



DAYANANDA SAGAR
UNIVERSITY

SCHOOL OF BASIC & APPLIED SCIENCES

SCHEME & SYLLABUS
FOR
BACHELOR OF SCIENCE (B.Sc.) – 2025

SPECIALIZATION: BIOTECHNOLOGY,
CHEMISTRY & MICROBIOLOGY

(With effect from 2025-26)

(From I & II Semesters)

DAYANANDA SAGAR UNIVERSITY
INNOVATION CAMPUS, KUDLU GATE, HOSUR ROAD,
BENGALURU -560114.

ANNEXURE -I B

SCHEME – B.Sc. – 2025-26 ONWARDS

I SEM – BCM

(BIOTECHNOLOGY, CHEMISTRY & MICROBIOLOGY)

SL	PROGRAM CODE	COURSE CODE	COURSE TITLE	CR/AU	SCHEME OF TEACHING						SCHEME OF EVALUATION	
					L	T	P	S/P	C		CIA	END EXAM
1	112	25BS1101	Basic Chemistry	CR	3	-	-	-	3		60	40
2	112	25BS1102	Basic Biochemistry	CR	3	-	-	-	3		60	40
3	112	25BS1103	Fundamentals of Cell Biology	CR	3	-	-	-	3		60	40
4	112	25BS1104	Basic Microbiology	CR	3	-	-	-	3		60	40
5	112	25BS1105	Principles of Genetics	CR	3	-		-	3		60	40
6	112	25BS1171	Integrated Chemistry & Biochemistry Practical	CR	-	-	4	-	2		60	40
7	112	25BS1172	Techniques in Cell Biology and Genetics Practical	CR	-	-	4	-	2		60	40
8	112	25BS1173	Basic Microbiology Practical	CR	-	-	4	-	2		60	40
9	112	25AU1101	English	AU	2	-	-	-	-		-	50
			Total		17	-	12		21		480	370

CR–Credit, AU–Audit, L–Lecture, T–Tutorial, P–Practical, S/P–Seminar/Project, C–No. of Credits, CIA – Continuous Internal Assessment

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II SEM – BCM

(BIOTECHNOLOGY, CHEMISTRY & MICROBIOLOGY)

SL	PROGRAM CODE	COURSE CODE	COURSE TITLE	CR/AU	SCHEME OF TEACHING						SCHEME OF EVALUATION	
					L	T	P	S/P	C		CIA	END EXAM
1	112	25BT1201	Principles of Immunology	CR	4	-	-	-	4		60	40
2	112	25CY1201	Physical Chemistry	CR	4	-	-	-	4		60	40
3	112	25MY1201	Microbial Physiology and Genetics	CR	4	-	-	-	4		60	40
4	112	25BS1201	Molecular Biology	CR	4	-	-	-	4		60	40
5	112	25BT1271	Immuno-Techniques Practical	CR	-	-	4	-	2		60	40
6	112	25 CY1271	Physical Chemistry and Molecular Biology Practical	CR	-	-	4	-	2		60	40
7	112	25MY1271	Microbial Physiology Practical	CR	-	-	4	-	2		60	40
8	112	25AU1201	Kannada	AU	2	-	-	-	-		-	50
			Total		18	-	12		22		420	330

CR–Credit, AU–Audit, L–Lecture, T–Tutorial, P–Practical, S/P–Seminar/Project, C–No. of Credits, CIA – Continuous Internal Assessment

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III SEM – BCM

(BIOTECHNOLOGY, CHEMISTRY & MICROBIOLOGY)

SL	PROGRAM CODE	COURSE CODE	COURSE TITLE	CR/AU	SCHEME OF TEACHING						SCHEME OF EVALUATION	
					L	T	P	S/P	C		CIA	END EXAM
1	112	25BT2301	Principles of Recombinant DNA Technology	CR	4	-	-	-	4		60	40
2	112	25CY2301	Inorganic Chemistry	CR	4	-	-	-	4		60	40
3	112	25MY2301	Industrial, Food and Dairy Microbiology	CR	4	-	-	-	4		60	40
4	112	25BS2301	Bioinformatics and Biostatistics	CR	4	-	-	-	4		60	40
5	112	25BT2371	Techniques in Recombinant DNA Technology Practical	CR	-	-	4	-	2		60	40
6	112	25CY2371	Inorganic Chemistry Practical	CR	-	-	4	-	2		60	40
7	112	25MY2371	Industrial, Food and Dairy Microbiology Practical	CR	-	-	4	-	2		60	40
8	112	25AU2301	Indian Constitution	AU	2	-	-	-	-		-	50
			Total		18	-	12		22		420	330

CR–Credit, AU–Audit, L–Lecture, T–Tutorial, P–Practical, S/P–Seminar/Project, C–No. of Credits, CIA – Continuous Internal Assessment

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IV SEM – BCM

(BIOTECHNOLOGY, CHEMISTRY & MICROBIOLOGY)

SL	PROGRAM CODE	COURSE CODE	COURSE TITLE	CR/AU	SCHEME OF TEACHING						SCHEME OF EVALUATION	
					L	T	P	S/P	C		CIA	END EXAM
1	112	25BT2401	Principles of Animal and Plant Biotechnology	CR	4	-	-	-	4		60	40
2	112	25CY2401	Organic Chemistry	CR	4	-	-	-	4		60	40
3	112	25MY2401	Immunology and Medical Microbiology	CR	4	-	-	-	4		60	40
4	112	25BS2401	Environmental Science	CR	2	-	-	-	2		60	40
5	112	25BS2402	Bioethics and IPR	CR	2	-		-	2		60	40
6	112	25BT2471	Techniques in Animal and Plant Biotechnology Practical	CR		-	4	-	2		60	40
7	112	25CY2471	Organic Chemistry Practical	CR	-	-	4		2		60	40
8	112	25MY2471	Immunology and Medical Microbiology Practical	CR	-	-	4		2		60	40
			Total		16	-	12		22		480	320

CR–Credit, AU–Audit, L–Lecture, T–Tutorial, P–Practical, S/P–Seminar/Project, C–No. of Credits, CIA – Continuous Internal Assessment

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V SEM – BCM

(BIOTECHNOLOGY, CHEMISTRY & MICROBIOLOGY)

SL	PROGRAM CODE	COURSE CODE	COURSE TITLE	CR/AU	SCHEME OF TEACHING						SCHEME OF EVALUATION	
					L	T	P	S/P	C		CIA	END EXAM
1	112	25BT3501	Industrial and Food Biotechnology	CR	4	-	-	-	4		60	40
2	112	25CY3501	Applied Chemistry	CR	4	-	-	-	4		60	40
3	112	25MY3501	Agricultural and Environmental Microbiology	CR	4	-	-	-	4		60	40
4	112	25BS3501	Research Methodology and Scientific Writing	CR	2	-	-	-	2		60	40
5	112	25BS3502	Nanoscience	CR	2	-		-	2		60	40
6	112	25BT3571	Industrial and Food Biotechnology Practical	CR	-	-	4	-	2		60	40
7	112	25CY3571	Applied Chemistry Practical	CR	-	-	4		2		60	40
8	112	25MY3571	Agricultural and Environmental Microbiology Practical	CR	-	-	4		2		60	40
			Total		16	-	12		22		480	320

CR–Credit, AU–Audit, L–Lecture, T–Tutorial, P–Practical, S/P–Seminar/Project, C–No. of Credits, CIA – Continuous Internal Assessment

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VI SEM – BCM

(BIOTECHNOLOGY, CHEMISTRY & MICROBIOLOGY)

SL	PROGRAM CODE	COURSE CODE	COURSE TITLE	CR/AU	SCHEME OF TEACHING						SCHEME OF EVALUATION	
					L	T	P	S/P	C		CIA	END EXAM
1	112	25BS3601	Project	CR	-	-	-	48	12		60	40
2	112	25BS3602	NPTEL/MOOC/ Swayam	CR	4	-	-	-	4		-	-
			Total		4			48	16		60	40

CR–Credit, AU–Audit, L–Lecture, T–Tutorial, P–Practical, S/P–Seminar/Project, C–No. of Credits, CIA – Continuous Internal Assessment

SL	CREDIT (CR)	MARKS	
		CIA MARKS	END EXAM MARKS
1	4	60	40
2	3	60	40
3	2	30	20
4	12	180	120

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SEMESTER	I					
YEAR	I					
COURSE CODE	25BS1101					
TITLE OF THE COURSE	BASIC CHEMISTRY					
SCHEME OF INSTRUCTION	Lecture Hours	Tutorial Hours	Practical Hours	Seminar / Projects Hours	Total Hours	Credits
	3	0	-	-	36	3

COURSE OBJECTIVES:

- Students will develop a clear understanding of the fundamental principles of atomic structure and stoichiometry, including quantum concepts and chemical calculations.
- Students will be able to explain chemical bonding using various theoretical models such as VSEPR, Valence Bond Theory (VBT), and Molecular Orbital Theory (MOT) to predict molecular geometry and bonding behavior.
- Students will be able to apply foundational concepts of organic chemistry to interpret electron delocalization, identify reactive intermediates, and classify different types of organic reactions.

