

DEPARTMENT OF BIOTECHNOLOGY

2021 REGULATION

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

Biotechnology curriculum is designed to impart knowledge, skill and attitude on the graduates to

PEO1	To produce engineers with in-depth knowledge of Basic engineering concepts in mathematics, physics, chemistry, mechanical, civil, electrical and electronics, computer science and biological sciences for engineering application.
PEO2	To train the students with technical skills in biotechnology and interdisciplinary field to meet the industrial demands.
PEO3	To upgrade the skills in microbial processes and computer based applications in Biotechnology.
PEO4	To expertise the students with analytical and problem solving abilities with special emphasis on research, entrepreneurship and career.
PEO5	To create responsible biotechnology engineers with high ethical and moral values

Programme Outcomes(POs)

Engineering Graduates will be able to:

PO1	Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2	Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO3	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 the public health and safety, and the cultural, societal, and environmental considerations.
PO4	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.
PO5	Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO6	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.
PO7	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.

PO8	Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO9	Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO10	Communication: Communicate effectively on complex engineering activities with the engineering community and with 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.
PO11	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.
PO12	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.

Programme Specific Outcomes (PSOs)

PSO1	To utilize the knowledge in biotechnology to identify nick areas for higher studies and research.
PSO2	To use skills in biotechnology to solve industrial problems in an environmentally sustainable manner.

**LIST OF COURSES
REGULATION 2021**

SL.NO	SUB.CODE	SUB.NAME
1	BMATS101	ENGINEERING MATHEMATICS FOR CSE STREAM-I
2	BCHES102	CHEMISTRY FOR CSE
3	BCEDK103	COMPUTER AIDED ENGINEERING DRAWING
4	BESCK104B	INTRODUCTION TO ELECTRICAL ENGINEERING
5	BPLCK105B	INTRODUCTION TO PYTHON PROGRAMMING
6	BENGK106	COMMUNICATIVE ENGLISH
7	BKSKK107/BKBKK107	SAMSKRUTHIKA KANNADA/BALAKE KANNADA
8	BSFHK158	SCIENTIFIC FOUNDATION FOR HEALTH
9	BMATS201	ENGINEERING MATHEMATICS FOR CSE STREAM-II
10	BPHYS202	PHYSICS FOR CSE
11	BPOPS203	PRINCIPLES OF PROGRAMMING USING C
12	BESCK204C	INTRODUCTION TO ELECTRONICS COMMUNICATION
13	BETCK205J	INTRODUCTION TO EMBEDDED SYSTEM
14	BPWSK206	PROFESSIONAL WRITING SKILLS IN ENGLISH
15	BICOK207	INDIAN CONSTITUTION
16	BIDTK258	INNOVATION AND DESIGN THINKING (IDT)
17	BBT301	CELL BIOLOGY AND GENETICS
18	BBT302	UNIT OPERATIONS + LAB

19	BBT303	BIOCHEMISTRY +LAB
20	BBT304	MICROBIOLOGY
21	BBTL305	MICROBIOLOGY LAB
22	BBT306X	ENGINEERING SCIENCE COURSE
23	BBT358X	ABILITY ENHANCEMENT COURSE/SKILL ENHANCEMENT COURSE - III
24	BBT401	MOLECULAR BIOLOGY & GENETIC ENGINEERING
25	BBT402	BIOSTATISTICS AND TOOLS + LAB
26	BBT403	IMMUNOTECHNOLOGY + LAB
27	BBTL404	MOLECULAR BIOLOGY & GENETIC ENGINEERING LAB
28	BBT405X	ENGINEERING SCIENCE COURSE
29	BBT456X	ABILITY ENHANCEMENT COURSE/SKILL ENHANCEMENT COURSE- IV
30	BBOK407	BIOLOGY FOR ENGINEERS (DR VM, SCE)
31	BUHK408	UNIVERSAL HUMAN VALUES COURSE

