



**BHAVAN'S VIVEKANANDA COLLEGE**  
OF SCIENCE, HUMANITIES & COMMERCE  
Sainikpuri, Secunderabad – 500094  
Reaccredited with 'A' grade by NAAC  
Autonomous College - Affiliated to Osmania University

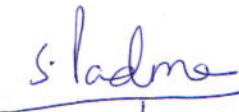
**Department of Biochemistry & Nutrition**  
Template for B. Sc BIOCHEMISTRY under CBCS  
PROGRAM NAME: BCNDC (BIOCHEMISTRY, NUTRITION & DIETETICS, CHEMISTRY)  
Academic year 2025-26

FIRST YEAR – SEMESTER-I				
Course Code	Course title	Course Type	HPW	CREDITS
	Environmental Science/Computer Skills	AECC-1	2	2
	English	CC-1A	4	4
	Second Language	CC-2A	4	4
BC134/ BC134 P	Chemistry of Biomolecules	DSC-1A	4T+2P=6	4+1=5
	Optional 2	DSC-2A	4T+2P=6	4+1=5
	Optional 3	DSC-3A	4T+2P=6	4+1=5
	<b>TOTAL</b>		<b>28</b>	<b>25</b>
SEMESTER-II				
	Environmental Science/Computer Skills	AECC-2	2	2
	English	CC-1B	4	4
	Second Language	CC-2B	4	4
BC234/ BC234 P	Chemistry of Proteins, Nucleic acids and Bioenergetics	DSC-1B	4T+2P=6	4+1=5
	Optional 2	DSC-2B	4T+2P=6	4+1=5
	Optional 3	DSC-3B	4T+2P=6	4+1=5
	<b>TOTAL</b>		<b>28</b>	<b>25</b>
SECOND YEAR –SEMESTER-III				
	English	CC-1C	3	3
	Second Language	CC-2C	3	3
BC334/ BC334 P	Enzymology and Metabolism of Carbohydrates and Lipids	DSC-1C	4T+2P=6	4+1=5
	Optional 2	DSC-2C	4T+2P=6	4+1=5
	Optional 3	DSC-3C	4T+2P=6	4+1=5
	Communicative Skills	SEC 1	2	2
SE334	Basics in Biochemical calculations and Biostatistics	SEC 2	2	2
	<b>TOTAL</b>		<b>28</b>	<b>25</b>

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SEMESTER-IV				
	English	CC-1D	3	3
	Second Language	CC-2D	3	3
BC434/ BC434 P	<b>Biochemical techniques and Metabolism of Amino acids and Nucleotides</b>	<b>DSC-1D</b>	<b>4T+2P=6</b>	<b>4+1=5</b>
	Optional 2	DSC-2D	4T+2P=6	4+1=5
	Optional 3	DSC-3D	4T+2P=6	4+1=5
	<b>Universal Human Values</b>	<b>SEC-3</b>	<b>2</b>	<b>2</b>
SE434	<b>Clinical Laboratory Diagnostics</b>	<b>SEC-4</b>	<b>2</b>	<b>2</b>
	<b>TOTAL</b>		<b>28</b>	<b>25</b>
THIRD YEAR –SEMESTER-V				
	English	CC-1E	3	3
	Second Language	CC-2E	3	3
BC534/ BC534 P	<b>A. Physiology and Clinical Biochemistry</b>	<b>DSE-1E</b>	<b>4T+2P=6</b>	<b>4+1=5</b>
	(or)			
BC534A/ BC534A P	<b>B. Microbiology, Genetics and rDNA technology</b>			
	Optional 2	DSE-2E	4T+2P=6	4+1=5
	Optional 3	DSE-3E	4T+2P=6	4+1=5
GE534	<b>Biochemistry and Physiology</b>	<b>GE</b>	<b>4T</b>	<b>4</b>
	<b>TOTAL</b>		<b>28</b>	<b>25</b>
SEMESTER-VI				
	English	CC-1F	3	3
	Second Language	CC-2F	3	3
BC634/ BC634 P	<b>A. Molecular Biology and Immunology</b>	<b>DSE-1F</b>	<b>4T+2P=6</b>	<b>4+1=5</b>
	(or)			
BC634A/ BC634A P	<b>B. Cell Biology and Biotechnology</b>			
	Optional 2	DSE-2F	4T+2P=6	4+1=5
	Optional 3	DSE-3F	4T+2P=6	4+1=5
BC634_O BC634_PW	<b>Optional Paper Theory – Biochemistry in health and Disease / Project Work</b>		<b>4</b>	<b>4</b>
	<b>TOTAL</b>		<b>28</b>	<b>25</b>
	<b>TOTAL CREDITS</b>			<b>150</b>

