Koneru Lakshmaiah Education Foundation
(Category -1, Deemed to be University estd. u/s. 3 of the UGC Act, 1956)
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Campus: Green Fields, Vaddeswaram - 522 302, Guntur District, Andhra Pradesh, INDIA.
Phone No. 08645 - 350200; www.klef.ac.in; www.klef.edu.in; www.kluniversity.in
Admin Off: 29-36-38, Museum Road, Governorpet, Vijayawada - 520 002. Ph: +91 - 866 - 3500122, 2577715, 2576129

DEPARTMENT OF BIOTECHNOLOGY

B.TECH-BT

ACADEMIC YEAR: 2021-2022

S No	Course Code	Course Title	CO NO	Description of the Course Outcome
1	20UC1101	INTEGRATED PROFESSIONAL SKILLS	CO1	Understand the concepts of grammar to improve communication, reading, and writing skills
			CO2	Demonstrate required knowledge over Dos and Don'ts of speaking in the corporate context. Demonstrate ability to face formal situations / interactions.
			CO3	Understand the varieties of reading and comprehend the tone and style of the author. Skim and scan effectively and appreciate rhetorical devices
			CO4	Apply the concepts of writing to draft corporate letters, emails, and memos
2	20UC1202	ENGLISH PROFICIENCY	CO1	Demonstrating different interpersonal skills for employability
			CO2	Distinguishing business essential skills
			CO3	Classifying social media and corporate communication skills
			CO4	Applying analytical thinking skills

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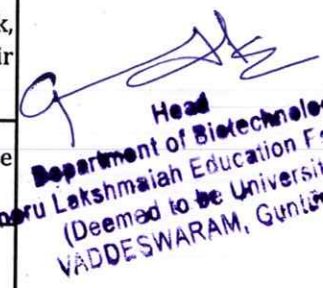
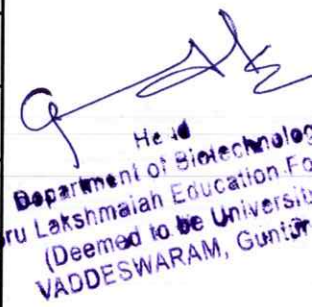
3	20UC2103	ESSENTIAL SKILLS FOR EMPLYOBAILITY	CO1	Developing critical and analytical reading skills
			CO2	Discovering different interpersonal skills to develop people skills
			CO3	To enhance the problem-solving skills of the students through the concepts of Simple Equations, Ratio, Proportion &Variation, Percentages, Profit & Loss, Averages, Allegations, Simple & Compound Interest.
			CO4	Apply diagrammatic representation of the given data to find the possible outcomes in the topics of Deductions, Cubes, Venn Diagrams and Arrangements
			CO5	To apply deductive logic to solve questions in Connectives, Blood relations, Ranking and time sequence, Symbols and notations. Apply principles of reflection and rotation to solve picture puzzles.
4	20UC2204	CORPORATE READINESS SKILLS	CO1	To distinguish product and process and quote them in speaking and writing activities
			CO2	To apply interpersonal skills
			CO3	To enhance the problem-solving skills of the students through the concepts of Numbers, Time & Work, Time & Distance, Permutations & Combinations, Probability which will enable them to improve their problem solving abilities which in turn improve their programming skills.
			CO4	To apply known facts to find the unknowns in the topics Clocks, Calendars, Binary Logic. Identify the rule set by analyzing the given observations in the topics Series, Analogy, Odd Man, Coding-Decoding
5	20UC0007	INDIAN HERITAE AND CULTURE	CO1	To familiarize with various aspects of the culture and heritage of India through ages.
			CO2	To acquaint with the contributions of Indians in the areas of languages and literature, religion and philosophy
			CO3	To understand the Social structure and the spread of Indian culture abroad
			CO4	To know the development of Science and Technology in India through ages and to appreciate the contributions of some of the great Indian scientists



