



PRATHYUSHA ENGINEERING COLLEGE

DEPARTMENT OF BIOTECHNOLOGY REGULATION-2021 COURSE OUTCOMES

SUB/SUB CODE	COs	COURSE OUTCOME
HS3152- PROFESSIONAL ENGLISH I	CO-1	Ability to use appropriate words in a professional context
	CO-2	Ability to gain understanding of basic grammatical structures and use them in right context.
	CO-3	Ability to read and interpret information presented in tables, charts and other graphic forms
	CO-4	Ability to write definitions, descriptions, narrations and essays on various topics
	CO-5	Ability to write essays on various topics
MA3151- MATRICES AND CALCULUS	CO-1	Use the matrix algebra methods for solving practical problems.
	CO-2	Apply differential calculus tools in solving various application problems. ideas on several variable functions.
	CO-3	Able to use differential calculus
	CO-4	Apply different methods of integration in solving practical problems.
	CO-5	Apply multiple integral ideas in solving areas, volumes and other practical problems.
PH3151- ENGINEERING PHYSICS	CO-1	Understand the importance of mechanics.
	CO-2	Express their knowledge in electromagnetic waves.
	CO-3	Demonstrate a strong foundational knowledge in oscillations, optics and lasers.
	CO-4	Understand the importance of quantum physics.
	CO-5	Comprehend and apply quantum mechanical principles towards the formation of energy bands.

CY3151- ENGINEERING CHEMISTRY	CO-1	To infer the quality of water from quality parameter data and propose suitable treatment methodologies to treat water.
	CO-2	To identify and apply basic concepts of nanoscience and nanotechnology in designing the synthesis of nanomaterials for engineering and technology applications.
	CO-3	To apply the knowledge of phase rule and composites for material selection requirements.
	CO-4	To recommend suitable fuels for engineering processes and applications.
	CO-5	To recognize different forms of energy resources and apply them for suitable applications in energy sectors.
GE3151- PROBLEM SOLVING AND PYTHON PROGRAMMING	CO-1	Develop algorithmic solutions to simple computational problems.
	CO-2	Develop and execute simple Python programs.
	CO-3	Write simple Python programs using conditionals and looping for solving problems. program into functions.
	CO-4	Decompose a Python
	CO-5	Represent compound data using Python lists, tuples, dictionaries etc.
	CO-6	Read and write data from/to files in Python programs.
GE3171- PROBLEM SOLVING AND PYTHON PROGRAMMING LABORATORY	CO-1	Develop algorithmic solutions to simple computational problems
	CO-2	Develop and execute simple Python programs.
	CO-3	Implement programs in Python using conditionals and loops for solving problems..
	CO-4	Deploy functions to decompose a Python program.
	CO-5	Process compound data using Python data structures.
	CO-6	Utilize Python packages in developing software applications.
BS3171-PHYSICS AND CHEMISTRY LABORATORY	CO-1	Ability to understand the functioning of various physics laboratory equipment. laboratory data.
	CO-2	Ability to use graphical models to analyze
	CO-3	Ability to use mathematical models as a medium for quantitative reasoning and describing physical reality.

	CO-4	Ability to access, process and analyze scientific information.
	CO-5	Ability to solve problems individually and collaboratively.
CHEMISTRY LABORATORY	CO-1	Ability to analyse the quality of water samples with respect to their acidity, alkalinity, hardness and DO.
	CO-2	Ability to determine the amount of metal ions through volumetric and spectroscopic techniques
	CO-3	Ability to analyse and determine the composition of alloys.
	CO-4	Ability to learn simple method of synthesis of nanoparticles
	CO-5	Ability to quantitatively analyse the impurities in solution by electroanalytical techniques
GE3172-ENGLISH LABORATORY	CO-1	Ability to listen to and comprehend general as well as complex academic texts information
	CO-2	Ability to listen to and understand different points of view in a discussion
	CO-3	Ability to speak fluently and accurately in formal and informal communicative contexts
	CO-4	To describe products and processes and explain their uses and purposes clearly and accurately
	CO-5	To express their opinions effectively in both formal and informal discussions
HS3252-PROFESSIONAL ENGLISH -II	CO-1	To compare and contrast products and ideas in technical texts.
	CO-2	To identify and report cause and effects in events, industrial processes through technical texts
	CO-3	To analyse problems in order to arrive at feasible solutions and communicate them in the written format.
	CO-4	To present their ideas and opinions in a planned and logical manner
	CO-5	To draft effective resumes in the context of job search.
MA3251- STATISTICS AND NUMERICAL METHODS	CO-1	Apply the concept of testing of hypothesis for small and large samples in real life problems.
	CO-2	Apply the basic concepts of classifications of design of experiments in the field of agriculture.
	CO-3	Appreciate the numerical techniques of interpolation in various intervals and apply the numerical techniques of differentiation and integration for engineering problems.

