



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

PROGRAM NAME: BCNDC (BIOCHEMISTRY, NUTRITION & DIETETICS, CHEMISTRY)
(Academic year 2023-24)

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. | 1hr |
| Water as a biological solvent and its role in biological processes. | 1hr |
| pH, Buffers, Henderson- Hasselbalch equation. | 2hrs |
| Acid-base and electrolyte balance in the body. | 2hrs |
| Structure and classification of prokaryotes. | 1hr |
| Sterilization methods and isolation of pure cultures. | 2hrs |
| Metabolic energy sources employed by prokaryotes. | 1hr |
| Structure and function of eukaryotic cell (plant and animal cell). | 2hrs |
| Phylogenetic classification and differentiation of eukaryotic cell. | 2hrs |
| Biological structures and metabolic processes in cell. | 1hr |

| UNIT II: - Amino acids and peptides | 15 hrs |
|---|---------------|
| Amino acids: Classification, structure, stereochemistry. | 3hrs |
| Chemical reactions of amino acids due to carboxyl and amino groups. | 3hrs |
| Titration curve of glycine and pKa values. | 2hrs |
| Essential and non-essential amino acids. | 1hr |
| Unusual amino acids. | 1hr |
| Peptide bond – nature, Types of conformations. | 3hrs |
| Biologically active peptides and polypeptides. | 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 |

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| 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, 4th 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

PROGRAM NAME: BCNDC (BIOCHEMISTRY, NUTRITION & DIETETICS, CHEMISTRY)
(Academic year 2023-24)

COURSE NAME: QUALITATIVE ANALYSIS OF BIOMOLECULES

PAPER CODE: BC134P
YEAR/SEMESTER: I/I

PPW: 3
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

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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 from different sources and also apply the knowledge in preparation of culture media, sterilization methods and isolation of pure cultures.

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**PROGRAM NAME: BCNDC (BIOCHEMISTRY, NUTRITION & DIETETICS,
CHEMISTRY)(Academic year2023-24)**

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

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| | 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

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| | 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. | |

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| Hyperchromic effect, T _m 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**

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| 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**

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| 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 ₀ F ₁ - 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, 4th 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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PROGRAM NAME: BCNDC (BIOCHEMISTRY, NUTRITION & DIETETICS, CHEMISTRY)
(Academic year 2023-24)

COURSE NAME: BIOCHEMICAL PREPARATIONS

PAPER CODE: BC234P
YEAR/SEMESTER: I/II

PPW: 3
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 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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PROGRAM NAME: BCNDC (BIOCHEMISTRY, NUTRITION & DIETETICS, CHEMISTRY)

COURSE NAME: ENZYMOLOGY AND METABOLISM OF CARBOHYDRATES AND LIPIDS

PAPER CODE: BC334

PPW: 4

YEAR/SEMESTER: II/III

NO.OF CREDITS: 4

COURSE OBJECTIVE: To familiarize students with nature, kinetics and different regulatory mechanisms of enzymes and to describe the metabolism and regulation of carbohydrates and lipids.

UNIT-WISE COURSE OBJECTIVES:

COb1 To discuss the nature of enzymes, factors affecting enzyme activity and basics of enzyme kinetics.

COb2 To outline the concept of enzyme catalysis and regulation with examples.

COb3 To describe about carbohydrate metabolism in plants and animals.

COb4 To explain the significance of lipid metabolism.

Unit I: - Enzymes

15 hrs

Introduction to biocatalysis, differences between chemical and biological catalysis.

1hr

Nomenclature and classification of enzymes.

2hrs

Enzyme specificity. Active site.

1hr

Principles of energy of activation, transition state.

2hrs

Definition of holo-enzyme, apo-enzyme, coenzyme, cofactor.

1hr

Fundamentals of enzyme assay, enzyme units.

1hr

Factors affecting the catalysis - substrate concentration, pH, temperature.

2hrs

Michaelis-Menten equation for uni-substrate reaction (derivation not necessary),

Lineweaver- Burke plot, Significance of K_m and V_{max} .

