

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

4th Semester

B.Tech Biotechnology

Scheme and Syllabus



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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.



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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.



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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

SCHEME OF INSTRUCTIONS & SYLLABI

Program-Biotechnology

Scheme of Instructions: Second Year B.Tech in Biotechnology

Semester IV

Sr. No.	Course Category	Course Code	Course Title	L	T	P	Contact Hrs/Wk	Course Credits	EXAM SCHEME				
									CT-1	CT-2	CA	ESE	TOTAL
1	BS	BBT2401	Cell & Molecular biology	3	-	-	3	3	15	15	10	60	100
2	BS	BBT2402	Biochemistry Metabolism	3	-	-	3	3	15	15	10	60	100
3	PCC	BBT2403	Green Biotechnology and Pollution Abatement	3	-	-	3	3	15	15	10	60	100
4	PCC	BBT2404	Bioinformatics and Computational Biology	3	-	-	3	3	15	15	10	60	100
5	PCC	BBT2405	Immunology and Immunotechnology	3	-	-	3	3	15	15	10	60	100
6	BS	BBT2406	Cell & Molecular Biology Lab	-	-	2	2	1	-	-	25	25	50
7	BS	BBT2407	Biochemistry Metabolism Lab	-	-	2	2	1	-	-	25	25	50
8	PCC	BBT2408	Bioinformatics and Computational Biology Lab	-	-	2	2	1	-	-	25	25	50
9	PROJECT	BBT2409	Micro Project	-	-	2	2	1	-	-	25	25	50
10	HSMC	BSH2401	Human Values for Professional Society	3	-	-	3	3	15	15	10	60	100
11	MCC	BAU2404	Group Reading of Classics	2	-	-	2	Audit	-	-	-	-	-
Total				20	0	8	28	22	90	90	160	460	800

L- Lecture

T-Tutorial

P-Practical

CT1- Class Test 1

CA-Teacher Assessment/ Continuous Assessment

CT2-ClassTest2 ESE-End Semester Examination (For Laboratory End Semester performance)

Course Category	HSMC(Hum., Soc.Sc.Mgmt.)	BSC (BasicSc.)	ESC (Engg. Sc.)	BS (Biological Sc.)	PCC (Program corecourses)	PEC (Program Elective Courses)	OEC (Biological Sc.)	PROJECT (Project/Seminar/ Industrial Training)	MCC (Mandatory Courses)
Credits	3	-	-	8	10	--	--	1	Yes
Cumulative Sum	9	18	14	16	21	--	--	1	--

Progressive Total Credits: 57+22= 79



BOS Chairman
Department Of Biotechnology
Tulsiramji Gaikwad Patil College Of
Engineering & Technology, Nagpur



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



Principal/Vice Principal
Tulsiramji Gaikwad Patil
College Of Engineering &
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Program: B. Tech. Biotechnology

Semester	Course Code	Name of Course	L	T	P	Credits
IV	BBT2401	Cell and Molecular Biology	3	-	-	3
Teaching Scheme			Examination Scheme			
Theory	3 Hrs/week		CT-I	15 Marks		
Tutorial	-		CT-II	15 Marks		
Total Credits	3		CA	10 Marks		
Duration of ESE: 3Hrs			ESE	60 Marks		

