

Department	B.Tech Biotechnology
Sem I	Course Outcome
COs	HS6151 Technical English – I
1	Learners should be able to speak clearly confidently and comprehensively using appropriate communicative strategies.
2	Learners should be able to communicate with one or many listeners using appropriate communicative strategies.
3	Learners should be able to write cohesively, coherently and flawlessly avoiding grammatical errors, using a wide vocabulary range, organizing their ideas logically on a topic.
4	Learners should be able to read different genres of texts adopting various reading strategies.
5	Learners should be able to listen/view and comprehend different spoken discourses/excerpts in different accents
COs	MA6151 Mathematics – I
1	This course equips students to have basic knowledge and understanding in the field of materials.
2	This course equips students to have basic knowledge and understanding in the field of integral calculus.
3	The students would become knowledgeable in the area of infinite series and their convergence for mathematical modeling.
4	This course equips students to have basic knowledge and understanding in the field of differential calculus.
5	This course equips students to have basic knowledge and understanding in the field of matrices and evaluation of multiple integrals.
COs	PH6151 Engineering Physics – I
1	The students will have knowledge on the basics of physics related to properties of matter.
2	The students will apply these fundamental principles to solve practical problems related to materials used for engineering applications.

3	The students will have knowledge on the basics of physics related to optics.
4	The students will have knowledge on the basics of physics related to properties of acoustics.
5	The students will have knowledge on the basics of crystal physics and quantum physics.
COs	CY6151 Engineering Chemistry – I
1	The knowledge gained on polymer chemistry will provide a strong platform to understand the concepts on these subjects for further learning.
2	The knowledge gained on thermodynamics will provide a strong platform to understand the concepts on these subjects for further learning.
3	The knowledge gained on spectroscopy will provide a strong platform to understand the concepts on these subjects for further learning.
4	The knowledge gained on phase rule will provide a strong platform to understand the concepts on these subjects for further learning.
5	The knowledge gained on nano materials will provide a strong platform to understand the concepts on these subjects for further learning.
COs	GE6151 Computer Programming
1	At the end of the course, the student should be able to design C programs for problems.
2	At the end of the course, the student should be able to write and execute C programs for simple applications.
3	At the end of the course, the student should be able to think logically and write pseudocode or draw flow charts for problems.
4	At the end of the course, the student would gain knowledge on the number systems and organization of a digital computer.
5	At the end of the course, the student would gain knowledge on the usage of arrays, strings, functions, pointers, structures and unions in C.
COs	GE6152 Engineering Graphics
1	On Completion of the course the student will be able to perform free hand sketching of basic geometrical constructions and multiple views of objects

2	On Completion of the course the student will be able to do orthographic projection of lines and plane surfaces.
3	On Completion of the course the student will be able to draw projections and solids and development of surfaces
4	On Completion of the course the student will be able to prepare isometric and perspective sections of simple solids
5	On Completion of the course the student will be able to demonstrate computer aided drafting.
COs	GE6161 Computer Practices Laboratory
1	At the end of the course, the student should be able to apply good programming design methods for program development.
2	At the end of the course, the student should be able to design and implement C programs for simple applications.
3	At the end of the course, the student should be able to develop recursive programs.
4	At the end of the course, the student should be able to use office software.
5	At the end of the course, the student would be familiar with presentation and visualization tools.
COs	GE6162 Engineering Practices Laboratory
1	At the end of the course, the student should be able to fabricate carpentry components .
2	At the end of the course, the student should be able to use welding equipments to join the structures
3	At the end of the course, the student should be able to fabricate electrical circuits.
4	At the end of the course, the student should be able to fabricate pipe connections including plumbing works.
5	At the end of the course, the student should be able to fabricate electronics circuits.
COs	GE6163 Physics and Chemistry Laboratory – I

1	The hands on exercises undergone by the students will help them to apply physics principles of thermal physics to evaluate engineering properties of materials.
2	The students will be outfitted with hands-on knowledge in the quantitative chemical analysis of water quality related parameters.
3	The hands on exercises undergone by the students will help them to apply physics principles of optics to evaluate engineering properties of materials.
4	At the end of the course, the student would be familiar with conductometric titration of strong acids and strong bases.
5	At the end of the course, the students would be able familiar with determination of molecular weight of polymer by vacometry.
Sem II	Course outcome
COs	HS6251 Technical English – II
1	Learners should be able to speak convincingly, express their opinions clearly using appropriate communicative strategies.
2	Learners should be able to write effectively and persuasively and produce different types of writing such as narration, description, exposition and argument as well as creative, critical, analytical and evaluative writing.
3	Learners should be able to read different genres of texts, infer implied meanings and critically analyse and evaluate them for ideas as well as for method of presentation.
4	Learners should be able to listen/view and comprehend different spoken excerpts critically and infer unspoken and implied meanings.
5	Learners should be able to initiate a discussion, negotiate, argue using appropriate communicative strategies.
COs	MA6251 Mathematics – II
1	Students would have learnt techniques in solving ordinary differential equations that model engineering problems
2	Students would have learnt the concepts of vector calculus, needed for problems in all engineering disciplines.
3	Students would have learnt the standard techniques of complex variable theory so as to apply them with confidence in application areas such as heat conduction, elasticity, fluid dynamics and flow the of electric current.
4	Students would have learnt the purpose of using Laplace transforms to create a new domain in which it is easier to handle the problem that is being investigated

