

Atal Bihari Vajpayee Vishwavidyalaya, Bilaspur (C.G.)



Scheme and Syllabus

of

M. Sc. (Biotechnology)

Program Code: MSCBT129

**Semester system for affiliated college
(As per LOCF and credit system)**

w.e.f. 2023-2024

(As approved by AC and EC meetings held on 16.08.2023 and 18.04.2023 respectively)



अटल बिहारी वाजपेयी विश्वविद्यालय, बिलासपुर (छ.ग.)

कोनी पुलिस थाना के सामने, बिलासपुर-रतनपुर मार्ग, कोनी, बिलासपुर (छ.ग.) 495009

Website : www.bilaspuruniversity.ac.in

Scheme of Biotechnology under Semester System

Program Code: MSCBT129

Semester	Course Code	Subject Name	Credit			Total Credit	Marks			
			L	T	P		ESE	IA	Total	
									Max	Min
First	BTT 101	General Microbiology	3	1	-	4	80	20	100	36
	BTT 102	Cell Biology	3	1	-	4	80	20	100	36
	BTT 103	Genetics	3	1	-	4	80	20	100	36
	BTT 104	Biochemistry	3	1	-	4	80	20	100	36
	BTP 101	Lab 1: Based on paper BTT 101 and BTT 102	-	-	2	2	100	-	100	36
	BTT P02	Lab 2: Based on paper BTT 103 and BTT 104	-	-	2	2	100	-	100	36
	Subtotal			12	4	4	20	-	-	600
Second	BTT 201	Molecular Biology	3	1	-	4	80	20	100	36
	BTT 202	Plant Biotechnology	3	1	-	4	80	20	100	36
	BTT 203	Environmental Biotechnology	3	1	-	4	80	20	100	36
	BTT 204	Medical Biotechnology (Elective)								
	BTT 205	Macromolecules and enzymology (Elective)	3	1	-	4	80	20	100	36
	BTT 206	Biostatistics (Elective)								
	BTP 201	Lab 3: Based on paper BTT 201 and BTT 202	-	-	2	2	100	-	100	36
	BTP 202	Lab 4: Based on paper BTT 203 and BTT 204/205/206	-	-	2	2	100	-	100	36
Subtotal			12	4	4	20	-	-	600	

Beher



Program Outcome of M.Sc. in Biotechnology

After the completion of the Program, the students will be able to:

PO1	Understand essentials of all the life-processes at the molecular level.
PO2	Understand various industries (e.g., food, fermentation industries, enzyme production, vaccine development industries and other biotechnology related industries) in context of Biotechnology.
PO3	Understand the knowledge of gene sequencing, primer designing and synthesis, molecular structure prediction, drug discovery and molecular diagnostics.
PO4	Have skills for acquisition, organization and processing of data for drawing accurate inferences in R&D sectors and knowledge of IPR for commercialization economic protection to the inventor
PO5	Produce quality materials at commercial-scale using tissue culture technique and manipulate organisms via recombinant DNA technology for bioremediation, gene therapy, diagnostics, disease-models, bio-fuel, crop improvement, protein engineering, and modifying metabolic pathways.

Program Specific Outcomes (PSOs) of M.Sc. Biotechnology

On completion of the Program, the students will specifically be able to:

PSO1	Apply knowledge of living organisms and their cellular processes for generating product for social welfare.
PSO2	Apply practical knowledge for careers in various industry, agriculture and applied research.
PSO3	Follow research ethics involving living organisms to contribute to application, advancement and impartment of knowledge in the field of Biotechnology.
PSO4	Understand In-depth aspects of Biotechnology with awareness of ethical issues in Medical, clinical and animal research and careers options.
PSO5	Pursue Research, work in Industries or be an entrepreneur.



अटल बिहारी वाजपेयी विश्वविद्यालय, बिलासपुर (छ.ग.)

कोनी पुलिस थाना के सामने, बिलासपुर-रतनपुर मार्ग, कोनी, बिलासपुर (छ.ग.) 495009

Website : www.bilaspuruniversity.ac.in

Part A: Introduction			
Program: MSc. Biotechnology		Semester: I	Year: I
w.e.f.: 2023-2024			
1.	Course Code	BTT 101	
2.	Course Title	General Microbiology	
3.	Course Type	Theory	
4.	Pre-requisite (if any)	Nil	
5.	Course Learning Outcomes (CLO)	<p>At the end of this course, the students will be able to:</p> <ul style="list-style-type: none"> • To understand about microbial diversity • To understand about microbial evolution, systematics and taxonomy. • To understand microbial growth and different culture media. • To understand metabolic diversity among microorganisms • To understand microbial disease, types, transmission and control 	
6.	Credit Value	4	
7.	Total Marks	Internal Marks: 20 External Marks: 80	Min Passing Marks: 36

Part B: Content of the Course		
Unit	Topics	Total Hours
I.	Microbial Evolution, Systematics and Taxonomy —New approaches to bacterial taxonomy classification including ribotyping; Ribosomal RNA sequencing; Characteristics of primary domains, Nomenclature and Bergey's Manual. Viruses: Discovery, classification, Structure and lifecycle of Bacterial, Plant and Animal viruses; Examples of few viruses- Herpes Pox, Adenoviruses, Retroviruses, Viroid and Prions. Prokaryotic cells: Structure and function.	12
II.	Archaea: Archaea as earliest lifeforms; Halophiles; Methanogens; Hyper-thermophilic Archaea: Thermoplasma. Bacteria: Purple and green bacteria; Cyanobacteria: Homoacetogenic bacteria; Acetic acid bacteria; Budding and appendaged bacteria; Spirilla: Spirochetes; Gliding and sheathed bacteria; Pseudomonads; Lactic and propionic acid bacteria: Endospore forming rods and cocci; Mycoplasma, Mycobacteria; Rickettsia. Chlamydia and Actinomycetes	12
III.	Microbial Growth — definition, mathematical expression and, growth curve, Synchronous growth; Continuous culture; environmental factors affecting growth - temperature, acidity, alkalinity, water availability and oxygen. Methods in Microbiology - Pure culture techniques; sterilization; Principles of microbial nutrition; Types of culture media: defined and undefined, selective and differential, minimal and enrichment; Enrichment culture Techniques for isolation of chemoautotrophs, chemoheterotrophs and photosynthetic microorganisms.	12

Behar



अटल बिहारी वाजपेयी विश्वविद्यालय, बिलासपुर (छ.ग.)

कोनी पुलिस थाना के सामने, बिलासपुर-रतनपुर मार्ग, कोनी, बिलासपुर (छ.ग.) 495009

Website : www.bilaspuruniversity.ac.in

IV.	Metabolic Diversity among Microorganisms - Photosynthesis in microorganisms; Role of Chlorophylls, carotenoids and phycobillins; Chemolithotrophy - Hydrogen iron - nitrite-oxidizing bacteria; Nitrate and sulphate reduction; Methanogenesis and acetogenesis; Fermentation diversity, syntrophy. Nitrogen metabolism; Nitrogen fixation.	12
V.	Microbial diseases — Infectious disease transmission; Respiratory infections caused by bacteria and viruses; Tuberculosis; Sexually transmitted diseases including AIDS, Diseases transmitted by animals (rabies, plague), insects and ticks (Rickettsia, Lyme disease, malaria). Food and water borne diseases. Host — Parasite Relationships — Normal micro flora of Skin, Oral cavity, Gastrointestinal tract; Virulence Pathogenesis. Disease control - Chemotherapy / Antibiotics, Antibiotics and Antimicrobial agents; Mode of action Resistance to antibiotics.	12
Part C - Learning Resource		
Text Books, Reference Books and e-Resources		
Text Books:		
<ul style="list-style-type: none">• General Microbiology, Stainer, R.Y., Ingraham, J.L., Wheelis, M.L. and Painter, P.R. Macmillan Press Ltd.• Brock Biology of Microorganisms, Madigan, M.T. Martinko, J.M. and Parker, J. Prentice-Hall.• Microbiology, Pelczar, M.J. Jr., Chan, E.C.S. and Kreig, N.R. Tata McGraw Hill (2009)• Microbial Genetics, Maloy, S.R., Cronan, J.E. Jr. and Freifelder, D. Jones, Bartlett Publishers.• Microbiology- a Laboratory Manual, Cappuccino, J.G. and Sherman, N. Addison Wesley.		
Reference Books:		
<ul style="list-style-type: none">• Microbiology: Lansing Prescott, John Harley, and Donald Klein; McGraw Hill 5th Edition (2001).• Microbiology - Tortora, Funke and Case; 10th Edition Pearson Education Benjamin Cummings publishers.		
E-Resources:		
<ul style="list-style-type: none">• https://faculty.ksu.edu.sa/sites/default/files/140_mbio-final_notes.pdf• https://microbiologynote.com/archaeobacteria-definition-types-characteristics-structure-examples/?utm_content=cmp-true• https://microbiologysociety.org/why-microbiology-matters/what-is-microbiology/microbes-and-the-human-body/microbes-and-disease.html• https://www.ndvsu.org/images/StudyMaterials/Micro/Bacterial-Classification.pdf		

Behar



अटल बिहारी वाजपेयी विश्वविद्यालय, बिलासपुर (छ.ग.)

