ANNEXURE -I A

DAYANANDA SAGAR UNIVERSITY

SCHOOL OF BASIC & APPLIED SCIENCES

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

SPECIALIZATION: BIOCHEMISTRY, BIOTECHNOLOGY & GENETICS

(With effect from 2025-26)
(From I & II Semesters)

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

ANNEXURE -I A

SCHEME – B.Sc. – 2025-26 ONWARDS

I SEM – BBG

(BIOTECHNOLOGY, BIOCHEMISTRY & GENETICS)

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	111	25BS1101	Basic Chemistry	CR	3	-	-	-	3		60	40
2	111	25BS1102	Basic Biochemistry	CR	3	-	-	-	3		60	40
3	111	25BS1103	Fundamentals of Cell Biology	CR	3	-	-	-	3		60	40
4	111	25BS1104	Basic Microbiology	CR	3	-	-	-	3		60	40
5	111	25BS1105	Principles of Genetics	CR	3	-		-	3		60	40
6	111	25BS1171	Integrated Chemistry & Biochemistry Practical	CR	-	-	4	-	2		60	40
7	111	25BS1172	Techniques in Cell Biology and Genetics Practical	CR	-	-	4	-	2		60	40
8	111	25BS1173	Basic Microbiology Practical	CR	-	-	4	-	2		60	40
9	111	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

ANNEXURE -I A

II SEM – BBG

(BIOTECHNOLOGY, BIOCHEMISTRY & GENETICS)

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	111	25BT1201	Principles of Immunology	CR	4	-	-	-	4		60	40
2	111	25BY1201	Bioanalytical Techniques	CR	4	-	-	-	4		60	40
3	111	25GS1201	Population and Evolutionary Genetics	CR	4	-	-	-	4		60	40
4	111	25BS1201	Molecular Biology	CR	4	-	-	-	4		60	40
5	111	25BT1271	Immuno-Techniques Practical	CR	-	-	4	-	2		60	40
6	111	25BY1271	Bioanalytical Techniques and Molecular Biology Practical	CR	-	-	4	-	2		60	40
7	111	25GS1271	Population and Evolutionary Genetics Practical	CR	-	-	4	-	2		60	40
8	111	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

ANNEXURE -I A

III SEM – BBG

(BIOTECHNOLOGY, BIOCHEMISTRY & GENETICS)

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	111	25BT2301	Principles of Recombinant DNA Technology	CR	4	-	-	-	4		60	40
2	111	25BY2301	Human Physiology	CR	4	-	-	-	4		60	40
3	111	25GS2301	Cytogenetics and Immunogenetics	CR	4	-	-	-	4		60	40
4	111	25BS2301	Bioinformatics and Biostatistics	CR	4	-	-	-	4		60	40
5	111	25BT2371	Techniques in Recombinant DNA Technology Practical	CR	-	-	4	-	2		60	40
6	111	25BY2371	Clinical Biochemistry-I Practical	CR	-	-	4	-	2		60	40
7	111	25GS2371	Cytogenetics and Immunogenetics Practical	CR	-	-	4	-	2		60	40
8	111	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

ANNEXURE -I A

IV SEM – BBG

(BIOTECHNOLOGY, BIOCHEMISTRY & GENETICS)

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	111	25BT2401	Principles of animal and plant Biotechnology	CR	4	-	-	-	4		60	40
2	111	25BY2401	Metabolism	CR	4	-	-	-	4		60	40
3	111	25GS2401	Applied Genetics	CR	4	-	-	-	4		60	40
4	111	25BS2401	Environmental Science	CR	2	-	-	-	2		60	40
5	111	25BS2402	Bioethics and IPR	CR	2	-		-	2		60	40
6	111	25BT2471	Techniques in Animal and Plant Biotechnology Practical	CR		-	4	-	2		60	40
7	111	25BY2471	Clinical Biochemistry -II Practical	CR	-	-	4		2		60	40
8	111	25GS2471	Applied Genetics 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

ANNEXURE -I A

V SEM – BBG

(BIOTECHNOLOGY, BIOCHEMISTRY & GENETICS)

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	111	25BT3501	Industrial and Food Biotechnology	CR	4	-	-	-	4		60	40
2	111	25BY3501	Enzymology	CR	4	-	-	-	4		60	40
3	111	25GS3501	Developmental Genetics	CR	4	-	-	-	4		60	40
4	111	25BS3501	Research Methodology and Scientific Writing	CR	2	-	-	-	2		60	40
5	111	25BS3502	Nanoscience	CR	2	-		-	2		60	40
6	111	25BT3571	Industrial and Food Biotechnology Practical	CR	-	-	4	-	2		60	40
7	111	25BY3571	Enzymology Practical	CR	-	-	4		2		60	40
8	111	25GS3571	Developmental Genetics 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

ANNEXURE -I A

VI SEM – BBG

(BIOTECHNOLOGY, BIOCHEMISTRY & GENETICS)

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	111	25BS3601	Project	CR	-	-	-	48	12		60	40
2	111	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

ANNEXURE -I A

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**

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.

