

Revised Syllabus

DEPARTMENT OF BIOTECHNOLOGY COURSE CURRICULUM & MARKING SCHEME

B.Sc. I & II Semester BIOTECHNOLOGY

(Based on Choice Based Credit System)

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)

Phone : 0788-2212030

Website - www.govtsciencecollegedurg.ac.in, Email – autonomousdurg2013@gmail.com

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

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

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

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DEPARTMENT OF BIOTECHNOLOGY



REVISED SYLLABUS

SUBJECT – BIOTECHNOLOGY

BACHELOR OF SCIENCE (B.Sc.)

B.Sc. I, Semester- I & II

(Based on Choice Based Credit System)

2022-23

Part A: Introduction			
Program: BSc Biotechnology		Class: BSc I Sem	Year: 2022 Session:2022-2023
1	Course Code	BBT01	
2	Course Title	Cell Biology, Biochemistry and Metabolism	
3	Course Type	Core Course	
4	Pre-requisite (if any)	To study this course, a student must have/had the subject Biology in class 12 th .	
5	About the course	The course is designed to develop understanding about Cell Biology, organizational structure of Biochemicals and their Metabolic process for regulation of life.	
6	Course Learning Outcomes (CLO)	After completing this course, the students will be able to - After completing this course, the students will be able to - <ul style="list-style-type: none"> • Understand Cellular organization, their division for continuation of life, and natural cellular death mechanism. • Understand the basic Biochemicals for organizational and functional expression of life. • Understand the metabolic regulations for survival and continuation of life. 	
6	Credit Value	Theory :3 + Practical 1 Total credit : 4	
7	Total Marks	Max. Marks: 75+25=100 Min Passing Marks :40%	
8		External: Internal assessment is 80: 20 (in percentage)	

Part B: Content of the Course		
Total No. of Lecturer (in hours per week):		
Total Lecturer: 60		
Unit	Topics	No. of Lectures
I	1. Cell theory. 2. Prokaryotic cell structure- Function and ultrastructure of cell (Gram positive and Gram negative), plasma membrane, flagella, pilli, endospore and capsule. 3. Eukaryotic cell structure- Cell wall. 4. Cell division- Mitosis and meiosis. 5. Plasma membrane- Structural and physiological concepts.	12
II	1. Cell organelles- Plasma membrane, mitochondria, Golgi bodies, endoplasmic reticulum, ribosome, chloroplast etc. 2. Nucleus- Organisation and chromosomes. 3. Cytoskeleton- microtubules, microfilaments and intermediate filaments. 4. Biology of cancer cells. 5. Apoptosis.	12

III	<ol style="list-style-type: none"> 1. Carbohydrates- Structure and classification. 2. Lipid- Structure and classification. 3. Amino acids - Structure and classification. 4. Three dimensional structure of proteins. 	12
IV	<ol style="list-style-type: none"> 1. Nucleic acid- DNA and RNA. 2. Enzymes- Nomenclature and classification. 3. Enzymes- Mechanism of action and factors affecting enzyme action. 4. Hormones- Plant and animal hormones. 	12
V	<ol style="list-style-type: none"> 1. Carbohydrate metabolism- Glycolysis, Krebs cycle, pentose phosphate pathway. 2. Lipid metabolism- β oxidation of fatty acid. 3. Protein metabolism- Transamination/deamination, urea cycle, amino acid synthesis of glutamic acid and phenylamine. 4. Nucleic acid metabolism. 	12

• Part C - Learning Resource

Text Books, Reference Books, Other Resources -

Molecular Biology of the Cell – Alberts
 Molecular Cell Biology – Lodish
 Cell and Molecular Biology – Gerald Karp
 Cell biology – C.B.Powar
 The Cell – Cooper
 Lehninger- Principles of Biochemistry
 Nelson & Cox. - Biochemistry
 Voet & Pratt. - Biochemistry
 Practical Biochemistry- Wilson & Walker.

The syllabus for B.Sc. Biotechnology is hereby approved for the session 2022-23-24-25.