6	20UC0008	INDIAN CONSTITUTION	CO1	To understand Constitutional development after Independence
			CO2	To learn the fundamental features of the Indian Constitution
			CO3	To get a brief idea of the powers and functions of Union and State Governments
			CO4	To understand the basics of working of Indian Judiciary and the Election Commission
7	20UC0009	ECOLOGY AND ENVIRONMENT	CO1	Understand the importance of Environmental education and conservation of natural resources.
			CO2	Understand the importance of ecosystems and biodiversity
			CO3	Apply the environmental science knowledge on solid waste management, disaster management and EIA process
			CO4	Understand the importance of Environmental education and conservation of natural resources
8	20UC0010	UNIVERSAL HUMAN VALUES & PROFESSIONAL ETHICS	CO1	Understand and identify the basic aspiration of human beings
			CO2	Envisage the roadmap to fulfill the basic aspiration of human beings.
			CO3	Analyze the profession and his role in this existence.
8	20MT1101	MATHEMATICS FOR COMPUTING	CO1	Model a system of equations for real world applications in engineering, physical and biological sciences, computer science, finance, economics and solve them through matrix algebra
			CO2	Model basic and computational techniques on discrete structures like relations, orders, functions & FSM, Lattices, and propositional &predicate logic Model real world structures and their related
			CO3	Applications using advanced discrete structures like graphs and trees. Model the given Statistical data for real world
			CO4	Applications in Engineering science, Economics and Management.
			CO5	Demonstrate the Aptitude and Reasoning skills (Tests in skilling hours)



9	21UC1001	DESIGN THINKING AND INNOVATION-1	CO1	Understand the basics of design thinking and its implications in product or service development
			CO2	Understand and Analyze the requirements of a typical problem
			CO3	Plan the necessary activities towards solving the problem through ideation and prototyping
			CO4	evaluate the solution and refine them based on the customer feedback
10	21SC1101	COMPUTATIONAL THINKING FOR DESIGN	CO1	Design Basic and Complex Building Blocks for real world problems using structured programming paradigm.
			CO2	Translate computational thinking into Logic Design for Solving real world problems.
			CO3	Apply and Analyse CRUD operations on Basic Data Structures using Asymptotic Notations.
			CO4	Apply and Analyse CRUD operations on Linear Data Structures using Asymptotic Notations.
			CO5	Apply the structured programming paradigm with logic building skills on Basic and Linear Data Structures for solving real world problems.
11	20ME1103	DESIGN TOOLS WORKSHOP –I	CO1	Practice design thinking by developing artistic skills, Visualize and complete his/her innovative design by final drafting using 3D modeling
			CO2	Understand the concept of web page, web browser, web server, and able to create Static webpages
			CO3	Understand the concept of report writing using a markup language Latex
			CO4	Understand the concept of data visualization and creating data visualization dashboards, Understand the basic concept of VR/AR.
12	21SC1202	DATA STRUCTURES	CO1	Apply measures of efficiency to algorithms and Compare various linear data structures like Stack ADT, Queue ADT, Linked lists.
			CO2	Analyze and compare linear data structures and analyze different searching and hashing techniques
			CO3	Analyze and compare various non – linear data structures like Trees and Graphs
			CO4	Analyze and compare various sorting algorithms, to select from a range of possible options, to provide justification for that selection, and to implement the algorithm in a particular context.
			CO5	Execute lab experiments and develop a small project along with his/her team members.

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13	21SC1209	DESIGN TOOLS WORKSHOP -II	CO1	Practice the design ideology by artistic skill
			CO2	Visualize the design ideology by using VR technology
			CO3	Visualize the design ideology by incorporating VR technique
			CO4	Visualize and present his design idea by applying AR technique
14	21BT1201	CELL BIOLOGY	CO1	Acquire the knowledge of cell and Nuclear Organization
			CO2	Compare Cell division and cell cycle
			CO3	Acquire the knowledge of tissues and Receptors
			CO4	Understand membrane Structure
15	21ES2101	PROCESS ENGINEERING PRINCIPLES	CO1	Describe the engineering calculations in Bioprocess Technology principles.
			CO2	Employ the basic principles of ideal gas law for measuring no. of moles of various solutions
			CO3	Employ the basic principles of material balance of a various reaction systems and Estimate the chemical and microbial kinetic parameters for better biomass and product formation.
			CO4	Employ the basic principles of Energy balance of a various reaction systems and Estimate the chemical and microbial kinetic parameters for better biomass and product formation.
16	21ES2103	BIOCHEMICAL THERMODYNAMICS	CO1	Acquire the knowledge of terminology and zeroth, first laws of thermodynamics.
			CO2	Determine entropy changes and apply second law of thermodynamics.
			CO3	Compute thermodynamic properties for fluids.
			CO4	Apply chemical engineering thermodynamics to phase and reaction equilibria and design thermodynamic models for microbial growth.