5	Students would have learnt techniques in complex integration and further evaluation of integrals by Cauchy's theorem.
COs	PH6252 Physics of Materials
1	The students will have knowledge on the basics of properties of conducting and super conducting Materials.
2	The students will apply these fundamental principles to solve practical problems related to materials used for engineering applications.
3	The students will have knowledge on the basics of Preparation and processing of insulating and magnetic materials.
4	The students will have knowledge on the basics of Preparation and processing of Electronic materials.
5	The students will have knowledge on the basics of Preparation and processing of Ceramic and new materials.
COs	CY6252 Chemistry for Technologists
1	The knowledge gained oils, fats, soaps & lubricants will provide a strong platform to understand the concepts on these subjects for further learning.
2	The students would have gained knowledge on Water quality parameters and their determination.
3	The knowledge gained on chemicals and auxiliaries will provide a strong platform to understand the concepts on these subjects for further learning.
4	The knowledge gained chemistry of interfaces will induce an interest for the students on these subjects for further learning.
5	The students would gain knowledge on colorants and their applications.
COs	BT6201 Biochemistry
1	Students would have learnt the different types of biological buffers and biomolecules with their significant functions.
2	Students would have knowledge about the structure and the chemical reactions involved in different biochemical pathways towards the energy generation processes.
3	Students will be able to understand the sources and types of proteins, enzymes, vitamins, hormones etc involved in wide range of biochemical reactions.

4	Students will be able to understand the biochemical values of metabolic pathways in relation to metabolic clinical disorders.
5	Students would have learnt the key principles involved in bioenergetics of various pathways.
COs	BT6202 Microbiology
1	Students will be well versed in the basic concepts of microbiology such as isolation, characterization and identification of microorganisms
2	Students will be familiar with structure, multiplication, metabolism and growth characteristics of bacteria and viruses.
3	Students would have learnt different methods to quantitate bacterial growth, aerobic and anaerobic bioenergetics and utilization of energy for biosynthesis of important molecules.
4	Students would gain knowledge in host-microbe interactions, importance of microorganisms and uses of antimicrobial agents.
5	At end of this course, students would have learnt about the production of primary, secondary metabolites, bio-fertilizers and bio-pesticides from microorganisms and their various applications.
COs	BT6211 Biochemistry Laboratory
1	Students would have learnt the different types of biological buffers and biomolecules with their significant functions.
2	Student would have learnt the qualitative analysis of sugars to screen the susceptible individual for the problem of carbohydrate metabolic disorders.
3	Students will be able to estimate the various major biomolecules to understand the progression of diseases.
4	Students would have learnt the basic analytical chromatography methods, TLC to analyse the samples for the presence of various lipid molecules.
5	Students would have gained the basic concepts for working in biochemistry lab and its statistical concepts.
COs	BT6212 Microbiology Laboratory
1	Student will be well versed in culture media preparation and sterilization techniques.
2	Students will be familiar with microscopic methods in the study of microorganisms by various staining techniques.

3	Students would have learnt different methods to quantify microbes
4	Students would gain knowledge about antibiotic sensitivity assay and effects of various disinfectants on microbes.
5	At end of this course, students would have learnt the effect of different parameters on bacterial and yeast growth.
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Sem III	Course Outcome
COs	MA6351 Transforms and partial differential equations
1	Students would get familiarize about the Fourier series to generate a sequence of waves
2	Students would have learnt about the Fourier Transform to a sequence non parabolic waves to a general function.
3	Students will be familiar with the construction of partial differential equation and finding methods to solve it
4	Students would gain knowledge about the applications of PDE in Chemical Engineering
5	Students would have acquired knowledge on Z Transforms for a 3D model and its solution
COs	BT6301 Stoichiometry and Fluid Mechanics
1	Upon successful completion of this course, the students will be able to solve problems related to units and conversions and fit the given data using the Methodologies
2	Upon successful completion of this course, the students will be able to solve problems related to material and energy balance concepts for biochemical processes
3	Upon successful completion of this course, the students will be able to apply their knowledge in the field of biochemical engineering from the principles of thermodynamics
4	Upon successful completion of this course, the students will be able to acquire knowledge related to fluid statics and dynamics, agitators and applications of various pumps.
5	Upon successful completion of this course, the students will be able to design reactors for biochemical processes

