MARIS STELLA COLLEGE (AUTONOMOUS), VIJAYAWADA-8

(Affiliated to Krishna University, Machilipatnam)

SYLLABUS

Subject: Biochemistry Course Title: Biomolecules No. of Hrs:60 LTP:400

Semester: I Course Code:20BCCCBM13 Credits :3

Objectives

- To acquire knowledge of the biological importance of water, pH, and buffers found in living cells
- To impart basic knowledge of biomolecules and their importance in biological systems
- To prepare solutions, buffers, and dilutions

Course Outcomes

- **CO1:** Represent the biomolecules in structural form
- **CO2:** Explain the classification of biomolecules
- CO3: Outline the Physico-chemical properties of biomolecules
- CO4: Explain the importance of biomolecules in living organisms

Unit I: Biophysical Concepts

Basic Classification of biomolecules, Water as a biological solvent and its role in industrial and biological processes. laboratory grade water, Total dissolved salts (TDS), The biological relevance of pH, measurement of pH, Handerson Hasselbalch equation. Buffers-Importance of buffers in biological systems.

Unit II: Carbohydrates

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. Glycosides, Structure and biological importance of disaccharides (sucrose, lactose, maltose) Structural polysaccharides (cellulose, chitin, pectin), storage

(10hrs)

(10hrs)

polysaccharides (starch, glycogen). Glycosaminoglycans, and Blood group substances. Galactomannans and their applications in modern foods.

Unit – III: Lipids

Lipids: Classification, saturated and unsaturated fatty acids, structure and properties of fats and oils (acid, saponification and iodine values, rancidity). General properties of phospholipids.

Prostaglandins- structure, types, and biological role. Lipoproteins- types, and functions. Biomembranes- Membrane composition and organization - Fluid mosaic model. Formation of micelles, bilayers, vesicles, and liposomes.

Unit IV: Amino Acids

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

Unit V: Proteins:

Proteins: Classification based on solubility, shape, and function. Determination of the amino acid composition of proteins. General properties of proteins, denaturation, and renaturation of proteins. Structural organization of proteins-primary, secondary, tertiary, and quaternary structures (e.g., Haemoglobin and Myoglobin), forces stabilizing protein structures. Outlines of protein sequencing. Ramachandran -plot.

Skill/Hands-on

Schematize the structures

Co-curricular Activities Textbooks

- Class Test
- Quiz
- Assignment

Prescribed Textbooks

1. Biochemistry 3rd Edition2006 by Satyanarayana, Chakrapani.

(10hrs)

(10hrs)

(10 hrs.)

(10hrs)

- 2. Outlines of Biochemistry, 5th Edition by E E Conn, PK Stumpf 693. John Wiley and Sons, New York. 1987
- 3. Leininger Principles of Biochemistry SEVENTH EDITION David L. Nelson Madison Michael M. Cox

Reference Textbooks

- 1. Proteins: A guide to study by physical & chemical methods, Haschemeyer and Haschemeyer,
- 2. Proteins: Structure, function, and evolution. Dickerson & Geis, 2nd Edn Benjamin/Cummings.
- 3. Fundamentals of Biochemistry by Donald Voet
- 4. Principles of Biochemistry White-A, Handler, Pand Smith E.L. Mc Grew Hill.

Subject: Biochemistry Semester: I Course Title: Qualitative Analysis -Practical No. of Hrs:30 LTP: 002 Credits:2

Objectives

- To explain to the student about Biosafety and good laboratory practices (GLP) to work in the laboratory,
- To impart knowledge on the principles, procedures, and calculations
- To identify biomolecules by qualitative Tests
- To Understand Handling of pH meter. Weighing machine.

Course outcomes

- **CO1:** Gain of knowledge for preparing all the reagents, buffer, and solutions by themselves
- CO2: Analysis of biological or non-biological sample biomolecules
- **CO3:** Identification of its chemical composition of Biomolecules

List of Experiments:

- Preparation of standard solutions by calculation of Normality, Molarity, and making dilutions.
 Preparation of buffers (acidic, neutral, and alkaline), and determination of pH.
- 2. Qualitative identification of carbohydrates- glucose, fructose, galactose ribose/xylose, maltose, sucrose, lactose, starch/glycogen.
- 3. Qualitative identification of amino acids-histidine, tyrosine, tryptophan, cysteine, and arginine.
- 4. Qualitative Identification of lipids- solubility, saponification, Acrolein, Bromine test (Unsaturation), Salkowski test.
- 5. Determination of lodine Number of oils.
- 6. Estimation of Cholesterol by Zak's method,
- 7. Estimation of total sugars by Anthrone method.
- 8. Estimation of amino acid by the Ninhydrin method.

