

DEPARTMENT OF BIOTECHNOLOGY

COURSE CURRICULUM & MARKING SCHEME

B.Sc. PART – II & III BIOTECHNOLOGY

SESSION : 2022-23



ESTD: 1958

GOVT. V.Y.T. PG AUTONOMOUS COLLEGE, DURG, 491001 (C.G.)

(Former Name – Govt. Arts & Science College, Durg)

NAAC Accredited Grade A⁺, College with CPE - Phase III (UGC), STAR COLLEGE (DBT)

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DURG, 491001 (C.G.)**

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NACC Accredited Grade 'A' College; College with Potential of Excellence (UGC)

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DEPARTMENT OF BIOTECHNOLOGY



SYLLABUS

SUBJECT – BIOTECHNOLOGY

BACHELOR OF SCIENCE (B.Sc.)

PART - 2

2022-23

**Syllabus and Marking Scheme for SECOND YEAR
Session 2022-23**

B.Sc. Biotechnology (BBT)

Paper No.	Course Code & Title of the Paper	Marks Allotted in Theory	
		Max.	Min.
I	BBT03 - -Molecular Biology and Biophysics	33/50/75	11/17/25
II	BBT 04 - Recombinant DNA Technology	33/50/75	11/17/25
III		34/50	11/17
IV	Lab Course/Practical	50	17

02/03 Theory Paper - 100/150

01 Practical - 50/100

Total Marks - 150

Note: This page should be used as cover page for each year separately

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Name and Signatures	
University Nominee – Prof. K. K. Sahu	Expert from other subject – Prof. Ranjana Shrivastava.....
Subject Expert – Dr. Pramod Mahish.....	Teacher Representation – Dr. Shweta Pandey.....
Subject Expert – Prof. M. M. Rai.....	Industrial Representation-Mr. Premanjan Biswas.....
Chairperson – Prof. Anil Kumar	Student Representation – Dr. Nikhil Mishra.....

BIOTECHNOLOGY

B.Sc. Part -2

PAPER – I

MOLECULAR BIOLOGY AND BIOPHYSICS (BBT03)

Specific Outcome –

The outcome of the course will be understanding about gene structure & functions and application of physics in biological science.

Learning Outcome –

The student will learn about behaviour of gene and operation of various instruments.

UNIT-I

1. Nucleic Acid: Bases, Nucleosides and Nucleotides, DNA and RNA structure.
2. Plasmids.
3. Transposons: Repetitive elements, LINEs & SINEs, Structure of Gene.

UNIT-II

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: NER, BER and Mismatch Repair.

UNIT-III

1. Genetic Code: Features, Condon Assignment and Wobble hypothesis.
2. Transcription: Initiation, Elongation and Termination in Prokaryotes.
3. Translation: Initiation, Elongation and Termination Translation machinery in Prokaryotes.
Operon-Concept of Operator, Regulator, Promoter gene, Inducer and Co-repressor.

UNIT –IV

1. Biophysics : Introduction, Scope and Application
2. Principle, Structure, Functions of the following:
 - a. Microscopy
 - b. Colorimeter and Spectroscopy
 - c. Electrophoresis
 - d. Centrifugation
 - e. Chromatography.

UNIT –V

1. Radioisotopes techniques: Measurement of radioactivity, Ionization Chambers, Geiger Muller and Scintillation Counter.
2. Autoradiography and DNA Fingerprinting.
3. Biosensor.

List of Books

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)
4. P.K. Gupta- Cell and molecular biology, Second Edition (2003), Rastogi publications.
5. Richard M-Twyaman-Advanced Molecular Biology, First South Asian Edition (1998), VivaBooks Pvt. Ltd.
6. K. Wilson and J.Walker (2012) Principle and Techniques of Biotechnology and MolecularBiotechnology.
7. Upadhya and Upadhya : Biophysical Chemistry.
8. David, I. Nelson and Michael M.Cox :Lehninger : Principal of Biochemistry 4th Edition. W.H. Freeman and Company, New York.
9. Buchanan, Gruissemen& Jones (2015) Biochemistry & Molecular Biology of Plant, 2ndedition.

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Examination Cell

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B (Short Answer)	2x5 = 10	2x5 = 10	3x5 = 15	5x5 = 25
C (Long Answer)	3x5 = 15	3x5 = 15	5x5 = 25	8x5 = 40

6. The half yearly internal examinations will be held. 10% out of marks obtained by the students in each paper in internal examinations will be added to 90% of marks obtained in each paper of annual examination.