कानेरी पुलिस थाना के सामने, बिलासपुर-रतनपुर मार्ग, कोनी, बिलासपुर (छ.ग.) 495009

Website: www.bilaspuruniversity.ac.in

Name and Signatures of Members of Board of Studies

Sl. No.	Category	Name of Nominated Members	Signature
1.	Chairperson	Dr. Neha Behar	
2.	Members	Dr. Arun Kumar Kashyap	
3.	VC Nominated members		
4.	Corporate / Industrial Area Representatives		



अटल बिहारी वाजपेयी विश्वविद्यालय, बिलासपुर (छ.ग.)

कोनी पुलिस थाना के सामने, बिलासपुर-रतनपुर मार्ग, कोनी, बिलासपुर (छ.ग.) 495009

Website : www.bilaspuruniversity.ac.in

Part A: Introduction			
Program: MSc. Biotechnology		Semester: I	Year: I
w.e.f.: 2023-2024			
1.	Course Code	BTT 102	
2.	Course Title	Cell Biology	
3.	Course Type	Theory	
4.	Pre-requisite (if any)	Nil	
5.	Course Learning Outcomes (CLO)	<p>At the end of this course, the students will be able to:</p> <ul style="list-style-type: none"> To understand about cell structures, organization and functions. To understand about nucleus, chromosomes and cell cycle. To understand transportation of nutrients and mechanism of signal transduction To understand about nucleic acids structure and related processes. To understand about cancer biology, oncogenes and therapeutics 	
6.	Credit Value	4	
7.	Total Marks	Internal Marks: 20 External Marks: 80	Min Passing Marks: 36

Part B: Content of the Course		
Unit	Topics	Total Hours
I.	Cell Theory; Structure and diversity of Prokaryotic and Eukaryotic cells; diversity of cell size and shape. Cellular organelles - Plasma membrane, cell wall & their structural organization; Mitochondria; Chloroplast; Other organelles and their organization. Cytoskeleton, Microtubules, Microfilaments, Cell junctions - Plasmodesmata, Gap junctions, Desmosomes, Adherence junctions.	12
II.	Nucleus; Nuclear Envelop and Nuclear pore. Chromatin concept - Euchromatin and heterochromatin, Histones, Nucleosome concept, Chromosome: Structure, types, staining, banding pattern and packaging of DNA. Cell Cycle: molecular events and model systems. Mitosis and Meiosis - Events and abnormalities.	12
III.	Transport of nutrients, ions and macromolecules across membranes, active, passive and collateral transport. Receptor mediated Endocytosis. Cellular responses to environmental signals in plants and animals - mechanisms of signal transduction. Cell motility - cilia, flagella of eukaryotes and prokaryotes. Isolation of cells, microscopic techniques for study of cells.	12
IV.	Nucleic Acid: DNA - structure, different forms, coiling & super coiling; Replication of DNA Nature, mechanism, process and experimental evidences. RNA - types structure, function and biosynthesis. Cellular basis of differentiation and development - mitosis, gametogenesis and fertilization. Development in Drosophila and Arabidopsis; Spatial and temporal regulation of Gene Expression.	12

As approved by academic council and executive council meetings

J. Behar



V.	Brief outline of Cancer Biochemistry and Cancer Phase of Cell Cycle, Cell Migration and Cancer Metastasis, Apoptosis and ageing, Agents promoting carcinogenesis, Genetic rearrangements in progenitor cells, oncogenes, tumor suppressor gene, virus-induced cancer, metastasis, interaction of cancer cells with normal cells, apoptosis, therapeutic interventions of uncontrolled cell growth.	12
Part C - Learning Resource		
Text Books, Reference Books, E-Resources		
Text Books:		
<ul style="list-style-type: none">• Gerald Karp - Cell and Molecular Biology 5th Edition (2007)• Geoffrey M. Cooper; Robert E. Hausman - The Cell: A Molecular Approach (2009)• E. J. Ambrose and Dorothy M. Easty, Second Edition (1977), Book Society and Nelson.• C.B. Powar — Cell Biology Third Edition, reprint (2005), Himalaya Publishing House.• Tortora, Funke and Case — Microbiology: An introduction 6th Edition, Benjamin/Cummings Publishing Co.• Lewis J. Klein smith and Valerie M. Kish - Principles of cell and molecular biology — Third Edition (2002)• P. K. Gupta— Cell and molecular biology, Second Edition (2003), Rastogi publications.• Lodish et al., Molecular cell Biology, 6th Edition, W.H. Freeman & Company, 2008.		
Reference Books:		
<ul style="list-style-type: none">• Alberts, B., Johnson, A., Lewis, J., Raff, M., Roberts, Keith; Walter, P., (eds) c2002: Molecular Biology of the Cell, Garland Science, New York and London.• Copper, G.M., & Hausman, R.E., 2004: The Cell: A Molecular Approach, 3rd ed., Sinauer Associates, Inc, Sunderland, Massachusetts.• Lodish, H. Berk A, Zipursky SL, et al., 2000: Molecular Cell Biology, 4th edition., W.H. Freeman, New York.		
E-Resources:		
<ul style="list-style-type: none">• https://onlinecourses.swayam2.ac.in/cec20_ma14/preview• https://onlinecourses.nptel.ac.in/noc23_bt50/preview• https://www.ncbi.nlm.nih.gov/books• http://www.di.uq.edu.au/sparqglossary#b• https://micro.magnet.fsu.edu• https://cellbiology.med.unsw.edu.au• https://epgp.inflibnet.ac.in/Home/ViewSubject?catid=1p0OY7YTBC1r5D2KEqnvVg		

Behar



अटल बिहारी वाजपेयी विश्वविद्यालय, बिलासपुर (छ.ग.)

कानेरी पुलिस थाना के सामने, बिलासपुर-रतनपुर मार्ग, कोनी, बिलासपुर (छ.ग.) 495009

Website: www.bilaspuruniversity.ac.in

Name and Signatures of Members of Board of Studies

Sl. No.	Category	Name of Nominated Members	Signature
1.	Chairperson	Dr. Neha Behar	
2.	Members	Dr. Arun Kumar Kashyap	
3.	VC Nominated members		
4.	Corporate / Industrial Area Representatives		



अटल बिहारी वाजपेयी विश्वविद्यालय, बिलासपुर (छ.ग.)

