Scheme of B.Sc./ B.Sc. (Hons.) Biotechnology

Year	Course Code	Subject Name	Theory/ Practical	Total Credit	Total Marks	
					Max	Min
First year	BIOT -1T	Biochemistry, Biostatics and Computers	Theory	4	50	17
	BIOT -2T	Cell Biology, Genetics and Microbiology	Theory	4	50	17
	BIOT -1P	LAB 1: Microbiology and Biochemical Techniques	Practical	2	50	17
Second year	BIOT -3T	Molecular Biology and Biophysics	Theory	4	50	17
	BIOT -4T	Recombinant DNA Technology and Genomics	Theory	4	50	17
	BIOT -2P	LAB 2: Molecular Biology, Bioinstrumentation, and Genomics	Practical	2	50	17
Third year	BIOT -5T	Plant, Environmental and Industrial Biotechnology	Theory	4	50	17
	BIOT -6T	Immunology, Animal and Medical Biotechnology	Theory	4	50	17
	BIOT -3P	LAB 3: Applied Biotechnology	Practical	2	50	17
			Total (I+II+III years)	**30**	**450**	--

Note: There shall be four extra credits in each year for internship/apprenticeship. The certificate of extra credits for this would be provided by the university concern.

Part A: Introduction				
Program: **Certificate Course**		Class: **B.Sc. I Year**	Year: **2022**	Session: **2022-2023**
1	Course Code	**BIOT-1P**		
2	Course Title	**LAB 1 : Microbiology and Biochemical Techniques**		
3	Course Type	**Practical**		
4	Pre-requisite (if any)	As per Govt. norms.		
5	Course Learning Outcomes (CLO)	At the end of this course, the students will be able to: perform experiment related to biochemistry, microbial culture, statistical tools and computer applications		
6	**Credit Value**	**Practical: 2**		
7	**Total Marks**	**Max. Marks: 50**	**Min Passing Marks : 17**	

Part B: Content of the Course	
Total No. of Teaching Hours – 20 / 30 Periods	
Tentative Practical List	**Note:** This is tentative list; the teachers concern can add more practical's as per requirement. 1. Laboratory rules, Tools, Equipment and Other requirements in Microbiological laboratory. 2. Counting of bacteria by counting chamber, by plate count. 3. Preparation of media and cultivation techniques: (a) Basic liquid media (broth) (b) Basic Solid media, (agar slants and deep tubes) (c) Demonstration of selective and differential media (d) Isolation and enumeration of microorganisms (e) Isolation from air, water and Soil (f) Antibiotic sensitivity test 4. Smears and staining methods: (a) Preparation of bacterial smear (b) Gram Negative & Positive staining 5. Methods of obtaining pure cultures (a) Streak plate method (b) Pure plate method (c) Spread plate method (d) Broth cultures 6. Growth & Biochemical techniques (a) Determination of bacterial growth curve (b) Amylase production test (c) Cellulose production test (d) Estimation of Sugar in given solution (e) Extraction and separation of lipids (f) Estimation of proteins 7. Study of mitotic division 8. Biostatistics: (a) Graphical and tabular presentation of data (b) Problems on mean, mode and median. 9. Practical related to word, spreadsheet and presentation software

Part C - Learning Resource

Text Books, Reference Books, Other Resources

Suggested Readings:

1. Tortora GJ, Funke BR and Case CL. (2008). Microbiology: An Introduction. 9th edition. Pearson Education
2. Madigan MT, Martinko JM, Dunlap PV and Clark DP. (2014). Brock Biology of Microorganisms. 14th edition. Pearson International Edition
3. Cappucino J and Sherman N. (2010). Microbiology: A Laboratory Manual. 9th edition. Pearson Education Limited
4. Atlas RM. (1997). Principles of Microbiology. 2nd edition. WM.T.Brown Publishers.
5. Pelczar MJ, Chan ECS and Krieg NR. (1993). Microbiology. 5th edition. McGraw Hill Book Company.
6. Stanier RY, Ingraham JL, Wheelis ML, and Painter PR. (2005). General Microbiology. 5th edition. McMillan.
7. Carter J and Saunders V(2007). Virology; principles and Applications. John Wiley and Sons
8. Flint SJ, Enquist, LW, Krug, RM, Racaniello, VR Skalka, AM (2004) Principles of Virology, Molecular Biology, Pathogenesis and Control.2nd edition.ASM Press
9. Shors Teri (2013) Understanding Viruses 2nd edition Jones and Bartlett Learning Burlington USA
10. Willey JM, Sherwood LM, and Woolverton CJ. (2013). Prescott's Microbiology. 9th edition. McGraw Hill Higher Education.
11. Dimmock, NJ, Easton, AL, Leppard, KN (2007). Introduction to Modern Virology. 6th edition, Blackwell Publishing Ltd.
12. Cann AJ (2012) Principles of Molecular Virology, Academic Press Oxford UK

E-learning Resources:

https://www.coursehero.com/file/83673254/Genetics-Lab-Notespdf/
https://britannica.com
https://en.wikibooks.org/wiki/Biochemistry
https://nptel.ac.in
https://learn.genetics.utah.edu/content/labs/
https://onlinelabs.in/biology

Part D: Assessment and Evaluation

Suggested Continuous Evaluation Methods:

Maximum Marks: 50
Continuous Comprehensive Evaluation (CCE): Not Applicable
University Exam(UE): 50 Marks

Internal Assessment: Continuous Comprehensive Evaluation (CCE)	Class Test/Assignment/Presentation	Not Applicable
External assessment University Exam (UE)	As per Govt. norms.	

