RVS COLLEGE OF ARTS AND SCIENCE

Autonomous and Affiliated to Bharathiar University, Approved by AICTE

Reaccredited with 'A+' Grade by NAAC

Sulur, Coimbatore – 641 402, Tamilnadu, India.

Web: www.rvscas.ac.in

0422-2687421/603

Estd 1986

RVS CAS

Building Intellectual Capital

DEPARTMENT OF BIOCHEMISTRY

B.Sc., BIOCHEMISTRY

2024-2027

HOD **PRINCIPAL** **COE**

VISION

Quality Education for Digital Era.

MISSION

To impart a need – based quality education through comprehensive curriculum by adopting apt technologies and progressive teaching, learning and research processes.

ABOUT THE DEPARTMENT

The Department of Biochemistry was established in 1996. The department is functioning with under graduate, Post graduate and Research programs with a team of 11 faculty members.

The Biochemistry focuses on life processes at the molecular level, that emphasis on the biochemistry and molecular biology of cellular metabolism and Bioenergetics.

The curriculum is designed for students seeking preparation for graduate studies, for the health-care professions, or for entry-level positions in science-related industries. The teaching and learning process is well executed properly and reveals with sophisticated instruments.

EXECUTIVE MEMBERS

CHAIRMAN

Dr. K.V. Kupusamy

MANAGING TRUSTEE

Dr. K. Senthil Ganesh

CORRESPONDENT

Mrs. S. Srividyalakshmi Senthil Ganesh

SECRETARY

Prof. Saramma Samuel

PRINCIPAL

Dr. T. Sivakumar

VICE PRINCIPAL

Dr. M.P. Ayyappadas

CONTROLLER OF EXAMIATIONS

Ms. G. Jeyalakshmi

HEAD OF THE DEPARTMENT

Dr. S.Shamina

PROGRAMME OUTCOMES (POs)

PO1	Domain Knowledge
PO2	Communicative Competence
PO3	Digital Strategic Knowledge
PO4	Multi-Cultural Competence
PO5	Critical Thinking and Problem Solving
PO6	Research and Analytical Skills
PO7	Moral, Ethical and Professional Responsibilities
PO8	Leadership and Lifelong Learning

PROGRAMME SPECIFIC OUTCOMES(PSOs)

Upon completion of **Bachelor of Biochemistry,** students are able to achieve the following outcomes.

PSO1	Apply to gain knowledge through lifelong learning to manage projects in multidisciplinary fields.
PSO2	Describe the fundamental concepts of specific molecules, cell, enzymes, organ system and metabolism of compounds
PSO3	Inspect technical aspects of molecular biology, clinical biochemistry, immunology and plant biochemistry via analytical skill and scientific knowledge domain.
PSO4	Implement in the field of health care sector and in various industries

RVS COLLEGE OF ARTS AND SCIENCE (Autonomous)
Sulur, Coimbatore – 641 402
SCHEME OF EXAMINATIONS
B.Sc Biochemistry 2024 – 2027 BATCH

Semester	Course Opted	Course Name	D	L	T	P	CIA	ESE	Marks	Credits
I	MIL - I	Tamil-I/Hindi-I / Malayalam – I/ French-I	3	4	-	-	25	75	100	3
	ELN - I	English-I	3	4	-	-	25	75	100	3
	DSC – I	Biomolecules	3	4	-	4	25	75	100	6
			3				25	75		
	DSC – II	Cell Biology and Microbiology	3	4	-	4	25	75	100	6
			3				25	75		
	NMS - I	Soft Skills - I	3	2	-	-	Grade			
	NCC	NCC/NSS/ IKS/ SPORTS/CULTURALS	-	2	-	-	-	-	-	-
	LIB	Library	-	1	-	-	-	-	-	-
	Total				**28**				**400**	**18**
II	MIL-II	Tamil-II/Hindi-II/Malayalam – II/French-II	3	4	-	-	25	75	100	3
	ELN - II	English-II	3	4	-	-	25	75	100	3
	DSC – III	Human Physiology and Endocrinology	3	4	-	4	25	75	100	6
			6				25	75		
	DSC – IV	Bioinstrumentation Techniques	3	4	-	4	25	75	100	6
			6				25	75		
	NMS - II	Soft Skills - II	3	2	-	-	Grade			
	AECC – 1	Environmental Studies	3	1	-	-	100	-	100	1
	NCC	NCC/NSS/ SPORTS/CULTURALS	-	1	-	-	-	-	-	-
	LIB	Library	-	1	-	-	-	-	-	-
	Total				**29**				**500**	**19**

