

**JAYPEE INSTITUTE OF INFORMATION
AND TECHNOLOGY**

B. TECH BIOTECHNOLOGY

SEMESTER VII

Course Code	17B1NBT 731	Semester : ODD	Semester: VII Session:2023-2024 Month from: July to December.
Course Name	Food Biotechnology		
Credits	4	Contact Hours	4
Faculty (Names)	Coordinat tor(s)	Dr. Smriti Gaur	
	Teacher(s) (Alphabet ically)	Dr. Smriti Gaur	
COURSE OUTCOMES			COGNITIVE LEVELS
CO1	Explain fundamental principles of food science and chemistry.		C2
CO2	Outline beneficial and harmful effects of microorganisms related to food		C2
CO3	Utilize microbes for development of functional food		C3
CO4	Examine methods that increase shelf life and quality parameters of food		C4
Mod ule No.	Title of the Module	Topics in the Module	No. of Lectures for the module
1.	Food Science and Food Chemistry	Food Science and Food Chemistry Concepts, Proteins in food, Lipids in food, Carbohydrates in food, Vitamin and minerals, food flavors and colors.	08
2.	Food Fermentations	Microbiology of fermented food products, traditional fermented food items like beverages (cereal and fruit juice based), bakery, fermented Vegetables and dairy products	06
3.	Food Processing and Preservation	Food spoilage and food borne diseases, Principles of food preservation – methods of preservation; irradiation, drying, heat processing(high temperature),	10

		chilling and freezing(low temperature),preservation by food additives	
4.	Functional Foods	Single Cell Protein, Probiotics and prebiotics, Yeast as a food supplement.	06
5.	Processed Food Industry	Enzymes in food industry, Current status of Indian processed food industry, key challenges	06
6.	Food safety and control	Food adulteration, Food safety regulations, Good manufacturing practices – HACCP, Regulations, GMO and GM Foods. International rules and regulations in export and import.	06
Total number of Lectures			42

Evaluation Criteria

Components	Maximum Marks
T1	20
T2	20
End Semester Examination	35
TA	25 (presentation and viva)
Total	10

Project based learning: Each student in a group of 2 will opt a food industry. They will discuss the various products manufactured by the industry, product processing, manufacturing applications, market information, job prospects etc. This will enhance the student's understanding about various food industries. This would help their employability into the food sector.

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)

1.	Food Science & Food Biotechnology, G.F.G Lopez and GVB Canovas CRC Press, Florida(2003)
2.	Bioprocess and Biotechnology for functional foods and Nutraceuticals, J.R Neeser , J.Bruce German Marcel and Dekker , New York (2004)
3.	Food Microbiology, Frazier W C, Westoff DC, Vanitha NM, Mc Graham Hill Education (2013)
4.	Essentials of food science by. Vaclavik VA and Elizabeth WC., Springer (2008)
5.	Food processing and preservation by Sivasankar B., PHI Private Limited (2008)

Course Code	15B1NBT832	Semester Odd (specify Odd/Even)	Semester VII Session 2023-2024 Month: July to December
Course Name	Biostatistics and its applications		
Credits	4	Contact Hours	4
Faculty (Names)	Coordinator(s)	Dr. Shalini Mani	
	Teacher(s) (Alphabetically)	Dr. Shalini Mani	
COURSE OUTCOMES			COGNITIVE LEVELS
C430-3.1	Explain the various statistical methods to design a biological studies and data representation.		Understanding (Level 2)
C430-3.2	Apply different statistical methods and approaches to study the significance of a study.		Apply (Level 3)
C430-3.3	Examine the relationship between different parameters of a study.		Analyze (Level 4)
C430-3.4	Choose appropriate statistical methods, tools and resources including prediction, validation and evaluation of the biological studies.		Evaluate (Level 5)
Module No.	Title of the Module	Topics in the Module	No. of Lectures for the module
1.	Introduction	Application and use of Biostatistics as a science, scope.	1
2.	Study design in various fields of research	general principles of study design and its implications for valid inference	1
3.	Sampling theory	Sampling scheme, simple/ systematic/ stratified/ cluster sampling, Sources of data collection	2
4.	Data presentation	Graphical, tabular, Mathematical, finding the central tendency, measure of variations	3
5.	Overview of different statistical methods used in the field of biological sciences.	Hypothesis testing, T-test, Chi square test, ANOVA, Sign Test, Wilcoxon Signed Rank Test, Wilcoxon Rank Sum Test, odds ratio, Binomial/normal/Poisson distribution of probabilities, determination of power of study and sample size calculation, regression analysis, correlation analysis,	12

6.	Analysis of data source	Assess data sources and data quality for the purpose of selecting appropriate data for specific research questions	4
7.	Selection of statistical methods	Identifying the appropriate statistical methods to be applied in a given research setting, applying the selected methods and analysis.	4
8.	Application of Biostatistical analysis.	Designing various studies of medical/ health/ Microbial/Agricultural/Genetics/Pharmaceutical science related studies. Data analysis using different methods Result interpretation	7
9.	Case studies	Based on various research studies and systematic reviews.	4
10.	SPSS, Stats at the bench	Introduction to SPSS, Entering data in SPSS editor. Solving the compatibility issues with different types of files. SPSS and working with descriptive statistics.	4

Total number of Lectures

42

Evaluation Criteria

Components

Maximum Marks

T1	20
T2	20
End Semester Examination	35
TA	25 (assignment, class test, quiz)
Total	100

Project Based learning: Students will learn to represent the data of various fields using various statistical methods. Students will also be able to select the appropriate statistical tool for analysis of different data set and interpret the outcome of any study.