Declaration

Syllabus is framed as per the ToR

Name	Signature
Dr DSVGK Kaladhar, Prof & Chairperson CBoS Biotechnology, UTD ABVV	
Dr Pramod Kumar Mahish, Asst. Professor Govt. Digvijay College Rajnandgaon	
Dr Saumya Khare, Asst Prof, Kalyan PG. College Bhilai	
Dr Shubha Thakur, Asst Prof, St. Thomas College Bhilai	
Dr Akanksha Jain, Asst Prof. Shri Shankaracharya Mahavidyalaya, Bhilai	
Dr Arun Kumar Kashyap, Asst Professor, Govt. E raghavendra Rao PG. Science College Bilaspur	
Dr Tarun Kumar Patel, Asst Professor, Sant Guru Ghasidas PG. College Kurud	
Dr Neha Behar, Asst Prof. DLS PG. College Bilaspur	
Dr Sanjana Bhagat, Asst Prof. Govt Ngarjuna PG. Science College, Raipur	
Dr Kamlesh Shukla, PRSU, Raipur	
Dr Ashish Kumar, Sant Gahira Guru Vishwavidyalay Sarguja	

Part A: Introduction				
Program: **Certificate Course**		Class: **B.Sc. I Year**	Year: **2022**	Session:**2022-2023**
1	Course Code	BIOT-1T		
2	Course Title	**Biochemistry, Biostatistics and Computers**		
3	Course Type	Theory		
4	Pre-requisite (if any)	As per Govt. norms		
5	Course Learning. Outcomes (CLO)	At the end of this course, the students will be able to: • Understand on fundamentals of biological molecules. • Understand the concept of proteins, carbohydrates, lipids, vitamins and nucleic acid. • Understand the types and structures of proteins, carbohydrates, lipids, vitamins and nucleic acid.		
6	Credit Value	Theory: 4		
7	Total Marks	**Max. Marks:** 50	**Min Passing Marks:** 17	

Part B: Content of the Course		
Total No. of Teaching – Periods- 60 / Hours – 40		
Unit	**Topics**	**No. of Period / Hour**
1	1. Introduction to Biochemistry: History, Scope and Development. 2. Carbohydrates: Classification, Structure and Function of Mono, Oligo and Polysaccharides. 3. Lipids: Structure, Classification and Function. 4. pH, pK, buffer, covalent and non-covalent bond.	12 Periods / 08 Hours
2	1. Amino acids and Proteins: Classification, Structure and Properties of amino acids, Types of Proteins and their Classification and Function. 2. Enzymes: Nomenclature and Classification of enzyme, Mechanism of enzyme action, Enzyme Kinetics and Factors affecting the enzymes action. Immobilization of enzyme and their application. 3. Enzyme inhibition: Competitive and non-competitive, feedback mechanism	12 Periods / 08 Hours
3	1. Carbohydrates, Proteins and Lipid Metabolism - Glycolysis, Glycogenesis, Glyconeogenesis, Glycogenolysis and Krebs cycle. Electron Transport Chain, β-oxidation of Fatty acids and Urea cycle 2. Vitamins - Structure, Classification and Function	12 Periods / 08 Hours
4	1. Scope of Biostatistics- types of data: graphical and tabular presentation, Collection of data-sampling techniques 2. Measures of Central Tendency: Mean, Median and Mode and Standard Deviation. 3. Probability Calculation: Addition and multiplication rule. 4. Chi square test, Correlation coefficient and regression lines, ANOVA	12 Periods / 08 Hours
5	1. Computers - Organization of computer, Digital and Analogue Computers, Concept of Hardware and Software, computer languages – high and low level 2.Word, spreadsheet and presentation software 3. Application of computer in online classrooms, meeting, test and e-library	12 Periods / 08 Hours
Keywords: Biomolecules, amino acids, carbohydrates, lipids, vitamins, Biostatistics, Computers		

Part C - Learning Resource

Text Books, Reference Books, Other Resources

Suggested Readings:

1. Lehninger Principles of Biochemistry (4th Ed.) Nelson, D., and Cox, M.; W.H. Freeman and Company, New York, 2005
2. Todd and Howards Mason (2004) Text book of Biochemistry, Fourth Edition
3. Lubert Stryer and Berg ((2004) Biochemistry, Fifth Edition
4. Diana Rain, Marni Ayers Barby - (2006) Textbook on Q level Programming. 4th Edition.
5. Karl Schwartz: (2006) Guide of Micro Soft. Marina Raod, 4th Edition.
6. E Balaguruswamy by Programming in BASIC (1991).
7. RC Campbell by Statistics for Biologists. .
8. P Cassel et al by Inside Microsoft Office,
9. AC Wardlaw by Practical Statistics for Experimental Biologists,
10. JH Zar by Bio-statistical analysis
11. RR Sokal FJ Rohlf by Introduction to Biostatistics
12. L Y Kun (2003) Microbial Biotechnology: Principles and applications
13. Khan and Khanum (1994) Fundamental of Biostastics
14. Berg, J. M., Tymoczko, J. L. and Stryer, L.(2006). Biochemistry. 6th Edition. W.H Freeman & Co.
15. Buchanan, B., Gruissem, W. and Jones, R. (2000) Biochemistry and Molecular Biology of Plants. American Society of Plant Biologists.
16. Hopkins, W.G. and Huner, P.A. (2008) Introduction to Plant Physiology. John Wiley and Sons.
17. Salisbury, F.B. and Ross, C.W. (1991) Plant Physiology, Wadsworth Publishing Co. Ltd.
18. Le CT (2003) Introductory biostatistics. 1st edition, John Wiley, USA
19. Glaser AN (2001) High YieldTM Biostatistics. Lippincott Williams and Wilkins, USA
20. DSVGK Kaladhar, Molecular Biochemistry (2018) RBSA Publishers ISBN 9788176117708.
21. Edmondson A and Druce D (1996) Advanced Biology Statistics, Oxford University Press.
22. Danial W (2004) Biostatistics: A foundation for Analysis in Health Sciences, John Wiley and Sons Inc.

E-learning Resources

https://ncert.nic.in/textbook/pdf/lech205.pdf
https://www.pdfdrive.com/biomolecules-books.html
https://swayam.gov.in/
https://www.edx.org/search?q=biomolecules&tab=course
https://britannica.com
https://en.wikibooks.org/wiki/Biochemistry
https://nptel.ac.in

Part D: Assessment and Evaluation

Suggested Continuous Evaluation Methods:
Maximum Marks: 50
Continuous Comprehensive Evaluation (CCE): Not Applicable
University Exam(UE): 50 Marks

Internal Assessment: Continuous Comprehensive Evaluation (CCE)	Class Test/Assignment/Presentation	Not Applicable
External assessment University Exam (UE) Time		As per Govt. norms
Any remarks/ Suggestions: -		

Declaration

Syllabus is framed as per the ToR

Name	Signature
Dr DSVGK Kaladhar, Prof & Chairperson CBoS Biotechnology, UTD ABVV	3/6/2022
Dr Pramod Kumar Mahish, Asst. Professor Govt. Digvijay College Rajnandgaon	3/6/22
Dr Saumya Khare, Asst Prof, Kalyan PG. College Bhilai	3.6.22
Dr Shubha Thakur, Asst Prof, St. Thomas College Bhilai	3/6/22
Dr Akanksha Jain, Asst Prof. Shri Shankaracharya Mahavidyalaya, Bhilai	3/6/22
Dr Arun Kumar Kashyap, Asst Professor, Govt. E raghavendra Rao PG. Science College Bilaspur	3/6/22
Dr Tarun Kumar Patel, Asst Professor, Sant Guru Ghasidas PG. College Kurud	03/06/2022
Dr Neha Behar, Asst Prof. DLS PG. College Bilaspur	3/6/22
Dr Sanjana Bhagat, Asst Prof. Govt Ngarjuna PG. Science College, Raipur	3/6/22
Dr Kamlesh Shukla, PRSU, Raipur	
Dr Ashish Kumar, Sant Gahira Guru Vishwavidyalay Sarguja	