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17	21ES2102	TRANSPORT PROCESS IN BIOLOGICAL SYSTEMS	CO 1	Apply principles of momentum transfer in biological systems
			CO 2	Apply principles of Heat Transfer in Biological systems
			CO 3	apply principles of Mass Transfer in Biological systems
			CO 4	Apply separation and purification unit operations in biological products
			CO5	Apply unit operations of momentum, heat and mass transfer in bio processing.
18	21CY1001	ENGINEERING CHEMISTRY	CO 1	Describe some important design considerations in choosing a battery for a specific application.
			CO 2	Predict potential complications from combining various chemicals or metals in an engineering setting
			CO 3	Examine water quality and select appropriate purification technique for intended problem
			CO 4	Explain the role of chemical kinetics in the formation and destruction of ozone in the atmosphere and predict the connection between molecular behavior and observable physical properties.
			CO 5	An ability to analyze & generate experimental skills
19	21PH1005	ENGINEERING PHYSICS	CO1	Understands structure of crystalline solids, kinds of crystal imperfections and appreciates structure-property relationship in crystals.
			CO2	Understands the deformation of materials in response to action of load, for identification of materials having specific engineering applications.
			CO3	Understands the motion of electrons in microscopic level
			CO4	Understand the properties of light and engineering applications of lasers
			CO5	Apply the knowledge on structure and properties of materials while executing related experiments and develop some inter disciplinary projects
20	21MT2011	BIOSTATISTICS	CO1	Interpret numerical data through various graphs and determination of various constants of the data
			CO2	Measure and estimate the degree of linear relationship between two variables
			CO3	Identify the suitable probability distribution to the given experimental data and calculation of various characteristics of the respective probability distributions
			CO4	Draw the statistical inference of the given data through various tests of statistical hypothesis, viz., tests for means (single and two), analysis of variance

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21	21BT2105	BIOCHEMISTRY	CO1	Understand the functions and properties of bio molecules (carbohydrates, nucleic acids, proteins, lipids) in biological systems.
			CO2	Understand the organization and biochemical reactions of bio molecules
			CO3	Understand the importance of various metabolic pathways
			CO4	Understand the importance of various biosignaling in biological systems
			CO5	Perform techniques used in biochemistry to address biochemical problems
22	21BT2106	MICROBIOLOGY	CO1	Acquire the knowledge about chronological development, classification, cell structure, characteristics and diseases of microorganisms
			CO2	Construction of growth curve, identification of various factors affecting growth and outline about microbial growth estimation methods
			CO3	Compare various media, isolation, identification and sterilization methods of microorganisms
			CO4	Demonstrate various methods of microbiology such as sterilization, isolation, identification and characterization.
			CO5	Apply various straining techniques for isolation of microbes from different sources.
23	21BT2107	BIOANALYTICAL TECHNIUES	CO1	Understand the basic principles of different bio analytical methods
			CO2	Knowledge about techniques related to electrophoresis & spectroscopy
			CO3	An understanding of use of Radioisotopes in biological sciences and its ethical issues
			CO4	An ability to perform centrifugation, chromatography, electrophoresis & spectroscopy techniques
			CO5	Analyze the methods for assay of bio molecules
24	21BT2108	MOLECULAR BIOLOG	CO1	Understand the genome organization & replication
			CO2	Compare DNA transcription and translation mechanisms
			CO3	Understand the gene regulation mechanisms
			CO4	Apply the gene expression in bacteria