	CO-4	Understand the knowledge of various techniques and methods for solving first and second order ordinary differential equations.
	CO-5	Solve the partial and ordinary differential equations with initial and boundary conditions by using certain techniques with engineering applications.
BE3252-BASIC ELECTRICAL, ELECTRONICS AND INSTRUMENTATION ENGINEERING	CO-1	Compute the electric circuit parameters for simple problems
	CO-2	Explain the concepts of domestic wiring and protective devices
	CO-3	Explain the working principle and applications of electrical machines
	CO-4	Analyze the characteristics of analog electronic devices
	CO-5	Explain the types and operating principles of sensors and transducers
GE3251-ENGINEERING GRAPHICS	CO-1	Use BIS conventions and specifications for engineering drawing.
	CO-2	Construct the conic curves, involutes and cycloid.
	CO-3	Solve practical problems involving projection of lines.
	CO-4	Draw the orthographic, isometric and perspective projections of simple solids.
	CO-5	Draw the development of simple solids.
BT3201-BIOORGANIC CHEMISTRY	CO-1	Ability to understand the elements of atom, charges and their bonding rules.
	CO-2	Ability to predict the time for product formation by measuring rate constants with kinetic mechanisms.
	CO-3	Ability to learn how to implement the learning for bioorganic molecules.
	CO-4	Ability to know the method for chemical synthesis of biomolecules.
	CO-5	Ability to predict the possible reactions for the formulation of products.
GE3271- ENGINEERING PRACTICES LABORATORY	CO-1	Draw pipe line plan; lay and connect various pipe fittings used in common household plumbing work; Saw; plan; make joints in wood materials used in common household wood work.
	CO-2	Wire various electrical joints in common household electrical wire work.

	CO-3	Weld various joints in steel plates using arc welding work; Machine various simple processes like turning, drilling, tapping in parts; Assemble simple mechanical assembly of common household equipments; Make a tray out of metal sheet using sheet metal work.
	CO-4	Solder and test simple electronic circuits; Assemble and test simple electronic components on PCB.
BT 3211-BIOORGANIC CHEMISTRY LABORATORY	CO-1	Comprehend the mechanism of reactions
	CO-2	Be able to synthesize various Bioorganic compounds
	CO-3	Be able to work independently for the experimentation.
GE3272- COMMUNICATION LABORATORY	CO-1	Speak effectively in group discussions held in a formal/semi formal contexts.
	CO-2	Discuss, analyse and present concepts and problems from various perspectives to arrive at suitable solutions
	CO-3	Write emails, letters and effective job applications.
	CO-4	Write critical reports to convey data and information with clarity and precision
	CO-5	Give appropriate instructions and recommendations for safe execution of tasks
MA3351- TRANSFORMS AND PARTIAL DIFFERENTIAL EQUATIONS	CO-1	Understand how to solve the given standard partial differential equations.
	CO-2	Solve differential equations using Fourier series analysis which plays a vital role in engineering applications.
	CO-3	Appreciate the physical significance of Fourier series techniques in solving one and two dimensional heat flow problems and one dimensional wave equations.
	CO-4	Understand the mathematical principles on transforms and partial differential equations would provide them the ability to formulate and solve some of the physical problems of engineering.
	CO-5	Use the effective mathematical tools for the solutions of partial differential equations by using Z transform techniques for discrete time systems.
BT3392-BIOCHEMISTRY	CO-1	Ensure students have a strong foundation in the structure and reactions of biomolecules.