2hrs

Enzyme inhibition- irreversible and reversible, types of reversible inhibitions - competitive, non-competitive and uncompetitive.

3hrs

Unit-II: - Enzyme Catalysis

15 hrs

Mechanism of enzyme action with examples - acid-base catalysis, covalent catalysis, electrostatic catalysis, and metal ion catalysis.

4hrs

Regulation of enzyme activity- allosterism and co-operativity, Glutamine synthetase as an allosteric enzyme.

3hrs

Covalent modulation - covalent phosphorylation of phosphorylase.

1hr

Zymogen activation- activation of trypsinogen and chymotrypsinogen.

1hr

Isoenzymes (CK, LDH) and Ribozyme.

2hrs

Multi enzyme complexes (PDH).

1hr

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| Immobilized enzymes. | 2hrs |
| Catalytic antibodies. | 1hr |
| Unit III: - Carbohydrate Metabolism | 15 hrs |
| Concept of anabolism and catabolism. | 1hr |
| Glycolytic pathway, energy yield, Fate of pyruvate - formation of lactate and ethanol, Pasteur effect. | 3hrs |
| Citric acid cycle, regulation, energy yield, amphipathic role. | 2hrs |
| Anaplerotic reactions. | 1hr |
| Glycogenolysis and glycogenesis. | 2hrs |
| Pentose phosphate pathway. | 2hrs |
| Gluconeogenesis. | 1hr |
| Photosynthesis - Light and Dark reactions, Calvin cycle, C4 Pathway. | 3hrs |
| Unit IV: - Lipid Metabolism | 15 hrs |
| Catabolism of fatty acids (β - oxidation) with even numbers. | 2hrs |
| Catabolism of fatty acids with odd number of carbon atoms. | 1hr |
| Ketogenesis. | 1hr |
| <i>de novo</i> synthesis of fatty acids, elongation of fatty acids in mitochondria and microsomes | 3hrs |
| Biosynthesis and degradation of triacylglycerol. | 2hrs |
| Biosynthesis and degradation of lecithin. | 1hr |
| Biosynthesis and regulation of cholesterol metabolism. | 2hrs |
| Role of HDL, LDL, and Very-low-density lipoprotein (VLDL) and cholesterol levels in body. | 3hrs |

REFERENCES:

1. Lehninger, Principles of Biochemistry, David L. Nelson, Michael M. Cox Publisher: W.H. Freeman.
2. Biochemistry- Satyanarayana. U and Chakrapani. U, Books & Allied Pvt. Ltd.
3. Principles of Biochemistry: General Aspects- Smith, E. L., Hill, R.L. Lehman, I.R. Lefkowitz, R. J. Handler, P., and White, A. McGraw- Hill.

COURSE OUTCOMES:

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

BC334.CO1 Interpret the significance and role of enzymes in a living cell.

BC334.CO2 Correlate the function of enzymes with cellular homeostasis.

BC334.CO3 Relate the metabolic events of carbohydrates in conversion of food to energy to run cellular processes.

BC334.CO4 Illustrate the pathways of lipid metabolism and their significance in energy production.

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(Academic year 2024-25)

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

COURSE NAME: QUANTITATIVE ANALYSIS & ENZYMOLOGY

PAPER CODE: BC334P
YEAR/SEMESTER: II/III

PPW: 2
NO.OF CREDITS: 1

COURSE OBJECTIVES

COb1 To understand the different quantitative methods for sugars.

COb2 To learn the steps in isolation, assay procedures and effect of physical factors on enzyme activity.

1. Estimation of reducing sugars by DNS method.
2. Estimation of total sugars by Anthrone method.
3. Estimation of Fructose by Roe's resorcinol method.
4. Analysis of Honey sample for total, reducing and non-reducing sugars.
5. Determination of achromic point of salivary α -amylase.
6. Assay of β -amylase from sweet potato.
7. Comparison of catalase activity in germinating seeds.
8. Assay of acid and alkaline phosphatases from biological samples.
9. Determination of optimum temperature for amylase.
10. Determination of optimum pH for phosphatase.