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PAPER – II

RECOMBINANT DNA TECHNOLOGY (BBT04)

Specific Outcome

The outcome of course will be applications of recombinant DNA technology.

Learning Outcome –

The student will learn about restriction enzyme, cDNA library, monoclonal antibody, DNA fingerprinting etc.

UNIT-I

1. Recombinant DNA technology: General concept. Steps in gene cloning and application.
2. Host controlled 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 deoxynucleotidyltransferase).
Reverse Transcriptase.

UNIT –II

1. Vectors: Plasmid, Bacteriophages, Cosmid, SV40 and Expression vectors.
2. Gene Library: Genomic and cDNA library.
3. Selection and Screening of Recombinants: Genetic and Hybridization methods.

UNIT –III

1. PCR: Types of PCR, Steps (Denaturation, Annealing and Extension); Applications, Advantages and Limitation of PCR.
2. Molecular Marker-RFLP, RAPD and Micro array.
3. Human Genome Project.

UNIT-IV

1. Basic concept of Gene Transfer Methods: Microinjection, Electroporation, Lipofection and Microprojectile.
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.

UNIT-V

1. Introduction to Bioinformatics: History, Objective and Application.
2. Major Bioinformatics Resource – NCBI, Types of Databases (Primary and Secondary Databases), BLAST and FASTA.
3. Basic concept of Genomics and Proteomics

List of Books

1. B.D. Singh (2004) Biotechnology, Expanding Horizons. First Edition. Kalyani Publishers, Ludhiana.
2. P.K. Gupta (2005) Biotechnology and Genomics, Rastogi Publication, Meerut.
3. Stanbury and Whittaker - Principles of Sterilization techniques, First Indian reprint Edition (1997). Aditya Book (P) Ltd. New Delhi.
4. L.E. Casida (1994) Industrial Microbiology Edition .
5. A.H. Patel (2003) Industrial Microbiology 4th Edition.
6. K.S. Bilgrami and A.K. Pandey(1998) Introduction to Biotechnology Edition 2nd (1998)
7. U Satyanarayan (2005) Biotechnology, First Edition Books and Allied (P) Ltd. Kolkata.
8. Atulkumar and Vandana A.Kumar (2004) Plant Biotechnology and tissue culture, Principle and Perspectives, International Books Distributing Co. Lucknow.
10. S Choudhuri, and DB Carlson (2008) Genomics: Fundamentals and applications, 1st edition.
11. TK Attwood and DJ Parry (2009) Introduction of Bioinformatics.
12. Philip E Bourne Helge Whisking (2003) Structural Bioinformatics.
13. Des Higgins and Willie Taylor (2000) Bioinformatics Sequence, Structure and Databanks.

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C (Long Answer)	3x5 = 15	3x5 = 15	5x5 = 25	8x5 = 40

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PRACTICAL LIST

EXPERIMENTS

1. Isolation of DNA from Plant cell.
2. Estimation of DNA by DPA method.
3. Isolation RNA from yeast cells

Experiment based on-

4. Centrifugation
5. Spectrophotometer/Colorimeter
6. Electrophoresis
7. Paper chromatography/TLC

Experiment based on Bioinformatics -

8. Retrieve DNA /Protein sequence from Biological Data Bases (NCBI).
9. Use of tools studied

SCHEME FOR PRACTICAL EXAMINATION

Time: 4 hrs.

1. Experiment based on DNA/RNA	M.M.: 50 10 marks
2. Experiment based on Instruments	10 marks
3. Experiment based on Bioinformatics	10 marks
4. Spotting	10 marks
5. <i>Viva - Voce</i>	05 marks
6. Record / Sessional	05 marks

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SYLLABUS
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BACHELOR OF SCIENCE (B.Sc.)

PART-3

2022-23

Syllabus and Marking Scheme for THIRD YEAR

Session 2022-23

B.Sc. Biotechnology (BBT)

Paper No.	Course Code & Title of the Paper	Marks Allotted in Theory	
		Max.	Min.
I	BBT05 - General Biotechnology	33/50/75	11/17/25
II	BBT06 - Immunology	33/50/75	11/17/25
III		34/50	11/17
IV	Lab Course/Practical	50	17

02/03 Theory Paper - 100/150

01 Practical - 50/100

Total Marks - 150

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BIOTECHNOLOGY

B.Sc. Part -3

PAPER – I

GENERAL BIOTECHNOLOGY (BBT05)

Specific Outcome –

In this course student will inherit information's about broader application of biotechnology.

