

SSR DEGREE COLLEGE
Telangana Council of Higher Education, Govt. of Telangana
B.Sc CBCS Common Core Syllabus for all Universities in Telangana
B.Sc – Biotechnology (w.e.f.2025-26)

FIRST YEAR SEMESTER I				
Code	Course Title	Course Type	HPW	Credits
BS101	Major - I Cell Biology, Genetics & Biostatistics	DSC1A	4T+2P=6	4+1=5
BS102	Major - II	DSC2A	4T+2P=6	4+1=5
BS103	Minor	DSC3A	4T+2P=6	4+1=5
BS104	English	AEC1A	5	5
BS105	Second Language	AEC2A	5	5
	Total		28	25
FIRST YEAR SEMESTER II				
BS201	Major - I Microbiology & Immunology	DSC1B	4T+2P=6	4+1=5
BS202	Major - II	DSC2B	4T+2P=6	4+1=5
BS203	Minor	DSC3B	4T+2P=6	4+1=5
BS204	English	AEC1B	5	5
BS205	Second Language	AEC2B	5	5
	Total		28	25
SECOND YEAR SEMESTER III				
BS301	Major - I Biological Chemistry & Molecular Biology	DSC1C	4T+2P=6	4+1=5
BS302	Major - II	DSC2C	4T+2P=6	4+1=5
BS303	Minor	DSC3C	4T+2P=6	4+1=5
BS304	English	AEC1C	5	5
BS305	Second Language	AEC2C	5	5
	Total		28	25
SECOND YEAR SEMESTER IV				
BS401	Major - I Recombinant DNA Technology & Bioinformatics	DSC1D	4T+2P=6	4+1=5
BS402	Major - II	DSC2D	4T+2P=6	4+1=5
BS403	Minor	DSC3D	4T+2P=6	4+1=5
BS404	English	AEC1D	5	5
BS405	Second Language	AEC2D	5	5
	Total		28	25

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THIRD YEAR SEMESTER V				
Code	Course Title	Course Type	HPW	Credits
BS501	Major – I Plant & Animal Biotechnology	DSC1E	4T+2P=6	4+1=5
BS502	Major - II	DSC2E	4T+2P=6	4+1=5
BS503	Basics in Biotechnology	MDC	4	4
BS504	Skill Enhancement Course - I	SEC1	2	2
BS505	Skill Enhancement Course - II	SEC2	2	2
BS506	Value Added Course - I	VAC1	3	3
	Total		23	21
THIRD YEAR SEMESTER VI				
BS601	Elective: Optional - I (A) Industrial & Environmental Biotechnology/ (B) Medical Biotechnology	DSC1F	4+2=6	4+1=5
BS602	Major – II A/B	DSC2F	4+2=6	4+1=5
BS603	Skill Enhancement Course - III	SEC3	2	2
BS604	Skill Enhancement Course – IV Biophysical and Molecular Techniques/ Fermentation Technology/ Food Biotechnology	SEC4	2	2
BS605	Value Added Course - II	VAC2	3	3
BS606	Internship/Project Work		4	4
	Total		23	21
	Grand Total			142

**Credits under Non-CGPA
(Community Engagement & Service)**

1	NSS/NCC/Sports/Extracurricular	Upto 3 Credits (2 in each year)
2	IKS	Upto 4 Credits (2 in each, after I & II years)

Major - I	30
Major - II	30
Minor	20
AEC (Ability Enhancement Course) - English	20
Second Language – Telugu/Hindi/Urdu etc.	20
MDC (Multi Disciplinary Course)	4
SEC (Skill Enhancement Course)	8
VAC (Value Added Course)	6
Internship/ Project Work	4
Total	142



**SSR DEGREE COLLEGE
(AUTONOMOUS)
BIO TECHNOLOGY**

CBCS Pattern with effect from the Academic Year 2025-26
Structure of the Curriculum

