GAYATRI VIDYA PARISHAD COLLEGE FOR DEGREE AND PG COURSES(A)

DEPARTMENT OF BIOCHEMISTRY

I B.Sc. Honours – BIOCHEMSITRY MAJOR

W.E.F. AY 2023-24

COURSE STRUCTURE (SEMESTER-I)

Course	Total Marks	Mid. Sem.	Sem. End		Teaching Hours Per Week	Credits
LANGUAGES, MULTI DISCIPLINARY AND SKILL ENHANCEMENT COURSES (COMMON FOR ALL)						
1. First Language: Telugu/ Hindi/ Sanskrit	100	40	60		4	3
2. Second Language: English	100	40	60		4	3
3. Multi Disny-1: Indian History	50	---	50		2	2
4. Skill Enhancement Course -1 Communication Skills	50	--	50		2	2
5. Skill Enhancement Course -2 Analytical Skills	50	-	50		2	2
TOTAL	350	80	270		14	12
PART II - CORE SUBJECTS MAJOR and MINOR						
B.Sc.						
1. MAJOR-1 Course-1 (i)CLASSICAL BIOLOGY.	100	40 (Mid + Activities) (20+20)	60		3	3
Lab / Practical/ Activities	-	-	-		2	1
2. MAJOR-2 Course-2 (i) APPLIED BIOLOGY	100	40 (Mid + Activities) (20+20)	60		3	3
Lab / Practical/ Activities	-	-	-		2	1
TOTAL	200	80	120		10	8
GRAND TOTAL	550	160	390		24	20

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COURSE STRUCTURE (SEMESTER-II)

Course	Total Marks	Mid. Sem.	Sem. End	Teaching Hours Per Week	Credits
LANGUAGES, MULTI DISCIPLINARY AND SKILL ENHANCEMENT COURSES (COMMON FOR ALL)					
1. First Language: Telugu/ Hindi/ Sanskrit	100	40	60	4	3
2. Second Language: English	100	40	60	4	3
3. Skill Enhancement Plan Nursery	50	--	50	2	2
4. Skill Enhancement Business Writing	50	-	50	2	2
TOTAL	300	80	220	12	10
PART II - CORE SUBJECTS MAJOR and MINOR					
B.Sc.					
5. MAJOR- Course-3 Biomolecules	100	40	60	3	3
Lab / Practical:	50	25	25	2	1
6. MAJOR Course-4 Cell biology	100	40	60	3	3
Lab/Practical::	50	25	25	2	1
7. MINOR Course-1 Biomolecules	100	40	60	3	3
Lab/Practical::	50	25	25	2	1
TOTAL	450	195	255	15	12
GRAND TOTAL	750	180	470	29	24

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DEPARTMENT OF BIOCHEMISTRY

B.Sc. – Honours in BIOCHEMISTRY - MAJOR

(w.e.f. 2023-24 AY onwards)

Semester -II

Course: 3 -Biomolecules

(Admitted Batch 2023-2024

Credits- 3 **45 hrs (3periods/week)**

Course objectives

1. To understand chemical foundation of biological systems
2. To identify and classify the carbohydrates, proteins, lipids and Nucleic acids.
3. To know the structure and functions of the carbohydrates, proteins, lipids and Nucleic acids.

CO 1: Unit - I: Biophysical Concepts **6 hrs**

Fundamentals of Biochemistry: History, scope and avenues of Biochemistry. Water as a biological solvent. Measurement of PH, Buffers, Biological relevance of Buffers. Outlines of surface tension, adsorption and osmosis and their biological relevance.

CO2: Unit - II: Carbohydrates **10 hrs**

Carbohydrates: Classification, monosaccharides, D and L designation, open chain and cyclic structures, epimers and anomers, mutarotation, reactions of carbohydrates (due to functional groups - hydroxyl , aldehyde and ketone. Amino sugars, Glycosides. Structure and biological importance of disaccharides (sucrose, lactose, maltose, isomaltose, trehalose), trisaccharides (raffinose, melezitose), structural polysaccharides (cellulose, chitin, pectin) and storage polysaccharides (starch, inulin, glycogen). Glycosaminoglycans.

CO3: Unit – III: Lipids **8 hrs**

Lipids: Classification, saturated and unsaturated fatty acids, structure and properties of fats and oils (acid, saponification and iodine values, rancidity). General properties and structures of phospholipids. Prostaglandins- structure, types and biological role. Lipoproteins- types and functions,

CO4: Unit-IV: Amino Acids and Proteins **12 hrs**

Amino Acids: Classification, structure, stereochemistry, chemical reactions of amino acids due to carbonyl and amino groups. Titration curve of glycine and pK values. Essential and nonessential amino acids, non-protein amino acids. Peptide bond - nature and conformation. Naturally occurring peptides - glutathione, enkephalin.