COs	BT6302 Bioorganic Chemistry
1	This course module will help the biotechnology students to know about basic knowledge about the elements of atom, charges and their bonding rule.
2	The students would be able to understand various types of reaction mechanisms.
3	The students would have learnt the kinetic and thermodynamic properties of the various reactions.
4	The students would be able to understand catalytic reactions with the presence of coenzymes, protons and metal ions etc.
5	The students will acquire knowledge about basic principles of chemical bonds, sequence DNA, peptides and also to synthesis peptides and various bio-organic compounds.
COs	BT6303 Cell Biology
1	Upon completion of this course, the students would have deeper understanding of cell at structural and functional level.
2	Upon completion of this course, the students would have broad knowledge on the molecular interaction between cells.
3	Upon completion of this course, the students would demonstrate a clear understanding of the signal transduction and secondary messengers
4	Upon completion of this course, the students would develop skills on working principles of microscopy and identification of cell types
5	Upon completion of this course, the students would understand various types of receptors, their quantitation and characterization.
COs	BT6304 Basic Industrial Biotechnology
1	At the end of the course, the students will be able to explain the steps involved in the production of bioproducts and methods to improve modern biotechnology.
2	At the end of the course, the students will be able to apply basic biotechnological principles and methods to solve biotechnological tasks.
3	At the end of the course, the students will be able to identify and debate the ethical, legal, professional, and social issues in the field of biotechnology.
4	At the end of the course, the students will be able to design and deliver useful modern biotechnology products to the society.

5	Upon successful completion of this course, the students will be able to apply basic biotechnological models to solve biotechnological tasks.
COs	GE6351 Environmental Science and Engineering
1	Students would have gained a clear knowledge on the existence of various ecosystems and the conservation of biodiversity.
2	Students would have a clear understanding that public awareness of environment is at infant stage.
3	Students would realize that ignorance and incomplete knowledge has lead to misconceptions.
4	Development and improvement in standard of living has lead to serious environmental disasters.
5	The impact of population growth on the environment and human health would be realized.
COs	BT6311 Cell Biology Laboratory
1	The candidate would have gained knowledge about the morphology of the basic microorganisms.
2	Basic knowledge about the operation and sterilization procedures in the laboratories would have been gained.
3	Different staining techniques to visualize the live and dead microorganisms would have been practiced.
4	An overview about blood cells and its morphology would have been studied.
5	Knowledge about different stages of cells would have been gained.
COs	BT6312 Bioorganic Chemistry Laboratory
1	Students will be well versed in preparation of analgesic compounds and chemical digestion of carbohydrates.
2	Students will be familiar with isolation of acid based compounds from chemical and natural sources.
3	Students would have learnt to synthesize carbohydrate derivatives used in pharmaceutical industries.

4	Students would gain knowledge about the preparation of pigments like lycopene and aminoacids like proline and cysteine from natural sources.
5	At end of this course, students would have also learnt to resolute chemical compounds and to derive biologically useful compounds from yeast.
Sem IV	Course Outcome
COs	MA6468 Probability and Statistics
1	The students will have a fundamental knowledge of the concepts of probability
2	The students will have knowledge of standard distributions which can describe real life phenomenon.
3	The students will have the notion of statistical techniques used in management problems.
4	The students will have the notion of sampling distributions used in management problems.
5	The students will have knowledge of statistical quality control
COs	BT6401 Analytical Methods and Instrumentation
1	This course helps the students to get knowledge about the light spectrum, absorption, NMR and Mass Spectroscopy.
2	The students will acquire knowledge on the different chromatographic methods for separation of biological products.
3	The students will gain knowledge on the different types of electrodes used for bio-chemical analysis.
4	This course enable the students to acquire knowledge on various types of spectroscopy.
5	The students will gain knowledge on the significance of signal and noise processes encountered in various instruments.
COs	BT6402 Applied Thermodynamics for Biotechnologists
1	At the end of this course, the student would have the ability to explain the theoretical concepts of thermodynamics and how it applies to energy conversion in technological applications and biological systems.