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)

1.	Marcello Pagano, Kinberlee Gauvreau, Principle of Biostatistics.
2.	Stephen W Looney, Biostatistical methods, Humana Press
3.	Alan J Cann, Maths from Scratch for Biologist, John Willey and Sons Limited Press.
4.	M Bremer, R W Doerge, Statistics at the Bench, Cold Spring harbor Lab Press.
5.	B K Mahajan, Methods in Biostatistics, VII edition, Jaypee Bothers Medical Publishers, 2010.

Course Code	17B1NBT734 ELECTIVE	Semester Odd	Semester VII Session 2023-2024 Month from July to December
Course Name	Stem Cells and Health Care		
Credits	4	Contact Hours	4
Faculty (Names)	Coordinator(s)	Prof. Sujata Mohanty	
	Teacher(s) (Alphabetically)	Prof. Sujata Mohanty	
COURSE OUTCOMES			COGNITIVE LEVELS
C430-1 .1	Compare the unique properties of stem cells derived from different sources		Understand Level (C2)
C430-1 .2	Select niche and various isolation and reprogramming methods of stem cells		Apply Level (C3)
C430-1 .3	Apply the acquired knowledge in Regenerative medicines		Apply Level (C3)
C430-1 .4	Analyze the guidelines, political and ethical issues for stem cell research		Analyze Level (C4)
Module No.	Title of the Module	Topics in the Module	No. of Lectures for the module
1.	Introduction to Stem Cells	Stem cells: the promising field of research, Unique Properties: Self-renewal, Potency and proliferation Asymmetric Cell Division, History of Stem Cells	04
2.	Types and sources of Stem Cells: Embryonic Stem cells; hESCs	Characteristics of ES cells: Sources (IVF & SCNT), Isolation and Culture Techniques, Characterization, Unique features, Genetic Manipulation and Differentiation	06

3.	Types and sources of Stem Cells: Adult Stem cells; ASCs	Types of Adult Stem Cells: Umbilical Cord Blood, Placental, Hematopoietic, Cardiac, Neural, Pancreatic Stem Cells Adult Stem Cells vs Embryonic stem cells	06
4.	Cloning and Reprogramming of somatic cells: iPSCs	Cloning strategy, Reprogramming of Cells to Stem cells, ipsc, Detail strategy and properties and application of ipsc	06
5.	Therapeutic Applications of Stem Cells	Stem cell Research and application in Healthcare, Tissue Engineering, Regenerative Medicine, Opportunities and Challenges, Case studies	10
6.	Stem cell Banking	Vision, collection and storage procedure, Insurance against life threatening diseases, Existing Centres both in India and abroad	04
7.	Stem cell research: Indian and Global scenario: Ethical and legal issues	Stem cell research Centers in India and abroad and their valuable contribution, National and International guidelines for conducting stem cell research	06
Total number of Lectures			42

Evaluation Criteria

Components	Maximum Marks
T1	20
T2	20
End Semester Examination	35
TA	25 (Assignment 1 and 2, Class Test, Presentation,)
Total	100

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)

1.	Robert Lanza et.al., Handbook of Stem Cells, Volume 1-Embryonic Stem Cells; 2006, Academic press
2.	Robert Lanza et.al. Handbook of Stem Cells Volume 2-Adult & Fetal Stem Cells
3.	M.J. Laughlin & H.M. Lazarus Allogeneic Stem cell Transplantation 2003 Humana Press, USA
4.	Mehmet R. TOPCUL and Idil CETIN Stem Cells in Cell Therapy and Regenerative Medicine,

	OMICS International, ebook, 2018
5.	Robert Paul. Essentials of Stem Cell Biology 2006 Elsevier Academic
6.	Jeanne F. Loring <u>Human Stem Cell Manual: A Laboratory Guide</u> , Elsevier Science& Technology, 2007
7.	Stewart Sell, Stem Cells Handbook 2003 Humana Press, USA
8.	Recent research articles will be discussed in the class and same will be provided.
9.	Websites: http, www.isscr.org/ , https://stemcells.nih.gov/

S.No.		Course Outcome	Cognitive level
1	Major Project Part-1 (10B19BT794)- Dr. Chakresh Kumar Jain		
	C450.1	Interpret the given research problem.	Understanding Level Level II
	C450.2	Organize the existing literature data to formulate the hypothesis	Applying Level Level III
	C450.3	Identify the experimental methods to test for the selected research problem	Applying Level Level III
	C450.4	Prepare and conclude with technical report	Create Level Level VI
<p>Major Project: Students research on topic of their interest and define problem statement, figure out probable solution by reviewing the current literature, Identify the experimental methods, perform all the experiment in lab and communicate their findings orally and by writing. This develops independent working and thinking ability, Experimental skills and other set of skills such as research, problem identification, problem solution, written and oral communication, etc.</p>			