COURSE OUTCOMES:

CO No.	Outcomes	Bloom's Taxonomy Level
CO1	Students will be able to describe the fundamental concepts of atomic structure and quantum mechanics, including Bohr's theory, de Broglie's equation, and Heisenberg's uncertainty principle.	L2
CO2	Students will be able to do stoichiometric calculations such as molarity, molality, and parts per million (ppm), and accurately prepare chemical reagents using standard formulas.	L3
CO3	Students will be able to analyse molecular structures and bonding characteristics using VSEPR theory, hybridisation concepts, and Molecular Orbital Theory.	L4

COURSE CONTENT:

MODULE 1: ATOMIC STRUCTURE & STOICHIOMETRY	12Hrs
Atomic structure: Review of Bohr's theory and its limitations, dual behaviour of matter and radiation, de Broglie's equation-derivation, Heisenberg's uncertainty principle. Elements of Quantum chemistry- Schrodinger wave equation (No derivation). Significance of ψ and ψ^2. Stoichiometry: Significant figures and calculations, accuracy, precision and errors in quantitative analysis. Atomic weights, molecular weights, mole concept, molarity, molality, normality, mole fraction, ppt, ppb and ppm. Numerical problems related to the above concepts. Classification, preparation and dilution of reagents/solutions. Use of $N_1V_1 = N_2V_2$ formula, Preparation of ppm level solutions from source materials (salts), conversion factors.	
MODULE 2: CHEMICAL BONDING	12Hrs

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Introduction, Ionic Bond, conditions for formation of an ionic bond, examples of formation of an ionic compound. Covalent Bond: octet rule, Lewis dot formulae (BeCl_2 , BF_3 , PCl_5 , SF_6). VSEPR concept and hybridisation concepts (structure of NH_3 , H_2O) Valence bond theory: postulates and its limitations, directional characteristics of covalent bonds, Application of VBT to BeCl_2 , BF_3 , molecules. Molecular orbital theory: postulates, linear combination of atomic orbitals, bonding, nonbonding and antibonding molecular orbitals, Molecular orbital energy level diagram of molecules (N_2 , O_2 , and CO). Weak Intermolecular interactions: van der Waals forces, dipole-dipole interactions and their significance. Hydrogen Bond: Definition, types, importance in biology.

MODULE 3: BASIC ORGANIC CHEMISTRY

12Hrs

Representation of structural formula of organic compounds: condensed formula and bond line formula of organic compounds. Delocalisation of electrons: Inductive effect, electrometric effect, resonance and hyperconjugation. Types of bond cleavage, curly arrow rules in representation of mechanistic steps; electrophiles, nucleophiles. Reactive intermediates: carbocations, carbanions, free radicals and carbenes—generation, structures, stability and examples. Types of organic reactions: Types of organic reactions with examples (electrophilic/ nucleophilic substitution/addition/free radical reaction).

REFERENCES:

1. Concise Inorganic Chemistry (2023) J.D. Lee, adapted by Sudarsan Guha, Wiley India Pvt. Ltd., New Delhi, India.
2. Organic Chemistry 7 th Edition (2011) Morrison RT, Boyd RN, Pearson Education, India.
3. Physical Chemistry 11 th Edition (2018) Atkins P, de Paula J, Keeler J, Oxford University Press, UK.
4. A Textbook of Advanced Organic Chemistry Vol-I (2024) Gail Carneiro, Gomathi Shridhar, Gulshanara Shaikh, Lakshmy Ravishankar, Sujatha Kale, Himalaya Publishing House, Mumbai, India.
5. Principles of Inorganic Chemistry – 33 rd Edition (2024) Puri, Sharma & Kalia, Vishal Publishing Co., India.
6. Textbook of Physical Chemistry Vol. 1 – 6 th Edition (2024) Kapoor, Macmillan Publishers, India.
7. A Textbook of Organic Chemistry (2023) B.S. Bahl and Arun Bahl, S. Chand Publishing, New Delhi, India
8. Physical Chemistry (2023) P.W. Atkins and Julio de Paula, adapted by M. Samuel, Oxford University Press India, New Delhi, India.
9. General Chemistry (2024) Darrell D. Ebbing and Steven D. Gammon, adapted by S. Chand, Cengage Learning India Pvt. Ltd., New Delhi, India.
10. Chemistry: Principles and Applications (2023) M.J. Sienko and R.A. Plane, adapted by B.K. Sharma, Tata McGraw-Hill Education, New Delhi, India.

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SEMESTER	I					
YEAR	I					
COURSE CODE	25BS1102					
TITLE OF THE COURSE	BASIC BIOCHEMISTRY					
SCHEME OF INSTRUCTION	Lecture Hours	Tutorial Hours	Practical Hours	Seminar / Projects Hours	Total Hours	Credits
	3	0	-	-	36	3
COURSE OBJECTIVES:						
- To understand the classification, structure, and chemical properties of major biomolecules such as carbohydrates, proteins, lipids, and nucleic acids. - To develop foundation knowledge of the biological functions and biochemical significance of biomolecules in cellular systems. - To apply basic principles of stereochemistry, bonding, and functional group interactions in understanding the behaviour of biomolecules.						
COURSE OUTCOMES:						
CO No.	Outcomes				Bloom's Taxonomy Level	
CO1	Students should be able to describe the structural features, classification, and functions of carbohydrates, proteins, lipids, and nucleic acids				L2	
CO2	Students should be able to apply the knowledge of biomolecular structures to explain their interactions, chemical behaviour, and relevance in metabolic pathways				L3	
CO3	Students should be able to interpret and analyze structural differences, isomerism, and functional properties of biomolecules in relation to their biological roles.				L4	
COURSE CONTENT:						
MODULE 1: CARBOHYDRATES					12Hrs	
Classification of carbohydrates, D- and L-configuration, Fischer and Haworth projections, conformational structures of monosaccharides, mutarotation, epimers, anomers, oxidation and reduction reactions of monosaccharides, osazone formation, glycosidic bond formation, structure of disaccharides including maltose, lactose, and sucrose, classification, structure and function of polysaccharides (starch, glycogen, cellulose, and chitin). Biological roles of carbohydrates in energy metabolism, cell recognition, and structural support.						
MODULE 2: AMINOACIDS AND PROTEINS					12Hrs	

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Classification of amino acids based on side chain properties, structure and chemical properties of amino acids, acid-base behavior, isoelectric point, peptide bond formation, levels of protein structure including primary, secondary (α -helix and β -pleated sheet), tertiary, and quaternary, stabilizing forces in protein structure such as hydrogen bonds, ionic bonds, hydrophobic interactions, and disulfide bridges, denaturation and renaturation. classification of proteins based on shape and solubility, and biological roles of proteins in catalysis, signaling, structure, transport, and immunity.

MODULE 3: LIPIDS AND NUCLEIC ACIDS

12Hrs

Lipids: Classification of lipids into fatty acids, triacylglycerols, phospholipids, glycolipids, and steroids, structure and function of saturated and unsaturated fatty acids, essential fatty acids, saponification and iodine number, amphipathic nature of phospholipids, structure and function of cholesterol and lipoproteins.

Nucleic acids: classification of nucleotides and nucleosides, structure of DNA including Watson-Crick model and Chargaff's rules, major and minor grooves, types and structure of RNA including mRNA, tRNA, and rRNA, base pairing and hydrogen bonding, tautomerism of nitrogenous bases, and roles of nucleic acids in genetic information storage, replication, and expression.

REFERENCES:

1. Nelson, D.L. & Cox, M.M. (2021). *Lehninger Principles of Biochemistry* (8th Edition). W.H. Freeman.
2. Voet, D. & Voet, J.G. (2022). *Biochemistry* (5th Edition). John Wiley & Sons.
3. Berg, J.M., Tymoczko, J.L., & Stryer, L. (2019). *Biochemistry* (9th Edition). W.H. Freeman.
4. Satyanarayana, U. (2017). *Biochemistry* (5th Edition). Elsevier
5. Jain, J.L., Jain, S., & Jain, N. (2021). *Fundamentals of Biochemistry* (7th Edition). S. Chand Publishing.
6. Murray, R.K., Granner, D.K., Mayes, P.A., & Rodwell, V.W. (2018). *Harper's Illustrated Biochemistry* (31st Edition). McGraw-Hill Education.
7. Zubay, G. (2020). *Biochemistry* (6th Edition). Wm. C. Brown Publishers.
8. Alberts, B., Johnson, A., Lewis, J., Raff, M., Roberts, K., & Walter, P. (2015). *Molecular Biology of the Cell* (6th Edition). Garland Science.
9. Stryer, L. (2019). *Biochemistry* (8th Edition). W.H. Freeman.
10. Boyer, R. (2018). *Biochemistry* (2nd Edition). Pearson.

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SEMESTER	I					
YEAR	I					
COURSE CODE	25BS1103					
TITLE OF THE COURSE	FUNDAMENTALS OF CELL BIOLOGY					
SCHEME OF Instruction	Lecture Hours	Tutorial Hours	Practical Hours	Seminar Projects Hours /	Total Hours	Credits
	3	-	-	-	36	3

COURSE OBJECTIVES:

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|---|
| <p>● To familiarize the students with the basic components of prokaryotic and eukaryotic cells with special focus on the physiological processes of the cell organelles and cell.</p> |
| <p>● To introduce the students to the cell membrane and cell wall.</p> <p>● To introduce the cell cycle and regulations and cell death pathways.</p> |

CO No.	Outcomes	Bloom's Taxonomy Level
CO1	Would be able to identify different organelles of the cell	L1
CO2	Would be able to identify the cell cycle and regulatory steps of the cell cycle	L2
CO3	Can demonstrate the essential importance of cell death pathways	L3

COURSE CONTENT:

MODULE 1: ULTRA STRUCTURE OF CELL AND BIOLOGICAL MEMBRANE	12Hrs
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Historical perspectives and discovery of cell, The cell theory, Prokaryotic (Bacteria) and Eukaryotic cells (Animal and Plant) - Characteristics and differences. Cell Wall: Ultrastructure, chemical composition and function. Structure and properties, Models of cell membrane, membrane constituents- phospholipids, glycolipid, cholesterol, membrane proteins, membrane carbohydrates. Transport of nutrients- transport of ions and macromolecules, diffusion, osmosis. Types of transport mechanisms: active and passive transport, symport, antiport, co-transport, endocytosis and exocytosis.

MODULE 2: CELL ORGANELLES	12Hrs
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Structure and general functions: Chloroplast (Envelope, Stroma, Thylakoids), Endoplasmic reticulum (Smooth and Rough); Golgi complex (Cisternae, Tubules, Vesicles), Mitochondria, Ribosomes, Lysosomes (Primary and Secondary). Cytoskeleton (Microtubules, Microfilaments and Intermediate Filaments), Cilia and Flagella. Structure and general functions of Nucleus (Nuclear envelope, Nucleoplasm and Nucleolus). Chromosomes-Structure and functions (Centromere, Secondary constrictions, Telomere). Types of Chromatin (Euchromatin and Heterochromatin); Dosage Compensation. Organization of Chromatin: Nucleosomes and Solenoid Model, Giant Chromosomes (Polytene and Lamp brush).