ANNEXURE -I A

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**

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.

ANNEXURE -I A

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:

- 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.
- To introduce the students to the cell membrane and cell wall.
- To introduce the cell cycle and regulations and cell death pathways.

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**

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**

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**

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

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

ANNEXURE -I A

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 Chakraborthy, 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 Archaebacteria and extremophiles.

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 Blacksman publications.
6. Textbook of Microbiology, (2013) Dubey RC, Maheswari DK S. Chand & Co.

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 A

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**

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 A

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.

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 A

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.

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.

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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**	**-**	**48**	**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 Basic Equipments
   (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

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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.

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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 – Comminication 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 A

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.

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MODULE 4: IMMUNOLOGICAL TECHNIQUES AND VACCINES	12Hrs
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, Pilliai S. 2011. Cellular and Molecular Immunology. 7th Ed, Elsevier Health.

ANNEXURE -I A

SEMESTER	**II**					
YEAR	**I**					
COURSE CODE	**25BY1201**					
TITLE OF THE COURSE	**BIO-ANALYTICAL TECHNIQUES**					
SCHEME OF Instruction	Lecture Hours	Tutorial Hours	Practical Hours	Seminar / Projects Hours	Total Hours	Credits
	4	**0**	**-**	**-**	**48**	**4**

COURSE OBJECTIVES:

- To provide students with a solid understanding of the theoretical foundations and applications of various bioanalytical techniques in the field of biochemistry and molecular biology.
- To give holistic view for understanding the screening, isolation, separation and characterization of molecules.
- To equip students with the ability to select, apply, and interpret results from bioanalytical techniques used for the qualitative and quantitative analysis of biomolecules.

CO No.	**Outcomes**	**Bloom's Taxonomy Level**
CO1	Students should be able to identify and describe the fundamental principles behind various bioanalytical techniques, including chromatography, spectroscopy, and electrophoresis.	L2
CO2	Students should be able to apply bioanalytical techniques to solve problems related to the analysis of biomolecules in complex biological systems, demonstrating competence in experimental procedures.	L3
CO3	Students should be able to interpret and analyze the data generated from bioanalytical techniques and interpret their results, ensuring correct application of the technique to biological samples.	L4

COURSE CONTENT:

MODULE 1: SPECTROSCOPIC TECHNIQUES **12Hrs**

Spectroscopy: Beer-Lambert's law, application and its limitations. Extinction coefficient, Principle, schematics and applications of Colorimeter and UV-Vis Spectroscopy.

Structural elucidation: IR and NMR their application in structural analysis of macro molecules.

MODULE 2: CHROMATOGRAPHY **12Hrs**

Principle of Chromatography. Distribution/partition coefficient, Absorption and Adsorption phenomenon, Retention factor (Rf & Rt concepts). Types: Planar and columnar. Paper and thin layer chromatography, types and their application in separation of biomolecules Types of matrices used, separation of biomolecules using gel permeation, ion exchange, affinity and adsorption chromatography with applications. Brief idea about High Performance Liquid Chromatography (HPLC)/ FPLC and Gas Chromatography (GC). Mass Spectrometry - Introduction and applications.

MODULE 3: ELECTROPHORESIS	12Hrs
Migration of ions in electric field, Factors affecting electrophoretic mobility. Paper electrophoresis, High voltage electrophoresis and their Applications. Principle, schematics and application of Agarose gel electrophoresis, Native PAGE, SDS-PAGE, Isoelectric focusing (IEF), 2D-PAGE and Capillary electrophoresis.	
MODULE 4: CENTRIFUGATION AND ISOTRACER TECHNIQUES	**12Hrs**
Centrifugation: Basic principles, RCF, Svedberg constant and Sedimentation coefficient. Preparative centrifugation: Differential & density gradient centrifugation, Applications. Analytical centrifugation: Determination of molecular weight of biomolecules. **Isotopic tracer techniqu**es: Radioactive & stable isotopes, Pattern and rate of radioactive decay. Measurement of radioactivity: Geiger-Muller counter, Solid & Liquid scintillation counters (Basic principle, instrumentation & technique), Autoradiography their advantages and limitations.	
REFERENCES:	