	CO-2	Introduce them to metabolic pathways of the major biomolecules and relevance to clinical conditions.
	CO-3	Correlate biochemical processes with biotechnology application.
	CO-4	Understand in detail about structures, types and classifications of amino acid.
	CO-5	Illustrate the metabolism of carbohydrates through various anabolic and catabolic pathways.
	CO-6	Relate the structure of DNA with its function in replication and gene expression.
BT3351-CELL BIOLOGY	CO-1	To have deeper understanding of cell at structural and functional level
	CO-2	To understand the structures and purposes of basic components of prokaryotic and eukaryotic cells
	CO-3	To become familiar on the use of cellular components to generate and utilize energy in cells
	CO-4	To possess broad knowledge on the molecular interaction between cells.
	CO-5	To demonstrate a clear understanding between secondary messengers and signal transduction mechanism
	CO-6	To develop skill on working principles of microscopy and identification of cell types.
BT3352-MICROBIOLOGY	CO-1	Microorganisms and examination of microorganisms
	CO-2	Structural organization of microorganisms
	CO-3	Nutritional requirements of microorganisms, their growth and metabolism
	CO-4	Control of microorganisms
	CO-5	Metabolites, bioremediation, biofertilizers,
	CO-6	biopesticides and biosensors
BT3301-BIOCHEMICAL THERMODYNAMICS	CO-1	To explain the theoretical concepts of thermodynamics and how it applies to energy Conversion.
	CO-2	To demonstrate the capability to analyse the energy conversion performance in a variety of modern applications in biological systems.
	CO-3	To design and carry out bioprocess engineering experiments, and analyse and interpret fundamental data to do the design and operation of bioprocesses.

	CO-4	To describe the criteria when two phases coexist in equilibrium and the vapour liquid equilibrium calculations.
	CO-5	To understand the microbial growth and product formation and its kinetics.
	CO-6	To explore the thermodynamic concepts in bio chemical engineering.
BT3391-BASIC INDUSTRIAL BIOTECHNOLOGY	CO-1	To explain the steps involved in the production of bio products and methods to improve modern biotechnology.
	CO-2	To apply basic biotechnological principles, methods and models to solve biotechnological tasks.
	CO-3	To identify and debate the ethical, legal, professional, and social issues in the field of biotechnology.
	CO-4	To design and deliver useful modern biotechnology products to the Society.
	CO-5	Recognize the concepts of industrial biotechnology.
	CO-6	Apply biotechnological concept and principles in bioprocesses.
BT3361-BIOCHEMISTRY LABORATORY	CO-1	Analyze current biochemical and molecular techniques to plan and carry out experiments.
	CO-2	Perform good biochemical laboratory practices.
	CO-3	Adapt methods for biochemical analysis.
	CO-4	Carry out experiments in biomolecular separations.
	CO-5	Learn and understand the principles behind the qualitative and quantitative estimation of biomolecules.
	CO-6	Understand the applicability of biochemical methods to realistic solution.
BT 3362-CELL AND MICROBIOLOGY LABORATORY	CO-1	Understand the advanced technical information pertaining to laboratory bio-safety and preventive measures from pathogenic microorganism.
	CO-2	Know the various aseptic techniques and sterilization methods.
	CO-3	Develop the minimum skills to work on several important techniques for the study of microorganisms in the laboratory.
	CO-4	Learn the various techniques of culturing of microorganisms and media preparation.
	CO-5	Study the growth of microorganisms by varying the growth conditions.

