigen antibody reaction and its application in immunodiagnosics for diagnosing various diseases by using different types of immunodiagnostic tests</p> <p>Discuss about the development of monoclonal antibodies for diagnosis, treatment and prevention of disease.</p> <p>Explain the new methods of treating various diseases are being explored by vaccine development.</p> <p>Describe the novel techniques used in immunodiagnosics.</p>
74	16BT E54	MOLECULAR MODELING & DRUG DESIGN Elective-VII (Core)	<p>Calculate Total energy of molecule by using force field potentials.</p> <p>Calculate Internal energy, Heat capacity, Temperature, pressure.</p> <p>Hard sphere potential. Continuous potential by Finite differential method.</p> <p>Choosing the initial configuration and analyzing the results of computer simulation.</p> <p>Simulation of polymers by Random walks method. Self avoiding walk method and classifies the CADD to treat Alzheimer's and TB diseases.</p>
75	18ME O06	RESEARCH METHODOLOGIES (Elective- VIII) Open	<p>Define research problem</p> <p>Review and asses the quality of literature from various sources.</p> <p>Understand and develop various research designs.</p> <p>Analyze problem by statistical techniques: ANOVA, F-test, Chi-square</p> <p>Improve the style and format of writing a report for technical paper/ Journal report</p>
76	16EC O02	BIOMEDICAL INSTRUMENTATION (Open Elective- I)	<p>Know the functionality of the human body.</p> <p>Know the practical limitations of electronic gadgets used for human systems.</p> <p>Measure various physiological parameters.</p> <p>Know the functionality of Bio medical recorders.</p> <p>Learn the concepts of Brain- computer interface.</p>
77	16EG O01	TECHNICAL WRITING (Open Elective-I)	<p>Communicate effectively, without barriers and understand aspects of technical communication.</p> <p>Differentiate between general writing and technical writing and write error free sentences using technology specific words</p> <p>Apply techniques of writing in business correspondence and in writing articles.</p> <p>Draft technical reports and technical proposals.</p> <p>Prepare agenda and minutes of a meeting and demonstrate effective technical presentation skills.</p>
78	16CS O03	IOT AND APPLICATIONS (Open Elective-II)	<p>Understand Internet of Things and its hardware and software components.</p> <p>Interface I/O devices, sensors & communication module.</p> <p>Remotely monitor data and control devices.</p> <p>Develop real time IoT based projects.</p> <p>Advance towards research based IoT in the field of biotechnology.</p>
79	16CS O04	BASICS OF DATA SCIENCE USING R (Open Elective-II)	<p>Understanding the basics of R, various statistical measures, algorithms useful for data analysis.</p> <p>Explore the programming skills needed to use R tool for biological data.</p> <p>Analyze biological data using R tool.</p> <p>Apply classification and clustering algorithms to biological data.</p>



			Identify and work with the technologies and resources related to bioinformatics.
80	16ME 001	O01 ENTREPRENEURSHIP (Open Elective-III)	Identify opportunities and deciding nature of industry
			Brainstorm ideas for new and innovative products or services
			Analyze the feasibility of a new business plan and preparation of Business plan
			Use project management techniques like PERT and CPM
			Analyze behavioral aspects and use time management matrix


Chairman, BoS, Biotech

HEAD
 Dept. of Bio-Technology
 Chaitanya Bharathi Institute of Technology,
 Gandipet, Hyderabad-500 075.