COURSE OUTCOME FOR BIOTECHNOLOGY

DEGREE	U.G
PROGRAMME	B.E - BIOTECHNOLOGY
ACADEMIC YEAR	2022
REGULATION	2022

FIRST SEMESTER	
1.Course Code and Name : BMATS101 ENGINEERING MATHEMATICS FOR CSE STREAM-I	
CO Statements	
At the end of the course, learners will be able	
CO1	apply the knowledge of calculus to solve problems related to polar curves and learn the notion of partial differentiation to compute rate of change of multivariate
CO2	analyze the solution of linear and nonlinear ordinary differential equation
CO3	get acquainted and to apply modular arithmetic to computer algorithms
CO4	make use of matrix theory for solving the system of linear equations and compute eigenvalues and eigenvectors
CO5	familiarize with modern mathematical tools namely MATHEMATICA/MATLAB/PYTHON/ SCILAB
2.Course Code and Name : BCHE102 CHEMISTRY FOR CSE	
CO Statements	
At the end of the course, learners will be able	
CO1	Identify the terms processes involved in scientific and engineering and applications
CO2	Explain the phenomena of chemistry to describe the methods of engineering processes
CO3	Solve the problems in chemistry that are pertinent in engineering applications
CO4	Apply the basic concepts of chemistry to explain the chemical properties and processes
CO5	Analyze properties and multidisciplinary situations processes associated with chemical substances in engineering

3.Course Code and Name: BCEDK103 COMPUTER AIDED ENGINEERING DRAWING

CO Statements

At the end of the course, learners will be able

CO1	Draw and communicate the objects with definite shape and dimensions
CO2	Recognize and Draw the shape and size of objects through different views
CO3	Develop the lateral surfaces of the object
CO4	Create a Drawing views using CAD software
CO5	Identify the interdisciplinary engineering components or systems through its graphical representation.

4.Course Code and Name: BESCK104B INTRODUCTION TO ELECTRICAL ENGINEERING

CO Statements

At the end of the course, learners will be able

CO1	Understand the concepts of various energy sources and Electric circuits.
CO2	Apply the basic Electrical laws to solve circuits
CO3	Discuss the construction and operation of various Electrical Machines.
CO4	Identify suitable Electrical machine for practical implementation.
CO5	Explain the concepts of electric power transmission and distribution, electricity billing, circuit protective devices and personal safety measures.

5.Course Code and Name: BPLCK105B INTRODUCTION TO PYTHON PROGRAMMING

CO Statements

At the end of the course, learners will be able

CO1	Demonstrate proficiency in handling loops and creation of functions
CO2	Identify the methods to create and manipulate lists, tuples and dictionaries
CO3	Develop programs for string processing and file organization
CO4	Interpret the concepts of Object-Oriented Programming as used in Python.

6.Course Code and Name: BENGK106 COMMUNICATIVE ENGLISH

CO Statements

At the end of the course, learners will be able

CO1	Understand and apply the Fundamentals of Communication Skills in their communication skills.
CO2	Identify the nuances of phonetics, intonation and enhance pronunciation skills.
CO3	To impart basic English grammar and essentials of language skills as per present

	requirement.
CO4	Understand and use all types of English vocabulary and language proficiency
CO5	Adopt the Techniques of Information Transfer through presentation
7.Course Code and Name: BSKK107/BKBKK107 SAMSKRUTHIKA KANNADA/BALAKE KANNADA	
CO Statements	
At the end of the course, learners will be able	
CO1	To Create the awareness regarding the necessity of learning local language for comfortable and healthy life.
CO2	To enable learners to Listen and understand the Kannada language properly.
CO3	To speak, read and write Kannada language as per requirement.
CO4	To train the learners for correct and polite conversation
CO5	To know about Karnataka state and its language, literature and General information about this state.
8.Course Code and Name: BSFHK158 SCIENTIFIC FOUNDATION FOR HEALTH	
CO Statements	
At the end of the course, learners will be able	
CO1	To understand and analyse about Health and wellness (and its Beliefs) & It's balance for positive mindset.
CO2	Develop the healthy lifestyles for good health for their better future.
CO3	Build a Healthy and caring relationships to meet the requirements of good/social/positive life
CO4	To learn about Avoiding risks and harmful habits in their campus and outside the campus for their bright future.
CO5	Prevent and fight against harmful diseases for good health through positive mindset.
SECOND SEMESTER	
11.Course Code and Name: BMATS201 ENGINEERING MATHEMATICS FOR CSE STREAM-II	
CO Statements	
At the end of the course, learners will be able	
CO1	Apply the concept of change of order of integration and variables to evaluate multiple integrals and their usage in computing area and volume.
CO2	Understand the applications of vector calculus refer to solenoidal, and irrotational vectors. Orthogonal curvilinear coordinates
CO3	Demonstrate the idea of Linear dependence and independence of sets in the vector space, and linear transformation
CO4	Apply the knowledge of numerical methods in analyzing the discrete data and solving