REFERENCES:

1. Experimental Biochemistry-A student companion-Beedu Sashidhar Rao and Vijay Deshpande.
2. Enzyme Assays- A practical Approach: Eisenthal, R and Dawson, M. I., IRL Press.
3. Biochemical Methods- Sadasivam, S and Manickam, A. New Age International Publishers.

COURSE OUTCOMES:

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

BC334P.CO1 Implement the knowledge in carbohydrate analysis of various biological samples.

BC334P.CO2 Apply the assay methods to determine enzyme activity in various sources.

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(Academic year 2024-25)

COURSE NAME: BASICS IN BIOCHEMICAL CALCULATIONS AND BIOSTATISTICS

PAPER CODE: SE334
YEAR/SEMESTER: II/III

PPW: 2
NO.OF CREDITS: 2

COURSE OBJECTIVE: To familiarize the students on the concept of biochemical calculations and biostatistics.

UNIT-WISE COURSE OBJECTIVES:

COb1 To explain the principles in basic biochemical calculations.

COb2 To train the students in various biostatistical methods.

Unit I: Basic Biochemical Calculations

15 hrs

1. Units and measurements
2. Concentration of analyte: Mole, Molarity, Normality and Percent solutions
3. Concept of density and specific gravity
4. Enzyme activity, Specific activity and purity index
5. pH scale and measurement of redox potential
6. Concept of buffers and Buffer preparations
7. Construction of calibration Curve and absorption curve (λ max)

Unit II: Biostatistics

15 hrs

1. Basic statistical concepts: Population, sampling and variables
2. Biostatistics: Measures of central tendency (Mean, Median, Mode)
3. Measurement of dispersion: Standard deviation, standard error, Spread sheets
4. Depiction of data by graphical methods
5. t-Test
6. Regression and Correlation, precision and accuracy
7. ANOVA

References:

1. Experimental Biochemistry-A student companion-Beedu Sashidhar Rao and Vijay Deshpande.
2. Laboratory Manual in Biochemistry- Jayaraman, J. Wiley Eastern
3. Enzyme Assays- A practical Approach: Eisenthal, R and Dawson, M. I., IRI. Press.
4. Biostatistics — Arora & Malhan, Himalaya Publishing House.

COURSE OUTCOMES:


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

SE334.CO1 Apply the biochemical calculations in project or research work.

SE334.CO2 Implement the various statistical methods to analyse and interpret the data statistically in research and pharma industries.

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

COURSE NAME: BIOCHEMICAL TECHNIQUES AND METABOLISM OF AMINO ACIDS AND NUCLEOTIDES

PAPER CODE: BC434
YEAR/SEMESTER: II/IV

PPW: 4
NO.OF CREDITS: 4

COURSE OBJECTIVE: To illustrate the significance of metabolic pathways of amino acids and nucleotides and to discuss the principle, instrumentation and applications of various biochemical techniques.

UNIT-WISE COURSE OBJECTIVES:

- COb1** To discuss the metabolism of amino acids and related genetic defects.
COb2 To explain the metabolic pathways of nucleotides in relation to genetic defects.
COb3 To discuss the principle and applications of centrifugation and chromatography techniques.
COb4 To explain the principle and applications of electrophoresis, photometric methods and radioisotopes.

Unit I: - Amino Acid Metabolism

15hrs

- General reactions of amino acid metabolism- transamination, decarboxylation & deamination. 2hrs
Urea cycle and its regulation. 2hrs
Catabolism of carbon skeleton of amino acids- glycogenic and ketogenic amino acids. 2hrs
Metabolism of Glycine, Serine, Aspartic acid and Methionine. 2hrs
Metabolism of Phenylalanine and Leucine. 3hrs
Biosynthesis of creatine. 1hr
Nitrogen cycle - Biological nitrogen fixation. 2hrs
Inborn errors of aromatic and branched chain amino acid metabolism. 1hr

