

Course code:	Allied -IA	T/P	C	H/W
22BBCA1	<b>General Biochemistry - I</b>	<b>T</b>	<b>3</b>	<b>3</b>
<b>Objectives</b>	<ul style="list-style-type: none"> <li>➤ To introduce the basic concepts of biochemistry and molecular makeup behind the biological functions of cell</li> <li>➤ To give insight on structure and functions of carbohydrates, protein, lipids and nucleic acid</li> <li>➤ To elaborate the significance of vitamins in living system.</li> </ul>			
<b>Unit-I</b>	<b>Carbohydrates: Monosaccharides:</b> Definition, Classification, Structure of Open-Chain, Haworth and Fischer formula. <b>Di, Tri, and Oligosaccharides:</b> Occurrence, Composition, Structure and Biological role of Sucrose, Lactose, Maltose, Raffinose. <b>Polysaccharides:</b> Occurrence, Composition, Structure and Biological role of homopolysaccharides - Cellulose, Chitin, Inulin, Starch, Glycogen; heteropolysaccharides-			
<b>Unit-II</b>	<b>Proteins:</b> Chemistry of monomeric units of proteins: Classification of Amino acids based on its side chains, Structure of Amino acids. <b>Structure:</b> Hierarchical structure of proteins: Primary structure – peptide bond and its characteristics, Secondary structure – alpha-helix and Beta-pleated sheets, Tertiary structure: Myoglobin, Quaternary structure – Hemoglobin			
<b>Unit-III</b>	<b>Lipids:</b> Definition and classification of storage and structural lipids. Storage lipids – structure, classification and function of fatty acid and triacylglycerols. Structural lipids – structure function and properties of phospholipids, glycerophospholipids, sphingolipids, sterol lipids.			
<b>Unit -IV</b>	<b>Nucleic acids:</b> Structure of purine and pyrimidines, nucleosides and nucleotides, polynucleotide. Structure, types and biological role of DNA and RNA.			
<b>Unit-V</b>	<b>Vitamins:</b> Source, Structure, deficiency diseases and biochemical functions of water soluble and fat soluble vitamins and their coenzyme activity.			
<b>Reference and Textbooks:-</b>				
<b>Text Books</b>				
Chatterjea, M.D., Rana, S., Venkatesh, T., Kambli, V.B., Sita Devi, C. (2011). <i>Text book of medical biochemistry</i> , (8 <sup>th</sup> ed.), Jaypee Brothers medical publication				
Fatima, D., Narayanan, L.M., Arumugam, N., Meyyan, R.P., Prasanna kumar, S., Nallasingam, K. (2019). <i>Biochemistry</i> (7 <sup>th</sup> ed.). Saras publication.				
Jain, J.L., Jain S., Jain N. (2016). <i>Fundamentals of Biochemistry</i> (7 <sup>th</sup> ed.) S. Chand @ Co.Ltd				
Mukherjee, K.L. (2000). <i>Medical laboratory technique</i> (2 <sup>nd</sup> ed.) Tata McGraw-Hill education				
Sathyanarayana, U. (2007). <i>Biochemistry</i> (2 <sup>nd</sup> ed.) Allied Books Publishers				
Satyanarayana, U., Chakrapani, U. (2021). <i>Biochemistry</i> (6 th ed.) Elsevier Publications				
<b>Book for reference:</b>				
Berg, J.M., Tymoczko, J.L., Gatto, Jr. G.J., Stryer, L., <i>Biochemistry</i> . (9 <sup>th</sup> ed.). W.H. Freeman, New York				
Eliot W.H. (2007) <i>Biochemistry and Molecular Biology</i> (3 <sup>rd</sup> ed.). Oxford University Press.				
Kennelly, P., Botham, K., McGuinness, O., Rodwell, V., Anthony Weil, P. (2022). <i>Harper's Illustrated Biochemistry</i> . (32 <sup>nd</sup> ed.). McGraw Hill / Medical.				
Nelson D.L., Cox, M.M. (2021). <i>Lehninger Principles of Biochemistry</i> (8 <sup>th</sup> ed.). Macmillan Learning				

Voet, D., & Voet, J. G. (2010). *Biochemistry* (4<sup>th</sup> ed.). Wiley.

Zubay, G. (1998). *Biochemistry*. (4<sup>th</sup> ed.). Wm.C. Brown Publishers.