कोनी पुलिस थाना के सामने, बिलासपुर-रतनपुर मार्ग, कोनी, बिलासपुर (छ.ग.) 495009

Website : www.bilaspuruniversity.ac.in

Part A: Introduction			
Program: MSc. Biotechnology		Semester: I	Year: I
w.e.f.: 2023-2024			
1.	Course Code	BTT 103	
2.	Course Title	Genetics	
3.	Course Type	Theory	
4.	Pre-requisite (if any)	Nil	
5.	Course Learning Outcomes (CLO)	<p>At the end of this course, the students will be able to:</p> <ul style="list-style-type: none"> • To understand about early studies involving genetics. • To understand about gene mapping methods. • To understand about types, causes and detection of mutation. • To understand microbial, human and quantitative genetics. • To understand about various genetic system, variation and selection. 	
6.	Credit Value	4	
7.	Total Marks	Internal Marks: 20 External Marks: 80	Min Passing Marks: 36
Part B: Content of the Course			
Unit	Topics	Total Hours	
I.	Introduction to Genetics; Early studies involving genetics. Mendel's laws of genetics; Concept of gene: Allele, multiple alleles, pseudo allele, complementation tests; Extensions of Mendelian principles; Codominance, incomplete dominance, gene interactions, pleiotropy, genomic imprinting, penetrance and expressivity, phenocopy, linkage and crossing over.	12	
II.	Gene mapping methods: Linkage maps, tetrad analysis, mapping with molecular markers, mapping by using somatic cell hybrids, development of mapping population in plants. Extra chromosomal inheritance: Inheritance of Mitochondrial and chloroplast genes, maternal inheritance. Regulation of gene expression in Prokaryotes and Eukaryotes; Attenuation and antitermination; Operon concept; DNA methylation.	12	
III.	Mutation: Types, causes and detection, mutant types – lethal, conditional, biochemical, loss of function, gain of function, germinal verses somatic mutants, insertional mutagenesis. Structural and numerical alterations of chromosomes: Deletion, duplication, inversion, translocation, ploidy and their genetic implications. physical and chemical mutagens, Ames test; Dosage compensation; Mutational Assay System.	12	
IV.	Microbial genetics: Methods of genetic transfers – transformation, conjugation, transduction and sex-duction, mapping genes by interrupted mating, fine structure analysis of genes. Human genetics: Pedigree analysis, lod score for linkage testing, karyotypes, genetic disorders. Quantitative genetics: Polygenic inheritance, heritability and its measurements, QTL mapping.	12	

As approved by academic council and executive council meetings

Neeraj



V.	Viruses and their Genetic system: Phage I and its life cycle; RNA phases; RNA viruses; Retroviruses. Genetic system of Yeast and Neurospora. Variation; sources of variation; selection; Heritability of variation, Process of speciation; Origin of new genes. Hardy Weinberg genetic equilibrium, genetic polymorphism and selection.	12
Part C - Learning Resource		
Text Books, Reference Books, E-Resources		
Text Books:		
<ul style="list-style-type: none">Genetics, Benjamin Pierce (2017) Genetics: A Conceptual Approach, Sixth Edition, W. H. FreemanGriffiths, William M. Gelbart, Jeffrey I-I. Miller, Richard C. Lewontin and Anthony J.F.Griffiths (2009) Modern Genetic Analysis. W. I-I. Freeman		
Reference Books:		
<ul style="list-style-type: none">D. Peter Snustad, Michael J. Simmons (2007) Principles of Genetics. Wiley India Pvt Ltd.Sandy Primrose and Richard Twyman (2016) Principles of Gene Manipulation and Genomics. Wiley-Blackwell		
E-Resources:		
<ul style="list-style-type: none">https://onlinecourses.swayam2.ac.in/ccc23_bt07/previewhttps://onlinecourses.swayam2.ac.in/ccc23_bt03/previewhttps://onlinecourses.swayam2.ac.in/ccc23_bt09/previewhttps://onlinecourses.swayam2.ac.in/ccc23_bt04/previewhttps://thebiologynotes.com/category/genetics/https://ocw.mit.edu/courses/7-03-genetics-fall-2004/pages/lecture-notes/		

Neeraj



अटल बिहारी वाजपेयी विश्वविद्यालय, बिलासपुर (छ.ग.)

काने 1 पुलिस थाना के सामने, बिलासपुर-रतनपुर मार्ग, कोनी, बिलासपुर (छ.ग.) 495009

Website: www.bilaspuruniversity.ac.in

Name and Signatures of Members of Board of Studies

Sl. No.	Category	Name of Nominated Members	Signature
1.	Chairperson	Dr. Neha Behar	
2.	Members	Dr. Arun Kumar Kashyap	
3.	VC Nominated members		
4.	Corporate / Industrial Area Representatives		



अटल बिहारी वाजपेयी विश्वविद्यालय, बिलासपुर (छ.ग.)

कोनी पुलिस थाना के सामने, बिलासपुर-रतनपुर मार्ग, कोनी, बिलासपुर (छ.ग.) 495009

Website : www.bilaspuruniversity.ac.in

Part A: Introduction			
Program: MSc. Biotechnology		Semester: I	Year: I
w.e.f.: 2023-2024			
1.	Course Code	BTT104	
2.	Course Title	Biochemistry	
3.	Course Type	Theory	
4.	Pre-requisite (if any)	Nil	
5.	Course Learning Outcomes (CLO)	<p>At the end of this course, the students will be able to:</p> <ul style="list-style-type: none"> To understand about scope and importance of biochemistry To understand about biophysical chemistry. To understand about structure, function and metabolism of carbohydrates. To understand about structure, function and metabolism of proteins. To understand about structure, function and metabolism of lipids. 	
6.	Credit Value	4	
7.	Total Marks	Internal Marks: 20 External Marks: 80	Min Passing Marks: 36
Part B: Content of the Course			
Unit	Topics		Total Hours
I.	Scope and importance of Biochemistry, Composition, structure and function of biomolecules (carbohydrates, lipids, proteins, nucleic acids and vitamins). chemical bonds (covalent & non covalent bonds), Chemical properties water molecules, stabilizing interaction (Vander-waals, electrostatic, hydrogen bonding, hydrophobic interaction).		12
II.	Principles of biophysical chemistry (pH, buffer, reaction kinetics, thermodynamics, colligative properties). Chemical foundations of Biology — pH, pKa, acids & bases, buffers. Principles of thermodynamics. Analytical techniques in biochemistry and biophysics for small molecules and macromolecules for quantization.		12
III.	Carbohydrates: structure and classification; Monosaccharide, Disaccharide, Oligosaccharide and Polysaccharides — types, structural features, methods for compositional analysis. Metabolism (anabolism and catabolism) of carbohydrates- Calvin cycle, glycolysis, glycogenesis, gluconeogenesis, glycogenolysis, glyoxalate pathway, kreb cycle and electron transport chain.		12
IV.	Amino acids and peptides — classification, chemical reactions and physical properties and bio-synthesis of amino acids. Proteins - structure, classification and separation, purification and criteria of homogeneity, end group analysis, hierarchy in structure, primary, secondary tertiary and quaternary structure of protein. Ramachandran plot / map. Metabolism of proteins; Proteins of bio-membrane and nucleoprotein		121



V.	Fatty acids - types and properties, biosynthesis of fatty acids. Lipids - classification, structure and functions. Metabolism of lipids: Synthesis of fats and oxidation of fats. Heterocyclic compounds and secondary metabolites in living systems — nucleotide: pigments, toxins, antibiotics. Vitamins structure and function- types and its application	12
Part C - Learning Resource		
Text Books, Reference Books, E-Resources		
Text Books: <ul style="list-style-type: none">• Nelson and Cox (2009) Principles of Biochemistry. Fifth Edition.• Albert L. Lehninger (2005) Biochemistry. Second Edition.• Todd and Howards Mason (2004) Text book of Biochemistry. Fourth Edition.• Jeremy M. Berg, John L. Tymoczko and Lubert Stryer (2007) Biochemistry, Sixth Edition• Voet D, Voet JG & Pratt CW (2006) Fundamentals of Biochemistry Second Edition. Wiley.		
Reference Books: <ul style="list-style-type: none">• Robert K. Murray, David A Bender, Kathleen M. Botham, Peter J. Kennelly, Victor W. Rodwell, P. Anthony Weil (2007) Harper's Illustrated Biochemistry, 28th Edition.• Buchanan, Gruissemen & Jones (2015) Biochemistry & Molecular Biology of Plant, 2nd edition.• M. Debnath, Tools and Techniques in Biotechnology.		
E-Resources: <ul style="list-style-type: none">• https://eppg.inflibnet.ac.in/Home/ViewSubject?catid=MNhNzp1RQIU+6LM40KjYIQ==• https://microbenotes.com/category/biochemistry/• https://www.mednotes.in/2019/10/biochemistry.html		



अटल बिहारी वाजपेयी विश्वविद्यालय, बिलासपुर (छ.ग.)