	CO-6	Identify the various stages of mitosis
GE3361-PROFESSIONAL DEVELOPMENT	CO-1	Use MS Word to create quality documents, by structuring and organizing content for their day to day technical and academic requirements
	CO-2	Use MS EXCEL to perform data operations and analytics, record, retrieve data as per requirements and visualize data for ease of understanding
	CO-3	Use MS PowerPoint to create high quality academic presentations by including common tables, charts, graphs, interlinking other elements, and using media objects.
BT3401-MOLECULAR BIOLOGY	CO-1	Understand the composition, structure and characteristics of nucleic acids.
	CO-2	Understand the chemical and molecular processes that occur in and between cells.
	CO-3	Discuss clearly about gene organization and mechanisms of control the gene expression.
	CO-4	Gain insights into the most significant molecular and cell-based methods to expand his/her understanding of biology.
	CO-5	Comprehend the basic mechanisms of cell division and its status under proliferative and degenerative disorders.
	CO-6	Articulate applications of molecular biology in the modern world.
GE3451-ENVIRONMENTAL SCIENCES AND SUSTAINABILITY	CO-1	To recognize and understand the functions of environment, ecosystems and biodiversity and their conservation.
	CO-2	To identify the causes, effects of environmental pollution and natural disasters and contribute to the preventive measures in the society.
	CO-3	To identify and apply the understanding of renewable and non-renewable resources and contribute to the sustainable measures to preserve them for future generations.
	CO-4	To recognize the different goals of sustainable development and apply them for suitable technological advancement and societal development.
	CO-5	To demonstrate the knowledge of sustainability practices and identify green materials, energy cycles and the role of sustainable urbanization

BT 3402-FLUID FLOW AND HEAT TRANSFER OPERATIONS	CO-1	Ability to gain knowledge of fluid in static, kinematic and dynamic equilibrium.
	CO-2	Ability to gain knowledge of applicability of physical laws in addressing problems in hydraulics
	CO-3	Ability to gain knowledge of heat transfer operation mode by conduction and apply them for design
	CO-4	Ability to get basic knowledge of heat transfer mode by convection and apply them for design
	CO-5	Ability to acquire knowledge of heat transfer by radiation and its related equipments.
BT3451-ANALYTICAL TECHNIQUES IN BIOTECHNOLOGY	CO-1	Able to visualize and interpret the theory of spectroscopic methods
	CO-2	Ability to have a practical hands on experience on Absorption Spectroscopic methods
	CO-3	To acquire experience in the purification by performing chromatography
	CO-4	To validate and analyse using spectrometric techniques
	CO-5	To validate and analyse using microscopic techniques
BT3491-CHEMICAL PROCESS CALCULATIONS IN BIOTECHNOLOGY	CO-1	To recite the basics of enzyme and principles of catalysis
	CO-2	To understand the enzyme kinetics and various enzyme kinetic models
	CO-3	To gain the knowledge to develop the enzyme immobilization and biosensors
	CO-4	To analyze and learn enzyme reactions for the production and purification process
	CO-5	To give the student a basic knowledge concerning biotransformation reactions with the usage of enzymes
	CO-6	To apply the skills for the development of processes and products
BT3452-INDUSTRIAL ENZYMOLOGY	CO-1	Able to impart knowledge on enzyme and enzyme reactions will be the key step in to proceed towards various concepts in biotechnology.
	CO-2	Able to impart theoretical and practical aspects of kinetics will provide the importance and utility of enzyme kinetics towards research.

	CO-3	Able to learn the process of immobilization has been increased steadily in food, pharmaceutical and chemical industries
	CO-4	Able to learn the process which will provide simple and easy method of implementation.
	CO-5	Able to know the ideas on Processing, Production and Purification of enzymes at an industrial scale will be helpful to work technologically.
BT 3411- CHEMICAL ENGINEERING LABORATORY FOR BIOTECHNOLOGISTS	CO-1	Acquire knowledge on the basic concepts of chemical engineering.
	CO-2	Develop the skill of material balance and energy balance in unit operations and unit process.
	CO-3	Analyse the chemical engineering principles and their applications in chemical, mechanical and biological perspectives.
	CO-4	Realize the design and working principles of fluid moving machinery and transport phenomena in biological systems.
	CO-5	Select and apply appropriate techniques used for biological products.
	CO-6	Recognize the need for instrumentation studies in technical environment.
BT3461-ANALYTICAL INSTRUMENTATION LABORATORY	CO-1	Ability to interpret the theory and perform experiment of Absorption Spectroscopic methods.
	CO-2	Ability to visualize and interpret the theory of spectroscopic methods by hands on experiments.
	CO-3	Ability to interpret the theory of spectroscopic methods by hands on experiments.
	CO-4	Ability to acquire experience in the purification by performing chromatography
	CO-5	Ability to validate and analyze spectrometric and microscopic techniques
BT3551 BIOPROCESS PRINCIPLES	CO-1	Ability to identify suitable process instrumentation for monitoring and control of fermentor.
	CO-2	Ability to formulate the fermentation medium to facilitate improved product production.
	CO-3	Ability to select and apply the sterilization techniques in bioprocessing.
	CO-4	Ability to interpret the metabolic stoichiometry in microbial processes.