MODULE 3: CELL CYCLE AND ITS CONTROL	12Hrs
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Introduction to cell cycle stages, Mitosis: Mitotic phases and Cytokinesis, Significance of Mitosis. Meiosis: First meiotic division, Second meiotic division, Significance of meiosis. Role of cyclins, Cdks

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and inhibitors of cell cycle progression, Cell cycle check points, Cell death: Apoptosis and necrosis, related pathways, cell senescence.

REFERENCES:

1. Verma P. S. Cell Biology, Genetics, Molecular Biology: Evolution and Ecology
2. (2006). S Chand Publishers.
3. Gerald Karp. Cell and Molecular Biology. 6th Edition (2009) Wiley Publications.
4. Bruce Alberts et al. Molecular Biology of the cell - (2002) Garland Publications.
5. Ambrose and Esty D. M. Cell Biology - (1997) ELBS Publications.
6. C.B Powar Cell Biology-, Himalaya Publications

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SEMESTER	I					
YEAR	I					
COURSE CODE	25BS1104					
TITLE OF THE COURSE	BASIC MICROBIOLOGY					
SCHEME OF Instruction	Lecture Hours	Tutorial Hours	Practical Hours	Seminar / Projects Hours	Total Hours	Credits
	3	0	-	-	36	3

COURSE OBJECTIVES:

- To introduce the fundamental principles and historical milestones in the field of microbiology.
- To impart knowledge on the structure, classification, and functional diversity of microorganisms including bacteria, viruses, fungi, protozoa, and algae.
- To develop an understanding of aseptic techniques, sterilization methods, and basic laboratory practices essential for microbiological research.

COURSE OUTCOMES:

CO No.	Outcomes	Bloom's Taxonomy Level
CO1	Students will be able to describe the history, scope, and significance of microbiology as a scientific discipline	L1
CO2	They will be able to differentiate between the major groups of microorganisms based on structure, function, and taxonomy. Also, they should be able to demonstrate understanding of microbial cell organization, metabolism, growth patterns, and genetics.	L2
CO3	Apply aseptic techniques and standard microbiological methods in laboratory settings.	L2
CO4	Analyze the role of microorganisms in natural environments, industrial processes, and human health.	L3

COURSE CONTENT:

MODULE 1: INTRODUCTION TO PROKARYOTES AND VIROLOGY	12 Hrs
Discovery of microorganisms: Contributions of Antony van Leeuwenhoek, Louis Pasteur, Robert Koch, Joseph Lister, Alexander Fleming, Ananda Chakraborty, Germ theory of disease, Scope of microbiology. Systematics: Principles of classification and taxonomy, Whittaker's five kingdom classification, Bergey's manual of bacteriology. Bacteriology: Ultrastructure and function - Slime layer, Capsule, Flagella, Pilus/ Fimbriae, Cell wall (Gram positive and negative), Cytoplasmic membrane, Cytoplasmic inclusion bodies, nuclear material, Plasmids and episomes, Ribosomes and Endospore. Reproduction – Binary fission and genetic exchange in bacteria (Conjugation, transformation and transduction). Special microbial forms: Actinomycetes, Spirochetes, Rickettsia, Chlamydiae. Introduction to Archaeobacteria and extremophiles.	

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Virology: General structure and characteristics of viruses, cultivation of viruses, general replication of viruses – lytic and lysogenic cycle with examples (TMV and Lambda phage), significance of viruses, viroids and prions.

MODULE 2: EUKARYOTES

12 Hrs

Fungi: General account of Fungi - General characteristics of fungi including habitat, distribution, nutritional requirements, fungal cell ultra- structure, thallus organization. Reproduction - asexual and sexual. Economic importance of fungi. Type study of Zygomycetes (Rhizopus), Ascomycetes (Aspergillus), Basidiomycetes (Agaricus) and Deuteromycetes (Fusarium).

Algae: General characteristics of algae including occurrence, thallus organization, algae cell ultrastructure. Reproduction and life cycles-vegetative, asexual and sexual reproduction. Economic importance of algae. Type study of Cyanophyta (Spirulina), Chlorophyta (Chlamydomonas and Spirogyra), Rhodophyta (Gracillaria).

Protozoa: General characteristics with special reference to Amoeba, Trypanosoma, Plasmodium, Paramecium.

MODULE 3: MICROSCOPY, GROWTH AND CONTROL

12 Hrs

Sterilization and Disinfection- Principles of sterilization and disinfection, methods of sterilization: physical (dry and moist heat, filtration, radiation) and chemical methods (disinfectants, antiseptics, antibiotics) – mode of action. Quality control in sterilization (Biological indicators).

Culture Techniques: Culture media and its types (simple, selective and differential media). Isolation and purification techniques of bacteria and fungi (aerobic and anaerobic). Brief introduction to biorepository.

Microbial Nutrition and Kinetics: Growth curve, Macro- and Micronutrients, Factors influencing the growth of microbes. Methods to measure microbial growth: Viable count, total count, turbidimetric methods, fungal growth measurement.

Staining techniques: Principles of staining, bacterial and fungal staining methods, Simple staining, differential staining (Gram staining, acid-fast staining), special staining methods (capsule, spore, and flagella staining).

Microscopy: Principles of resolution and magnification. Types- optical and electron microscopy – Basic principle, sample preparation, applications and limitations of Simple, Compound, Dark field, Phase contrast, Fluorescence, Confocal, Atomic force microscope (Toppling & sliding mode), and Electron Microscope -TEM , SEM and Cryo .

TEXT BOOKS:

1. Brock Biology of Microorganisms 16th Edition (2020) Madigan MT, Martinko JM, Dunlap PV, Clark DP Prentice Hall publisher USA.
2. Foundations in Microbiology, (10th Edition) (2018) Kathleen Park Talaro and Barry Chess, Tata McGraw, India.
3. Microbiology, 10th Edition (2017) Lansing M Prescott, Donald A Klein, John P Harley, McGraw Hill publisher.
4. Microbiology and Parasitology (2016) B. S. Nagoba, Elsevier Health Sciences.
5. Textbook of Microbiology (2016) R. Ananthanarayan, Orient Blackman publications.
6. Textbook of Microbiology, (2013) Dubey RC, Maheswari DK S. Chand & Co.

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7. Microbiology, 8th Edition International Student Version Jacquelyn G. Black (Marymount University) (2012), Wiley publication.
8. Understanding Microbes: An Introduction to a Small World Jeremy W. Dale (2012), Wiley-Blackwell.
9. Microbiology, 7th Edition (2009) Michael J Pelczar, Microbiology, Tata McGraw, India.
10. Advances in Applied Microbiology. (2007) Wayne W. Umbreit and D. Pearlman. Academic Press.
11. Evidence-Based Diagnosis: An Introduction to Clinical Epidemiology 2nd Edition, by Thomas B. Newman, Michael A. Kohn (2020).2 edition, Publisher: Cambridge University Press.
12. Virusphere: From Common Colds to Ebola Epidemics--Why We Need the Viruses That Plague Us (2020). 1st edition, Frank Ryan (Author), Publisher: Prometheus.
13. Guide to Clinical and Diagnostic Virology (2019), (ASM Books) 1st Edition, by ReetiKhare, Publisher: ASM Press.
14. Virology (2019), P. Saravanan. 5. Recent Advances in Animal Virology (2019) 1st Edition, Kindle Edition, by Yashpal Singh Malik, Raj Kumar Singh, Mahendra Pal Yadav, Publisher: Springer

ANNEXURE -I B

SEMESTER	I					
YEAR	I					
COURSE CODE	25BS1105					
TITLE OF THE COURSE	PRINCIPLES OF GENETICS					
SCHEME OF Instruction	Lecture Hours	Tutorial Hours	Practical Hours	Seminar / Projects Hours	Total Hours	Credits
	4	0	-	-	48	4
COURSE OBJECTIVES:						
• This course introduces undergraduate students to the fundamental principles of genetics, covering Mendelian inheritance, chromosomal theory, gene expression, and mutation. • It emphasizes the basic mechanisms of heredity, gene interaction, and the molecular basis of genetic material. • The course prepares students to understand and apply genetic principles in biology, biotechnology, agriculture, and medicine.						
COURSE OUTCOMES:						
CO No.	Outcomes				Bloom's Taxonomy Level	
CO1	Describe the basic laws of inheritance and apply Mendelian principles to solve genetic problems.				L2	
CO2	Understand chromosomal behavior during cell division and its relation to inheritance.				L1	
CO3	Explain gene structure, function, and expression at a fundamental level.				L2	
CO4	Analyze simple pedigree charts and genetic crosses using classical genetics approaches.				L3	
COURSE CONTENT:						
MODULE 1: MENDELIAN GENETICS AND EXTENSION OF MENDELIAN PRINCIPLES					12 Hrs	
History and importance of genetics, Mendel's experiments, laws of segregation and independent assortment, and their applications. Dihybrid crosses, test crosses, and backcrosses. Deviations from Mendelian ratios (incomplete dominance, codominance, multiple alleles, and lethal alleles). Gene interaction (epistasis, complementary genes, and modifier genes). Sex determination systems in animals and plants, sex-linked, sex-limited, and sex-influenced inheritance.						
MODULE 2: CHROMOSOMAL BASIS OF INHERITANCE AND LINKAGE					12 Hrs	

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Structure and function of chromosomes, mitosis, meiosis. Chromosome theory of inheritance, genetic linkage, recombination, and crossing over. Construction of simple genetic maps using recombination frequency and the concepts of linkage groups and map units. Structural and numerical chromosome variations (deletions, duplications, inversions, translocations, aneuploidy, and polyploidy) and their effects on phenotype and disease.

MODULE 3: MOLECULAR BASIS OF GENES AND MUTATIONS

12 Hrs

Concept of genes, units of heredity, the discovery of DNA as genetic material, basic structure of DNA and RNA. Central dogma of molecular biology (replication, transcription, and translation). The genetic code and its properties. Gene mutations, spontaneous and induced mutations, mutagens, DNA repair mechanisms. Applications of genetics in agriculture, human health, and biotechnology.