	the physical and engineering problems.
CO5	Get familiarize with modern mathematical tools namely MATHEMATICA/ MATLAB /PYTHON/ SCILAB
12.Course Code and Name: BPHYS202 PHYSICS FOR CSE	
CO Statements	
At the end of the course, learners will be able	
CO1	Describe the principles of LASERS and Optical fibers and their relevant applications.
CO2	Discuss the basic principles of the Quantum Mechanics and its application in Quantum Computing.
CO3	Summarize the essential properties of superconductors and its applications in qubits.
CO4	Illustrate the application of physics in design and data analysis.
CO5	Practice working in groups to conduct experiments in physics and perform precise and honest measurements.
13.Course Code and Name: BPOPS203 PRINCIPLES OF PROGRAMMING USING C	
CO Statements	
At the end of the course, learners will be able	
CO1	Elucidate the basic architecture and functionalities of a computer and also recognize the hardware parts.
CO2	Apply programming constructs of C language to solve the real world problem
CO3	Explore user-defined data structures like arrays in implementing solutions to problems like searching and sorting
CO4	Explore user-defined data structures like structures, unions and pointers in implementing solutions
CO5	Design and Develop Solutions to problems using modular programming constructs using functions
14.Course Code and Name: BESCK204C INTRODUCTION TO ELECTRONICS COMMUNICATION	
CO Statements	
At the end of the course, learners will be able	
CO1	Prepare students with fundamental knowledge/ overview in the field of Electronics and Communication Engineering.
CO2	Equip students with a basic foundation in electronic engineering required for comprehending the operation and application of electronic circuits, logic design, embedded systems, and communication systems.
CO3	Professionalism & Learning Environment: To inculcate in first-year engineering students an ethical and professional attitude by providing an academic environment inclusive of effective communication, teamwork, ability to relate engineering issues to a broader social context, and life-long learning needed for a successful professional career.

15.Course Code and Name: BETCK205J INTRODUCTION TO EMBEDDED SYSTEM	
CO Statements	
At the end of the course, learners will be able	
CO1	Explain characteristics of Embedded System design
CO2	Acquire knowledge about basic concepts of circuit emulators, debugging and RTOS
CO3	Analyse embedded system software and hardware requirements
CO4	Develop programming skills in embedded systems for various applications.
CO5	Design basic embedded system for real time applications
16.Course Code and Name: BPWSK206 PROFESSIONAL WRITING SKILLS IN ENGLISH	
CO Statements	
At the end of the course, learners will be able	
CO1	To understand and identify the Common Errors in Writing and Speaking.
CO2	To Achieve better Technical writing and Presentation skills.
CO3	To read Technical proposals properly and make them to Write good technical reports
CO4	Acquire Employment and Workplace communication skills
CO5	To learn about Techniques of Information Transfer through presentation in different level
17.Course Code and Name: BICOK207 INDIAN CONSTITUTION	
CO Statements	
At the end of the course, learners will be able	
CO1	Analyse the basic structure of Indian Constitution.
CO2	Remember their Fundamental Rights, DPSP's and Fundamental Duties (FD's) of our constitution.
CO3	Know about our Union Government, political structure & codes, procedures.
CO4	Understand our State Executive & Elections system of India
CO5	Remember the Amendments and Emergency Provisions, other important provisions given by the constitution.
3.Course Code and Name: BIDTK258 INNOVATION AND DESIGN THINKING (IDT)	
CO Statements	
At the end of the course, learners will be able	
CO1	Appreciate various design process procedure
CO2	Generate and develop design ideas through different technique
CO3	Identify the significance of reverse Engineering to Understand products
CO4	Draw technical drawing for design ideas

THIRD SEMESTER	
1.Course Code and Name: BBT301 UNIT OPERATIONS + LAB	
CO Statements	
At the end of the course, learners will be able	
CO1	Co-relate cellular structure-function relationship in the context of cell growth and death
CO2	Apply the concepts of cell signalling to biofilm formation
CO3	Apply the principles of Mendelian Genetics to understand gene interactions, multiple alleles and sex-linked inheritance
CO4	Apply principles of Chromosome structure and gene frequencies in the context of inherited disorders and population genetics.
2.Course Code and Name :BBT302 DIGITAL DESIGN AND COMPUTER ORGANIZATION	
CO Statements	
At the end of the course, learners will be able	
CO1	Describe the nature and properties of fluids.
CO2	Perform various flow measurements using different instruments.
CO3	Explain the Principles of various mechanical operations like size reductions, conveying equipment, sedimentation and mixing tanks.
CO4	Illustrate the laws governing the heat and mass transfer operations
CO5	Analyse the construction details of heat and mass transfer equipment for specific requirements.
3.Course Code and Name : BBT303 BIOCHEMISTRY + LAB	
CO Statements	
At the end of the course, learners will be able	
CO1	Explain the fundamentals of biologically important molecules such as structures, functions and interactions
CO2	Understand complex biochemical pathways within living cells and the associated metabolic disorders
CO3	Comprehend biochemical principles and apply them to biological systems/samples
CO4	Perform basic biochemical experiments, analyse, interpret and present the data
4.Course Code and Name : BBT304 MICROBIOLOGY	