काने 1 पुलिस थाना के सामने, बिलासपुर-रतनपुर मार्ग, कोनी, बिलासपुर (छ.ग.) 495009

Website: www.bilaspuruniversity.ac.in

Name and Signatures of Members of Board of Studies

Sl. No.	Category	Name of Nominated Members	Signature
1.	Chairperson	Dr. Neha Behar	
2.	Members	Dr. Arun Kumar Kashyap	
3.	VC Nominated members		
4.	Corporate / Industrial Area Representatives		



Part A: Introduction			
Program: MSe. Biotechnology	Semester: I	Year: I	w.e.f.: 2023-2024
1. Course Code	BTP 101		
2. Course Title	Lab 1: Based on paper BTT 101 and BTT 102 (General Microbiology and Cell Biology)		
3. Course Type	Practical		
4. Pre-requisite (if any)	Nil		
5. Course Learning Outcomes (CLO)	<p>At the end of this course, the students will be able to:</p> <ul style="list-style-type: none"> • Practical knowledge of the preparation of liquid and solid media for growth of microorganisms. • Isolate and maintain pure culture of organisms. • Study Growth curve of bacterial population. • Prepare and Study mitosis. • Do assay of antibiotics and demonstration of antibiotics resistance. 		
6. Credit Value	2		
7. Total Marks	Maximum Marks: 100	Min Passing Marks: 36	
Part B: Content of the Course			
Units	<ol style="list-style-type: none"> 1. Preparation of liquid and solid media for growth of microorganisms. 2. Isolation and maintenance of organisms by plating, streaking and serial dilution methods. Slants and stab cultures. Storage of microorganisms. 3. Isolation of pure culture from soil and water. 4. Growth; Growth curve; Measurement of bacterial population by turbidity and serial dilution methods. Effect of temperature, pH and carbon nitrogen sources on growth. 5. Microscopic examination of bacteria, yeast and molds and study of organisms by Gram stain, Acid fast stain and staining for spores. 6. Assay of antibiotics and demonstration of antibiotics resistance. 7. One step growth curve of bacteria 8. To prepare the temporary stained slide of onion bulb peel to study the structure of plant cell. 9. Preparation and Study of slide of mitosis using from onion root tips squash. 10. Schedule for study of mitotic index. 11. To determine the abnormal mitotic index. 12. Preparation and study of slide for meiosis using young anthers of <i>Allium cepa</i>. 13. To determine the meiotic index in the flower bud of <i>Allium cepa</i>. 14. Any other practical as per the facility available in the institute and according to the teacher concern. 		Total no of Hours
BTT 101 and BTT 102			15

Behag



अटल बिहारी वाजपयी विश्वावेद्यालय, बिंलासपुर (छ.ग.)

कोनी पुलिस थाना के सामने, बिंलासपुर-रतनपुर मार्ग, कोनी, बिंलासपुर (छ.ग.) 495009

Website : www.bilaspuruniversity.ac.in

Part A: Introduction			
Program: MSc. Biotechnology		Semester: I	Year: 2023 w.e.f.: 2023-2024
1.	Course Code	BTP 102	
2.	Course Title	Lab 1: Based on BTT 103 and BTT 104 (Genetics and Biochemistry)	
3.	Course Type	Practical	
4.	Pre-requisite (if any)	Nil	
5.	Course Learning Outcomes (CLO)	At the end of this course, the students will be able to: <ul style="list-style-type: none"> • Perform experiments based on Mendel's laws • Studies of prokaryotic & eukaryotic cells • Qualitative test for Carbohydrate • Qualitative test for amino acids • Qualitative test for proteins 	
6.	Credit Value	2	
7.	Total Marks	Maximum Marks: 100	Min Passing Marks:36
Part B: Content of the Course			
Units	1. Experiments for Mendel's experiments- a. Problems based on monohybrid and dihybrid cross b. Mendel's law-based problems c. problems based on sex inked inheritance d. autosomal disease-based problems e. pedigree analysis-based problems 2. Studies of prokaryotic & eukaryotic cells 3. Qualitative test for Carbohydrate. (Molisch's test) 4. Qualitative test for Carbohydrate. (Anthrone test) 5. Qualitative test for Carbohydrate. (Benedict's test) 6. Qualitative analysis of Carbohydrate by Barfoed's test. 7. Qualitative test for amino acid by Ninhydrin reaction. 8. Qualitative test for amino acid by Xanthoproteic reaction. 9. Qualitative test for Proteins using Biuret test. 10. Qualitative test for amino acid by Millon's test. 11. Any other practical as per the facility available in the institute and according to the teacher concern.		Total no of Hours
BTT 103 and BTT 104			15

Part C: Learning Resources Text Book, Reference Book and E resources	
Text Book	
1. Laboratory Manual in Biotechnology and Microbiology, Aneja K. R. 2. Practical Microbiology, R. C. Dubey 3. Laboratory Manual in Microbiology, P. Gunasekaran	
E-resources	
https://www.vlab.co.in/ba-nptel-labs-biotechnology-and-biomedical-engineering https://www.vlab.co.in/broad-area-biotechnology-and-biomedical-engineering https://www.amrita.edu/research/project/virtual-amrita-laboratories-biotechnology/	

Behar



अटल बिहारी वाजपेयी विश्वविद्यालय, बिलासपुर (छ.ग.)

काने 1 पुलिस थाना के सामने, बिलासपुर-रतनपुर मार्ग, कोनी, बिलासपुर (छ.ग.) 495009

Website: www.bilaspuruniversity.ac.in

Name and Signatures of Members of Board of Studies

Sl. No.	Category	Name of Nominated Members	Signature
1.	Chairperson	Dr. Neha Behar	
2.	Members	Dr. Arun Kumar Kashyap	
3.	VC Nominated members		
4.	Corporate / Industrial Area Representatives		



अटल बिहारी वाजपेयी विश्वविद्यालय, बिलासपुर (छ.ग.)

कोनी पुलिस थाना के सामने, बिलासपुर-रतनपुर मार्ग, कोनी, बिलासपुर (छ.ग.) 495009

Website : www.bilaspuruniversity.ac.in

Part A: Introduction			
Program: M.Sc. Biotechnology		Semester: II	Year: I
w.e.f.: 2023-2024			
1.	Course Code	BTT 201	
2.	Course Title	Molecular Biology	
3.	Course Type	Theory	
4.	Pre-requisite (if any)	Nil	
5.	Course Learning Outcomes (CLO)	At the end of this course, the students will be able to: <ul style="list-style-type: none">• Understand the structure and functioning of nucleic acid• Understand the fundamentals of molecular biology• Understand the concept of tools applied in the study of Biotechnology• Understand the process of expression of gene• Understand the regulation of gene expression in prokaryotes and eukaryotes	
6.	Credit Value	04	
7.	Total Marks	Internal Marks: 20 External Marks: 80	Min Passing Marks: 36

Part B: Content of the Course		
Unit	Topics	Total Hours
I.	Basic of Nucleic Acid Structure of Chromosome and its organization. Nucleic Acid: Bases, Nucleosides and Nucleotides, Structure, types and functions of DNA and RNA. Structure, types and functions of Plasmids. Transposons: Repetitive elements, Retro-transposons, LINEs & SINEs, Structure of Gene.	12
II.	Replication, Mutation & Repair DNA Replication: Enzymes involved and mechanism of DNA Replication in Prokaryotes and Eukaryotes. Mutation: Molecular level of Mutation, Types of Mutagens, Spontaneous and Induced Mutation. DNA Repair: Direct, NER, BER, Mismatch and Recombination.	12
III.	Process of transcription and RNA Processing Concept of gene, structure of gene, Transcription: Initiation, Elongation and Termination in prokaryotes. Process of initiation transcription in Eukaryotes for rRNA, tRNA and mRNA. Processing of RNA in Eukaryotes.	12
IV.	Regulation of Gene Expression Genetic Code: Features, Codon Assignment and Wobble hypothesis, Translation: Initiation, Elongation and Termination Translation machinery in Prokaryotes and Eukaryotes. Operon- Concept of Operator, Regulator, Promoter gene, Inducer and Co-repressor. Lac operon, Trp attenuation.	12

Nechar



V.	Gene silencing approaches: Cosuppression, antisense RNA techniques, ribozyme (Hammer head, hairpin ribozymes) mediated methods, dsRNA (microRNA and small interfering RNA).	12
----	---	----

Part C - Learning Resource

Text Books, Reference Books, E-Resources

Text Books:

- James D. Watson, Tania A. Baker, Stephen P. Bell, Alexander Gann, Michael Levine, Richard Losick, Molecular Biology of Genes, The Benjamin/ Cummings Publishing Company, New York.
T. A. Brown, Genomes, Wiley Publishers (Asia Pvt Ltd).
Lubert Stryer, Jeremy Berg, John Tymoczko Biochemistry, W.H.Freeman, USA.
Bruce Alberts, Alexander Johnson, Julian Lewis, Martin Raff, Keith Roberts, Peter Walter, Molecular Biology of the Cell, Garland, USA.
David L. Nelson, Michael M. Cox, Lehninger: Principles of Biochemistry, W.H.Freeman, USA.
Hartl and Jones, Genetics, Jones and Bartlett publishers, USA.
H.K.Das, Textbook of Biotechnology, Wiley Dreamtech India Pvt. Ltd. Voet and Voet, Biochemistry, John Wiley and sons (Asia Pvt Ltd).