Unit II: - Nucleotide Metabolism

15hrs

- Biosynthesis and regulation of purine nucleotides (*de novo* and Salvage pathways). 2hrs
Biosynthesis and regulation pyrimidine nucleotides (*de novo* and Salvage pathways). 2hrs
Allosteric regulation of Aspartate Transcarbamoylase (ATCase). 1hr
Catabolism of Purines and Pyrimidines. 3hrs
Biosynthesis of deoxyribonucleotides- Ribonucleotide reductase. 2hrs
Thymidylate synthase and its significance. 1hr
Disorders of nucleotide metabolism- Gout, Lesch- Nyhan syndrome. 1hr
Biosynthesis and degradation of Heme and Porphyrins. 3hrs

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| Unit III: - Biochemical Techniques – I | 15hrs |
| Methods of tissue homogenization (Potter-Elvehjem, mechanical blender, sonicator & enzymatic). | 1hr |
| Principle and applications of centrifugation techniques- differential, density gradient. | 2hrs |
| Ultra-centrifugation- preparative and analytical. | 3hrs |
| Principles and applications of – paper & thin layer chromatographic techniques. | 1hr |
| Principle and applications of gel filtration chromatography. | 2hrs |
| Principle and applications of ion- exchange chromatography. | 2hrs |
| Principle and applications of affinity chromatography. | 2hrs |
| Peptide sequencing and mapping. | 2hrs |

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| Unit IV: - Biochemical Techniques - II | 15 hrs |
| Electrophoresis - principle and applications of paper, polyacrylamide (native and SDS). | 2hrs |
| Principle and applications of agarose gel electrophoresis. | 2hrs |
| Principle of Isoelectric focusing. | 1hr |
| Colorimetry and Spectrophotometry – Laws of light absorption - Beer-Lambert's law, UV and visible absorption spectra, molar extinction coefficient. | 3hrs |
| Biochemical applications of spectrophotometer. | 3hrs |
| Principle of fluorimetry. | 1hr |
| Tracer techniques: Radioisotopes, units of radio activity, half-life, β and γ - emitters. | 1hr |
| Use of radioactive isotopes in biology. Principle of autoradiography. | 2hrs |

REFERENCES:

1. Principles and techniques of practical Biochemistry- Wilson, K and Walker, J. Cambridge Press.
2. The Tools of Biochemistry- Cooper, T.G. John Wiley & Sons Press.
3. Physical Biochemistry- Friefelder, D. W. H. Freeman Press.
4. Analytical Biochemistry- Holme. D. J. and Peck. H., Longman.
5. Biophysical Chemistry: Principles and Techniques –Upadhyay A., Upadhyay K and Nath. Himalaya Publishing House.
6. Lehninger Principles of Biochemistry, David L. Nelson, Michael M. Cox Publisher: W.H. Freeman

COURSE OUTCOMES:

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

BC434.CO1 Relate the metabolic pathways of amino acids to various cellular functions.

BC434.CO2 Correlate metabolic pathways of nucleotides to various cellular functions.

BC434.CO3 Analyze and apply different techniques according to the sample and design the experiments in research projects.

BC434.CO4 Apply the analytical skills to research projects.

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**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
(Academic year 2024-25)

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

COURSE NAME: QUANTITATIVE ANALYSIS AND BIOCHEMICAL TECHNIQUES

PAPER CODE: BC434P
YEAR/SEMESTER: II/IV

PPW: 2
NO.OF CREDITS: 1

COURSE OBJECTIVES:

COb1 To understand the different quantitative methods for amino acids and proteins.
COb2 To learn different biochemical techniques for the separation of biomolecules.

1. Estimation of amino acid by ninhydrin method.
2. Estimation of protein by Biuret method.
3. Estimation of protein by Lowry's method.
4. Separation of plant pigments from various leaf and vegetable sources by TLC.
5. Separation of amino acids by paper electrophoresis.
6. Separation of proteins by SDS-PAGE and staining by Coomassie blue.
7. Separation of amino acids by paper chromatography.
8. Determination of ion exchange capacity of a resin by titrimetry.
9. Gel filtration chromatography.
10. Data analysis and construction of line, pie and bar graphs.