Course Contents


Unit I	Concept of cell and Cell cycle: Introduction to general concept of cell, internal organization of Cell. Prokaryotic and Eukaryotic cell, Cell organelles Cell membrane, mitochondria, Golgi bodies, Ribosome, Endoplasmic reticulum, Lysosomes, Vacuole, Cytoplasm, Plant and animal cells. Cell cycle, Mitosis, meiosis, and Cytokinesis
Unit II	Cell transport: Simple and facilitated diffusion, active and passive transport. Types of receptors, Ligand molecules, mechanism of signal transduction (tyrosine kinase, G-protein, Ras)
Unit III	Basic Concepts of genome and its organization: Nucleic acid as the genetic material, Importance of Molecular Biology. Nucleosides & Nucleotides, purines and pyrimidines. Biologically important nucleotides, Watson and Crick model of DNA structure, A, B & Z forms of DNA, Super coiled and relaxed DNA, denaturation and renaturation of DNA, melting temperature (T _m).
Unit IV	Replication of DNA in prokaryotes: Features of DNA Replication, Proof of semi conservative nature of DNA replication, Features of bidirectional DNA replication. Mechanism of bidirectional DNA replication Damage, Repair and Mutation: Causes (spontaneous, chemical agent, radiation) and types of DNA damage. Mechanism of DNA repair: Direct repair, base excision repair, nucleotide excision repair, mismatch repair, recombination repair. Molecular basis of mutation, types of mutation (missense mutation, nonsense mutation, silent mutation, point mutation, frame shift mutation).
Unit V	Gene expression :- RNA structure and types of RNA, Transcription in prokaryotes with E. Coli as model system: Prokaryotic RNA polymerase, role of sigma factor, promoter, Initiation, elongation and termination of RNA chains, Genetic code, properties of genetic code, Wobble hypothesis, concept of operons, Regulation of gene expression in bacteria: lac operon concept.

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Text Books	
T.1	Molecular Biology of cell-Bruce Albert's et al, Garland publications
T.2	Rastogi, S.C, Cell Biology, New Age International publishers, 2005
Reference Books	
R.1	Cell Biology-Jack D.Bruke, The William Twilkins Company
R.2	Principles of Gene Manipulations - Old & Primrose Publications

Useful Links	
1	https://nptel.ac.in/courses/102/106/102106025/
2	https://www.ncbi.nlm.nih.gov/books/NBK26880/
3	http://www.molbiolcell.org/
4	https://www.cellsignal.com/

	Course Outcomes	CL	Class Sessions	Lab Sessions
BBT2401.1	Analyze the Concept of cell and Cell cycle	4	8	-
BBT2401.2	Examine the cell transport and receptors involved	3	9	-
BBT2401.3	Determine the genetic material organization in various cells	3	9	-
BBT2401.4	Demonstrate the processes involved in DNA replication and impact of DNA damages on cellular processes	3	9	-
BBT2401.5	Illustrate concept of gene expression.	4	8	-


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Program: B. Tech. Biotechnology

Semester	Course Code	Name of Course	L	T	P	Credits
IV	BBT2402	Biochemistry Metabolism	3	-	-	3
Teaching Scheme			Examination Scheme			
Theory	3 Hrs/week		CT-I		15 Marks	
Tutorial	-		CT-II		15 Marks	
Total Credits	3		CA		10 Marks	
Duration of ESE: 3Hrs			ESE		60 Marks	

Course Contents

Unit I	Carbohydrate Metabolism: Gluconeogenesis, glycolysis and TCA cycle, Glycogen metabolism, Hormonal regulation of carbohydrate metabolism. Electron transport chain.
Unit II	Lipid Metabolism: Beta oxidation, oxidation of saturated and unsaturated fatty acids, fatty acid biosynthesis, ketone bodies. Synthesis of phospholipids.
Unit III	Nucleic Acid metabolism: De novo synthesis path way, Salvage pathway, disorders of purine and pyrimidine metabolism.
Unit IV	Protein Metabolism: Protein and amino acid metabolism (aromatic and sulfur), Mechanism of transamination, deamination and decarboxylation of amino acids
Unit V	Biochemical Energetics: Energy- Yielding and Energy Requiring Reactions, Oxidation-Reduction Reactions, ATP Yield, ATP pump

Text Books

- | | |
|-----|---|
| T.1 | Principles of Biochemistry-AlbertL. Lehninger CBS Publishers & Distributors |
| T.2 | Biochemistry - Lubertstryer Freeman International Edition |

Reference Books


- | | |
|-----|---|
| R.1 | Fundamentals of Biochemistry- J.L.JainS.Chand and Company |
| R.2 | Biochemistry by U. Satyanarayana and U. Chakrapani |

Useful Links



- | | |
|---|---|
| 1 | https://nptel.ac.in/courses/104/105/104105076/ |
| 2 | https://www.biology.arizona.edu/biochemistry/biochemistry.html |
| 3 | http://www.metpathways.org/ |