2	At the end of this course, the student would have the ability to demonstrate the capability to analyze the energy conversion performance in a variety of modern applications in biological systems.
3	At the end of this course, the student would have the ability to design and carry out bioprocess engineering experiments.
4	At the end of this course, the student would have the ability to analyze and interpret fundamental data to execute the design and operation of bioprocesses.
5	At the end of this course, the student would have the ability to describe the criteria when two phases coexist in equilibrium and the vapour liquid equilibrium calculations, microbial growth and product formation.
COs	BT6403 Heat Transfer Operations
1	Upon successful completion of this course, the students will be able to understand the purpose of mixing and agitation, types of agitators, scale up of agitators and dimensional analysis.
2	Upon successful completion of this course, the students will be able to understand about different modes of heat transfer, different laws and terms used for design purpose and industrial applications, steady state and transient
3	Upon successful completion of this course, the students will be able to understand the concepts of forced and natural convection, boiling and condensation and radiation heat transfer
4	Upon successful completion of this course, the students will be able to understand about the design and operating principle of heat exchangers.
5	At the end of course, the students will be able to understand NTU concepts, design of single and multi effect evaporators.
COs	BT6404 Enzyme Technology and Biotransformation
1	The knowledge on enzyme and enzyme reactions will be the key step in to proceed towards various concepts in biotechnology.
2	The theoretical and practical aspects of enzyme kinetics will provide the importance and utility of enzyme kinetics towards research.
3	The process of immobilization has been increased steadily in food, pharmaceutical and chemical industries and thus this study will provide simple and easy method of implementation.
4	Ideas on Processing, Production and Purification of enzymes at an industrial scale will be helpful to work technologically.
5	Upon successful completion of the course in Enzyme technology, graduates will be able to understand the concepts of biotransformations in the field of pharmaceutical industry.
COs	BT6405 Bioprocess Principles

1	Upon completion of the course in Bioprocess Principles, graduates will be able to apply engineering principles to systems containing biological catalysts to meet the needs of the society.
2	Upon completion of this course, graduates will be able to convert the promises of molecular biology and genetic engineering into new processes to make bio-products in economically feasible way.
3	Upon completion of this course, graduates will be able to interpret the kinetics of living cells and to develop a strategy to solve the issues emerging during fermentation processes.
4	Upon completion of this course, graduates will be able to enhance and modify the biological materials to improve its usefulness by finding the optimal formulation materials to facilitate product production
5	Upon successful completion of this course, the students will be able to design reactors for biochemical processes.
COs	BT6411 Chemical Engineering Laboratory
1	Upon completion of this practical course, the student will have knowledge on the basic principles of chemical engineering.
2	Upon completion of this practical course, the student will be able to apply the skill of material balance in unit operations and unit processes.
3	Upon completion of this practical course, the student will be able to understand energy balance in unit operations and unit process of chemical engineering and biotechnology.
4	Upon completion of this practical course, the student will be able to analyze the principles of chemical engineering and its applications in chemical, mechanical and biological perspectives.
5	Upon completion of this practical course, the student will understand the design and working principles of fluid moving machinery and transport phenomena.
COs	BT6412 Instrumental Methods of Analysis Laboratory
1	This practical course enables the students to gain knowledge on various types of spectroscopy.
2	The students would gain experience in the purification of various biological compounds by performing chromatographic techniques.
3	This practical course enables the students to gain knowledge on the concepts of molar absorptivity and stoichiometry.
4	The student will acquire knowledge on the working principle of nephelometry, fluorimetry and chemical actinometry.
5	This course helps to get knowledge on various instrumental and analytical techniques employed in the analysis of biological samples.

Sem V	Course Outcome
COs	BT6501 Protein Structure Function and Proteomics
1	Upon completion of this course, students will be able to analyze the various interactions in protein makeup.
2	Upon completion of this course, students will be familiar with different levels of protein structure.
3	Upon completion of this course, students will be able to know the role of functional proteins in various fields of study.
4	Upon completion of this course, students will be able to practice the latest applications of protein science in their research.
5	Upon completion of this course, students will be able to know the basic components and applications of proteomics in biological systems.
COs	BT6502 Bioprocess Engineering
1	Upon completion of Bioprocess Engineering course, graduates will be able to select appropriate bioreactor configurations, operation modes based upon the nature of bioproducts, cell lines and other process criteria.
2	Upon completion of Bioprocess Engineering course, graduates will be able to apply modeling and simulation of bioprocesses so as to reduce costs and to enhance the quality of products and systems.
3	Upon completion of Bioprocess Engineering course, graduates will be able to plan a research career or to work in the biotechnology industry with strong foundation about bioreactor design and scale-up.
4	Upon completion of Bioprocess Engineering course, graduates will be able to integrate research lab and Industry; identify problems and seek practical solutions for large scale implementation of Biotechnology.
5	Upon successful completion of this course, the students will be able to design reactors for biochemical processes.
COs	BT6503 Mass Transfer Operation
1	Upon completion of this course, the students will be able to demonstrate about gas -liquid, vapour- liquid and solid-liquid and liquid-liquid equilibrium.
2	Upon completion of this course, the students will be able to classify and use the accurate engineering correlations of diffusion and mass transfer coefficients to model a separation process.
3	Upon completion of this course, the students will be able to investigate a multi-stage equilibrium separation processes, simultaneous phase equilibrium and mass balances in continuous separation processes (absorbers, strippers, and