Part A: Introduction				
Program: **Diploma Course**		Class: **B.Sc. II Year**	Year: **2023**	Session: 2023-2024
1	Course Code	BIOT-2P		
2	Course Title	**LAB 2: Molecular Biology, Bioinstrumentation, and Genomics**		
3	Course Type	**Practical**		
4	Pre-requisite (if any)	As per Govt. norms.		
5	Course Learning Outcomes (CLO)	At the end of this course, the students will be able to: • Understand on fundamentals of Recombinant DNA Technology. • Understand on estimation of DNA and RNA. • Understand on the concept of bioinformatics		
6	**Credit Value**	**Practical: 2**		
7	**Total Marks**	**Max. Marks: 50**	**Min Passing Marks : 17**	

Part B: Content of the Course	
Total No. of Teaching Hours – 20 / 30 Periods	
Tentative Practical List	**Note:** This is tentative list; the teachers concern can add more program as per requirement. 1. Preparation of LB broth and agar 2. Isolation of DNA from Plant cell. 3. Estimation of DNA by DPA method. 4. Isolation RNA from yeast cells 5. Use of Centrifugation 6. Determination of glucose concentration using Spectrophotometer/Colorimeter 7. Electrophoresis, Agarose gel and SDS PAGE 8. Isolation of primary metabolites and Secondary metabolites from Paper chromatography/TLC 9. Retrieve DNA /Protein sequence from Biological Data Bases (NCBI). 10. Use of Bioinformatics tools studied 11. Primer designing 12. Study of similar sequence alignment using BLAST and Clustal W 13 Generating phylogenetic tree using MEGA 14. Tertiary structure prediction using SWISSMODEL
Keywords: DNA/RNA Isolation, NCBI, BLAST, Electrophoresis, TLC	

Part C - Learning Resource

Text Books, Reference Books, Other Resources

Suggested Readings:

1. Lehninger: Principles of Biochemistry (2013) 6th ed., /Nelson, D.L. and Cox, M.M., W H Freeman and Company (New York), ISBN:13: 978-1-4641-0962-1 / ISBN:10:1-4292- 3414-8.
2. Devlin, T.M., Textbook of Biochemistry with Clinical Correlations (2011) 7th ed., John Wiley & Sons, Inc. (New York), ISBN: 978-0-470-28173-4 / BRV ISBN: 978-0-470- 60152-5.
3. Karp, G. 2010. Cell and Molecular Biology: Concepts and Experiments. 6th Edition. John Wiley& Sons. Inc.
4. De Robertis, E.D.P. and De Robertis, E.M.F. 2006. Cell and Molecular Biology. 8th edition. Lippincott Williams and Wilkins, Philadelphia.
5. Cooper, G.M. and Hausman, R.E. 2009. The Cell: A Molecular Approach. 5th edition. ASM Press & Sunderland, Washington, D.C.; Sinauer Associates, MA.
6. Becker, W.M., Kleinsmith, L.J., Hardin. J. and Bertoni, G. P. 2009 The World of the Cell 7th edition. Pearson Benjamin Cummings Publishing, San Francisco.
7. Donald, V. and Judith G.V., Biochemistry (2011) 4th ed., John Wiley & Sons Asia Pvt. Ltd. (New Jersey), ISBN:978-1180-25024.
8. Nicholas C.P. and Lewis S Fundamentals of Enzymology (1999) 3rd ed., Oxford University Press Inc. (New York), ISBN:0 19 850229 X.

9. Berg, J.M., Tymoczko, J.L. and Stryer L.,Biochemistry (2012) 7th ed., W.H. Freeman and Company (New York), ISBN:10:1-4292-2936-5, ISBN:13:978-1-4292-2936-4
10. Akanksha Jain, Sonia Bajaj, Sushma Solanki (2022) Text book of Biotechnology, Probecell Press

E-learning Resources:

https://ia600105.us.archive.org/30/items/FundamentalsBiochemistry4e_201802/FundamentalsBiochemistry4e.pdf
https://vlab.amrita.edu/?sub=3&brch=273
https://britannica.com
https://en.wikibooks.org/wiki/Biochemistry
https://nptel.ac.in
https://www.biointeractive.org/classroom-resources/bacterial-identification-virtual-lab
https://www.vlab.co.in/

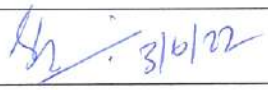
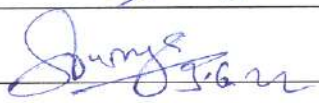
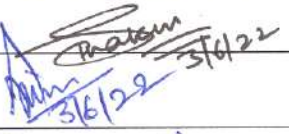
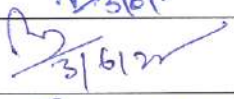
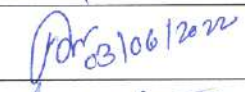
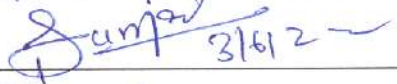
Part D: Assessment and Evaluation

Suggested Continuous Evaluation Methods:
Maximum Marks: 50
Continuous Comprehensive Evaluation (CCE): Not Applicable
University Exam(UE): 50 Marks

Internal Assessment: Continuous Comprehensive Evaluation (CCE)	Class Test/Assignment/Presentation	Not Applicable
External assessment University Exam (UE)	As per Govt. norms.	