CO Statements	
At the end of the course, learners will be able	
CO1	Be able to classify microorganism along with their structural and functional roles
CO2	Apply learning of microscopy and microbial techniques in identification and enumeration
CO3	Identify microbes through use of appropriate culture, characterize them under given conditions and study the microbial growth along with its control
CO4	Describe and relate the occurrence of microbes caused diseases.
CO5	Explain the occurrence and role of general microflora of air, water and soil.
5.Course Code and Name: BBTL305 MICROBIOLOGY LAB	
CO Statements	
At the end of the course, learners will be able	
CO1	Learn the basic techniques in Microbiology.
CO2	Apply the knowledge and execute experiments on methods of sterilization, identification, and characterization of microbes.
CO3	Observe and deduce conclusion of bacterial growth studies
CO4	Design and execute an experiment in basic microbiology.
6.Course Code and Name: BBT306A PYTHON PROGRAMMING	
CO Statements	
At the end of the course, learners will be able	
CO1	Develop algorithmic solutions to simple computational problems.
CO2	Read, write, debug, and execute simple Python programs.
CO3	Structure simple Python programs for solving problems.
CO4	Decompose a Python program into functions.
7.Course Code and Name: BBT306B HUMAN ANATOMY AND PHYSIOLOGY	
CO Statements	
At the end of the course, learners will be able	
CO1	Apply the basic knowledge of physiology as a process of various human anatomical systems
CO2	Co-relate functioning of different tissue and organ systems in the context of health and disease.
CO3	Co-relate functioning of different tissue and organ systems in the context of health and d Analyze the interface between different organ systems essential for maintenance of health & well-being.isease.
8.Course Code and Name: BBT306C R PROGRAMMING FOR BIOLOGISTS	
CO Statements	
At the end of the course, learners will be able	
CO1	Download and install R and RStudio.
CO2	Use of operators and functions in R.
CO3	Solve fundamental problems.
CO4	Apply R in data management and visualization.

9.Course Code and Name: BBT306D PLANT PHYSIOLOGY AND PHYTOHORMONES	
CO Statements	
At the end of the course, learners will be able	
CO1	comprehend the fundamental principles of plant physiology.
CO2	Examining the mechanisms of plant hormone action.
CO3	Analysing the interaction between phytohormones and the environment..
10.Course Code and Name: BBT358A BIO-LAB MANAGEMENT AND RISK ASSESSMENT	
CO Statements	
At the end of the course, learners will be able	
CO1	Apply principles of biology to understand risk and its assessment.
CO2	Deduce methods to minimize and mitigate the risks.
CO3	Evaluate risk-benefit analysis of different genetic engineering interventions based upon case studies.
CO4	Correlate laws pertaining to biological risk to the sustainable use of GMOs in different applications.
11.Course Code and Name: BBT358B DATA PRESENTATION, ERROR ANALYSIS AND INFERENCES	
CO Statements	
At the end of the course, learners will be able	
CO1	Understand the fundamentals of concepts and skills of physical education, health, nutrition and fitness.
CO2	Familiarization of health related exercises, sports for overall growth and development.
CO3	Create a foundation for the professionals in physical education and sports.
CO4	Participate in the competition at regional/state /national/international levels.
CO5	Create consciousness among the students on health, fitness and wellness in developing and maintaining a healthy lifestyle.
11.Course Code and Name: BPEK359 PHYSICAL EDUCATION (PE) (SPORTS AND ATHLETICS)	
CO Statements	
At the end of the course, learners will be able	
CO1	Understand the sources of data, present the data for specific purposes/application.
CO2	Gain ability to analyse the occurrence of errors in data sets.
CO3	Demonstrate the ways to draw inferences from data.

