



TULSIRAMJI GAIKWAD-PATIL College of Engineering and Technology

Wardha Road, Nagpur - 441108

Accredited with NAAC A+ Grade

Approved by AICTE, New Delhi, Govt. of Maharashtra

(An Autonomous Institution Affiliated to RTM Nagpur University)



Department of Biotechnology

Teaching Scheme and Syllabus

of

3rd Semester B.Tech Biotechnology

(From Academic Year 2024-25)



TULSIRAMJI GAIKWAD-PATIL College of Engineering and Technology

Wardha Road, Nagpur - 441108

Accredited with NAAC A+ Grade

Approved by AICTE, New Delhi, Govt. of Maharashtra

(An Autonomous Institution Affiliated to RTM Nagpur University)



Department of Biotechnology

Vision of Institute

To emerge as a learning Centre of Excellence in the National Ethos in domains of Science,
Technology and Management.

Mission of Institute

1. To strive for rearing standard and stature of the students by practicing high standards of professional ethics, transparency and accountability.
2. To provide facilities and services to meet the challenges of Industry and Society.
3. To facilitate socially responsive research, innovation and entrepreneurship.
4. To ascertain holistic development of the students and staff members by inculcating knowledge and profession as work practices.



TULSIRAMJI GAIKWAD-PATIL College of Engineering and Technology

Wardha Road, Nagpur - 441108

Accredited with NAAC A+ Grade

Approved by AICTE, New Delhi, Govt. of Maharashtra

(An Autonomous Institution Affiliated to RTM Nagpur University)

Department of Biotechnology



Vision of the Department

To produce competent Entrepreneurs, Researchers and industry ready Professionals in
Biotechnology through quality education

Mission of the Department

1. To impart quality technical education and unique interdisciplinary research by merging science and technology
2. To make students aware about techniques of modern biotechnology and industrial advancements
3. To Inculcate Social and Ethical values in the students and empower them through imparting of knowledge and skills in biotechnology

Program Education Objectives (PEO)

1. Develop Biotechnology graduates as human resource with technical competencies and strong foundation of science and engineering.
2. Acquire fundamental knowledge of mathematics, Biosciences and engineering to analyze, design and implement solutions to the Biotechnological problems.
3. Understand emerging concepts and trends in Biotechnology and allied fields.
4. Apply various tools to develop innovative systems for the bioprocesses.



TULSIRAMJI GAIKWAD-PATIL College of Engineering and Technology

Wardha Road, Nagpur - 441108

Accredited with NAAC A+ Grade

Approved by AICTE, New Delhi, Govt. of Maharashtra

(An Autonomous Institution Affiliated to RTM Nagpur University)



Department of Biotechnology

Program Outcomes (PO)

- 1. Engineering Knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
- 2. Problem Analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
- 3. Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
- 4. Conduct investigations of complex problems:** Use research based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
- 5. Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and software tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
- 6. The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
- 7. Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
- 8. Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
- 9. Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
- 10. Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
- 11. Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
- 12. Lifelong learning:** Recognize the need for, and have the preparation and ability to engage in independent and lifelong learning in the broadest context of technological change.

Program Specific Outcomes (PSO)

PSO-1: Ability to apply the acquired knowledge and recent techniques to come up with ideas in the domains of Bioprocess Engineering, Bioinformatics and Biopharmaceuticals.

PSO-2: Ability to utilize their proficiency and skills in solving real life problems in Diagnostics Genetic Engineering and Fermentation Technology using recent technologies.

PSO-3: Analyzing the impact of Biotechnology Engineering solutions in the societal and human context to create productive human resource for the country.



Tulsiramji Gaikwad-Patil College of Engineering & Technology, Nagpur

(An Autonomous Institution Affiliated to RTM Nagpur University, Nagpur)

SCHEME OF INSTRUCTION & SYLLABI

Programme: B. Tech Biotechnology

Scheme of Instructions: Second Year B. Tech. in Biotechnology (As Per NEP 2020)