Declaration

Syllabus is framed as per the ToR

Name	Signature
Dr DSVGK Kaladhar, Prof & Chairperson CBoS Biotechnology, UTD ABVV	
Dr Pramod Kumar Mahish, Asst. Professor Govt. Digvijay College Rajnandgaon	
Dr Saumya Khare, Asst Prof, Kalyan PG. College Bhilai	
Dr Shubha Thakur, Asst Prof, St. Thomas College Bhilai	
Dr Akanksha Jain, Asst Prof. Shri Shankaracharya Mahavidyalaya, Bhilai	
Dr Arun Kumar Kashyap, Asst Professor, Govt. E raghavendra Rao PG. Science College Bilaspur	
Dr Tarun Kumar Patel, Asst Professor, Sant Guru Ghasidas PG. College Kurud	
Dr Neha Behar, Asst Prof. DLS PG. College Bilaspur	
Dr Sanjana Bhagat, Asst Prof. Govt Ngarjuna PG. Science College, Raipur	
Dr Kamlesh Shukla, PRSU, Raipur	
Dr Ashish Kumar, Sant Gahira Guru Vishwavidyalay Sarguja	

Part A: Introduction				
Program: **Certificate Course**		Class: **B.Sc. I Year**	Year: **2022**	Session:**2022-2023**
1	Course Code	BIOT-2T		
2	Course Title	**Cell Biology, Genetics and Microbiology**		
3	Course Type	Theory		
4	Pre-requisite (if any)	As per Govt. norms		
5	Course Learning. Outcomes (CLO)	At the end of this course, the students will be able to: • Understand on fundamentals of cellular organization, microorganisms and inheritance • Understand the concept of genetics and microbial fundamentals • Understand the types of cell organelles and various microbes		
6	Credit Value	Theory: 4		
7	Total Marks	**Max. Marks:** 50	**Min Passing Marks:** 17	

Part B: Content of the Course		
Total No. of Teaching – Periods- 60 / Hours – 40		
Unit	**Topics**	No. of Period / Hour
1	1. Cell theory and its modern interpretation 2. Diversity of Cell shape and size. 3. Prokaryotic cell structure: Function and ultra-structure of cell (Gram positive and Gram negative Bacteria), Flagella, Pilli, Endospore and Capsule. 4. Eukaryotic cell: Plants and animal.	12 Periods / 08 Hours
2	1. Cytoplasm: Structure and Functions of Endoplasmic reticulum, Ribosome, Golgi complex, Lysosomes, Nucleus, Mitochondria, Chloroplast and Chromosomes 2. Cytoskeleton: Microtubules, Microfilaments and Intermediate filaments. 3. Cell division: Mitosis and Meiosis. Cell cycle 4. Programmed Cell Death.	12 Periods / 08 Hours
3	1. Mendel's Laws of Inheritance. Non-mendelian inheritance 2. Linkage and Crossing over. 3. Chromosome variation in number and structure: Deletion, Duplication, Translocation, Inversion and Aneuploidy, Euploidy (Monoploidy, Polyploidy and its importance).	12 Periods / 08 Hours
4	1. History, Scope and Development of Microbiology. 2. Basic techniques of Microbial Culture 3. Microbial Growth & Nutrition of Bacteria: Isolation, media sterilization-physical and chemical agents, pure culture- pour plate method, streak plate method and spread plate method. 4. General features and Economic importance of Fungi, bacteria and cyanobacteria.	12 Periods / 08 Hours
5	1. Bacterial Reproduction: Conjugation, Transduction and Transformation. 2. Mycoplasma – History, Classification, Structure reproduction & Diseases. 3. Viruses – Basic features, Structure, Classification, Multiplication and Bacteriophages (Morphology, life cycle, infection and medicinal importance)	12 Periods / 08 Hours
Keywords: Cell, Cytoplasm, Law of inheritance, Gene interaction, Microbial culture, microbial reproduction.		

Part C - Learning Resource

Text Books, Reference Books, Other Resources

Suggested Readings:

1. C.B. Power- Cell biology, First Edition (2005), Himalaya Publishing House.
2. Gereld Karp - Dell and molecular biology, 4th Edition (2005)
3. P.K. Gupta - Cell and molecular biology, Second Edition (2003), Rastogi publications.
4. S.S. Purohit - Microbiology : Fundamentals and Applications, 6th Edition (2004)
5. R.C. Dubey and D.K. Maheshwari: Practical Microbiology. S.Chand Publication.
6. Tortora, Funke and Case - Microbiology, An introduction, sixth Edition (1995), Benjamin/Cummings Publishing Company.
7. Prescott, Harlyey and Klein - Microbiology, Third Edition, Wm. C. Brown Publishers (1996).
8. P. Chakraoborthy - Textbook of microbiology, Second Edition (2007).
9. Microbial Genetics, David Freifelder, John F Cronan, Stanley R Maloy, Jones and Bartlett Publishers.
10. Elements of Human Genetics. I.I. cavalla-Sfoeza, WA Benjamin Advanced Book Program.

E-learning Resources

https://www.easybiologyclass.com/topic-genetics/
https://freebookcentre.net/medical_text_books_journals/genetics_ebooks_online_texts_download.html
https://britannica.com
https://en.wikibooks.org/wiki/Biochemistry
https://nptel.ac.in

Part D: Assessment and Evaluation

Suggested Continuous Evaluation Methods:
Maximum Marks: 50
Continuous Comprehensive Evaluation (CCE): Not Applicable
University Exam(UE): 50 Marks

Internal Assessment: Continuous Comprehensive Evaluation (CCE)	Class Test/Assignment/Presentation	Not Applicable
External assessment University Exam (UE) Time 3Hours		As per Govt. norms.

Any remarks/ Suggestions: -

Declaration

Syllabus is framed as per the ToR

Name	Signature
Dr DSVGK Kaladhar, Prof & Chairperson CBoS Biotechnology, UTD ABVV	3/6/22
Dr Pramod Kumar Mahish, Asst. Professor Govt. Digvijay College Rajnandgaon	3/6/22
Dr Saumya Khare, Asst Prof, Kalyan PG. College Bhilai	
Dr Shubha Thakur, Asst Prof, St. Thomas College Bhilai	3/6/22
Dr Akanksha Jain, Asst Prof. Shri Shankaracharya Mahavidyalaya, Bhilai	3/6/22
Dr Arun Kumar Kashyap, Asst Professor, Govt. E raghavendra Rao PG. Science College Bilaspur	3/6/22
Dr Tarun Kumar Patel, Asst Professor, Sant Guru Ghasidas PG. College Kurud	03/06/2022
Dr Neha Behar, Asst Prof. DLS PG. College Bilaspur	
Dr Sanjana Bhagat, Asst Prof. Govt Ngarjuna PG. Science College, Raipur	3/6/22
Dr Kamlesh Shukla, PRSU, Raipur	
Dr Ashish Kumar, Sant Gahira Guru Vishwavidyalay Sarguja	