Code	Course Title	Hours/Week		Credits		
		Theory	Practical	Theory	Practical	Total
Semester – I						
BS 104	PAPER -I: Cell Biology, Genetics & Biostatistics	4	2	4	1	5
Semester – II						
BS 204	PAPER –II : Microbiology & Immunology	4	2	4	1	5
Semester – III						
BS 302	PAPER – III : Biological chemistry & Molecular Biology	4	2	4	1	5
Semester – IV						
BS 402	PAPER – IV : Recombinant DNA Technology & Bioinformatics	4	2	4	1	5
Semester – V						
BS 501	PAPER – V : Plant & Animal Biotechnology	2		2		2
BS 502	SEC : 1 -	2		2		2
BS 503	SEC : 2 -	3		3		3
BS 504	VAC : 1 -	4		4		4
Semester – VI						
BS 601	Elective : Optional – I (A) Industrial & Environmental Biotechnology (B) Medical Biotechnology	4	2	4	1	5
BS 602	SEC : 3	2		2		2
BS 603	SEC : 4	2		2		2
BS 604	VAC : 2	3		3		3
	PROJECT	2		2		2

B.Sc BIOTECHNOLOGY I YEAR
SEMESTER- I
Major - I (DSC-1A)
BS 101: CELL BIOLOGY, GENETICS AND BIOSTATISTICS

IE - 30
SEE - 70

Course Objectives

- A. To understand intracellular organization of prokaryotic & eukaryotic cells & its morphology.
- B. To comprehend the molecular process of cell cycle, cell division and cell death.
- C. To understand the mechanism of inheritance and variation
- D. To comprehend the basic concepts of biostatistics and significance

Course Outcomes

- A. Knowledge on cytological architectural of prokaryotic & eukaryotic cell
- B. Attain Knowledge on the basic mechanism underlying in cell cycle, cell division and cell death
- C. Acquire the knowledge of traits inheritance from one generation to another
- D. Gain knowledge of sampling and measures of central tendency, probability and Hypothesis testing

Unit I: Cell Structure and Functions

- 1.1 Cell as basic unit of living organisms - bacterial, fungal, plant and animal cells
- 1.2 Ultrastructure of Prokaryotic cell: Cell membrane, Nucleoid, Plasmids
- 1.3 Ultrastructure of Eukaryotic cell: Cell wall, Cell membrane, Nucleus, Mitochondria, Chloroplast, Endoplasmic reticulum, Golgi apparatus, Ribosomes, Lysosomes, Peroxisomes, Glyoxysomes
- 1.4 Cell membrane - Fluid mosaic model, Sandwich model, Cell membrane permeability, Transport across membrane – active & passive transport, Cytoskeleton – microtubules & microfilaments
- 1.5 Structure of Chromosome – chromatids, centromere, telomere, Components of chromosomes – histones & non histones
- 1.6 Specialized chromosomes – Polytene & Lampbrush chromosomes

Unit II: Cell Division and Cell Cycle

- 2.1. Bacterial cell division
- 2.2. Phases of Eukaryotic Cell cycle
- 2.3. Mitosis - Stages (Spindle assembly) & significance
- 2.4. Meiosis - Stages (Synaptonemal complex) & significance
- 2.5. Regulations of Cell cycle – proteins involved in check points
- 2.6. Senescence, Necrosis and Apoptosis

Unit III: Principles and Mechanism of Inheritance

- 3.1 Mendel's experiments on Pea plants, Mendel's Laws – Law of Dominance, Law of Segregation - Monohybrid Ratio, Law of Independent Assortment - Dihybrid ratio
- 3.2 Deviation from Mendel's Laws - Partial or Incomplete dominance (Eg. Flower Colour in *Mirabilis jalapa*), Co-dominance (Eg. MN Blood groups), Non allelic interactions - types