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25	21BT2109	IMMUNOLOGY	CO1	Understand the various defense mechanism of body system
			CO2	Compare different types of Ag-Ab reactions
			CO3	Differentiate the role of B and T cells
			CO4	Development of ELISA method for Ag-Ab reactions
			CO5	Apply the various techniques for the vaccine production
26	21BT3110	BIOINFORMATICS	CO1	Acquire the theoretical basis of bioinformatics and understand the access and analyze the biological information from databases.
			CO2	Manipulate the DNA/protein sequences using standalone pc programs and with the help of the worldwide web.
			CO3	Apply multiple sequence alignment tools on gene and protein sequences to find homologs, construct and interpret the evolutionary trees.
			CO4	Use genome informatics tools and model protein three-dimensional structure of proteins.
			CO5	Choose the sequences from the databases and apply sequence alignment, tree construction tools to infer their relations.
27	21BT3111	GENETIC ENGINEERING	CO1	Understand the process of gene cloning
			CO2	Apply the role of vectors in cloning process
			CO3	Analyze various types of PCR
			CO4	Compare various gene technology methods
			CO5	Analyze cloning methods using recombinant molecules
28	21BT3112	FERMENTATION TECHNOLOGY	CO1	Acquire the knowledge of fermentation process basics
			CO2	Understand the knowledge of medium optimization
			CO3	Acquire the knowledge of medium sterilization.
			CO4	Understand the principles of aeration and agitation
			CO5	Demonstrate fermentation processes to produce value added proteins and other biological substances for human, animal therapeutic use, food production processing and bio fuels.

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29	21BT3113	BIOCHEMICAL REACTION ENGINEERING	CO1	Acquire the knowledge of reaction engineering basics and batch reaction system.
			CO2	Understand different bioreactor systems to analyze microbial growth and product formation.
			CO3	Compare various multiphase bioreactors
			CO4	Analyze biochemical processes for various biochemical parameters on microbial growth.
			CO5	Demonstrate processes to produce value added proteins and other biological substances for human, animal therapeutic use, food production processing and bio fuels.
30	21BT3181	PLANT AND ANIMAL BIOTECHNOLOGY	CO 1	Acquire the knowledge of plant tissue culture and understand the principles and methods of plant genetic transformation.
			CO 2	Apply concepts of genetic engineering and genome editing to molecular farming in plants
			CO 3	Acquire the comprehension of animal cell culture principle and application and scale up of animal cell culture
			CO 4	Apply the concepts of Transgenic Animals, Recombinant DNA Technology, and Tissue Engineering in Animal Biotechnology
			CO 5	Apply tissue culture and genetic transformation in plant and cell culture techniques in animal cells
31	21BT3182	DOWNSTREAM PROCESSING	CO1	Acquire the knowledge of primary separation and recovery processes
			CO2	Apply the principles of solid removal unit operations and product enrichment operations
			CO3	Apply the principles of aqueous two-phase extraction process and product purification methods
			CO4	Analyze the methods of alternative separation, product polishing and formulations
			CO5	Evaluate the bioseparation methods for recovery, isolation and purification of various bioproducts
32	21T3051	MOLECULAR GENETICS	CO 1	Acquire the knowledge of Genome Organization &Types of Sequences and Recombination
			CO 2	Describe about Gene Expression Regulation
			CO 3	Compare X chromosome & Mt DNA analysis in Forensics
			CO4	Compare Y Chromosome & Mt DNA analysis in Forensics

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33	21BT3052	TRANSGENIC TECHNOLOGY	CO 1	Acquire the knowledge of vehicles for transgenic technology and transgenic plants
			CO 2	Describe transgenic animals and silencing technology
			CO 3	Develop gene therapy
			CO4	Develop knockouts strategies
34	21BT3053	MOLECLAR EXPRESSION TECHNOLOGY	CO 1	Acquire the knowledge of gene expression and Prokaryotic system-
			CO 2	Describe mammalian system
			CO 3	Develop various strategies of Protein purification system
			CO 4	Develop various strategies of Protein stability
35	21BT3054	GENOMICS AND PROTEOMICS	CO 1	Acquire the knowledge of Genomes
			CO 2	Compare micro array analysis
			CO3	Develop protein networks
			CO 4	Develop mapping strategies
36	21BT3055	MOLECULAR MARKERS AND DIAGNOSTICS	CO1	Acquire the Diagnosis of Viral & Bacterial diseases analysis
			CO2	Understand Biochemical Disorders
			CO3	Understand Immunodiagnostics and applications
			CO4	Apply DNA based Diagnostics
37	21BT3056	GENE AND ENVIRONMENT	CO 1	Acquire the knowledge of genes and its impact on environment
			CO 2	Describe about environmental factors that damage DNA
			CO 3	Compare detoxification and antioxidant defences
			CO4	Compare stress genes from organisms