Part A: Introduction				
Program: **B.Sc Course**		Class: **B.Sc. III Year**	Year: **2024**	Session: **2024-2025**
1	Course Code	**BIOT-3P**		
2	Course Title	**LAB 3: Applied Biotechnology**		
3	Course Type	**Practical**		
4	Pre-requisite (if any)	As per Govt. norms		
5	Course Learning Outcomes (CLO)	At the end of this course, the students will be able to: • learn to prepare Plant Tissue Culture (PTC) media • learn to perform PTC • learn to determine the quality of water • learn to perform the diagnostic test of microbial disease		
6	**Credit Value**	**Practical: 2**		
7	**Total Marks**	**Max. Marks: 50**	**Min Passing Marks : 17**	

Part B: Content of the Course	
Total No. of Teaching Hours – 20 / 30 Periods	
Tentative Practical List	**Note:** This is tentative list; the teachers concern can add more practical's as per requirement. 1. Preparation of Tissue culture media (ATC/PTC). 2. Sterilization of plant material (Explants). 3. Seed Germination, Root, Shoot and Callus Culture. 4. Determination of total dissolved solids of water. 5. Determination of DO, BOD, COD of water. 6. Determination of Coliform by MPN Test. 7. Production of Enzymes/Antibiotics/Acids. 8. Effect of Biopesticides on microorganism. 9. Antigen Antibody interaction- Determination of Blood Group and Rh factor. 10. Widal Test 11. VDRL Test. 12. ELISA Test. 13. Perform of Immuno-diffusion test

Part C - Learning Resource
Text Books, Reference Books, Other Resources
Suggested Readings: 1. Molecular Biotechnology: Principles and Applications of Recombinant DNA (2010) 4th ed., Glick B.R., Pasternak, J.J. and Patten, C.L., ASM Press (Washington DC), ISBN: 978-1-55581-498-4 (HC). 2. Lehninger: Principles of Biochemistry (2013) 6th ed., Nelson, D.L. and Cox, M.M., W.H. Freeman and Company (New York), ISBN:13; 978-1-4641-0962-1 / ISBN:10-14641- 0962-1. 3. Textbook of Biochemistry with Clinical Correlations (2011) Devlin, T.M. John Wiley & Sons, Inc. (New York), ISBN: 978-0-4710-28173-4. 4. Molecular Biochemistry (2018) DSVGK Kaladhar, RBSA Publishers ISBN 9788176117708. 5. . Introduction to Human Physiology (2013) 8th edition; Lauralee Sherwood. Brooks/Cole, Cengage Learning.

E-learning Resources:

https://britannica.com
https://en.wikibooks.org/wiki/Biochemistry
https://nptel.ac.in
https://freebookcentre.net/biology-books-download/Introduction-to-Biotechnology-Laboratory-Manual.html
http://site.iugaza.edu.ps/mwhindi/files/Laboratory_Manual_And_Workbook_In_Microbiology.pdf
https://www.vnmkv.ac.in/student-academic/Study_Material_Practical_Manual_Fundamental_of_Plant_Biochemistry_Biotechnology.pdf

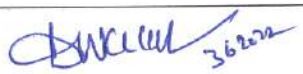
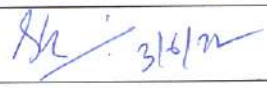
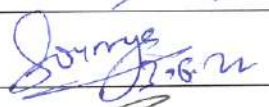
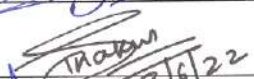
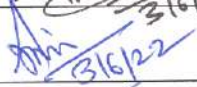
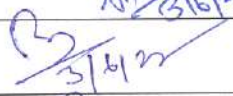
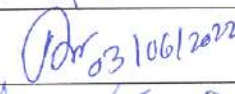
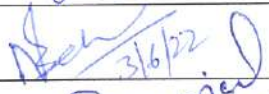
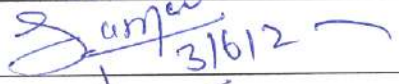
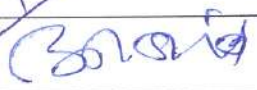
Part D: Assessment and Evaluation

Suggested Continuous Evaluation Methods:
Maximum Marks: 50
Continuous Comprehensive Evaluation (CCE): Not Applicable
University Exam(UE): 50 Marks

Internal Assessment: Continuous Comprehensive Evaluation (CCE)	Class Test/Assignment/Presentation	Not Applicable
External assessment University Exam (UE)	As per Govt. norms	

Declaration

Syllabus is framed as per the ToR

Name	Signature
Dr DSVGK Kaladhar, Prof & Chairperson CBoS Biotechnology, UTD ABVV	
Dr Pramod Kumar Mahish, Asst. Professor Govt. Digvijay College Rajnandgaon	
Dr Saumya Khare, Asst Prof, Kalyan PG. College Bhilai	
Dr Shubha Thakur, Asst Prof, St. Thomas College Bhilai	
Dr Akanksha Jain, Asst Prof. Shri Shankaracharya Mahavidyalaya, Bhilai	
Dr Arun Kumar Kashyap, Asst Professor, Govt. E raghavendra Rao PG. Science College Bilaspur	
Dr Tarun Kumar Patel, Asst Professor, Sant Guru Ghasidas PG. College Kurud	
Dr Neha Behar, Asst Prof. DLS PG. College Bilaspur	
Dr Sanjana Bhagat, Asst Prof. Govt Ngarjuna PG. Science College, Raipur	
Dr Kamlesh Shukla, PRSU, Raipur	
Dr Ashish Kumar, Sant Gahira Guru Vishwavidyalay Sarguja	

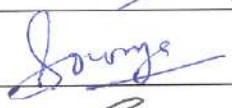
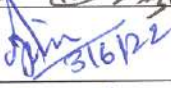
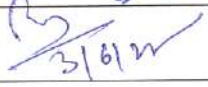
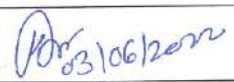
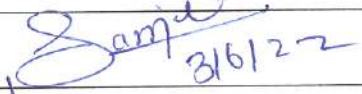
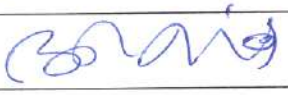
Part A: Introduction				
Program: **Diploma Course**		Class: **B.Sc. II Year**	Year: **2023**	Session:**2023-2024**
1	Course Code	BIOT-3T		
2	Course Title	**Molecular Biology and Biophysics**		
3	Course Type	Theory		
4	Pre-requisite (if any)	As per Govt. norms		
5	Course Learning. Outcomes (CLO)	At the end of this course, the students will be able to: • Understand on fundamentals of molecular biology and instrumentation • Understand the concept of tools applied in the study of biotechnology • Understand the expression of gene		
6	Credit Value	Theory: 4		
7	Total Marks	**Max. Marks:** 50	**Min Passing Marks:** 17	