Semester – III



SN	Sem	Type	BoS/ Dept	Sub Code	Subject	T/P	Contact Hours			Credits	% Weightage			ESE Duration	Total Marks
							L	P	Hrs		CT/IA	CA	ESE		
1	III	PCC	BT	BBT32301	Microbiology and Cell Biology	T	3	-	3	3	30	10	60	3 Hrs	100
2	III	PCC	BT	BBT32302	Biochemistry and Molecular Biology	T	3	-	3	3	30	10	60	3 Hrs	100
3	III	OEC		B\$\$323XX	Open Elective-I	T	4	-	4	4	30	10	60	3 Hrs	100
4	III	HSSM	BA	BBA32305	Entrepreneurship and Startups	T	2	-	2	2	14	6	30	2 Hrs	50
5	III	VEC	SH	BSH32308	Ethics in Engineering Practices	T	2	-	2	2	14	6	30	2 Hrs	50
6	III	MDM	SH	BSH32307	Probability and Statistics	T	2	-	2	2	14	6	30	2 Hrs	50
7	III	PCC	BT	BBT32303	Microbiology and Cell Biology Lab	P	-	2	2	1	-	25	25	2 Hrs	50
8	III	PCC	BT	BBT32304	Biochemistry and Molecular Biology Lab	P	-	2	2	1	-	25	25	2 Hrs	50
9	III	CEP	BT	BBT32305	Medical/ Agricultural Surveys	P	-	4	4	2	-	50	-	-	50
Total							16	08	24	20	132	148	320	19 Hrs	600

Course Category	BSC/ ESC (Basic Science Course/ Engineering Science Course.)	PCC (Programme Core courses)	PEC (Programme Elective courses)	Multidisciplinary courses	SEC (Skill Course)	Humanities Social Science & Management	Experiential Learning Courses	CC (Liberal Learning Courses)
Credits	--	08	--	02	--	04	02	--
Cumulative Sum	29	10	--	06	04	08	02	04

PROGRESSIVE TOTAL CREDITS: 43+20=63

				June, 2024	1.00	Applicable for AY 2024-25 Onwards
Chairperson	Dean Academics	Vice Principal	Principal	Date of Release	Version	

Programme: B.Tech Biotechnology

List of **Program Electives** offered by The **Biotechnology** Department

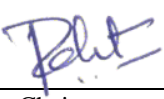

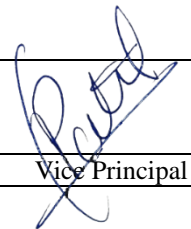
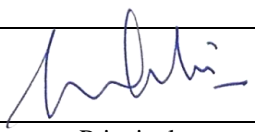
Program Elective- I	Program Elective-II	Program Elective- III	Program Elective- IV	Program Elective- V
Semester V	Semester VI	Semester VI	Semester VII	Semester VIII
BBT33507- Bioprocess Calculations	BBT33605- Enzyme Technology	BBT33608- Biosimilars Technology	BBT34703- Biological Fuel Cell Technology	BBT34706- Good Manufacturing and Laboratory Practices
BBT33508- Biofertilizer and Biopesticide technology	BBT33606- Animal and Plant Biotechnology	BBT33609- Stem cell Technology	BBT34704- Enzyme Technology	BBT34707- Biosensors
BBT33509- Bioinformatics and Computational Biology	BBT33607- Epigenetics and Genomic Variations	BBT33610- Big Data in Biology	BBT34705- Systems Biology	BBT34708- Artificial Intelligence and Machine Learning

Program: B.Tech Biotechnology

List of **Open Electives** offered by **Biotechnology** Department

Open Elective-I	Open Elective-II	Open Elective-III
Semester-III	Semester-IV	Semester-V
BBT32309: Food and Nutrition	BBT32408: Waste Management	BBT35310: Bioterrorism and National Security

Course Category	BSC (Basic Science Course)	ESC (Engineering Science Course.)	PCC (Programme Core courses)	PEC (Programme Elective courses)	Multi- disciplinary courses	VSEC (Skill Course)	Humanities Social Science & Management	Experiential Learning Courses	CC (Liberal Learning Courses)	Semester Wise Credits
Sem -I	10	5	2	--	--	2	--	--	2	21
Sem -II	8	8	--	--	--	2	2	--	2	22
Sem -III	--	--	8	--	6	1	4	2	--	20
Sem -IV	--	--	10	--	4	2	6	--	--	22
Sem -V	--	--	11	4	6	--	--	--	--	21
Sem -VI	--	--	8	8	2	2	--	--	--	20
Sem -VII	--	--	4	2	2	--	--	12	--	20
Sem -VIII	--	--	4	6	2	--	--	8	--	20
Cumulative Sum	18	13	47	20	22	9	12	20	4	165