Proteins: Classification based on solubility, shape and function. Determination of amino acid composition of proteins. General properties of proteins, denaturation and renaturation of proteins. Structural organization of proteins- primary, secondary, tertiary and quaternary structures (Eg. Hemoglobin and Myoglobin).

CO5: Unit-V: Nucleic acids and porphyrins **9 hrs**

Types of RNA and DNA. Structure of purines and pyrimidines, nucleosides, nucleotides. Stability and formation of phosphodiester linkages. Effect of acids, alkali and nucleases on DNA and RNA. Structure of Nucleic acids- Watson-Crick DNA double helix structure, denaturation and renaturation kinetics of nucleic acids-, *T*m-values and their significance, cot curves and their significance. Structure of porphyrins: Identification of Porphyrins, Protoporphyrin, porphobilinogen properties, Structure of metalloporphyrins–Heme, cytochromes and chlorophylls.

COURSE OUTCOMES: CO1: Students gain the knowledge about chemical foundation of life
CO2: Students able to identify different types of carbohydrates found in nature, able to discriminate between them and understand their significance in biological systems
CO3: Students gain the knowledge of types and structures of lipids which enables them to understand the importance of lipids in maintenance of health
CO4: Students describe structure, physical and chemical properties of aminoacids and get the knowledge of the diversified nature and function of proteins
CO5: Students can apply mathematical knowledge and understand the structure and functions of DNA and also able to identify various types of porphyrins present in the nature

SUGGESTED BOOKS:

1. Fundamentals of Biochemistry –Jain, J.L., Jain, S., Jain, N. S. Chand & Co.
2. Biochemistry – Satyanarayana. U and Chakrapani. U, Books & Allied Pvt. Ltd.
3. Biochemistry – Rama Rao. A and Ratna Kumari. D, Kalyani Publishers.

Reference books:

1. Textbook of Biochemistry -West E.S., Todd. W.R, Mason .H.S and. Bruggen, J.T.V.- Oxford & IBH Publishers. 4th Edition.

2. Nelson.D.L. and Cox.M..M- Lehninger's Principles of Biochemistry- Freeman & Co.7th Edition

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DEPARTMENT OF BIOCHEMISTRY

B.Sc. – Honours in BIOCHEMISTRY - MAJOR

(w.e.f. 2023-24 AY onwards)

Semester -II

Course: 3 -Biomolecules- Practical syllabus

(Admitted Batch 2023-2024

CREDITS: 2 **MAX: 50M**

1.Preparation of buffers (acidic, neutral and alkaline) and determination of pH.

2.Qualitative identification of carbohydrates- glucose, fructose, ribose/xylose, maltose, sucrose, lactose, starch/glycogen.

3.Qualitative identification of amino acids-histidine, tyrosine, tryptophan, cysteine, arginine.

4.Qualitative identification of lipids- solubility, saponification, acrolein test, Salkowski test, Lieberman-Burchard test.

5.Preparation of Osazones and their identification

6. Estimation of proteins in biological samples by using – Biuret method, Lowry Method and Bradfoed method

7.Estimation of amino Acids in Biological samples by using Ninhydrin method.

COURSE OUTCOMES:	
CO1 : 1 & 2	students able to prepare buffers and apply the knowedge to calculate the pH values of charged biomolecules.
CO2 : 3,4 & 5:	Students identify various carbohydrates, aminoacids and lipids present in the nature by performing qualitative analysis
CO 6 &7 :	students will able

Recommended books:

1. Experimental Biochemistry: *A Student companion*- Sashidhar Rao, B and Deshpande, V. IK International (P) Ltd. Pub.

2. Modern Experimental Biochemistry- Boyer. R. Pearson Education

3. Biochemical Methods –Sadasivam, S and Manickyam, A.- New Age International publishers

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DEPARTMENT OF BIOCHEMISTRY

B.Sc. – Honours in BIOCHEMISTRY - MAJOR

(w.e.f. 2023-24 AY onwards)

Semester -II

Course: 4 - CELL BIOLOGY

(Admitted Batch 2023-2024

Credits: 3 45 hrs(3 hrs/week)

COURSE OBJECTIVES

1. To study the cell organelles in prokaryotic and eukaryotic cells.
2. Detailed information on Cell division, Cell cycle regulation with cdk and cyclins,MPK, MPF.
3. To know the cell communication, molecules, proteins in cell adhesion and desmosomes, hemidesmosomes, gap junctions, extracellular matrix, integrins.
4. Knowledge on ER mediated Protein Sorting and Targeting
5. Knowledge on Composition of plasma membrane and various transport mechanisms.