  
 28/4/28  
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**Department of Biochemistry & Nutrition**  
(Academic year 2025-26)

**PROGRAM NAME: BCNDC (BIOCHEMISTRY, NUTRITION & DIETETICS, CHEMISTRY)**

**COURSE NAME: CHEMISTRY OF BIOMOLECULES**

**PAPER CODE: BC134**  
**YEAR/SEMESTER: I/I**

**PPW: 4**  
**NO. OF CREDITS: 4**

**COURSE OBJECTIVE:** To familiarize the students with the basic classification and identification of different biomolecules.

**UNIT-WISE COURSE OBJECTIVES:**

- COB1** To explain the molecular architecture of prokaryotic and eukaryotic cells.  
**COB2** To discuss classification of amino acids and properties of proteins.  
**COB3** To discuss the classification of sugars and their chemical reactions.  
**COB4** To explain the classification of fats.

**UNIT I: - Introduction to molecules of life**

**15 hrs**

Origin of life- chemical evolution and rise of living systems.  
Water as a biological solvent and its role in biological processes.  
pH, Buffers, Henderson- Hasselbalch equation.  
Acid-base and electrolyte balance in the body.  
Structure and classification of prokaryotes.  
Sterilization methods and isolation of pure cultures.  
Metabolic energy sources employed by prokaryotes.  
Structure and function of eukaryotic cell (plant and animal cell).  
Phylogenetic classification and differentiation of eukaryotic cell.  
Biological structures and metabolic processes in cell.

1hr  
1hr  
2hrs  
2hrs  
1hr  
2hrs  
1hr  
2hrs  
2hrs  
1hr

**UNIT II: - Amino acids and peptides**

**15 hrs**

Amino acids: Classification, structure, stereochemistry.  
Chemical reactions of amino acids due to carboxyl and amino groups.  
Titration curve of glycine and pKa values.  
Essential and non-essential amino acids.  
Unusual amino acids.  
Peptide bond – nature, Types of conformations.  
Biologically active peptides and polypeptides.

3hrs  
3hrs  
2hrs  
1hr  
1hr  
3hrs  
2hrs

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**UNIT III: - Carbohydrates****15hrs**

Classification, monosaccharides, D and L designation, open chain and cyclic structures, epimers and anomers, mutarotation. 4hrs

Reactions of carbohydrates (due to functional groups-hydroxyl, aldehyde and ketone) 2hrs

Amino sugars, Glycosides. 1hr

Structure and biological importance of disaccharides (sucrose, lactose, maltose, isomaltose, trehalose), trisaccharide's (raffinose, melezitose), structural polysaccharides (cellulose, chitin, pectin) and storage polysaccharides (starch, inulin, glycogen). 4hrs

Glycosaminoglycans, Bacterial cell wall polysaccharides. 2hrs

Outlines of glycoproteins, glycolipids and blood group substances. 2hrs

**UNIT IV: - Lipids****15hrs**

Lipids: Classification, saturated and unsaturated fatty acids. 2hrs

Structure and properties of fats and oils. 1hr

Acid value, saponification and iodine values, rancidity. 2hrs

General properties and structures of phospholipids and sphingolipids. 2hrs

Cholesterol- structure and properties. 1hr

Lipoproteins: Types and functions. 2hrs

Properties of lipid aggregates – micelles, bilayers. Liposomes 2hrs

Composition and architecture of membranes. 1hr

Fundamental properties of biological membranes. 1hr

Experimental proof for fluidity and dynamic properties. 1hr

**REFERENCES:**

1. Lehninger, Principles of Biochemistry, David L. Nelson, Michael M. Cox Publisher: W. H. Freeman.
2. Biochemistry, 4<sup>th</sup> Edition- Donald Voet, Judith G. Voet. - Publisher John Wiley & Sons.
3. Outlines of Biochemistry- Conn. E. E., Stumpf. P.K., Bruening, G and Doi. R.H., John Wiley & Sons.
4. Biochemistry- Satyanarayana. U and Chakrapani. U, Books & Allied Pvt. Ltd.
5. Textbook of Biochemistry – West. E.S., Todd. W. R, Mason. H.S., and Bruggen, J.T.V., Oxford & IBH.