Part B: Content of the Course		
Total No. of Teaching – Periods- 60 / Hours – 40		
Unit	**Topics**	No. of Period / Hour
1	1. Nucleic Acid: Bases, Nucleosides and Nucleotides, Structure, types and functions of DNA and RNA. 2. Structure, types and functions of Plasmids. 3. Transposons: Repetitive elements, Retro-transposons, LINEs & SINEs. Structure of Gene.	12 Periods / 08 Hours
2	1. DNA Replication: Enzymes involved and mechanism of DNA Replication in Prokaryotes. 2. Mutation: Molecular level of Mutation, Types of Mutagens, Spontaneous and Induced Mutation. 3. DNA Repair: Direct, NER, BER, Mismatch and Recombination.	12 Periods / 08 Hours
3	1. Transcription: Initiation, Elongation and Termination in prokaryotes. 2. Genetic Code: Features, Codon Assignment and Wobble hypothesis 3. Translation: Initiation, Elongation and Termination Translation machinery in Prokaryotes. 4. Operon- Concept of Operator, Regulator, Promoter gene, Inducer and Co-repressor.	12 Periods / 08 Hours
4	1. Biophysics : Introduction, Scope and Application 2. Principle, Types, Instrumentation and Functions of the following: a. Microscope b. Colorimeter and UV-VIS Spectrophotometer c. Electrophoresis (Agarose and PAGE) d. Centrifuge e. Chromatography (Paper, TLC and HPLC).	12 Periods / 08 Hours
5	1. Radioisotopes techniques: Radioactive decay, Measurement of radioactivity, Ionization Chambers, Geiger Muller and Scintillation Counter. 2. Autoradiography, DNA Fingerprinting, 3. Blotting techniques: Southern Northern and western blotting.	12 Periods / 08 Hours
Keywords: DNA, RNA, Replication, Transcription, Translation, Bioinstruments, Biophysics		

Part C - Learning Resource		
Text Books, Reference Books, Other Resources		
Suggested Readings: 1. Gerald Karp - Cell and Molecular biology, 4th Edition (2005). 2. Lewis J.Klein Smith and Valerie M.Kish-Principles of cell and molecular biology-Third Edition (2002) 3. P.K. Gupta- Cell and molecular biology, Second Edition (2003), Rastogi publications. 4. Richard M-Twyaman-Advanced Molecular Biology, First South Asian Edition (1998), VivaBooks Pvt. Ltd. 5. K. Wilson and J. Walker (2012) Principle and Techniques of Biotechnology and Molecular Biotechnology. 6. DSVGK Kaladhar, Molecular Biochemistry (2018) RBSA Publishers ISBN 9788176117708. 7. Upadhya and Upadhya : Biophysical Chemistry. 8. David, I. Nelson and Michael M.Cox :Lehniger : Principal of Biochemistry 4th Edition. W.H. Freeman and Company, New York. 9. Buchanan, Gruissemen & Jones (2015) Biochemistry & Molecular Biology of Plant, 2nd edition. **E-learning Resources** https://ncert.nic.in/textbook/pdf/lech205.pdf https://www.pdfdrive.com/biomolecules-books.html https://swayam.gov.in/ https://www.edx.org/search?q=biomolecules&tab=course https://britannica.com https://en.wikibooks.org/wiki/Biochemistry https://nptel.ac.in		
Part D: Assessment and Evaluation		
Suggested Continuous Evaluation Methods: Maximum Marks: 50 Continuous Comprehensive Evaluation (CCE): Not Applicable University Exam(UE): 50 Marks		
Internal Assessment: Continuous Comprehensive Evaluation (CCE)	Class Test/Assignment/Presentation	Not Applicable
External assessment University Exam (UE) Time 3Hours		As per Govt. norms
Any remarks/ Suggestions: -		

Declaration

Syllabus is framed as per the ToR

Name	Signature
Dr DSVGK Kaladhar, Prof & Chairperson CBoS Biotechnology, UTD ABVV	
Dr Pramod Kumar Mahish, Asst. Professor Govt. Digvijay College Rajnandgaon	
Dr Saumya Khare, Asst Prof, Kalyan PG. College Bhilai	
Dr Shubha Thakur, Asst Prof, St. Thomas College Bhilai	
Dr Akanksha Jain, Asst Prof. Shri Shankaracharya Mahavidyalaya, Bhilai	
Dr Arun Kumar Kashyap, Asst Professor, Govt. E raghavendra Rao PG. Science College Bilaspur	
Dr Tarun Kumar Patel, Asst Professor, Sant Guru Ghasidas PG. College Kurud	
Dr Neha Behar, Asst Prof. DLS PG. College Bilaspur	
Dr Sanjana Bhagat, Asst Prof. Govt Ngarjuna PG. Science College, Raipur	
Dr Kamlesh Shukla, PRSU, Raipur	
Dr Ashish Kumar, Sant Gahira Guru Vishwavidyalay Sarguja	

Part A: Introduction				
Program: Diploma **Course**		Class: **B.Sc. II Year**	Year: **2023**	Session:**2023-2024**
1	Course Code	BIOT-4T		
2	Course Title	RECOMBINANT DNA TECHNOLOGY AND GENOMICS		
3	Course Type	Theory		
4	Pre-requisite (if any)	As per Govt. norms		
5	Course Learning. Outcomes (CLO)	At the end of this course, the students will be able to: • Understand the fundamentals of Genetic engineering and biological databases • learn the basic techniques of RDT • Understand the concept of genomics		
6	Credit Value	Theory: 4		
7	Total Marks	**Max. Marks:** 50	**Min Passing Marks:** 17	