Semester	Course Opted	Course Name	D	L	T	P	CIA	ESE	Marks	Credits
III	MIL-III	Tamil-III/Hindi-III/Malayalam – III/French-III	3	4	-	-	25	75	100	3
	ELN - III	English-III	3	4	-	-	25	75	100	3
	DSC – V	Enzymology	3	4	-	4	25	75	100	6
			6				25	75		
	DSC – VI	Bioenergetics & Metabolism	3	4	-	4	25	75	100	6
			6				25	75		
	DSE - I	Elective- I	3	5	1	-	25	75	100	6
	NMS - III	Soft Skills - III	3	2	-	-	Grade			
	NCC	NCC/NSS/ SPORTS/CULTURALS	-	1	-	-	-	-	-	-
	Total				**33**				**500**	**24**
IV	MIL-IV	Tamil-IV/Hindi-V/Malayalam –IV/French-IV	3	4	-	-	25	75	100	3
	ELN - IV	English-IV	3	4	-	-	25	75	100	3
	DSC – VII	Clinical Biochemistry& Clinical Lab Technology	3	4	-	4	25	75	100	6
			6				25	75		
	DSC – VIII	Molecular Biology	3	4	-	4	25	75	100	6
			6				25	75		
	DSE - II	Elective – II	3	5	1	-	25	75	100	6
			3				25	75		
	NMS-IV	Soft Skills - IV	3	2	-	-	Grade			
	AECC –2	Aptitude	3	3			100	-	100	3
	NCC -G1	NCC/NSS/ SPORTS/CULTURALS	-	1	-	-	Good/ Satisfactory			
	Total				**36**				**600**	**27**

Semester	Course Opted	Course Name	D	L	T	P	CIA	ESE	Marks	Credits
V	DSC – IX	Genetic Engineering	3	4	-	4	25	75	100	6
			6				25	75		
	DSC – X	Immunology	3	4	-	4	25	75	100	6
			6				25	75		
	DSE-III	Elective-III	3	5	1	-	25	75	100	6
	DSE – IV	Elective - IV (EDC)	3	5	1	-	25	75	100	6
	Any ONE Group									
	Group A									
	SEC – G - A 1	Placement - College to Corporate I	3	2	-	-	50	-	50	2
	SEC – G-A 2	Placement - College to Corporate II	3	2	-	-	50	-	50	2
	Group B									
	SEC – G - B	Industrial Biochemistry	3	4	-	-	100	-	100	4
	Total				**32**				**500**	**28**
VI	DSC – XI	Drug Biochemistry	3	4	-	4	25	75	100	6
			6				25	75		
	DSC – XII	Plant Biochemistry	3	4	-	4	25	75	100	6
			6				25	75		
	DSE- V	Elective-V	3	5	1	-	25	75	100	6
	DSE – VI	Elective- VI	3		-	6	25	75	100	6
		TOTAL			**28**				**400**	**24**
I - VI	ALCTA *(e-Learning in MOOC Platform)					Extra Credits				**4***
TOTAL									**2900**	**140 + 4***
										144

ABBREVIATIONS

MIL - Multi Indian/ International Languages

ELN - English

DSC - Discipline Specific Courses

DSE - Discipline Specific Elective Courses

EDC - Extra Disciplinary Course

NMS - Naan Muthalvan Scheme

AECC - Ability Enhancement Compulsory Courses

SEC - Skill Enhancement Courses (Group A&B)

NCC - Non-Credit Course

ALCTA – Advanced Learner Course in Thrust Area

DSE I -Discipline Specific Elective Courses I: (III Semester)

1. Allied Chemistry 2. Environmental Biochemistry

DSE II- Discipline Specific Elective Courses II: (IV Semester)

1. Biostatistics 2. Marine Biochemistry

DSE III-Discipline Specific Elective Courses III: (V Semester)

1. Clinical Data Analytics 2. Stem cells and cancerbiology

DSE IV- Discipline Specific Elective Courses IV (EDC): (V Semester)

1. Extra Disciplinary Course (EDC) - List Enclosed

DSE V- Discipline Specific Elective Courses IV: (VI Semester)

1. Recombinant DNA technology 2. Nutritional Biochemistry

DSE VI- Discipline Specific Elective Courses IV: (VI Semester)