REFERENCES:

1. Genetics: Analysis and Principles 7th Edition (2021) Brooker RG. McGraw-Hill Education, USA.
2. Genetics: A Conceptual Approach 7th Edition (2024) Pierce BA. W.H. Freeman, USA.
3. Principles of Genetics 7th Edition (2008) Snustad DP, Simmons MJ. Wiley, USA.
4. Introduction to Genetic Analysis 12th Edition (2025) Griffiths AJF, Doebley J, Peichel C, Wassarman DA. W.H. Freeman, USA.
5. Human Genetics: Concepts and Applications 14th Edition (2023) Lewis R. McGraw-Hill Education, USA.
6. Essentials of Genetics 10th Edition (2019) Klug WS, Cummings MR, Spencer CA, Palladino MA. Pearson, USA.
7. Genetics: From Genes to Genomes 5th Edition (2015) Hartwell LH, Hood L, Goldberg ML, Reynolds AE, Silver LM, Veres RC. McGraw-Hill Education, USA.
8. Thompson & Thompson Genetics and Genomics in Medicine 9th Edition (2019) Nussbaum RL, McInnes RR, Willard HF. Elsevier, USA.
9. The Gene: An Intimate History 1st Edition (2016) Mukherjee S. Scribner, USA.
10. The Genetical Theory of Natural Selection 1st Edition (1930) Fisher RA. Clarendon Press, UK.

ANNEXURE -I B

SEMESTER	I					
YEAR	I					
COURSE CODE	25BS1171					
TITLE OF THE COURSE	INTEGRATED CHEMISTRY & BIOCHEMISTRY PRACTICAL					
SCHEME OF Instruction	Lecture Hours	Tutorial Hours	Practical Hours	Seminar Projects Hours /	Total Hours	Credits
	-	-	4	-	48	2

COURSE OBJECTIVES:

- To introduce students to fundamental biochemical techniques for detecting, extracting, and estimating biomolecules such as carbohydrates, proteins, lipids, and nucleic acids.
- To develop students' technical skills in executing experiments, recording results, and interpreting biomolecular data using standard lab protocols.

COURSE OUTCOMES:

CO No.	Outcomes	Bloom's Taxonomy Level
CO1	The students will be able to perform standard biochemical analysis of biomolecules and apply correct techniques with accuracy and precision.	L2
CO2	The students will be able to perform standard biochemical analysis of biomolecules and apply correct techniques with accuracy and precision.	L3
CO3	Analyze experimental results and evaluate the biochemical properties of biomolecules based on laboratory findings and controls.	L5

EXPERIMENTS/PRACTICALS:

1. General laboratory practice and SOP of glassware (pipette, burette and volumetric flask).
2. Calculations and preparation of Buffers.
3. Determination of strength of HCl using NaOH solution (Standardisation of NaOH using Potassium hydrogen phthalate as a primary standard).
4. Determination of iron (II) using potassium dichromate.
5. Estimation of proteins in milk.
6. Estimation of carbohydrates in vegetables (Potatoes).
7. Estimation of ascorbic acid in fruits by titrimetric method.

REFERENCES:

1. Pandey O.P., Bajpai D.N., & Giri S. *Practical Chemistry (For B.Sc. I, II, and III Year Students)*. S. Chand.

ANNEXURE -I B

2. Venkateswaran V., Veeraswamy R., & Kulandaivelu AR. *Basic Principles of Practical Chemistry*. Sultan Chand & Sons.
3. Furniss, Brian Stanley (2011). *Vogel's Textbook of Practical Organic Chemistry, 5th Edition*. Pearson Education India.
4. Sawhney, S. K., & Singh, R. (2014). *Introductory Practical Biochemistry* (7th ed., reprint). Narosa Publishing House.
5. Plummer, D. T. (2017). *An Introduction to Practical Biochemistry* (3rd ed.). McGraw Hill Education.
6. Wilke, P. (2017). *Biochemical Practical: A Laboratory Manual* (2nd ed.). Springer.
7. Benson, H. (2016). *Laboratory Manual in Biochemistry* (6th ed.). Brooks/Cole, Cengage Learning.
8. Sadasivam, S., & Manickam, A. (2012). *Biochemical Methods* (3rd ed.). New Age International.
9. Green, D.W., & Winton, J.A. (2016). *Practical Biochemistry: A Laboratory Manual* (5th ed.). Pearson Education.

ANNEXURE -I B

SEMESTER	I					
YEAR	I					
COURSE CODE	25BS1172					
TITLE OF THE COURSE	TECHNIQUES IN CELL BIOLOGY AND GENETICS PRACTICAL					
SCHEME OF Instruction	Lecture Hours	Tutorial Hours	Practical Hours	Seminar Projects Hours /	Total Hours	Credits
	-	0	4	-	48	2

COURSE OBJECTIVES:

- Develop a comprehensive understanding of microscopy techniques (bright field, dark field, phase contrast) and their application in measuring cellular structures such as onion epidermal cells and yeast cells using micrometry.
- Apply staining and microscopic examination techniques to identify and differentiate the stages of mitosis and meiosis.
- Analyze the structural and functional integrity of organelles by isolating chloroplasts and staining mitochondria in yeast cells, utilizing microscopy for detailed observation.
- Evaluate inheritance patterns through blood group analysis (ABO and Rh systems) and pedigree construction to determine autosomal dominant, recessive, and sex-linked traits.

COURSE OUTCOMES:

CO No.	Outcomes	Bloom's Taxonomy Level
CO1	Students will be able to identify and differentiate the stages of mitosis and meiosis by examining onion root tips and grasshopper testis using staining techniques and microscopic analysis.	L4
CO2	Students will be able to assess the effectiveness of isolation and staining techniques for chloroplasts and mitochondria in yeast cells, utilizing microscopy for structural analysis.	L5
CO3	Students will be able to construct pedigrees and interpret inheritance patterns to determine genetic transmission modes, including autosomal dominant, recessive, and sex-linked traits, through blood group analysis.	L6

LIST OF EXPERIMENTS

1. Introduction to Microscopy (Bright Field, Dark Field, Phase Contrast Microscopy) and microscopic measurements onion epidermal cells and yeast cell using Micrometry
2. Chloroplast isolation and their microscopic examination and vital staining of mitochondria.
3. Cell division: Study of mitosis using onion root tips.
4. Preparation and staining of grasshopper testis and onion flower buds to study the stages of meiosis.
5. Determination of ABO and Rh blood groups to understand the concepts of co-dominance and multiple alleles.

ANNEXURE -I B

6. Construction and analysis of genetic pedigrees to determine inheritance patterns, including autosomal dominant, recessive, and sex-linked traits.

REFERENCES:

1. Practical Skills in Biology 6th Edition (2020) Jones A, Reed R, Weyers J Pearson Education UK .
2. Molecular Cell Biology Laboratory Manual 3rd Edition (2023) Hudson J, Collins P Oxford University Press UK.
3. Dr. Renu Gupta , Dr. Seema Makhija , Dr. Ravi Toteja. Cell Biology : Practical Manual. Prestige Publishers, 2018.
4. Amit Gupta and Bipin Kumar Sati . Practical laboratory manual- cell biology. Lambert Academic Publishing, 2019.
5. Alberts et al., (2002). Molecular Biology of the Cell, Garland Publishing, Inc., 4th ed.
6. Techniques in Cell Biology and Genetics 1st Edition (2019) Singh R Academic Press USA.

ANNEXURE -I B

SEMESTER	I					
YEAR	I					
COURSE CODE	25BS1173					
TITLE OF THE COURSE	BASIC MICROBIOLOGY PRACTICAL					
SCHEME OF Instruction	Lecture Hours	Tutorial Hours	Practical Hours	Seminar / Projects Hours	Total Hours	Credits
	-	-	4	-		2

COURSE OBJECTIVES:

By the end of this course, students should be able to:

1. Demonstrate proper aseptic technique and prevent contamination of cultures, media, and environment during microbiological procedures.
2. Make use of laboratory equipment safely and effectively
3. Prepare and use culture media and interpret microbial morphology and growth

COURSE OUTCOMES:

CO No.	Outcomes	Bloom's Taxonomy Level
CO1	Students will be able to describe the history, scope, and significance of microbiology as a scientific discipline	L1
CO2	They will be able to differentiate between the major groups of microorganisms based on structure, function, and taxonomy. Also, they should be able to demonstrate understanding of microbial cell organization, metabolism, growth patterns, and genetics.	L2
CO3	Apply aseptic techniques and standard microbiological methods in laboratory settings.	L2
CO4	Analyze the role of microorganisms in natural environments, industrial processes, and human health.	L3

LIST OF LABORATORY/ PRACTICAL EXPERIMENTS

1. Good lab Practices and of Basic Equipment
(Autoclave, Hot air oven, Incubator, pH meter, Centrifuge, Colorimeter/ Spectrophotometer, Laminar air flow)
2. Culture media preparation
 - a. Basal media (Nutrient agar, broth, MRBA)
 - b. Selective media (EMB, McConkey)
 - c. Enriched media (Blood agar)
3. Pure culture techniques (Pour, Spread, Streak, Slant, Broth and Stab culture)
4. Staining techniques
(Simple, Gram's, Capsule, Endospore, fungal staining)
5. Micrometry: measurement of yeast cells
6. Study of Eukaryotes (permanent slides): Algae, Fungi, Protozoa
7. Study of growth curve of bacteria by turbidimetric method

TEXT BOOKS:

1. Aneja, K.R. 2014. Laboratory Manual of Microbiology and Biotechnology. Medtec

ANNEXURE -I B

2. Atlas R.M. Microbiology- Fundamentals and applications, Macmillan Publishing Company, New York.
3. Cappuccino, J.G., and Sherman, N. 1999. Microbiology - A Laboratory Manual. Fourth Edition. The Addison Wesley Longman, Inc England.
4. Pelczar, M. J., Chan E.C.S. and Krieg N.R. 1993. Microbiology. McGraw Hill Book Company, New York.
5. Prescott, L.M., Harley, J.P. and Klein, D.A. 2011. Microbiology. WCB McGraw-Hill, NY.