				June, 2024	1.00	Applicable for AY 2024-25 Onwards
Chairperson	Dean Academics	Vice Principal	Principal	Date of Release	Version	



Department of Biotechnology

Second Year B.Tech (Third Semester)			
BBT32301: Microbiology and Cell Biology			
Teaching Scheme		Examination Scheme	
Lectures	3 Hr / Week	ESE	60 Marks
Tutorial	-	CIE	40 Marks
Practical	-	Total	100 Marks
Theory Credits: 3		Duration of Exam: 3 Hours	
Course Objectives			
The Objectives of this course is:			
1.	To understand the definition, history, and contributions of key figures in the development of microbiology, as well as the classification and concepts of microorganisms.		
2.	To explore the structure and function of prokaryotic and eukaryotic microorganisms, including bacteria, viruses, algae, fungi, and protozoa, and differentiate between pathogenic and non-pathogenic microorganisms.		
3.	To learn about the isolation and culture techniques of microbes, including sources of microorganisms, types of nutritional media, and methods for obtaining pure cultures.		
Course Contents			
Unit I	Basic of Microbiology: Definition of Microbiology, Brief history of Microbiology, contribution of A.V. Leeuwenhoek, Louis Pasteur, Robert Koch and Edward Jenner in development of Microbiology, concept of microorganism, different classes of microorganism.		
Unit II	Microbial cell structure and Function: Concept of Prokaryotic and Eukaryotic microorganism, structure (Morphology and Anatomy) and function of different microorganism-Bacteria, Virus, Algae, Fungi and Protozoa. Pathogenic and non-pathogenic microorganism		
Unit III	Isolation and culture of Microbes- Different sources of Microorganism, concept of microbial cultures, Nutritional media and its types, serial dilution technique, pure culture and Mixed culture, different techniques for Isolation of pure culture- Streaking method, Pour plate method and Spread Plate method.		
Unit IV	Basic of Cell Biology: Introduction to cell Biology, Concept of Cell discovery of cell, Classification of cell on different criteria-Cell size, Cell shape and No. of cell and C/N ratio, Concept of Prokaryotic and Eukaryotic cell, Structure and Function of Prokaryotic and Eukaryotic cell.		
Unit V	Cell structure and organization: Cell cytoplasm and Protoplasm, composition of cytoplasm, concept of cell organelles, structure and function of different cell organelles- Nucleus, Cell wall, Plasma Membrane, Golgi complex, Endoplasmic reticulum, Mitochondria and Chloroplast. Cellular organization in simple and complex organism.		



Department of Biotechnology

Text Books	
T.1	Prescott's Microbiology by Joanne M. Willey, Linda S. Sherwood, and Christopher J. Woolverton
T.2	Molecular Biology of the Cell by Bruce Alberts et al.
Reference Books	
R.1	Microbiology by Michael J. Pelczar, E.C.S. Chan, and Noel R. Krieg
R.2	Cell and Molecular Biology: Concepts and Experiments by Gerald Karp

Useful Links	
1	https://microbenotes.com/
2	https://link.springer.com/journal/284

Course Outcomes		CL	Hours
BBT32301.1	Analyze the historical contributions to microbiology and classify different classes of microorganisms	4	8
BBT32301.2	Compare the structure and function of prokaryotic and eukaryotic microorganisms, including bacteria, viruses, algae, fungi, and protozoa	4	8
BBT32301.3	Develop techniques for isolating and culturing microbes, including streaking, pour plate, and spread plate methods	4	8
BBT32301.4	Explain the principles of cell biology, including cell discovery, classification, and the differences between prokaryotic and eukaryotic cells	3	9
BBT32301.5	Evaluate the structure and function of various cell organelles and their roles in cellular organization in both simple and complex organisms	4	8


BOS Chairman

Department Of Biotechnology
Tulsiramji Gaikwad Patil Collage Of
Engineering & Technology, Nagpur


