

DAYANANDA SAGAR UNIVERSITY
SHAVIGE MALLESHWARA HILLS, KUMARASWAMY LAYOUT
BENGALURU – 560 111, KARNATAKA.

SCHOOL OF BASIC & APPLIED SCIENCES



SCHEME & SYLLABUS
FOR
BACHELOR OF SCIENCE (B.Sc.) – 2022

WITH HONOURS

B.SC. HONS IN BIOCHEMISTRY
B.SC. HONS IN BIOTECHNOLOGY
B.SC. HONS IN GENETICS
B.SC. HONS IN MICROBIOLOGY
B.SC. HONS IN CHEMISTRY

(With effect from 2022-23)

SCHEME - B.Sc. - 2022-23 ONWARDS

I SEM - Common to All

SL	PROGRAM CODE	COURSE CODE	COURSE TITLE	CR / AU	SCHEME OF TEACHING					PRE-REQUISITE	
					L	T	P	S/P	C	SEM	COURSE CODE
1	139	22BS1101	ESSENTIALS OF BIOCHEMISTRY	CR	4	-	4	-	6	*	***
2	139	22BS1102	BASIC MICROBIOLOGY	CR	4	-	4	-	6	*	***
3	139	22BS1103	CHEMISTRY-I	CR	4	-	4	-	6	*	***
4	139	22BS1104	ENVIRONMENT AND PUBLIC HEALTH	CR	3	-	-	-	3	*	***
5	139	22BS1105	ENGLISH - 1	CR	2	-	-	-	2	*	***
6	139	22BS1106	KANNADA - 1	CR	2	-	-	-	2	*	***
					19	-	12	-	25		

II SEM - Common to All

SL	PROGRAM CODE	COURSE CODE	COURSE TITLE	CR / AU	SCHEME OF TEACHING					PRE-REQUISITE	
					L	T	P	S/P	C	SEM	COURSE CODE
1	139	22BS1201	CELL BIOLOGY	CR	4	-	4	-	6	*	***
2	139	22BS1202	BASIC GENETICS	CR	4	-	4	-	6	*	***
3	139	22BS1203	MICROBIAL DIVERSITY AND KINETICS	CR	4	-	4	-	6	*	***
4	139	22BS1204	BIOSTATISTICS	CR	3	-	-	-	3	*	***
5	139	22BS1205	ENGLISH - II	CR	2	-	-	-	2	*	***
6	139	22BS1206	KANNADA - II	CR	2	-	-	-	2	*	***
					19	-	12	-	25		

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

SCHEME - B.Sc. - 2022-23 ONWARDS

III SEM - Common to All

SL	PROGRAM CODE	COURSE CODE	COURSE TITLE	CR / AU	SCHEME OF TEACHING					PRE-REQUISITE	
					L	T	P	S/P	C	SEM	COURSE CODE
1	139	22BS2301	BIOPHYSICS AND INSTRUMENTATION	CR	4	-	4	-	6	*	***
2	139	22BS2302	MOLECULAR BIOLOGY	CR	4	-	4	-	6	*	***
3	139	22BS2303	EVOLUTIONARY GENETICS	CR	4	-	4	-	6	*	***
4	139	22BS2304	CHEMISTRY - II	CR	3	-	-	-	3	*	***
5	139	22BS2305	COMPUTER APPLICATIONS	CR	2	-	-	-	2	*	***
6	139	22BS2306	CONSTITUTION OF INDIA	CR	2	-	-	-	2	*	***
					19	-	12	-	25		

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

SCHEME - B.Sc. HONS - BIOCHEMISTRY - 2022-23 ONWARDS

IV SEM

SL	PROGRAM CODE	COURSE CODE	COURSE TITLE	CR / AU	SCHEME OF TEACHING					PRE-REQUISITE	
					L	T	P	S/P	C	SEM	COURSE CODE
1	139	22BY2401	HUMAN ANATOMY & PATHOLOGY	CR	4	-	4	-	6	*	***
2	139	22BY2402	METABOLISM I	CR	4	-	4	-	6	*	***
3	139	22BY2403	NUTRITION	CR	2	-	-	-	2	*	***
4	139	22BS2401	BIOSAFETY AND GOOD LABORATORY PRACTICE	CR	2	-	-	-	2	*	***
					12	-	08	-	16		

V SEM

SL	PROGRAM CODE	COURSE CODE	COURSE TITLE	CR / AU	SCHEME OF TEACHING					PRE-REQUISITE	
					L	T	P	S/P	C	SEM	COURSE CODE
1	139	22BY3501	HUMAN PHYSIOLOGY	CR	4	-	4	-	6	*	***
2	139	22BY3502	METABOLISM II	CR	4	-	4	-	6	*	***
3	139	22BS3501	BIOETHICS AND IPR	CR	2	-	-	-	2	*	***
4	139	22BS3502	BIOINFORMATICS	CR	2	-	-	-	2	*	***
					12	-	08	-	16		

VI SEM

SL	PROGRAM CODE	COURSE CODE	COURSE TITLE	CR / AU	SCHEME OF TEACHING					PRE-REQUISITE	
					L	T	P	S/P	C	SEM	COURSE CODE
1	139	22BY3601	ENZYMOLGY	CR	4	-	4	-	6	*	***
2	139	22BY3602	IMMUNOLOGY	CR	4	-	4	-	6	*	***
3	139	22BS3601	BASIC PRINCIPLES OF 'MULTI-OMICS'	CR	2	-	-	-	2	*	***
4	139	22BS3602	TOXICOLOGY	CR	2	-	-	-	2	*	***
					12	-	08	-	16		

SCHEME - B.Sc. HONS - BIOCHEMISTRY - 2022-23 ONWARDS

VII SEM

SL	PROGRAM CODE	COURSE CODE	COURSE TITLE	CR / AU	SCHEME OF TEACHING					PRE-REQUISITE	
					L	T	P	S/P	C	SEM	COURSE CODE
1	139	22BY4701	GENETIC ENGINEERING	CR	4	-	4	-	6	*	***
2	139	22BY4702	SIGNAL TRANSDUCTION	CR	4	-	4	-	6	*	***
3	139	22BY4703	PLANT PHYSIOLOGY BIOCHEMISTRY	CR	4	-	4	-	6	*	***
4	139	22BS4701	RESEARCH METHODOLOGY	CR	3	-	-	-	3	*	***
					15	-	12	-	21		

VIII SEM

SL	PROGRAM CODE	COURSE CODE	COURSE TITLE	CR / AU	SCHEME OF TEACHING					PRE-REQUISITE	
					L	T	P	S/P	C	SEM	COURSE CODE
1	139	22BS4801	RESEARCH PROJECT	CR	-	-	-	-	12	*	***
2	139	22BS4802	MOOC / SWAYAM / NPTEL / ANY SIMILAR	CR	2	-	-	-	2	*	***
					02	-	-	-	14		

SCHEME - B.Sc. HONS - BIOTECHNOLOGY - 2022-23 ONWARDS

IV SEM

SL	PROGRAM CODE	COURSE CODE	COURSE TITLE	CR / AU	SCHEME OF TEACHING					PRE-REQUISITE	
					L	T	P	S/P	C	SEM	COURSE CODE
1	139	22BT2401	PLANT BIOTECHNOLOGY	CR	4	-	4	-	6	*	***
2	139	22BT2402	GENETIC ENGINEERING	CR	4	-	4	-	6	*	***
3	139	22BT2403	FUNDAMENTALS OF PLANT PHYSIOLOGY AND PATHOLOGY	CR	2	-	-	-	2	*	***
4	139	22BS2401	BIOSAFETY AND GOOD LABORATORY PRACTICE	CR	2	-	-	-	2	*	***
					12	-	08	-	16		

V SEM

SL	PROGRAM CODE	COURSE CODE	COURSE TITLE	CR / AU	SCHEME OF TEACHING					PRE-REQUISITE	
					L	T	P	S/P	C	SEM	COURSE CODE
1	139	22BT3501	IMMUNOLOGY	CR	4	-	4	-	6	*	***
2	139	22BT3502	ANIMAL BIOTECHNOLOGY	CR	4	-	4	-	6	*	***
3	139	22BS3501	BIOETHICS AND IPR	CR	2	-	-	-	2	*	***
4	139	22BS3502	BIOINFORMATICS	CR	2	-	-	-	2	*	***
					12	-	08	-	16		

VI SEM

SL	PROGRAM CODE	COURSE CODE	COURSE TITLE	CR / AU	SCHEME OF TEACHING					PRE-REQUISITE	
					L	T	P	S/P	C	SEM	COURSE CODE
1	139	22BT3601	INDUSTRIAL BIOTECHNOLOGY	CR	4	-	4	-	6	*	***
2	139	22BT3602	ENVIRONMENTAL BIOTECHNOLOGY	CR	4	-	4	-	6	*	***
3	139	22BS3601	BASIC PRINCIPLES OF 'MULTI-OMICS'	CR	2	-	-	-	2	*	***
4	139	22BS3602	TOXICOLOGY	CR	2	-	-	-	2	*	***
					12	-	08	-	16		

SCHEME - B.Sc. HONS - BIOTECHNOLOGY - 2022-23 ONWARDS

VII SEM

SL	PROGRAM CODE	COURSE CODE	COURSE TITLE	CR / AU	SCHEME OF TEACHING					PRE-REQUISITE	
					L	T	P	S/P	C	SEM	COURSE CODE
1	139	22BT4701	FOOD TECHNOLOGY	CR	4	-	4	-	6	*	***
2	139	22BT4702	MEDICAL BIOTECHNOLOGY	CR	4	-	4	-	6	*	***
3	139	22BT4703	AGRICULTURAL BIOTECHNOLOGY	CR	4	-	4	-	6	*	***
4	139	22BS4701	RESEARCH METHODOLOGY	CR	3	-	-	-	3	*	***
					15	-	12	-	21		

VIII SEM

SL	PROGRAM CODE	COURSE CODE	COURSE TITLE	CR / AU	SCHEME OF TEACHING					PRE-REQUISITE	
					L	T	P	S/P	C	SEM	COURSE CODE
1	139	22BS4801	RESEARCH PROJECT	CR	-	-	-	-	12	*	***
2	139	22BS4802	MOOC / SWAYAM / NPTEL / ANY SIMILAR	CR	2	-	-	-	2	*	***
					02	-	-	-	14		

SCHEME - B.Sc. HONS - GENETICS - 2022-23 ONWARDS

IV SEM

SL	PROGRAM CODE	COURSE CODE	COURSE TITLE	CR / AU	SCHEME OF TEACHING					PRE-REQUISITE	
					L	T	P	S/P	C	SEM	COURSE CODE
1	139	22GS2401	CYTOGENETICS	CR	4	-	4	-	6	*	***
2	139	22GS2402	DEVELOPMENTAL BIOLOGY	CR	4	-	4	-	6	*	***
3	139	22GS2403	QUANTITATIVE GENETICS	CR	2	-	-	-	2	*	***
4	139	22BS2401	BIOSAFETY AND GOOD LABORATORY PRACTICE	CR	2	-	-	-	2	*	***
					12	-	08	-	16		

V SEM

SL	PROGRAM CODE	COURSE CODE	COURSE TITLE	CR / AU	SCHEME OF TEACHING					PRE-REQUISITE	
					L	T	P	S/P	C	SEM	COURSE CODE
1	139	22GS3501	MICROBIAL GENETICS	CR	4	-	4	-	6	*	***
2	139	22GS3502	MOLECULAR GENETICS & GENOMICS	CR	4	-	4	-	6	*	***
3	139	22BS3501	BIOETHICS AND IPR	CR	2	-	-	-	2	*	***
4	139	22BS3502	BIOINFORMATICS	CR	2	-	-	-	2	*	***
					12	-	08	-	16		

VI SEM

SL	PROGRAM CODE	COURSE CODE	COURSE TITLE	CR / AU	SCHEME OF TEACHING					PRE-REQUISITE	
					L	T	P	S/P	C	SEM	COURSE CODE
1	139	22GS3601	HUMAN GENETICS	CR	4	-	4	-	6	*	***
2	139	22GS3602	POPULATION GENETICS	CR	4	-	4	-	6	*	***
3	139	22BS3601	BASIC PRINCIPLES OF 'MULTI-OMICS'	CR	2	-	-	-	2	*	***
4	139	22BS3602	TOXICOLOGY	CR	2	-	-	-	2	*	***
					12	-	08	-	16		