of Epistasis, modification of Dihybrid ratios

- 3.3 Penetrance and Expressivity (Eg. Polydactyly, Waardenburg syndrome), Pleiotropism, Phenocopy - Microcephaly, Cleft lip; Multiple allelism (Eg: Coat colour in Rabbits, Eye color in *Drosophila* and ABO Blood groups)
- 3.5 X-Y chromosomes - Sex determination in *Drosophila*, Birds, Man, *Bonellia*; Sex-linked inheritance - X- linked Inheritance (Hemophilia, Colour blindness), X-inactivation, Y-linked inheritance - Holandric genes
- 3.6 Linkage and Recombination - Cytological proof of crossing over and phases of linkage, recombination frequency, gene mapping
- 3.7 Non-Mendelian Inheritance - Maternal effect (Shell coiling in Snail), Variegation in leaves of *Mirabilis jalapa*; Cytoplasmic male sterility in Maize; Mitochondrial inheritance in Humans

Unit IV: Biostatistics-Basic Concepts

- 4.1 Introduction to Biostatistics; Kinds of data & variables, sample size, methods of sampling - random & non-random, sampling errors
- 4.2 Diagrammatic (line diagram, bar diagram & pie diagram) and graphical representation of data (histogram, frequency polygon & frequency curve)
- 4.3 Measures of central tendency - mean, median, mode; merits and demerits
- 4.4 Measures of dispersion - range, mean deviation, variance and standard deviation, standard error, merits and demerits
- 4.5 Concepts of probability - random experiments, events, probability rules, uses of permutations and combinations; Probability distribution: Binomial & Poisson distributions (discrete distribution) and Normal distribution (continuous distribution)
- 4.6 Hypothesis testing - null and alternative hypothesis; Test of Significance (Student's t -test and Z-test). Chi-square test & its significance; Analysis of variation (ANOVA)

Practicals

50 Marks

- 1. Microscopic observation of cells: bacteria, fungi, plant and animal
- 2. Preparation of different stages of Mitosis (onion root tips)
- 3. Preparation of different stages of Meiosis (pollen mother cells in plants)
- 4. Monohybrid and Dihybrid ratio in *Drosophila*/Maize
- 5. Problems on Co-dominance
- 6. Problems on Epistasis
- 7. Problems on Mean, Median and Mode
- 8. Construction of bar diagram, pie diagram, line diagram, histogram
- 9. Problems on probability & probability distribution
- 10. Problems on Hypothesis testing - Student's t-test, Z-test, Chi-square test

Reference books

- 1. Cell & Molecular Biology by E.D.O. Robertis & E.M.F De Robertis, Waverly
- 2. The cell: A Molecular approach. Geoffrey M Cooper, Robert E Hausman, ASM press
- 3. Cell Biology and Genetics by P. K. Gupta.
- 4. Theory & problems in Genetics by Stansfield, Schaum out line series McGrawhill
- 5. An introduction to Genetic Analysis by Anthony, J.F. J.A. Miller, D.T. Suzuki, R.C.

- Richard Lewontin, W.M-Gilbert, W.H. Freeman publication
6. Biometry by: Sokal and Rohlf W.H. Freeman
 7. Biostatistics by: N.T.J. Bailey
 8. Fundamentals of Biostatistics: Khan and Khanum. Ukaaz publications, India
 9. Biostatistics; Jayasree Publishers by: VishweswaraRao K



B.Sc BIOTECHNOLOGY I YEAR
SEMESTER - II
Major- I (DSC-1B)
BS 201: MICROBIOLOGY & IMMUNOLOGY

IE - 30
SEE - 70

1. Course Objectives (C. Obj):

- A. To learn the general characteristics of microorganisms
- B. To gain knowledge of the sterilization methods and bacterial growth
- C. To understand an overview of different types of immunity, cells & organs involved in the immune system.
- D. To comprehend the immunoglobulins and autoimmune disorders