1. Project report-VIVA VOCE 2. Industrial Training

DISCIPLINESPECIFICELECTIVECOURSES(DSE)IV:(V-SEMESTER)								
DSE–IV- EXTRADISCIPLINARY COURSE:(EDC)								
Course	**Course Name**	**L**	**T**	**P**	**CIA**	**ESE**	**Total**	**Credits**
One Course–From the Group								
B.A.English	ProfessionalCommunication	5	1	-	25	75	100	6
BBA	Entrepreneurship	5	1	-	25	75	100	6
BBA(CA)	ProjectManagement	5	1	-	25	75	100	6
B.COM	InsuranceandRiskManagement	5	1	-	25	75	100	6
B.COM(CA)	SocialMediaMarketing	5	1	-	25	75	100	6
B.COM(IT)	E-Commerce	5	1	-	25	75	100	6
B.COM(PA)	IndianTax System	5	1	-	25	75	100	6
B.COM(BA)	Digitalmarketing	5	1	-	25	75	100	6
BCA	Responsive Web Design	5	1	-	25	75	100	6
B.Sc.,(CS)	Business Analytics	5	1	-	25	75	100	6
B.Sc.,(IT)	BigDataEngineering	5	1	-	25	75	100	6
B.Sc.,CSHM	Hospitality Management	5	1	-	25	75	100	6
B.Sc.,ECS	Fundamentalsof Digital Computers	5	1	-	25	75	100	6
B.Sc.,MATHS	Computational Mathematics	5	1	-	25	75	100	6
B.Sc.,BC	HealthManagement	5	1	-	25	75	100	6
B.Sc.,BT	Forensic Science	5	1	-	25	75	100	6
B.Sc.,MB	Microbes–Health &Disease	5	1	-	25	75	100	6
B.Sc.,N&D	Health and Life Style Disorders	5	1	-	25	75	100	6
BBA Logistics	International Logistics	5	1	-	25	75	100	6
B.Sc Psychology	Stress and Conflict Management	5	1	-	25	75	100	6
Total							**100**	**6**

RVS COLLEGE OF ARTS AND SCIENCE (Autonomous)
Sulur, Coimbatore – 641 402

SCHEME OF EXAMINATIONS

B.Sc Biochemistry 2024 – 2027 BATCH

Semester	Course Opted	Course Name	D	L	T	P	CIA	ESE	Marks	Credits
I	MIL - I	Tamil-I/Hindi-I / Malayalam – I/ French-I	3	4	-	-	25	75	100	3
	ELN - I	English-I	3	4	-	-	25	75	100	3
	DSC – I	Biomolecules	3 3	4	-	4	25 25	75 75	100	6
	DSC – II	Cell Biology and Microbiology	3 3	4	-	4	25 25	75 75	100	6
	NMS - I	Soft Skills - I	3	2	-	-	Grade			
	NCC	NCC/NSS/ IKS/ SPORTS/CULTURALS	-	1	-	-	-	-	-	-
	LIB	Library	-	1	-	-	-	-	-	-
	Total				**28**				**400**	**18**

Course Title	: **BIOMOLECULES (T)**	Course Code	:13A
Semester	: **I**	Course Group	:**DSC-I**
Teaching Scheme in Hrs (L:T:P) : **4:0:0**		Credits	: **4 Credits**
Map Code	: **C(THEORY CONCEPTS)**	Total Contact Hours: 60	
CIA	: **25 Marks**	SEE	: **75Marks**
Programme: **BSC-BIOCHEMISTRY**			

Course outcome: (Cos)

No.	Course Outcome (Cos): After completion of this course, the students will be able to	PSOs	Cl. Ses	CL
CO1	Interpret structure, function of water and relate structure of Carbohydrates.	PSO 2	12	U
CO2	Describe and review structure and properties of types of lipids	PSO 2	12	U
CO3	Summarize the type of amino acids, and characteristic features of proteins	PSO 3	12	U
CO4	Illustrate the structure and functions of nucleic acids.	PSO1	12	AP
CO5	Compute the role of vitamins and minerals in physiological aliments.	PSO 4	12	AP

UNIT-1 **Lecture hours: 12**

Introduction - Structure of water

Physical properties of water - Hydrogen bonding of water, solvent properties of water, hydrophobic interactions.

Carbohydrates - Introduction (Definition & Classification), Types of Monosaccharides (Introduction & Classification, Cyclic structure & Anomeric forms Haworth projection formula), Disaccharides (Introduction & Classification, structure & functions of Sucrose, maltose & lactose), Polysaccharides (Introduction & Classification), Starch & Glycogen (Structure & Function), Structural polysaccharide (Structure & Function).

UNIT-2 **Lecture hours: 12**

Lipids – Introduction (Definition & Classification), Simple lipids (Fats, oils & waxes. Physical properties - Solubility, specific gravity, melting point, color & odor), Chemical properties of

Fats (Hydrolysis, Saponification Number, Iodine Number, RM value, Acid Number and Rancidity of fats), Compound lipids (Structure & functions of Phospholipids, Glycolipids and Lipoproteins), Derived lipids (Saturated, Unsaturated fatty acids) Sterols and Steroids (Cholesterol and itsstructure)

UNIT-3 **Lecture hours: 12**

Amino acid- Introduction (Definition & structure), Classification (Based on functional groups, amino acids as ampholytes), Aliphatic Amino acids (Structure and properties), Aromatic aminoacids(Structure and properties),Peptide bond (Structure & properties),Identification(N&C terminal residues)

Protein - Introduction (Classification & properties), Structure of proteins (Primary, secondary, tertiary & Quaternary structures), Denaturation & Renaturation of proteins (Physical & chemical agents, coagulation, refolding)

UNIT-4 **Lecture hours: 12**

Nucleic acids - Introduction (Definition & Types), Purines (Structure of Adenine, Guanine, Xanthine & Hypoxanthine), Pyrimidines (Structure of Thymine, Uracil & Cytosine),Nucleosides & nucleotides (Structure),DNA (DNA double helix - Watson & Crick model, Chargaff's rule),Types(A, B & Z forms),Denaturation & Renaturation (Effect of pH & temperature on DNA), RNA - Types (mRNA, rRNA, tRNA, -Structures and their biological roles)

UNIT-5 **Lecture hours: 12**

Vitamins Introduction - Definition &classification.

