

SARDAR PATEL UNIVERSITY
Vallabh Vidyanagar Gujarat
(Reaccredited with 'A' Grade by NAAC (CGPA 3.11)
Syllabus with effect from the Academic Year 2023-2024

Bachelor of Science
B.Sc. Biotechnology Semester I

Major subject

Course Code	US1MABIT01	Title of the Course	Basics of Biotechnology-1
Total Credits of the Course	04	Hours per Week	04

Course Objectives	<ol style="list-style-type: none"> 1. To give an overview, concept and scope of Biotechnology. 2. To understand basic structure and types of nucleic acid. 3. To study DNA as heredity material. 4. To study analytical tools
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Course Content		
Unit-1	OVERVIEW AND SCOPE OF BIOTECHNOLOGY Biotechnology-Definition, history, concept of old and new biotechnology, Major areas of Biotechnology (Red, white, Green, Blue,Gold etc.), Scope and importance of Biotechnology, commercial potential of Biotechnology, Various GOI schemes for Biotechnology in India-BIRAC, BioNEST, DBT, GSBTM, Bio-incubators, Biotech Parks, Biopharma mission, Biotech KISAN programme. Concept and definitions- cloning vectors, transgenic animal/ plant, GMO	Weightage*(%) 25
Unit-2	Cell Division, Regulation & cell-cell communication: Cell nucleus (Nuclear envelop, nucleolus, chromosome), cell cycle (G,M,S phases), Cell division (Mitosis and meiosis), Cell cycle regulation (Cell cycle and its control, cell death mechanisms- Apoptosis, necrosis), cell-cell interaction, cell locomotion- Amoeboid, flagella, cilia, cytoplasmic streaming.	25
Unit-3	Bioanalytical tool: Principle, types. Working and application of tools: microscope (Bright field microscope, Phase Contrast, fluorescent microscope SEM, TEM,), Autoclave, Spectrophotometer (visible and UV), Centrifuge(differential & gradient), PH meter	25

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Unit-4	Griffith's experiment, Hershey and Chase experiment, Avery & Mac Cleod, McCarty Experiment. Structure of DNA (Watson & Crick Model), Types of DNA (A, B, & Z) Genetic Code, Wobble's Hypothesis, Chargaff's Rule. Structure, types and functions of RNA (mRNA, tRNA, rRNA,). Plasmid: its characteristics and its classification. Concept of gene	25
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Teaching-Assignments, Learning	Chalk Board, Power-point presentation, Quizzes Methodology Videos available on NPTEL and BISAG
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Evaluation Pattern		
Sr. No.	Details of the Evaluation	Weightage
1.	Internal written/Practical examination (As per CBCS R.6.8.3)	15%
2.	Internal continuous Assessment in the form of Practical, viva –voice ,Quizzes, Seminars, Assignment,Attendance(As per CBSC R 6.8.3)	15%
3.	University Examination	70%

Course Outcomes: Having completed this course, the learner will be able to	
1.	Students will learn about biotechnology and its concepts as well as various scopes in Biotechnology
2.	They will learn the basic structure and types of Nucleic acid and Genetic Code
3.	They also acquire the knowledge about various extra chromosomal DNA .
4.	They will learn about usage of bioanalytical tools.

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Suggested References:	
Sr No	References
1.	Biotechnology- Expanding Hoirizon- B D Singh
2.	Molecular Biology of Gene- Watson, Hopkins & Roberts
3.	Genomics- T A Brown
4.	Principles of Biochemistry- Lehninger and Cocks
5.	Text book of Biotechnology- R C Dubey
6.	Biotechnology, Satyanarayana. U,
7.	Biotechnology and Genomics, Gupta P.K:

On-line resources to be used if available as reference material
On-line Resources
Relevant entries on Wikipedia and Encyclopaedia Britannica

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Bachelor of Science
B.Sc. Biotechnology Semester I
Major subject- Practical

Course Code	US1MABIT02	Title of the Course	Practical
Total Credits of the Course	04	Hours per Week	04