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BBT2402	Course Outcomes	CL	Class Sessions	Lab Sessions
	Students will be able to:			
BBT2402.1	Examine different biochemical pathways like Gluconeogenesis, glycolysis and TCA cycle	3	9	-
BBT2402.2	Break down the pathways for lipid metabolism	4	9	-
BBT2402.3	Illustrate the processes of nucleic synthesis	3	9	-
BBT2402.4	Examine the protein synthesis and metabolism	3	8	-
BBT2402.5	Outline the Oxidation-Reduction Reactions and ATP Yield	4	9	-


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Program: B. Tech. Biotechnology

Semester	Course Code	Name of Course	L	T	P	Credits
IV	BBT2403	Green Biotechnology and Pollution Abatement	3	-	-	3

Course Contents

Unit I	Biological Waste Treatment: Principles and design aspects of various waste treatment methods with advanced bioreactor configuration. Biological wastewater treatment and Solid waste management, minimal national standards for waste disposal.
Unit II	Biodegradation of Xenobiotic Compounds: Xenobiotic compounds-Definition, examples and sources. Biodegradation, effect of chemical structure on biodegradation, recalcitrance, cometabolism and biotransformation. Factors affecting biodegradation, microbial degradation of hydrocarbons. Biotransformations and Biocatalysts.
Unit III	Bioremediation and Bio restoration: Introduction and types of bioremediation, bioremediation of surface soil and sludge, bioremediation of subsurface material, In situ and Exsitu technologies. Phytoremediation, bio restoration and reforestation.
Unit IV	Eco-Friendly Bioproducts from Renewable Sources: Fundamentals of composting process, scientific aspects and prospects of biofuel production: bioethanol, biohydrogen and biodiesel; biofertilizers and biopesticides.
Unit V	Biotechnology in Environment Protection: Current status of biotechnology in environment protection and its future, release of genetically engineered organisms in the environment.

Text Books

1	Introduction to Wastewater Treatment- R. S. Ramalho, Academic Press.
2	Environmental Processes I-III, J. Winter, 2nd ed., Wiley Publications
3	Elements of Water Pollution Control Engineering – O.P. Gupta, Khannabooks.
4	Energy Technology – O.P. Gupta, Khannabooks, 2018.
5	Bharucha Erach, The Biodiversity of India, Mapin Publishing Pvt. Ltd.

Reference Books

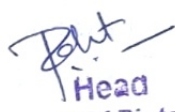
1	Environmental Biotechnology, B.C. Bhattacharya & Ritu Banerjee, Oxford Press, 2007.
2	Environmental Biotech, Pradipta Krimar, I.K. International Pvt. Ltd., 2006.
3	Environmental Microbiology & Biotechnology, D.P. Singh, S.K. Dwivedi, New Age International Publishers, 2004.
4	Biodegradation and Bioremediation 1999 (2nd edition). Martin Alexander, Elsevier Science & Technology.

Useful Links



1	https://nptel.ac.in/courses/103107215
2	https://archive.nptel.ac.in/courses/102/105/102105088/

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	Course Outcomes	CL	Class Sessions	Lab Sessions
BBT2403.1	Describe the concept of Biological waste management with waste treatment methods.	2	9	-
BBT2403.2	Analyze the biodegradable compounds and factors affecting biodegradation, microbial degradation of hydrocarbons.	4	9	-
BBT2403.3	Illustrate the Concepts of bioremediation, bioremediation, phytoremediation, and reforestation.	3	8	-
BBT2403.4	Determine how waste could be converted to useful resources	3	8	-
BBT2403.5	Apply the use of biotechnology in environment protection.	3	8	-


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Program: B. Tech. Biotechnology

Semester	Course Code	Name of Course	L	T	P	Credits
IV	BBT2404	Bioinformatics and Computational Biotechnology	3		-	3

Teaching Scheme		Examination Scheme	
Theory	3 Hrs/week	CT-I	15 Marks
Tutorial		CT-II	15 Marks
Total Credits	3	CA	10 Marks
Duration of ESE: 3Hrs		ESE	60 Marks