SCHEME - B.Sc. HONS - GENETICS - 2022-23 ONWARDS

VII SEM

SL	PROGRAM CODE	COURSE CODE	COURSE TITLE	CR / AU	SCHEME OF TEACHING					PRE-REQUISITE	
					L	T	P	S/P	C	SEM	COURSE CODE
1	139	22GS4701	ANIMAL GENETICS	CR	4	-	4	-	6	*	***
2	139	22GS4702	PLANT GENETICS	CR	4	-	4	-	6	*	***
3	139	22GS4703	BEHAVIORAL GENETICS	CR	4	-	4	-	6	*	***
4	139	22BS4701	RESEARCH METHODOLOGY	CR	3	-	-	-	3	*	***
					15	-	12	-	21		

VIII SEM

SL	PROGRAM CODE	COURSE CODE	COURSE TITLE	CR / AU	SCHEME OF TEACHING					PRE-REQUISITE	
					L	T	P	S/P	C	SEM	COURSE CODE
1	139	22BS4801	RESEARCH PROJECT	CR	-	-	-	-	12	*	***
2	139	22BS4802	MOOC / SWAYAM / NPTL / ANY SIMILAR	CR	2	-	-	-	2	*	***
					02	-	-	-	14		

SCHEME – B.Sc. HONS – MICROBIOLOGY– 2022-23 ONWARDS

IV SEM

SL	PROGRAM CODE	COURSE CODE	COURSE TITLE	CR / AU	SCHEME OF TEACHING					PRE-REQUISITE	
					L	T	P	S/P	C	SEM	COURSE CODE
1	139	22MY2401	MICROBIAL PHYSIOLOGY	CR	4	-	4	-	6	*	***
2	139	22MY2402	IMMUNOLOGY AND IMMUNO-TECHNIQUES	CR	4	-	4	-	6	*	***
3	139	22MY2403	PHARMACEUTICAL MICROBIOLOGY	CR	2	-	-	-	2	*	***
4	139	22BS2401	BIOSAFETY AND GOOD LABORATORY PRACTICE	CR	2	-	-	-	2	*	***
					12	-	08	-	16		

V SEM

SL	PROGRAM CODE	COURSE CODE	COURSE TITLE	CR / AU	SCHEME OF TEACHING					PRE-REQUISITE	
					L	T	P	S/P	C	SEM	COURSE CODE
1	139	22MY3501	MEDICAL AND CLINICAL MICROBIOLOGY	CR	4	-	4	-	6	*	***
2	139	22MY3502	MICROBIAL GENETICS AND GENETIC ENGINEERING	CR	4	-	4	-	6	*	***
3	139	22BS3501	BIOETHICS AND IPR	CR	2	-	-	-	2	*	***
4	139	22BS3502	BIOINFORMATICS	CR	2	-	-	-	2	*	***
					12	-	08	-	16		

VI SEM

SL	PROGRAM CODE	COURSE CODE	COURSE TITLE	CR / AU	SCHEME OF TEACHING					PRE-REQUISITE	
					L	T	P	S/P	C	SEM	COURSE CODE
1	139	22MY3601	INDUSTRIAL MICROBIOLOGY	CR	4	-	4	-	6	*	***
2	139	22MY3602	NANO MICROBIOLOGY AND EXTREMOPHILES	CR	4	-	4	-	6	*	***
3	139	22BS3601	BASIC PRINCIPLES OF 'MULTI-OMICS'	CR	2	-	-	-	2	*	***
4	139	22BS3602	TOXICOLOGY	CR	2	-	-	-	2	*	***
					12	-	08	-	16		

SCHEME - B.Sc. HONS - MICROBIOLOGY - 2022-23 ONWARDS

VII SEM

SL	PROGRAM CODE	COURSE CODE	COURSE TITLE	CR / AU	SCHEME OF TEACHING					PRE-REQUISITE	
					L	T	P	S/P	C	SEM	COURSE CODE
1	139	22MY4701	FOOD AND DIARY MICROBIOLOGY	CR	4	-	4	-	6	*	***
2	139	22MY4702	ENVIRONMENTAL MICROBIOLOGY	CR	4	-	4	-	6	*	***
3	139	22MY4703	MICROBIAL-PLANT INTERACTIONS	CR	4	-	4	-	6	*	***
4	139	22BS4701	RESEARCH METHODOLOGY	CR	3	-	-	-	3	*	***
					15	-	12	-	21		

VIII SEM

SL	PROGRAM CODE	COURSE CODE	COURSE TITLE	CR / AU	SCHEME OF TEACHING					PRE-REQUISITE	
					L	T	P	S/P	C	SEM	COURSE CODE
1	139	22BS4801	RESEARCH PROJECT	CR	-	-	-	-	12	*	***
2	139	22BS4802	MOOC / SWAYAM / NPTL / ANY SIMILAR	CR	2	-	-	-	2	*	***
					02	-	-	-	14		

SCHEME – B.Sc. HONS – CHEMISTRY– 2022-23 ONWARDS

IV SEM

SL	PROGRAM CODE	COURSE CODE	COURSE TITLE	CR / AU	SCHEME OF TEACHING					PRE-REQUISITE	
					L	T	P	S/P	C	SEM	COURSE CODE
1	139	22CY2401	INORGANIC CHEMISTRY	CR	4	-	4	-	6	*	***
2	139	22CY2402	PHYSICAL CHEMISTRY - I	CR	4	-	4	-	6	*	***
3	139	22CY2403	PHARMACEUTICAL CHEMISTRY	CR	2	-	-	-	2	*	***
4	139	22BS2401	BIOSAFETY AND GOOD LABORATORY PRACTICE	CR	2	-	-	-	2	*	***
					12	-	08	-	16		

V SEM

SL	PROGRAM CODE	COURSE CODE	COURSE TITLE	CR / AU	SCHEME OF TEACHING					PRE-REQUISITE	
					L	T	P	S/P	C	SEM	COURSE CODE
1	139	22CY3501	ORGANIC CHEMISTRY - I	CR	4	-	4	-	6	*	***
2	139	22CY3502	PHYSICAL CHEMISTRY - II	CR	4	-	4	-	6	*	***
3	139	22BS3501	BIOETHICS AND IPR	CR	2	-	-	-	2	*	***
4	139	22BS3502	BIOINFORMATICS	CR	2	-	-	-	2	*	***
					12	-	08	-	16		

VIVI SEM

SL	PROGRAM CODE	COURSE CODE	COURSE TITLE	CR / AU	SCHEME OF TEACHING					PRE-REQUISITE	
					L	T	P	S/P	C	SEM	COURSE CODE
1	139	22CY3601	ORGANIC CHEMISTRY - II	CR	4	-	4	-	6	*	***
2	139	22CY3602	SPECTROSCOPY	CR	4	-	4	-	6	*	***
3	139	22BS3601	BASIC PRINCIPLES OF 'MULTI-OMICS'	CR	2	-	-	-	2	*	***
4	139	22BS3602	TOXICOLOGY	CR	2	-	-	-	2	*	***
					12	-	08	-	16		

SCHEME - B.Sc. HONS - CHEMISTRY - 2022-23 ONWARDS

VII SEM

SL	PROGRAM CODE	COURSE CODE	COURSE TITLE	CR / AU	SCHEME OF TEACHING					PRE-REQUISITE	
					L	T	P	S/P	C	SEM	COURSE CODE
1	139	22CY4701	POLYMER CHEMISTRY	CR	4	-	4	-	6	*	***
2	139	22CY4702	INORGANIC CHEMISTRY - II	CR	4	-	4	-	6	*	***
3	139	22CY4703	NANOSCIENCE AND MATERIAL CHEMISTRY	CR	4	-	4	-	6	*	***
4	139	22BS4701	RESEARCH METHODOLOGY	CR	3	-	-	-	3	*	***
					15	-	12	-	21		

VIII SEM

SL	PROGRAM CODE	COURSE CODE	COURSE TITLE	CR / AU	SCHEME OF TEACHING					PRE-REQUISITE	
					L	T	P	S/P	C	SEM	COURSE CODE
1	139	22BS4801	RESEARCH PROJECT	CR	-	-	-	-	12	*	***
2	139	22BS4802	MOOC / SWAYAM / NPTL / ANY SIMILAR	CR	2	-	-	-	2	*	***
					02	-	-	-	14		

SCHEME – B.Sc. HONS –2022-23 ONWARDS

MINOR COURSES OFFERED FROM IV SEM TO VI SEM

SL	PROGRAM CODE	COURSE CODE	COURSE TITLE	CR / AU	SCHEME OF TEACHING					PRE-REQUISITE	
					L	T	P	S/P	C	SEM	COURSE CODE
BIOCHEMISTRY											
1	139	22BY2404	ANATOMY AND PHYSIOLOGY	CR	4	-	4	-	6	*	***
2	139	22BY3503	METABOLISM	CR	4	-	4	-	6	*	***
3	139	22BY3601	ENZYMOLGY	CR	4	-	4	-	6	*	***
BIOTECHNOLOGY											
1	139	22BT2401	PLANT BIOTECHNOLOGY	CR	4	-	4	-	6	*	***
2	139	22BT3502	ANIMAL BIOTECHNOLOGY	CR	4	-	4	-	6	*	***
3	139	22BT3601	INDUSTRIAL BIOTECHNOLOGY	CR	4	-	4	-	6	*	***
GENETICS											
1	139	22GS2404	GENOMICS	CR	4	-	4	-	6	*	***
2	139	22GS3503	GENETIC TESTING	CR	4	-	4	-	6	*	***
3	139	22GS3601	HUMAN GENETICS	CR	4	-	4	-	6	*	***
MICROBIOLOGY											
1	139	22MY2404	MICROBIAL FERMENTATION	CR	4	-	4	-	6	*	***
2	139	22MY3503	MEDICAL MICROBIOLOGY AND DIAGNOSTICS	CR	4	-	4	-	6	*	***
3	139	22MY3603	MICROBIOME AND EXTREMOPHILES	CR	4	-	4	-	6	*	***
CHEMISTRY											
1	139	22CY2401	INORGANIC CHEMISTRY	CR	4	-	4	-	6	*	***
2	139	22CY3503	PHYSICAL CHEMISTRY	CR	4	-	4	-	6	*	***
3	139	22CY3603	ORGANIC CHEMISTRY	CR	4	-	4	-	6	*	***

SEMESTER	I					
YEAR	I					
COURSE CODE	22BS1101					
TITLE OF THE COURSE	ESSENTIALS OF BIOCHEMISTRY					
SCHEME OF INSTRUCTION	Lecture Hours	Tutorial Hours	Practical Hours	Seminar/Projects Hours	Total Hours	Credits
	4	-	4	-	60	6

Prerequisite Courses (if any)			
#	Sem/Year	Course Code	Title of the Course
-	-	-	-

COURSE OBJECTIVES:
<ul style="list-style-type: none"> To create in depth understanding about fundamentals of biomolecules, their structure and significance. To know about the structural and functional classification of biomolecules

CO No.	OUTCOMES	Bloom's Taxonomy Level
CO1	Will be able to demonstrate the composition and structure of various bio-molecules molecules in the living systems	L1
CO2	Should be able to correlate the structure and functions of bio-molecules, like carbohydrates, lipids, proteins and nucleic acids in biological systems	L2
CO3	Should be able to demonstrate the mechanism of interaction and functions various bio-molecules in living systems.	L3
CO4	Should be able to demonstrate the normal and abnormal structure of various bio-molecules in the context of various medical conditions	L3

COURSE CONTENT:
MODULE 1 15Hrs BIOCHEMICAL CALCULATIONS Solutions, Stock Solutions- preparation and dilution of stock solutions. Avogadro Number Molarity, Molality, mole fraction and Normality. Density and Relative Density. Ionic Strength - pKa, pKb and pI. Equilibrium Constants, Dissociation constant, Henderson-Hasselbalch equation and buffer preparations. Electrochemical series, Nernst equation, standard electrode potential. pH, pOH. Law of Rational indices and Miller indices with numerical. Calculation of molecular weight of proteins and nucleic acids.
MODULE 2 15Hrs CARBOHYDRATES Simple Carbohydrates: Structure and classification of carbohydrates. Configuration and conformational aspects of monosaccharides and sugar derivatives. Brief structural elucidation by permethylation (MALDI), Glycosidic linkages in disaccharides and glycosides (GC-MS). Complex Carbohydrates: Homopolysachharides and heteropolysachharides - starch, glycogen, cellulose chitin, glycosaminoglycans and proteoglycans; Glycoproteins and Glycolipids.

MODULE 3	15Hrs
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AMINO ACID AND PROTEINS

Primary structure – Structure, classification and acid-base properties of amino acids, Peptide bond, Primary structure –scheme of determination –amino acid composition analysis, N and C terminal analysis, cleavage of Disulfide bond, chemical and enzymatic fragmentation and sequencing through Edman's reagent.

Secondary structure: α -, PP-, β and π -helix, β pleated sheet, β bend, Peptide bond geometry and Ramchandran plot, motifs and domains.

Tertiary structure: Interactions stabilizing tertiary structure; denaturation of proteins, secondary and tertiary structure of fibrous proteins: α -keratin, silk fibroin and collagen.