<b>Outcomes</b>	On successful completion of course students will <ul style="list-style-type: none"><li>➤ Gain knowledge on structure, properties and biological role of carbohydrates</li><li>➤ Be able to understand the structure of protein the building block of living system</li><li>➤ Gain information on the role of lipids in biological system</li><li>➤ Illustrate the structure of nucleotides, distinguish DNA and RNA and describe the structure of DNA, types of RNA and their biological functions</li><li>➤ Gain insight on significance of vitamins in living system</li></ul>
-----------------	--

Course code: 22BBCAP1	Allied -IA		T/P	C	H/W
	Practical - General Biochemistry - I		P	2	2
<b>Objectives</b>	<p>➤ To impart knowledge of methods and techniques available for analyzing biomolecules in biological samples</p> <p>A. Introduction-Common laboratory tools used in Biochemistry lab: Plastic and glass test tubes, Microcentrifuge tubes, beakers, flasks, graduated cylinders, micropipettes, weighing balance, autoclave</p> <p>B. Estimation of Reducing Sugar by Dinitro Salicylic acid Method</p> <p>C. Estimation of Cellulose</p> <p>D. Qualitative Analysis of Lipids</p> <p>E. Qualitative Analysis of Proteins</p> <p>F. Determination of DNA concentration using Diphenylamine (DPA) method.</p> <p>G. Determining the Vitamin C content of food.</p>				
<p><b>Reference and Textbooks:-</b></p> <p>Manickam, A., Sadasivam, S. (2007). <i>Biochemical Methods</i>. India: New Age International (P) Limited.</p> <p>Plummer, D. T. (1987). <i>An Introduction to Practical Biochemistry</i>. India: McGraw-Hill.</p> <p>Singh, R., Sawhney, S.K. (eds.) (2005). <i>Introductory Practical Biochemistry</i>. United Kingdom: Alpha Science International.</p> <p><b>Books for reference</b></p> <p>Jayaraman, J. (2011). <i>Laboratory Manual in Biochemistry</i>. New Age International Private Limited</p> <p>Jones, E. (2011). <i>Manual Practical Medical Biochemistry</i>. India: Jaypee Brothers Medical Publishers.</p> <p>Varley, H. (2005). <i>Practical Clinical Biochemistry</i> (4<sup>th</sup> ed.), CBS Publishers.</p>					
<b>Outcomes</b>	<p>➤ To gain knowledge in handling biological samples</p> <p>➤ Students will be able to detect and quantify the various biomolecules</p>				