Fat soluble vitamins - Sources & physiological functions of vitamin A, D, E, K.

Water soluble vitamins - Sources & physiological functions of vitamin B complex and vitamin C

Vitamin deficiency - Deficiency symptoms of vitamins.

Minerals Introduction - Definition &classification. Mineral requirement.

Essential macro minerals - Sources & functions of calcium, chloride, magnesium, phosphorus, Potassium, sodium &sulphur.

Essential micro minerals - Sources & functions of boron, chromium, cobalt, copper, iodine, iron,manganese, molybdenum and zinc.

Text Books :

T1.Biochemistry|Edition:5W.H.Freeman company,NewYork LUBERT STRYER(2015)

T2. Essentials of Biochemistry | Edition:2 | Books and Allied (P) Ltd | U.CHAKRAPANI AND U.SATHYANARAYANA (2016)

T3. Fundamentals of Biochemistry | Edition:II | S.Chand& Company | JAIN.J.L(2015)

Reference Books :

R1. Fundamentals of Biochemistry | Edition:1 | John Wiley & Sons Inc USA | DONALD VOET AND JUDITH G. VOET(2014)

R2. Lehninger Principles of Biochemistry | Edition:3 | Mac millan Worth Publishers USA | DAVID.L NELSON ANDMICHAEL.M.COX(20

Course Title : **BIOMOLECULES (P)**	Course Code : 13P
Semester : **I**	Course Group : **DSC-I**
Teaching Scheme in Hrs (L:T:P) :**0:0:4**	Credits : **4**
Map Code : **H(PRACTICAL EXPERIMENTS)**	Total Contact Hours: **60**
CIA : **25 Marks**	SEE : **75Marks**
Programme: **BSC-BIOCHEMISTRY**	

List of Experiments:

1. Qualitative Analysis of Monosaccharides- Glucose andFructose
2. Qualitative Analysis of Disaccharides - Sucrose andMaltose
3. Qualitative Analysis of Polysaccharides - Starch andDextrin
4. Determination of Acid number of edibleoil.
5. Determination of saponification number of edibleoil
6. Estimation of unsaturated fat by iodine value ofoil.
7. Qualitative Analysis of Non-polar, Aliphatic Aminoacids- Methionine,Leucine
8. Qualitative Analysis of Aromatic Aminoacids- Tyrosine,Tryptophan
9. Qualitative Analysis of Polar, Uncharged Aminoacid-Serine
10. Qualitative Analysis of Charged Aminoacid- Histidine
11. Identification of protein by Biuretmethod
12. Denaturation of protein usingEgg
13. Isolation of protein from different organicsources
14. Quantify the amount of casein present in milksamples
15. Isolation & Purification of DNA

Text Books :

T1.Biochemical methods |Edition:3 Publisher : New age International (P)

S.Sadasivam,A.Manickam (2007)

T2. Practical Biochemistry | Edition:2 | Books and Allied (P) Ltd | David Plummer (2016)

Reference Books

R1. Practical Biochemistry | Edition:1 | Poonam Agarwal (2017)

Course Title	: **CELL BIOLOGY AND MICROBIOLOGY (T)**	Course Code:13B
Semester	: **I**	Course Group:**DSC-II**
Teaching Scheme in Hrs (L:T:P) : **4:0:0**		Credits: **4Credits**
Map Code	: **C(THEORY CONCEPTS)**	Total Contact Hours: 60
CIA	: **25 Marks**	SEE: **75Marks**
Programme: **BSC-BIOCHEMISTRY**		

S.No.	**Course Outcome (Cos): After completion of this course, the students will be able to**	**PSOs**	**Cl. Ses**	**CL**
CO1	Identify and Define the model of a cell and its Functions	PSO2	12	R
CO2	Describe and report the cell fractionation.	PSO3	12	U
CO3	Summarize and interpret the clinical significance of microorganism.	PSO4	12	U
CO4	Discuss and restate in own words the laboratory diagnosis of viruses.	PSO4	12	U
CO5	Sequence the unique mechanism of microbes.	PSO1	12	AP

UNIT - 1 **LECTURE HOURS: 12**

Cell biology : Cell membrane - (Introduction, Structure and functions- Fluid mosaic model, Unit membrane model),Membrane transport- (Active and Passive transport-Endocytosis and Exocytosis-Pinocytosis and Phagocytosis),Cell structure - (cytoplasm -structure – composition),Cellular organelles - (Nucleus-Mitochondria-Golgi bodies-Lysosomes-Endoplasmic reticulum-Peroxisomes-Plastids- Vacuoles-Ribosomes),Cytoskeleton - (structure and function)

UNIT - 2 **LECTURE HOURS: 12**

Cell division and cell growth : Cell division - (Mitosis and Meiosis ,reductive division), Cell cycle- (Phases of cell cycle -cell cycle regulation,cell cycle check points).