Reference Books:

- Benjamin Lewin, Gene VIII, Oxford University press, U.K.
T. A. Brown, Genomes, Wiley Publishers (Asia Pvt Ltd).

E-Resources:

1. https://onlinecourses.swayam2.ac.in/cec20_ma13/preview
2. https://onlinecourses.swayam2.ac.in/cec19_bt02/preview
3. <https://www.classcentral.com/course/swayam-molecular-biology-19952>
4. https://onlinecourses.nptel.ac.in/noc21_bt41/preview
5. https://epgp.inflibnet.ac.in/epgpdata/uploads/epgp_content/S000002BI/P001357/M021478/ET/1501754242E-TextModule7Bacterialtranscription.pdf

Behera





अटल बिहारी वाजपेयी विश्वविद्यालय, बिलासपुर (छ.ग.)

काने 1 पुलिस थाना के सामने, बिलासपुर-रतनपुर मार्ग, कोनी, बिलासपुर (छ.ग.) 495009

Website: www.bilaspuruniversity.ac.in

Name and Signatures of Members of Board of Studies

Sl. No.	Category	Name of Nominated Members	Signature
1.	Chairperson	Dr. Neha Behar	
2.	Members	Dr. Arun Kumar Kashyap	
3.	VC Nominated members		
4.	Corporate / Industrial Area Representatives		





अटल बिहारी वाजपेयी विश्वविद्यालय, बिलासपुर (छ.ग.)

कोनी पुलिस थाना के सामने, बिलासपुर-रतनपुर मार्ग, कोनी, बिलासपुर (छ.ग.) 495009

Website : www.bilaspuruniversity.ac.in

Part A: Introduction			
Program: M.Sc. Biotechnology		Semester: II	Year: I
w.e.f.: 2023-2024			
1.	Course Code	BTT 202	
2.	Course Title	Plant Biotechnology	
3.	Course Type	Theory	
4.	Pre-requisite (if any)	Nil	
5.	Course Learning Outcomes (CLO)	At the end of this course, the students will be able to: <ul style="list-style-type: none">• Understand the basics of plant tissue culture• Understand the production of haploid and triploid• Understand the basics of plant genetic manipulation• Understand the application of Biotechnology for crop improvement• Understand the different application of Plant Genetic Engineering	
6.	Credit Value	04	
7.	Total Marks	Internal Marks: 20 External Marks: 80	Min Passing Marks: 36

Part B: Content of the Course		
Unit	Topics	Total Hours
I	Basics of Plant tissue culture: Introduction to the techniques of plant tissue culture. Concept of cellular totipotency, Nutritional requirements, single cell culture, micro-propagation, somaclonal variation, somatic embryogenesis and production of embryoids.	12
II	Production of Haploid and triploid: Haploid and double haploid production, Protoplast isolation and culture. Somatic hybridization and cybrid production and their applications in crop improvement. Productions of virus free plants using meristem culture.	12
III	Basics of plant genetic manipulation: Basis of tumor formation, hairy roots, features of Ti and Ri plasmids, mechanisms of DNA transfer, role of virulence genes, use of Ti and Ri as vectors, binary vectors, use of 35S and other promoters, genetic markers, use of reporter genes, methods of nuclear transfer, particle bombardment, electroporation, microinjection, transformation of monocots. Transgene stability and gene silencing. Herbicide and insect resistance.	12
IV	Applications of Plant Genetic Engineering – Plant Genetic Engineering: Transgenic plants, genetically modified (GM) plants (Bt cotton, Bt Brinjal), crop improvement, herbicide resistance, insect resistance, virus resistance, plants as bioreactors. Genetic modification in Agriculture –transgenic plants, genetically modified foods, application, future applications and Ecological impact of transgenic plants.	12

Neha



V	Plant secondary metabolites: Control mechanisms and manipulation of alkaloids and industrial enzymes (Shikimate and PHA pathway), biodegradable plastics, therapeutic proteins, Edible vaccines, purification strategies. Green house Technology. Biotic and Abiotic stress.	12
---	---	----

Part C - Learning Resource

Text Books, Reference Books, E-Resources

Text Books:

1. Plant Tissue Culture by MK Razdan & SS Bhojwani (1996) Elsevier
2. Plant Physiology by L Taiz & E Zeiger 4th Edition (2006) Sinauer Associates Inc, Publishers
3. Experiment in Microbiology, Plant pathology and Tissue culture by K.R. Aneja, Wishwa Prakashan
4. Genetic Transformation of Plants, Edited by Jackson, J.F.; Linskens, H.F. , Springer 2003

Reference Books:

1. Plant Biotechnology and Transgenic Plants, Edited by Kirsi Marja Oksman-Caldentey, Wolfgang Barz Marcel Dekker 2002.
2. Plant Tissue Culture Concepts and Laboratory Exercises, Second Edition, Robert N Trigiano, Dennis J Gray, CRC Press November 1999

E-Resources:

1. [https://epgp.inflibnet.ac.in/epgpdata/uploads/epgp_content/S000003BT/P001030/M028040/LM/152023471633QuadrantIIIlearnmore\(PTG,TiandRiPlasmid.pdf](https://epgp.inflibnet.ac.in/epgpdata/uploads/epgp_content/S000003BT/P001030/M028040/LM/152023471633QuadrantIIIlearnmore(PTG,TiandRiPlasmid.pdf)
2. <https://epgp.inflibnet.ac.in/Home/ViewSubject?catid=t5vt4STquHRj94mcOBMr5g==>
3. https://onlinecourses.swayam2.ac.in/ee21_bt03/preview
4. <https://www.classcentral.com/course/swayam-plant-biochemistry-and-plant-biotechnology-23080>
5. <https://epgp.inflibnet.ac.in/Home/ViewSubject?catid=t5vt4STquHRj94mcOBMr5g==>

Behar





अटल बिहारी वाजपेयी विश्वविद्यालय, बिलासपुर (छ.ग.)

काने 1 पुलिस थाना के सामने, बिलासपुर-रतनपुर मार्ग, कोनी, बिलासपुर (छ.ग.) 495009

Website: www.bilaspuruniversity.ac.in

Name and Signatures of Members of Board of Studies

Sl. No.	Category	Name of Nominated Members	Signature
1.	Chairperson	Dr. Neha Behar	
2.	Members	Dr. Arun Kumar Kashyap	
3.	VC Nominated members		
4.	Corporate / Industrial Area Representatives		





अटल बिहारी वाजपेयी विश्वविद्यालय, बिलासपुर (छ.ग.)

कोनी पुलिस थाना के सामने, बिलासपुर-रतनपुर मार्ग, कोनी, बिलासपुर (छ.ग.) 495009

Website : www.bilaspuruniversity.ac.in

Part A: Introduction			
Program: M.Sc. Biotechnology		Semester: II	Year: I
w.e.f.: 2023-2024			
1.	Course Code	BTT 203	
2.	Course Title	Environment Biotechnology	
3.	Course Type	Theory	
4.	Pre-requisite (if any)	Nil	
5.	Course Learning Outcomes (CLO)	At the end of this course, the students will be able to: <ul style="list-style-type: none">• Able to evaluate the potential of biodegradation of organic pollutants,• Understand the phenomenon of phytoremediation• Learn about the environmental quality evaluation, monitoring, and remediation• Learn about the use of biosensors in environmental analysis, environmental engineering.• Understand the application of Biotechnology in pollution abatement	
6.	Credit Value	04	
7.	Total Marks	Internal Marks: 20 External Marks: 80	Min Passing Marks: 36