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38	21BT3057	MOLECULAR GENETICS	CO 1	Acquire the knowledge of Genome Organization &Types of Sequences and Recombination
			CO 2	Describe about Gene Expression Regulation
			CO 3	Compare X chromosome & Mt DNA analysis in Forensics
			CO4	Compare Y Chromosome & Mt DNA analysis in Forensics
39	21BT3058	DNA FORENSICS	CO 1	Students will demonstrate an understanding of the principles and techniques used in DNA analysis for forensic purposes.
			CO 2	Students will develop the skills to interpret DNA evidence collected from crime scenes or other forensic contexts.
			CO 3	Students will gain an understanding of the legal and ethical considerations involved in DNA forensics
			CO 4	Students will develop critical thinking and problem-solving skills through hands-on exercises and case studies in DNA forensics
40	21BT3061	MICROBIAL TECHNOLOGY	CO 1	Acquire the knowledge of microbial technology
			CO 2	Screen out medium and strain development
			CO 3	Develop various strategies to produce Primary and secondary Metabolites
			CO 4	Design various strategies to produce Enzymes, recombinant Proteins, and other special bio products
41	21BT3062	PHARMACEUTICAL BIOTECHNOLOGY	CO 1	Acquire the knowledge of Fundamentals of pharmaceutical Practice
			CO 2	Asses the drug metabolism and pharmacokinetics and formulate pharmaceutical dosage & blood, plasma products
			CO 3	Compare various Pharmaceutical products
			CO 4	Develop various strategies of manufacturing processes

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42	21BT3063	METABOLIC ENGINEERING	CO 1	Acquire the knowledge of Introduction of Metabolic Engineering
			CO 2	Acquire the knowledge of Genetic improvement of strains
			CO 3	Analyze metabolic pathways
			CO 4	Develop experimental determination strategies of of Flux
43	21BT3064	BIORESOURCE TECHNOLOGY	CO1	Acquire the knowledge of Bioresources
			CO2	Understand the knowledge of Biogas production
			CO3	Describe the methods for Bioethanol and Biobutanol production
			CO4	Describe the methods for Biodiesel production
44	21BT3065	BIOPROCESS ECONOMICS AND PLANT DESIGN	CO 1	Understand basics of economic evaluation
			CO 2	Acquire the knowledge of Bioprocess Economics
			CO 3	Develop various strategies of process design
			CO 4	Design various strategies of Basic considerations in equipment design and Basic Design Problems
45	21BT3066	ENZYME ENGINEERING	CO1	Acquire the knowledge of terminology and classification of enzymes.
			CO2	Understand the mechanisms of enzyme catalysis and action.
			CO3	Evaluate the kinetics of enzyme parameters.
			CO4	Understand the various industrial enzymes and their applications.

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46	21BT3067	BIOPROCESS VALIDATION AND cGMP	CO1	Acquire the knowledge of terminology and classification of enzymes.
			CO2	Understand the mechanisms of enzyme catalysis and action.
			CO3	Evaluate the kinetics of enzyme parameters.
			CO4	Understand the various industrial enzymes and their applications.
47	21BT3068	FOOD TECHNOLOGY	CO1	Acquire the knowledge of food associated microbes
			CO2	Describe food processing
			CO3	Develop various strategies involved in preservation and storage
			CO4	Conclude various principles involved in food microbiology
48	21BT3072	BIOMEDICAL INFORMATICS	CO 1	Acquire the knowledge of web programming with Javascript
			CO 2	Understand genomics role in informatics
			CO 3	Analyze biochemical pathways
			CO 4	Develop virtual Physiological Human; geometric models of proteins
49	21BT3073	PERL AND BIOPERL PROGRAMMING	CO 1	Acquire the knowledge of an Introduction to Perl & Variables and Data Types
			CO 2	Acquire the knowledge of Arrays and Hashes
			CO 3	Describe Control Structures & String Manipulation and Input and Output- Program Parameters
			CO 4	Develop various strategies involved in Bioperl