Quaternary structure: Hemoglobin Structure, molecular basis of Sickle-cell anemia; Cross linking agents to determine subunit composition. Introduction to protein folding

Protein folding: Protein renaturation and denaturation, significance of Anfinsen's experiment, Landscape model of folding, accessory proteins- protein molecular chaperones;

MODULE 4**15Hrs****LIPIDS AND NUCLEIC ACID 15Hrs**

Lipids: Classification, Nomenclature and biological functions of lipids. Complex lipids - phospholipids, sphingolipids, galactolipids and Eicosanoids and sterols–prostaglandins, thromboxanes and leukotrienes.

Nucleic acids: Nucleosides, nucleotides and polynucleotides; Primary and secondary structure, properties and types of DNA; structure and function of RNA's; Specialized sequences: G-quadruplexes, palindromic and mirror repeats; denaturation and renaturation curves of nucleic acids;

TEXT BOOKS/REFERANCES:

1. Biochemistry 4th Ed. Donald Voet & Judith G. Voet, John Wiley & Sons, Inc. (2010).
2. Lehninger- Principles of Biochemistry; DL Nelson and MM Cox, 6th Ed. Macmillan Publications (2012).
3. Physical Biology of the Cell, 2nd Ed. Rob Phillips, Jane Kondev, Julie Theriot, Hernan Garcia, Garland Publishers (2012).
4. Proteins Structures and Molecular Properties 2nd Ed. Thomas E. Creighton, W H Freeman and Co. (1993).
5. Principles of Protein Structure, Function, & evolution, Dickerson & Geis, 2nd Ed. Benjamin-Cummings (1983).
6. Biochemistry; David Rawn, J, Neil Patterson Publishers (1989).
7. Biochemistry 6th Ed; Jeremy M Berg, John L Tymoczko and Lubert Stryer, W H Freeman and Co. (2006).
8. Physical Biochemistry, Kensal Edward Van Holde, Prentice Hall.

ESSENTIALS OF BIOCHEMISTRY-PRACTICALS**EXPERIMENTS**

1. Qualitative analysis of carbohydrates - Monosaccharides (Glucose, Fructose), Disaccharides (Lactose, Maltose, Sucrose), Polysaccharides (Starch).
2. Qualitative analysis of amino acids (tryptophan, tyrosine, cysteine, methionine, arginine, proline and histidine).
3. Estimation of protein by Lowry method
4. Estimation of sugar by Miller method.
5. Estimation of DNA by DPA method.
6. Determination of free amino acid content in germinating seeds.
7. Determination of Vitamin C content in lemon juice

TEXT BOOKS/ REFERENCES

1. Introductory Practical Biochemistry- Sawhney and Singh. Narosa Publishing house. 2012, 7thed
2. An Introduction to practical Biochemistry—Plummer D. T, Tata Mc Graw Hill

SEMESTER	I					
YEAR	I					
COURSE CODE	22BS1102					
TITLE OF THE COURSE	BASIC MICROBIOLOGY					
SCHEME OF INSTRUCTION	Lecture Hours	Tutorial Hours	Practical Hours	Seminar/Projects Hours	Total Hours	Credits
	4	-	4	-	60	6

Prerequisite Courses (if any)			
#	Sem/Year	Course Code	Title of the Course
-	-	-	-

COURSE OBJECTIVES:
• To equip the students about the importance of microorganisms in our global society.
• To create in-depth knowledge of the structural and functional characteristics of prokaryotic and eukaryotic cells and their classification.
• To make students to learn basic microbiological techniques employed for isolation, culturing and identification of prokaryotic and eukaryotic microorganisms.

COURSE OUTCOMES:		
CO No.	OUTCOMES	BLOOM'S TAXONOMY LEVEL
CO1	Students will be acquainted with fundamental aspects of basic microbiology & isolation techniques	L1
CO2	Enable the students to understand the diversity of microbial, structure, function and their environment	L2
CO3	Students will be able to understand the importance of microorganisms	L3
CO4	Students will be equipped with fundamental knowledge of microbial growth patterns and kinetic studies enabling them to apply the same in various allied fields.	L2

COURSE CONTENT:	
MODULE 1	15Hrs
HISTORY AND SCOPE OF MICROBIOLOGY	
Development of microbiology as a discipline, spontaneous generation and biogenesis. Scope, disciplines and Applications of microbiology. Contributions of Antony von Leeuwenhoek, Joseph Lister, Edward Jenner, Louis Pasteur, Robert Koch, Alexander Fleming, Sumbunath Dey, Ananda Chakroborty, Paul Ehrlich, Selman A. Waksman, Lazaro Spallanzani, Dmitri Iwanovsky, Martinus Beijerinck, Sergei Winogradsky, Elie Metchnikoff and Sir Ronald Ross in the field of Microbiology. Difference between prokaryotic and eukaryotic microorganisms. General structure and characteristics of viruses, bacteria, fungi, algae and Protozoa. General account of microbiome.	
MODULE 2	15Hrs

MICROSCOPY	
Principles of microscopy - resolving power, numerical aperture, working distance and magnification. Types- optical and electron microcopy – Basic principle, sample preparation, applications and limitations of Simple, Compound, Dark field, Phase contrast, Confocal, Atomic force microscope (Toppling & sliding mode), Fluorescence and Electron Microscope - TEM and SEM. Staining techniques: Nature of dyes, Physical and chemical theories of staining, Principles and applications of a) Simple, negative staining b) Differential Staining- Gram's and Acid-fast staining c) Structural staining –cell wall, endospore, flagella, capsular staining, fungal staining.	
MODULE 3	15Hrs
MICROBIAL TECHNIQUES	
Sterilization and Disinfection: Definition, Principles, construction, and applications for physical and chemical methods of sterilization. Physical: Boiling, Pasteurization, Fractional sterilization -Tyndallization and Moist heat under pressure autoclave. Dry heat sterilization - Incineration and hot air oven. Filtration – seitz filter, membrane filter and laminar air flows. Radiation Ionizing radiation and non-ionizing radiation. Chemical methods: Alcohol, aldehydes, phenols, halogen, metallic salts, Quaternary ammonium compounds and sterilizing gases as antimicrobial agents. Culture media and its types: Components, Types - Simple, Selective, Transport, Enriched, Differential media. Pure culture techniques: Isolation and purification techniques of bacteria and fungi (aerobic and anaerobic).	
MODULE 4	15Hrs
GROWTH KINETICS	
Definition of microbial growth, factors affecting microbial growth (pH, temperature, oxygen concentration, pressure and radiations). Cell division, Growth curve of bacteria, kinetics of growth. Mathematics of growth- generation time and growth rate constant. Measurement of growth: Measurement of cell numbers- Counting chambers, electronic counters, viable counting techniques, membrane filter technique. Measurement of cell mass- dry weight and turbidity measurement. Measurement of cell activity, Batch culture, Continuous culture - Chemostat and Turbidostat. Synchronous culture.	

TEXT BOOKS/REFERANCES:	
<ol style="list-style-type: none"> Alexopoulos, C.J., Mims, C.W., and Blackwell, M. 2007. Introductory Mycology; Fourth edition, Wiley India Private Limited Aneja, K.R. 2014. Laboratory Manual of Microbiology and Biotechnology. Medtec Atlas R.M. Microbiology- Fundamentals and applications, Macmillan Publishing Company, New York. Benson, H. J. 1994. Microbiological Application. WCB McGraw-Hill of India Private Limited. Brock T.D and Madigan M.T. Biology of Microorganisms 6th Edition. Prentice Hall, Eagle wood cliffs N. J. Lengeler, Joseph W/Drews, Gerhart. Biology of the prokaryotes Blackwell Pub. 1999. Nigel Dimmock, Andrew Easton and Keith Leppard. Introduction to Modern Virology: 5th edition, Blackwell Publishing, 2005 Pelczar, M.J., Chan, E.C.S and Kreig N.R. Microbiology Tata McGraw-Hill 5th Edition.Pub.1986. Pommerville, J.C. 2007. Alcamo's Fundamentals of Microbiology. Eighth Edition. Jones and Bartlett Publishers, USA. Prescott, L.M. Microbiology 6th edition. Mc Graw Hill. 2005. Salle, A. J. 1984. Fundamental Principles of Bacteriology. Tata McGraw-Hill Publishing Company Limited, New Delhi. Salle, A.J. Principles of Microbiology, 2nd edition., 1997, Mc Graw Hill.1997. Stainer, R.Y., et al., General Microbiology 5th edition MacMillan Press.2005. 	

14. Tortora, Funke and Case. Microbiology, 9th Edition. Benjamin Cummings. 2009.

List of Laboratory/Practical Experiments activities to be conducted (if any) :

1) Study of instruments a) Autoclave b) Hot air oven c) Incubator d) pH meter e) High speed centrifuge f) Colorimeter g) UV-Vis Spectrophotometer h) Laminar air flow	(2 Units)
2) Media Preparation: a) Basal media (Nutrient agar and broth, PDA media and MRBA) b) Selective media (EMB agar and McConkey agar), c) Enriched media (Blood agar).	
3) Isolation of bacteria and fungi by serial dilution technique from soil, water and air.	
4) Methods of pure culture techniques a) Pour plate technique b) Spread plate technique c) Streak plate technique	
5) Transfer of media and inoculum a) Slant culture technique b) Broth culture technique c) Stab culture technique	
6) Microscopic examination of bacterial smear a) Simple staining b) Gram's staining c) Capsule staining d) Endospore staining	
7) Microscopic observation of temporary slides a. Algae: Chlamydomonas and Spirulina b. Fungi: Rhizopus, Aspergillus, Penicillium, Yeast. c. Protozoa: Amoeba, Paramecium and Euglena.	

REFERENCES

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

SEMESTER	I					
YEAR	I					
COURSE CODE	22BS1103					
TITLE OF THE COURSE	CHEMISTRY I					
SCHEME OF INSTRUCTION	Lecture Hours	Tutorial Hours	Practical Hours	Seminar/Projects Hours	Total Hours	Credits
	4	-	4	-	60	6

Prerequisite Courses (if any)			
#	Sem/Year	Course Code	Title of the Course
-	-	-	-

COURSE OBJECTIVES:
<ul style="list-style-type: none"> To make the students to understand basic facts and concepts in chemistry while retaining the exciting aspects of chemistry so as to develop interest in the study of chemistry as a discipline. To make the students to familiarize with the basic concepts related to modern atomic theory, quantum chemistry, titrations, periodic table and gaseous state of matter.

COURSE OUTCOMES:		
CO No.	OUTCOMES	BLOOM'S TAXONOMY LEVEL
CO1	Students will learn about handling of data and basics of different titrations	L1
CO2	Students will learn about advanced principles of atomic structure	L2
CO3	Students will get the knowledge periodic table and classification elements in the periodic table	L3
CO4	Students will learn about various aspects of gaseous state of matter	L2

COURSE CONTENT:
MODULE 1 15Hrs ANALYTICAL CHEMISTRY Handling of analytical data: SI and CGS units of measurements and physical constants and their inter conversion; Significant figures and calculations, accuracy, precision and errors in quantitative analysis. Stoichiometry: atomic weights, molecular weights, mole concept, molarity, molality, normality, mole fraction, ppt, ppb and ppm. Numerical problems related to the above concepts. Titrimetric analysis: Basic principle of titrimetric analysis. 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. Acid-base titrimetry: Titration curves, Quantitative applications – selecting and standardizing a titrant, inorganic analysis -alkalinity, acidity. Complexometric titrimetry: Indicators for EDTA titrations, titration methods employing EDTA -direct, back, displacement and indirect determinations, Application-determination of hardness of water. Redox titrimetry: Balancing redox equations, titration curves, Theory of redox indicators. Precipitation titrimetry: Titration curves, indicators for precipitation titrations involving silver nitrate Gravimetric Analysis: Requisites of precipitation, mechanism of precipitation, Factors influencing precipitation, Co-precipitation, post-precipitation.
MODULE 2 15Hrs

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. Hydrogen atomic spectra. Need of a new approach to Atomic structure. Elements of Quantum chemistry- Schrodinger wave equation and meaning of various terms in it. Significance of ψ and ψ^2 , Schrödinger equation for hydrogen atom. Radial and angular parts of the hydrogenic wave functions (atomic orbitals) and their variations for $1s$, $2s$, $2p$, $3s$, $3p$ and $3d$ orbitals (Only graphical representation). Radial and angular nodes and their significance. Quantum numbers and their Significance. Shapes of s , p and d atomic orbitals, nodal planes. Rules for filling up of electrons in various orbitals (Aufbau principle, Pauli's exclusion principle, Hund's rule of maximum multiplicity and $n+1$ rule), Electronic configuration of the elements (up to $Z=30$) and anomalous electronic configurations. Stability of half-filled and completely filled orbitals- concept of pairing and exchange energy.	
MODULE 3	15Hrs
PERIODICITY OF ELEMENTS	
Classification of elements into s , p , d , and f -blocks, cause of periodicity. Brief discussion of the following properties of the elements, with reference to s -& p -block and the trends shown: Effective nuclear charge, shielding or screening effect, Slater rules, variation of effective nuclear charge in periodic table. Atomic and ionic radii Ionization enthalpy, Successive ionization enthalpies and factors affecting ionization enthalpy and trends in groups and periods. Electron gain enthalpy and trends in groups and periods. Electronegativity, Pauling's/ Allred Rochow's scales. Variation of electronegativity with bond order, partial charge, hybridization, group electronegativity.	
MODULE 4	15Hrs
BASIC ORGANIC CHEMISTRY	
Representation of structural formula of organic compounds: condensed formula and bond line formula of organic compounds, classification of organic compounds based on functional groups with examples. Delocalisation of electrons: Inductive effect, electrometric effect, resonance (mesomeric effect, EWG and EDG, +M and -M effects) and hyper conjugation. Reactive intermediates: Types of bond cleavage, curly arrow rules in representation of mechanistic steps; electrophiles, nucleophiles, 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 with examples. Aromaticity: Kekule structure of benzene - molecular orbital picture of benzene - resonance energy and stability of benzene - Huckel's rule (aromatic, non-aromatic, and antiaromatic molecules) - aromaticity of benzene and benzenoid compounds - aromaticity of three, four, five, six, seven and eight-membered systems - annulenes.	