Course Code	15B19BT793	Semester ODD	Semester VII Session 2023-2024 Month: from July -December
Course Name	Summer Training Viva		
Credits	2	Contact Hours	NA
Faculty (Names)	Coordinator(s)	Dr. Smriti Gaur	
	Teacher(s) (Alphabetically)	Dr. Smriti Gaur	
Course Outcomes: At the completion of the course, students will be able to			
Sl. No.	DESCRIPTION	COGNITIVE LEVEL (BLOOM's TAXONOMY)	
C455.1	Extend theoretical knowledge to real time Industry and Institutes	Understanding Level Level II	
C455.2	Demonstrate a capacity for critical reasoning and independent learning	Understanding Level Level II	
C455.3	Make use of Industrial Training experience to prepare a scientific report	Applying Level Level III	
C455.4	Develop greater clarity about academic and career goals	Applying Level Level III	
Project Based Learning: Summer Training viva is an absolutely Project Based Learning. Students expose themselves to various working environment of Industry/Academic Institutes/ Health practising centres during the execution of their project work and this interface facilitate themincultivating the entrepreneurial culture, R&D aspect, innovation and also motivate them towards right Employability.			

Course Code	1812HS411	Semester Odd	Semester VII Session 2023-2024 Month from July-December
Course Name	HUMAN RESOURCE ANALYTICS		
Credits	3	Contact Hours	3-0-0
Faculty (Names)	Coordinator(s)	Dr Kanupriya Misra Bakhru	
	Teacher(s) (Alphabetically)	Dr Kanupriya Misra Bakhru	
COURSE OUTCOMES			COGNITIVE LEVELS
C401-20.1	Understand different analytical techniques used for solving HR related problems.		Understand Level (C 2)
C401-20.2	Apply descriptive and predictive analysis techniques to understand trends and indicators in human resource data.		Applying Level (C 3)
C401-20.3	Analyze key issues related to human resource management using analytical techniques.		Analyze Level (C 4)
C401-20.4	Critically assess and evaluate the outputs obtained from analytical tools and recommend HR related decisions.		Evaluate Level (C 5)
C401-20.5	Create hypotheses, propose solutions and validate using appropriate analytical techniques		Create Level (C6)
Module No.	Title of the Module	Topics in the Module	No. of Lectures for the module
1.	Introduction to Human Resource (HR) Analytics	Understanding the need for mastering and utilizing HR analytic techniques, Human capital data storage and 'big (HR) data' manipulation, Predictors, prediction and predictive modeling, Current state of HR analytic professional and academic training, HR's Contribution to Business Value, the Changing Nature of HR.	8
2.	Human Resource information systems and data	Understanding HR metrics and data, Data collection, tracking, entry, Data availability in the entire Employment Lifecycle, Approaches and costs of collecting HR related data, Analysis software options, Using SPSS, Preparing the data, Using Tableau.	10

3.	Analysis Strategies	From descriptive reports to predictive analytics, Statistical significance, Data integrity, Types of data, Categorical variable types, Continuous variable types, Using group/team-level or individual-level data, Dependent variables and independent variables, Introduction of tools for HR data analysis: Correlation, Regression, Factor Analysis, Cluster Analysis, Structural equation modeling.	10
4.	Application of Human Resource Analytics	Workforce Planning Analytics, Diversity Analytics, Talent Sourcing Analytics, Talent Acquisition Analytics, Talent Engagement Analytics, Training and Intervention Analytics, Analytical Performance Management, Retention Analytics. Data Visualization and Storytelling using Tableau.	12
5.	Future of Human Resource Analytics	Rise of Employee Behavioral Data, Automated Big Data Analytics, Big Data Empowering Employee Development, Quantification of HR, Artificial Intelligence in HR.	6
Total number of Lectures			44

Evaluation Criteria

Components	Maximum Marks
T1	20
T2	20
End Semester Examination	35
TA	25 (Project, Quiz)
Total	100

Project Based Learning:

Students, in groups of 5-6, are required to select a contemporary topic of HR. Further students are required to select a sector from where they will collect the data. Data should be collected from at least 50 respondents from the chosen sector. The information can be collected with the help of an interview or some kind of questionnaire pertaining to the HR topic chosen. Analysis of the collected data should be done using SPSS software. Findings should be discussed and recommendations should be suggested.

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)

1.	Edwards and Edwards, Predictive HR Analytics. Mastering the HR Metric, Kogan Page, Limited, 2019
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2.	Banerjee, Pandey and Gupta, Practical Applications of HR Analytics, Sage, 2019
3.	Bhattacharyya, HR Analytics: Understanding Theories and Applications, Sage, 2017
4.	Isson, Harriott and Jac Fitz-enz, People Analytics in the Era of Big Data: Changing the Way You Attract, Acquire, Develop, and Retain Talent, Wiley, 2016
5.	Guenole, Ferrar and Feinzig, The Power of People: How Successful Organizations Use Workforce Analytics To Improve Business Performance, First Edition, Pearson, 2017
6.	Sesil, Applying Advanced Analytics to HR Management Decisions: Methods for Selection, Developing, Incentive and Improving Collaboration, Pearson, 2014