REFERENCES:

1. Experimental Biochemistry-A student companion-Beedu Sashidhar Rao and Vijay Deshpande.
2. An Introduction to Practical Biochemistry-Plummer, D. T. Tata McGraw -Hill.
3. Introductory Practical Biochemistry (ed) Sawhney, S. K. Randhir Singh-Narosa Publications House.

COURSE OUTCOMES:

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

- BC434P.CO1** Quantify amino acids and proteins in different samples.
BC434P.CO2 Apply the relevant biochemical technique to analyse the sample for research purpose.



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COURSE NAME: CLINICAL LABORATORY DIAGNOSTICS

PAPER CODE: SE434
YEAR/SEMESTER: II/IV

PPW: 2
NO.OF CREDITS: 2

COURSE OBJECTIVE: To familiarize students with theory and practical aspects of various clinical laboratory diagnostic tests of blood and urine.

UNIT-WISE COURSE OBJECTIVES:

COB1 To explain about clinical laboratory automation, methods of specimen collection and preservation.

COB2 To explain about biochemical tests associated with various organ functions.

Unit I Clinical Biochemistry

15 hrs

1. Organization of clinical laboratory. Introduction to instrumentation and automation in clinical biochemistry laboratories, safety regulations and first aid.
2. General comments on specimen collection, types of specimen for biochemical analysis.
3. Precision, accuracy, quality control, precautions and limitations of specimen collection.
4. Basic physiology of hepatic, renal and cardiovascular systems.
5. Biochemical symptoms associated with hepatic and renal diseases and their diagnostic biochemical profile.
6. Clinical significance of variations in blood glucose. Diabetes mellitus.
7. Composition and functions of lipoproteins. Clinical significance of elevated lipoproteins.
8. Liver function tests.
9. Renal function tests and urine analysis.
10. Involvement of enzymes in diagnosis of heart disease including aspartate transaminase, isoenzymes of creatine kinase and lactate dehydrogenase and troponin.

Unit II: Practicals

15 hrs

1. Collection of blood and storage.
2. Separation and storage of serum.
3. Estimation of blood glucose by glucose oxidase-peroxidase method.
4. Estimation of serum Triglycerides.
5. Estimation of bilirubin (direct and indirect).

A. Sai Reddy
23/3/24

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Sainikpuri, Secunderabad - 500094

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Professor Karuna Rupula
Department of Biochemistry
University College of Science
Osmania University
Hyderabad-500 007 (TS)

6. Use of urine strip / dipstick method for urine analysis.
7. Quantitative determination of serum creatinine.
8. Quantitative determination of serum urea.
9. Estimation of creatine kinase MB.
10. Estimation of SGOT.

References:

1. Medical Laboratory Technology - a Procedure Manual for Routine Diagnostic Tests Vol. I (2010), Mukherjee, K.L., Tata Mc Graw-Hill Publishing Company Limited (New Delhi). ISBN:9780070076594 / ISBN:9780070076631
2. Medical Laboratory Technology - a Procedure Manual for Routine Diagnostic Tests Vol. II (2010), Mukherjee, K.L., Tata Mc Graw - Hill Publishing Company Ltd. (New Delhi), ISBN: 9780070076648.
3. Medical Biochemistry (2005) 2nd ed., Baynes, J.W. and Dominiczak, M.H., Elsevier Mosby Ltd. (Philadelphia), ISBN:0-7234-3341-0.
4. Experimental Biochemistry: A Student Companion (2005) Rao, B.S. and Deshpande, V., IK International Pvt. Ltd. (New Delhi), ISBN: 81-88237-41-8.
5. Textbook of Medical Laboratory Technology: Godkar P.B. and Godkar D.p.2ndEdition, Bhalani publishing House
6. Textbook of Medical Physiology: Guyton A.C. and Hall J.E., Saunders publications

COURSE OUTCOMES:

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

SE434.CO1 Apply the knowledge in collection and preservation of blood and urine samples in diagnostic labs.

SE434.CO2 Perform the diagnostic tests and analyze the results associated with various organ functions in health and disease.