TEXT BOOKS/REFERANCES:
<ol style="list-style-type: none"> 1. A New Concise Inorganic Chemistry", J. D. Lee, 5th Ed, Chapman & Hall, London (1996). 2. Organic Chemistry. R.T. Morrison and R.N. Boyd. 6th Ed. Prentice Hall, India (1992) 3. Physical chemistry, 9th Ed., Peter Atkins and Julio de Paula, Oxford University Press (2009) 4. Principles of Inorganic Chemistry B. R. Puri and L. R. Sharma, Jauhar S. P-S. N. Chand & Co., 1998 5. Inorganic Chemistry, ELBS 2nd Edition D. F. Shriver, P. W. Atkins and C. H. Langford, Oxford Univ. Press 2002. 6. Quantitative Analysis, R.A. Day and A.L. Underwood, 6th edition, 1993 prentice Hall, Inc. New Delhi.

EXPERIMENTS

1. Calibration of glassware, pipette, burette and volumetric flask.
2. Determination of sodium carbonate and sodium bicarbonate in a mixture.
3. Determination of iron (II) using potassium dichromate.
4. Determination of chlorine in bleaching powder using iodometric method.
5. Standardization of EDTA solution and determination of hardness of water.
6. Determination of Ba^{2+} as BaSO_4 BY gravimetric method.
7. Determination of Fe^{2+} as Fe_2O_3 by gravimetric method.

TEXT BOOKS/ REFERENCES

1. Vogel's Text Book of Practical Organic Chemistry, 5th Edition, A.J. Hannford, A.R. Tatchell, B.S. Hurnis, P.W.G. Smith, Pearson Publication.
2. Enhancing undergraduate chemistry laboratories, J. Carndoff, N. Reid, RS. C. Publication.
3. Experimental Organic Chemistry Laboratory Manual, J.I. Garcia, J.A. Dobado, G. Francisco, Elsevier Publication.
4. Chemistry Practical Inorganic Qualitative Analysis For Under Graduate Students, M.J. Mamtora, S.C. Karad, J.S. Makasana, Lap Lambert Academic Publishing.
5. Advanced Practical Chemistry, K. Chelladurai, K. Subbian, Lap Lambert Academic Publishing.

SEMESTER	I					
YEAR	I					
COURSE CODE	22BS1104					
TITLE OF THE COURSE	ENVIRONMENT AND PUBLIC HEALTH					
SCHEME OF Instruction	Lecture Hours	Tutorial Hours	Practical Hours	Seminar/Projects Hours	Total Hours	Credits
	3	-	-	-	45	3

Perquisite Courses (if any)			
#	Sem/Year	Course Code	Title of the Course
-	-	-	-

COURSE OBJECTIVES:
<ul style="list-style-type: none"> • Develop strong foundations in epidemiology with special focus on infectious diseases, their environmental transmission, and treatment strategies. • Understand recent advances made in combating or preventing the spread of infectious diseases. • Understand the effects of human interventions on the dynamics and functioning of ecosystems

COURSE OUTCOMES:		
CO No.	OUTCOMES	Bloom's Taxonomy Level
CO1	Students will be able to deliberate on the possible solutions for: global health challenges, improving diseases and overall health status, in economically poor countries.	L1
CO2	Student will be able to propose prudent solution for integrated management of water and food supplies.	L2
CO3	Develop critical thinking and communication skills for the design and executions of research projects.	L3

COURSE CONTENT:	
MODULE 1	7 Hrs
Introduction. Infectious diseases: clinical symptoms, epidemiology, treatment, global surveillance and challenges in eradicating major diseases. Interpreting graphic and tabular data; trends, controls, variation, and uncertainty in measurements.	
MODULE 2	15 Hrs
INTRODUCTION TO MICROBIAL PATHOGENS	
Communicable diseases. Complexity of ecosystems and microbial habitats: Cholera and Malaria- clinical symptoms, epidemiology and mechanisms of disease transmission. Pathogen dynamics in the environment. Mode of waterborne disease transmission. Chemical, microbial control practiced in agriculture and human health.	
MODULE 3	15 Hrs
HUMAN MICROBIOME AND PUBLIC HEALTH	
Health status of populations, modelling the dynamics of infection. Modes of disease transmission, major stages in disease process, surveillance, and immunization. Biological, social & economic factors in public health.	

Earth and Human microbiome project. Policies and practices with respect to wild life protection, water and air quality, industrial and household waste disposal.

MODULE 4

8 Hrs

PERSPECTIVES AND INTERVENTIONS IN PUBLIC HEALTH

Epidemiological perspectives. Disease burden and surveillance; Alternative systems of medicine. Ayurveda, Yoga, Unani, Siddha and Homeopathy (AYUSH); Universal Immunization Programme (UIP); Reproductive Health-Youth Unite for Victory on AIDS.

REFERENCES:

1. Park, K. (2011). Preventive and Social Medicine. Benarsi Das Publications. (pp. 16- 19, 24-27)
2. Sadgopal, M., & Sagar, A. (2007, July-September). Can Public Health open up to the AYUSH System and give space for People's Views of Health and Disease? mfc bulletin, 45-50.
3. Sekhsaria, P. (2007). Conservation in India and the Need to Think Beyond 'Tiger vs. Tribal'. Biotropica, 39(5), 575-577.
4. UNDP. (2013). The Human Development Report, The Rise of the South: Human Progress in Diverse World. New York: UNDP. (also available in Hindi)

SEMESTER	I					
YEAR	I					
COURSE CODE	22BS1105					
TITLE OF THE COURSE	ENGLISH – I					
SCHEME OF Instruction	Lecture Hours	Tutorial Hours	Practical Hours	Seminar/Projects Hours	Total Hours	Credits
	2	-	-	-	30	2

Perquisite Courses (if any)			
#	Sem/Year	Course Code	Title of the Course
-	-	-	-

COURSE OBJECTIVES:
<ul style="list-style-type: none"> To encourage the students to speak English confidently and enable them to communicate for day-to-day needs. To build up their confidence in the usage of English and to enhance their written communicative competence also helping them for competitive exams.

COURSE OUTCOME:		
CO No.	OUTCOMES	Bloom's Taxonomy Level
CO1	Students are confident in oral and written communication	L1
CO2	Have enhanced competence for competitive exams	L2

COURSE CONTENT:	
MODULE 1	7 Hrs
COMMUNICATION SKILLS Definition, importance of communication, communication process – source, message, encoding, channel, decoding, receiver, feedback, context, levels of communication, Flow of Communication, Verbal and Non-Verbal Communication, Barriers to Communication - physiological, physical, cultural, language, gender, interpersonal, psychological, emotional. Perspective in communication/ Communication styles: introduction, visual perception, language, other factors affecting our perspective – past experiences, prejudices, feelings, environment	
MODULE 2	7 Hrs
Elements of communication – introduction, face to face communication – tone of voice, body language (non-verbal communication), verbal communication, physical communication; Basic listening skills: introduction, self-awareness, active listening, becoming an active listener, listening in difficult situations; Interview skills: purpose of an interview, do's and don't's of an interview; Giving presentations: dealing with fears, planning your presentation, structuring your presentation, delivering your presentation, techniques of delivery; Group discussion: introduction, communication skills in group discussion, do's and don't's of group discussion;	

Phonetics: The Organs of Speech, The Description and Classification of Speech Sounds, The Description and Classification of Vowels, The Description and Classification of Consonants, Phonetic symbols and the IPA, Phonemic and Phonetic Transcription Phonology, Phoneme sequences and Consonant Cluster, The Syllable, Word Accent, Accent and Rhythm in Connected Speech, Intonation, Varieties of English Pronunciation.

MODULE 3

6Hrs

EFFECTIVE WRITING SKILLS

Effective written communication: introduction, when and when not to use written communication – complexity of the topic, amount of discussion required, shades of meaning, formal communication

Writing effectively: subject lines, put the main point first, and know your audience, organisation of the message, Paragraph Writing, Letter Writing, Report Writing, Book Review, Scientific writing, Making a message – Transitivity/ intransitivity – complementation – talking about closely linked action – using two verbs together (eg: She started laughing), Transforming messages – Making statements, questions, orders and suggestions – denying – rejecting – disagreeing – possibility – ability, permission, obligation etc.

MODULE 4

10 Hrs

GRAMMAR

Word Classes: Open Word Classes: - Nouns, Verbs, Adjectives, Adverbs, Pronouns; Closed Word Classes: - Pre-determiners, Determiners, Numerals, Enumerators, Prepositions, Conjunctions, Auxiliary Verbs, Interjection;

Morphology: Bound and Free Morphemes; Affixes, Stems and Roots; Morphological Analysis; **Phrases:** Noun Phrase, Verb Phrase, Genitive Phrase, Adjective Phrase, Adverb Phrase, Prepositional Phrase, Phrases and its types, Clauses and its types, Sentences and its types, Common errors, phonetics;

Clauses: Clause Elements, Clause Types, Kinds, Concord;

Sentences: Simple Sentences, Compound Sentences, Complex Sentences;

Sub Ordination: Sub-Clauses, Finite and Non-Finite Sub-Clauses;

Co-ordination: Linked and Unlinked Coordination, Synthesis;

Ambiguity: Types of Ambiguity, Structural and Lexical Ambiguity;

Common Errors: Nouns and Pronouns, Articles, Verbs, Concord, Adjectives, Adverbs, Prepositions, Vocabulary, Expressing time, Referring to present, past and future time - use of adjuncts - frequency and duration, Talking about manner and place, Information about place, manner - position of adjuncts - types of adverbs (time, frequency, duration etc), Reporting what people say/think, Reporting verbs - reporting someone's actual words - reporting in one's own words, The structure of information, Focusing on the thing affected (passive voice) - selecting focus (left structure) taking the focus off the subject (impersonal 'it' etc.) – Introducing something new (with 'there') - focusing on information using adjuncts.

TEXT BOOKS:

1. Crystal, David. 1985, Rediscover Grammar with David Crystal. Longman
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 Longman 17
6. Hewings, M. 1999, Advanced English Grammar. Cambridge University Press
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, Mc GrawHill Education, 2011.

