



B.Sc. (Biotechnology) Semester-3

Course Code	US03CBIT51	Title of the Course	Fundamentals of Biotechnology
Total Credits of the Course	4	Hours per Week	4

Course Objectives:	<ol style="list-style-type: none">1. To educate the students on concept and scope of biotechnology2. To understand the tools used in biotechnology3. To educate the students on nucleotides structure and chemistry
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Course Content		
Unit	Description	Weightage* (%)
1.	Biotechnology-Definition, history, concept of old and new biotechnology, Major areas of Biotechnology (Red, white, Green, Blue & Gold), 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, Challenges faced by Biotechnology. Concept and definitions- cloning vectors, transgenic animal/ plant, GMO	25%
2.	Composition of DNA-Concept of nucleoside and nucleotides. DNA double helix structure (Watson and Crick model). , Chargaff's rule. Genetic code, Wobble's hypothesis. RNA –Structure, types and function (t-RNA, m-RNA, r-RNA ,sn-RNA, micro RNA) .RNA isolation: principle and methodology(LiCl, Guanidium thiocyanate)	25%
3.	Extra chromosomal DNA(mitochondria & chloroplast,)- basic structure, properties and use to the host, Plasmid DNA-basic properties, classification, types- natural (Ti, F, R, Col, Ri) artificial (pBR322 and PUC8) plasmid competency and transformation	25%
4.	Instrument in Biotechnology: Incubator, Agarose gel electrophoresis, U.V. Transilluminator, Laminar air flow hoods (LAF), Centrifuge-Types, principle and use, differential and isopycnic centrifugation. Methodology & role of reagents in Genomic DNA isolation in plant & yeast	25%

Teaching-Learning Methodology	Chalk board, Power point presentation, quizzes, 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-voce, Quizzes, Seminars, Assignments, Attendance (As per CBCS R.6.8.3)	15%
3.	University Examination	70%

Course Outcomes: Having completed this course, the learner will be able to	
1.	Understand the scope and career option in Biotechnology
2.	Understand the chemical, structure and function of nucleotides
3.	Understand the extra chromosomal DNA and plasmid vectors
4.	Understand the various instruments workings used in Biotechnology lab

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





On-line resources to be used if available as reference material

On-line Resources

Nptel.ac.in

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B.Sc. (Biotechnology) Semester-3

Course Code	US03CBIT52	Title of the Course	Fundamentals of Microbiology
Total Credits of the Course	4	Hours per Week	4

Course Objectives:	<p>1. To understand basic concepts, classification method and structure of Microbial world.</p> <p>2. To understand instruments and technique for studying microorganism</p> <p>...</p>
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Course Content		
Unit	Description	Weightage* (%)
1.	Define Prokaryotes, Difference between Eukaryotes and Prokaryotes, Distribution of Prokaryotes in Nature, Pioneers of Microbiology (Antony van Leewanhock, Louis Pasteur, Robert Kotch), Major groups of microorganism (Bacteria, Fungi, Algae, Protozoa and virus). Major characteristic for classifying bacteria, General methods of classifying Bacteria (intuitive method, numerical method, genetic relatedness), introduction of Bergey's Manual.	25
2.	Size, shape, arrangement of Bacterial cell, Bacterial structure: External (cell wall, Envelope, Pili, flagella, Capsule/sheath/prostheca) Internal (cytoplasmic membrane, cytoplasmic inclusion, nuclear material, ribosome). Specific structure Endospore. Nutritional requirement of bacteria, Nutritional type of bacteria. Physical condition required for bacteria growth (pH and temperature). Normal Growth curve.	25
3.	Principle of Microscopy (magnification and resolution), Bright field microscopy (simple and compound), Principle and working of Autoclave. Importance of staining dyes and stain, preparation of smear, fixation, mordent decolourizer. Simple staining(Monochrome and negative staining, Differential staining(Gram's staining), Special staining (endospore , cell wall)	25
4.	Definition Pure culture and Axenic culture, Media: general ingredients used in media classification media on basis of nature and consistency types of media (differential media, selective media, assay media, enrichment media. Technique for isolation of Pure culture. Concept of sterilization, characteristic of antimicrobial agent, Physical antimicrobial agent(heat, radiation ,filtration, osmotic pressure) , chemical antimicrobial agent(phenol, alcohol, halogen, surfactants heavy metals)	25
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Teaching-Learning Methodology	
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3.	University Examination	70%

Course Outcomes: Having completed this course, the learner will be able to	
1.	Understand the major group of microbes and microbial classification and taxonomy.
2.	Understand the morphology and nutritional criteria of bacteria.
3.	Understand microscopy and various staining techniques.
4.	Understand concept and isolation of pure culture, and antimicrobial agents.

Suggested References:	
Sr. No.	References
1.	Microbiology ,Pelczar, Chan, and kreig , 5 th edition
2.	Elementary microbiology, H A Modi
3.	Prescott's microbiology
4.	Microbiology R M Atlas





On-line resources to be used if available as reference material

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B.Sc. (Biotechnology) Semester-3

Course Code	US03CBIT53	Title of the Course	Practicals
Total Credits of the Course	4	Hours per Week	4

Course Objectives:	The main purpose of study of laboratory instruments and laboratory work is to provide students with conceptual, practical, and theoretical knowledge to help them learn scientific concepts and through scientific methods to understand the science
	To learn about different tests used for identification of bacterial species based on the differences in biochemical activities of different bacteria.
	To have hands of experiments in isolation of DNA and plasmid DNA.

Course Content

Unit	Description	
	<p>SECTION 1</p> <ol style="list-style-type: none"> 1 Study of lab instruments: Microscope ,Centrifuge, Autoclave and Incubator 2 Biochemical test (E.coli) Carbohydrate fermentation test, IMViC & TSI test. 3 Effect of heavy metals on the growth of bacteria. 4 Extraction of protein by TCA method. 5 Quantitative and qualitative analysis of soil microflora. (TVC) 6 Isolation of genomic DNA from E.coli. <p>SECTION 2</p> <ol style="list-style-type: none"> 1 Isolation of microorganisms from soil sample by streak/spread and pour plate method. 2 Gram's staining 3 Use of selective and differential media 4 Effect of pH and temperature on the growth of microorganisms. 5 UV absorption of isolated DNA and determine its purity. 6 Monochrome staining 7 Negative staining 	

Teaching-Learning Methodology	Chalk board, Power point presentation,quizzes, Videos available on NPTEL and BISAG
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3.	University Examination	70%

Course Outcomes: Having completed this course, the learner will be able to	
1.	To gain basic knowledge of various practical work and learn about use of laboratory instruments.
2.	Gain basic knowledge on various pure culture techniques for the isolation of microorganisms from various samples and effect of different environmental factors on growth of organisms.
3.	Characterize and differentiate various types of bacteria using different staining techniques.
4.	To gain basic knowledge of various practical work and learn about use of laboratory instruments.

On-line resources to be used if available as reference material





On-line Resources

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