Prescribed Text Books

- 1. Experimental Biochemistry: A Student Companion by Beedu Sashidhar Rao, Vijay Deshpande.
- 2. An introduction to practical biochemistry. David T. Plummer, Tata Mac Grew-Hill. Practical Biochemistry – J. Jayaraman, 2nd Edition.
- Biochemical calculations Seigel, IH, 2nd Edit, John Wiley & Sons Inc., 1983.

Reference Text Books

- 1. Principles and Techniques of Practical Biochemistry. Eds. Williams and Wilson.
- Techniques in Molecular biology Ed. Walker & Gastra, Croom Helm, 1983.
- 3. Principles of instrumental analysis, 2nd Ed, Holt-Sanders, 1980.
- 4. An introduction to spectroscopy for Biochemistry. Ed. Brown S.N., Academic press.
- 5. Analytical Biochemistry, Holmes, and Hazel peck, Longman, 1983.
- 6. Biophysical chemistry, Edsall & Wyman, Academic press Vol. II & I.

SYLLABUS

Subject: Biochemistry Semester: II **Course Title: Biophysical Techniques** Course Code:20BCCCBT23 & Microbiological Methods No. of Hrs:60 LTP:400

Objectives

- To impart knowledge about biological significance and structures of Nucleic Acids
- To incorporating theoretical and practical knowledge of principles and working of analytical instrumentation.
- To know the usage of Instrumentation for analyzing/Separation of biochemically active compounds.

Course Outcomes

- **CO1:** Explain the different types and construction of different biophysical Instruments
- **CO2:** Summarize the principles of biophysical Instruments and microbiological methods
- **CO3:** Describe different biophysical techniques and microbiological methods
- **CO4:** Apply Biophysical techniques and Microbiological Methods for identification of sample

Unit-I: Nucleic Acids and Porphyrins

General Structure of nucleotides. nucleosides, purines, and pyrimidines, Nucleic acids - Structure and types of DNA and RNA. Watson-Crick DNA double helix structure, biological importance Hydrolysis of nucleic acids. formation of phosphodiester bonds, Introduction to circular DNA, supercoiling, Denaturation of nucleic acids hyperchromic effect, Tm-values, and their significance.

Structure of porphyrins, protoporphyrin, porphobilinogen Properties, Identification of Porphyrins, Metalloporphyrins-heme, Cyanocobalamin and chlorophylls.

(10hrs)

Credits3

Unit-II: Centrifugation and Electrophoresis techniques

Methods of tissue homogenization: (Potter-Elvejham, mechanical blender, sonicaton, and enzymatic). Centrifugation techniques- principles, and applications- differential, density gradient. Ultra-centrifugation- preparative and analytical.

Electrophoresis- principles and applications of paper, polyacrylamide (native and SDS) and agarose gel electrophoresis, isoelectric focusing, immune-electrophoresis-types, and applications.

Unit-III: Chromatographic techniques

Types of chromatographic techniques, Principle and applications - Paper chromatography-solvents, Rf value, applications; Thin layer chromatography-principle, choice of adsorbent and solvent, Rf value, applications;

Gel filtration, Ion-exchange- Chromatography applications, separation of metal ions, Affinity chromatography.

Unit-IV: Spectroscopy and tracer techniques

Electromagnetic radiation, Beer-Lambert's law. Colorimetry and Spectrophotometry, spectrofluorimetric, flame photometry.

Tracer techniques: Radioisotopes, units of radioactivity, half-life, β , and γ - emitters, use of radioactive isotopes in biology.

Unit-V: Microbial techniques:

Microscopy: Basic principles of light microscopy, phase contrast, electron microscope, and fluorescent microscope and their applications. Preparation of different growth media, isolation and culturing and preservation of microbes.

Gram's staining- Gram-positive and Gram-negative bacteria, Flagellar staining for motility and Endospore staining, Sterilization Techniques-Physical methods, chemical methods, radiation methods, ultrasonic and. Antibiotic resistance.