**COURSE OUTCOMES:**

At the end of the course students will be able to:

**BC134.CO1** Compare the organization of prokaryotic cell to eukaryotic cell.

**BC134.CO2** Differentiate the amino acids based on their side chains.

**BC134.CO3** Distinguish between the simple and complex sugars.

**BC134.CO4** Relate the different types of fats and their importance in cellular architecture.

  
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**Department of Biochemistry & Nutrition**

**(Academic year 2025-26)**

**PROGRAM NAME: BCNDC (BIOCHEMISTRY, NUTRITION & DIETETICS, CHEMISTRY)**

**COURSE NAME: QUALITATIVE ANALYSIS OF BIOMOLECULES**

**PAPER CODE: BC134P**

**YEAR/SEMESTER: I/I**

**PPW: 2**

**NO. OF CREDITS: 1**

**COURSE OBJECTIVES:**

**COB1** To inculcate good laboratory practices and laboratory hygiene.

**COB2** To learn preparation of standard solutions and buffers and identify the biomolecules qualitatively. To learn preparation and sterilization of culture media to isolate microorganisms.

1. Introduction to Good Laboratory Practices (GLP). Principles of Laboratory Hygiene and Safety.
2. Preparation of standard solutions. Molarity, Normality, percentage solutions.
3. Preparation of buffers (acidic, neutral and alkaline) and determination of pH. Calibration of pH meter.
4. Titration curve of glycine and determination of  $pK$  and  $pI$  values.
5. Qualitative identification of carbohydrates - glucose, fructose, ribose/xylose, maltose, sucrose, lactose, starch/glycogen.
6. Preparation of Osazones and their identification.
7. Qualitative identification of amino acids - histidine, tyrosine, tryptophan, cysteine, arginine.
8. Qualitative identification of lipids - solubility, saponification, acrolein test, Salkowski test. Test for unsaturation – Hubl's iodine test, Bromine decolourisation test.
9. Preparation of culture media and sterilization.
10. Isolation of pure cultures.

**REFERENCES:**

1. Experimental Biochemistry-A student companion-Beedu Sashidhar Rao and Vijay Deshpande.
2. Laboratory Manual in Biochemistry- Jayaraman, J. Wiley Eastern

**COURSE OUTCOMES:**

At the end of the course students will be able to:

**BC134P.CO1** Gain knowledge in understanding laboratory safety and implementing routine practice.

**BC134P.CO2** Prepare various buffers and solutions and perform qualitative tests to identify biomolecules in different sources and also apply the knowledge in preparation of culture media, Sterilization methods and isolation of pure cultures.

*S. Lakshmi*  
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**PROGRAM NAME: BCNDC (BIOCHEMISTRY, NUTRITION & DIETETICS, CHEMISTRY)**

**COURSE NAME: CHEMISTRY OF PROTEINS, NUCLEIC ACIDS AND  
BIOENERGETICS**

**PAPER CODE: BC234**  
**YEAR/SEMESTER: I/II**

**PPW:4**  
**NO OF CREDITS:4**

**COURSE OBJECTIVE:** To familiarize the students with the structural features of proteins, nucleic acids and basic concepts of Bioenergetics.

**UNIT-WISE COURSE OBJECTIVES:**

- COb1** To understand the structural hierarchy of proteins.
- COb2** To discuss the structure and properties of nucleic acids.
- COb3** To explain the energy transformation reactions in biological systems.
- COb4** To describe the organization of ETC complexes.

**UNIT I: - Proteins**

**15hrs**

- Proteins classification based on solubility, shape and functions. 3hrs
- Determination of amino acid composition of proteins. 2hrs
- General properties of proteins. 2hrs
- Denaturation and renaturation of proteins. 1hr
- Structural organization of proteins- primary structure, secondary structure, tertiary and quaternary structures (eg, hemoglobin and myoglobin). 4hrs
- Forces stabilizing the structure of proteins. 1hr
- Strategies of protein sequencing. 2hrs

**UNIT II: - Nucleic Acids**

**15hrs**

- Nature of nucleic acids, Structure of purines, pyrimidines, nucleosides, nucleotides. 3hrs
- Stability and formation of phosphodiester linkages. 1hr
- Effect of acids, alkali and nucleases on DNA and RNA. 1hr
- Experiments showing DNA as store of genetic information. 2hrs
- Structure of Nucleic acids - Watson-Crick DNA double helix structure. 1hr
- Types of DNA/RNA. 2hrs
- Structural variations of DNA/RNA - Palindromes, mirror repeats, hairpin and cruciform. 1hr
- Introduction to circular DNA, super coiling. 1hr