Course code: 22BBCA2	Allied -IB	T/P	C	H/W
	General Biochemistry - II	T	3	3
<b>Objectives</b>	<ul style="list-style-type: none"> <li>➤ To provide insight on how living cells harness energy and channel it to biological work.</li> <li>➤ To gain knowledge in basic biological pathways involved in the inter-convention of nutritive materials to cellular metabolites</li> <li>➤ To provide basic understanding on metabolism of nucleic acid.</li> <li>➤ To gain fundamental knowledge of Enzymology</li> <li>➤ To impart knowledge on hormonal regulation in cell signaling process</li> </ul>			
<b>Unit-I</b>	<b>Carbohydrate metabolism:</b> Glycolysis – aerobic and anaerobic, energetic of glycolysis. TCA cycle – amphibolic nature, energetics of TCA cycle. Glyoxalate cycle. Pentose phosphate pathway, Gluconeogenesis. <b>Bioenergetics: Introduction to bioenergetics</b> - Laws of thermodynamics, Concept of enthalphy, entropy and free energy. Endergonic and exergonic reactions. Coupled reactions. High energy compounds – structural features of ATP and its free energy change during hydrolysis, other high energy compounds.. <b>Mitochondrion:</b> Structure of mitochondrial membranes, Mitochondrial enzymes. Electron transport chain and oxidative phosphorylation			
<b>Unit-II</b>	<b>Amino Acid Metabolism :</b> Fate of dietary protein; Amino acid metabolism: Glucogenic and ketogenic amino acids, Reactions of Urea cycle. <b>Lipid metabolism:</b> Biosynthesis of fatty acid, Triglycerides, phospholipids, and cholesterol Oxidation of fatty acid – $\alpha$ , $\beta$ and $\omega$ types, $\beta$ -oxidation of even number saturated fatty acids			
<b>Unit -III</b>	<b>Nucleic Acid Metabolism:</b> Biosynthesis and catabolism of nucleotides: Purine and pyrimidine nucleotides – denovo synthesis and salvage pathways, Regulation of purine and pyrimidine nucleotide synthesis. Biosynthesis of nucleotide coenzymes – inhibitors of nucleotide biosynthesis.			
<b>Unit -IV</b>	<b>Enzymology:</b> History, general characteristics, nomenclature, IUB enzyme classification with examples.Enzyme kinetics – MM equation, LB plot, Eadie and Hofstee plot.-Importance of Enzyme purification. Strategies for purification- yield, catalytic activity and purity. -Immobilization of enzymes and their industrial applications.			
<b>Unit -V</b>	<b>Hormones:</b> Introduction to endocrine system, Hormones- definition, classification, Mechanism of action of hormones, Class I and Class II hormone, role of second messengers in hormone action.			
<b>Reference and Textbooks:-</b>				
<b>Text Books:</b>				
Asokan, P. (2005) <i>Enzymes</i> . (2 <sup>nd</sup> ed.), Chinna publications.				
Kennelly, P., Botham, K., McGuinness, O., Rodwell, V., Anthony Weil, P. (2022). <i>Harper Illustrated Biochemistry</i> . (32 <sup>nd</sup> ed.), McGraw Hill / Medical.				
Palmer, T. (1997) <i>Understanding enzymes</i> (4 <sup>th</sup> ed.)Prentice Hall Publishers. .				
Palmer, T. (1997). <i>Understanding enzymes</i> (4 <sup>th</sup> ed.). Prentice Hall.				
Satyanarayana, U., Chakrapani, U. (2021). <i>Biochemistry</i> (6 th ed.) Elsevier Publications.				
Vasudevan, D. M., Vaidyanathan, K., S, S. (2013). Textbook of Biochemistry for Medical				

Students. India: Jaypee Brothers Medical Publishers Pvt. Limited.

**Books for Reference:**

Berg, J.M., Tymoczko, J.L., Gatto, Jr. G.J., Stryer, L., *Biochemistry*. (9<sup>th</sup> ed.) WH Freeman, New York.

Frisell, W. R. (1982). *Human Biochemistry*. United Kingdom: Macmillan. Devlin T.M. (2010). *Text book of biochemistry with clinical correlations* (7<sup>th</sup> ed.) Wiley-Liss.

Murray, R., Rodwell, V., Bender, D., Botham, K. M., Kennelly, P. J., Weil, P. A. (2009). *Harper's Illustrated Biochemistry*, 28<sup>th</sup> (ed.) United Kingdom: Mcgraw-hill.

Nelson D.L., Cox, M.M. (2021). *Lehninger Principles of Biochemistry* (8<sup>th</sup> ed), Macmillan Learning

Voet, D., Voet, J.G., Pratt, C.W. (2016). *Fundamentals of Biochemistry: Life at the molecular level*. (5<sup>th</sup> ed.) Wiley.

Zubay G.L. (1998) *Biochemistry* (4<sup>th</sup> ed.) Wm.C Brown Publishers.

**Outcomes**

Students will be able to

- Comprehend various biochemical changes that obey the basic thermodynamic principles
- Understand the biochemical and regulatory process in metabolism and its bioenergetics.
- Apply the knowledge of metabolic pathways to biotechnological and biochemical research
- Gain knowledge on enzymes (biocatalysts), and their salient attributes including unique conformation and amazing catalytic properties.
- Assess the crucial role of hormones in cell signaling and metabolic pathways