Skill / Hands-on

- Schematize the structures of Nucleic acids
- Isolations of biologically relevant compounds.
- Different separation techniques for analysing biologically active compounds
- Basic microbial Techniques -Sterilization techniques, medium preparation

Co-curricular Activities:

- Structure practicing sessions
- Class Tests
- Quiz
- Assignment

(10hrs)

(10hrs)

(10hrs)

(10hrs)

(10hrs)

Prescribed Textbooks

- 1. Textbook of Biophysical Chemistry Nath & Upadhyaya., Himalaya publications
- 2. Leininger Principles of Biochemistry, Seventh edition David L. Nelson Madison Michael M. Cox.
- 3. Outlines of Biochemistry, 5th Edition by E E Conn, PK Stumpf 693. John Wiley and Sons, New York. 1987
- Biochemistry Prof. U. Satyanarayana, 3rd revised Edition:2006, Arunabha Sen, books and allied (P)Ltd, 8/1Chintamoni Das Iane, Kolkata 700009.

Reference Textbooks

- 1. Biochemistry by L. Steyer (1995) W.H. Freeman Press, San Francisco, USA. 4.
- 2. Biochemistry, by Voet. D. and Voet, J.G. (2004). 3rd Edition, John Wiley & Sons, Inc. USA.

Subject: Biochemistry		Semester: II	
Course Title: Biophys	ical Techniques	Course Code: 21BCP2BT22	
- Practical			
Date		Max. Marks: 50	
Time: 30 Hrs.	LTP: 002	Credits: 2	

Objectives

- To explain to the student about the Biosafety and good laboratory practices (GLP) to handle instrumentation.
- To impart the knowledge on the principles, procedure, and calculations
- To identify a mixture of components
- To understand the principles and Handling of instrumentation.

Course Outcomes

- **CO1:** Analyse the biomolecules using analytical techniques
- **CO2:** Test the biologically relevant samples by isolation techniques and identification methods.
- **CO3:** Evaluate of biological relevant samples

List of Practical

- 1. Separation of amino acids by circular paper chromatography.
- 2. Separation of plant pigments by TLC
- 3. Separation of serum proteins by paper electrophoresis.
- 4. Isolation of casein from milk.
- 5. To verify Lambert beer 's law for $K_2Cr_2O_7$ using colorimeter.
- 6. Absorption spectra of nucleic acids- DNA using spectrophotometer
- 7. Gram Staining Procedure
- 8. Hanging Drop Method

Prescribed Textbooks

1. Experimental Biochemistry: A Student Companion by Beedu Sashidhar Rao, Vijay Deshpande.

- 2.An introduction to practical biochemistry. David T. Plummer, Tata Mac Grew-Hill. Practical Biochemistry – J. Jayaraman, 2nd Edition.
- Biochemical calculations Seigel, IH, 2nd Edit, John Wiley & Sons Inc., 1983.

Reference Textbooks

- 1.Principles and Techniques of Practical Biochemistry. Eds. Williams and Wilson.
- 2.Techniques in Molecular biology Ed. Walker &Gastra, Croom Helm, 1983.
- 3. Principles of instrumental analysis, 2nd Ed, Holt-Sanders, 1980.
- 4. An introduction to spectroscopy for Biochemistry. Ed. Brown S.N., Academic press.
- 5. Analytical Biochemistry, Holmes, and Hazel peck, Longman, 1983.
- 6. Biophysical chemistry, Edsall & Wyman, Academic press Vol. II & I.

MARIS STELLA COLLEGE (AUTONOMOUS), VIJAYAWADA - 8

(Affiliated to Krishna University, Machilipatnam)

SYLLABUS

Subject: Biochemistry	Semest	ter: III
Course Title: Enzymology	Course	Code:20BCCCIM33
& Intermediary Metabolism	1	
No. of Hrs:60	LTP:400	Credits:3

Course objectives

- To understand the concepts of enzymes and enzyme-substrate reactions.
- To impart basic knowledge about the bioenergetics and energy transformations of living organisms.
- To provide information on metabolic processes undergone by the biomolecules
- To emphasize the importance of the metabolism of biological systems

Course outcomes:

- CO1: Explain the physiological importance of enzymes and their role in metabolism
- **CO2:** Summarize the concepts of thermodynamics and energy transformations in metabolism.
- **CO3:** Outline the metabolism of different biomolecules.
- **CO4:** Explain the pathophysiology of metabolic diseases

Unit-I: Enzymology

(10 hrs.)

Introduction to Biocatalysts, differences between chemical and biological catalysis. Nomenclature and classification of enzymes. Fundamentals of enzyme assays, enzyme units. Definition- holoenzyme, apoenzyme, cofactors, active site, enzyme specificity. Activation energy, transition state theory. Outlines of the mechanism of enzyme action - Interaction between enzyme and substrate-lock and key and induced fit models. Michaelis -Menten equation, Significance of Km and Vmax Enzyme inhibition (Reversible and Irreversible). Factors affecting enzyme activity (temperature, pH, enzyme. and substrate concentration). Commercial application of enzymes.