SEMESTER	I					
YEAR	I					
COURSE CODE	22BS1106					
TITLE OF THE COURSE	KANNADA KALI – I					
SCHEME OF Instruction	Lecture Hours	Tutorial Hours	Practical Hours	Seminar/Projects Hours	Total Hours	Credits
	2	0	0	0	30	2

Perquisite Courses (if any)			
#	Sem/Year	Course Code	Title of the Course
-	-	-	-

COURSE OBJECTIVES:
<ul style="list-style-type: none"> 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 OUTCOME		
CO No.	OUTCOMES	Bloom's Taxonomy Level
CO1	Students should be able to read, write and communicate in Kannada	L3

COURSE CONTENT:

1. ALPHABETS – AKSHARAMAALE - ಅಕ್ಷರಮಾಲೆ
2. SIGNS OF VOWELS AND CONJUNCT CONSONANTS – KAAGUNITHA MATTHU OTTHAKSHARAGALU
ಕಾಗುಣಿತ ಮತ್ತು ಒತ್ತಕ್ಷರಗಳು
3. DAILY USING WORDS PART – 1
DINANATHYADAPADAGALUBHAAGA – 1
ದಿನನಿತ್ಯದ ಪದಗಳು ಭಾಗ – 1
4. WEEKDAY AND MONTH NAMES – VAARADAMATTHU THINGALAHESARUGALU
ವಾರದ ಮತ್ತು ತಿಂಗಳ ಹೆಸರುಗಳು
5. TASTE – RUCHI – ರುಚಿ
6. COLOURS – BANNAGALU – ಬಣ್ಣಗಳು
7. NUMBERS – SANKYEGALU – ಸಂಖ್ಯೆಗಳು
8. DAILY USING WORDS PART – 2
DINANATHYADAPADAGALUBHAAGA – 2
ದಿನನಿತ್ಯದ ಪದಗಳು ಭಾಗ – 2
9. QUESTION PATTERNS – PRASHNEYA VIDHAANAGALU
ಪ್ರಶ್ನೆಯ ವಿಧಾನಗಳು
10. MEASUREMENTS – ALATHEGALU – ಅಳತೆಗಳು
11. EDUCATION WORDS – SHAIKSHANIKAPADAGALU
ಶೈಕ್ಷಣಿಕ ಪದಗಳು
12. FRUITS – HANNUGALU – ಹಣ್ಣುಗಳು

13. VEGETABLES – THARAKAARIGALU – ತರಕಾರಿಗಳು

14. FOOD ITEMS – AHAARA PADAARTHAGALU

ಆಹಾರ ಪದಾರ್ಥಗಳು

15. DAILY USING WORDS PART -3 –

DINANTHYADA PADAGALU BHAAGA-3

ದಿನನಿತ್ಯದ ಪದಗಳು ಭಾಗ -3

16. METALS – LOHAGALU – ಲೋಹಗಳು

17. RELATIVES – SAMBANDHIKARU – ಸಂಬಂಧಿಕರು

18. SEASONS AND CLOTHES –

KAALAGALU MATTHU BATTEGALU

ಕಾಲಗಳು ಮತ್ತು ಬಟ್ಟೆಗಳು

19. HOUSE AND FURNITURE –

MANE MATTHU PEETOPAKARANAGALU

ಮನೆ ಮತ್ತು ಪೀಠೋಪಕರಣಗಳು

20. VERBS – KRIYAA PADAGALU – ಕ್ರಿಯಾ ಪದಗಳು

SEMESTER	II					
YEAR	I					
COURSE CODE	22BS1201					
TITLE OF THE COURSE	CELL BIOLOGY					
SCHEME OF INSTRUCTION	Lecture Hours	Tutorial Hours	Practical Hours	Seminar/Projects Hours	Total Hours	Credits
	4	-	4	-	60	6

Prerequisite Courses (if any)			
#	Sem/Year	Course Code	Title of the Course
-	-	-	-

COURSE OBJECTIVES:
<ul style="list-style-type: none"> 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 and to the very basics of cell cycle and cell death pathways.

COURSE OUTCOMES:		
CO No.	OUTCOMES	BLOOM'S TAXONOMY LEVEL
CO1	Should be able to identify different organelles of the cell	L1
CO2	Should be able to demonstrate/identify the different parts of cell cycle and their function	L2
CO3	Should be able to identify the regulatory steps of the cell cycle	L3
CO4	Should be able to demonstrate the essential importance of cell death pathways	L2

COURSE CONTENT:	
MODULE 1	15Hrs
MODULE 1 ULTRA STRUCTURE OF CELL	
Prokaryotic (Bacteria) and Eukaryotic cells (Animal and Plant) - Characteristics and differences. Cell Wall: Ultrastructure, chemical composition and function. Plasma membrane: Chemical composition (Lipids, Proteins, Carbohydrates), Structure (Fluid mosaic model). Mode of transport across membrane: Active Transport (Pumps) and Passive transport (Osmosis, Diffusion).	
MODULE 2	15Hrs
CELL ORGANELLES - I	
Structure and general functions: Chloroplast (Envelope, Stroma, Thylakoids); Endoplasmic Reticulum (Smooth and Rough); Golgi complex (Cisternae, Tubules, Vesicles); Mitochondria; Ribosomes; Lysosomes (Primary and Secondary); Microsomes.	
MODULE 3	15Hrs
CELL ORGANELLES - II	
Structure and general functions: Cytoskeleton (Microtubules, Microfilaments and Intermediate Filaments); Cilia and Flagella. Structure and general functions of Nucleus (Nuclear envelope, Nucleoplasm and Nucleolus). Chromosomes- Discovery, 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 Lampbrush).	
MODULE 4	15Hrs
CELL GROWTH AND CELL DIVISION	
Cell cycle: Introduction to cell cycle stages (Interphase and M phase); Introduction to Cell cycle control (Cyclins and Cyclin dependent kinases). Mitosis: Mitotic phases; Cytokinesis; Significance of Mitosis. Meiosis: First meiotic division; Second meiotic division, Synaptonemal complex; Significance of meiosis. Introduction to programmed cell death (Apoptosis & Necrosis).	

TEXT BOOKS/REFERANCES:
<ol style="list-style-type: none"> 1. Verma P. S. Cell Biology, Genetics, Molecular Biology: Evolution and Ecology (2006). S Chand Publishers. 2. Gerald Karp. Cell and Molecular Biology. 6th Edition (2009) Wiley Publications. 3. Bruce Alberts et al. Molecular Biology of the cell - (2002) Garland Publications. Ambrose and Esty D. M. Cell Biology - (1997) ELBS Publications. 4. Robertis E. D. F. and Robertis E. M. F. Genetics and Molecular Biology - (2001) Saunders College.

EXPERIMENTS
1. Introduction to Microscopy (Bright Field, Dark Field, Phase Contrast Microscopy)
2. Microscopic measurements using micrometry – calibration of ocular and stage, measurement of onion epidermal cells and yeast by Micrometry.
3. Cell division: Study of mitosis using onion root tips.
4. Chloroplast isolation and their microscopic examination
5. Vital Staining of mitochondria (yeast).
6. Meiosis demonstration using grass hopper testis/onion flower buds
7. Study of model organisms - -Tobacco Mosaic Virus, Lambda Phage, <i>Neurospora crassa</i> , <i>Caenorhabditis elegans</i> , <i>Arabidopsis thaliana</i> , <i>Drosophila</i> .

TEXT BOOKS/ REFERENCES
<ol style="list-style-type: none"> 1. Dr. Renu Gupta , Dr. Seema Makhija , Dr. Ravi Toteja. Cell Biology : Practical Manual. Prestige Publishers, 2018. 2. Amit Gupta and Bipin Kumar Sati . Practical laboratory manual- CELL BIOLOGY.LAP Lambert Academic Publishing, 2019. 3. Alberts et al., (2002). Molecular Biology of the Cell, Garland Publishing, Inc., 4th ed.

SEMESTER	II					
YEAR	I					
COURSE CODE	22BS1202					
TITLE OF THE COURSE	BASIC GENETICS					
SCHEME OF INSTRUCTION	Lecture Hours	Tutorial Hours	Practical Hours	Seminar/Projects Hours	Total Hours	Credits
	4	0	4	0	60	6

Perquisite Courses (if any)			
#	Sem/Year	Course Code	Title of the Course
-	-	-	-

COURSE OBJECTIVES:
<ul style="list-style-type: none"> To gain insight on the historical perspective of the evolution of genetics. To comprehend and identify the different types of mendelian and non-mendelian inheritance.

COURSE OUTCOMES:		
CO No.	OUTCOMES	Bloom's Taxonomy Level
CO1	Students will have clarity to the background of genetics before getting into details in the forthcoming semesters	L3
CO2	They will be capable differentiate between mendelian and non mendelian inheritance sources along with associated intricacies.	L3
CO3	Student will gain the ability to analyse and relate phenotype to genotype and potential factors influencing the interaction.	L3

COURSE CONTENT:	
MODULE 1 HISTORY OF GENETICS AND MENDELIAN PRINCIPLES	15Hrs
Pre- formation, History and scope of Genetics, Pre- Mendelian genetic concepts epigenesis, pangenesi, germplasm theory. Mendel- Life and his experiments on pea plants. Principle of Dominance (Dominance and Recessiveness); Laws of Inheritance and their applications. Monohybrid Cross, Dihybrid Cross, Back Cross, Test Cross	
MODULE 2 EXTENSIONS OF MENDELISM AND GENE INTERACTIONS	15Hrs
Co-dominance and incomplete dominance - definition, examples. Multiple allelism- definition, Eye color in Drosophila, Blood groups and Rh factor in Human; Allelic series; Lethal alleles; Multi-factorial inheritance- Skin colour in Humans; Penetrance and Expressivity; Plieotropy. Epistasis- dominant, recessive. Supplementary and Complementary gene interactions; Non epistatic inter allelic gene interaction, Position effect.	
MODULE 3 SEX DETERMINATION AND EXTRA CHROMOSOMAL INHERITANCE	15Hrs
Chromosomal theory of Inheritance - Concepts and evidences. Mechanism of sex determination- XX-XY; XX-	

XO; ZZ-ZW; Bridges genetic balance theory. Environmental and hormonal control of sex determination Gynandromorphs / Intersexes, Super sexes in *Drosophila*. Sex differentiation and dosage compensation (*Drosophila* and Man). Sex linked and sex-limited traits in Humans. Hemophilia, Hypertrichosis. Extra Chromosomal inheritance, flower colour in *Mirabilis jalapa*, kappa particle in *Paramecium*, sigma factor in *Drosophila*, Cytoplasmic Male Sterility (CMS) in maize.

MODULE 4 MODEL ORGANISMS IN GENETICS

15Hrs

Bacteria - *E. coli*; Viruses - Tobacco Mosaic Virus; Bacteriophage - Lambda Phage; Fungi- *Neurospora* species, *N. crassa*, *Saccharomyces cerevisiae*; Nematode - *Caenorhabditis elegans*, Plant - *Arabidopsis thaliana*, Fly - *Drosophila melanogaster*, Fish - Zebra fish (*Danio rerio*), Mammal - Mice (*Mus musculus*) and Rat (*Rattus rattus*).

TEXT BOOK/ REFERENCES:

1. Verma P. S. Cell Biology, Genetics, Molecular Biology: Evolution and Ecology (2006). S Chand Publishers.
2. Strickberger M. W., Genetics. (1968) Macmillan Publishers.
Mathew Hamilton, (2009) Population Genetics, Wiley-Blackwell
3. Snustad D. P., Simmons M. J., Principles of Genetics. 5th Edition (2008) John Wiley & Sons.
4. Brooker R. B., Genetics Analysis and Principles. Fourth Edition (2009) McGraw-Hill.
5. Tamarin R. H., Principle of Genetics. Seventh Edition. (2002) Tata-McGraw Hill.
6. Hart D and Jones E.W., Genetics Principles and Analysis. 4th Edition (1998) Jones and Bartlett Publication.
7. Atherly A. G., Girton J. R. and Donald M. C. J. F. The Science of Genetics (1999) Sounders College Publication / Harcourt Brace.
8. Sturtevant A. H., A History of Genetics (1965). Harper and Row New York. Mendel G. The First Geneticist by Orel V. (1996) Oxford University Press, New York.
9. Ross S. A first course in Probability. 4th Edition (1994). McMillan, New York.
10. Stansfield W. D., Theory and problems of Genetics (Schaum's Outline Series). (2002) McGraw Hill.
11. Stubbe H., History of Genetics (1972). Harper and Row New York.
12. Prasad S. Fundamentals of Biostatistics (1993). Emkay publications, New Delhi.
13. Khan and Khanum. Fundamentals of Biostatistics. II Revised Edition. (2004). Ukaaz Publication.

EXPERIMENTS

1. Temporary squash preparation of : Grasshopper Testes, Onion flower bud
2. Observation of meiotic stages in permanent slides
3. Blood Typing
4. Sex differentiation in *Drosophila*
5. Preparation of Barr bodies from buccal smear.
6. Problem solving on : (a) Probability (b) multiple alleles (c) Gene interactions (d) Sex Linkage
7. Studies on mendelian traits: (a) Flower color in *Mirabilis jalapa* (b) Coat color in Mice (c) Comb pattern in fowl.

REFERENCES

1. Brooker, R. J. 1999. Genetics: Analysis and Principles. Benjamin Cummings, Longman, INC.
2. Gardner E. J. M. J. Simmons and D.P. Snustad 1991 Principles of Genetics. John Wiley & Sons. INC. New York.
3. Klug, W. S. and M. R. Cummings 1994 Concepts of Genetics MacMillan Colley Publishing and Company NY.
4. Strickberger M. W. 1996. Genetics. Mac Millan Publishing Co. New York
5. Tamarin, R H. 1999. Principles of Genetics. McGraw-Hill.