1. Skoog, D.A., Holler, F.J., & Crouch, S.R. (2017). Principles of Instrumental Analysis (7th Edition). Brooks/Cole.
2. Wilson, K., & Walker, J. (2018). Principles and Techniques of Biochemistry and Molecular Biology (8th Edition).
3. Bersillon, R., & Poole, C.F. (2019). Introduction to Modern Liquid Chromatography (3rd Edition). Wiley.
4. Davis, B.J. (2020). Electrophoresis: Principles and Techniques (5th Edition). Academic Press.
5. Glick, B.R., & Pasternack, J.J. (2020). Molecular Biotechnology: Principles and Applications of Recombinant DNA (5th Edition). ASM Press.
6. Garrett, R.H., & Grisham, C.M. (2017). Biochemistry (6th Edition). Cengage Learning.
7. Pavia, D.L., Lampman, G.M., Kriz, G.S., & Vyvyan, J.R. (2018). Introduction to Spectroscopy (5th Edition). Cengage Learning.
8. Rodrigues, J.A., & Guntrum, J.D. (2018). Bioanalytical Chemistry: Techniques and Applications (2nd Edition). Wiley.
9. Rao, M.V., & Subramanian, M.R. (2017). Fundamentals of Electrophoresis (2nd Edition). Springer.
10. Harris, D.C. (2018). Quantitative Chemical Analysis (9th Edition). W.H. Freeman.

ANNEXURE -I A

SEMESTER	**II**					
YEAR	**I**					
COURSE CODE	**25GS1201**					
TITLE OF THE COURSE	**POPULATION AND EVOLUTIONARY GENETICS**					
SCHEME OF Instruction	Lecture Hours	Tutorial Hours	Practical Hours	Seminar / Projects Hours	Total Hours	Credits
	4	**0**	**-**	**-**	**48**	**4**

COURSE OBJECTIVES:

- To explain the core concepts of population genetics, including allele and genotype frequencies, the Hardy-Weinberg equilibrium, and the impact of microevolutionary forces on genetic variation within populations.
- To provide students with a detailed understanding for applying molecular markers and statistical techniques to assess genetic diversity, determine genetic differentiation among populations, and interpret population structure using real-world data.

COURSE OUTCOMES:

CO No.	Outcomes	Bloom's Taxonomy Level
CO1	Students will be able to define key terms in population genetics, such as gene pool, allele frequency, and genetic drift. Explain the fundamental principles of the Hardy-Weinberg equilibrium and its assumptions.	L2
CO2	Students will be able to analyze genetic diversity within populations by interpreting molecular marker data. Apply statistical methods to assess genetic differentiation and infer population structure based on empirical datasets.	L3
CO3	Students will be able to evaluate the impact of evolutionary forces like selection and genetic drift on population dynamics. Synthesize molecular evolution concepts to interpret evolutionary relationships, divergence times, and molecular adaptations.	L4
CO4	Students will be able to design and present a research project that applies population genetics principles to address a real-world question or issue. Reflect on the ethical considerations and practical implications of using population genetics in diverse contexts such as medicine, conservation, and forensics.	L5

COURSE CONTENT:

MODULE 1: INTRODUCTION TO POPULATION GENETICS	**12 Hrs**

Definition and scope of population genetics, Key concepts: gene pool, allele frequency, genotype frequency, Historical development and significance. Hardy - Weinberg Law, Genetic drift: definition, types, and effects, Gene flow: impact on genetic diversity. Mutation: role in generating genetic variation. Natural selection: mechanisms and outcomes. Polygenic traits vs. Mendelian traits. Heritability and its estimation. Phenotypic variation: genetic vs. environmental components. Response to selection and selective breeding.

MODULE 2: GENETIC VARIATION AND EVOLUTION	**12 Hrs**

DNA sequence variation: SNPs, indels, and CNVs, Molecular markers in population genetics (microsatellites, SNPs). Applications of molecular markers in studying genetic diversity. Population subdivision and its causes. FST and related indices for measuring genetic differentiation. Genetic structure analysis: clustering methods, Principal Component Analysis (PCA). Molecular clocks and their applications. Molecular phylogenetics and constructing phylogenetic trees. Examples of rapid evolution in response to environmental changes. Evolutionary arms race and coevolution. Human evolution: insights from population genetics.