Microscopic-Principles of Light microscopy; Phase contrast microscopy; Confocal microscopy; Electron microscopy (EM)- scanning EM and scanning transmission, Fluorescence microscopy

UNIT - 3 **LECTURE HOURS: 12**

Bacteriology -gram positive bacteria

Staphylococcus aureus, Streptococcus pyogenes, Corynebacterium diphtheria, Clostridium tetani, Bacillus anthracis, Mycobacterium tuberculosis (Morphology, cultural characteristics, antigenicity, pathogenesis, clinical symptoms, laboratory diagnosis, prevention and treatment).

Bacteriology - gram negative bacteria

Escherichia coli, Klebsiella pneumonia, Salmonella typhi, Shigella species, Vibrio cholerae, Pseudomonas species (Morphology, cultural characteristics, antigenicity, pathogenesis, clinical symptoms, laboratory diagnosis, prevention and treatment).

UNIT - 4 **LECTURE HOURS: 12**

Virology

Hepatitis virus, Rabies virus, Influenza virus, Mumps, Polio virus, Measles virus (Morphology, pathogenesis, clinical symptoms, laboratory diagnosis, prevention and treatment).

Plant viruses

Tobacco mosaic virus, Bunchy top of banana, Satellite viruses, Viroid, Double stranded DNA viruses, Assay methods (Morphology, pathogenesis, symptoms, transmission and lab diagnosis).

Animal viruses

Prions, Rinder pest, Blue tongue, Raniket Dion, Foot and mouth disease Oncogenic virus-Papilloma virus (Morphology, pathogenesis, symptoms, transmission and lab diagnosis). Antiviral agents - Action and mechanism of antiviral drug)

UNIT - 5 **LECTURE HOURS: 12**

Fungi General characteristics of fungi - Distribution, importance, structure, nutrition and metabolism. Characteristics of fungal division- Zygomycota – charecteristics structure properties and application. Ascomycota - structure properties and application. Basidiomycota - charecteristics structure properties and application. Slime molds and water molds - Reproduction and life cycle. Yeast life cycle - Phases in the cycle.

Protozoa

General characters of protozoa, classification and representative types - Sarcomastigophora, Apicomplexa, Microspora, Ciliospora. Algae- General characteristics of algal division - Chlorophyta, Euglenophyta, Chrysophyta, Phaeophyta, Rhodophyta, Pyrrophyta.communications)

Text Books :

T1: Cell and Molecular Biology | Edition:8 | Lippincott Williams and Wilkins, Philadelphia | De Robertis, E.D.P. AND T2: De Robertis, E.M.F. (2010) The Cell: A Molecular Approach | Edition:5 | Sunderland, Mass. Sinauer Associates, Inc. | Cooper, G.M AND Hausman, R.E(2009)

T2: Karp's Cell and Molecular Biology: Concepts and Experiments anet Iwasa, Wallace marshall. Publication: John Wiley & Sons Inc; Edition: 8 edition (29 December 2015)

T3: The Cell: A Molecular Approach –Geoffrey M. Cooper, Robert E. Hausman Publication: Sinauer Associates Inc; Edition: 6 edition (1 February 2013)

T4: De Robertis, E.D.P. and De Robertis, E.M.F. (2006). Cell and Molecular Biology.VIII Edition. Lippincott Williams and Wilkins, Philadelphia.

T5: Cooper, G.M. and Hausman, R.E. (2009). The Cell: A Molecular Approach. V Edition. ASM Press & Sunderland, Washington, D.C.; Sinauer Associates, MA

T6: Becker, W.M., Kleinsmith, L.J., Hardin. J. and Bertoni, G. P. (2009). The World of the Cell. VII Edition. Pearson Benjamin Cummings Publishing, San Fr

ReferenceBooks :

R1: Cell and Molecular Biology: Concepts and Experiments | Edition:6 | John | Karp, G(2010)

R2: Essential Cell Biology | Edition:4 | Garland Science | Bruce Alberts AND Dennis Bray (2013

Course Title	**: Cell Biology and Microbiology (P)**	**Course Code : 13Q**	
Semester	**: I**	**Course Group**	**: DSC-II**
Teaching Scheme in Hrs (L:T:P) : 0:0:4		**Credits**	**4**
Map Code	**: H (PRACTICAL - EXPERIMENTS)**	**Total Contact Hours : 60**	
CIA	**: 25 Marks**	**SEE**	**: 75 Marks**
Programme: BSC-BIOCHEMISTRY			