SEMESTER	II					
YEAR	I					
COURSE CODE	22BS1203					
TITLE OF THE COURSE	MICROBIAL DIVERSITY AND KINETICS					
SCHEME OF INSTRUCTION	Lecture Hours	Tutorial Hours	Practical Hours	Seminar/Projects Hours	Total Hours	Credits
	4	-	4	-	60	6

Perquisite Courses (if any)			
#	Sem/Year	Course Code	Title of the Course
-	-	-	-

COURSE OBJECTIVES:
<ul style="list-style-type: none"> To understand microbial diversity, classification, structure of different groups of microbes and their functions
<ul style="list-style-type: none"> To strengthen the knowledge on cell and cellular organisation of prokaryotic and eukaryotic systems.
<ul style="list-style-type: none"> To know about the economic importance of the microbes.

COURSE OUTCOMES:		
CO No.	OUTCOMES	BLOOM'S TAXONOMY LEVEL
CO1	Enable students to relate the principles in classifying microbes	L1
CO2	Apply the knowledge in identifying different microorganisms and to study their life cycles	L2
CO3	Elucidate the role of beneficial and harmful effects	L3

COURSE CONTENT:
MODULE 1 15Hrs MICROBIAL DIVERSITY AND SYSTEMATICS Microbial Systematics: Binomial nomenclature, Whittaker's five kingdom and Carl Woese's three kingdom classification systems. Brief account of Bergey's manual of systematic and determinative bacteriology. Criteria for classification of bacteria. Molecular methods (DNA homology, DNA-RNA homology, G+C ratio), phage typing and Serological methods in taxonomy, Numerical taxonomy.
MODULE 2 15Hrs PROKARYOTIC MICROBIOLOGY Bacteriology: Ultra structure of Bacteria: Classification, Structure external to the cell wall- Slime layer, Capsule, Flagella, Pilus/ Fimbriae. Cell wall, Cytoplasmic membrane; Cytoplasmic inclusion bodies. Bacterial Chromosome, Plasmids and Episomes, Ribosomes, Exospores, Endospore and Cysts. General account of Archaeobacteria, Actinomycetes. Virology: Classification, General structure, characteristics, cultivation and replication of viruses. Type study: classification, structure, replication, cultivation and application of - TMV and Lambda phage. Viroids and Prions.

MODULE 3	15Hrs
PHYCOLOGY	
Classification, General characteristics of algae including occurrence, thallus organization. Algal Ultrastructure, pigments, flagella, eyespot food reserves. Reproduction: vegetative, asexual and sexual. Types of life cycles: Haplontic, Diplontic, Haplobiontic and Diplobiontic. Type study of Cyanophyta (<i>Spirulina</i>), Chlorophyta (<i>Spirogyra</i>), Rhodophyta (<i>Gracillaria</i>). Economic importance of algae.	
MODULE 4	15Hrs
MYCOLOGY AND PROTOZOLOGY	
Fungi: Classification, General characteristics of fungi including habitat, distribution, nutritional requirements, fungal cell ultra- structure, thallus organization and aggregation, fungal cell wall structure and synthesis. Reproduction asexual and sexual. Type study of Zygomycetes (<i>Rhizopus</i>), Ascomycetes (<i>Aspergillus</i>), Basidiomycetes (<i>Agaricus</i>) and Deuteromycetes (<i>Fusarium</i>). Economic importance of fungi.	
Protozoa: General characteristics of protozoa. Type study - <i>Amoeba</i> , <i>Paramecium</i> , <i>Plasmodium</i> .	

TEXT BOOKS:
<ol style="list-style-type: none"> Alexopoulos, C.J., Mims, C.W., and Blackwell, M. 2007. Introductory Mycology. ; Fourth edition, Wiley India Private Limited Aneja, K.R. 2014. Laboratory Manual of Microbiology and Biotechnology. Medtec Atlas R.M. Microbiology- Fundamentals and applications, Macmillan Publishing Company, New York. Benson, H. J. 1994. Microbiological Application. WCB McGraw-Hill of India Private Limited. Brock, T. D. and Madigan, M.T. 1996. Biology of Microorganisms. Prentice Hall of India Private Limited. Cappuccino, J.G., and Sherman, N. 1999. Microbiology - A Laboratory Manual. Fourth Edition. The Addison Wesley Longman, Inc England. Pelczar, M. J., Chan E.C.S. and Krieg N.R. 1993. Microbiology. McGraw Hill Book Company, New York. Pommerville, J.C. 2007. Alcamo's Fundamentals of Microbiology. Eighth Edition. Jones and Bartlett Publishers, USA. Prescott, L. M., Harley, J.P. and Klein, D.A. 2011. Microbiology. WCB McGraw-Hill, New York. Salle, A. J. 1984. Fundamental Principles of Bacteriology. Tata McGraw-Hill Publishing Company Limited, New Delhi. Sharma, O. P. 1986. Text Book of Algae. Tata McGraw-Hill Education. Stanier R.Y., and Ingraham J.L. 1991. General Microbiology. Prentice Hall of India Private Limited, New Delhi. Vashishta, B.R. 2010. Botany for Degree Students – Algae. S. Chand and Co.

EXPERIMENTS
1. Isolation and identification of fungi (Lactophenol cotton blue mount).
2. Isolation and Identification of algae.
3. Study of Protozoa by using permanent slides: <i>Amoeba</i> , <i>Paramecium</i> , <i>Giardia</i> , <i>Plasmodium</i> .
4. Study of bacterial growth curve by turbidometric method.
5. Study of growth curve of fungi by colony diameter method
6. Cultivation and propagation of bacteriophage.
7. Cultivation of Algae / Algal growth.

REFERENCES:

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

SEMESTER	II					
YEAR	I					
COURSE CODE	22BS1204					
TITLE OF THE COURSE	BIOSTATISTICS					
SCHEME OF INSTRUCTION	Lecture Hours	Tutorial Hours	Practical Hours	Seminar/Projects Hours	Total Hours	Credits
	3	-	-	-	45	3

Perquisite Courses (if any)			
#	Sem/Year	Course Code	Title of the Course
-	-	-	-

COURSE OBJECTIVES:
<ul style="list-style-type: none"> To familiarize the students with basic concepts and principles of statistics To understand the applications of statistics in biological sciences.

COURSE OUTCOMES:		
CO No.	OUTCOMES	BLOOM'S TAXONOMY LEVEL
CO1	Student will be aware of various applied and allied domains like statistics and will be able to think creatively	L2
CO2	Students will be empowered for better prospects leading to project design and execution.	L3

COURSE CONTENT:	
MODULE 1	5 Hrs
Measures of Central Tendencies	
Introduction to Bio-statistics and its significance, use of replicates, Tabulation and graphical representations of data. Different models of data presentations. Frequency distribution. Measures of Central tendency: Arithmetic mean, mode & median.	
MODULE 2	15Hrs
Dispersion And Correlation	
Measures of variability: Range, mean deviation and percentiles. Standard deviation and co-efficient of variation, Standard error Properties of the data: linear regression and correlation-test of significance, skewness and kurtosis and their various measures, Simple linear correlation and regression analysis. Analysis of variance. Sampling methods and their significance.	
MODULE 3	7 Hrs
Probability Distributions	
Probability: types of event, sample space, definition, conditional probability, addition and multiplication rules of probability and some simple problems. Probability distributions- Binomial, Poisson and Normal distributions with simple numerical	
MODULE 4	8 Hrs
Testing of hypothesis:	
Basic concepts and definitions, types of errors, confidence intervals. Tests based on Normal, student's t, chi-square and F distributions, interpretation of "p" value. Statistical package- Features of statistical software, SPSS	

for various applications in Biostatistical program.

TEXT BOOKS/REFERANCES:

1. Daniel (1999). Biostatistics (3 edition) Panima Publishing Corporation.
2. Khan (1999). Fundamentals of Biostatistics, Panima Publishing Corporation
3. Swardlaw, A.C. (1985). Practical Statistics for Experimental Biologists, Joh
4. Bazin, M.J. (1983). Mathematics in microbiology Academic press
5. Green, R.H. (1979). Sampling design & Statistical methods for environmental Biologists, Wiley Int. N.Y.
6. Campbell, R.C. (1974). Statistics for Biologists, Cambridge Univ. Press, Cambridge
7. Bliss, C.I.K. (1967). Statistics in Biology, Vol.1 Mc Graw Hill, New York. Wiley and Sons, Inc. NY.

SEMESTER	II					
YEAR	I					
COURSE CODE	22BS1205					
TITLE OF THE COURSE	ENGLISH – II					
SCHEME OF Instruction	Lecture Hours	Tutorial Hours	Practical Hours	Seminar/Projects Hours	Total Hours	Credits
	2	-	-	-	30	2

Perquisite Courses (if any)			
#	Sem/Year	Course Code	Title of the Course
-	-	-	-

COURSE OBJECTIVES:
<ul style="list-style-type: none"> To encourage the students to speak English confidently and enable them to communicate for day-to-day needs. To build up their confidence in the usage of English and to enhance their written communicative competence also helping them for competitive exams.

COURSE OUTCOMES:		
CO No.	OUTCOMES	Bloom's Taxonomy Level
CO1	Students are confident in oral and written communication	L1
CO2	Have enhanced competence for competitive exams	L2

COURSE CONTENT:	
MODULE 1	5 Hrs
COMMUNICATION SKILLS Definition, importance of communication, communication process – source, message, encoding, channel, decoding, receiver, feedback, context, levels of communication, Flow of Communication, Verbal and Non-Verbal Communication, Barriers to Communication - physiological, physical, cultural, language, gender, interpersonal, psychological, emotional. Perspective in communication/ Communication styles: introduction, visual perception, language, other factors affecting our perspective – past experiences, prejudices, feelings, environment	
MODULE 2	8 Hrs
<p>Elements of communication – introduction, face to face communication – tone of voice, body language (non-verbal communication), verbal communication, physical communication;</p> <p>Basic listening skills: introduction, self-awareness, active listening, becoming an active listener, listening in difficult situations;</p> <p>Interview skills: purpose of an interview, do's and don't's of an interview;</p> <p>Giving presentations: dealing with fears, planning your presentation, structuring your presentation, delivering your presentation, techniques of delivery;</p> <p>Group discussion: introduction, communication skills in group discussion, do's and don't's of group discussion;</p> <p>Phonetics: The Organs of Speech, The Description and Classification of Speech Sounds, The Description</p>	

and Classification of Vowels, The Description and Classification of Consonants, Phonetic symbols and the IPA, Phonemic and Phonetic Transcription Phonology, Phoneme sequences and Consonant Cluster, The Syllable, Word Accent, Accent and Rhythm in Connected Speech, Intonation, Varieties of English Pronunciation.	
MODULE 3	7 Hrs
EFFECTIVE WRITING SKILLS	
<p>Effective written communication: introduction, when and when not to use written communication – complexity of the topic, amount of discussion required, shades of meaning, formal communication</p> <p>Writing effectively: subject lines, put the main point first, and know your audience, organisation of the message, Paragraph Writing, Letter Writing, Report Writing, Book Review, Scientific writing, Making a message – Transitivity/ intransitivity – complementation – talking about closely linked action – using two verbs together (eg: She started laughing), Transforming messages – Making statements, questions, orders and suggestions – denying – rejecting – disagreeing – possibility – ability, permission, obligation etc.</p>	
MODULE 4	10 Hrs
GRAMMAR	
<p>Word Classes: Open Word Classes: - Nouns, Verbs, Adjectives, Adverbs, Pronouns; Closed Word Classes: - Pre-determiners, Determiners, Numerals, Enumrators, Prepositions, Conjunctions, Auxiliary Verbs, Interjection;</p> <p>Morphology: Bound and Free Morphemes; Affixes, Stems and Roots; Morphological Analysis; Phrases: Noun Phrase, Verb Phrase, Genitive Phrase, Adjective Phrase, Adverb Phrase, Prepositional Phrase, Phrases and its types, Clauses and its types, Sentences and its types, Common errors, phonetics;</p> <p>Clauses: Clause Elements, Clause Types, Kinds, Concord;</p> <p>Sentences: Simple Sentences, Compound Sentences, Complex Sentences;</p> <p>Sub Ordination: Sub-Clauses, Finite and Non-Finite Sub-Clauses;</p> <p>Co-ordination: Linked and Unlinked Coordination, Synthesis;</p> <p>Ambiguity: Types of Ambiguity, Structural and Lexical Ambiguity;</p> <p>Common Errors: Nouns and Pronouns, Articles, Verbs, Concord, Adjectives, Adverbs, Prepositions, Vocabulary, Expressing time, Referring to present, past and future time - use of adjuncts - frequency and duration, Talking about manner and place, Information about place, manner - position of adjuncts - types of adverbs (time, frequency, duration etc), Reporting what people say/think, Reporting verbs - reporting someone's actual words - reporting in one's own words, The structure of information, Focusing on the thing affected (passive voice) - selecting focus (left structure) taking the focus off the subject (impersonal 'it' etc.) – Introducing something new (with 'there') - focusing on information using adjuncts.</p>	

REFERENCES:

1. Crystal, David. 1985, Rediscover Grammar with David Crystal. Longman
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 Longman 17
6. Hewings, M. 1999, Advanced English Grammar. Cambridge University Press
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, Mc GrawHill Education, 2011.