4	Upon completion of this course, the students will be able to design and construction with operating principles of process economics of separating equipments.
5	Upon successful completion of this course, the students will be able to design reactors for mass transfer process.
COs	BT6504 Molecular Biology
1	By the end of this course, students should be able to describe the basic structure and biochemistry of nucleic acids & proteins and discriminate between them.
2	By the end of this course, students should be able to identify the principles of DNA replication.
3	By the end of this course, students should be able to identify the principles of transcription and translation and explain how they relate to each other.
4	By the end of this course, students should be able to discuss clearly about gene organization and mechanisms of controlling the gene expression in various organisms.
5	By the end of this course, students should be able to articulate applications of molecular biology in the modern world.
COs	BT6511 Bioprocess Laboratory – I
1	At the end of this course, students will be able to explain about Enzyme kinetics and characterization and how to use them for practical applications.
2	At the end of this course, students will be able to evaluate the growth kinetics of microorganisms and become adopted with medium optimization techniques.
3	At the end of this course, students will be able to determine an experimental objective, understand the theory behind the experiment and operate the relevant equipment safely.
4	At the end of this course, students will be able to demonstrate good lab citizenry and the ability to work in team.
5	Upon successful completion of this course, the students will be able to design reactors for biochemical processes.
COs	BT6512 Molecular Biology Laboratory
1	By the end of this course, students should be able to demonstrate knowledge and understanding of the principles underpinning DNA isolation from various sources.
2	By the end of this course, students should be able to demonstrate knowledge and understanding of restriction digestion.

3	By the end of this course, students should be able to demonstrate the ability to carry out competent cell preparation and transformation.
4	By the end of this course, students should be able to demonstrate the ability to carry out phage titration.
5	By the end of this course, students will be aware of the hazardous chemicals and safety precautions in case of emergency.
COs	BT6006 Biopharmaceutical Technology
1	The knowledge gained in this course would be used to understand and evaluate different pharmaceutical parameters for the current and future biotechnology related products on the market.
2	This course paves a way to the students to acquire knowledge on novel biotechnological and pharmaceutical products, current medicines and their applications in therapeutic and diagnostic fields.
3	The course would facilitate the students to demonstrate knowledge and understanding of current topical and newly emerging aspects of pharmaceutical biotechnology.
4	The course would facilitate the students to understand the legal steps involved in progressing a new drug to market.
5	The course would facilitate the students in grasping the current regulatory acts and safety norms of the modern pharmaceutical industries.
COs	BT6003 Principles of Food Processing
1	The students can understand about different constituents present in food and microorganism involved in processing of food.
2	Through this subject the students can understand about principles and different preservations techniques of food.
3	Through this subject the student can understand about unit operations in modern food processing and impact of the process on food quality.
4	The students will acquire knowledge about various microorganisms which are beneficial and harmful to mankind.
5	The students will be able to design new food products with the existing technologies.
Sem VI	Course Outcome
COs	BT6601 Total Quality Management For Biotechnologists

1	Upon completion of this course, the students will be able to know the basic knowledge of total quality management principles and concepts of current biotech industries.
2	Upon completion of this course, the students will be able to know the customer-oriented quality, leadership & continuous improvement process and supplier selection and management.
3	Upon completion of this course, the students will be able to know the six sigma concept methodology & applications and the TQM tools.
4	Upon completion of this course, the students will be able to know the design of quality systems of ISO auditing in the field of Biotechnology.
5	The students would be aware of Environmental Management system (EMS) that promotes a healthier relationship between the customer and organization, towards environmental concern.
COs	BT6602 Immunology
1	The students after completing the course would be aware of immune system structure and functions.
2	The students would be aware of immunity to various pathogens.
3	The students would be aware of how to produce the therapeutic/diagnostic molecules.
4	The students would be aware of tumour, allergy and hypersensitivity reactions.
5	The students would gain knowledge on the concepts of autoimmunity, autoimmune disorders & diagnosis.
COs	BT6603 Genetic Engineering and Genomics
1	The students after completing this course would be aware of how to clone commercially important genes.
2	The students would be aware of how to produce the commercially important recombinant proteins.
3	The students would be aware of gene and genome sequencing techniques.
4	The students would be aware of construction of genomic and cDNA libraries.
5	The students would be aware of microarrays, analysis of gene expression and proteomics.