Course Contents

Unit I	Introduction to Bioinformatics: Field of bioinformatics and its applications. Biological databases and tools: Nucleotide sequence databases, Protein sequence Databases, structural and functional databases, Patent databases.
Unit II	Data Retrieval Tools and Alignments: Entrez, Ensembl-Biomart. Sequence comparisons & alignment concepts, Global Alignments – Needleman-Wunsch Algorithm Local Alignments – Smith-Waterman Algorithm. Pairwise Sequence alignment: Pairwise alignment, Dynamic programming, Scoring Matrices, Gaps. BLAST and its types
Unit III	Multiple sequence alignment: Dynamic and heuristic methods, Relevance to inferences about evolution, introduction to molecular phylogeny. Phylogenetic analysis: Introduction, Types of Phylogenetic Trees, Methods and Applications, Bootstrap.
Unit IV	Computational Genetics: Epigenetics and its role in transcription regulation, development, and diseases. Genomic variations and its associations: Linking genes, variations and diseases; Introduction to biomarkers and personalized medicine.
Unit V	Bioinformatics for human diseases: Genome-wide association studies of human diseases, Genome editing tools and applications to human diseases, applications of bioinformatics in identification of human diseases

Text Books

T.1	Bioinformatics – A Practical Guide to the Analysis of Genes and Proteins by Andreas Baxevanis, Francis Ouellette, Wiley-Interscience, 2005.
T.2	Introduction to Bioinformatics by T. K. Attawood & D.J. Parry-smith, 8th reprint, Pearson education, 2004

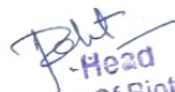
Reference Books

R.1	Jonathan Pevsner. Bioinformatics and Functional Genomics, 2nd Edition
R.2	Introduction to Bioinformatics by Arthur M. Lesk



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Useful Links	
1	http://www.ncbi.nlm.nih.gov/genbank/
2	https://www.ebi.ac.uk/embl/
3	http://www.ddbj.nig.ac.jp/
4	https://nptel.ac.in/courses/102106065

	Course Outcomes:	CL	Class Sessions	Lab Sessions
	Students will be able to:			
BBT2404.1	Select the appropriate data for the analysis	5	7	-
BBT2404.2	Illustrate the similarity and use the databases	4	8	-
BBT2404.3	Analyse the conserved domains by studying sequence alignments	4	7	-
BBT2404.4	Assess the relationships using phylogenetic trees and analyse the conserved domains	5	8	-
BBT2404.5	Analyze and visualize the macromolecular structures	4	9	-


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Program: B. Tech. Biotechnology

Semester	Course Code	Name of Course	L	T	P	Credits
IV	BBT2405	Immunology and Immunotechnology	3		-	3

Teaching Scheme		Examination Scheme	
Theory	3 Hrs/week	CT-I	15 Marks
Tutorial		CT-II	15 Marks
Total Credits	3	CA	10 Marks
Duration of ESE: 3Hrs		ESE	60 Marks

Course Contents

Unit I	Introduction, innate and acquired immunity, active and passive immunity. Introduction to cells (T&B lymphocytes, NK cells, mast cells, dendritic cells) and organs of immune system Primary and secondary (bone marrow, thymus, lymph nodes, CALT and MALT). Structure of antigens and antibody. Antigens classification, isotypes, functions and diversity. Antibody structure, functions, types, monoclonal and polyclonal antibody, Major histocompatibility
Unit II	B and T cell receptors cytokines and their biological role, T-cell development negative positive selection, TCR rearrangement, co-stimulatory molecules brief idea about antigen processing and presentation, Humoral and cell mediated immune response. Complement system: concept of activation, classical and alternative pathway.
Unit III	Immunology Techniques-Antigen-antibody interaction, precipitin reaction, agglutination immuno-diffusion. Immunoassay techniques immuno-electrophoresis, ELISA, Immunochemistry, immunofluorescence. Flow Cytometry. Blood group determination RIA
Unit IV	Vaccines-Active and passive immunization: Live, killed, attenuated, subunit vaccines, Vaccine technology, Design of recombinant antibodies. recombinant vector vaccines, synthetic
Unit V	Vaccines-Active and passive immunization: Live, killed, attenuated, subunit vaccines, Vaccine technology, Design of recombinant antibodies. recombinant vector vaccines, synthetic peptide Vaccines and subunit vaccines DNA vaccines. Antibody engineering Commercial production polyclonal and monoclonal antibodies, Chimeric antibody, humanized antibody Methods of preparation, their clinical applications and applications in Research and development