(CO1) UNIT-I 8 hrs

Prokaryotic and Eukaryotic cells: Cell organelles Structure, Composition and functions of nucleus, mitochondria,CV CFD plastids, endoplasmic reticulum, Golgi, lysosomes, vacuole, micro bodies, ribosomes, cytoskeleton.

(CO2)UNIT-II 10hrs

Cell division: mitosis**,** meiosis**,** cell cycle and its regulation, different phases of cell cycle. Apoptosis, Regulation of cell cycle, Cyclins, MPF, Cyclin dependent kinases, Growth factors, Nuclear Laminins, inhibition of cell cycle progression, MPF and progression to Metaphase, Proteolysis and MPF, Regulation of MPF activity. Check points in cell cycle regulation.

(CO3) UNIT-III 10 hrs

Cell communication: general principles of cell communication, cell adhesion and roles of different adhesion molecules, cell junction/gap junctions, extracellular matrix, integrins. Signal transduction: Cell surface receptor, G-protein coupled receptors, signal transduction pathways, second messengers, regulation of signaling pathways, bacterial and plant two component systems, bacterial chemotaxis, and quorum sensing.

(CO4 UNIT-IV **8 hrs**

Protein Sorting and Targeting: Overall pathway of synthesis of nuclear coded, secretory, lysosomal and membrane proteins. Import across ER – Signal hypothesis, post translational modifications of secretory/membrane proteins in ER, sorting of lysosomal proteins,

Mannose- 6 - Phosphate receptors, synthesis, trafficking, and localization of mitochondrial proteins. Protein traffic into and out of nucleus.

(CO5) UNIT-V **9hrs**

Bio membranes: Chemical composition of Membranes, Composition of plasma and organelle membranes of animal and plant cells. Lipids, proteins, and Carbohydrates of membranes Distribution of membrane lipids. Assembly of membrane components. Molecular structure of membranes: Miscelle, and liposomes, biological membrane; Symmetry of the membrane; Membrane fluidity; fluid mosaic model of biological membranes. Nanomaterials and their applications.

Membrane Transport: Donnan membrane equilibrium, Diffusion across cellular membranes Mediated transport; Energetics of transport systems; Passive transport anion exchange proteins; Active transport; Active transport of Na+ K+ (Sodium potassium ATPase) Ca2+ (Ca2+-ATPase). Active transport of sugars coupled to Phosphorylation; group translocation (Y-Glutamyl cycle). Proton motive force in bacterial transport processes. Ionophores Gap junctions; Endocytosis, Exocytosis. Nature of receptors

COURSE OUTCOMES: CO1: Students gain the knowledge about Different cell organelles structure and function.
CO2: Students will understand the cell division and its regulation.
CO3: Students gain the knowledge of cell communication mechanism and various methods of cell communication.
CO4: Students will understand protein targeting mechanisms they will appreciate signalling pathways of protein sorting.
CO5: Students will understand the composition of bio membranes and understand transport mechanisms across the cell membrane.

Recommended books:

1. Cell Biology, Genetics, Molecular Biology, Evolution and Ecology- P.S. Varma and VK Agarwal- S.chand Publications.

2. Cell Biology – S. C. Rastogi – Rastogi Publications.

Reference Books:

1. Molecular Cell Biology- Harvey Lodish -by W.H. Freeman and Company"

2. Cell and Molecular Biology- D-Roberties

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B.Sc. – Honours in BIOCHEMISTRY - MAJOR

(w.e.f. 2023-24 AY onwards)

Semester -II

Course: 4 - CELL BIOLOGY PRACTICAL SYLLABUS

(Admitted Batch 2023-2024

Credits-2

1. Estimation of Chlorophyl
2. Isolation of chloroplast
3. Isolation of mitochondria from the liver
4. Mitosis experiment
5. Meiosis experiment
6. Nuclei staining by DAPI / PI
7. Apoptosis- DNA Ladder Pattern, Annexin V staining
8. Flow cytometric analysis

Course Outcomes:

1. Students will be to Isolate the cells and count them

2: Analyse the viability and examine the division mechanisms of cells

3: Resolve the biological materials by electrophoresis

4: Do cell culture works

Recommended Books

1. Goldman, Emanuel, and Lorrence H. Green, eds. Practical handbook of microbiology. CRC Press, 2015.

2. Dubey, R. C., and D. K. Maheshwari. Practical microbiology. S. Chand, 2002.

3. Microbiology: A laboratory manual by Cappuccino and Sherman, Pearson Education, 6th Ed.