ANNEXURE -I B

SEMESTER	I					
YEAR	I					
COURSE CODE	25AU1101					
TITLE OF THE COURSE	ENGLISH					
SCHEME OF Instruction	Lecture Hours	Tutorial Hours	Practical Hours	Seminar / Projects Hours	Total Hours	Credits
	2	-	-	-	2	-

COURSE OBJECTIVES:

- To understand the fundamental principles of verbal and non-verbal communication and recognize barriers that affect interpersonal interaction.
- To develop effective speaking and listening skills for academic and professional settings, including interviews, presentations, and group discussions.
- To enhance writing skills for scientific and formal communication including CVs, reports, and official correspondence.
- To demonstrate a command of phonetics and grammatical structures to improve clarity, accuracy, and fluency in spoken and written English.

COURSE OUTCOMES:

CO No.	Outcomes	Bloom's Taxonomy Level
CO1	Students will be able to identify and explain communication models, styles, and barriers in both academic and professional contexts.	L2
CO2	Students will be able to participate actively in group discussions, interviews, and oral presentations using appropriate language and non-verbal cues.	L3
CO3	Students will be able to write structured and grammatically accurate paragraphs, letters, reports, and scientific documents.	L3
CO4	Students will be able to use correct phonetic transcription, stress, and intonation patterns to improve pronunciation and spoken clarity.	L3

COURSE CONTENT:

MODULE 1: COMMUNICATION & INTERPERSONAL SKILLS	12 Hrs
Fundamentals of Communication: Definition, importance, and types (verbal & non-verbal), Communication process and barriers- physiological, physical, cultural, language, gender, interpersonal, psychological, emotional, Interpersonal skills and communication styles Listening & Speaking Skills: Active listening and responding, Participating in discussions and interviews, Public speaking and oral presentations Presentation & Group Discussion: Structure and delivery of effective presentations, Group discussion techniques: do's and don'ts, Overcoming communication anxiety.	

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Writing Skills: Characteristics of effective written communication, Paragraph writing, Letter writing: formal, Report writing Preparing CVs and cover letters for internships/jobs and scientific writing basics. Email etiquette.

MODULE 2: WRITING, PHONETICS, AND GRAMMAR

12 Hrs

Phonetics and Pronunciation: Organs of speech, Classification of vowels and consonants, IPA symbols and transcription (phonemic and phonetic), Syllables, stress, rhythm, and intonation, Varieties of English pronunciation

Grammar Essentials: Word classes: open (nouns, verbs, adjectives, adverbs) and closed classes (prepositions, determiners, auxiliaries, etc.), Morphology: roots, stems, affixes, morphemes, Phrases: noun, verb, adjective, adverb, genitive, and prepositional phrases, Clauses and sentences: types and structures (simple, compound, complex), Subordination and coordination, Ambiguity: structural and lexical.

Common Grammar Errors and Sentence Focus: Errors in nouns, pronouns, verbs, adjectives, adverbs, prepositions, Tense and aspect: expressing present, past, future, frequency, and duration, Sentence focus: passive voice, impersonal structures, introducing new info, adjunct placement, Reported speech: direct and indirect reporting.

TEXT BOOKS:

1. Crystal, David., Rediscover Grammar with David Crystal. Longman,1985.
2. Bakshi, R. N. A Course in English Grammar. Orient Longman
3. Close, R. A. Reference Grammar for Students of English. Orient Longman
4. Krishnaswamy, N. Modern English – A Book of Grammar, Usage & composition. Macmillan India Ltd.
5. Aroor, Usha (Ed.) WordMaster Learner's Dictionary of Modern English. Orient Longman17.
6. Hewings, M., Advanced English Grammar. Cambridge University Press,1999.
7. Basic communication skills for technology, Andreja J. Ruther Ford, 2nd Edition, Pearson Education, 2011.
8. Communication Skills, Sanjay Kumar, Pushpalata, 1st Edition, Oxford Press, 2011.
9. Brilliant – Communication Skills, Gill Hasson, 1st Edition, Pearson Life, 2011.
10. Soft Skill and Professional Communication, Francis Peters SJ, 1st Edition, McGraw Hill Education, 2011.

ANNEXURE -I B

SEMESTER	II					
YEAR	I					
COURSE CODE	25BT1201					
TITLE OF THE COURSE	PRINCIPLES OF IMMUNOLOGY					
SCHEME OF Instruction	Lecture Hours	Tutorial Hours	Practical Hours	Seminar / Projects Hours	Total Hours	Credits
	4	-	-	-	48	4

COURSE OBJECTIVES:

- To provide basic understanding on Immune system: Cells and organs of the immune system
- To give basic framework and knowledge on structure and functions of antibodies, antigens. and antigen specificity of antibodies. antigen -antibody interactions, generation of immune response.
- To equip the students with knowledge on immunological techniques and vaccines

CO No.	Outcomes	Bloom's Taxonomy Level
CO1	Students will be able to identify different immune cells, lymphoid organs and explain their functions	L1
CO2	Students will be able to depict the basic structures of antibodies and the nature of their interaction with antigens. Should display basic functions of antibodies via their effector mechanisms, isotypes of antibodies.	L3
CO3	Students will be able to explain immunotechniques and vaccines	L2

COURSE CONTENT:

MODULE 1: COMPONENTS, CELLS AND TISSUES OF THE IMMUNE SYSTEM	12Hrs
Elements of Immune System: History and scope of Immunology, Innate, and Acquired immunity, Humoral and Cell mediated Immunity. Cells and organs of immune system and their functions – Primary and secondary lymphoid organs, T cells, B Cells, macrophage, NK cells Basic outline or scheme of clonal selection in the humoral (B cell) and cellular (T cell) branches of immunity. Immunological memory.	
MODULE 2: ANTIGENS AND ANTIBODIES	12Hrs
Antigens and Antibodies: Antigens – types, epitopes, haptens, factors affecting immunogenicity, adjuvant concept; Antibodies – structure, isotypes, and functions of Immunoglobulins. Antibody production: Polyclonal and monoclonal. Complement system – components, functions, activation pathways (classical, alternative, lectin mediated).	
MODULE 3: IMMUNE RESPONSES	12Hrs
Antigen presenting cells (APCs), Major Histocompatibility Complex (MHC) – MHC I and II. Antigen processing and presentation- endogenous and exogenous antigen processing. Cytokines (interleukins and interferons); Interleukins and Interferons – brief introduction and their important functions. Products and factors produced by T-cell activation; Primary and secondary Immune response.	
MODULE 4: IMMUNOLOGICAL TECHNIQUES AND VACCINES	12Hrs

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Principles in brief of Antigen-Antibody reactions – Precipitation, Hemagglutination – Blood grouping, ELISA, Immunofluorescence, Western blotting, RIA. Vaccines and Immunization: Passive and Active immunization, immunization schedules. Types of Vaccines – Inactivated, Attenuated, and Recombinant vaccines.

REFERENCES:

1. Immunology - Kuby J, Judy Owen, Jenni Punt, Sharon Stranford. 6th Edition.
2. Vaman Rao C. 2007. Immunology, 2nd Ed. Narosa Publishing.
3. Roitt IM. 2001. Essentials of Immunology, Blackwell Scientific Publishers, London.
4. Murphy K and Weaver C. 2016. Janeway's Immunobiology, 9th Ed. W.W. Norton & Company. <https://doi.org/10.1201/9781315533247>
5. Abbas AK, Lichtman AH, Pillai S. 2011. Cellular and Molecular Immunology. 7th Ed, Elsevier Health.

ANNEXURE -I B

SEMESTER	II					
YEAR	I					
COURSE CODE	25 CY1201					
TITLE OF THE COURSE	PHYSICAL CHEMISTRY					
SCHEME OF INSTRUCTION	Lecture Hours	Tutorial Hours	Practical Hours	Seminar / Projects Hours	Total Hours	Credits
	4	0	-	-	48	4

COURSE OBJECTIVES:

- Students will develop a comprehensive understanding of the fundamental concepts in states of matter and thermodynamics along with their significance in physical chemistry.
- Students will be capable to understand the key concepts and applications of chemical kinetics, and electrochemistry.
- Students will be able to solve problems based on rate laws, Bragg's law, Nernst equation, gas laws, reaction kinetics and entropy.

COURSE OUTCOMES:

CO No.	Outcomes	Bloom's Taxonomy Level
CO1	Students will be able to describe the behaviour of gases, liquids, and solids using fundamental concepts such as Raoult's law, the van der Waals equation, crystallography, and the basic laws of thermodynamics.	L2
CO2	Students will demonstrate proficiency in applying the Maxwell-Boltzmann distribution, reaction rate theories, and thermodynamic principles to calculate physical constants, energy changes.	L3
CO3	Students will be able to understand physical chemistry systems—including electrochemical cells and chemical reactions—using theoretical models, and analytical problem-solving techniques.	L3

COURSE CONTENT:

MODULE 1: STATES OF MATTER	12Hrs
Gaseous state: Introduction, Need for Maxwell-Boltzmann distribution law, mathematical expression, Maxwell-Boltzmann equation (no derivation) Definitions and expressions for rms velocity and average velocity, relationships between them. Problems. Andrew's isotherm on carbon dioxide and explanation of the curves (no experimental details). Derivation of critical constants T_c, P_c and V_c from van der Waal's equation. Problems on the calculation of T_c, P_c and V_c, a and b. Liquid Mixture: Review of Raoult's law, ideal and non-ideal solutions. Completely miscible liquids-Fractional distillation T_c curves for all the three types, azeotropic mixtures -examples. Completely miscible liquids-Critical solution temperature (Three types), examples. Effect of addition of salt on CST of phenol-water system. Immiscible liquids-Steam distillation and its applications. Acid and bases (Brønsted-Lowry Theory, Lewis Theory), pK_a, pK_b, pH, pOH, preparation of buffers, Henderson-Hasselbalch equation. Solid state	

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Crystalline state, Laws of crystallography. Symmetry elements in crystals, crystal systems. Weiss and Miller indices. X-ray diffraction of crystals-derivation of Bragg's equation (Problems).