Text Books

- | | |
|-----|---|
| T.1 | Immunology Kuby, R.A. Goldsby, T.J. Kind 1997, 4th Edition B.A. Osborne |
| T.2 | Essential of immunology Ivan Roitt-Blackwell 1997, 4th Edition B.A. Osborne |

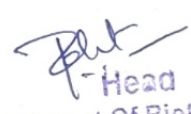
Reference Books

- | | |
|-----|---|
| R.1 | Fundamentals of Immunology Paul W.E. (Eds.) 1998 Raven press, New York. |
| R.2 | William, R. Clark The Experimental Foundations of Modern Immunology (1991)(4th Edition) John Wiley and Sons, New York |



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Useful Links	
1	https://archive.nptel.ac.in/courses/102/105/102105083/
2	https://www.niaid.nih.gov/topics/immunology
3	http://www.microbiologybook.org/immunology/ivc.html

	Course Outcomes	CL	Class Sessions	Lab Sessions
	Students will be able to:			
BBT2405.1	Distinguish between innate and acquired, Immunity and understand the structure and function of molecules, cells and organs of the immune system	2	8	-
BBT2405.2	Describe cell mediated and antibody-mediated immunity and role of complement proteins in defence mechanism	2	9	-
BBT2405.3	Summarize different serological techniques such as agglutination, precipitation, immunoelectrophoresis RIA, ELISA routinely used in clinical analysis and diagnosis	5	9	-
BBT2405.4	Classify vaccines and learn the techniques of design of different vaccines, monoclonal antibody productions and their applications in research.	4	9	-
BBT2405.5	Outline the types of hypersensitivity reactions, Immune tolerance and mechanism of graft rejection including tumor immunology.	4	8	-


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Program: B. Tech Biotechnology							
Semester	Course Code	Name of Course	L	T	P	Credits	
IV	BBT2406	Cell and Molecular Biology Lab	-	-	2	1	
Teaching Scheme			Examination Scheme				
Practical	2Hrs/week		CT-I		-		
Tutorial	-		CT-II		-		
Total Credits	1		CA		25 Marks		
			ESE		25 Marks		
Sr. No.	List of Experiment					CO	
1	Analyzing the different phases of mitosis.					1	
2	Analyzing the different phases of meiosis.					1	
3	Demonstration of handling Centrifuge and PCR.					2	
4	Estimation of Chloroplast from Spinach leaves.					2	
5	Isolation genomic DNA from plant					3	
6	Isolation of genomic DNA from bacterial culture					3	
7	Determination of induced mutation by physical method [UV rays].					4	
8	Examination of direct repair of mutated cells.					4	
9	Estimation of the concentration of RNA in a given unknown sample by Orcinol method					5	
10	Estimation of DNA concentration by Diaphenalyine amine [DPA] method in the given samples.					5	
Text Books/Reference Books							
1	Cell Biology Verma & Aggrawal						
2	Cell and molecular Biology Gerald Karp						
Useful Links							
1.	https://nptel.ac.in/courses/102/103/102103015/						



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	Course Outcomes Students will be able to:	CL	Class Sessions	Lab Sessions
BBT2406.1	Analyze the Concept of cell and Cell cycle	4	-	4
BBT2406.2	Examine the cell transport and receptors involved	3	-	4
BBT2406.3	Determine the genetic material organization in various cells	3	-	4
BBT2406.4	Demonstrate the processes involved in DNA replication and impact of DNA damages on cellular processes	3	-	4
BBT2406.5	Illustrate concept of gene expression.	4	-	4