Course Code	17B1NPH732	Semester : Odd	Semester: VII, Session: 2023-2024 Month from: July to December
Course Name	Nanoscience and Technology		
Credits	3	Contact Hours	3
Faculty (Names)	Coordinator(s)	Prof. Navendu Goswami	
	Teacher(s) (Alphabetically)	Prof. Navendu Goswami	
COURSE OUTCOMES			COGNITIVE LEVELS
C401-4 .1	Define the Nanoscience and Technology and to know about various other terminologies and developments involved with Nanoscience and Technology		Remembering (C1)
C401-4 .2	Classify the nanomaterials depending on the nature of dimensionalities, type of materials classes and explain the basic concepts of nanomaterials		Understanding (C2)
C401-4 .3	Apply the concepts of Nanoscience for solving the theoretical and numerical problems		Applying (C3)
C401-4 .4	Determine the properties of nanomaterials through suitable characterization tools		Analyzing (C4)
Module No.	Title of the Module	Topics in the Module	No. of Lectures for the module
1.	Introduction	Development of nanoscience and nanotechnology, naturally occurring nanomaterials, Crystallinity of nanomaterials, Metallic nanostructures, Semiconductor nanostructures Magnetic nanomaterials, Chemically assisted nanostructures, Growth in 2-D nanostructures, Carbon nanomaterials	10
2.	Properties of Nanomaterials	Surface to volume ratio, Surface states and energy, Nanoscale oscillators, Confinement in nanostructures, Density of States and number of states of 0-, 1-, 2-, 3-dimensional systems, Change in Band structure and gap, Energy levels, confinement energy and emission in nano, Fluorescence by QDs, Concept of Single electron transistor	5

3.	Nanomaterials Synthesis	Introduction to synthesis techniques, Top down and bottom up approach, Biological methods, Sol-gel method, Nucleation and growth, Ball Milling technique, Chemical vapor deposition, Physical Vapor deposition: Concept of Epitaxy and sputtering, Basics of Photolithography and its limitations, Soft Lithography and Nanolithography	10
4.	Characterization of Nanomaterials	Resolving power (Rayleigh and other criteria) of microscopes and their limitations for nanostructure measurements, Concept of Far and Near field and modification by NSOM, Basic principle, Design of setup, Theory and working, Characterization procedure, result analysis, Merits/demerits of SEM, TEM, STM, AFM	5
5.	Application of Nanomaterials	Nanoelectronics, Nanobiotechnology, Catalysis by nanoparticles, Quantum dot devices, Quantum well devices, High Tc nano-Superconductors, Nanomaterials for memory application, CNT based devices, MEMS and NEMS	10

Total number of Lectures			40
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Evaluation Criteria

Components	Maximum Marks
T1	20
T2	20
End Semester Examination	35
TA	25 [2 Quiz (10 M), Attendance (10 M) and Cass performance (5 M)]
Total	100

Project based learning: Students would work on a project of their choice in the field of Nanoelectronics, Nanobiotechnology, Catalysis by nanoparticles, Quantum dot devices, Quantum well devices, High Tc nano-Superconductors, Nanomaterials for memory application, CNT based devices, MEMS and NEMS. In such projects students can apply the basic concepts of Nanoscience for solving theoretical and numerical problems. They can also work on analysis of a nanomaterial to determine its properties through suitable characterization tools such as SEM, TEM, AFM etc. The learning gained through this project would consolidate the understanding and provide skills of analysis and application in Nanoscience and Technology and thereby providing the employability prospects in the organizations and industries involved in the research and development of nanomaterials synthesis and characterizations, nanoelectronics, nanobiotechnology/nanomedicine etc.

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)

1.	<i>Nanostructures and nanomaterials: synthesis properties and application</i> , Guozhong Cao, Imperial college press, London.
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2.	<i>Introduction to nanotechnology</i> , Charles Poole <i>et al</i> J John Wiley & Sons, Singapore.
3.	<i>The Handbook of Nanotechnology: Nanometer Structures, Theory, Modeling, and Simulation</i> , A.Lakhtakia, Spie Press USA.
4.	<i>Springer Handbook of Nanotechnology</i> , Edited by B. Bhushan, Springer Verlag.

Detailed Syllabus

Lecture-wise Breakup

Course Code	18B12CS424	Semester Odd	Semester VII Session 2023-24 Month from July to December
Course Name	Algorithm Analysis and Artificial Intelligence		
Credits	3	Contact Hours	3-0-0

Faculty (Names)	Coordinator(s)	Alka Singhal	
	Teacher(s) (Alphabetically)	Alka Singhal	

COURSE OUTCOMES		COGNITIVE LEVELS
C401-12. 1	Analyze algorithm's time complexities (Master's method, Recursion tree and substitution method- Sorting and Searching algorithms)	Analyse Level (Level 4)
C401-12. 2	Propose solutions for real life computing problems using greedy, divide & conquer, and dynamic programming techniques.	Create Level (Level 6)
C401-12. 3	Apply informed and uninformed searching algorithms(A*, Hill Climbing and Simulated Annealing) in AI related problems.	Apply Level (Level 3)
C401-12. 4	Solve constraint satisfaction problems and adversarial search algorithms	Create Level (Level 6)
C401-12. 5	Apply inference mechanisms(propositional logic , first order predicate logic, and probabilistic reasoning)	Apply Level (Level 3)
C401-12. 6	Design and simulate Genetic Algorithms for Optimization.	Create Level (Level 6)