List of Experiments

1. Microscopic view of prokaryotic cells using staining techniques. - Simple staining
2. Microscopic view of prokaryotic cells using staining techniques - Gram staining
3. Mitotic cell division by using - onion root tip
4. Separation of nucleic acid bases - By paper chromatography.
5. Preparation of cell culture media
6. Cellular Organelles separation by using centrifugation technique.
7. Isolation and enumeration of Bacteria from soil
8. Isolation and enumeration of Fungi from bread
9. Isolation and identification of photosynthetic algae Spirulina

Text Books :

T1.Cell Biology practical manual |Edition:1 Publisher : New age International (P) Renu Gupta, Seema Makhija (2018)

T2. Varley's Practical Clinical Biochemistry | Edition:6 | Books and Allied (P) Ltd | Alan H Gowenlock (2006)

Reference Books

R1. Microbiology – a Laboratory Manual, Edition : 12, 2020 Benjamin- Cummings Publishing Company, James G. Cappuccino (1999)

Course Title	: TRADITIONAL HERBAL MEDICINE	Course Group: NCC G1
Semester	: I	

No.	Course Outcome (Cos): After completion of this course, the students will be able to	POs & PSOs	Cl. Ses	CL
CO1	Understand raw material as source of herbal drugs from cultivation to herbal drug product	PSO 1	8	U
CO2	Discuss WHO and ICH guidelines for evaluation of herbal drugs	PSO 2	8	Ap
CO3	Summarize the herbal cosmetics, natural sweeteners, nutraceutical	PSO 2	8	Ap
CO4	Distinguish the appreciate patenting of herbal drugs, GMP .	PSO 3	8	Ap
CO5	Illustrate the present scope and future prospects of Herbal Drug Industry	PSO3	8	Ap

UNIT-I

INTRODUCTION OF HERBS:

Herbs as raw materials: Definition of herb, herbal medicine, herbal medicinal product, herbal drug preparation Source of Herbs

Steps for Herbal drug preparation : Selection, identification and authentication of herbal materials Processing of herbal raw material

Biodynamic Agriculture

Good agricultural practices in cultivation of medicinal plants including Organic farming. Pest and Pest management in medicinal plants: Biopesticides/Bioinsecticides.

Indian Systems of Medicine

a) Basic principles involved in Ayurveda, Siddha, Unani and Homeopathy

b) Preparation and standardization of Ayurvedic formulations viz Aristas and Asawas,Ghutika,Churna, Lehya and Bhasma.

UNIT-II

NUTRACEUTICALS:

General aspects, Market, growth, scope and types of products available in the market. Health benefits and role of Nutraceuticals in ailments like Diabetes, CVS diseases, Cancer, Irritable bowel syndrome and various Gastro intestinal diseases.

Study of following herbs as health food: Alfaalfa, Chicory, Ginger, Fenugreek, Garlic, Honey, Amla, Ginseng, Ashwagandha, Spirulina

Herbal-Drug and Herb-Food Interactions: General introduction to interaction and classification. Study of following drugs and their possible side effects and interactions: Hypercium, kava-kava, Ginkobiloba, Ginseng, Garlic, Pepper & Ephedra.

UNIT-III

HERBAL COSMETICS:

Sources and description of raw materials of herbal origin used via, fixed oils, waxes, gums colours, perfumes, protective agents, bleaching agents, antioxidants in products such as skin care, hair care and oral hygiene products.

Herbal Excipients – Significance of substances of natural origin as excipients – colorants, sweeteners, binders, diluents, viscosity builders, disintegrants, flavors & perfumes.

Herbal formulations :Conventional herbal formulations like syrups, mixtures and tablets and Novel dosage formslike phytosomes

UNIT- IV

EVALUATION OF DRUGS :

WHO & ICH guidelines for the assessment of herbal drugsStability testing of herbal drugs.

Patenting and Regulatory requirements of natural products:

a) Definition of the terms: Patent, IPR, Farmers right, Breeder's right, Bioprospecting andBiopiracy

b) Patenting aspects of Traditional Knowledge and Natural Products. Case study of Curcuma& Neem.

Regulatory Issues - Regulations in India (ASU DTAB, ASU DCC), Regulation of manufacture of ASU drugs - Schedule Z of Drugs & Cosmetics Act for ASU drugs.

UNIT-V

GENERAL INTRODUCTION TO HERBAL INDUSTRY:

Herbal drugs industry: Present scope and future prospects.

A brief account of plant based industries and institutions involved in work on medicinal andaromatic plants in India.

Schedule T – Good Manufacturing Practice of Indian systems of medicine Components of GMP (Schedule – T) and its objectives

Infrastructural requirements, working space, storage area, machinery and equipments, standard operating procedures, health and hygiene, documentation and records.