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Program: B. Tech Biotechnology								
Semester	Course Code	Name of Course	L	T	P	Credits		
IV	BBT2407	Biochemistry Metabolism Lab	-	-	2	1		
Teaching Scheme			Examination Scheme					
Practical	2Hrs/week		CT-I		-			
Tutorial	-		CT-II		-			
Total Credits	1		CA		25 Marks			
			ESE		25 Marks			
Sr. No.	List of Experiment						CO	
1	Determination of Michaelis constant of enzymes.						1	
2	Examination of amylase enzyme activity from sweet potato.						1	
3	Examination of phosphatase enzyme activity from potato.						2	
4	Analysis of lactate dehydrogenase enzyme activity.						2	
5	Determination of succinate dehydrogenase activity.						3	
6	Analysis of alanine aminotransferase activity.						3	
7	Isolation and crystallization of enzyme urease from jack beans.						4	
8	Determining the effect of inhibitors on enzyme activity						4	
9	Examination of aspartate amino transferase activity						5	
10	Estimate the lysozyme enzymatic activity of the given sample.						5	
Text Books/Reference Books								
1	Fundamentals of Biochemistry- Dr.A.C.Deb							
2	Principles of Biochemistry –Albert Lehninger CBS Publishers & Distributors							
Useful Links								
1.	https://nptel.ac.in/courses/102/106/102106087							

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	Course Outcomes Students will be able to:	CL	Class Sessions	Lab Sessions
BBT2407.1	Examine different biochemical pathways like Gluconeogenesis, glycolysis and TCA cycle	3	-	4
BBT2407.2	Break down the pathways for lipid metabolism	4	-	4
BBT2407.3	Illustrate the processes of nucleic synthesis	3	-	4
BBT2407.4	Examine the protein synthesis and metabolism	3	-	4
BBT2407.5	Outline the Oxidation-Reduction Reactions and ATP Yield	4	-	4



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Program: B.Tech Biotechnology								
Semester	Course Code	Name of Course	L	T	P	Credits		
IV	BBT2408	Bioinformatics and Computational Biology Lab	-	-	2	1		
Teaching Scheme			Examination Scheme					
Practical	2 Hrs/week		CT-I			-		
Tutorial	-		CT-II			-		
Total Credits	1		CA			25 Marks		
			ESE			25 Marks		
Sr. No.	List of Experiment						CO	
1	Accessing databases from NCBI.						1	
2	Extracting protein and nucleotide sequences						1	
3	Exploring database Search Tools.						2	
4	Perform similarity search using BLAST.						2	
5	Perform Multiple sequence alignment and Pairwise sequence alignment.						3	
6	Analyse the onservd domains						3	
7	Demonstrate the construction of Phylogenetic trees.						4	
8	Examining the patterns in genomes.						4	
9	Demo of Protein Structure Visualization and Manipulation using Pymol/RASMOL						5	
10	Demo of Data Structure Algorithms for gene, protein sequence analysis						5	
Text Books/Reference Books								
1	Bioinformatics: A practical guide to Analysis of Genes & Proteins by A. D. BaxevanisJohn Willey and sons, 2005							
2	Fundamental Concepts of Bioinformatics by D. E. Krane and M. L. Raymer, Pearson Publication, 2006.							
3	Bioinformatics: Tools & Applications by D. Edward and J. Stajich, Springer, 2009.							

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Useful Links	
1.	www.ncbi.nlm.nih.gov/genbank/
2.	https://pymol.org/
3.	https://www.perl.org/
4.	https://www.ebi.ac.uk/embl/

	Course Outcomes	CL	Class Sessions	Lab Sessions
	Students will be able to:			
BBT2409.1	Select the appropriate data for the analysis	5	-	4
BBT2409.2	Illustrate the similarity and use the databases	4	-	4
BBT2409.3	Analyse the conserved domains by studying sequence alignments	4	-	4
BBT2409.4	Assess the relationships using phylogenetic trees and analyse the conserved domains	5	-	4
BBT2409.5	Analyze and visualize the macromolecular structures	4	-	4