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

B. Sc. I Sem Practical
Total No. of Classes (in hours per week): Total Credit: 01 (Classes 15) CODE-BBP01

**B. Sc. I Sem
PRACTICALS**

The practical work will be based on the theory syllabus and the students will be required to perform practical knowledge of the following content as below mention -

1. Preparation of mitotic index from plants and animals.
2. Preparation of slide of blood cells.
3. Preparation of slide of giant chromosomes.
4. Preparation of slide of epithelial cells.
5. Biochemical test of carbohydrates.
6. Biochemical test of lipids.
7. Biochemical test of proteins.
8. Action of salivary amylase on starch.
9. Action of trypsin on proteins.
10. Effect of temperature, pH and substrate concentration on action of enzymes.
11. Separation of amino acids by chromatography.
12. Separation of chlorophyll by chromatography.

Scheme of Practical Examination

Duration : 3 Hours

**Maximum marks : 25
Pass marks: 40%**

Distribution of Marks :

	Marks
1. Any two practicals from Cell Biology and two from Biochemistry and metabolism section	(4X4 = 16)
2. Viva-Voce -	04
3. Field work – (CCE)-	2.5
4. Practical record –(CCE)-	2.5

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Part A: Introduction			
Program: BSc Biotechnology		Class: BSc I Sem	Year: 2022 Session:2022-2023
1	Course Code	BBT01-SEC01	
2	Course Title	Enzymology	
3	Course Type	Skill Enhancement Course	
4	Pre-requisite (if any)	To study this course, a student must have/had the subject Biology in class 12 th .	
5	About the course	The course is designed to develop understanding about basic knowledge of Enzyme, its actions and applications.	
6	Course Learning Outcomes (CLO)	After completing this course, the students will be able to - <ul style="list-style-type: none"> • Understand scientific presentation of enzyme system. • Different forms of enzyme and their mechanism for regulation of life. • Methods for enzyme production and their application for enterprenureship. • Practically apply techniques of enzymatic applications. 	
6	Credit Value	Theory:1 + Practical :1; Total Credit 2	
7	Total Marks	Max. Marks: 25+25=50	Min Passing Marks : 40%
8		External : Internal assessment is 80:20 (in percentage)	

Part B: Content of the Course		
Total No. of Lecturer (in hours per week):		
Total Lecturer: 30		
	Topics	No. of Lectures
I	1. Enzyme catalysis, inhibition and regulation. 2. Techniques for studying enzymatic action. 3. Multienzyme complex 4. Methods of enzyme production. 5. Immobilization of enzymes-Methods and Applications. 6. Allosteric enzymes with special reference to Phosphofructo Kinase. 7. Industrial applications of enzymes. 8. Emzymatic Assays.	30

• Part C - Learning Resource

Text Books, Reference Books, Other Resources -

- Lehninger Principles of Biochemistry- Nelson & Cox. B
- Biochemistry-Voet& Pratt.
- Principles of Enzymology- Price & Stevens.
- Enzyme Biocatalysis, Principle & Applications- Andres Illanes.
- Enzyme Kinetics- Hans Bisswanger

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Subject Expert – Prof. M. M. Rai.....	Industrial Representation-Mr. Premanjan Biswas.....
Chairperson–Prof. Anil Kumar.....	Student Representation – Dr. Nikhil Mishra.....

B. Sc. I Sem Practical Total No. of Classes (in hours per week): Total Credit: 01 (Classes 15) CODE-SEC01
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**B. Sc. I Sem
PRACTICALS (SEC)**

The practical work will be based on the theory syllabus and the students will be required to perform practical knowledge of the following content as below mention –

1. Practical exploration of isolation of enzymes.
2. Practical exploration of purification of enzymes.
3. Practical exploration of immobilisation of enzymes.
4. Practical exploration of effect of temperature, pH and substrate concentration on enzyme action.
5. Practical exploration of action of salivary amylase.
6. Practical exploration for production of enzymes

Scheme of Practical Examination

Duration : 3 Hours

Maximum marks : 25
Pass marks: 40%

Distribution of Marks :