Course code: 22BBCAP2	Allied Course		T/P	C	H/W
	Practical II–General Biochemistry		P	2	2
<b>Objectives</b>	<ul style="list-style-type: none"> <li>➤ To understand the importance of cellular Metabolism.</li> <li>➤ To attain hands on experience in enzyme assays</li> <li>➤ To gain knowledge about handling clinical samples and to analyze various biochemical parameters.</li> </ul>				
<ol style="list-style-type: none"> <li>1. Estimation of glucose by Benedict’s titrimetric method</li> <li>2. Estimation of protein by Biuret method</li> <li>3. Quantitative analysis of aminoacids by Ninhydrin method</li> <li>4. Estimation of specific activity of amylase.</li> <li>5. Assay on the effect of pH on enzyme activity</li> <li>6. Assay the effect of temperature on activity of salivary amylase</li> </ol>					
<b>Reference and Textbooks:-</b>					
<b>Text Books:</b>					
Chatterjea, M.D., Rana, S., Venkatesh, T., Kambli, V.B., Sita Devi, C. (2011). <i>Text book of medical biochemistry</i> ,(8 <sup>th</sup> ed.), Jaypee Brothers medical publication					
Jayaraman, J. (2011). <i>Laboratory Manual in Biochemistry</i> . New Age International Private Limited					
Mukherjee, K.L. (2000). <i>Medical laboratory technique</i> (2 <sup>nd</sup> ed,) Tata McGraw-Hill education					
Satyanarayana, U., Chakrapani, U. (2021). <i>Biochemistry</i> (6 th ed.) Elsevier Publications					
<b>Books for Reference</b>					
Burtis C.A., Brun, D.E. (2014). <i>Tietz Fundamentals of Clinical Chemistry and Molecular Diagnostics</i> (7 <sup>th</sup> ed.) W.B. Saunders Publishers.					
Damodaran G. K., Geetha Damodaran, K. (2016). <i>Practical Biochemistry</i> . India: Jaypee Brothers Medical Publishers Pvt. Limited.					
Plummer, D., (2017). <i>An introduction to Practical Biochemistry</i> . (3 <sup>rd</sup> ed.), McGraw Hill Education					
Varley, H. (2005). <i>Practical Clinical Biochemistry</i> (4 <sup>th</sup> ed.), CBS Publishers.					
Wood, E. J. (2012). <i>Practical Biochemistry for Colleges</i> . United Kingdom: Elsevier Science.					
<b>Outcomes</b>	<p>On successful completion of course the students will be able to</p> <ul style="list-style-type: none"> <li>➤ Gain basic knowledge and expertise to work in biochemical and diagnostic laboratories</li> <li>➤ Assess the parameters in clinical samples and understand the basics of metabolism.</li> <li>➤ Understand the principle behind the mechanism of enzymes on human system</li> </ul>				

Course code: 22BBCA3	Allied Course		T/P	C	H/W
	Analytical Biochemistry		T	3	3
<b>Objectives</b>	<ul style="list-style-type: none"> <li>➤ To introduce various techniques to the students which are used in biological research</li> <li>➤ To gain theoretical knowledge in the working principles behind analytical techniques.</li> <li>➤ To impart the experimental skill in the form of practical exercise so that students can execute the techniques in biological research</li> </ul>				
<b>Unit-I</b>	<b>Centrifugation:</b> Basic principles: Sedimentation principle, relative centrifugal force, revolutions per minute, types of rotors; types of centrifuges: Ultracentrifuge – Preparative and analytical, Density gradient centrifugation; Differential gradient centrifugation.				
<b>Unit-II</b>	<b>Chromatography:</b> General principles – column, paper and thin layer chromatography – HPTLC, HPLC, ion exchange, Gas liquid and size exclusion chromatography Application and selection of chromatography method for biology.				
<b>Unit-III</b>	<b>Electrophoresis:</b> Basic principle of electrophoresis: paper electrophoresis, polyacrylamide gel electrophoresis. SDS-PAGE- electrophoresis and their applications. Agarose gel electrophoresis and its applications.				
<b>Unit-IV</b>	<b>Spectrophotometry:</b> Basic principle of electromagnetic radiation energy, wavelength, wavenumber and frequency, absorption and emission spectra, Beer-Lambert law and its limitations, Extinction coefficient. UV and visible absorption spectroscopy – principle, instrumentation and biochemical applications of spectrophotometers. Principle and Application of spectrofluorimetry.				
<b>Unit-V</b>	<b>Nuclear chemistry:</b> Radio isotopes, units of radio activity, half life, $\beta$ and $\gamma$ - emitters. Detection and measurement of radioactivity - Methods based upon ionization– GM counter, excitation– Scintillation counter, Autoradiography. Biological hazards of radiation and safety measures in handling radio isotopes.				
<b>Reference and Textbooks:-</b>					
<b>Text Books:</b>					
Asokan, P. (2006). <i>Basics of Analytical Biochemical Techniques</i> , Chinna Publications.					
Upthayay, A. (2020). <i>Biophysical chemistry – Principles and Techniques (3<sup>rd</sup> ed.)</i> . Himalaya Publishers.					
<b>Books for Reference:</b>					
Katoch R. (2011). <i>Analytical Techniques in Biochemistry and Molecular Biology</i> . Springer					
Robinson, J.W., Skelly Frame, E.M., Frame II, G.M. (2004). <i>Undergraduate Instrumental Analysis</i> . CRC Press.					
Vijayalakshmi, M.A. (2002) <i>Biochromatography Theory and Practice</i> . CRC Press.					
Wilson K., Walker, J. (2000) <i>Practical Biochemistry (5<sup>th</sup> ed.)</i> Cambridge University Press.					
Wilson, K., Goulding, K.H. (1992). <i>A biologist's Guide to Principles and Techniques of Practical Biochemistry</i> . Cambridge University Press.					
<b>Outcomes</b>	<p>On successful completion of the course the students will</p> <ul style="list-style-type: none"> <li>➤ Have a strong analytical background on techniques involving biomolecular identification and separation.</li> </ul>				