Part B: Content of the Course		
Units	Topics	Total Hours
I	Introduction to Environmental Biotechnology: Ecosystems: biotic and abiotic components, Ecological pyramids, Food chains, Food webs, Habitat and niche, Energy flow in ecosystems, Types of ecosystems, Biological Magnification. Pollutants of atmosphere, water and solid wastes, Hazardous wastes. Microbial interactions in ecosystems. Introduction to Novel biocatalysts and biomaterials, Lignocellulosic residues, Biofuel and fossil fuels, Biomining and bioleaching, Bioremediation, Biosensors in bioprocessing, ecosystem analysis and related software.	12
II	Pollution and Pollution Cause: Air, Water and Soil pollution Point and non-point source pollution, Air pollution control: particulate emission, control devices, control of Sulphur dioxide pollution and vehicular pollution. Water pollution control: primary, secondary and tertiary treatment. Solid waste and soil pollution management: waste monitoring, treatment and management of non-hazardous solid waste, non-degradable solid waste, colour codes, medical solid waste.	12
III	Biodegradation and Bioconversion: Biodegradation, Bioconversion and Bioabsorption Microorganisms in lignocellulose degradation, Cellulases and xylanases, Biodegradation of starch, glycogen, pullulan, dextrans and proteins. Xenobiotic compounds: chemical properties influencing biodegradability, mechanisms of degradation, microorganisms for degrading organic pollutants (petroleum products, methane/n-alkanes, alkenes, cycloaliphatic compounds). Microorganisms in metal absorption, factors affecting bioabsorption, Phytoremediation.	12

Dehan



IV	Biotechnological Applications in Environmental Management: microorganisms and techniques, Bioenergy, Bioethanol and Biodiesel, Biomethanation (Biogas from anaerobic treatment), Biofertilizers and biopesticides, Composting: process and decomposition stages, vermicomposting, Biopolymers and Bioplastics, Bioleaching, Nanomaterials.	12
V	Remedial Mechanisms of Industrial Problems Pulp and paper industry: problems associated and treatment of pollutants, Tannery industry: effluent characteristics and treatment, Ex situ bioremediation, Distillery effluent treatment, Treatment methods for dye industry effluents, Waste reduction and treatment of effluents from pharmaceutical, petroleum and dairy industries.	12

Part C - Learning Resource

Text Books, Reference Books, E-Resources

Text Books:

1. Environmental Science, S.C. Santra.
2. Environmental Biotechnology, Pradipta Kumar Mohapatra.
3. Environmental Biotechnology – Concepts and Applications, Hans-Joachim Jordening and Josef Winter.
4. Waste Water Engineering, Metcalf and Eddy, Tata McGraw hill.
5. Agricultural Biotechnology, S.S. Purohit.
6. Environmental Microbiology : Methods and Protocols, Alicia L. Ragout De Spencer, John F.T. Spencer.
7. Introduction to Environmental Biotechnology, Milton Wainwright.
8. Principles of Environmental Engineering, Gilbert Masters.
9. Wastewater Engineering – Metcalf & Eddy.

Reference Books:

1. Environmental Biotechnology – Concepts and Applications, Hans-Joachim Jordening and Josef Winter.
2. Waste Water Engineering, Metcalf and Eddy, Tata McGraw hill.

E-Resources:

1. <https://epgp.inflibnet.ac.in/Home/ViewSubject?catid=t5vt4STquHRj94mcOBMr5g==https://lecturenotes.in/subject/652/environmental-biotechnology-eb>
2. <https://epgp.inflibnet.ac.in/Home/ViewSubject?catid=t5vt4STquHRj94mcOBMr5g==>
3. <https://epgp.inflibnet.ac.in/Home/ViewSubject?catid=t5vt4STquHRj94mcOBMr5g==>
4. https://onlinecourses.nptel.ac.in/noc21_bt41/preview/
5. <https://www.slideshare.net/tanujanautiyal/environmental-biotechnology-50099488>

Sehar



अटल बिहारी वाजपेयी विश्वविद्यालय, बिलासपुर (छ.ग.)

काने ी पुलिस थाना के सामने, बिलासपुर-रतनपुर मार्ग, कोनी, बिलासपुर (छ.ग.) 495009

Website: www.bilaspuruniversity.ac.in

Name and Signatures of Members of Board of Studies

Sl. No.	Category	Name of Nominated Members	Signature
1.	Chairperson	Dr. Neha Behar	
2.	Members	Dr. Arun Kumar Kashyap	
3.	VC Nominated members		
4.	Corporate / Industrial Area Representatives		



अटल बिहारी वाजपेयी विश्वविद्यालय, बिलासपुर (छ.ग.)

कोनी पुलिस थाना के सामने, बिलासपुर-रतनपुर मार्ग, कोनी, बिलासपुर (छ.ग.) 495009

Website : www.bilaspuruniversity.ac.in

Part A: Introduction			
Program: M.Sc. Biotechnology	Semester: II	Year: 2023	w.e.f.: 2023-2024
1. Course Code	BTT 204		
2. Course Title	Medical Biotechnology		
3. Course Type	Theory		
4. Pre-requisite (if any)	Nil		
5. Course Learning Outcomes (CLO)	At the end of this course, the students will be able to: <ul style="list-style-type: none">• Will understand the basic of vaccinology• Will understand the production of monoclonal antibody• Will have knowledge of normal flora of human body• Will understand the concept of gene therapy• Will have knowledge of different genetic disease of human		
6. Credit Value	04		
7. Total Marks	Internal Marks: 20 External Marks: 80	Min Passing Marks:36	

Part B: Content of the Course		
Unit	Topics	Total Hours
I	Vaccinology & Hybridoma Technology Active and passive immunization; live, killed, attenuated, subunit vaccines; vaccine technology: role and properties of adjuvants, recombinant DNA and protein-based vaccines, plant-based vaccines, reverse vaccinology; peptide vaccines, conjugate vaccines. generation of monoclonal antibodies, hybrid monoclonal antibodies.	12
II	Immune enhancing technology immune-enhancing technologies. Synthetic therapy; synthetic DNAs, therapeutic Ribozymes, synthetic drugs. Tools in medical biotechnology: Methods of nucleic acid analysis, the polymerase chain reaction, DNA finger printing, Southern blot and Western blot analysis; RAPD, AFLP, RFLP.	12
III	Flora of Human Body Normal microflora of human body, nosocomial infections, carriers, septic shock, septicemia, pathogenicity, virulence factors, toxins, biosafety levels.	12
IV	Genetic disease & Gene therapy Genetic disease, type of inheritance, single-gene and multifactorial inheritance, example of genetic diseases. biological role and properties, embryonic stem cell and adult stem cells, Therapeutic uses and application, problems in uses of stem cells. Gene therapy- vector system, application of gene therapy, ethical issue related to gene therapy.	12

N. S. Ch



V	DNA in Disease Diagnosis and Medical forensic- Method of DNA assay: Hybridization, DNA probe DNA probe Mechanism of action, DNA in Diagnosis of infectious disease (Tuberculosis, Malaria, AIDS). DNA in Diagnosis of genetic Disease (Sickle cell Anemia, Huntington Disease), Assisted reproductive technology, manipulation of reproduction in animal and Human.	12
---	--	----

Part C - Learning Resource

Text Books, Reference Books, E-Resources

Text Books:

- Benjamin E. (1996), Immunology – A short course 3rd Edition, John Wiley, New York
Kuby J. (1997), Immunology, 3rd Edition, W.H. Freeman & Co., New York
Roitt, I.M. (1997), Essential Immunology, 9th Edition, Oxford Black Well Science, London
Tizard I.R. (1995), Immunology – An introduction, 4th Edition, Philadelphia Saunders College
press.

Reference Books:

1. John E. Hall, Medical Physiology by Guyton, Saunders, 12th edition
2. Mims' Medical Microbiology By (author) Richard Goering, By (author) Hazel Dockrell, By
(author) Mark Zuckerman, By (author) Ivan M. Roitt, By (author) Peter L. Chiodini Saunders
(W.B.) Co Ltd.

E-Resources:

1. <https://nptel.ac.in/courses/102103041>
2. https://onlinecourses.swayam2.ac.in/cec20_bt17/preview
3. https://onlinecourses.swayam2.ac.in/cec20_bt05/preview
4. <https://nptel.ac.in/courses/102103038>

Behar



अटल बिहारी वाजपेयी विश्वविद्यालय, बिलासपुर (छ.ग.)