	Marks
1. Any 2 practicals from list	(2X8 = 16)
2. Viva-Voce -	04
2. Field work – (CCE)-	2.5
3. Practical record –(CCE)-	2.5

Total marks 25

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Part A: Introduction			
Program: BSc Biotechnology		Class: BSc I, Sem II	Year: 2022 Session:2022-2023
1	Course Code	BBT02	
2	Course Title	Microbiology and Molecular Biology	
3	Course Type	Core Course	
4	Pre-requisite (if any)	To study this course, a student must have/had the subject Biotechnology in Semester First.	
5	About the course	The course is designed to develop understanding about Microbial world and Molecular mechanisms for regulation of life. After successful completion of first year course, student will be able to earn a Certificate in Biotechnology.	
6	Course Learning Outcomes (CLO)	After completing this course, the students will be able to - <ul style="list-style-type: none"> • Understand various categories of microbes of living world. • Develop capability to culture and maintenance of microbes. • Understand regulatory mechanism for precursor of life-DNA • Understand mechanism of genetic expression for regulation of life. 	
6	Credit Value	Theory : 3 + Practical 1 Total credit : 4	
7	Total Marks	Max. Marks: 75+25	Min Passing Marks : 40%
8		External: Internal assessment is 80:20 (in percentage)	

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Subject Expert – Prof. M. M. Rai.....	Industrial Representation-Mr. Premanjan Biswas.....
Chairperson–Prof. Anil Kumar.....	Student Representation – Dr. Nikhil Mishra.....

Part B: Content of the Course		
Total No. of Lecturer (in hours per week): Total Lecturer: 60		
Unit	Topics	No. of Lectures
I	<ol style="list-style-type: none"> 1. Classification of microorganisms and taxonomy. 2. Molecular basis of microbial taxonomy. 3. Growth media for culture of bacterial, viral and fungal microbes; sterilisation. 4. Isolation, purification and culture methods of microbes (bacteria, virus and fungi). 	12
II	<ol style="list-style-type: none"> 1. Bacterial reproduction- Conjugation,transduction and transformation. 2. Mycoplasma- Classification, structure and pathogenesis. 3. Virus- Structure, classification, multiplication, pathogenesis and bacteriophages. 4. Food and water microbes. 	12
III	<ol style="list-style-type: none"> 1. DNA replication. 2. DNA damage and repair. 3. Transcription in prokaryotes and eukaryotes. 4. Processing of RNA. 	12
IV	<ol style="list-style-type: none"> 1. Genetic code. 2. Translation in prokaryotes and eukaryotes. 3. Post translational modification of proteins. 4. Operon concept. 	12
V	<ol style="list-style-type: none"> 1. Recombination- Homologous and non-homologous recombination. 2. Recombination- Site specific recombination and transposons. 3. Molecular markers. 4. Catalytic RNAs (si RNA and miRNA) 	12

• Part C - Learning Resource

Text Books, Reference Books, Other Resources -

- Molecular Biology; Watson.
- Gene VIII; Benjamin Lewin.
- The Cell, A molecular Approach; Geoffrey M. Cooper.
- Molecular Biology of the Cell; Alberts
- Cell and Molecular Biology; Lodish.
- Microbiology – Prescott
- Microbiology – Pelczar&Pelczar
- General Microbiology I and II – Powar and Daginawala
- Microbiology – Tortora

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Chairperson–Prof. Anil Kumar.....	Student Representation – Dr. Nikhil Mishra.....

B. Sc. I Sem Practical
Total No. of Classes (in hours per week): Total classes: 15

**B. Sc. II Sem
PRACTICALS (BBP02)**

The practical work will be based on the theory syllabus and the students will be required to perform practical knowledge of the following content as below mention -

1. Various techniques for sterilization.
2. Preparation of microbial media.
3. Isolation and culture of microbes from air, soil and water.
4. Determination of Gram positive and Gram negative bacteria.
5. Streak plate method for culturing of microbes.
6. Pour plate method for culturing of microbes.
7. Spread plate method for culturing of microbes.
8. Broth culture method for culturing of microbes.
9. Determination of bacterial growth curve.
10. Isolation of DNA from bacteria, plant and animal cells.
11. Estimation of DNA.
12. Estimation of RNA.
13. Elucidation of DNA bands by electrophoresis.