Dean Academics

Tulsiramji Gaikwad-Patil
College Of Engineering
and Technology, Nagpur



Department of Biotechnology

Second Year B.Tech (Third Semester)			
BBT32302: Biochemistry and Molecular Biology			
Teaching Scheme		Examination Scheme	
Lectures	3 Hr / Week	ESE	60 Marks
Tutorial	-	CIE	40 Marks
Practical	-	Total	100 Marks
Theory Credits: 3		Duration of Exam: 3 Hours	
Course Objectives			
The Objectives of this course is:			
1.	To understand the classification, structure, function, and chemical reactions of carbohydrates, including the physical and chemical properties of sugars, starch, and pectin.		
2.	To explore the classification, structure, and properties of amino acids and proteins, including the processes of denaturation and renaturation of proteins.		
3.	To learn about the classification, structure, and biological functions of fatty acids and lipids, including triacylglycerol, phospholipids, and glycolipids.		
Course Contents			
Unit I	Carbohydrates: Classification, structure and function of carbohydrates. Chemical reaction of carbohydrate, physical and chemical properties of sugars, starch, pectin.		
Unit II	Amino Acids and proteins Classification, structure of amino acids, Classification and structure of protein (primary, tertiary and quaternary). Denaturation and renaturation of protein.		
Unit III	Nucleic acid: structure and type of DNA and RNA Structure and functions of Nucleic acids: Nucleosides & Nucleotides, purines and pyrimidines. Biologically important nucleotides		
Unit IV	DNA Replication, Transcription and Translation: Prokaryotic DNA replication, Eukaryotic DNA replication. Transcription, Translation, Genetic Code-Deciphering of genetic code and important properties of genetic code		
Unit V	Fatty acids and lipids: Classification, structure, properties and biological function of fatty acids and simple lipids – triacylglycerol, phospholipids and glycolipids.		

Text Books	
T.1	Lehninger Principles of Biochemistry by Nelson David L. and Cox Michael M.
T.2	Biochemistry by U Satyanarayana
Reference Books	
R.1	Biochemistry by Jeremy M. Berg, John L. Tymoczko, and Lubert Stryer
R.2	The Cell by Geoffrey M. Cooper and Robert E. Hausman

Useful Links	
1	https://www.genome.jp/kegg/
2	https://brenda-enzymes.org/



Department of Biotechnology

Course Outcomes		CL	Hours
BBT32302.1	Describe the classification, structure, and function of carbohydrates, and analyze their chemical reactions and properties	2	8
BBT32302.2	Explain the classification and structure of amino acids and proteins, and analyze the processes of protein denaturation and renaturation	3	9
BBT32302.3	Understand the structure and types of DNA and RNA, and explain the functions of nucleic acids, nucleosides, nucleotides, purines, and pyrimidines	2	9
BBT32302.4	Analyze the processes of DNA replication, transcription, and translation in prokaryotic and eukaryotic cells, and evaluate the genetic code	4	8
BBT32302.5	Classify and describe the structure, properties, and biological functions of fatty acids and simple lipids, including triacylglycerol, phospholipids, and glycolipids	2	9

BOS Chairman

Department Of Biotechnology
Tulsiramji Gaikwad Patil Collage Of
Engineering & Technology, Nagpur

Dean Academics

Tulsiramji Gaikwad-Patil
College Of Engineering
and Technology, Nagpur



Department of Biotechnology

Second Year B.Tech (Third Semester)

OE I- BBT23206: Food and Nutrition

Teaching Scheme			Examination Scheme	
Lectures	4 Hr / Week		ESE	60 Marks
Tutorial	-		CIE	40 Marks
Practical	-		Total	100 Marks
Theory Credits: 4			Duration of Exam: 3 Hours	
Course Objectives				
The Objectives of this course is:				
1.	To understand the microorganisms associated with food, their growth factors, and spoilage mechanisms.			
2.	To learn principles and techniques of food preservation emphasizing inactivation, inhibition, and recontamination prevention.			
3.	To explore the production processes of commercially important organic acids and understand their significance in food technology.			
Course Contents				
Unit I	Food Microbiology: Micro-organisms associated with food, factors affecting growth of micro-organisms in food, food spoilage. Enzymatic and nonenzymatic changes in food spoilage.			
Unit II	Food Preservation Techniques: Principles of different modes of food preservation; Preservation methods with emphasis on inactivation, inhibition, and avoiding recontamination.			
Unit III	Production of Primary and Secondary Metabolites: The process of production of some commercially important organic acids: citric acid, lactic acid, acetic acid, gluconic acid, amino acids and alcohol.			
Unit IV	Food composition and nutrients present in foods: Nutrition terminologies, Food pyramid, energy value of food, factors affecting and calorie needs for Basal Metabolic Energy, physical activity and diet induced thermogenesis; energy imbalance and body weight regulation.			
Unit V	Human Nutrition: Role of carbohydrate, lipids and protein in human nutrition. Digestion and absorption of nutrients in human body, Fortification: chemical & biofortification.			