Book References :

TEXT BOOK :

T1- Essential of Pharmacognosy by Dr.S.H.Ansari. Edition 3 .2019

T2 - Pharmacognosy & Phytochemistry by V.D.Rangari Edition 3 (2020)

REFERENCE BOOK:

R1- Pharmacopoeal standards for Ayurvedic Formulation (Council of Research in Indian Medicine & Homeopathy, edition 5 (2018)

R2- Mukherjee, P.W. Quality Control of Herbal Drugs: An Approach to Evaluation of Botanicals. Business Horizons Publishers, New Delhi, India, 2021

Course Title : **BIO INSTRUMENTATION TECHNIQUES (T)**	Course Code : **23A**
Semester : **II**	Course Group : **DSC-IV**
Teaching Scheme in Hrs (L:T:P) : **4:0:0**	Credits :**4**
Map Code : **C(THEORY CONCEPTS)**	Total Contact Hours :**60**
CIA : **25 Marks**	SEE : **75 Marks**
Programme : **BSC-BC**	

No.	Course Outcome	PSOs	CL. Ses	CL
CO1	Understand the concept of pH, buffer systems, and electrodes, and comprehend the process and uses of centrifugation.	PSO 1	12	U
CO2	Demonstrate the principles, tools and types of chromatographic techniques.	PSO 2	12	AP
CO3	Determining the principles of electrophoresis and realize its applications.	PSO 2	12	AP
CO4	Describing the application of calorimetry, including its principles, tools, and techniques.	PSO 2	12	U
CO5	Understand the theoretical principles of radioactivity and appreciate the uses of radioisotopes.	PSO 1	12	U

UNIT – I (LECTURE HOURS: 12)

pH AND CENTRIFUGATION

pH – Introduction- (Definition), Determination of pH- (using indicators and pH meter), Henderson's Hasselbach equation- (Relationship between pKa & pH) Buffer- (Acids & Bases), Buffer system- (Bicarbonate Buffer system, Hb Buffer system), Types of Electrode- (calomel electrode, silver-silver chloride electrode and standard hydrogen electrode),
CENTRIFUGATION- (Introduction, types of centrifugation and Rotor types), Ultra centrifugation- (Working, applications and its types.)

UNIT – II (LECTURE HOURS: 12)

CHROMATOGRAPHY TECHNIQUES:

Chromatography - (Introduction & Definition), Paper Chromatography- (Principle, Types – ascending descending & circular, Technique & applications), Thin Layer chromatography- (Principle, Technique & applications),Gas Liquid chromatography- (Principle, Technique & applications),Ion exchange chromatography- (Principle, Technique & applications),HPLC- (Principle, Technique & applications), Affinity Chromatography- (Principle, Technique & applications), Molecular sieve Chromatography-(Principle, Technique & applications)

UNIT – III (LECTURE HOURS: 12)

ELECTROPHORESIS:

Electrophoresis – (Introduction, types and Factors affecting electrophoretic mobility), Agarose Gel Electrophoresis- (Principle, technique and applications), SDS – PAGE- (Principle, technique and applications), Isoelectric focusing- (Principle, technique and applications), ELISA (Principal & application)

UNIT – IV (LECTURE HOURS: 12)

COLORIMETRY:

Colorimetry- (Introduction, colour and absorption), Beer - Lambert's law- (Principle & Laws), Working of a single cell photoelectric colorimeter - (Principal instrumentation & applications), UV-Spectrophotometry- (Principle, Instrumentation and applications), Atomic absorption spectroscopy- (Principle, Instrumentation and applications), Flourimetry- (Principle, Instrumentation and applications)

UNIT – V (LECTURE HOURS: 12)

ISOTOPES AND RADIOACTIVITY:

Radioactivity- **(**Introduction, radioisotopes), Radioactive decay- (Types and rate of Radioactive decay), units of radio activity- (Curie, Bequerel, specific activity), Detection and measurement of radio activity based on ionization- (GM counter, Scintillation counting, Autoradiography), Applications of radioisotopes, Biological and Medical sciences

Text Books:

T1: A biologists guide to principles and techniques of practical biochemistry | Edition:5 | Wilson and Walker (2000)

T2: Modern Experimental Biochemistry | Edition:4 | Longman | Boyer and Rodney (2009)

T3: Biophysical Chemistry Principles and Techniques | Edition:4| Upadhyay and Nath (1997)

Reference Books:

R1: Analytical Biochemistry | Edition:4 | Longman | David James Holme (1997)

R2: Techniques for the Study of Biological Structure and Function | Cantor, Charles R (2000)

Course Title : **BIO INSTRUMENTATION TECHNIQUES (P)**	Course Code : **23P**
Semester : **II**	Course Group : **DSC-IV**
Teaching Scheme in Hrs (L:T:P) : **0:0:4**	Credits :**2**
Map Code : **CH (PRACTICAL- EXPERIMENTS)**	Total Contact Hours :**60**
CIA : **40 Marks**	SEE : **60 Marks**
Programme : **BSC-BC**	

LIST OF EXPERIMENTS

1. Determination of pH by using pH meter.
2. Preparation of Buffers- Bicarbonate, Phosphate, Acetate and Citrate.
3. Separation of carbohydrates by Paper Chromatography – Circular, Ascending, Descending.
4. Separation of amino acids from biological samples using Thin Layer Chromatography.
5. Separation of biological compounds using centrifugation technique.
6. SDS-gel Electrophoresis – Demonstration
7. Separation of DNA by using Agarose gel electrophoresis – Demonstration
8. Quantitative estimation of biomolecules by calorimetric technique.
9. Quantitative estimation of biomolecules by spectroscopy technique.
10. Industrial visit to learn techniques in radioactivity
11. Visualization of DNA fragments by UV- transilluminator.
12. FT-IR instrumentation and demonstration.