2. Course Outcomes (C.O):

- A. Understanding the basics of microbiology and microbial classification
- B. To culture different bacteria and know how to preserve them
- C. Remember, interpret, and use the basic concepts to have a comprehensive understanding of antigen-antibody interactions and their relevance in immunology
- D. Define, summarize, use, and analyse the knowledge, skills, and competencies to understand immunoassays effectively in various scientific and biomedical sciences

Unit I: Fundamentals of Microbiology

- 1.1 Historical development of Microbiology and Contributors of Microbiology
- 1.2 Microscopy: Bright field microscopy, Dark field microscopy, Phase contrast microscopy, Fluorescent microscopy, Scanning and Transmission Electron microscopy
- 1.3. Outlines of Classification of microorganisms, Methods of Classification
- 1.4. Structure and general characteristics of bacteria and virus
- 1.5. Disease-causing pathogens and symptoms (*Mycobacterium*, Hepatitis)
- 1.6. Structure and general characteristics of micro-algae and fungi

Unit II: Culture and Identification of Microorganisms

- 2.1. Methods of sterilization - physical and chemical methods
- 2.2. Bacterial nutrition - nutritional types of bacteria, essential macro, micronutrients and growth factors.
- 2.3. Bacterial growth curve - batch and continuous cultures, synchronous cultures, measurement of bacterial growth-measurement of cell number and cell mass
- 2.4. Factors affecting bacterial growth
- 2.5. Culturing of anaerobic bacteria and viruses
- 2.6. Pure culture and its characteristics

Unit III: Basics of Immunology

- 3.1 Types of Immunity - innate and adaptive Immunity
- 3.2 Cells of the immune system: T-cells (helper and cytotoxic cells), B-cells, Natural killer cells, Macrophages, Basophils and Dendritic cells
- 3.3 Primary organs of immune system - Thymus and Bone marrow



- 3.4 Secondary organs of immune system - Spleen and Lymph nodes
- 3.5 Antigens-immunogenicity vs antigenicity, factors affecting antigenicity, Epitopes,
- 3.6 Haptens & types of adjuvants

Unit IV: Humoral and Cell Mediated Immunity

- 4.1 Structure of immunoglobulin- types and functions of immunoglobulins
- 4.2 Monoclonal antibody (MAbs) production and its applications
- 4.3 Major Histocompatibility Complex (MHC) & Human Leukocyte Antigen (HLA)- role in organ transplantation
- 4.4 Cell mediated immunity- T-cell receptor (TCR), Antigen Presenting Cells (APCs), ternary complex (TCR, peptide & MHC); cytokines
- 4.5 Hypersensitivity- types I, II, III & IV
- 4.6 Autoimmunity- Mechanisms of autoimmunity; Autoimmune diseases- Systemic lupus erythematosus, Rheumatoid arthritis

Practicals

50 Marks

- 1. Sterilization methods – Autoclave, Hot Air Oven, Filtration
- 2. Preparation of microbiological media (bacterial, algal & fungal)
- 3. Isolation of bacteria by streak, spread and pour plate methods
- 4. Isolation of bacteria from soil
- 5. Simple staining and differential staining (Gram's staining)
- 6. Bacterial growth curve
- 7. Blood grouping
- 8. Single radial immunodiffusion
- 9. ELISA
- 10. Viability test of cells/bacteria (Evans blue test or trypan blue test)

Reference books

- 1. Biology of Microorganisms by: Brock, T.D. and Madigan, M.T.
- 2. Microbiology by: Prescott, L.M., Harley, J.P. Klein, D.A.
- 3. Microbiology by: Pelczar, M.J, Chan, E.C.S., Ereig, N.R.
- 4. Microbiological applications by: Benson
- 5. Essential Immunology. Publ: Blackwell by: Roitt I.
- 6. Immunology. Publ: Blackwell by: Reeve G. & Todd I.
- 7. Cellular and Molecular Immunology. Saunders Publication, Philadelphia by: Abbas A.K., Lichtman A.H., Pillai S.
- 8. Kuby's Immunology. W.H. Freeman and Company by: Golds R.A., Kindt T.J., Osborne