Sr.	Module	Chapters	Lectures
1.	Introduction	Time Complexity analysis: Master's Method. Divide and Conquer methods: Insertion Sort, Merge Sort, Quick Sort	06
2.	Divide and Conquer and Greedy Algorithms	Strassen's Matrix multiplication , Knapsack Problem; Coin change Problem; Huffman Coding; Activity Selection; Minimum Spanning tree, shortest path.	09
3.	Dynamic Programming Algorithms	Knapsack Problem; Coin change Problem; Matrix chain Multiplication, Longest common subsequence etc.	05
4.	Artificial Intelligence : Problem Spaces and Problem Solving by search	State Spaces, Uninformed search strategies (BFS, DFS, DLS, IDS, Bidirectional search), Informed Search & exploration (A*, Heuristic, Local search algorithms, online search agents)	07
5.	Constraint satisfaction problems	Constraint satisfaction problems (backtracking, variable and value ordering, local search), Adversarial Search (games, alpha beta pruning, elements of chance, state of art games)	06
6.	Propositional Logic	Knowledge based agents, PL, FOPL, Syntax and semantics, use, knowledge engineering) , Inference in FOPL(Propositional vs First order inference	06
7.	Uncertainty	Probabilistic reasoning, Bayesian rule, Bayesian network, Inference, Reasoning over time	03
8.	Genetic Algorithms	Travelling Salesman Problem, Knapsack Problem	01
Total number of Lectures			43

Evaluation Criteria

Components	Maximum Marks
T1	20
T2	20
End Semester Examination	35
TA	25(Attendance-10Quiz/Assignments/Presentations/Mini-Project- 15)
Total	100

Project based learning: Each student understood on the application of Artificial Intelligence for algorithmic optimization. They presented the application by a power-point presentation. It can help improve the efficiency of the real life projects in the real world IT organizations.

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication etc.

TEXT BOOKS

1. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, and Clifford Stein , Introduction to Algorithms, MIT Press, 3rd Edition, 2009

2. Artificial Intelligence – A modern approach by Stuart Russel and Peter Norvig, PHI, 2008.

REFERENCE BOOKS Journals, Reports, Websites etc. in the IEEE format

3. Artificial Intelligence Review: An International Science and Engineering Journal, Springer

4. Nunes de Castro, Leandro, “ Nature-Inspired Computing Design, Development, and Applications” IGI Global, 31-May-2012 - 435 pages

5. Steven Skiena ,The Algorithm Design Manual, Springer; 2nd edition , 2008

6. Knuth, The art of Computer Programming Volume 1, Fundamental Algorithms, Addison-Wesley Professional; 3 edition,1997

7.	Horowitz and Sahni, Fundamentals of Computer Algorithms, Computer Science Press, 1978
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Course Code	17B1NBT739	Semester ODD (specify Odd)	Semester VII Session 2023 -2024 Month from: July-Dec.
Course Name	Biocomputing and Applications		
Credits	4	Contact Hours	4

Faculty (Names)	Coordinator(s)	Dr. Nidhi
	Teacher(s) (Alphabetically)	Dr. Nidhi
COURSE OUTCOMES		COGNITIVE LEVELS
CO1	Understand about the biocomputing methods, principles and practices.	Understand Level (C2)
CO2	Outline the advanced genomics, transcriptomics and proteomics, methods	Understand Level (C2)
CO3	Apply web-based methods and tools for simulation of biological problems	Apply Level (C3)
CO4	Analyze vaccine designing and protein-ligand interactions for drug discovery	Analyze Level(C4)

Module No.	Subtitle of the Module	Topics in the module	No. of Lectures for the module
1.	Bio-computing basics	Basics of Biological system, DNA/RNA/Protein, structures, Bioinformatics problems, Mapping, computational methods, limitations Information scope	5

2.	Genomics methods and tools	homology search programs, Psi, Phi-BLAST, Wu Blast, MEGABLAST, T-Coffee, EMBOSS, Gene mapping, Genscript, Bioedit, MEGA, PAML, etc, methods; PSSM/PWM, Entropy, information content etc.	6
3.	Web based tools for complex analysis	Genome annotation and editing methods and tools. Protein, Nucleic Acid sequences and complex, analysis and modelling tools, pipelines. Etc.	5
4.	Trascriptomics methods and tools	Transcriptome profiling, RNA-seq, NGS Data generation and analysis, KEGG, Blast2GO, Validation.	5
5	Proteomics tools	Quantitative proteomics (PANDA), Sub-cellular, localization, nuclease site prediction. Maldi- tof MS data analysis, Open source [Opl analyzer etc.], protein microarray	5
6	Immunoinformatics methods and tools	Immunoinformatics (Case study), antigen/epitopes identification, Prediction of MHC I and MHC binding site, Databases IMGT/LIGM-DB, MHC-Peptide Interaction Database, vaccine design, Peptide designing tool	7
7.	Protein ligand interactions and simulations	Molegro/Autodock software, structure of protein structure (pdb), Genetic algorithm, basics of drug-enzyme and simulations, structure-based designing, target-based designing, high throughput computation of drug molecule, virtual screening, Modules; QSAR, Molegro/ docker/ online free tools etc	9
Total number of Lectures			42
Evaluation Criteria			