COs	BT6604 Chemical Reaction Engineering
1	Upon completion of this course, the students would be able to design and conduct an experimental investigation in order to determine rate equations.
2	Upon completion of this course, the students would be able to demonstrate an ability to solve material and energy balances in order to analyze the performance of a reactor.
3	Upon completion of this course, the students would be able to demonstrate an experimental data using standard statistical methods to establish quantitative results.
4	Upon completion of this course, the students would be able to design a reactor for bio-based products to achieve production and yield specifications.
5	Upon successful completion of this course, the students will be able to understand the concepts of catalysed and non catalysed reactions.
COs	BT6611 Genetic Engineering Laboratory
1	By the end of this course, students should be able to demonstrate knowledge and understanding of plasmid DNA isolation, restriction and ligation of DNA
2	By the end of this course, students should be able to demonstrate the ability to carry out competent cell preparation and transformation.
3	By the end of this course, students should be able to demonstrate the ability to carry out SDS-PAGE and various blotting techniques.
4	By the end of this course, students should be able to describe the main principles, methods for preparation and cloning of DNA in various organisms.
5	By the end of this course, students should be able to express clearly about the gene amplification and analysis of DNA.
COs	BT6612 Bioprocess Laboratory- II
1	At the end of this course, graduates gain ability to investigate, design and conduct experiments, analyze and interpret data and apply the laboratory skills to solve complex bioprocess engineering problems.
2	At the end of this course, graduates become creative, innovative and adaptable engineers as leaders or team members in their organizations and society.
3	At the end of this course, graduates perform competently in chemical and bioprocess industries and become important contributors to national development.
4	At the end of this course, graduates will demonstrate advancement in their career through increasing professional responsibility and continued life-long learning.

5	Upon successful completion of this course, the students will be able to design reactors for biochemical processes.
COs	BT6007 Animal Biotechnology
1	Upon completion of this subject, the students will be able to understand about the animal cell culture.
2	Upon completion of this subject, the students will be able to get a clear knowledge on animal diseases and their diagnosis.
3	Upon completion of this subject, the students will be able to gain knowledge for therapy of animal infections.
4	Upon completion of this subject, the students would know the concepts of micromanipulation technology and transgenic animal technology.
5	Upon completion of this subject, the students will be able to use the knowledge gained in this section to apply in the field of clinical research.
COs	BT6010 Plant Biotechnology
1	To understand the fundamentals of plant cells, their structure and functions.
2	To learn the nitrogen fixation mechanism and significance of viral vectors.
3	To gain knowledge about the plant tissue culture techniques.
4	To use the gained knowledge for the development of therapeutic products.
5	To learn about the transgenic plants, their production and applications.
COs	GE6562 Employability Skills
1	At the end of the course, learners should be able to participate in conversations both formal and informal successfully.
2	At the end of the course, learners should be able to read different types of texts.
3	At the end of the course, learners should be able to listen to and understand foreign accents.

4	At the end of the course, learners should be able to attend phone calls successfully.
5	At the end of the course, learners should be able to attend interviews successfully.
Sem VII	Course Outcome
COs	BT6701 Bioinformatics and Computational Biology
1	Upon completion of this course, students will be able to develop bioinformatics tools.
2	Upon completion of this course, students will be able to develop programming skills.
3	Upon completion of this course, students will be able to apply computational based solutions for biological perspectives.
4	Upon completion of this course, students will be able to pursue higher education in the field of bioinformatics and drug designing.
5	Upon completion of this course, students will be able to practice life-long learning of applied biological science.
COs	BT6702 Downstream Processing
1	Upon successful completion of this course, the students will be able to define the fundamentals of downstream processing for product recovery.
2	Upon successful completion of this course, the students will be able to understand the requirements for successful operations of downstream processing.
3	Upon successful completion of this course, the students will be able to describe the components of downstream equipments and explain the purpose of each.
4	Upon successful completion of this course, the students will be able to apply principles of various unit operations used in downstream processing and enhance problem solving techniques required in multi-factorial manufacturing
5	Upon successful completion of this course, the students will be able to understand the concepts of freeze drying and crystallization processes.
COs	BT6703 Creativity, Innovation and New Product Development
1	On completion of the course, students will have gained knowledge on various issues related to patents.