काने ी पुलिस थाना के सामने, बिलासपुर-रतनपुर मार्ग, कोनी, बिलासपुर (छ.ग.) 495009

Website: www.bilaspuruniversity.ac.in

Name and Signatures of Members of Board of Studies

Sl. No.	Category	Name of Nominated Members	Signature
1.	Chairperson	Dr. Neha Behar	
2.	Members	Dr. Arun Kumar Kashyap	
3.	VC Nominated members		
4.	Corporate / Industrial Area Representatives		



अटल बिहारी वाजपेयी विश्वविद्यालय, बिलासपुर (छ.ग.)

कोनी पुलिस थाना के सामने, बिलासपुर-रतनपुर मार्ग, कोनी, बिलासपुर (छ.ग.) 495009

Website : www.bilaspuruniversity.ac.in

Part A: Introduction			
Program: M.Sc. Biotechnology		Semester: II	Year: I
		w.e.f: 2023-2024	
1.	Course Code	BTT 205	
2.	Course Title	Macromolecule and Enzymology	
3.	Course Type	Theory (Elective)	
4.	Pre-requisite (if any)	Nil	
5.	Course Learning Outcomes (CLO)	<p>At the end of this course, the students will be able to:</p> <ul style="list-style-type: none"> • Will have knowledge of structure of biomolecule • Will understand the basic organization of Bio membrane • Will understand the mechanism of biological oxidation • Will have knowledge of basic of Enzyme • Will understand the Kinetics of Enzyme Action 	
6.	Credit Value	4	
7.	Total Marks	Internal Marks: 20 External Marks: 80	Min Passing Marks: 36

Part B: Content of the Course		
Unit	Topics	Total Hours
I	Protein: Introduction and protein structure Chemical basis of life; Composition of living matter; Water – properties, pH, ionization and hydrophobicity; Emergent properties of biomolecules in water; structure of proteins: protein folding and mis-folding, primary and higher order structures; structure-function relationships in model proteins: ribonuclease A, myoglobin, hemoglobin, chymotrypsin.	12
II	Carbohydrate and lipid: Carbohydrates and lipids Carbohydrates; mono, di, and polysaccharides; suitability in the context of their different functions cellular structure, energy storage, glycosylation of other biomolecules - glycoproteins and glycolipids; Lipids structure and properties of important members of storage and membrane lipids; lipoproteins.	12
III	Bio membrane and Biological Oxidation: Biomembrane organization - sidedness and function; Membrane bound proteins - structure, properties and function; membrane transport, nucleic acids - structure, diversity and function. Bioenergetics-basic principles; Equilibria and concept of free energy; Coupled processes; Glycolytic pathway; Kreb's cycle; Oxidative phosphorylation;	12
IV	Basic Enzymology: Introduction and scope, nomenclature and classification of enzymes, basic mechanism of catalysis, enzyme catalysis in organic media and ionic liquids, Industrial applications. Module II: Enzyme Kinetics Single substrate- steady state kinetics, King-Altman's method, Inhibitors and activators, Multi-substrate systems, Effect of pH and temperature, Allosteric enzymes.	12
V	Enzyme Kinetics: Thermodynamic explanation for transition complex formation, reaction mechanisms, Michaelis – Menten equation and its limitations, presentation of enzymatic data (direct and semilogarithmic), LB plot method to study enzyme kinetics, effect of substrate, pH and temperature on kinetics, allosteric enzyme kinetics. Module III: Purification and immobilization of Enzymes	12
Part C - Learning Resource		
Text Books, Reference Books, E-Resources		

N. Khan



Text Books:

1. Biochemistry (Fifth Edition), Lubert Stryer.
2. V.Voet and J.G.Voet, Biochemistry, 3rd edition, John Wiley, New York, 2004.
3. Enzyme Technology, M.F. Chaplin and C. Bucke, Cambridge University Press.
4. Enzymes: A Practical Introduction to Structure, Mechanism and Data Analysis, R.A. Copeland, John Wiley and Sons Inc.
5. Enzymes Biochemistry, Biotechnology, Clinical Chemistry, Trevor Palmer
6. Enzyme Kinetics: Behaviour and Analysis of Rapid Equilibrium and Steady State Enzyme Systems, I.H. Segel, Wiley-Interscience
7. Industrial Enzymes & their applications, H. Uhlig, John Wiley and Sons Inc

Reference Books:

1. Principles of Biochemistry, A.L. Lehninger, D.L. Nelson, M.M. Cox., Worth Publishing.
2. Harper's Biochemistry K. Robert, M.D. Murray, D.K. Granner, P.A. Mayes and V.I. Rodwell, McGraw Hill/ Appleton and Lange

E-Resources:

1. https://onlinecourses.swayam2.ac.in/cec20_bt12/preview
2. <https://www.classcentral.com/course/swayam-biomolecules-structure-function-in-health-and-disease-17534>
3. https://ugcmooocs.inflibnet.ac.in/index.php/courses/view_ug/353
4. https://epgp.inflibnet.ac.in/epgpdata/uploads/epgp_content/S001174BS/P001200/M010885/ET/1479287438P5M18eTextAug23.pdf

Neha



अटल बिहारी वाजपेयी विश्वविद्यालय, बिलासपुर (छ.ग.)

कोनी पुलिस थाना के सामने, बिलासपुर-रतनपुर मार्ग, कोनी, बिलासपुर (छ.ग.) 495009

Website : www.bilaspuruniversity.ac.in

Part A: Introduction			
Program: M.Sc. Biotechnology		Semester: II	Year: I
w.e.f: 2023-2024			
1.	Course Code	BTT 206	
2.	Course Title	Biostatistics	
3.	Course Type	Theory (Elective)	
4.	Pre-requisite (if any)	Nil	
5.	Course Learning Outcomes (CLO)	At the end of this course, the students will be able to: 1. Learn data collection, organization, summarization and analysis. 2. Demonstrate skills in drawing inferences about a body of data when only a part of the data is observed. 3. Demonstrate skills in interpreting and communicating the results of statistical analysis, orally and in writing. 4. Apply basic statistical concepts commonly used in Health and Medical Sciences. 5. Have knowledge to test the hypothesis	
6.	Credit Value		
7.	Total Marks	Internal Marks: 20 External Marks: 80	Min Passing Marks: 36
Part B: Content of the Course			
Unit	Topics	Total Hours	
I.	Measures of central tendency and dispersion: Basic terms, measures of central tendency and dispersion: Population, sample, variable, parameter, primary and secondary data, screening and representation of data. Frequency distribution, tabulation, bar diagram, histograms, pie diagram, cumulative frequency curves. Mean median, mode, quartiles and percentiles, measures of dispersion: range, variance, standard deviation, coefficient of variation.	12	
II.	Probability and distributions: Probability and distributions: Sample space, events, equally likely events. Definition of probability (frequency approach), independent events. Addition and multiplication rules, conditional probability, examples bernoulli, binomial, poisson and normal distributions.	12	
III.	Methods of sampling: Methods of sampling: Use of random numbers to generate simple random samples with replacement and without replacement. Sampling distribution and standard deviation of sample mean. Stratified sampling and its advantages.	12	
IV.	Hypothesis testing: Hypothesis testing: Hypothesis, critical region, and error probabilities. Tests for proportion, equality of proportions, equality of means of normal populations when variance known and when variances are unknown. Chi-square test for independence. P-value of the statistic. Introduction to analysis of variance.	12	
V.	Introduction, component of bioassay, role of statistics in bioassay, Type of biological assays: direct assays, indirect assays, parallel line assays, ratio estimators, asymptotic distributions, Filler's theorem. Three basic principles of design of experiments: Randomization, replication and local control. Designs of Experiments: Completely Randomized Designs (CRD), Randomized Block Designs (RBD), Latin Square Designs (LSD).	12	
Part C - Learning Resource			
Text Books, Reference Books, E-Resources			

Behera



Text Books:

1. Pandey M. (2015): Biostatistics-Basic and Advanced-MV Learning.
2. Govindarajulu Z. (2000): Statistical Techniques in Bioassay, S. Kargar
3. Zar, J.H. (2007): Biostatistical Analysis, Pearson Education 4th edition.
4. Kempthorne O. (2007): Design and Analysis of Experiments, 2nd Edition, Vol I-II, Wiley.
5. Montgomery D. C. (2008): Design and Analysis of Experiment, 7th Edition, John Wiley & sons.
6. Dass M. N. and Giri N. C. (1986): Design and Analysis of Experiments, 2nd Edition, Wiley.