Text Books	
T.1	Fundamental Food Microbiology (3rd Edition) – by Bibek Ray. CRC Press: ISBN - 0-8493-1610-3
T.2	Toledo, R.T. Fundamentals of Food Process Engineering, Chapman and Hall; 2000
Reference Books	
R.1	Shakuntala, N., & Many, O. Food: Facts and Principles, New Age International; 2001.
R.2	Food, Nutrition and Diet Therapy by Krause and Mahan 1996, Publisher- W.B.Saund



Department of Biotechnology


Useful Links

1	https://nptel.ac.in/courses/103107088
2	https://nptel.ac.in/courses/126105013
3	https://nptel.ac.in/courses/126105027

Course Outcomes		CL	Hours
BBT23206.1	Discuss the fundamentals of microbes associated with food and factors responsible for food spoilage.	2	8
BBT23206.2	Analyse the different methods in food preservation technology	3	9
BBT23206.3	Explain process of production of industrially important microbial metabolites.	2	7
BBT23206.4	Analyse the effects of food in various factors like BMR and physical activity.	3	7
BBT23206.5	Summarize the role of different food components in the human nutrition	5	8


BOS Chairman
Head

Department Of Biotechnology
Tulsiramji Gaikwad Patil Collage Of
Engineering & Technology, Nagpur


Dean Academics
Dean Academics
Tulsiramji Gaikwad-Patil
College Of Engineering
and Technology, Nagpur



Department of Biotechnology

Second Year B.Tech (Third Semester)

BBA32305: Entrepreneurship and Startups

Teaching Scheme			Examination Scheme	
Lectures	2 Hr / Week		ESE	30 Marks
Tutorial	-		CIE	20 Marks
Practical	-		Total	50 Marks
Theory Credits: 2			Duration of Exam: 2 Hours	

Course Objectives

The Objectives of this course is:

1. To understand the definitions, traits of an entrepreneur, and the concepts of intrapreneurship and motivation, as well as the differences and similarities between entrepreneurs and managers.
2. To explore the process of transforming an idea into a startup, including ideation, incubation, designing product-market fit (PMF), technology readiness levels, market analysis, competition evaluation, strategy development, marketing, accounting, and risk analysis.
3. To learn about funding options for startups, including angel funding, venture funding, and private equity, and understand the differences between these funding sources.

Course Contents

Unit I	Introduction to Entrepreneurship and Start – Ups: Definitions, Traits of an entrepreneur, Intrapreneurship, Motivation. Types of Business Structures, Similarities/differences between entrepreneurs and managers.
Unit II	Idea to Start-up: Concept of Ideation and incubation, Designing PMF, Technology Readiness Levels, Market Analysis – Identifying the target market, Competition evaluation and Strategy Development, Marketing and accounting, Risk analysis.
Unit III	Funding for Startups: Introduction, angel funding, venture funding, difference between angel and venture funding, private equity fund

Text Books

T.1	Entrepreneurship Development by S.S. Khanka
T.2	The Startup Mindset: How Government Can Help Entrepreneurs Create Jobs by Rajiv Chimanlal Shah

Reference Books

R.1	The Entrepreneurial Mindset: From Opportunity to Execution by Rita Gunther McGrath and Ian MacMillan
R.2	Startup Compass by Ujwal Kalra and Shobhit Shubhankar

Useful Links

1	https://nptel.ac.in/courses/107101092
2	https://nptel.ac.in/courses/110106141




Department of Biotechnology

Course Outcomes		CL	Hours
BBA32305.1	Describe the definitions, traits, and motivation of entrepreneurs and intrapreneurs, and compare different business structures and roles of entrepreneurs and managers	2	8
BBA32305.2	Analyze the process from ideation to startup, including PMF design, market analysis, competition evaluation, strategy development, marketing, accounting, and risk analysis	4	8
BBA32305.3	Evaluate various funding options for startups, including angel funding, venture funding, and private equity, and understand their differences	4	8