Learning Outcome –

Student will learn about tissue culture, molecular marker, environmental process and fermentation process.

- UNIT – 1**
1. Plant cell and tissue culture: General introduction, History and Scope.
 2. Application of Tissue culture.
 3. Concept of cellular differentiation.
 4. Agrobacterium, Ti and Ri Plasmid.
 5. Bt gene, Molecular markers (RFLP, RAPD), Edible Vaccine.
- UNIT – 2**
1. Organogenesis, Embryogenesis, Protoplast isolation and fusion.
 2. Germplasm storage and Cryopreservation.
 3. Anther and Ovary culture.
- UNIT – 3**
1. General introduction and scope of environmental biotechnology.
 2. Environmental pollution and its types.
 3. Control of pollution through biotechnology.
 4. Waste water treatment : Physical, Chemical and Biological.
- UNIT – 4**
1. Bio-fertilizer, Bio-pesticides, IPR.
 2. Global environmental problems: General introduction, Ozone depletion, Acid rain Green house effect.
- UNIT – 5**
1. Bioreactors and its types.
 2. Fermentation (Lactic acid, Alcohol).
 3. Maintenance of industrial micro organisms.
 4. Food technology : Introduction, Canning, Packing and Food preservation.

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PAPER – II

IMMUNOLOGY (BBT06)

Specific Outcome

In this course student will understand various aspect of immunological process.

Learning Outcome –

The student will learn about antigen-antibody, cell mediated immunity and pathogenicity due to autoimmunity.

- UNIT – 1**
1. Immunology – General concept, history and development.
 2. Immune system and immunity, Organization of immune system.
 3. Antigen – Antibody and its types.
- UNIT – 2**
1. Cell involved in immune system, Type and cells, Basic structure and Function, Cytokines.
 2. Cell mediated immunity, Interferons, Hypersensitivity.
- UNIT – 3**
1. Antigen – Antibody interaction, Principle and its types.
 2. Immunohaematology – General concept, Blood group system, Rh factor, Medical application of blood group.
- UNIT – 4**
1. Origin and diversity in immune system.
 2. Effector mechanisms.
 3. Immunity of infectious disease, Monoclonal antibodies.
- UNIT – 5**
1. Autoimmune diseases : Hemolytic anaemia, Rheumatoid arthritis, Insulin dependent diabetes, Myasthenia gravis.
 2. Organ transplantation, Immunodeficient diseases, Cancers, AIDS.

List of Books

1. Immunology – Kuby.
2. Text book of microbiology – Anantnarayan&Panikar.
3. Immunology – Roitt.
4. Immunology – NandiniSethi.
5. Biotechnology – Fundamental &Application : S.S. Purohit.
6. Plant Tissue Culture – Rojdo.
7. Plant Tissue Culture (Practical) – H.S. Chawla.
8. Fundamental of Immunology – W.Paul.
9. Plant Biotechnology – B.D. Singh, Kalyani Publication.
10. Plant Biotechnology – R.S. Chawla – Oxford and IBH Publishing Co. Pvt. Ltd.
11. Fundamental of Microbiology &Immunology –Ajit Kr. Banerjee, Nirmala Banerjee, New Central Book Agency (P) Ltd. Kolkata.
12. A text book of Biotechnology – InduShekhar Thakur, I.K. International Pvt. Ltd (New Delhi).

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PRACTICAL LIST

EXPERIMENTS

Plant :

1. Sterilization of plant materials.
2. Preparation of tissue culture media.
3. Plant tissue culture by plant parts.

Environment :

1. Determination of total dissolved solids of water.
2. Determination of DO, BOD, COD of water.
3. MPN test.

Industrial :

1. Food preservation techniques.
2. Application of biopesticides on micro organisms.
3. Production of Citric acid by micro organisms.

Immunology :

1. Blood grouping in relation to antigen antibody interaction.
2. Rh factor determination.
3. Widal test.
4. VDRL test.
5. Double diffusion experiment.
6. ELISA test.

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SCHEME FOR PRACTICAL EXAMINATION

Time : 4 hrs

M.M. : 50

1. Experiment based on Paper – 1	
(i) Plant tissue culture	
(ii) Environment / Industrial	
2. Experiment based on Paper – 2	15
3. Spots 05 (based on paper 1 & 2, at least two spots from each paper)	10
4. Viva-voce	05
5. Sessional	05
6. Total	50

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