References:

1. Dr. J. Jayaraman, Laboratory Manual in Biochemistry New Age International Publishers.
2. David Plummer, An Introduction to Practical Biochemistry –Tata McGraw Hill Education, 3rd edition.

Course Title :**HUMAN PHYSIOLOGY AND ENDOCRINOLOGY**	Course Code : **23A**
Semester :**II**	Course Group : **DSC - III**
Teaching Scheme in Hrs (L:T) : **4:0:4**	Credits **4**
Map Code: **C(THEORY)**	Total Contact Hours: **60**
CIA: **25 Marks**	SEE # : **75 Marks**
Programme: **BSC-BC# - Semester End Exam**	

No	**Course Outcome (Cos): After completion of this course, the students will be able to**	**PSOs**	**Cl.Ses**	**CL**
CO1	Discuss the anatomy and functions of digestive system	PS01	12	U
CO2	Demonstrate the composition, function, and mechanism of body fluids	PS01	12	AP
CO3	Distinguish the mechanism of Circulatory and Respiratory system .	PS02	12	AN
CO4	Categorize the general organization and function of Nervous system	PS02	12	AP
CO5	Illustrate the structure and function of the kidney and the mechanism of action of hormones	PS03	12	AP

UNIT-1 **LECTURE HOUR 12**

DIGESTIVE SYSTEM

Anatomy of the digestive system - structural features of intestinal organs, parts of the digestive systemsalivary, gastric and biliary secretions - composition, properties, mechanism and functions.. Digestion , secretion, and absorption in the small intestine - Digestion and absorption of carbohydrates, lipids and proteins.

UNIT-2 **LECTURE HOUR 12**

BODY FLUIDS

Extracellular fluid-blood and plasma - Definition ,composition and function Blood cells - wbc, rbc and platelets - introduction and functions
Blood groups and blood coagulation - abo & rh factor - mechanism of blood coagulation

UNIT-3 **LECTURE HOUR 12**

CIRCULATORY & RESPIRATORY SYSTEM

Circulation – Function of heart and blood vessels, Respiration– Internal & External respiration Exchange of gases - exchange of gases between lung and blood and between blood andtissues transport of respiratory gases O2 and CO2

UNIT-4 **LECTURE HOUR 12**

NERVOUS SYSTEM & EXCRETORY SYSTEM

Central nervous system - general organization, Brain –structure and function.
Functional units- Neuron - structure and its function, Resting and action potential - conduction of nerve impulses, synaptic transmission, Brain –structure and function

UNIT-5 **LECTURE HOUR 12**

ENDOCRINAL SYSTEM

Definition and scope of Endocrinology - Anatomical aspects of mammalian endocrine system. Definition of a hormone- chemical nature of mammalian hormones- types of hormone receptors- secondary messenger system- general mechanism of peptide and non- peptide hormones action. Chemical structure and classes of chemical messenger Anterior and Posterior lobe of pituitary hormones. Hormone secretion and Transport. Mechanism of action of hormone

Text Books :

T1 Medical Physiology | Edition:5 | JP | Dr.SembulingamL AND SembulingamPrema(2012) T2 Medical Physiology | Edition:11 | Arun printers| ChatterjeeCC(2013)

Reference Books :

R1 Endocrinology | Edition:1 | MJP | Prakash S. Lohar(2015)
R2 Molecular cell biology | Edition:6 |W.H.freeman | LodishHarvey(2017)

Course Title : **Human Physiology and Endocrinology**	Course Code : 23P
Semester : **II**	Course Group : **DSC - XI**
Teaching Scheme in Hrs (L:T:P) : **0:0:4**	Credits 2
Map Code: C(THEORY)	Total Contact Hours: 60
CIA: **25 Marks**	SEE # : **75 Marks**
Programme: **BSC-BC# - Semester End Exam**	

LIST OF EXPERIMENTS:

1. Estimation of glucose by OT method
2. Estimation of protein by LOWRY'S method
3. Estimation of urea by DAM –TSC method
4. Collection of blood- separation of serum and plasma
5. Determination of bleeding time
6. Determination of clotting time
7. Preparation of Bicarbonate buffer
8. Estimation of Hb by shali's method
9. Analysis of normal and abnormal constituents in urine sample.
10. Determination of blood groups