BOS Chairman

Department Of Biotechnology
Tulsiramji Gaikwad Patil Collage Of
Engineering & Technology, Nagpur


Dean Academics
Tulsiramji Gaikwad-Patil
College Of Engineering
and Technology, Nagpur



Department of Biotechnology

Second Year B.Tech (Third Semester)				
BSH32308: Ethics in Engineering Practices				
Teaching Scheme			Examination Scheme	
Lectures	2 Hr / Week		ESE	30 Marks
Tutorial	-		CIE	20 Marks
Practical	-		Total	50 Marks
Theory Credits: 2			Duration of Exam: 2 Hours	
Course Objectives				
The Objectives of this course is:				
1.	To understand the Human Values, Ethics and Engineering Ethics.			
2.	To understand Professional practices in Engineering for Engineers.			
3.	To understand types of ethical violations and consequence of their influence on business practice, economy and society in general.			
Course Contents				
Unit I	Introduction to Engineer Ethics: Morals, Values, Integrity & Ethics, what are Engineering Ethics, Importance of Engineering Ethics, Code of Ethics, Potential Moral Problems of Engineering Ethics.			
Unit II	Professional Practices in Engineering: Happiness, Prosperity & Harmony, Professional Ethics, Engineering Ethics, Principles of Engineering Ethics, Environmental Ethics, Public Interest Litigation (PIL), Intellectual property Rights (IPR).			
Unit III	An Overview of Engineering Ethics: Ethics in Industry, Professional Practices in Engineering, Ethical behavior, Industry professional malpractices, Workplace Safety, Responsibility and Rights, Basics of business ethics - Corporate Social Responsibility – Issues of Management – Crisis Management.			

Text Books	
T.1	A New Look into Social Science: Shabbir, Sheikh and Dwadashiwar, S. Chand Publisher
T.2	Constitution of India and Professional Ethics: Reddy, G.B. and Mohd. Suhaib, IK International Publishing House. 2006
T.3	Introduction to Engineering Ethics: Martin, Mik, Roland Schinzinger, 2 nd edition (16 February 2009) McGraw-Hill Education;
Reference Books	
R.1	Human Resource Development and Management: A. M. Sheikh, 3 rd Revised Edition, S Chand & Co Ltd.
R.2	A Gift of Fire: Social, Legal and Ethical Issues, for Computing and the Internet: Sara Baase, 3 rd Edition PHI Publications.
R.3	Case study in Information Technology Ethics: Richard A. Spinello, 2 nd Edition PHI Publications.
R.4	Internet Ethics: Duncan Lanford, Macmillan Education UK.
R.5	Computer and Ethics in the Cyber age: D. Micah Hester and Paul J. Ford.



Department of Biotechnology

Useful Links

1	https://nptel.ac.in/courses/110/105/110105079/
2	https://nptel/courses/video/1101323279/L54.html
3	https://nptel/courses/video/110105079/L54.html

Course Outcomes		CL	Hours
BSH32308.1	Describe Basic Human Values, Ethics & Importance of Engineering Ethics.	2	8
BSH32308.2	Illustrate the Basic Ethics for Engineers, Principles of Engineering Ethics & Fundamental Rights of individuals of society.	2	8
BSH32308.3	Discuss Ethics for Engineer Professionals, and their Safety, Responsibility & Rights.	2	8


BOS Chairman
Head

Department Of Biotechnology
Tulsiramji Gaikwad Patil Collage Of
Engineering & Technology, Nagpur


Dean Academics

Dean Academics
Tulsiramji Gaikwad-Patil
College Of Engineering
and Technology, Nagpur



Department of Biotechnology

Second Year B.Tech (Third Semester)

BSH32307: Probability and Statistics

Teaching Scheme			Examination Scheme	
Lectures	2 Hr / Week		ESE	30 Marks
Tutorial	-		CIE	20 Marks
Practical	-		Total	50 Marks
Theory Credits: 2			Duration of Exam: 2 Hours	

Course Objectives

The Objectives of this course is:

1. To understand and apply numerical methods, including Gauss elimination and iterative methods such as Gauss-Seidel and Jacobi's method.
2. To learn the fundamentals of set theory and probability, including the definitions of random experiments, events, and theorems of probability.
3. To explore probability distributions and statistical concepts, including measures of central tendency, skewness, variance, standard deviation, covariance, and correlation.