Unit- II: Bioenergetics and Biological oxidation (10 hrs.)

Bioenergetics: Thermodynamic principles – Chemical equilibrium; free energy, enthalpy (H), entropy (S). Free energy change in biological transformations in living systems; High energy compounds -ATP. Organization of electron transport Chain. Oxidative phosphorylation- inhibitors of oxidative phosphorylation.

Unit-III: Carbohydrate Metabolism (10 hrs.)

Overview of metabolism- Glycolytic pathway, anaplerotic reactions of Citric Acid Cycle. Pentose Phosphate Pathway, Glycogenolysis, and glycogenesis, Gluconeogenesis with energy yields. Disorders of carbohydrate metabolism- Diabetes Mellitus. Photosynthesis- Light and Dark reactions.

Unit-IV: Amino acid and Lipid Metabolism

General reactions of amino acid metabolism- transamination, decarboxylation and deamination, Biosynthesis of creatine. Disorders of aromatic and branched-chain amino acid metabolism, phenylketonuria, maple syrup urine disease. β - oxidation of fatty acids, Biosynthesis of triacylglycerol, disorders of lipid metabolism- Gaucher disease.

(10 hrs.)

(5hrs.)

(5hrs.)

Unit-V: Metabolism of Nucleic acid and porphyrin (10 hrs.)

Biosynthesis and regulation of purine and pyrimidine nucleotides - De novo synthesis, Catabolism of purines and pyrimidines, Haem biosynthesis degradation, Disorders of nucleotide and porphyrin metabolism- Gout, and porphyria.

Skill / Hands-on

Schematize the metabolic reactions

- Calculation of Energy transformations
- Connecting different metabolisms to the TCA cycle

Co-curricular Activities:

- Metabolic reaction structures practicing sessions
- Assignments on metabolic disorders
- Drawing chart for whole Intermediary metabolism

Prescribed Textbooks

- 1. Biochemistry 3rd Edition2006 by Satyanarayana, Chakrapani4th revised Edition
- 2. Biochemistry (2012) 7th ed., Berg, J.M., Tymoczko, J.L., and Stryer L., W.H. Freeman and Company (New York), ISBN:10:1-4292-2936-5, ISBN:13:978-1-4292-2936
- Lehninger: Principles of Biochemistry (2013) 6th ed., Nelson, D.L. and Cox, M.M., W.H. Freeman and Company (New York), ISBN:13:978-1-4641-0962-The biochemistry of Nucleic acids; Adams et al., Chapman and Hall, 1986.
- 4. Outlines of Biochemistry, 5th Edition by E E Conn, PK Stumpf 693. John Wiley and Sons, New York. 1987

Reference text Books

- Textbook of Biochemistry with Clinical Correlations (2011) 7th ed., Devlin, T.M., John Wiley & Sons, Inc. (New Jersey), ISBN:978-0-470-28173-4.
- 2. Biochemistry, A problem Approach, 2nd Edn. Wood, W.B. Addison Wesley 1981.
- 3. Principles of Biochemistry White-A, Handler, Pand Smith E.L. Mc Graw Hill.

MARIS STELLA COLLEGE (AUTONOMOUS), VIJAYAWADA - 8

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SYLLABUS

Subject: BiochemistrySemester: IIICourse Title: Enzymology-PracticalCourse Code:20BCP3EN32No. of hours: 30LTP 002Credits: 2

Course objectives

- Learn the various Enzymes assays
- Quantitation of biologically important parameters.

Course outcomes

After completion of the practical, students will be able to

CO1: perform assays for different enzymes

CO2: Examine the different biologically important parameters.

- 1. Assay of amylase.
- 2. Assay of urease.
- 3. Assay of catalase
- 4. Effect of pH, the temperature on enzyme activity.
- 5. Effect substrate concentration on enzyme activity.
- 6. Estimation of Haemoglobin by Cyanmethemoglobin method.
- 7. Estimation of Urea by Diacetyl Monoxime (DAM) Method
- 8. Estimation of Blood Glucose by DNS method.

Prescribed Textbook

- 1. Experimental Biochemistry: A Student Companion by Beedu Sashidhar Rao, Vijay Deshpande.
- Wilson and Walker's Principles and Techniques of Biochemistry and Molecular Biology. Andreas Hoffman and Samuel Cloekie.
- 3. An introduction to practical biochemistry. David T. Plummer, Tata Mac Grew-Hill.