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50	21BT3074	MOLECULAR MODELLING AND DRUG DESIGN	CO 1	Acquire the knowledge of Introduction to Molecular Modeling
			CO 2	Describe the Basic concepts of Protein Modeling and Protein structure Determination
			CO 3	Develop Molecular Dynamics and Simulations
			CO 4	Design and construct Molecular modeling strategies in Drug Designing
51	21BT3075	STRUCTURAL BIOLOGY	CO 1	Acquire the knowledge of Structural biology of Nucleic Acids
			CO 2	Describe the Protein dynamics
			CO 3	Compare various techniques for structural biology
			CO 4	Conclude the principles involved in structure predictions and structural elucidation
52	21BT3076	SYSTEMS BIOLOGY	CO1	Understand the network properties
			CO2	Analyze regulatory network throughsystems biology software
			CO3	Analyze Algorithms for biochemical network construction
			CO4	Analyze Microarrays
53	21BT3077	APPLIED BIOINFORMATICS	CO 1	Acquire the knowledge of genomics
			CO 2	Describe the Protein dynamics
			CO 3	Compare various techniques for applied bioinformatics
			CO 4	Conclude the applications of system biology

54	21BT3078	PYTHON AND R PROGRAMMING	CO1	Understand the basics of Python and R programming
			CO2	Analyze Biological sequence analysis with python
			CO3	Analyze biological data statistics
			CO4	Analyze gene expression with R
55	21BT3079	DATABASE MANAGEMENT SYSTEMS	CO 1	Acquire knowledge on database systems
			CO 2	Apply SQL in relational model
			CO 3	Compare data storage devices
			CO 4	Analyze current trends in data types
56	21BT3081	STEM CELL TECHNOLOGY	CO1	Acquire the knowledge of stem cell technology
			CO2	Understand stem cell characterization and tissue engineering
			CO3	Illustrate various strategies involved in regulation and stem cell.
			CO4	Apply various principles involved in stem cell therapies.
57	21BT3082	HEALTHCARE BIOTECHNOLOGY	CO1	Acquire the knowledge of simple proteins and therapeutic agents
			CO2	Acquire the knowledge of Human diseases
			CO3	Describe the various vaccines used
			CO4	Understand the applications of genetic engineering in healthcare

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58	21BT3083	CANCER BIOLOGY	CO 1	Acquire the knowledge of cancer
			CO 2	Understand about various agents in carcinogenesis
			CO 3	Apply molecular biology in various cancer cells
			CO 4	Apply the role of immune cells in Cancer
59	21BT3084	NEURO BIOLOGY	CO 1	Understand the basic concepts of neuroscience
			CO 2	Understand Neurotransmitters and Receptors
			CO 3	Compare and contrast vestibular system
			CO 4	Develop various strategies of nervous system andits Neuronal modulation
60	21BT3085	BIOELECTRONICS AND BIOSENSORS	CO 1	Understand concepts of biosensors
			CO 2	Compare transducers in biosensors
			CO 3	Apply bioelectronics in imaging process
			CO 4	Develop various strategies for design for biophotonic computer
61	21BT3086	TISSUE ENGINEERING	CO1	Remember the knowledge of Tissue Engineering and Cell-Based Therapies
			CO2	Recall the knowledge of Tissue culture basics
			CO3	Understand 3D organization and angiogenesis
			CO4	Apply the role of Stem Cells in treating tissue defects using case studies

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62	21BT3087	VIROLOGY	CO 1	Acquire the knowledge of viruses
			CO 2	Acquire the knowledge of techniques in virology
			CO 3	Analyze structure of viruses
			CO 4	Compare plant and animal viruses
63	21BT3088	NANOBIOTECHNOLOGY	CO 1	Understand concepts of nanotechnology
			CO 2	Compare biopolymer and Lipo polymer strategies
			CO 3	Develop various strategies of nucleic acid based nonmaterial's
			CO 4	Conclude various principles involved in Biocompatible material's
64	OEBT0001	IPR & PATENT LAWS	CO 1	Acquire the knowledge of intellectual property rights
			CO 2	Describe the principles and regulatory affairs
			CO 3	Develop documentation ,Protocols and Case Studies on patents
			CO 4	Compare various Case Studies on Patents

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