MODULE 3: APPLIED POPULATION GENETICS	**12 Hrs**

Genetic diversity and conservation of endangered species. Minimum Viable Population (MVP) and effective population size (Ne). Inbreeding depression and its management. Studying ecological interactions using genetic data. Landscape genetics and gene flow patterns. Identifying source populations and migration routes. Genetic basis of diseases and their prevalence in populations. Genome-wide association studies (GWAS) and identifying disease-associated variants. Personalized medicine and its ethical considerations. Human genetic diversity and migration patterns. Genetic admixture and its implications. Population genetics and forensic applications.

MODULE 4: MOLECULAR EVOLUTION AND IMPLICATIONS	**12 Hrs**

Coalescent theory: concepts and applications. Coalescent simulations and their significance. Molecular clock and coalescent-based dating methods. Positive selection and detecting adaptive evolution. Molecular basis of adaptation in specific organisms. Evolution of gene families and functional divergence. Comparative genomics and studying genome evolution. Horizontal gene transfer and its impact on genomes. Evolution of non-coding DNA and regulatory elements.

REFERENCES:

1. Principles of Population Genetics 4th Edition (2007) Hartl DL, Clark AG. Sinauer Associates, USA.
2. Population Genetics: A Concise Guide 2nd Edition (2004) Gillespie JH. Johns Hopkins University Press, USA.
3. An Introduction to Population Genetics: Theory and Applications 1st Edition (2013) Nielsen R, Slatkin M. Sinauer Associates, USA.
4. Evolution and the Genetics of Populations, Volume 4: Variability Within and Among Natural Populations New Edition (1984) Wright S. University of Chicago Press, USA.
5. Molecular Evolutionary Genetics Reprint Edition (1987) Nei M. Columbia University Press, USA.
6. The Genetics of Human Populations 1st Edition (1971) Cavalli-Sforza LL, Bodmer WF. Dover

Publications, USA.
7. Population Genetics and Microevolutionary Theory 1st Edition (2006) Templeton AR. Wiley-Liss, USA.
8. Evolutionary Genetics 1st Edition (1989) Maynard Smith J. Oxford University Press, UK.
9. Genetics and Analysis of Quantitative Traits 1st Edition (1998) Lynch M, Walsh B. Sinauer Associates, USA.
10. Genetics of Populations 3rd Edition (2005) Hedrick PW. Jones & Bartlett Learning, USA.

ANNEXURE -I A

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:

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).

ANNEXURE -I A

SEMESTER	**II**					
YEAR	**I**					
COURSE CODE	**25BY1271**					
TITLE OF THE COURSE	**BIOANALYTICAL TECHNIQUES AND MOLECULAR BIOLOGY PRACTICAL**					
SCHEME OF Instruction	Lecture Hours	Tutorial Hours	Practical Hours	Seminar / Projects Hours	Total Hours	Credits
	-	**0**	**4**	**-**	**48**	**2**

COURSE OBJECTIVES:

- To provide practical experience with various bioanalytical techniques used in biological and clinical analysis, focusing on their applications and limitations.
- To develop hands-on skills/ SOP in sample preparation, calibration of instruments, and the execution of bioanalytical methods such as spectrophotometry, electrophoresis, chromatography, and centrifugation.
- To enable students to critically analyze experimental data, troubleshoot issues, and interpret results from bioanalytical experiments effectively.

CO No.	Outcomes	Bloom's Taxonomy Level
CO1	Should will be able to identify different laboratory instruments and their components used in bioanalysis.	L1
CO2	Should will be able to understand how calibration and sample preparation influence the results in bioanalytical methods.	L2
CO3	Should will be able to conduct experiments involving UV-Visible Spectroscopy, Electrophoresis, Chromatography, and Centrifugation, and effectively interpret the results.	L3

EXPERIMENTS:

1. Determination of extinction coefficient using colorimetry.
2. Determination of lambda maximum of biomolecules using UV spectroscopy.
3. Estimation of sugar by Miller method.
4. Estimation of pKa of amino acid (glycine).
5. Circular Paper chromatography for amino acid/ sugars and Rf calculations.
6. Separation of amino acid by Thin Layer Chromatography (TLC).
7. Column chromatography of phyto-pigments on adsorbent (silica/alumina).
8. Extraction of DNA from plant/bacterial/ animal cells.
9. Extraction of RNA from given sample (plant/animal/microbe)
10. Quantification of DNA by spectrophotometry.
11. Separation and visualization of DNA/RNA on agarose gel electrophoresis.