	<ul style="list-style-type: none"><li>➤ Understand the principle and application of centrifugation techniques</li><li>➤ Be able to understand the various spectroscopic techniques and their application in biochemistry.</li><li>➤ Gain knowledge on principles and applications of different chromatography techniques</li><li>➤ Understand the principle and application of electrophoresis for various biomolecules.</li><li>➤ Acquire knowledge on types of radiation, detection methods and its biological hazards</li></ul>
--	--

Course code: 22BBCAP3	Allied Course		T/P	C	H/W
	Practical III- Analytical Biochemistry		P	2	2
<b>Objectives</b>	➤ To analyze the biochemical components from the biological samples ➤ Acquire analytical and hands on skills to perform research in the area of Biochemistry.				
	<ol style="list-style-type: none"> <li>1. Verification of Beer – Lambert’s Law</li> <li>2. Qualitative Analysis of Biomolecules               <ol style="list-style-type: none"> <li>A. Qualitative Analysis of Carbohydrates                   <ul style="list-style-type: none"> <li>• Monosaccharide’s :- Pentose, Glucose, Fructose, Mannose</li> <li>• Disaccharides : - Sucrose. Maltose, Lactose</li> <li>• Polysaccharides :- Starch, Dextrin and Glycogen</li> </ul> </li> <li>B. Qualitative Analysis of Lipids</li> <li>C. Qualitative Analysis of Amino acids and Proteins                   <ul style="list-style-type: none"> <li>• Aliphatic :- Histidine, Arginine, &amp;Proline</li> <li>• Aromatic:- Tyrosine, Tryptophan, Phenylalanine</li> <li>• Sulphur containing aminoacids:- cystine, cysteine &amp; methionine</li> </ul> </li> </ol> </li> <li>3. Biochemical Preparation               <ol style="list-style-type: none"> <li>i. Starch from Potato</li> <li>ii. Casein from Milk</li> </ol> </li> <li>4. Separation of Amino Acids by Circular Chromatography</li> </ol>				
	<p><b>Text Books and Reference Books</b></p> <p><b>Text Books</b></p> <p>Anand, C. (2014). Instrumental methods of Analysis. Himalaya Publishing house - ISBN : 978- 93-5142-088-0 2.</p> <p>Damodaran, G.K. (2016). <i>Practical Biochemistry</i>. Jaypee Brothers Medical Publishers Pvt. Limited</p> <p>Jain, A., Jain, R., Jain S. (2020). <i>Basic Techniques in Biochemistry, Microbiology and Molecular Biology Principles and Techniques</i>. Springe</p> <p>Jayaraman, J. (1981). <i>Laboratory Manual in Biochemistry</i>. New Delhi: New Age International (Pvt.) Ltd. Publishers</p> <p>Walker, W. (2018). <i>Wilson and Walker's Principles and Techniques of Biochemistry and Molecular Biology</i>. Cambridge University Press - ISBN: 9781316677056</p> <p><b>Reference Books</b></p> <p>Bernard J.White, J. F. (2015). Biochemical Techniques - Theory And Practice. CBS Publishers &amp; Distributors.</p> <p>Bhowmik, G., Bose, S. (2011). <i>Ana Techniqs in Biotechnology</i>. Tata</p>				