MODULE 2: CHEMICAL KINETICS

12Hrs

Review of terms –Rate, Order and Molecularity. Derivation of expression for the rate constant of a second order reaction with $a = b$ and $a \neq b$. Expression for half-life of a second order reaction. Problems on rate constant, half-life period and order of reaction. Determination of order of reaction: differential method, method of integration, method of half-life period and isolation method. Theories of reaction rates: Simple collisions theory based on hard sphere model, transition state theory (equilibrium hypothesis). Effect of temperature on rate of reaction, Arrhenius equation, concept of activation energy. Problems. Expression for the rate constant based on equilibrium constant and thermodynamic aspects.

MODULE 3: THERMODYNAMICS

12Hrs

Exact and inexact differentials. Review of terms, I law of Thermodynamics. Work done (derivation with problems) in isothermal and adiabatic expansion and compression of an ideal gas (IUPAC sign conventions to be used). Heat capacity of a gas at constant pressure and constant volume: relation between P, V and T in an adiabatic process to be derived. Spontaneous and non-spontaneous processes.

Second law of thermodynamics: Limitations of I law of thermodynamics with illustrations. different ways of stating II law. Concept of entropy and its physical significance. Heat engine-Carnot's cycle and derivation of the expression for its efficiency. Problems based on efficiency equation. II law in terms of efficiency (η). Calculation of entropy changes in reversible isothermal and reversible adiabatic processes. Gibb's free energy: Criteria for equilibrium and spontaneous processes. Gibb's-Helmholtz equation-Derivation. Change of free energy with respect to temperature and pressure. Clausius-Clapeyron equation. Its applications to ΔT_b and ΔT_f determination (thermodynamic derivation not required). III law of thermodynamics-statement only. Elementary concept of residual entropy.

MODULE 4: ELECTROCHEMISTRY

12Hrs

Review of electrolytes and conductance-related terms, methods of determination of molar conductance. Conductometric titrations (only acid-base type). Ionic mobility. Conductivity of water. Kohlrausch's law and its applications. Problems based on these. Limitations of Arrhenius theory: qualitative account of Debye-Huckel theory, Debye-Huckel Onsagar equation for aqueous solutions of 1: 1 electrolytes. Verification of DHO equation. Galvanic cell: conventions of representing galvanic cells-reversible and irreversible cells, derivation of Nernst equation for single electrode potential (free energy concept). Types of electrodes: Metal and gas electrodes (chlorine), metal/metal insoluble salt electrodes, redox electrodes. Reference electrodes-standard hydrogen electrode, calomel electrode, quinhydrone electrode and glass electrode. Determination of pH using these electrodes. Numerical problems. Concentration cells: (i) emf of concentration cells, (ii) determination of solubility of sparingly soluble salts and numerical problems. Redox electrodes, emf of redox electrodes.

REFERENCES:

ANNEXURE -I B

1. **Physical Chemistry** 12th Edition (2022) Peter Atkins, Julio de Paula, James Keeler. OUP Oxford, UK.
2. **Elements of Physical Chemistry** 7th Edition (2017) Peter Atkins, Julio de Paula. OUP Oxford, UK.
3. **Physical Chemistry: A Molecular Approach** 1st Edition (1997) Donald A. McQuarrie, John D. Simon. University Science Books, USA.
4. **Introduction to Physical Chemistry** 3rd Edition (1998) Mark Ladd. Cambridge University Press, UK.
5. **Text-Book of Physical Chemistry** 2nd Edition (1948) Samuel Glasstone. D. Van Nostrand Company, USA.
6. **Principles of Physical Chemistry** 48th Edition (2022) B. R. Puri, L. R. Sharma, M. S. Pathania. Vishal Publishing Co., India.
7. **Textbook of Physical Chemistry** 14th Edition (1983) P. L. Soni, O. P. Dharmarha, U. N. Dash. Sultan Chand & Sons, India.
8. **Physical Chemistry** 5th Edition (2022) Robert J. Silbey; Robert A. Alberty; George A. Papadantonakis; Mounqi G. Bawendi. John Wiley & Sons, USA.
9. **Physical Chemistry** 6th Edition (1996) Gordon M. Barrow. McGraw-Hill College, USA.
10. **Physical Chemistry** 3rd Edition (1983) Gilbert W. Castellan. Addison-Wesley, USA.

ANNEXURE -I B

SEMESTER	II					
YEAR	I					
COURSE CODE	25MY1201					
TITLE OF THE COURSE	MICROBIAL PHYSIOLOGY AND GENETICS					
SCHEME OF Instruction	Lecture Hours	Tutorial Hours	Practical Hours	Seminar / Projects Hours	Total Hours	Credits
	4	0	-	-	48	4

COURSE OBJECTIVES:

- This course explores the fundamental principles of microbial physiology and genetics, examining the structure, function, metabolism, and genetic systems of microorganisms.
- Students will learn about diverse metabolic pathways, and the mechanisms of genetic variation.
- Beyond the core principles, the course will examine the practical applications of microbial genetics.

CO No.	Outcomes	Bloom's Taxonomy Level
CO1	Upon successful completion of this course, students will be able to describe the structural components of bacterial, archaeal, and eukaryotic microbial cell envelopes.	L1
CO2	Learn about diverse metabolic pathways, and the mechanisms of genetic variation.	L2
CO3	Explain the mechanisms of transport across microbial cell membranes.	L3
CO4	To employ the practical applications of microbial genetics	L4

COURSE CONTENT:

MODULE 1: MICROBIAL CELL ENVELOPE AND TRANSPORT	12Hrs
Microbial Cell Membrane: Structure and composition of bacterial and fungal cell membranes. Early Concepts of the Plasma Membrane, Davson-Danielli Model (Sandwich Model) and The Fluid Mosaic Model: components, dynamics, and functions. Difference between bacterial and archaeal cell envelopes. Cell walls of fungi (Chitin, glucans, mannans), algae (cellulose, other polysaccharides, Protists (pellicle). Membrane Transport Mechanisms: Passive Transport: Simple diffusion, facilitated diffusion (channels and carriers). Active Transport: Primary active transport (ATP-binding cassette transporters, ion pumps), secondary active transport (symport and antiport), uniport, symport and antiport, role of permeases in transport, Group translocation (phosphotransferase system in bacteria).	
MODULE 2: METABOLISM	12Hrs
Carbohydrate Metabolism: Glycolysis: pathways, regulation, and energy yield. TCA cycle. Electron transport chain and oxidative phosphorylation. Pentose phosphate pathway (HMP Shunt), Entner-Doudoroff's (ED) pathway, Gluconeogenesis. Glycogen metabolism. Theories of ATP synthesis. Phototrophy (Photophosphorylation): Light-dependent reactions in prokaryotes (cyclic and non-cyclic photophosphorylation, reaction centres). Carotenoids and Phycobilins. Oxygenic and anoxygenic photosynthesis.	

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Chemolithotrophy: Inorganic compounds as Electron Donors, Hydrogen (H₂) oxidation, Oxidation of reduced sulfur compounds, Iron (Fe²⁺) oxidation, Nitrification and anammox.

Fermentation: Anaerobic Metabolism: Overview of fermentation: definition, purpose, and significance. Homo and hetero- Lactic acid fermentations. Fermentation without substrate-level phosphorylation. Syntrophy

MODULE 3: INTRODUCTION TO MICROBIAL GENETICS

12Hrs

Genome organisation and methods of genetic exchange: Key differences in genome organisation and structure in prokaryotes (Bacteria and archaea), eukaryotes and viruses. Plasmids and their role. The concept of the microbial gene pool and its dynamic nature. C-value paradox, Methods of Genetic exchange: Transformation, conjugation, and Transduction

Genetics of Eukaryotic Microorganisms: Nuclear and organellar genomes in yeast and fungi. Mitochondrial and chloroplast DNA: unique features and maternal inheritance. Genetic analysis in yeast: mating types and the yeast life cycle.

DNA Replication, Repair, and Maintenance in Microbes: Prokaryotic DNA Replication. Mechanisms of DNA repair in microbes: mismatch repair, base excision repair, nucleotide excision repair, SOS response. The role of topoisomerases in maintaining DNA structure.

MODULE 4: APPLIED GENETICS

12Hrs

Microbial Genetics and Antibiotic Resistance: Genetic mechanisms of antibiotic resistance (mutations, horizontal gene transfer). The role of plasmids and transposons in the spread of resistance. Mechanisms of resistance to different classes of antibiotics. Strategies to combat antibiotic resistance.

Applications of phages. Phage therapy: potential and challenges

Applications of Microbial Genetics: Recombinant DNA technology, gene cloning, and protein expression. Microbial forensics and diagnostics. Microbial genomics and metagenomics in environmental studies.

REFERENCES:

1. Moat, A. G., Foster, J. W., & Spector, M. P. (Eds.). (2002). *Microbial physiology*. John Wiley & Sons.
2. Madigan, M. T., Martinko, J. M., & Parker, J. (1997). *Brock biology of microorganisms* (Vol. 11). Upper Saddle River, NJ: Prentice hall.
3. Maloy, S. R., Cronan, J. E., & Freifelder, D. M. (1994). *Microbial genetics*.
4. Brown, T. A. (2020). *Gene cloning and DNA analysis: an introduction*. John Wiley & Sons.
5. Lewin, B., Krebs, J., Kilpatrick, S. T., & Goldstein, E. S. (2011). *Lewin's genes X*. Jones & Bartlett Learning.
- Hartl, D. L., Jones, E. W., Hartl, D. L., & Jones, E. W. (1998). *Genetics: principles and analysis*.