SEMESTER 4	
13.Course Code and Name : BBT401 MOLECULAR BIOLOGY & GENETIC ENGINEERING	
CO Statements	
At the end of the course, learners will be able	
CO1	Understand the basic concepts of genetic engineering for augmentation of traits.
CO2	Apply and comprehend the principles of gene manipulation, expression and interaction of genes and proteins
CO3	Evaluate the screening and interaction studies using classical/conventional and high through put methods.
CO4	Design the strategies for gene cloning and gene editing.
14.Course Code and Name : BBT402 BIOSTATISTICS AND TOOLS + LAB	
CO Statements	
At the end of the course, learners will be able	
CO1	Gather data, present appropriately and perform uni-variate, bi-variate analysis of data.
CO2	Analyze the statistically designed biological experiments,
CO3	Draw inferences about the characteristics of population from the samples using parametric and non-parametric tests.
15.Course Code and Name : BBT403 IMMUNOTECHNOLOGY+ LAB	
CO Statements	
At the end of the course, learners will be able	
CO1	Outline the molecular and cellular mechanisms involved in the development and regulation of the immune response,
CO2	Detail the cause, challenges and treatment for Immune System Pathologies and Dysfunctions.
CO3	Apply the major immunological laboratory techniques and their application to both clinical analysis and experimental research.
16.Course Code and Name : BBTL404 MOLECULAR BIOLOGY & GENETIC ENGINEERING LAB	
CO Statements	
At the end of the course, learners will be able	
CO1	Apply the principles of molecular biology and genetic engineering.
CO2	Conduct experiments related to isolation, separation, quantification, digestion and amplification of nucleic acids.
CO3	Interpret and discuss the outcome of the experiments formally through written reports.

17.Course Code and Name : BBT405A BIOCHEMICAL THERMODYNAMICS	
CO Statements	
At the end of the course, learners will be able	
CO1	Describe the concepts of system, surrounding, process, entropy and laws of thermodynamics.
CO2	Explain the PVT behaviour of pure fluids & gases and derive equations of state for real gases.
CO3	Determine the partial molar properties and activity coefficients of the solution.
CO4	Illustrate the phase rule for reacting systems and effect of temperature, pressure one equilibrium constants.
CO5	Correlate these aspects to biochemical reactions and energetics.
18.Course Code and Name : BBT405B MARINE BIORESOURCES AND APPLICATIONS	
CO Statements	
At the end of the course, learners will be able	
CO1	Apply the basics of ecology to understand ocean ecosystems with reference to their sustainable use
CO2	Evaluate the role of marine ecosystems as a source of bioactive compounds
CO3	Apply principles of toxicology in ecological integrity fauna
CO4	Analyze the role of bioremediation in the context of safeguarding marine resources.
7.Course Code and Name : BBT405C BIOPROCESS PRINCIPLES & STOICHIOMETRY	
CO Statements	
At the end of the course, learners will be able	
CO1	Discuss the significance of material and energy balance for bioprocess technology.
CO2	Solve problems related to material and energy balance to give solutions for bioprocess development
CO3	Develop the flowsheet for general processes operating in bioprocess industry.
CO4	Appreciate the stoichiometry of microbial growth and product formation involved in bioprocess technology.
8.Course Code and Name : BBT405D STRUCTURAL BIOLOGY AND BIOPHYSICAL TECHNIQUES	
CO Statements	
At the end of the course, learners will be able	
CO1	Describe the structural aspects of macro molecules like proteins, nucleic acids and bio membranes.
CO2	Demonstrate their structure function hypothesis via suitable techniques.
CO3	Apply the specific biophysical, spectroscopic, chromatographic techniques for various case studies.
9.Course Code and Name : BBTL456B WATER ANALYSIS LAB	
CO Statements	
At the end of the course, learners will be able	
CO1	Describe the physical, chemical and microbial compositions of natural waters, and explain how and why these compositions vary describe the main sources of water pollution.
CO2	Identify the criteria for drinking water acceptability in India.
10.Course Code and Name : BBTL456C EXTRACTION METHODS AND HERBAL PRODUCTS LAB	
CO Statements	

At the end of the course, learners will be able	
CO1	Isolate and extract products from natural materials using recovery techniques.
CO2	Prepared and characterise phytoconstituents using herbal resources
8.Course Code and Name : BBOK407 BIOLOGY FOR ENGINEERS	
CO Statements	
At the end of the course, learners will be able	
CO1	Elucidate the basic biological concepts via relevant industrial applications and case studies
CO2	Evaluate the principles of design and development, for exploring novel bioengineering projects
CO3	Corroborate the concepts of biomimetics for specific requirements.
CO4	Think critically towards exploring innovative biobased solutions for socially relevant problems