Scheme of Practical Examination

Duration : 3 Hours

Maximum marks : 25

Pass marks: 40%

Distribution of Marks :

	Marks
1. Any two practicals from Molecular Biology and two from Microbiology (Total 4 practicals)	(4X4 = 16)
2. Viva-Voce -	04
3. Field work – (CCE)-	2.5
4. Practical record –(CCE)-	2.5

Total marks 25

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Part A: Introduction			
Program: BSc Biotechnology		Class: BSc I Sem II	Year: 2022 Session: 2022-2023
1	Course Code	BBT02-SEC02	
2	Course Title	Nanobiotechnology	
3	Course Type	Skill Enhancement Course	
4	Pre-requisite (if any)	To study this course, a student must have/had the subject Biotechnology in Semester First.	
5	About the course	The course is designed to generate knowledge of Nanoscience technology and its applications for industrial applications.	
6	Course Learning Outcomes (CLO)	After completing this course, the students will be able to - <ul style="list-style-type: none"> • Understand the various forms of Nanoscience. • Understand the mechanism for synthesis of Nanomaterials. • Understand Characterisation techniques of Nanomaterials. • Apply various forms of Nanomaterials to resolve problems of life. • Develop practical competency for Nanomaterial synthesis, characterization and applications. 	
6	Credit Value	Theory :1; Practical : 1; Total credit : 2	
7	Total Marks	Max. Marks: 25+25= 50 Min Passing Marks : 40%	
8		External: Internal assessment is 80:20 (in percentage)	

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Part B: Content of the Course		
Total No. of Lecturer (in hours per week): Total Lecturer: 30		
Unit	Topics	No. of Lectures
I	1. Nanoscience and nanotechnology, classification of nanomaterials. 2. Size dependent properties of nanomaterials (chemical, thermal, electronic, optical and magnetic). 3. Nanoparticle- synthesis, properties and application. 4. Synthesis of nanomaterials by chemical vapour deposition. 5. Synthesis of nanomaterials by physical vapour deposition . 6. Carbon nanotubes- types, synthesis and applications. 7. Characterization of nanomaterials by optical (UV-Vis/fluorescence) and X-ray diffraction method. 8. Characterisation of nanomaterials by imaging and size (TEM/SEM). 9. Characterization of nanomaterials by vibrational (FT-IR)	30

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• Part C - Learning Resource

Text Books, Reference Books, Other Resources -

- Biochemistry – Voet, Voet and Prat o
- Nanoprticle Technology for Drug Delivery- R.B. Gupta
- Biophysical Chemistry – Upadhyaya and Nath
- Biophysics- VasanthaPattabhi and N. Gautham

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B. Sc. I Sem II Practical
Total No. of Classes (in hours per week): Total Credit: 01 (Classes 15) CODE-SEC02

**B. Sc. II Sem
PRACTICALS (SEC)**

The practical work will be based on the theory syllabus and the students will be required

1. Practical demonstration of synthesis of silver nanoparticles using organic and inorganic compounds.
2. Practical demonstration of synthesis of ZnO nanoparticles using organic and inorganic compounds.
3. Practical demonstration of synthesis of green nanoparticles using silver/gold/ZnO/others.
4. Practical demonstration of characterization of nanoparticles by available instruments in the lab.
5. Practical demonstration of antimicrobial, insecticidal, environmental and other applications of nanoparticles.

Scheme of Practical Examination

Duration : 3 Hours

**Maximum marks : 25
Pass marks: 40%**

Distribution of Marks :

	Marks
1. Any 2 practicals from list	(2X8 = 16)
2. Viva-Voce -	04
4. Field work – (CCE)-	2.5
5. Practical record –(CCE)-	2.5

Total marks 25

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