ANNEXURE -I B

SEMESTER	II					
YEAR	I					
COURSE CODE	25BS1201					
TITLE OF THE COURSE	MOLECULAR BIOLOGY					
SCHEME OF Instruction	Lecture Hours	Tutorial Hours	Practical Hours	Seminar / Projects Hours	Total Hours	Credits
	4	-	-	-	48	4

COURSE OBJECTIVES:

- Understand the structure, types, and functions of DNA and RNA, and their roles in cellular processes.
- Explain the pathways of genetic information flow, including DNA replication, transcription, translation
- Explain the basic concepts of gene expression regulation and DNA repair processes.

CO No.	Outcomes	Bloom's Taxonomy Level
CO1	To demonstrate the fundamental understanding of structure and the flow of genetic information in cells from DNA to RNA to protein	L1
CO2	To compile the steps involved in DNA replication and display experimental evidence that indicates that it is semi conservative in nature	L2
CO3	To demonstrate a fundamental understanding of the key steps involved in transcription, translation, and the regulation of gene expression	L3

COURSE CONTENT:

MODULE 1: THE MOLECULAR BASIS OF LIFE	12Hrs
Central dogma, DNA and RNA as genetic material – experimental proof. Evidences for DNA as the genetic material- Griffith's transformation experiment, Hershey and Chase experiment, evidence for RNA as the genetic material of viruses (TMV/Retroviruses). Nucleic acids: DNA structure and types (A, B and Z model), Denaturation and renaturation kinetics of DNA, Genome and its organisation: idea about gene, coding sequence, regulatory sequence, intron, exon.	
MODULE 2: DNA REPLICATION AND ITS COMPONENTS	12Hrs
Replication of DNA (Conservative, Dispersive and Semi Conservative DNA replication, Meselson and Stahl experiment), Features of bidirectional DNA replication. Mechanism of DNA replication (Prokaryotes and Eukaryotes), DNA repair.	
MODULE 3: TRANSCRIPTION AND ITS COMPONENTS (Gene expression)	12Hrs
RNA structure and types of RNA – mRNA, tRNA and rRNA, small RNA (miRNA, siRNA, snRNA). RNA polymerases, Mechanism of transcription – initiation, elongation and termination in prokaryotes and eukaryotes. Post-transcriptional modifications of Eukaryotic mRNA (Poly A tailing, 5' capping and splicing mechanisms)	
MODULE 4: TRANSLATION AND REGULATION OF GENE EXPRESSION	12 Hrs
Genetic code, wobble hypothesis, Components of Protein synthesis machinery: Charging of tRNA, aminoacyl tRNA synthetases, ribosome assembly, Mechanism of protein synthesis in prokaryotes:	

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initiation, elongation and termination. Post translational modification of Proteins. Regulation of Gene expression in Prokaryotes – Operon concepts, induction, repression, attenuation (examples of Lac and Trp operons). Regulation of Gene expression in Eukaryotes –galactose metabolism in yeast. Gene silencing (RNAi interference)

REFERENCES:

1. Cell & Molecular Biology by Gerald Karp, 3rd Edition, John Wiley & Sons (2009)
2. Molecular Biology of the Gene by James Watson et al, Pearson Education (2013)
3. Molecular Biology of the Cell, Bruce Alberts et al, Garland Science Publication (2007)
4. Principles of Biochemistry by Nelson and Cox, WH Freeman Publications (2008)
5. Textbook of Cell and Molecular Biology by Ajoy Paul, Books and Allied Ltd (2011).
6. Molecular Biology and Genetic Engineering by P K Gupta, Deep and Deep Publications (2008).
7. Cell Biology, Genetics, Molecular Biology, evolution and Ecology by PS Verma and VK Agarwal, S. Chand Publications (2006).

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SEMESTER	II					
YEAR	I					
COURSE CODE	25BT1271					
TITLE OF THE COURSE	IMMUNO-TECHNIQUES PRACTICAL					
SCHEME OF Instruction	Lecture Hours	Tutorial Hours	Practical Hours	Seminar / Projects Hours	Total Hours	Credits
	-	-	4	-	48	2

COURSE OBJECTIVES:

- To develop a comprehensive understanding of fundamental immunological techniques and assays.
- To provide practical experience in isolating DNA & RNA from plant or animal cells using simple extraction protocols.
- Quantify and assess the quality of extracted DNA while understanding how nucleic acids are separated based on size, charge, and molecular weight.

CO No.	Outcomes	Bloom's Taxonomy Level
CO1	Students will apply microscopy techniques to gain a clearer understanding of theoretical concepts and effectively correlate them with practical observations.	L2
CO2	Students will learn to accurately measure cell size and distinguish between different types of blood cells based on their morphological features.	L3
CO3	Students will have hands on practical exposure for isolation and analyses of nucleic acids using modern techniques and equipment	L3

EXPERIMENTS

1. Agglutination Reactions: Blood group identification and Rh Typing
2. Study of different cells in whole blood using Giemsa/Leishman stain.
3. Determination of the concentration of viable cells in a suspension by Haemocytometer counting and determination of percentage viability (trypan blue).
4. Demonstration of qualitative Dot ELISA.
5. Demonstration of Radial Immuno-Diffusion / Ouchterlony double diffusion.
6. Demonstration of Rocket Immuno-Electrophoresis.

TEXT BOOKS/ REFERENCES:

1. Recombinant DNA: A Short Course by JD Watson, J. Tooze and DT Kurtz. Scientific American books. USA. 1983.
2. Biotechnology A Laboratory Course by Becker JM, Caldwell GA, Zachgo EA. Second edition. Elsevier. 1996.
3. Analytical techniques in Biochemistry and Molecular Biology; Katoch, Rajan. Springer 2011
4. Lab Manual in Biochemistry, Immunology and Biotechnology by Arti Nigam and Archana Ayyagari. TATA McGraw Hill publishers, 2008.
5. Lab Manual in Biochemistry, Immunology and Biotechnology by Arti Nigam and Archana

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Ayyagari. TATA McGraw Hill publishers,2008.

6. Balakrishnan S, Karthik K, Duraisamy S. 2015. Practical Immunology- A Laboratory Manual. DOI:10.13140/RG.2.1.4075.4728.
7. Hay FC, Westwood OMR. 2002. Practical Immunology, 4th Ed. Wiley-Blackwell, Malden, MA.
8. Nigam A. 2008. Lab Manual in Biochemistry, Immunology and Biotechnology. Tata McGraw-Hill Pub., (India).

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SEMESTER	II					
YEAR	I					
COURSE CODE	25 CY1271					
TITLE OF THE COURSE	PHYSICAL CHEMISTRY AND MOLECULAR BIOLOGY PRACTICAL					
SCHEME OF INSTRUCTION	Lecture Hours	Tutorial Hours	Practical Hours	Seminar Projects Hours /	Total Hours	Credits
	0	0	4	-	48	2

COURSE OBJECTIVES:

- To make the students learn about the usage of various apparatus such as specific gravity bottle, viscometer and stalagmometer.
- To make the students to learn about the experiments related to conductimetric and pH metric titrations.

COURSE OUTCOMES:

CO No.	Outcomes	Bloom's Taxonomy Level
CO1	Students will be familiar with various with conductometric and pH metric titrations.	L2
CO2	Students will be versed with the use and applications of specific gravity bottle, viscometer and pH meter.	L3

EXPERIMENTS:

- Determination of the density using specific gravity bottle and surface tension of a liquid using Stalagmometer.
- Determination of viscosity of the given liquid using Ostwald's viscometer.
- Determination of pKa of a weak acid by pH metric method.
- Conductometric titration of hydrochloric acid with sodium hydroxide.
- Determination of velocity constant for acid catalysed hydrolysis of methyl acetate.
- Determination of equivalent conductivity of 0.1 N sodium chloride and verification of DHO equation.
- Extraction of DNA from plant/bacterial/ animal cells.
- Extraction of RNA from given sample (plant/animal/microbe)
- Quantification of DNA by spectrophotometry.
- Separation and visualization of DNA/RNA on agarose gel electrophoresis.

REFERENCES:

- Experiments in Physical Chemistry, 9th Edition (2020) Carl W. Garland, Joseph W. Nibler, David P. Shoemaker. McGraw-Hill Education, USA.
- Vogel's Quantitative Chemical Analysis, 6th Edition (2009) J. Mendham, R.C. Denney, M.J.K. Thomas, David J. Barnes. Pearson Education India.

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3. Enhancing Undergraduate Chemistry Laboratories J. Carnduff, N. Reid. Royal Society of Chemistry, UK.
4. Advanced Practical Chemistry K. Chelladurai, K. Subbian. LAP Lambert Academic Publishing, Germany.
5. Jocelyn, E. K., Elliot, S. G., Stephen, T. K. (2009), Lewin's Gene X. Jones & Barlett.
6. Krebs, J.E., Goldstein, E.S. and Kilpatrick, S.T. (2014). Lewin's Genes XI. Jones and Bartlet India Pvt. Ltd.
7. Freshney, R.I. (2011). Culture of Animal Cells: A Manual of Basic Technique and Specialized Applications. Wiley online library.
8. Primrose, S. B., and R. M. Twyman. Principles of gene manipulation and Genomics. Blackwell Publishing MA. USA. 2006.
9. Recombinant DNA: A Short Course by JD Watson, J. Tooze and DT Kurtz. Scientific American books. USA. 1983.

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SEMESTER	II					
YEAR	I					
COURSE CODE	25MY1271					
TITLE OF THE COURSE	MICROBIAL PHYSIOLOGY PRACTICAL					
SCHEME OF Instruction	Lecture Hours	Tutorial Hours	Practical Hours	Seminar / Projects Hours	Total Hours	Credits
	-	0	4	-	48	2

COURSE OBJECTIVES:

- This course aims to provide a foundational understanding of microbial physiology and genetics through theory and practical lab work. Students will learn core principles of microbial function and heredity, develop essential microbiological and basic molecular techniques, gain hands-on experimental skills, and learn to interpret scientific data in these areas.