Course Objectives	<ol style="list-style-type: none"> 1. To impart knowledge for handling instruments and its working 2. To teach qualitative and quantitative analysis of macromolecule
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Course Content
Section-I
<ol style="list-style-type: none"> 1. Study of mitosis by Onion root tip. 2. Study of meiosis using suitable plant material. 3. Nucleotide composition of RNA by paper chromatography 4. Separation of cell organelles using differential centrifugation 5. Isolation of plasmid DNA by alkali lysis method. 6. Estimation of DNA by DPA method 7. Estimation of RNA by orcinol method 8. Phenol-Chloroform extraction of DNA.
Section-II
<ol style="list-style-type: none"> 9. Study of lab instruments: Microscope, Centrifuge, spectrophotometer, autoclave, pH meter 10. Study of pH meter and adjustment of pH of medium. 11. Sterilization of Laboratory Glassware and Media using Autoclave 12. Disposal of Laboratory waste. 13. UV absorption of isolated DNA and determine its purity 14. Verification of Beer's Law(Methylene blue, $Kmno_4$) 15. Find out Normality of Acid and Base. 16. Study of inanimate objects using microscope. 17. Demonstration on Chloroplast DNA isolation. 18. Demonstration on mitochondrial DNA isolation 19. Presentation/ seminar/ laboratory visit.

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Teaching-Assignments, Learning	Chalk Board, Power-point presentation, Quizzes Methodology Videos available on NPTEL and BISAG
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Evaluation Pattern		
Sr. No.	Details of the Evaluation	Weightage
1.	Internal written/Practical examination (As per CBCS R.6.8.3)	-
2.	Internal continuous Assessment in the form of Practical, viva –voice ,Quizzes, Seminars, Assignment,Attendance(As per CBSC R 6.8.3)	-
3.	University Examination	100%

Course Outcomes: Having completed this course, the learner will be able to	
1.	Students will learn about the handling reagents and instruments in safe and precise manner
2.	They will learn to identify various macromolecules and their estimation
3.	They will learn to isolation and storage of DNA.

On-line resources to be used if available as reference material	
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Relevant entries on Wikipedia and Encyclopaedia Britannica	

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Bachelor of Science
B.Sc. Biotechnology Semester I
Minor subject

Course Code	US1MIBIT01	Title of the Course	Basics of Biotechnology-2
Total Credits of the Course	02	Hours per Week	02

Course Objectives	1. To understand basic structure and types of nucleic acid. 2. To study DNA as heredity material.
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Course Content		
Unit-1	Bioanalytical tool: Principle, types. Working and application of tools: microscope (Bright field microscope, Phase Contrast, fluorescent microscope SEM, TEM,), Autoclave, Spectrophotometer (visible and UV), Centrifuge(differential & gradient), PH meter	Weightage*(%) 50
Unit-2	Griffith's experiment, Hershey and Chase experiment, Avery & Mac Cleod, McCarty Experiment. Structure of DNA (Watson & Crick Model), Types of DNA (A, B, & Z) Genetic Code, Wobble's Hypothesis, Chargaff's Rule. Structure, types and functions of RNA (mRNA, tRNA, rRNA,). Plasmid: its characteristics and its classification. Concept of gene	50

Teaching-Assignments, Learning	Chalk Board, Power-point presentation, Quizzes Methodology Videos available on NPTEL and BISAG
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Evaluation Pattern		
Sr. No.	Details of the Evaluation	Weightage
1.	Internal written/Practical examination (As per CBCS R.6.8.3)	15%
2.	Internal continuous Assessment in the form of Practical, viva –voice ,Quizzes, Seminars, Assignment,Attendance(As per CBSC R 6.8.3)	15%

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3.	University Examination	70%
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Course Outcomes: Having completed this course, the learner will be able to	
1.	Students will learn about biotechnology and its concepts as well as various scopes in Biotechnology
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Bachelor of Science
B.Sc. Biotechnology Semester I
Minor subject- Practical

Course Code	US1MIBIT02	Title of the Course	Practical
Total Credits of the Course	02	Hours per Week	02

Course Objectives	<ol style="list-style-type: none"> 1. To impart knowledge for handling instruments and its working 2. To teach qualitative and quantitative analysis of macromolecule
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Course Content
Section-I
<ol style="list-style-type: none"> 1. Study of mitosis by Onion root tip. 2. Study of meiosis using suitable plant material. 3. Nucleotide composition of RNA by paper chromatography 4. Separation of cell organelles using differential centrifugation 5. Isolation of plasmid DNA by alkali lysis method. 6. Estimation of DNA by DPA method 7. Estimation of RNA by orcinol method 8. Phenol-Chloroform extraction of DNA. 9. Study of lab instruments: Microscope, Centrifuge, spectrophotometer, autoclave, pH meter