Course Contents

Unit I	Numerical Methods: Numerical Solution of Algebraic and Transcendental equations: Newton–Raphson Gauss elimination method, Iterative Methods Gauss Seidal and Jacobi's Method ,
Unit II	Probability Distributions & Mathematical Expectation: Random variables, discrete and continuous random variable, joint distributions. Mathematical Expectations: Definition of mathematical expectation, the variance and standard deviations, moment generating function
Unit III	Sampling Techniques: Population, sample, standard error, confidence intervals, Testing a hypothesis, Null hypothesis, Alternative hypothesis, t-test and Chi-square test, Z-test .

Text Books

T.1	Numerical Methods by B.S. Grewal
T.2	Introduction to Set Theory by J.P. Tremblay and R. Manohar

Reference Books

R.1	Computer Oriented Numerical Methods by V. Rajaraman
R.2	Fundamentals of Mathematical Statistics by S.C. Gupta and V.K. Kapoor

Useful Links

1	https://web.northeastern.edu/ding/statlab/lab.html
2	https://nptel.ac.in/courses/111102111



Department of Biotechnology

Course Outcomes		CL	Hours
BSH32307.1	Apply Gauss elimination, Gauss-Seidel, and Jacobi iterative methods to solve systems of linear equations.	3	8
BSH32307.2	Analyze probability problems by defining random experiments, sample spaces, and using addition and multiplication theorems.	4	8
BSH32307.3	Evaluate statistical data by computing measures of central tendency, skewness, variance, standard deviation, and interpreting probability distributions such as binomial, Poisson, and normal distributions.	5	8

BOS Chairman

Department Of Biotechnology
Tulsiramji Gaikwad Patil Collage Of
Engineering & Technology, Nagpur

Dean Academics

**Tulsiramji Gaikwad-Patil
College Of Engineering
and Technology, Nagpur**



Department of Biotechnology

Second Year B.Tech (Third Semester)

BBT32303: Microbiology and Cell Biology Lab

Teaching Scheme			Examination Scheme	
Lectures	2 Hr / Week		ESE	25 Marks
Tutorial	-		CIE	25 Marks
Practical	-		Total	50 Marks
Practical Credit: 1			Duration of Exam: 2 Hours	

Course Objectives

The Objectives of this course is:

1.	To understand the preparation, sterilization, and disinfection of media, along with methods for determining total and viable microbial counts.
2.	To learn techniques for microbial staining, isolation, and preservation of pure cultures, as well as the determination of microbial growth curves.
3.	To explore methods for analyzing mitosis phases, isolating plant pigments and genomic DNA, visualizing cell structures with phase contrast microscopy, and separating blood cells by centrifugation.

Sr. No.	Experiments
1	Media preparation, sterilization and disinfection
2	Total count and viable count determination
3	Microbial simple and differential staining methods
4	Isolation of pure culture and its preservation
5	Microbial Growth Curve Determination
6	Analyzing the different phases of mitosis
7	Isolation of plant pigments
8	Isolation genomic DNA from plant
9	Visualization of cell structure using phase contrast microscopy
10	Separation of blood cells by centrifugation

Text Books

T.1	Prescott's Microbiology by Joanne M. Willey, Linda S. Sherwood, and Christopher J. Woolverton
T.2	Molecular Biology of the Cell by Bruce Alberts et al.

Reference Books

R.1	Microbiology by Michael J. Pelczar, E.C.S. Chan, and Noel R. Krieg
R.2	Cell and Molecular Biology: Concepts and Experiments by Gerald Karp



Department of Biotechnology

Useful Links

1	https://mvi-au.vlabs.ac.in/
2	https://cbi-au.vlabs.ac.in/

Course Outcomes		CL	Hours
BBT32303.1	Analyze the historical contributions to microbiology and classify different classes of microorganisms	4	4
BBT32303.2	Compare the structure and function of prokaryotic and eukaryotic microorganisms, including bacteria, viruses, algae, fungi, and protozoa	4	4
BBT32303.3	Develop techniques for isolating and culturing microbes, including streaking, pour plate, and spread plate methods	4	4
BBT32303.4	Explain the principles of cell biology, including cell discovery, classification, and the differences between prokaryotic and eukaryotic cells	3	4
BBT32303.5	Evaluate the structure and function of various cell organelles and their roles in cellular organization in both simple and complex organisms	4	4