	<p>McGraw-Hill education.</p> <p>Dua, S. (2010). <i>Biochemical Methods of Analysis: Theory and Applications</i>. Narosa - ISBN-10 : 1842655906 / ISBN-13 : 978-1842655900</p> <p>Rajan, S., Christy, R.S. (2018). <i>Experimental Procedures in Life Sciences</i>. CBS Publishers &amp; Distributors Pvt Ltd.</p> <p>Sengar, R.S. (2014). <i>Laboratory Manual of Biochemistry Methods and Techniques</i>. New India Publishing Agency</p>
<b>Outcomes</b>	<p>On successful completion of course students will</p> <ul style="list-style-type: none"> <li>➤ Gain knowledge in handling the biological samples</li> <li>➤ Be able to assay the biomolecules using UV-Visible spectroscopy</li> <li>➤ Be able to qualitatively detect carbohydrates, lipids and amino acid in the biological samples</li> <li>➤ Obtain analytical skills in separating samples (amino acids) using paper chromatography</li> </ul>

Course code: 22BBCA4	Allied Course		T/P	C	H/W
	Diagnostic Biochemistry		T	3	3
<b>Objectives</b>	<ul style="list-style-type: none"> <li>➤ To develop basic skill in sample collection and handling of biological samples</li> <li>➤ To understand the various diagnostic procedures and biochemical parameters</li> </ul>				
<b>Unit-I</b>	Specimen collection and processing (Blood, urine, feaces), use of anti-coagulants and preservatives for blood and urine. Transport of Clinical Samples. Units of measurements of solutes in solution, e.g. Normality, Molality, Molarity, Osmolarity, Ionic strength. Osmosis and its application - Isotonic solution, hyper and hypotonic solution				
<b>Unit-II</b>	<b>Enzymes:</b> Acid phosphatases, LDH, CPK, Hormones- T3, TSH, LH. Immunoglobulins- IgA, IgM, IgE				
<b>Unit -III</b>	<b>Serodiagnostic procedures-</b> Precipitation tests, Agglutination test, VDRL test, Vidal test, (Slide and tube method) , Complement fixation test, skin test- Montaux test, Lepramin test.				
<b>Unit -IV</b>	Clinical chemistry tests: Blood sugar level - hypo, hyper glycemia, Diabetes mellitus, types – GTT. Metabolism of Bilirubin- Jaundice - types differential diagnosis and liver function tests. Renal functional test - clearance test - Urea, Creatinine, Inulin, PAH test, concentration and dilution test. Gastric functional tests - collection of gastric contents, examination of gastric residues, FTM stimulation test, tubeless gastric analysis.				
<b>Unit- V</b>	Blood bank, blood group and Rh factor, Coomb's test, Coagulation studies, Prothrombin test (PT), Partial PT, Plasma fibrinogen. Test for amino acidurias, Test for phenyl ketonuria, Test for keto acids.				
<b>Reference and Textbooks:-</b>					
Text Books					
Ahmed, N. (ed.) (2016). <i>Clinical Biochemistry</i> . United Kingdom: Oxford University Press.					
Chawla, R. (2014). <i>Practical Clinical Biochemistry: Methods and Interpretations</i> . India: Jaypee Brothers Medical Publishers Pvt. Limited.					
Chawla, R. (2014). <i>Practical Clinical Biochemistry: Methods and Interpretations</i> . India: Jaypee Brothers Medical Publishers Pvt. Limited.					
Rifai, N. (2019). <i>Tietz Fundamentals of Clinical Chemistry and Molecular Diagnostics</i> . United States: Elsevier - Health Sciences Division.					
Shinde, R., Chatterjea, M. (2011). <i>Textbook of Medical Biochemistry</i> . (8 <sup>th</sup> ed.). India: Jaypee Brothers Medical Publishers Pvt. Limited.					
Varley, H. (2006). <i>Practical Clinical Biochemistry</i> . (6 <sup>th</sup> ed.) India: CBS Publishers & Distributors.					
<b>Books for reference</b>					
Devlin, T.M. (2011). <i>Textbook of Biochemistry with Clinical Correlations</i> . United Kingdom: Wiley					
Litwack, G. (2021). <i>Human Biochemistry</i> . Netherlands: Elsevier Science.					
Murphy, M. J., Srivastava, R., Deans, K. (2018). <i>Clinical Biochemistry: An Illustrated Colour Text</i> . United Kingdom: Elsevier Health Sciences.					