REFERENCES:

1. Skoog, D.A., Holler, F.J., & Crouch, S.R. (2017). Principles of Instrumental Analysis (7th ed.). Brooks/Cole, Cengage Learning.
2. Wilson, K., & Walker, J. (2010). Principles and Techniques of Biochemistry and Molecular Biology (7th ed.). Cambridge University Press.
3. Glick, B.R., & Pasternak, J.J. (2017). Molecular Biotechnology: Principles and Applications of Recombinant DNA (5th ed.). ASM Press.
4. Harris, D.C. (2015). Quantitative Chemical Analysis (9th ed.). W.H. Freeman and Company.
5. Miller, J.N., & Miller, J.C. (2010). Statistics and Chemometrics for Analytical Chemistry (6th ed.). Pearson Education.
6. Ruch, T.L., & Maier, P.L. (2013). Biochemical and Biotechnological Applications of Bioanalytical Techniques. Wiley.
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9. Freshney, R.I. (2011). Culture of Animal Cells: A Manual of Basic Technique and Specialized Applications. Wiley online library.
10. Primrose, S. B., and R. M. Twyman. Principles of gene manipulation and Genomics. Blackwell Publishing MA. USA. 2006.
11. Recombinant DNA: A Short Course by JD Watson, J. Tooze and DT Kurtz. Scientific American books. USA. 1983.

ANNEXURE -I A

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 Maunal in Biochemistry, Immunology and Biotechnology by Arti Nigam and Archana Ayyagari. TATA McGraw Hill publishers,2008.
5. Lab Maunal in Biochemistry, Immunology and Biotechnology by Arti Nigam and Archana

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).

ANNEXURE -I A

SEMESTER	**II**					
YEAR	**I**					
COURSE CODE	**25GS1271**					
TITLE OF THE COURSE	**POPULATION AND EVOLUTIONARY 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 population genetic principles, including Hardy-Weinberg equilibrium, genetic drift, and molecular clock estimation.
- Apply molecular genetic techniques such as microsatellite analysis, SNP genotyping, and GWAS to assess genetic diversity and population structure.
- Analyze genetic data using bioinformatics tools to interpret genetic variation, allele frequencies, and evolutionary patterns.
- Evaluate the impact of genetic drift, selection, and mutation using simulations and statistical approaches to understand evolutionary dynamics.

COURSE OUTCOMES:

CO No.	**Outcomes**	**Bloom's Taxonomy Level**
CO1	Students will be able to conduct Hardy-Weinberg equilibrium simulations and interpret the genetic stability or variation in simulated populations.	L3
CO2	Students will be able to perform microsatellite analysis and SNP genotyping to assess genetic diversity and population structure using molecular data.	L4
CO3	Students will be able to evaluate evolutionary dynamics such as genetic drift and molecular clock estimation in populations of varying sizes using simulation data.	L5

LIST OF EXPERIMENTS

1. Hardy-Weinberg equilibrium simulation.
2. Microsatellite analysis for genetic diversity.
3. Genetic drift simulation with populations of different sizes.
4. SNP genotyping and population structure analysis.
5. Molecular clock estimation.
6. GWAS analysis using bioinformatics tools.

REFERENCES:

ANNEXURE -I A

1. Population Genetics 2nd Edition (2021) Hamilton MB Wiley-Blackwell USA.
2. Evolutionary Genetics: Concepts and Case Studies 1st Edition (2018) Fox CW, Wolf JB Oxford University Press UK.
3. Genetic Data Analysis for Plant and Animal Breeding 1st Edition (2020) Deb UK, Singh S Academic Press USA.
4. Principles of Population Genetics 4th Edition (2007) Hartl DL, Clark AG Sinauer Associates USA.
5. Introduction to Evolutionary Genetics 1st Edition (2019) Lewis JR Cambridge University Press UK.
6. Molecular Population Genetics 1st Edition (2018) Charlesworth B, Charlesworth D Oxford University Press UK.
7. Handbook of Statistical Genetics 3rd Edition (2022) Balding DJ, Bishop M, Cannings C Wiley-Blackwell USA.

ANNEXURE -I A

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 – SHAIKSHANIKA 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 ಸ್ವರೂಪಗಳು
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. ಅನುಕರಣವಾಚಿ ಪದಗಳು 2. ವಿರುದ್ಧ ಪದಗಳು, ನುಡಿಗಟ್ಟುಗಳು
   3. ವಿದ್ಯರ್ಥಕ ಪದಗಳು 4. ಅರ್ಥ, ಸಮಾನಾರ್ಥ, ನಾನಾರ್ಥ ಪದಗಳು
   5. ನಿಷೇದಾರ್ಥಕ 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

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