 Head
 Department Of Biotechnology
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	Tulsiramji Gaikwad-Patil College of Engineering and Technology Wardha Road, Nagpur-441 108 NAAC Accredited with A+ Grade (An Autonomous Institute Affiliated to RTM Nagpur University, Nagpur)	
Program: B. Tech. III Semester (All Branches)		
Semester IV	BSH2301: Human Values for Professional Society	
Teaching Scheme		Examination Scheme
Theory	3 Hrs/week	CT-I 15 Marks
Tutorial	-	CT-II 15 Marks
Total Credits	3	CA 10Marks
Duration of ESE: 3Hrs		ESE 60 Marks
Pre- Requisite: Ethical Science & Business Ethics		Total Marks 100 Marks
Course Contents		
Unit I	Introduction to Value Education Value Education, Definition, Concept and Need for Value Education, The Content and Process of Value Education, Basic Guidelines for Value Education, Self-exploration as a means of Value Education.	
Unit II	Harmony in the Human Being, Family, Society and Nature Human Being is more than just the Body, Understanding Myself as Co-existence of the Self and the Body, Understanding the activities in the Self and the activities in the Body, Family as a basic unit of Human Interaction and Values in Relationships, The Basics for Respect and today's Crisis: Affection, Guidance, Reverence, Glory.	
Unit III	Social Ethics The Basics for Ethical Human Conduct, Defects in Ethical Human Conduct, Holistic Alternative and Universal Order, Universal Human Order and Ethical Conduct.	
Unit IV	Basic Theories Basic Ethical principles, Moral Developments, Deontology, Utilitarianism, Virtue theory, Rights Theory, Casuist Theory, Moral Absolution, Moral Rationalism, Moral Pluralism, Ethical Egoism, Feminist Consequentialism, Moral Issues, Moral Dilemmas, Moral Autonomy.	
Unit V	Global Issues in Professional Ethics: Introduction- Current Scenario, Technology Globalization of MNCs, International Trade, World Summits, Issues, Business Ethics and Corporate Governance, Sustainable Development Ecosystem, Energy Concerns, Ozone Deflection, Pollution, Ethics in Manufacturing and Marketing, Media Ethics; War Ethics; Bio Ethics, Intellectual Property Rights.	


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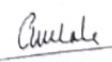
Text Books	
T.1	A.N Tripathy, New Age International Publishers, 2003.
T.2	Bajpai. B. L, New Royal Book Co, Lucknow, Reprinted, 2004.
T.3	Bertrand Russell Human Society in Ethics & Politics.
T.4	Professional Ethics: R. Subramanian, Oxford University Press, 2015.
Reference Books	
R.1	Corliss Lamont, Philosophy of Humanism.
R.2	Gaur. R.R, Sangal. R, Bagaria. G.P, A Foundation Course in Value Education, Excel Books, 2009.
R.3	Gaur. R.R, Sangal. R, Bagaria. G.P, Teachers Manual Excel Books, 2009.
R.4	I.C. Sharma. Ethical Philosophy of India Nagin & co Julundhar.
R.5	Mortimer. J. Adler, – Whatman has made of man.
R.6	Engineering Ethics, Concepts Cases: Charles E Harris Jr., Michael S Pritchard, Michael J Rabins, Cengage Learning, 2015.



COs	Course Outcomes	CL	Class Sessions
CO1	Describe Value Education and its role for Self-exploration.	2	9
CO2	Illustrate the Harmony in the Human Being and Society.	3	9
CO3	Examine the Ethical Human Conduct along with Universal Order.	3	9
CO4	Use of various theories of Basic Ethical principles.	3	9
CO5	Predict Global Issues in Professional Ethics and Sustainable Development.	3	10


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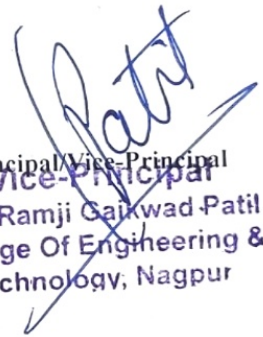

Vice-Principal
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Second Year (Semester-IV) B.Tech. Electrical Engineering BAU2404: Group Reading of Classics			
Teaching Scheme Practical 2Hrs/week Total Credit 0 Audit Course		Examination Scheme CA - ESE - Total -	
Activity This will make group to read one or two books during a semester.			
Process An hour may be fixed for a small group for a particular classic. Group sits and each person reads aloud (if possible with proper modulation) taking turns. This if done properly for an hour one may complete 30-40 pages in an hour. A normal classic can be finished in 15 to 20 days. If serious books on philosophy etc. are taken up a discussion can be held after every idea is complete.			


BOS Chairman
Head
 Department Of Biotechnology
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Dean Academics
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Principal/Vice-Principal
Tulsi Ramji Gaikwad Patil
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