Components	Maximum Marks
T1	20
T2	20
End Semester Examination	35
TA	25 (Assignments 1, class test. PBL)
Total	100

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Papers, Reports, Websites etc. in the IEEE format)	
1.	Smith, D.W , “Biocomputing : Informatics and Genome Projects”, Academic press Inc.,1994
2.	BaxevanisA., D & Ouellette “Bioinformatics A practical guide to analysis of genes and protein”, Wiley-Interscience, 1998.
3.	David Mount “Bioinformatics: Sequence and Genome analysis”, Cold Spring Harbor Laboratory Press, 2001.
4	Recent Research papers and online resources

Applied Numerical Methods (17B1NMA732)

Couse Description

Course Code	17B1NMA732	Semester - Odd	Semester VII Session 2023-24 Month from July 2023 - Dec 2023
Course Name	Applied Numerical Methods		
Credits	3	Contact Hours	3-0-0
Faculty (Names)	Coordinator(s)	Dr. Pankaj Kumar Srivastava and Dr. Yogesh Gupta	

	Teacher(s) (Alphabetically)	Dr. Pankaj Kumar Srivastava and Dr. Yogesh Gupta	
COURSE OUTCOMES			COGNITIVE LEVELS
After pursuing the above-mentioned course, the students will be able to:			
C401-8.1	explain the methods for roots of non-linear equations, interpolation and numerical linear algebra.		Understanding (C2)
C401-8.2	apply numerical methods for system of linear and non-linear equations, interpolation, differentiation, integration and differential equations.		Applying (C3)
C401-8.3	analyse numerical methods for finding approximate solutions of related problems.		Analyzing (C4)
C401-8.4	evaluate computational techniques for approximation, initial and boundary value problems.		Evaluating (C5)
Module No.	Title of the Module	Topics in the Module	No. of Lectures for the module
1.	Roots of Non-linear Equations	Concept of round-off and truncation errors. Iterative methods to find roots for one or more nonlinear equations with their convergence	6
2.	Interpolation and Approximation	Interpolating polynomial, Lagrange formula with error, Formulae for equi-spaced points, Divided differences, Spline Interpolation, Least square approximation	7
3.	Numerical Differentiation and Integration	Approximation of derivatives, Newton-Cote's formulae, Gauss-Legendre quadrature formulae, Double integration	7
4.	Numerical Linear Algebra	Gauss-elimination and LU-Decomposition Methods, Iterative methods: Jacobi and Gauss Seidel Methods and their convergence, Power's method for the largest eigen-value, Jacobi and Householder's methods for eigen-values of real symmetric matrices	10
5.	Numerical Solutions of ODE and PDE	Runge-Kutta and predictor corrector methods for IVPs, Finite difference methods for BVPs, Shooting methods, Numerical solutions of parabolic and elliptic partial differential equations by Finite Difference Methods	12

Total number of Lectures		42
Evaluation Criteria		
Components	Maximum Marks	
T1	20	
T2	20	
End Semester Examination	35	
TA	25 (Quiz , Assignments, PBL)	
Total	100	
Project Based Learning: Each student in a group of 4-6 will apply the concepts of numerical methods for the solution of ODE and PDE.		
Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)		
1.	Gerald, C.F. and Wheatley P.O. , Applied Numerical Analysis, 6 th Ed., Pearson Education, 1999.	
2.	Conte, S.D. and deBoor, C. , Elementary Numerical Analysis, 3 rd Ed., McGraw-Hill, 1980.	
3.	Gupta, R.S. , Elements of Numerical Analysis, 1 st Ed., Macmillan 2009.	
4.	Jain, M.K., Iyengar, S.R.K. and Jain, R.K. , Numerical Methods for Scientific and Engineering Computation 5 th Ed., New Age International, New Delhi, 2007.	
5.	Smith, G.D. , Numerical Solution of Partial Differential Equations, 2 nd Ed., Oxford, 1978.	

Detailed Syllabus

Course Code	15B1NHS731	Semester ODD (specify Odd/Even)	Semester: VII Session 2023-24 Month from July to December
Course Name	Disaster Management		
Credits	3	Contact Hours	3-0-0

Faculty (Names)	Coordinator(s)	Dr Nilu Choudhary
	Teacher(s) (Alphabetically)	Dr Nilu Choudhary

COURSE OUTCOMES		COGNITIVE LEVELS
C401-2.1	Understand basic concept of disasters, and its types, disaster prevention and risk reduction	Understand(C2)
C401-2.2	Apply different approaches of Disaster Risk Reduction (DRR)	Apply (C3)
C401-2.3	Analyze and enhance awareness of institutional processes in the country during disaster.	Analyze (C4)
C401-2.4	Evaluate strategies and develop skills to respond potential disaster with due sensitivity.	Evaluate (C5)

Module No.	Title of the Module	Topics in the Module	No. of Lectures for the module
1.	Introduction to Disasters	Concepts and definitions of Disaster(Hazard, Vulnerability, Resilience, Risks)	4
2.	Disasters: Classifications & Causes	Understanding Natural and manmade disasters. Social ,Economic, Political, Environmental, Health, Psychological.	4