SEMESTER	II					
YEAR	I					
COURSE CODE	22BS1206					
TITLE OF THE COURSE	KANNADA KALI – II					
SCHEME OF Instruction	Lecture Hours	Tutorial Hours	Practical Hours	Seminar/Projects Hours	Total Hours	Credits
	2	0	0	0	30	2
Perquisite Courses (if any)						
#	Sem/Year	Course Code	Title of the Course			
-	-	-	-			

COURSE OBJECTIVES:
<ul style="list-style-type: none"> 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 OUTCOME		
CO No.	OUTCOMES	Bloom's Taxonomy Level
CO1	Students should be able to read, write and communicate in Kannada	L3

COURSE CONTENT:
<ol style="list-style-type: none"> BODY PARTS – DEHADA ANGAANGAGALU ದೇಹದ ಅಂಗಾಂಗಗಳು HEALTH INFORMATION (HISTORY TAKING) – AAROgyADA MAAHITHI – ಆರೋಗ್ಯದ ಮಾಹಿತಿ MEDICAL WORDS AND DISEASES – VAIDYAKEEYA PADAGALU MATTHU KAAVILEGALU ವೈದ್ಯಕೀಯ ಪದಗಳು ಮತ್ತು ಖಾಯಿಲೆಗಳು PATIENT CASE RECORD – ROGIYA DAAKHALEYA VIVARA ರೋಗಿಯ ದಾಖಲೆಯ ವಿವರ COMMON PHYSIOTHERAPY WORDS – PHYSIOTHERAPY YA SAAMAANYA PADAGALU ಫಿಜಿಯೋಥೆರಪಿಯ ಸಾಮಾನ್ಯ ಪದಗಳು DOCTOR & PATIENT CONVERSATION – VAIDHYA & ROGIYA SAMBAASHANE ವೈದ್ಯ & ರೋಗಿಯ ಸಂಭಾಷಣೆ DENTAL RELATED WORDS – HALLIGE SAMBANDHISIDA PADAGALU ಹಲ್ಲಿಗೆ ಸಂಬಂಧಿಸಿದ ಪದಗಳು DENTAL TREATMENT INSTRUCTIONS – DANThA CHIKITHSEYA SUCHANEGALU ದಂತ ಚಿಕಿತ್ಸೆಯ ಸೂಚನೆಗಳು GENERAL CHECK UP – SAAMAANYA CHIKITHSE ಸಾಮಾನ್ಯ ಚಿಕಿತ್ಸೆ HEALTH EXAMINATIONS – AAROgyADA PAREEKSHEGALU ಆರೋಗ್ಯದ ಪರೀಕ್ಷೆಗಳು

11. OPPOSITE WORDS – VIRUDDHA PADAGALU

ವಿರುದ್ಧ ಪದಗಳು

12. VERBS - KRIYAA PADAGALU – ಕ್ರಿಯಾ ಪದಗಳು

13. LIQUID ITEMS – NEERINAAMSHADA PADAGALU

ನೀರಿನಾಂಶದ ಪದಗಳು

14. FEELINGS – BHAAVANEGALU – ಭಾವನೆಗಳು

15. TENSES – KAALASOOCHAKAGALU – ಕಾಲಸೂಚಕಗಳು

16. COMMUNICATION WORDS –
SAMBHAASHANEYA PADAGALU

ಸಂಭಾಷಣೆಯ ಪದಗಳು

SEMESTER	III					
YEAR	II					
COURSE CODE	22BS2301					
TITLE OF THE COURSE	BIOPHYSICS AND INSTRUMENTATION					
SCHEME OF INSTRUCTION	Lecture Hours	Tutorial Hours	Practical Hours	Seminar/Projects Hours	Total Hours	Credits
	4	-	4	-	60	6

Prerequisite Courses (if any)			
#	Sem/Year	Course Code	Title of the Course
-	-	-	-

COURSE OBJECTIVES:
<ul style="list-style-type: none"> To create general understanding about theoretical concepts of techniques used to detect and assay biomolecules.
<ul style="list-style-type: none"> To familiarize the students with basic concepts and principles of biophysical and biochemical techniques used in biological sciences.
<ul style="list-style-type: none"> To give holistic view for understanding the screening, isolation, separation and characterization of molecules

COURSE OUTCOMES:		
CO No.	OUTCOMES	BLOOM'S TAXONOMY LEVEL
CO1	Student will be scientifically equipped with understanding of the about the different biomolecules and their important functions.	L1
CO2	Student will be aware of the analytical tools and their instrumentation used in biotechnology/biological sciences.	L2
CO3	Students will have a basic understanding of biomedical equipments	L3
CO4	Students will be empowered for better prospects leading to project design and execution.	L2

COURSE CONTENT:	
MODULE 1	15Hrs
<p>Spectroscopy: Beer-Lambert's law, application and its limitations. Extinction coefficient, Principle, schematics and applications of Colorimeter and UV-Vis Spectroscopy.</p> <p>Structural elucidation: CD, IR, NMR, x-ray Diffraction & their application in structural analysis of macro molecules, Mass spectroscopy (LC-MS and MALDI).</p>	
MODULE 2	15Hrs
<p>Chromatography: 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) and Gas Chromatography (GC).</p>	

MODULE 3	15Hrs
<p>Electrophoresis: 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, SDS-PAGE, Isoelectric focusing (IEF), 2D-PAGE and Capillary electrophoresis</p>	
MODULE 4	15Hrs
<p>Isotopic tracer techniques: 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.</p> <p>Centrifugation: Basic principles, RCF, Svedberg constant and Sedimentation coefficient. Preparative centrifugation: Differential & density gradient centrifugation, Applications. Analytical centrifugation: Determination of molecular weight of biomolecules.</p>	

TEXT BOOKS/REFERANCES:

<ol style="list-style-type: none"> Principles and Techniques of Practical Biochemistry – Keith Wilson and John Walker. Cambridge low price edition. Biophysical Chemistry – Upadhyay, Upadhyay and Nath. Himalaya Publications Analytical Techniques in Biochemistry and Molecular biology – Katoch. Springer. Fundamentals of Analytical Chemistry - Skoog, Holler and West. Saunders Handbook of Analytical Techniques – Gunzler and Williams. Wiley & Sons Immunology – Kuby. Freeman Publishers A Textbook of Practical Biochemistry- Joshi and Saraswat. Jain Publishers.

EXPERIMENTS

1. pH metric titrations of HCl-NaOH / Acetic acid-NaOH.
2. Determination of pI of amino acid (glycine).
3. Determination of extinction coefficient using colorimetry.
4. Determination of lambda maximum of biomolecules using UV spectroscopy.
5. Estimation of pKa of amino acid (glycine).
6. Determination of density & viscosity of given unknown solution.
7. Separation of amino acid by Thin Layer Chromatography (TLC).
8. Column chromatography of phyto-pigments on adsorbent (silica/alumina).

TEXT BOOKS/ REFERENCES

<ol style="list-style-type: none"> Principles and Techniques of Practical Biochemistry – Keith Wilson and John Walker. Cambridge low price edition. Biophysical Chemistry – Upadhyay, Upadhyay and Nath. Himalaya Publications.

SEMESTER	III					
YEAR	II					
COURSE CODE	22BS2302					
TITLE OF THE COURSE	MOLECULAR BIOLOGY					
SCHEME OF INSTRUCTION	Lecture Hours	Tutorial Hours	Practical Hours	Seminar/Projects Hours	Total Hours	Credits
	4	-	4	-	60	6

Prerequisite Courses (if any)			
#	Sem/Year	Course Code	Title of the Course
-	-	-	-

COURSE OBJECTIVES:
<ul style="list-style-type: none"> Understand the general principles of central dogma, DNA and RNA types structure and their role in cells. Explain the mechanisms of DNA replication, RNA synthesis and repair, various levels of gene expression, regulation and protein function.

COURSE OUTCOMES:		
CO No.	OUTCOMES	BLOOM'S TAXONOMY LEVEL
CO1	To demonstrate the fundamental understanding of central dogma of molecular biology	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 the fundamentals of steps involved in transcription and translation	L3

COURSE CONTENT:	
MODULE 1	15Hrs
THE MOLECULAR BASIS OF LIFE	
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, Types of RNA – mRNA, tRNA and rRNA, mi RNA.	
MODULE 2	15Hrs
DNA REPLICATION AND ITS COMPONENTS	
Replication of DNA (Conservative, Dispersive and Semi Conservative DNA replication, Meselson and Stahl experiment), theta and rolling circle model of replication. Prokaryotic and Eukaryotic – Enzymes and proteins involved in replication. DNA repair.	
MODULE 3	15Hrs
DNA TRANSCRIPTION AND ITS COMPONENTS	
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	15Hrs
TRANSLATION AND REGULATION OF GENE EXPRESSION	
Genetic code, wobble hypothesis, Mechanism of translation in prokaryotes and eukaryotes, 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.	

TEXT BOOKS/REFERANCES:
<ol style="list-style-type: none"> 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).

EXPERIMENTS
1. Extraction of DNA from plant/bacteria and animal sources (2 Units)
2. Separation of DNA on agarose gel electrophoresis, Visualization of DNA (2 units)
3. Quantification of DNA by spectrophotometry

TEXT BOOKS/ REFERENCES
<ol style="list-style-type: none"> 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.

SEMESTER	III					
YEAR	II					
COURSE CODE	22BS2303					
TITLE OF THE COURSE	EVOLUTIONARY GENETICS					
SCHEME OF INSTRUCTION	Lecture Hours	Tutorial Hours	Practical Hours	Seminar/Projects Hours	Total Hours	Credits
	4	-	4	-	60	6

Perquisite Courses (if any)			
#	Sem/Year	Course Code	Title of the Course
-	-	-	-

COURSE OBJECTIVES:
<ul style="list-style-type: none"> To make student understand the forces that have an impact on levels of genetic variations in natural and/or experimental populations for both qualitative and quantitative traits.
<ul style="list-style-type: none"> To enable students to choose, apply and evaluate several methods for studying genetic variation in and between species.

COURSE OUTCOMES:		
CO No.	OUTCOMES	BLOOM'S TAXONOMY LEVEL
CO1	This course will be helpful to the students to conceptualize the existence of genetic variation and speciation.	L1
CO2	Students will be able to describe the basic mechanisms behind evolution of DNA sequences and gene structure	L2
CO3	Student will gain the ability to analyze and relate phenotype to genotype and potential factors influencing the interaction.	L3

COURSE CONTENT:	
MODULE 1	15Hrs
CLASSICAL EVOLUTIONARY GENETICS Darwinism, Neo Darwinism and Synthetic Theory. Evolution of Sexual Reproduction. Sex Ratio and Sex Determination. Competition Among Levels of Organization. Speciation and Phylogeny. Coalescent Theory. Drift versus selection in population. Kin and group Selection.	
MODULE 2	15Hrs
INHERITANCE OF QUANTITATIVE TRAITS Quantitative versus Qualitative traits. Gene and genotype frequencies, mating patterns, Hardy-Weinberg principle, heterozygotes, extension of H-W principle to multiple alleles, sex-linked alleles. Non-random mating, inbreeding and assortative mating, inbreeding coefficient. Factors that change allelic frequencies	
MODULE 3	15Hrs
GENETIC POLYMORPHISMS AMONG POPULATIONS Genetic polymorphism, transient and stable and factors responsible for stable polymorphism. DNA markers and populations differences. Application of population genetics. Role of population genetics in genetic counselling. Genetic origin and evolution of human races. Genetic Demography, age and gender specific	

death and birth rates, intrinsic rate of natural increase. Index of opportunity for natural selection.	
MODULE 4	15Hrs
Molecular Evolution	
Dating major evolutionary events. The Cambrian explosion and the K-T radiation. Aligning DNA and protein sequences. Selection at the molecular level: variations in substitution rates and their causes in nuclear, organellar, and viral DNA. Mechanisms of genomic evolution: Endosymbiosis and lateral gene transfer, Transposition and gene duplications, Domain shuffling and concerted evolution. Genetic assimilation and canalization in development.	