2	On completion of the course, students will have gained knowledge on how to develop a product.
3	On completion of the course, students will have gained knowledge on various issues related to marketing research.
4	On completion of the course, students will have gained knowledge on various issues related to selection and evaluation
5	On completion of the course, students will have gained knowledge about innovation and creativity.
COs	BT6711 Downstream Processing Laboratory
1	Upon successful completion of this course, the students would have acquired knowledge for the separation of whole cells and other insoluble ingredients from the culture broth.
2	Upon successful completion of this course, the students would have learned cell disruption techniques to release intracellular products.
3	Upon successful completion of this course, the students would have learned various techniques like evaporation, extraction, precipitation and membrane separation for concentrating biological products.
4	Upon successful completion of this course, the students would have learned the basic principles and techniques of chromatography to purify the biological products and formulate the products for different end uses.
5	Upon successful completion of this course, the students will be able to understand the concepts of freeze drying and crystallization processes.
COs	BT6712 Immunology Laboratory
1	The students would be aware of immune system cells and tissues.
2	The students would have knowledge on immunological /clinical tests
3	The students would be able to isolate lymphocytes and monocytes.
4	The students would be able to identify various immune system cells.
5	The students would have knowledge on animal handling and immunization techniques.
COs	BT6713 Bioinformatics Laboratory

1	To understand basic commands in UNIX O/S.
2	To apply Perl programming in bioinformatics.
3	To develop bioinformatics tools.
4	To understand different biological databases.
5	To carry out sequence and phylogenetic analysis.
COs	BT6013 Bioconjugate Technology and Applications
1	Upon completion of this course, the students would know about joining of two molecules to form a hybrid conjugate with the help of linkers.
2	Upon completion of this course, the students would know about active groups of various chemical reactions and targets of the functional groups.
3	Upon completion of this course, the students would know about antibody modification and conjugation.
4	Upon successful completion of this course, the students would gain knowledge on the applications of bioconjugate reagents.
5	Upon successful completion of this course, the students would know about enzyme & nucleic acid modifications and their applications.
COs	BT6018 Neurobiology and Cognitive Sciences
1	Upon completion of this course, the students will be able to know the anatomy and organization of nervous system.
2	Upon completion of this course, the students will be able to understand the functions of nervous system.
3	Upon completion of this course, the students will be able to analyse how drugs affect cellular function in the nervous system.
4	Upon completion of this course, the students will be able to understand the basic mechanism associated with behavioural science.
5	Upon successful completion of this course, the students would gain knowledge on the neuro disorders and innovate biotechnological means for the therapy of nervous diseases.

Sem VIII	Course Outcome
COs	Project Work
1	The student may develop a process of interest to achieve strategic goals
2	The student may develop skills to manage creative teams and project process effectively and efficiently
3	The student may develop a leadership effectiveness in organizations
4	The students may acquire concepts to address specific management needs
5	The student may develop a tool to for the betterment of the society
Department	M.Tech Biotechnology - REGULATIONS - 2013
Sem I	Course Outcome
COs	MA7161 Applied Statistics for Biotechnologists
1	Students will be able to work on random variable distribution
2	Students will be able to differentiate among different sampling techniques
3	Students will be able to apply different distribution techniques
4	Students will learn about hypothesis formulation and experimentation technique
5	Students will be able to learn about different classification technique
COs	BY7101 Bioprocess Technology
1	Upon completion of the course the students will learn about elemental balances

2	Upon completion of the course the students will learn about different modeling process about biotechnology
3	Upon completion of the course the students will learn about design and operation of fermentors
4	Upon completion of the course the students will get an exposure on monitoring parameters for bioreactors.
5	Upon completion of the course the students will learn to derive different biological products
COs	BY7102 Computational Biology
1	Students will learn about different algorithms existing to solve biological problems
2	Students will learn to construct phylogenetic tree
3	Students will learn about protein modeling and simulations
4	Students will learn about gene finding and microarrays
5	Students will learn about PERL for biological software development
COs	BY7103 Entrepreneurship, IPR and Biosafety
1	Upon completion of the course the students will learn about basics of entrepreneurship
2	Upon completion of the course the students will learn about protection of rights
3	Upon completion of the course the students will learn about different types of patents
4	Upon completion of the course the students will learn about patent filing
5	Upon completion of the course the students will learn about biosafety levels
COs	BY7104 Advanced Genetic Engineering

1	Students will be acquiring knowledge about cloning and expression of genes
2	Students will be acquiring knowledge about construction of DNA libraries
3	Students will be acquiring knowledge about sequencing techniques
4	Students will be acquiring knowledge about different types of PCR techniques
5	Students will be acquiring knowledge about gene therapy
COs	BY7111 Preparative and Analytical Techniques In Biotechnology
1	Students will gain practical knowledge about protein estimation techniques
2	Students will gain practical knowledge about separation of lipids and other substances
3	Students will gain practical knowledge about ion exchange chromatography
4	Students will gain practical knowledge about SDS PAGE
5	Students will gain practical knowledge about purification of IgG
Sem II	Course outcome
COs	BY7002 Biology for Chemical Engineers
1	Upon completion of the course the students will learn about nature of biological molecules
2	Upon completion of the course the students will learn about basics of genes and its end products
3	Upon completion of the course the students will learn about energetics in molecular biology
4	Upon completion of the course the students will learn about secondary metabolites production