3.	Impact of Disaster on Caste, Class and Gender	Caste and disaster, Disaster discrimination, in terms of caste, class, gender, age location, disability, Role of Women's in Disaster..	5
4.	Approaches to Disaster Risk reduction	Disaster cycle - its analysis, Phases, Culture of safety, prevention, mitigation and preparedness, community based DRR, Structural - nonstructural measures roles and responsibilities of community.	5
5.	Disaster Management Act(2005)	DM Act and Policy, plans, Programmes and Legislation.	3
6.	Inter-relationship between Disasters and Development	Factors affecting Vulnerabilities, differential impacts, impact of development of projects such as dams, embankments, changes in land-use and relevance of indigenous knowledge, appropriate technology and local resources.	5
7.	Disaster Risk Management in India	Hazard and Vulnerability profile of India, Components of Disaster Relief: Water, Food, Sanitation, Shelter, and Health	5
8	Risk Society	Risk Society in 1992,Ulrick Beck, Processes of Modernization, The new paradigm of risk society	3
9	Global trends in disasters	Urban disasters, Pandemics(COVID2019), Epidemics, complex emergencies, Climate change, Agenda21:For Local actions,	4

10	Disaster, Environment and Development	Environment Management, Waste Management, Types of Disaster Waste, Sources of Waste	4
Total number of Lectures			42
Evaluation Criteria			
Components		Maximum Marks	
T1		20	
T2		20	
End Semester Examination		35	
TA		25(Assignments/Case Study, Project, Attendance)	
Total		100	

Project Based Learning: Students in group of 5-6 will be given project to understand the menace of disaster through waste deposition in our environment. To make this subject application-based students develop cost effective and environmentally sound techniques and strategies for solid waste management. By installing high tech driven composters students can analyze and evaluate the implications of waste in our environment through this live project. Converting solid waste in organic manure, produced in college mess -canteen, later on that organic manure and liquid manure can be used for gardens and parks in college premises.

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)	
1.	Government of India, 2009. National Disaster Management Policy.
2.	Gupta Anil K, Sreeja S. Nair. 2011 Environmental Knowledge for Disaster Risk Management, NIDM, New Delhi
3.	Indian Journal of Social Work 2002. Special Issue on Psychosocial Aspects of Disasters, Volume 63, Issue 2, April

4.	Alexander David, Introduction in "Confronting Catastrophe", Oxford University Press, 2000
5	Coppola P Damon, 2007. Introduction to International Disaster Management
6	Yojana :A DEVELOPMENT MONTHLY Magazine, Volume 61,January 2017
7	S.K. Misra& V. K. Puri, Indian Economy, Himalaya Publishing House, 2011.
8	Parasuraman, S. & P.V. Unnikrishnan, 2005, "Disaster Response in India: An Overview," India Disasters Report, Punjablok.
9	Satapathy S. (2009) Psychosocial care in Disaster management, A training of trainers manual (ToT), NIDM publication.
10	Blaikie, P, Cannon T, Davis I, Wisner B 1997. At Risk Natural Hazards, Peoples' Vulnerability and Disasters, Routledge.
11	Dave, R.K. (2018) , Disaster Management in India : Challenges and Strategies
12	Disaster Management and Rehabilitation, Rajdeep Dasgupta, 2007
13	Jensen, John R., 2007, Remote Sensing of the Environment: An Earth Resource Perspective, 2nd Ed., Up Saddle River, NJ: Prentice Hall
14	NDMA, 2010, National Disaster Management Guidelines , Role of NGOs in Disaster Management

Detailed Syllabus

Course Code	15B1NBT832	Semester Odd (specify Odd/Even)	Semester B Tech VII/ Integrated VII/M Sc (Micro) I/ MSc (Env Biotech) I Session 2023-2024 Month July to December
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Course Name	Biostatistics and Its applications		
Credits	4	Contact Hours	4

Faculty (Names)	Coordinator(s)	Shalini Mani
	Teacher(s) (Alphabetically)	Shalini Mani

COURSE OUTCOMES		COGNITIVE LEVELS
C430-3.1	Explain the various statistical methods to design a biological studies and data representation.	Understanding (Level 2)
C430-3.2	Apply different statistical methods and approaches to study the significance of a study.	Apply (Level 3)
C430-3.3	Examine the relationship between different parameters of a study.	Analyze (Level 4)
C430-3.4	Choose appropriate statistical methods, tools and resources including prediction, validation and evaluation of the biological studies.	Evaluate (Level 5)

Module No.	Title of the Module	Topics in the Module	No. of Lectures for the module
1.	Introduction	Application and use of Biostatistics as a science, scope.	1
2.	Study design in various fields of research	general principles of study design and its implications for valid inference	1
3.	Sampling theory	Sampling scheme, simple/ systematic/ stratified/ cluster sampling, Sources of data collection	2
4.	Data presentation	Graphical, tabular, Mathematical, finding the central tendency, measure of variations	3
5.	Overview of different statistical methods used in the field of biological sciences.	Hypothesis testing, T-test, Chi square test, ANOVA, Sign Test, Wilcoxon Signed Rank Test, Wilcoxon Rank Sum Test, odds ratio, Binomial/normal/Poisson distribution of probabilities, determination of power of study and sample size calculation, regression analysis, correlation analysis,	13
6.	Analysis of data source	Assess data sources and data quality for the purpose of selecting appropriate data for specific research questions	3