TEXT BOOKS/REFERANCES:
<ol style="list-style-type: none"> 1. D.B. Futuyma. <i>Evolutionary Biology</i>, Third Edition. Sinauer, 1997. 2. Hedrick P.W.(2011). <i>Genetics of Populations</i>. Jones and Bartlett Publishers, Massachusetts. 3. Jobling, M., Hollox, E., Hurles, M., Kivisild, T. and Tyler-Smith, C. (2013). <i>Human Evolutionary Genetics</i>. Garland Science. 4. RDM Page and LC Holmes. <i>Molecular Evolution: A Phylogenetic Approach</i>. Blackwell Science, 1998. 5. Relethford, J.H. (2012). <i>Human Population Genetics</i>. John Wiley & Sons. 6. Snusted, D.P., Simmons, M. J. (2010). <i>Principles of Genetics</i>. John Wiley & Sons, New York. 7. Knight, J.C. (2009). <i>Human Genetic Diversity –Functional consequences for Health and Disease</i>. Oxford University Press, USA.

EXPERIMENTS
1. Homology modelling
2. Construction of Phylogenetic trees: roots, nodes, clades etc.
3. Study of Quantitative inheritance in Kernel colour in Wheat/Skin colour in man.
4. Problem solving on: (a) Probability (b) multiple alleles (c) Gene interactions (d) Sex Linkage
5. Linkage mapping
6. Pedigree analysis

TEXT BOOKS/ REFERENCES
<ol style="list-style-type: none"> 1. Brooker, R. J. 1999. <i>Genetics: Analysis and Principles</i>. Benjamin Cummings, Longman, INC. 2. D. Graur and W-H Li. <i>Fundamentals of Molecular Evolution</i>. Sinauer, 1999. 3. RDM Page and LC Holmes. <i>Molecular Evolution: A Phylogenetic Approach</i>. Blackwell Science, 1998. 4. Nielsen, R. and Slatkin, M. (2013). <i>An Introduction to Population Genetics: Theory and Applications</i>. Sinauer Associates, Inc.

SEMESTER	III					
YEAR	II					
COURSE CODE	22BS2304					
TITLE OF THE COURSE	CHEMISTRY II					
SCHEME OF INSTRUCTION	Lecture Hours	Tutorial Hours	Practical Hours	Seminar/Projects Hours	Total Hours	Credits
	3	-	-	-	45	3

Prerequisite Courses (if any)			
#	Sem/Year	Course Code	Title of the Course
-	-	-	-

COURSE OBJECTIVES:
<ul style="list-style-type: none"> To study the basic types of bonding, various theories of chemical bonding and chemical bonds in molecules.
<ul style="list-style-type: none"> To make students understand about the liquid state of matter, different properties of liquids, laws governing liquids and colligative properties and their applications.
<ul style="list-style-type: none"> To impart knowledge to understand basic concepts of organic chemistry starting from nomenclature to types of organic reactions.

COURSE OUTCOMES:		
CO No.	OUTCOMES	BLOOM'S TAXONOMY LEVEL
CO1	Students will get in basic knowledge about types of chemical bonding and chemical bonding in molecules.	L1
CO2	Enable to understand in depth knowledge about chemical bonding and various theories related to that.	L2
CO3	Students will learn about the basic principles of organic chemistry	L3
CO4	Students will be equipped with fundamental knowledge of liquid state of matter.	L2

COURSE CONTENT:	
MODULE 1	10 Hrs
CHEMICAL BONDS – I	
<p>Introduction: Need for the atoms to form molecules, and types of chemical bonds with examples Ionic Bond: Definition and conditions for formation of an ionic bond between atoms, examples of formation of an ionic compound between alkali metal/alkaline earth metals. Lattice energy, its effect on stability and solubility of ionic solids, Born – Haber cycle for NaCl and MgO. Covalent Bond: Definition, octet rule, Lewis dot formulae of a few simple molecules and ions, electron deficient and excess molecules (BeCl₂, BF₃, PCl₅, SF₆). Geometry of covalent molecules: (VSEPR concept and hybridisation concepts) basic concepts and definitions: Examples simple inorganic molecules and ions such as NH₃, H₂O, H₃O⁺, SF₄.</p>	
MODULE 2	11 Hrs
CHEMICAL BONDS – II	
Theories of covalent bonds (VBT and MOT): Valence bond theory (VBT): postulates and its limitations,	

directional characteristics of covalent bonds, Application of VBT to BeCl_2 , BF_3 , SiCl_4 , PCl_5 , SF_6 molecules. Molecular orbital theory: postulates, linear combination of atomic orbitals (LCAO), bonding, nonbonding and antibonding molecular orbitals, pictorial representation of formation of s and p MOs from the corresponding atomic orbitals, Molecular orbital energy level diagram and molecular orbital configuration involving s and p orbitals their importance for the following molecules, (H_2 , N_2 , O_2 , HF and CO). Metallic Bond: Definition, properties of metals and band theory. Weak Intermolecular interactions: van der Waals forces, dipole-dipole interactions and their significance. Hydrogen Bond: Definition, types, importance.

MODULE 3	12 Hrs
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GASEOUS STATE

Gaseous state - Elementary aspects of kinetic theory of gases, Ideal and real gases – deviation from ideal behavior- Van der Waals equation for real gases, causes of deviation from ideal behavior, Need for Maxwell-Boltzmann distribution law, mathematical expression for both based on this law (no derivation). Mean free path, collision frequency and collision number. Expressions for most probable velocity, rms velocity and average velocity, relationships between them, problems.

Critical phenomenon - Andrew's isotherm on carbon dioxide and explanation of the curves (no experimental details). Explanation of velocity distribution curves. Derivation of critical constants T_c , P_c and V_c from van der Waal's equation and their experimental determination by Cagniard de La Tour method for T_c and P_c . Amagats mean density method for V_c . Problems on the calculation of T_c , P_c and V_c , a and b. Law of corresponding states - statements, reduced equation of state and explanation, Joule-Thomson effect-explanation. Inversion temperature-definition (no derivation). The application of Joule-Thomson effect to the liquefaction of air and hydrogen by Linde's process.

MODULE 4	12 Hrs
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LIQUIDS AND SOLUTIONS

Properties of liquids-Viscosity, Surface tension and Parachor-Definition, mathematical expression, numerical problems and factors affecting them. Viscosity- Definition, mathematical expression, Coefficient of viscosity, effect of temperature, size, weight, shape of molecules and intermolecular forces on it. Surface Tension- Definition, mathematical expression, effect of temperature and solute on it Parachor-Definition, Sugden equation, calculation and applications. Numerical problems. 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. Distribution law-Statement, partition coefficient and condition for validity of distribution law. Application-solvent extraction. Dilute solutions- Review of colligative properties and concentration terms. Determination of molecular mass of a solute by: (i) Berkeley- Hartley method(ii) Beckmann's method (iii) Landsberger's method. Numerical problems.

TEXT BOOKS/REFERANCES:

1. Vogel's Text Book of Practical Organic Chemistry, 5th Edition, A.J. Hannford, A.R. Tatchell, B.S. Hurnis, P.W.G. Smith, Pearson Publication.
2. Enhancing undergraduate chemistry laboratories, J. Carndoff, N. Reid, RS. C. Publication.
3. Experimental Organic Chemistry Laboratory Manual, J.I. Garcia, J.A. Dobado, G. Francisco, Elsevier Publication.
4. Chemistry Practical Inorganic Qualitative Analysis For Under Graduate Students, M.J. Mamtora, S.C. Karad, J.S. Makasana, Lap Lambert Academic Publishing.
5. Advanced Practical Chemistry, K. Chelladurai, K. Subbian, Lap Lambert Academic Publishing.

SEMESTER	III					
YEAR	II					
COURSE CODE	22BS2305					
TITLE OF THE COURSE	COMPUTER APPLICATIONS					
SCHEME OF Instruction	Lecture Hours	Tutorial Hours	Practical Hours	Seminar/Projects Hours	Total Hours	Credits
	2	-	-	-	30	2

Perquisite Courses (if any)			
#	Sem/Year	Course Code	Title of the Course
-	-	-	-

COURSE OBJECTIVES:
<ul style="list-style-type: none"> • Graduates of the program will possess strong fundamental concepts in mathematics, science, and technology to address technological challenges • Acquire an attitude and aptitude for research, entrepreneurship and higher studies in the field of Computer Science and information technology.

COURSE OUTCOME:		
CO No.	OUTCOMES	Bloom's Taxonomy Level
CO1	To analyze, design and implement multifaceted biological problems of any domain with innovative and efficient approaches	L2
CO2	Attain better communication, presentation, time management and team work skills leading to responsible & competent professionals	L2

COURSE CONTENT:	
MODULE 1	15 Hrs
CATEGORIES OF COMPUTERS AND OPERATING SYSTEMS	
Evolution, Generations of computers (I, II, III, IV, V) Classification of computers, Input and output devices, Storage devices: Hard disk, Diskette, Magnetic tape, RAID, ZIP, devices, Digital tape, CD-ROM, DVD (capacity and access time), Main Circuit Board of a PC: Chips, Ports, Expansion. The Minicomputer, Mainframe Computers, Parallel processing Computer & the Super Computer, Operating System concepts, Windows 98/XP and later versions, Windows server NT/2000, Unix/Linux & servers. Introduction to networking: various terminologies, Associated hardware devices, gadgets (Router, Switch) tools, services, and resources, Network Topologies and Protocols, LAN, WAN and MAN World Wide Web (WWW) Network security: fire walls.	
MODULE 2	15 Hrs
INTERNET, VIRUSES AND PROGRAMMING CONCEPTS	
Introduction, Office Automation Software (Open Source Software). What is a virus? Virus symptoms, How do they get transmitted? What are the dangers? General Precautions, Search engines: Google, Yahoo, Concepts in text-based searching, searching Medline, PubMed, bibliographic databases. Algorithms, Flowcharts, Algorithms: Concepts & definitions, converting algorithms to flowchart; Coding: flowcharts to programs, Comparing algorithms, flowcharts & programs.	

TEXT BOOKS/ REFERENCES

1. Computer Fundamentals, 4th edition (2004) P.K. Sinha, BPB publication, India
2. Computer Networks. 4th edition (2008). Tanenbaum. Pearson Education, India
3. Biostatistics: P.N.Arora ,P.K.Malha.
4. Introduction to Database Management Systems, 1st edition, (2004), Atul Kahate, Pearson education, India.

SEMESTER	III					
YEAR	II					
COURSE CODE	22BS2306					
TITLE OF THE COURSE	CONSTITUTION OF INDIA					
SCHEME OF Instruction	Lecture Hours	Tutorial Hours	Practical Hours	Seminar/Projects Hours	Total Hours	Credits
	2	0	0	0	30	2

Prerequisite Courses (if any)			
#	Sem/Year	Course Code	Title of the Course
-	-	-	-

COURSE OBJECTIVES:
• Define a constitution
• Describe the salient features of the Indian Constitution
• Explain different ways of acquiring Indian Citizenship
• List the Fundamental Rights and Fundamental Duties of Indian citizens
• Describe the Directive Principles of State Policy and their significance

COURSE OUTCOMES:		
CO No.	OUTCOMES	Bloom's Taxonomy Level
CO1	Students will appreciate the fundamental law of the land	L1
CO2	Students will be aware of what kind of government the country will have.	L1
CO3	Aid in understanding what lays down the rules to govern the country	L2
CO4	It also tells about the rights and also the duties of its citizens	L1

COURSE CONTENT:	
MODULE 1	6 Hrs
Framing of the Indian Constitution: Role of the Constituent Assembly. Philosophy of the Constitution: Objectives, resolution, preamble, fundamental Rights and Duties. Human rights and Environmental protection.	
MODULE 2	6 Hrs
Special Rights created in the Constitution of Dalits, Backward Classes, Women and Children, and religious and linguistic minorities. Directive Principles of State policy: The need to balance fundamental rights with directive principles.	
MODULE 3	6 Hrs
Union Executive: President, Prime Minister and Council of Ministers; powers and functions, coalition Government, problems in their working. Union Legislature: Lok Sabha and Rajya Sabha, powers and functions. Recent trends in their functioning.	

MODULE 4	6 Hrs
State Government: Governor, Chief Minister and Council of ministers, Legislature. Centre – State relations: Political, financial, administrative: Recent Trends.	
MODULE 5	6 Hrs
Judiciary: Supreme Court, Judicial Review, Writs, Public interest litigations. Enforcing rights through writs. Emergency provisions (Article 356)	

TEXT BOOKS/ REFERENCES

1. Computer Fundamentals, 4th edition (2004) P.K. Sinha, BPB publication, India
2. Computer Networks. 4th edition (2008). Tanenbaum. Pearson Education, India
3. Biostatistics: P.N.Arora ,P.K.Malha.
4. Introduction to Database Management Systems, 1st edition, (2004), Atul Kahate, Pearson education, India.