Part B: Content of the Course		
Total No. of Teaching – Periods- 60 / Hours – 40		
Unit	**Topics**	No. of **Period / Hour**
1	1. Recombinant DNA technology: General concept. Steps in gene cloning and application. 2. Restriction Modification System, Ligases and Polymerases, Klenow fragment, Taq, Pfu polymerase and Nuclease (Endo, Exo and restriction endonuclease). 3. Modification Enzyme (Kinase, Phosphates and terminal deoxynucleotidyl transferase). Reverse Transcriptase.	12 Periods / 08 Hours
2	1. Vectors: Plasmid, Bacteriophages, Cosmid, Phagemid, BAC, YAC and Expression vectors. 2. Gene Library: Genomic and cDNA library. 3. Selection and Screening of Recombinants: Genetic (Blue White Screening) and Hybridization methods- Colony hybridization and immunoblotting	12 Periods / 08 Hours
3	1. PCR: Types of PCR, Steps (Denaturation, Annealing and Extension); Applications, Advantages and Limitation of PCR. 2. Molecular Marker-RFLP, RAPD, AFLP, SSR SNP . 3. Site Directed Mutagenesis, Gene Silencing (siRNA, miRNA)	12 Periods / 08 Hours
4	1. Basic concept of Gene Transfer Methods: Microinjection, Electroporation, Lipofection. 2. Gene Therapy: In vivo and Ex vivo, Germ line and Somatic gene therapy. 3. Basic idea of Stem cell technology: Types of stems cell cultures and their Significance.	12 Periods / 08 Hours
5	1. Basic concept of Genomics: Structural and Functional Genomics 2. Shot Gun and Whole Genome Sequencing 3. Comparative Genomics: RT-PCR, SAGE, Microarray 4. Human Genome Project.	12 Periods / 08 Hours
Keywords: Genetic engineering, Gene therapy, Bioinformatics, Genomics, Molecular Markers, PCR		

Declaration

Syllabus is framed as per the ToR

Name	Signature
Dr DSVGK Kaladhar, Prof & Chairperson CBoS Biotechnology, UTD ABVV	
Dr Pramod Kumar Mahish, Asst. Professor Govt. Digvijay College Rajnandgaon	
Dr Saumya Khare, Asst Prof, Kalyan PG. College Bhilai	
Dr Shubha Thakur, Asst Prof, St. Thomas College Bhilai	
Dr Akanksha Jain, Asst Prof. Shri Shankaracharya Mahavidyalaya, Bhilai	
Dr Arun Kumar Kashyap, Asst Professor, Govt. E raghavendra Rao PG. Science College Bilaspur	
Dr Tarun Kumar Patel, Asst Professor, Sant Guru Ghasidas PG. College Kurud	
Dr Neha Behar, Asst Prof. DLS PG. College Bilaspur	
Dr Sanjana Bhagat, Asst Prof. Govt Ngarjuna PG. Science College, Raipur	
Dr Kamlesh Shukla, PRSU, Raipur	
Dr Ashish Kumar, Sant Gahira Guru Vishwavidyalay Sarguja	

Part A: Introduction				
Program: **B.Sc. Course**		Class: **B.Sc. III Year**	Year: **2024**	Session:**2024-2025**
1	Course Code	BIOT-5T		
2	Course Title	**Plant, Environmental and Industrial Biotechnology**		
3	Course Type	Theory		
4	Pre-requisite (if any)	As per Govt. norms		
5	Course Learning. Outcomes (CLO)	At the end of this course, the students will be able to: • learn the basics of plant tissue culture • learn the application of GMO plants • learn about basics of Environmental Biotechnology and its management • learn the basics of Biological degradation of pollutant • learn the basics of Bioreactor		
6	Credit Value	Theory: 4		
7	Total Marks	**Max. Marks:** 50	**Min Passing Marks:** 17	

Part B: Content of the Course		
Total No. of Teaching – Periods- 60 / Hours – 40		
Unit	**Topics**	No. of Period / Hour
1	1.Introduction to Plant cell and tissue culture: History Scope and Applications; Tissue culture media 2. Micropropagation, Somatic embryogenesis, Organogenesis, Somaclonal variations 3. Protoplast isolation and fusion, Anther and Ovule culture, Triploid production	12 Periods / 08 Hours
2	1.Agrobacterium mediated Transformation, Ti & Ri Plasmid 2. Bt gene and its applications, Edible vaccine; Genetically modified plants: Herbicide resistant Plant and drought resistant plants 3. Germplasm storage and cryopreservation	12 Periods / 08 Hours
3	1. Environmental Biotechnology: Introduction and scope 2. Environmental pollution and its types, Global environmental problems (Acid rain, Ozone depletion, Global warming) 3. Solid Waste management: Principle of management, Concept of composting and Vermicomposting 4. Wastewater Treatment: Primary, Secondary and Tertiary treatment	12 Periods / 08 Hours
4	1.Biofertilizer and Biopesticides: types and applications 2. Bioremediation and Biodegradation of Xenobiotics: Phytoremediation, Bioleaching 3. Biological indicators of pollution, Biotechnological method of pollution management	12 Periods / 08 Hours
5	1. Types of Bioreactor: Design of Stirred tank, Fluidized bed 2. Fermentation: Lactic acid & Alcohol 3. Industrially important microoganisms: Isolation, Preservation (Slant, Mineral Oil and Lyophilize) and its application) 4. Food Technology: Production of fermented foods (Chees, Butter milk & Yoghourt), Food spoilage, Canning, Packing and Food Preservation	12 Periods / 08 Hours
Keywords: Plant cell and Tissue culture, Agrobacterium, Waste water treatment, Bioremediation, Bioreactor,		

Part C - Learning Resource		
Text Books, Reference Books, Other Resources		
Suggested Readings: 1. A text Book of Biotechnology: Indu Shekher Thakur, 2nd edition. I.K. International Pvt. Ltd. New Delhi. 2. Biotechnology (Fundamentals and Applications): S.S. Purohit - Agrobios (India), Jodhpur. 3. Fundamentals of Microbiology and Immunology: Ajit Kr. Banerjee, Nirmalya Banerjee – New Central Book Agency (NCBA); 1st edition (2017) 4. Plant Biotechnology: H.S. Chawla Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi. 5. Plant Biotechnology: B.D. Singh - Kalyani Publication, New Delhi. 6. Biotechnology: Fundamental & Application (2005) S.S. Purohit 7. Immunology: J. Kubey et al. 7th edition. 8. Immunology: Roitt et al. 9. Fundamental of Immunology: W. Paul. 10. Plant Tissue culture: K. K. De. 11. Plant Tissue Culture (Practical): H.S. Chawla. 12. Biochemistry & Molecular Biology of Plant: Buchanan, Gruissemen& Jones 2nd edition. 13. Tools and Techniques in Biotechnology (2011) M. Debnath **E-learning Resources** https://swayam.gov.in/ https://lecturenotes.in/subject/652/environmental-biotechnology-eb https://britannica.com https://en.wikibooks.org/wiki/Biochemistry https://nptel.ac.in https://onlinecourses.nptel.ac.in/noc21_bt41/preview		
Part D: Assessment and Evaluation		
Suggested Continuous Evaluation Methods: Maximum Marks: 50 Continuous Comprehensive Evaluation (CCE): Not Applicable University Exam(UE): 50 Marks		
Internal Assessment: Continuous Comprehensive Evaluation (CCE)	Class Test/Assignment/Presentation	Not Applicable
External assessment University Exam (UE) Time 3Hours		As per Govt. norms
Any remarks/ Suggestions: -		