COURSE OUTCOMES:

CO No.	Outcomes	Bloom's Taxonomy Level
CO1	Upon completion of this course, students will be able to isolate and cultivate bacteria from environmental samples and prepare pure cultures.	L1
CO2	Determine bacterial growth curves and analyze the effect of environmental factors (pH, salinity) on microbial growth.	L3
CO3	Perform basic staining techniques and conduct and interpret biochemical tests for bacterial identification and characterisation.	L2
CO4	Develop practical skills in performing experiments related to microbial physiology and genetics.	L4

EXPERIMENTS:

1. Effect of pH/ salinity on bacterial growth
2. Biochemical test: Catalase, Oxidase
3. Hydrogen sulfide production in TSIA
4. Indole, Methyl Red, Voges-Proskauer, Citrate Utilization Test
5. Plate assays for enzyme screening: Starch, Casein and Gelatin hydrolysis
6. Study of UV mutagenesis in *E. coli*.

REFERENCES:

10. Aneja, K. R. (2007). Experiments in microbiology, plant pathology and biotechnology. New Age International.
11. Aneja, K. R. (2008). A textbook of Basic and Applied Microbiology. New Age International.
12. Maheshwari, D. K. (2002). *Practical Microbiology*. S. Chand Publishing.
13. Sastry, A. S. (2017). *Essentials of Practical Microbiology*. JP Medical Ltd. Parija, S. C. (2007). *Textbook of practical microbiology*. Ahuja Publishing House.
14. Green, M. R., & Sambrook, J. (2012). A laboratory manual. *John Inglis*.

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SEMESTER	II					
YEAR	I					
COURSE CODE	25AU1201					
TITLE OF THE COURSE	KANNADA KALI					
SCHEME OF Instruction	Lecture Hours	Tutorial Hours	Practical Hours	Seminar / Projects Hours	Total Hours	Credits
	2	-	-	-	2	-

COURSE OBJECTIVES:

- To enable students read and write in Kannada
- To make students to communicate in Kannada helping them to interact with local people for their daily needs

COURSE OUTCOMES:

CO No.	Outcomes	Bloom's Taxonomy Level
CO1	Students should be able to read, write and communicate in Kannada	L1

COURSE CONTENT:

1. ALPHABETS – AKSHARAMAALE - ಅಕ್ಷರಮಾಲೆ
2. SIGNS OF VOWELS AND CONJUNCT CONSONANTS – KAAGMODULEHA MATTHU OTTHAKSHARAGALU ಕಾಗುಣಿತ ಮತ್ತು ಒತ್ತಕ್ಷರಗಳು
3. DAILY USING WORDS PART – 1 DINANITHYADA PADAGALU BHAAGA – 1 ದಿನನಿತ್ಯದ ಪದಗಳು ಭಾಗ – 1
4. WEEKDAY AND MONTH NAMES – VAARADA MATTHU THINGALA HESARUGALU ವಾರದ ಮತ್ತು ತಿಂಗಳ ಹೆಸರುಗಳು
5. TASTE – RUCHI – ರುಚಿ
6. COLOURS – BANNAGALU – ಬಣ್ಣಗಳು
7. NUMBERS – SANKYEGALU - ಸಂಖ್ಯೆಗಳು
8. DAILY USING WORDS PART – 2 DINANITHYADA PADAGALU BHAAGA – 2 ದಿನನಿತ್ಯದ ಪದಗಳು ಭಾಗ – 2
9. QUESTION PATTERNS – PRASHNEYA VIDHAANAGALU ಪ್ರಶ್ನೆಯ ವಿಧಾನಗಳು
10. MEASUREMENTS – ALATHEGALU - ಅಳತೆಗಳು
11. EDUCATION WORDS – SHAIKSHANIKI PADAGALU ಶೈಕ್ಷಣಿಕ ಪದಗಳು
12. LIQUID ITEMS – NEERINAAMSHADA PADAGALU ನೀರಿನಾಂಶದ ಪದಗಳು
13. FRUITS – HANNUGALU – ಹಣ್ಣುಗಳು
14. VEGETABLES – THARAKAARIGALU – ತರಕಾರಿಗಳು

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15. FOOD ITEMS – AAHAARA PADAARTHAGALU
ಆಹಾರ ಪದಾರ್ಥಗಳು
16. DAILY USING WORDS PART -3 –
DINANITHYADA PADAGALU BHAAGA -3
ದಿನನಿತ್ಯದ ಪದಗಳು ಭಾಗ -3
17. METALS – LOHAGALU – ಲೋಹಗಳು
18. RELATIVES – SAMBANDHIKARU – ಸಂಬಂಧಿಕರು
19. SEASONS AND CLOTHES –
KAALAGALU MATTHU BATTEGALU
ಕಾಲಗಳು ಮತ್ತು ಬಟ್ಟೆಗಳು
20. HOUSE AND FURNITURE –
MANE MATTHU PEETOPAKARANAGALU
ಮನೆ ಮತ್ತು ಪೀಠೋಪಕರಣಗಳು
21. OPPOSITE WORDS – VIRUDDHA PADAGALU
ವಿರುದ್ಧ ಪದಗಳು
22. VERBS - KRIYAA PADAGALU – ಕ್ರಿಯಾ ಪದಗಳು
23. ANIMALS – PRAANIGALU – ಪ್ರಾಣಿಗಳು
24. INSECTS – KRIMIKEETAGALU – ಕ್ರಿಮಿಕೀಟಗಳು
25. BIRDS – PAKSHIGALU – ಪಕ್ಷಿಗಳು
26. FEELINGS – BHAAVANEGALU – ಭಾವನೆಗಳು
27. TENSES – KAALASOOCHAKAGALU – ಕಾಲಸೂಚಕಗಳು
28. COMMUNICATION WORDS – SAMBHAASHANEYA PADAGALU-
ಸಂಭಾಷಣೆಯ ಪದಗಳು

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SEMESTER	II					
YEAR	I					
COURSE CODE	25AU1201					
TITLE OF THE COURSE	KANNADA MANASU					
SCHEME OF Instruction	Lecture Hours	Tutorial Hours	Practical Hours	Seminar / Projects Hours	Total Hours	Credits
	2	-	-	-	2	-

COURSE OBJECTIVES:

- To enable students read and write in Kannada
- To make students to communicate in Kannada helping them to interact with local people for their daily needs

COURSE OUTCOMES:

CO No.	Outcomes	Bloom's Taxonomy Level
CO1	Students should be able to read, write and communicate in Kannada	L1

COURSE CONTENT:

ಕನ್ನಡ ಪಠ್ಯಕ್ರಮ		
1.	ಕನ್ನಡ ಭಾಷಾ ವಿಜ್ಞಾನದ ಪ್ರಾರಂಭಗಳು	
2.	ಭಾಷಾ ಕಲಿಕೆಯ ವಿವಿಧ ನೆಲೆಗಳು	
3.	ವ್ಯವಹಾರಿಕ ಭಾಷೆಯಲ್ಲಿ ಕನ್ನಡ	
4.	ಕಂಪ್ಯೂಟರ್ ಕಲಿಕೆಯಲ್ಲಿ (ಗಣಕಯಂತ್ರ) ಕನ್ನಡ ಬಳಕೆ	
5.	ಪತ್ರ ಲೇಖನ	
	1. ವೈಯಕ್ತಿಕ ಪತ್ರಗಳು	2. ವ್ಯವಹಾರಿಕ ಪತ್ರಗಳು
6.	ಪ್ರಬಂಧ ರಚನೆ	
	1. ಸಾಮಾಜಿಕ ಕ್ಷೇತ್ರ	2. ಶೈಕ್ಷಣಿಕ ಕ್ಷೇತ್ರ
7.	ಗಾದೆಗಳ ಬಳಕೆ	
	1. ಜನಪದದ ಶೈಲಿ	2. ಅನುಭವದ ಶೈಲಿ
8.	ವಾಕ್ಯ ಸಂಯೋಜನೆ	
	1. ಸರಳ ವಾಕ್ಯ	2. ಮಿಶ್ರವಾಕ್ಯ
	3. ಸಂಯೋಜಿತ ವಾಕ್ಯ	
9.	ವ್ಯಾಕರಣ ಭಾಗ	
	1. ಅನುಕರಣವಾಚಕ ಪದಗಳು	2. ವಿರುದ್ಧ ಪದಗಳು, ನುಡಿಗಟ್ಟುಗಳು
	3. ವಿದ್ಯರ್ಥಕ ಪದಗಳು	4. ಅರ್ಥ, ಸಮಾನಾರ್ಥ, ನಾನಾರ್ಥ ಪದಗಳು
	5. ನಿಷೇಧಾರ್ಥಕ ಪದಗಳು	6. ಸಂಖ್ಯಾವಾಚಕ, ನಾಮವಾಚಕಗಳು
	7. ವಿಭಕ್ತಿ ಪ್ರತ್ಯಯಗಳು	8. ಕ್ರಿಯಾಪದಗಳು, ಧಾತುರೂಪ
	9. ಪದ ವಿಂಗಡಣೆ	10. ದ್ವಿರುಕ್ತಿ, ಜೋಡುನುಡಿ, ಇತ್ಯಾದಿ

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10. ಸೃಜನಾತ್ಮಕ ಬರವಣಿಗೆ
 1. ವಿಷಯದ ಆಯ್ಕೆ
 2. ಅನಿಸಿಕೆಯ ಭಾಗ
 3. ವಿಶ್ಲೇಷಣೆ
 4. ಉಪಸಂಹಾರ
11. ವಿಷಯದ ಚರ್ಚೆ, ಪ್ರಬಂಧ ಮಂಡನೆ
12. ಸಮೂಹ ಚರ್ಚೆ, ಪಠ್ಯ - ಪದ್ಯ - ನಾಟಕ ಭಾಗ
13. ವಿಷಯ ಸಂಗ್ರಹಣೆ, ವರದಿ, ಲೇಖನ ಕಲೆ
14. ಸಂಪರ್ಕ ಮಾಧ್ಯಮಗಳು - ಅದರ ಬಳಕೆ
15. ಸ್ವತಂತ್ರ ಕಥೆ, ವರ್ಣನೆ, ಪ್ರವಾಸಕಥನ ಮತ್ತು ಅನುಭವಗಳ ನಿರೂಪಣೆ