7.	Selection of statistical methods	Identifying the appropriate statistical methods to be applied in a given research setting, applying the selected methods and analysis.	4
8.	Application of Biostatistical analysis.	Designing various studies of medical/ health/ Microbial/Agricultural/Genetics/Pharmaceutical science related studies. Data analysis using different methods Result interpretation	7
9.	Case studies	Based on various research studies and systematic reviews.	4
10.	SPSS, Stats at the bench	Introduction to SPSS, Entering data in SPSS editor. Solving the compatibility issues with different types of files. SPSS and working with descriptive statistics.	4
Total number of Lectures			42

Evaluation Criteria	
Components	Maximum Marks
T1	20
T2	20
End Semester Examination	35
TA	25 (assignment, class test, quiz)
Total	100

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)	
1.	Pranab Kumar Banerjee, Introduction to Biostatistics (4 th Edition), S Chand and Company, 2015.
2.	Veer Bala Rastogi, Biostatistics (3 rd Edition), Medtech, 2015
3.	S. Kartikeyan, R. M. Chaturvedi, R. M. Bhosale, Comprehensive textbook of biostatistics and research methodology(1 st Edition), Bhalani Publishing House, 201
4.	B Antonisamy Prasanna Premkumar Solomon Christopher, Principles and Practice of Biostatistics, Elsevier India, 2017
5.	Susan Holmes, Wolfgang Huber, Modern statistics for Modern Biology. Cambridge University Press, 2019

Detailed Syllabus
Lecture-wise Breakup

Course Code	17B1NBT737 NBA CODE C431-2	Semester Odd	Semester 7th Session 2023-2024 Month from
Course Name	Enzymes in Food Processing		
Credits	3-0-0	Contact Hours	42

Faculty (Names)	Coordinator	1. Dr. Neeraj Wadhwa
	Teacher(s) (Alphabetically)	Dr. Neeraj Wadhwa

COURSE OUTCOMES		COGNITIVE LEVELS
C434-1.1	Explain role of various enzymes in food processing	Understand level (C2)
C434-1.2	Identify need based enzymes for food biotechnology	Apply level (C3)
C434-1.3	Examine recent technology used in Food processing Industries	Analysing level (C4)

C434-1.4	List quality assurance protocol and economic consideration.	Analysing level (C4)
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Module No.	Title of the Module	Topics in the Module	No. of Lectures for the module
1.	General characteristics of Technical Enzymes	Enzyme analysis, technical Enzyme units Enzyme kinetics principles of enzyme assay and kinetic studies; techniques for enzyme extraction and purification from microbes , plant and animal source, Increasing yields	4
2.	Description of Enzymes and their substrates	Carbohydrate Hydrolyzing Enzymes – amylases, cellulase, Hemicellulases, Isomerase, Pectin degradation, Units of enzyme used,protein sequencing	4
3.	Description of Enzymes and their substrates	Proteases: Plant, animal, microbial, Fat hydrolysis: Lipases , Phospholipases	4
4.	Application of Enzymes Preparation	Enzyme in Starch and Sugar Industry , Enzyme in Brewing Industry , Analytical monitoring of mashing Process, Cold stabilization Enzymatic Alcohol production - continuous process	6
5.	Commercial enzyme production, and the processing	Beverage Industry,Enzymes in Juice and Wine making	4
6.	Flour processing	Enzyme in Flour Processing and Baking – Flour component and enzymes	4

7.	Dairy Industry	Enzymes in Dairy Industry, cheese making and ripening aroma and flavor production, cold sterilization, Enzymes in product modification.Prevention of bitternes	4
8.	Proteolysis	Debittering, Hydrolysis of Soy protein, fish protein, Milk protein, collagen, Blood protein	4
9.	Nutrition	Silage enzymes, Additives in fodder ,Chicken feed ,Pig husbandry,	4
10.	Legal and economic consideration	Regulatory requirements for enzyme preparation Economic consideration for the use of technical enzymes	4
Total number of Lectures			42

4

Evaluation Criteria	
Components	Maximum Marks
T1	20
T2	20
End Semester Examination	35
TA	25 (Assignment)
Total	100
PBL Component : Student will form group of 3- 5 students and submit report on recent and innovative technologies that are applied in the food industry involving enzymes	
Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Papers, Reports, Websites etc. in the IEEE format)	
1.	N. Tilak, T.Steve & R. Gerald, <i>Enzymes in Food Processing</i> 3rd Edition, USA: Academic Press, 1993.
2.	J.W. Robert. & V.O. <u>Maarten</u> <i>Enzymes in Food Technology</i> : John Wiley and Sons: 2009.
3.	U. Helmut, <i>Industrial enzymes and their applications</i> 3rd Edition, John Wiley and Sons: 1998.

4.	W.S. Dominic, <i>Food enzymes: structure and Mechanism</i> , Chapman &Hall, USA: 1995.
5.	E. Robert, D.J. Michael , <i>Enzyme assays: a practical approach</i> , Oxford University Press: 2002