Declaration

Syllabus is framed as per the ToR

Name	Signature
Dr DSVGK Kaladhar, Prof & Chairperson CBoS Biotechnology, UTD ABVV	
Dr Pramod Kumar Mahish, Asst. Professor Govt. Digvijay College Rajnandgaon	
Dr Saumya Khare, Asst Prof, Kalyan PG. College Bhilai	
Dr Shubha Thakur, Asst Prof, St. Thomas College Bhilai	
Dr Akanksha Jain, Asst Prof. Shri Shankaracharya Mahavidyalaya, Bhilai	
Dr Arun Kumar Kashyap, Asst Professor, Govt. E raghavendra Rao PG. Science College Bilaspur	
Dr Tarun Kumar Patel, Asst Professor, Sant Guru Ghasidas PG. College Kurud	
Dr Neha Behar, Asst Prof. DLS PG. College Bilaspur	
Dr Sanjana Bhagat, Asst Prof. Govt Ngarjuna PG. Science College, Raipur	
Dr Kamlesh Shukla, PRSU, Raipur	
Dr Ashish Kumar, Sant Gahira Guru Vishwavidyalay Sarguja	

Part A: Introduction				
Program: B.Sc **Course**		Class: **B.Sc. III Year**	Year: **2024**	Session:**2024-2025**
1	Course Code	BIOT-6T		
2	Course Title	**Immunology, Animal and Medical Biotechnology**		
3	Course Type	Theory		
4	Pre-requisite (if any)	As per Govt. norms		
5	Course Learning. Outcomes (CLO)	At the end of this course, the students will be able to: • learn the basics of immune system • learn about the DNA diagnostic methods • learn the types of Ag-Ab interaction • learn the basics of Animal tissue culture		
6	Credit Value	Theory: 4		
7	Total Marks	**Max. Marks:** 50	**Min Passing Marks:** 17	

Part B: Content of the Course		
Total No. of Teaching – Periods- 60 / Hours – 40		
Unit	**Topics**	**No. of Period / Hour**
1	1. Concept of Immunity: Innate and Acquired, Humoral and Cell mediated Response. 2. Cells and Organs involved in Immune system-Structure and Function. 3. Antigen, Antibody: Types, Structure and Functions.	12 Periods / 08 Hours
2	1. Cytokines 2. Autoimmune diseases- Hemolytic Anemia, Rheumatoid arthritis, Insulin dependent diabetes. 3. Immuno deficiencies. Diseases-SCID, AIDS.	12 Periods / 08 Hours
3	1. Antigen-Antibody Interaction: Agglutination, Precipitation, RIA, ELISA. Immuno Electrophoresis and Immunofluorescence. 2. Immunity of Infectious Diseases: Protozoa (Malaria, Kalaazar), Bacteria (T.B., Typhoid) and Virus (Influenza, Pox). 3. Fundamental of Diseases: Swine flu, Dengue and Covid-19.	12 Periods / 08 Hours
4	1. Animal Cell Culture and Growth Media. 2. Primary, Secondary culture and Established Cell line Culture. 3. Tissue engineering: Basic Concept, Transgenic animal: Mice and Sheep.	12 Periods / 08 Hours
5	1. Hypersensitivity, Interferon and Monoclonal antibody. 2. Organ Transplantation, Biology of Cancer. 3. *In vitro* fertilization and Embryo Transfer. 4. Vaccine vectors and Nucleic acid vaccines 5. DNA in disease diagnosis (Tuberculosis and AIDS)	12 Periods / 08 Hours
Keywords: Immunity, Cytokines, Ag-Ab Interaction, Animal Cell Culture, Hypersensivity, DNA in Disease Diagnosis.		

Part C - Learning Resource		
Text Books, Reference Books, Other Resources		
Suggested Readings: 1. Fundamentals of Microbiology and Immunology: Ajit Kr. Banerjee, Nirmalya Banerjee –New Central Book Agency (P) Ltd., Kolkata. 2. Plant Biotechnology: H.S. Chawla Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi. 3. Plant Biotechnology: B.D. Singh - Kalyani Publication, New Delhi. 4. Biotechnology: Fundamental & Application (2005) S.S. Purohit 5. Immunology: J. Kubey et al. 7th edition. 6. Immunology: Roitt et al. 7. Fundamental of Immunology: W. Paul. 8. Biotechnology : Books and Allied Ltd : U Satyanarayana 9. Immunology : Saras Publication : Dulsy Fatima, N Arumugam **E-learning Resources** https://britannica.com https://en.wikibooks.org/wiki/Biochemistry https://nptel.ac.in https://www.vedantu.com/biology/immunology https://www.clearitmedical.com/2019/06/biology-notes-biotechnology-principles-and-processes.html https://www.edx.org/learn/immunology		
Part D: Assessment and Evaluation		
Suggested Continuous Evaluation Methods: Maximum Marks: 50 Continuous Comprehensive Evaluation (CCE): Not Applicable University Exam(UE): 50 Marks		
Internal Assessment: Continuous Comprehensive Evaluation (CCE)	Class Test/Assignment/Presentation	Not Applicable
External assessment University Exam (UE) Time 3Hours		As per Govt. norms
Any remarks/ Suggestions: -		

Declaration

Syllabus is framed as per the ToR

Name	Signature
Dr DSVGK Kaladhar, Prof & Chairperson CBoS Biotechnology, UTD ABVV	
Dr Pramod Kumar Mahish, Asst. Professor Govt. Digvijay College Rajnandgaon	
Dr Saumya Khare, Asst Prof, Kalyan PG. College Bhilai	
Dr Shubha Thakur, Asst Prof, St. Thomas College Bhilai	
Dr Akanksha Jain, Asst Prof. Shri Shankaracharya Mahavidyalaya, Bhilai	
Dr Arun Kumar Kashyap, Asst Professor, Govt. E raghavendra Rao PG. Science College Bilaspur	
Dr Tarun Kumar Patel, Asst Professor, Sant Guru Ghasidas PG. College Kurud	
Dr Neha Behar, Asst Prof. DLS PG. College Bilaspur	
Dr Sanjana Bhagat, Asst Prof. Govt Ngarjuna PG. Science College, Raipur	
Dr Kamlesh Shukla, PRSU, Raipur	
Dr Ashish Kumar, Sant Gahira Guru Vishwavidyalay Sarguja	