BOS Chairman

Department Of Biotechnology
Tulsiramji Gaikwad Patil Collage Of
Engineering & Technology, Nagpur


Dean Academics

Tulsiramji Gaikwad-Patil
College Of Engineering
and Technology, Nagpur



Department of Biotechnology

Second Year B.Tech (Third Semester)

BBT32304: Biochemistry and Molecular Biology Lab

Teaching Scheme			Examination Scheme	
Lectures	2 Hr / Week		ESE	25 Marks
Tutorial	-		CIE	25 Marks
Practical	-		Total	50 Marks
Practical Credit: 1		Duration of Exam: 2 Hours		

Course Objectives

The Objectives of this course is:

1.	To conduct qualitative and quantitative estimations of amino acids, proteins, RNA, and DNA using various biochemical methods.
2.	To analyze the presence of carbohydrates qualitatively and amplify specific DNA sequences using PCR.
3.	To perform advanced molecular biology techniques including restriction digestion, plasmid DNA isolation, and southern blotting.

Sr. No.	Experiments
1	Qualitative estimation of amino acids.
2	Quantitative estimation of protein by biuret method.
3	Quantitative estimation of protein by Bradford method.
4	Quantitative Estimation of RNA by orcinol reagent.
5	Quantitative Estimation of DNA by diphenylamine reagent method.
6	Analyze the presence of carbohydrate qualitatively.
7	Amplify specific DNA sequences using PCR.
8	Perform restriction digestion of given DNA sample.
9	Isolate plasmid DNA from bacterial cultures.
10	To perform southern blotting technique.

Text Books

T.1	Lehninger Principles of Biochemistry by Nelson David L. and Cox Michael M.
T.2	Biochemistry by U Satyanarayana

Reference Books

R.1	Biochemistry by Jeremy M. Berg, John L. Tymoczko, and Lubert Stryer
R.2	The Cell by Geoffrey M. Cooper and Robert E. Hausman



Department of Biotechnology


Useful Links

1	https://biotech01.vlabs.ac.in/
2	https://mbvi-au.vlabs.ac.in/

Course Outcomes		CL	Hours
BBT32304.1	Describe the classification, structure, and function of carbohydrates, and analyze their chemical reactions and properties	2	4
BBT32304.2	Explain the classification and structure of amino acids and proteins, and analyze the processes of protein denaturation and renaturation	3	4
BBT32304.3	Understand the structure and types of DNA and RNA, and explain the functions of nucleic acids, nucleosides, nucleotides, purines, and pyrimidines	2	4
BBT32304.4	Analyze the processes of DNA replication, transcription, and translation in prokaryotic and eukaryotic cells, and evaluate the genetic code	4	4
BBT32304.5	Classify and describe the structure, properties, and biological functions of fatty acids and simple lipids, including triacylglycerol, phospholipids, and glycolipids	2	4


BOS Chairman

Department Of Biotechnology
Tulsiramji Gaikwad Patil Collage Of
Engineering & Technology, Nagpur


Dean Academics
Tulsiramji Gaikwad-Patil
College Of Engineering
and Technology, Nagpur



Second Year B.Tech Biotechnology (Third Semester)

BBT32305: Medical/ Agricultural Surveys

Teaching Scheme			Examination Scheme	
Lectures	4 Hr / Week		ESE	25
Tutorial	-		CIE	25
Practical	-		Total	50
Theory Credits: 2			Duration of Exam: 2Hr	

Course Contents

During the semester-long 'Medical/Agricultural Surveys' project, students will conduct detailed surveys focusing on local agriculture or medical issues. They will engage with farmers, medical professionals, and pathologists to gather specific data using interviews, questionnaires, and observational studies. After collecting data, students will analyze it rigorously to identify prevalent challenges and underlying causes. Based on their analysis, students will propose practical solutions tailored to the community's needs, aiming to improve agricultural practices or healthcare delivery. They will document their progress, findings, and reflections, culminating in presentations to stakeholders to demonstrate their application of theoretical knowledge in solving real-world issues effectively.

				June, 2024	1.00	Applicable for AY 2024-25 Onwards
Chairperson	Dean Academics	Vice Principal	Principal	Date of Release	Version	