Teaching-Assignments, Learning	Chalk Board, Power-point presentation, Quizzes Methodology Videos available on NPTEL and BISAG
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Evaluation Pattern		
Sr. No.	Details of the Evaluation	Weightage
1.	Internal written/Practical examination (As per	-

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	CBCS R.6.8.3)	
2.	Internal continuous Assessment in the form of Practical, viva –voice ,Quizzes, Seminars, Assignment,Attendance(As per CBSC R 6.8.3)	-
3.	University Examination	100%

Course Outcomes: Having completed this course, the learner will be able to	
1.	Students will learn about the handling reagents and instruments in safe and precise manner
2.	They will learn to identify various macromolecules and their estimation
3.	They will learn to isolation and storage of DNA.

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Bachelor of Science
B.Sc. Biotechnology Semester I
Interdisciplinary subject

Course Code	US1IDBIT01	Title of the Course	Introduction to Biotechnology
Total Credits of the Course	02	Hours per Week	02

Course Objectives	<ol style="list-style-type: none"> To give an overview, concept and scope of Biotechnology. To understand basic structure and types
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Course Content		
Unit-1	OVERVIEW AND SCOPE OF BIOTECHNOLOGY Biotechnology-Definition, history, concept of old and new biotechnology, Major areas of Biotechnology (Red, white, Green, Blue,Gold etc..), Scope and importance of Biotechnology, commercial potential of Biotechnology, Various GOI schemes for Biotechnology in India-BIRAC, BioNEST, DBT, GSBTM, Bio-incubators, Biotech Parks, Biopharma mission, Biotech KISAN programme. Concept and definitions- cloning vectors, transgenic animal/ plant, GMO	Weightage*(%) 50
Unit-2	Cell Division, Regulation & cell-cell communication: Cell nucleus (Nuclear envelop, nucleolus, chromosome), cell cycle (G,M,S phases), Cell division (Mitosis and meiosis), Cell cycle regulation (Cell cycle and its control, cell death mechanisms- Apoptosis, necrosis), cell-cell interaction, cell locomotion- Amoeboid, flagella, cilia, cytoplasmic streaming.	50

Teaching-Assignments, Learning	Chalk Board, Power-point presentation, Quizzes Methodology Videos available on NPTEL and BISAG
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Evaluation Pattern		
Sr. No.	Details of the Evaluation	Weightage
1.	Internal written/Practical examination (As per CBCS R.6.8.3)	15%
2.	Internal continuous Assessment in the form of Practical, viva –voice ,Quizzes, Seminars,	15%

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	Assignment, Attendance (As per CBSC R 6.8.3)	
3.	University Examination	70%

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Bachelor of Science
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Interdisciplinary subject- Practical

Course Code	US1IDBIT02	Title of the Course	Practical
Total Credits of the Course	02	Hours per Week	02

Course Objectives	<ol style="list-style-type: none"> 1. To impart knowledge for handling instruments and its working 2. To teach qualitative and quantitative analysis of macromolecule
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Course Content
<ol style="list-style-type: none"> 1. Study of lab instruments: Microscope, Centrifuge, spectrophotometer, autoclave, pH meter 2. Study of pH meter and adjustment of pH of medium. 3. Sterilization of Laboratory Glassware and Media using Autoclave 4. Disposable of Laboratory waste. 5. UV absorption of isolated DNA and determine its purity 6. Verification of Beer's Law(Methylene blue, KmnO4) 7. Find out Normality of Acid and Base. 8. Study of inanimate objects using microscope. 9. Demonstration on Chloroplast DNA isolation. 10. Demonstration on mitochondrial DNA isolation 11. Presentation/ seminar/ laboratory visit.

Teaching-Assignments, Learning	Chalk Board, Power-point presentation, Quizzes Methodology Videos available on NPTEL and BISAG
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Evaluation Pattern		
Sr. No.	Details of the Evaluation	Weightage
1.	Internal written/Practical examination (As per CBCS R.6.8.3)	-
2.	Internal continuous Assessment in the form of	-

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3.	University Examination	100%

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