Reference Books:

1. Methods in Biostatistics: For Medical Students and Research Workers, 7th Edition, Mahajan BK.
2. Understanding Biostatistics, Kallen A, 2011.
3. Fundamentals of Biostatistics 7th Edition, Rosner B, 2010.

E-Resources:

1. https://epgp.inflibnet.ac.in/epgpdata/uploads/epgp_content/S000034ST/P001025/M009957/ET/1546938553M1.pdf<https://lecturenotes.in/subject/652/environmental-biotechnology-eb>
2. https://epgp.inflibnet.ac.in/epgpdata/uploads/epgp_content/bioinformatics/02._basic_biostatistics/introduction_to_statistics_and_bio_statistics/et/5227_et_04_et.pdf
3. https://onlinecourses.nptel.ac.in/noc19_bt19/preview

Neha



अटल बिहारी वाजपेयी विश्वविद्यालय, बिलासपुर (छ.ग.)

कानेरी पुलिस थाना के सामने, बिलासपुर-रतनपुर मार्ग, कोनी, बिलासपुर (छ.ग.) 495009

Website: www.bilaspuruniversity.ac.in

Name and Signatures of Members of Board of Studies

Sl. No.	Category	Name of Nominated Members	Signature
1.	Chairperson	Dr. Neha Behar	
2.	Members	Dr. Arun Kumar Kashyap	
3.	VC Nominated members		
4.	Corporate / Industrial Area Representatives		



अटल बिहारी वाजपेयी विश्वविद्यालय, बिलासपुर (छ.ग.)

कोनी पुलिस थाना के सामने, बिलासपुर-रतनपुर मार्ग, कोनी, बिलासपुर (छ.ग.) 495009

Website : www.bilaspuruniversity.ac.in

Part A: Introduction			
Program: M.Sc. Biotechnology	Semester: II	Year: I	w.e.f.: 2023-2024
1	Course Code	BTP 201	
2	Course Title	Laboratory Course	
3	Course Type	Practical	
4	Pre-requisite (if any)	Nil	
5	Course Learning Outcomes (CLO)	At the end of this course, the students will be able to: 1. will learn the isolation of DNA 2. will learn the isolation of plasmid 3. will learn the preparation of media for plant tissue culture 4. will learn the sterilization and inoculation of callus 5. will learn the basic PTC technique	
6	Credit Value	02	
7	Total Marks	Max. Marks: 100	Min Passing Marks: -36

Part B: Content of the Course		
Based on Paper	Suggested laboratory Work/ Field Exercise	Total No. of Hours
BTT201	<ol style="list-style-type: none">1. Isolation of DNA from human blood.2. Isolation of genomic DNA from bacteria and purification by column chromatography.3. Isolation of genomic DNA from plant.4. Isolation and separation of plasmid DNA.5. Agarose gel Electrophoresis.6. Any other suggested by the teacher incharge	15
BTT202	<ol style="list-style-type: none">1. Sterilization of Plant material.2. Plant tissue culture by plant parts.3. To prepare medium for Plant tissue culture4. Callus induction and Organogenesis5. Any other Experiment suggested by the Teacher	15

Part C: Learning Resources	
Text Book, Reference Book and E resources	
Text Book	<ol style="list-style-type: none">1. Laboratory Manual in Biotechnology and Microbiology, Aneja K. R.2. Practical Microbiology, R. C. Dubey3. Laboratory Manual in Microbiology, P. Gunasekaran4. Any other Book Suggested by Teacher
E-resources	<ol style="list-style-type: none">1. https://www.vlab.co.in/ba-nptel-labs-biotechnology-and-biomedical-engineering2. https://www.vlab.co.in/broad-area-biotechnology-and-biomedical-engineering3. https://www.amrita.edu/research/project/virtual-amrita-laboratories-biotechnology/4. https://www.vlab.co.in/ba-nptel-labs-biotechnology-and-biomedical-engineering5. https://www.vlab.co.in/broad-area-biotechnology-and-biomedical-engineering6. https://www.amrita.edu/research/project/virtual-amrita-laboratories-biotechnology/

N. S. Chauhan



अटल बिहारी वाजपेयी विश्वविद्यालय, बिलासपुर (छ.ग.)

कोनी पुलिस थाना के सामने, बिलासपुर-रतनपुर मार्ग, कोनी, बिलासपुर (छ.ग.) 495009

Website : www.bilaspuruniversity.ac.in

Part A: Introduction			
Program: M.Sc. Biotechnology		Semester: II	Year: I
w.e.f.: 2023-2024			
1	Course Code	BTP 202	
2	Course Title	Laboratory Course	
3	Course Type	Practical	
4	Pre-requisite (if any)	Nil	
5	Course Learning Outcomes (CLO)	At the end of this course, the students: <ul style="list-style-type: none">• Will be able to perform BOD and COD analysis• Will be able to calculate the TDS, Microorganism present in water sample• Will be able to check the potability of water• Will be able to do basic medical test• Will be able to perform statistical analysis.	
6	Credit Value	02	
7	Total Marks	Max. Marks: 100	Min Passing Marks: 36

Part B: Content of the Course		
Based on Paper	Topics	Total No. of Hours
BTT 203	<ol style="list-style-type: none">1. To determine the total dissolved solids of water.(TDS)2. Determination of Dissolved oxygen (DO) of water.3. Determination of chemical oxygen demand (COD) of water.4. Determination of biochemical oxygen demand (BOD) of water.5. To screen the antagonism between two microorganisms.6. Determination of effect of fungicide on the growth of fungi.7. Effect of fungicide on the antagonism between two microorganisms.8. To determine the Most Probable number (MPN) of a given water sample.9. Isolation and identification of microorganisms from industrial waste water.10. Any other suggested by the teacher	15
BTT 204	<ol style="list-style-type: none">1. Enumeration of WBC in blood sample.2. Preparation of a blood smear and differential blood count.3. To separate serum from the given blood sample.4. To determine Albumin Globulin ratio in given serum sample.5. Estimation of serum protein by Folin Lowry test.6. Isolation of Immunoglobulin.7. Separation of serum protein by SDS PAGE.8. Any other suggested by the teacher	15
BTT 205	<ol style="list-style-type: none">1. Qualitative test for Carbohydrate.(Benedict's test)2. Qualitative analysis of Carbohydrate by Barfoed's test.3. Qualitative test for amino acid by Ninhydrin reaction.4. Qualitative test for amino acid by Xanthoprotic reaction.5. Qualitative test for Proteins using Biuret test.	Any one as per elective

Neeru



	6. Qualitative test for amino acid by Millon's test.	
BTF 206	<ol style="list-style-type: none">1. Draw Histogram, Pie, Graph, Line graph2. To perform spread sheet application.3. To perform image processing.4. Computer based statistical tools.5. Calculate the mean value of given sample.6. Calculate the median of the given sample.7. Find out the mode value of given sample	

Part C: Learning Resources
Text Book, Reference Book and E resources

Text Book

1. Laboratory Manual in Biotechnology and Microbiology, Aneja K. R.
2. Practical Microbiology, R. C. Dubey
3. Laboratory Manual in Microbiology, P. Gunasekaran
4. Any other Book Suggested by Teacher

E-resources

1. <https://www.vlab.co.in/ba-nptel-labs-biotechnology-and-biomedical-engineering>
2. <https://www.vlab.co.in/broad-area-biotechnology-and-biomedical-engineering>
3. <https://www.amrita.edu/research/project/virtual-amrita-laboratories-biotechnology/>
4. <https://www.vlab.co.in/ba-nptel-labs-biotechnology-and-biomedical-engineering>
5. <https://www.vlab.co.in/broad-area-biotechnology-and-biomedical-engineering>
6. <https://www.amrita.edu/research/project/virtual-amrita-laboratories-biotechnology/>

Behar





अटल बिहारी वाजपेयी विश्वविद्यालय, बिलासपुर (छ.ग.)

काने 1 पुलिस धाना के सामने, बिलासपुर-रतनपुर मार्ग, कोनी, बिलासपुर (छ.ग.) 495009

Website: www.bilaspuruniversity.ac.in

Name and Signatures of Members of Board of Studies

Sl. No.	Category	Name of Nominated Members	Signature
1.	Chairperson	Dr. Neha Behar	
2.	Members	Dr. Arun Kumar Kashyap	
3.	VC Nominated members		
4.	Corporate / Industrial Area Representatives		