Srivastava, R., Murphy, M., Cowan, R. A., Gaw, A., O'Reilly, D. S. J. (2013). *Clinical Biochemistry E-Book: An Illustrated Colour Text*. United Kingdom: Elsevier Health Sciences.

Zilva, J., Pannall, P. R. (1994). *Clinical Chemistry, Diagnosis and treatment*, (7<sup>TH</sup> ed.). PG Publishing Pvt. Ltd. Wallach, J. (1982). *Interpretation of Diagnostic test – A Synopsis*, (5<sup>th</sup> ed.) Little Brown and Company

**Outcomes**

On successful completion of the course the students will

- Attain the skill to handle the biological samples carefully and process it according to analysis
- Understand the significance of marker enzymes in disease diagnosis
- Gain insights on immunological tests related to infectious disease diagnosis
- Gain knowledge on biochemical test used to diagnose disorders of Liver, kidney and GIT
- Understand Blood grouping, blood clotting pathways and the blood clotting disorders

Course code:	Core Course	T/P	C	H/W
22BBCAP4	Practical IV–Diagnostic Biochemistry	P	2	2
<b>Objectives</b>	<p>➤ To analyze the normal and abnormal values of biochemical parameters in biological samples</p> <ol style="list-style-type: none"> <li>1. Separation of Blood and Serum</li> <li>2. Estimation of proteins from serum by Lowry Method</li> <li>3. Estimate the following constituents in Blood and Serum               <ol style="list-style-type: none"> <li>a. Blood Urea</li> <li>b. Blood Sugar</li> <li>c. Blood Cholesterol</li> </ol> </li> <li>4. Urine Quantitative Analysis / Normal / Abnormal Constituents               <ol style="list-style-type: none"> <li>a. Estimation of Urea in Urine</li> <li>b. Estimation of Creatinine in Urine</li> <li>c. Estimation of Chloride in Urine</li> <li>d. Determination of titrable acidity in Urine</li> </ol> </li> <li>5. Separation of serum protein by SDS PAGE</li> </ol>			
<b>Reference and Textbooks:-</b>				
<b>Text Books</b>				
Chawla, R. (2014). <i>Practical Clinical Biochemistry: Methods and Interpretations</i> . India: Jaypee Brothers Medical Publishers Pvt. Limited.				
Jayaraman, J. (2004). <i>Laboratory Manual in Biochemistry</i> . India: New Age International (P) Limited Publishers.				
Maheshwari, N. (2008). <i>Clinical Biochemistry</i> . India: Jaypee Brothers Medical Publishers Pvt. Limited.				
Manickam, A., Sadasivam, S. (2007). <i>Biochemical Methods</i> . India: New Age International (P) Limited.				
Varley, H. (2006). <i>Practical Clinical Biochemistry</i> . (6 <sup>th</sup> ed.) India: CBS Publishers & Distributors.				
<b>Books for Reference</b>				
Devlin, T.M. (2011). <i>Textbook of Biochemistry with Clinical Correlations</i> . United Kingdom: Wiley.				
Hasnain, S. E., Talwar, G. P., Sarin, S. K. (2015). <i>Textbook of Biochemistry, Biotechnology, Allied and Molecular Medicine</i> . India: Prentice Hall India Pvt., Limited				
Hofmann, A., Walker, J.M., Wilson, K., Clokie, S. (2018). <i>Wilson and Walker's Principles and Techniques of Biochemistry and Molecular Biology</i> . United Kingdom: Cambridge University Press.				
Murphy, M. J., Srivastava, R., Deans, K. (2018). <i>Clinical Biochemistry: An Illustrated Colour Text</i> . United Kingdom: Elsevier Health Sciences.				
Shivaraja. S.Y.M., Ganesh. M.K., Shivashankara. A.R. (2008). <i>Laboratory Manual for Practical Biochemistry</i> . India: Jaypee Brothers Medical Publishers Pvt. Limited.				
<b>Outcomes</b>	On successful completion of course the students will be able to			

	<ul style="list-style-type: none"><li>➤ Analyze the abnormalities in the constituents of urine and Serum, sample collection and handling.</li><li>➤ Demonstrate various methods to assess the parameters in clinical samples and to understand the basics of metabolism.</li><li>➤ Acquire basic knowledge and expertise to work in biochemical and diagnostic laboratories</li></ul>
--	---