5	Upon completion of the course the students will learn about higher forms of life
COs	BY7006 Food Processing and Biotechnology
1	Students will acquire knowledge about intentional food additives and enzymes in food processing
2	Students will acquire knowledge about food fermentation and intoxication
3	Students will acquire knowledge about processing food
4	Students will acquire knowledge about various food preservation techniques
5	Students will acquire knowledge about dairy and milk products
COs	BY7008 Environmental Biotechnology
1	This course will equip students about the scientific and engineering principles of microbiological treatment
2	This course will equip students about to clean up the contaminated environment
3	This course will equip students about generating valuable resources for the human society
4	This course will equip students about conventional treatment methodologies
5	This course will equip students about alternate sources of energy to avoid environmental issues
COs	BY7201 Bioseparation Technology
1	This course paves way for characterization of biomolecules
2	This course paves way for solid liquid separation and cell disruption
3	This course paves way for two phase extraction and separation techniques

4	This course paves way for different chromatographic techniques
5	This course paves way to study about end stage processing techniques
COs	BY7202 Immunotechnology
1	Students will be able to acquire knowledge about cell mediated responses
2	Students will be able to acquire knowledge about antibodies and diagnostics
3	Students will be able to acquire knowledge about cellular immunology
4	Students will be able to acquire knowledge about vaccine development and reverse vaccinology
5	Students will be able to acquire knowledge about combinatorial libraries
COs	BY7203 Animal Biotechnology
1	Upon completion of the course the students will learn about the production of regulatory proteins
2	Upon completion of the course the students will learn about different viral vectors
3	Upon completion of the course the students will learn about hybridoma technology
4	Upon completion of the course the students will learn about gene therapy and probes
5	Upon completion of the course the students will learn about assisted reproductive techniques
COs	BY7211 Microbial and Immuno Technology Laboratory
1	Students will gain practical knowledge about staining of microbes
2	Students will gain practical knowledge about animal handling and immunization

3	Students will gain practical knowledge about characterization of antigens
4	Students will gain practical knowledge about separation of mononuclear cells
5	Students will gain practical knowledge about spleenocytes and proliferation
COs	BY7015 Plant Biotechnology
1	Students will acquire knowledge about differentially expressed genes
2	Students will acquire knowledge about the structure and function of chloroplast and mitochondria
3	Students will acquire knowledge about secondary metabolites synthesis
4	Students will acquire knowledge about agrobacterium and plant viruses
5	Students will acquire knowledge about molecular pharming
COs	BY7022 Nanobiotechnology
1	The course will make the students understand about fundamental concepts of nanotechnology
2	The course will make the students understand about fabrication and characterization of nanomaterials
3	The course will make the students understand about measurement of nanomaterials
4	The course will make the students understand about bioconjugation of materials
5	The course will make the students understand about drug delivery
COs	BY7024 Enzyme Technology and Industrial Applications
1	The students would have acquired knowledge about enzyme kinetics and immobilization

2	The students would have acquired knowledge about methods of investigating enzymes
3	The students would have acquired knowledge about immobilization techniques and its applications
4	The students would have acquired knowledge about functional interconversion
5	The students would have acquired knowledge about biotransformation and drug producing enzymes
Sem III	Course Outcome
COs	BY7311 Advanced Molecular Biology and Genetic Engineering Laboratory
1	The students would have gained practical knowledge about isolation of DNA
2	The students would have gained practical knowledge about electroporation to yeast
3	The students would have gained practical knowledge about cDNA synthesis
4	The students would have gained practical knowledge about ELISA
5	The students would have gained practical knowledge about southern blotting
COs	BY7312 Advanced Bioprocess and Downstream processing Laboratory
1	Equip students about enzyme kinetics
2	Equip students about enzyme immobilization studies
3	Equip students about batch cultivation of E.coli
4	Equip students about cell disruption methods
5	Equip students about high resolution purification

COs	BY7313 Project Work (Phase I)
1	The students would have gained knowledge to disseminate the area of interest
2	The students would have gained knowledge about literature survey
3	The students would have gained knowledge to select the methodologies for the research work
4	The students would have gained knowledge about the principles behind the process
5	The students would have gained knowledge about the expected outcome of the work
Sem IV	Course Outcome
COs	BY7411 Project Work (Phase II)
1	Upon completion of the project work the students would have achieved the expected outcome of the research
2	Upon completion of the project work the student would have gained knowledge to develop a product which will benefit the society
3	Upon completion of the project work the student would have predicted the commercial probability of their product
4	Upon completion of the project work the student would gain knowledge about the success rate of the product
5	Upon completion of the project work the student would have assessed the impact of the research work