	CO-5	Ability to analyze the kinetics of microorganisms during fermentation processes
	CO-6	Ability to develop strategies to solve the issues in bioprocessing.
BT3552 IMMUNOLOGY	CO-1	Ability to understand the structure, functions and integration of immune system.
	CO-2	Ability to understand the antigen-antibody interactions that offers defence mechanism.
	CO-3	Ability to gain knowledge in the importance of learning immunoregulation in Immunity development
	CO-4	Ability to understand the importance of various techniques of therapeutically significant monoclonal and engineered antibodies production
	CO-5	Ability to gain awareness of the concepts and mechanism behind tumour development, allergy and hypersensitivity reactions.
	CO-6	Ability to gain knowledge in immuno therapeutic development for Clinical Applications
BT 3501 GENETIC ENGINEERING	CO-1	Ability to clone commercially important genes
	CO-2	Ability to produce the commercially important recombinant proteins
	CO-3	Ability to be aware of gene and genome sequencing techniques
	CO-4	Ability to design modern tools and techniques for manipulation and analysis of genomic sequences
	CO-5	Ability to develop skills in microarrays, analysis of gene expression and proteomics
	CO-6	Ability to strategize research methodologies employing genetic engineering techniques
BT3511 MOLECULAR BIOLOGY AND GENETIC ENGINEERING LABORATORY	CO-1	Ability to understand basic techniques of DNA isolation and manipulation.
	CO-2	Ability to Gain experience in selecting genetically transformed organisms for downstream analysis.
	CO-3	Ability to gain awareness on the basic techniques involved in analysis of gene expression at nucleic acids and proteins level
	CO-4	Ability to establish the ability to carry out laboratory experiments and interpret the results.

	CO-5	Ability to apply practical knowledge to solve biotechnological problems.
	CO-6	Ability to gain awareness of the hazardous chemicals and safety precautions in case of emergency.
BT3040 BIO-FERTILIZER PRODUCTION AND MUSHROOM CULTIVATION	CO-1	Ability to train the students about mushroom cultivation, using different types of mushrooms
	CO-2	Ability to gain hands on experience in mushroom cultivation, using different types of mushrooms.
	CO-3	Ability to equip the students with skills in bio-composting and biofertilizer production.
	CO-4	Ability to instill in students the ability and skills required to become self-employed / entrepreneur.
	CO-5	Ability to gain knowledge on the marketing potential of the produced mushroom and composts.
BT3010 PROTEIN ENGINEERING	CO-1	Analyze the various interactions in protein make up
	CO-2	Be familiar with different level of proteins
	CO-3	Know the role of functional proteins in various field of study.
	CO-4	Practice the latest application of protein science in their research.
	CO-5	Understand the major factors of protein folding.
	CO-6	Analyze and compare protein sequence data.
MX3084 DISASTER RISK REDUCTION AND MANAGEMENT	CO-1	To impart knowledge on the concepts of Disaster, Vulnerability and Disaster Risk reduction(DRR)
	CO-2	To enhance understanding on Hazards, Vulnerability and Disaster Risk Assessment Prevention And Risk Reduction
	CO-3	To develop disaster response skills by adopting relevant tools and technology
	CO-4	Enhance awareness of institutional processes for Disaster Response in country n
	CO-5	Develop rudimentary ability to respond to their surroundings with potential Disaster Response in areas where they live,with due sensitivity.