Helix to random coil transition. Denaturation and renaturation of nucleic acids.	
Hyperchromic effect, T <sub>m</sub> values and their significance.	1hr
Re-association kinetics, cot curves and their significance.	1hr
Additional functions of nucleotides – energy carriers, as components of enzyme cofactors	1hr

### UNIT III: - Bioenergetics -I

15 hrs

Energy transformations in the living system.	1hr
Enthalpy, entropy and Gibb's free energy.	2hrs
Reduction potentials.	2hrs
Free energy concept. Exergonic and endergonic reactions.	2hrs
High energy compounds.	2hrs
Role of ATP in biological systems.	1hr
Inorganic phosphate- phosphate group donor.	1hr
Phosphate group transfer potential. Substrate level phosphorylation.	2hrs
Cytochromes-structure, types and their functions.	2hrs

### UNIT IV: - Bioenergetics- II

15hrs

Biological oxidations: Definition, enzymes involved- oxidases, dehydrogenases and oxygenases.	
Redox reactions.	3hrs
Ultra-structure of mitochondria. Electron transport chain and carriers involved.	3hrs
Coenzymes and proteins as electron carriers.	2hrs
Oxidative phosphorylation, theories of oxidative phosphorylation- Mitchell's chemiosmotic theory, F <sub>0</sub> F <sub>1</sub> - ATPase.	3hrs
Inhibitors of respiratory chain and oxidative phosphorylation, Uncouplers.	2hrs
Formation of reactive oxygen species and their disposal through enzymatic reactions.	2hrs

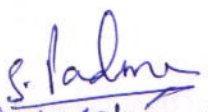
### REFERENCES:


1. Lehninger, Principles of Biochemistry, David L. Nelson, Michael M. Cox Publisher: W.H. Freeman
2. Biochemistry, 4<sup>th</sup> Edition- Donald Voet, Judith G. Voet. - Publisher John Wiley & Sons.
3. Biochemistry- Satyanarayana U and Chakrapani. U, Books & Allied Pvt. Ltd.

### COURSE OUTCOMES:

At the end of the course students will be able to:

- BC234.CO1 Relate to the structural organization of proteins to their functions.
- BC234.CO2 Distinguish the structural features and properties of nucleic acids.
- BC234.CO3 Interpret the concepts of biological oxidation and energy production.
- BC234.CO4 Demonstrate the organization of ETC complexes.

  
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Bharatiya Vidya  
**Bhavan**

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**PROGRAM NAME: BCNDC (BIOCHEMISTRY, NUTRITION & DIETETICS, CHEMISTRY)**  
**COURSE NAME: BIOCHEMICAL PREPARATIONS**

**PAPER CODE: BC234P**

**YEAR/SEMESTER: I/II**

**PPW: 2**

**NO. OF CREDITS: 1**

**COURSE OBJECTIVES:**

**COB1** To understand the concept of absorption maxima of coloured and colourless solutions.

**COB2** To isolate and identify macromolecules from natural sources.

1. Absorption maxima of colored substances- *p*-Nitrophenol, Methyl orange and  $\text{KMnO}_4$ .
2. Absorption spectra of protein-BSA, nucleic acids- Calf thymus DNA.
3. Isolation and identification of cholesterol from egg yolk.
4. Isolation of lipids from biological samples.
5. Isolation and identification of lecithin from egg yolk.
6. Isolation and identification of starch from potato.
7. Isolation and identification of albumin from egg white.
8. Isolation and identification of casein from milk.
9. Isolation and identification of glycogen from liver.
10. Quantitation of glycine by formol titration method.

**REFERENCES:**

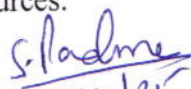
1. Experimental Biochemistry-A student companion-Beedu Sashidhar Rao and Vijay Deshpande.
2. Laboratory Manual in Biochemistry- Jayaraman, J. Wiley Eastern


**COURSE OUTCOMES:**

At the end of the course students will be able to:

**BC234P.CO1** Analyse the presence of compounds based on its absorption maxima.

**BC234P.CO2** Apply different isolation methods for various biomolecules from their natural sources.

  
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