BT3561 IMMUNOLOGY LABORATORY	CO-1	The students would be aware of immune system cells and tissues.
	CO-2	The students would have knowledge on immunological/clinical tests.
	CO-3	The students would be able to isolate lymphocytes and monocytes.
	CO-4	The students would be able to identify various immune system cells.
	CO-5	The students would become familiar with the techniques involved in antigen-antibody reaction
	CO-6	The students will be able to identify the cellular and molecular basis of immune responsiveness
BT3601 Bioinformatics	CO-1	Ability to use and describe bioinformatics data and information resources.
	CO-2	Ability to apply computational based solutions for biological perspectives
	CO-3	Ability to analyze the evolutionary relationship between the organisms
	CO-4	Ability to understand the macromolecules structure prediction methods
	CO-5	Ability to relate how bioinformatics methods can be used in sequence to structure and function analysis.
	CO-6	Ability to learn the applications of bioinformatics approach for drug discovery, genomics and proteomics.
BT3651 Bioprocess Engineering	CO-1	Ability to describe various bioreactor configurations and operation modes.
	CO-2	Ability to apply the knowledge of bioreactor scale up on the basis of rule of thumbs.
	CO-3	Ability to define kinetic parameters and apply the bioreactor considerations for immobilized enzymes systems.
	CO-4	Ability to utilize modelling approaches and simulation concepts for bioprocess estimations.
	CO-5	Ability to apply bioreactor considerations for the development of recombinant products.
	CO-6	Ability to explore the engineering concepts of bioreactors.
BT3611 Bioinformatics Lab	CO-1	Ability to understand basic commans UNIX OS.
	CO-2	Ability to apply Perl programming to develop bioinformatics tools.

	CO-3	Ability to retrieve and analyze sequence and structure data.
	CO-4	Ability to access the databases and tools used for computer aided drug designing.
	CO-5	Ability to compare and analyse biological sequences.
	CO-6	Ability to know the relationship of biomolecules from different species.
BT3661 Bioprocess Laboratory	CO-1	Ability to explain about Enzyme kinetics and characterization
	CO-2	Ability to use enzyme kinetics and characterization for practical applications.
	CO-3	Ability to evaluate the growth kinetics of microorganisms and become adept with medium optimization techniques.
	CO-4	Ability to determine an experimental objective, understand the theory behind the experiment
	CO-5	Ability to demonstrate good lab citizenry and the ability to work in team
INDUSTRIAL TRAINING / INTERNSHIP II##	CO-1	Ability to plant layout, machinery, organizational structure and production processes in the firm or research facilities in the laboratory/research institute
	CO-2	Ability to analysis of industrial / research problems and their solutions
	CO-3	Ability to documenting of material specifications, machine and process parameters, testing parameters and results
	CO-4	Ability to preparing of Technical report and presentation
BT 3751 Downstream Processing	CO-1	Ability to define the fundamentals of downstream processing for product recovery
	CO-2	Ability to understand the requirements for successful operations of downstream processing
	CO-3	Ability to describe the components of downstream equipment
	CO-4	Ability to explain the purpose of downstream equipment
	CO-5	Ability to apply principles of various unit operations used in downstream processing and enhance problem solving techniques

BT3761 Downstream Laboratory	CO-1	Ability to acquire knowledge for the separation of whole cells and other insoluble ingredients from the culture broth.
	CO-2	Ability to learn cell disruption techniques to release intracellular products
	CO-3	Ability to learn various techniques like evaporation, extraction, precipitation, membrane separation for concentrating biological products
	CO-4	Ability to learn the basic principles and techniques of chromatography to purify the biological products and formulate the products for different end uses.
	CO-5	Ability to learn the formulation of the products for different end uses.
B T3811 Project Work / Internship#	CO-1	Ability to formulate and analyze problem / create a new product/ process.
	CO-2	Ability to design and conduct experiments to find solution
	CO-3	Ability to analyze the results and provide solution for the identified problem,
	CO-4	Ability to prepare project report
	CO-5	Ability to make presentation.