Reference Textbook

- 1. Analytical Biochemistry, Holmes, and Hazel peck, Longman, 1983.
- 2. A textbook of quantitative inorganic analysis including elementary instrumental analysis, Vogel ELBS.

MARIS STELLA COLLEGE (AUTONOMOUS), VIJAYAWADA

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SYLLABUS

Subject: Biochemistry Course Title: Physiology, Nutrition & Clinical Biochemistry Semester: IV Course Code: 20BCCCCB43

No. of Hours: 60 LTP: 400

Objectives

- To understand the concepts of Physiological systems
- To acquire basic knowledge about the serological tests
- To impart knowledge of nutritional requirements
- To emphasize the importance of the Hormones of biological systems

Course Outcomes

CO1: Describe different components of blood, and different Physiological systems

- CO2: Classify the Physiological systems and Hormones based on functions
- **CO3:** Explain the details of nutrient requirements for functioning of various physiological systems
- CO4: Understand the pathophysiology of different organs in health and disease

UNIT – I: Digestion and Blood

Digestion and absorption of carbohydrates, lipids, and proteins. Role of enzymes and gastrointestinal hormones in digestion.

Composition of the blood, Blood groups, coagulation of blood, and disorders of blood coagulation (haemophilia). Haemoglobin and transport

of gases in the blood (oxygen and CO₂). Types of anaemias, hemoglobinopathies - sickle cell anaemia.

UNIT – II: Excretory System and Musculoskeletal System (10 Hrs.)

Muscles - types of muscles, Organization, of the skeletal system, Structure of bone, and mechanism of muscle contraction.

Introduction to excretory system Organization of kidney, Structure, and functions of the nephron, Urine formation, Role of kidneys in maintaining acid-base and electrolyte balance in the body.

(10 Hrs.)

Credits: 3

UNIT - III: Nervous System and Endocrinology

Introduction to the nervous system, the general organization of a nervous system, Neurons -structure, types, properties and functions; Neurotransmitters, Reflex -types, Endocrinology - organization of the endocrine system. Classification of hormones. Outlines of chemistry, physiological role, and disorders of hormones of, pituitary, hypothalamus. thyroid, parathyroid, and Introduction of gastrointestinal hormones. Mechanism of hormonal action (outlines).

UNIT - IV: Nutritional Biochemistry

Balanced diet. Calorific values of foods and their determination by bomb calorimeter. BMR and factors affecting it. The specific dynamic action of foods. Energy requirements, Sources of complete and incomplete proteins. The biological value of proteins. Malnutrition - Kwashiorkor, Marasmus, and PEM.

Vitamins - sources, structure, biochemical roles, deficiency disorders of water - and fat -soluble vitamins. Introduction to nutraceuticals and functional foods. Bulk and trace elements -Ca, Mg, Fe, I, Cu, Mo, Zn, Se, and F.

UNIT – V: Clinical Biochemistry

Plasma proteins in health and disease. Serum lipids and lipoproteins. Liver function tests - conjugated and total bilirubin in serum, albumin: globulin ratio, Serum enzymes in liver diseases -SGOT, SGPT, GGT, CPK, Acid, and alkaline phosphatases. Normal and abnormal constituents of urine. Renal function tests -Blood urea, creatinine, GFR, creatinine clearance. GTT and gastric and pancreatic function tests.

Skill / Hands - on (12 Hrs.)

- 1. Schematize the metabolic reactions
- 2. Identification of biologically relevant metabolites
- 3. Calculation of Energy transformations
- 4. Connecting different metabolisms to TCA cycle

(10 Hrs.)

(10 Hrs.)

(10 Hrs.)

Co-curricular Activities

- 1. Schematic models of different Physiological Systems
- 2. Assignments
- 3. Schematic representations through Charts

Prescribed Books

- 1. Biochemistry 3 Edition 2006 by Satyanarayana, Chakrapani 3rd revised.
- 2. Essentials of Food and Nutrition, Vol. I & II, M.S. Swaminathan.
- Text Book of Biochemistry with clinical correlations. Thomas M. Devlin (John Wily).
- 4. Harper's Review of Biochemistry, Murray et al (Longman).
- 5. Biochemical aspects of human disease R.S. Elkeles and A.S. Tavil. (Blackwell Scientific Publications).
- 6. Human Physiology by Chaterjee and Chatterjee

Reference Books

- 1. Guyton and Hall Textbook of Medical Physiology.
- 2. Clinical Biochemistry S. Ramakrishnan and Rajiswami.
- Chemical Biochemistry (Metabolic and clinical aspects) by W.J.Marshall & S.K. Bangert.
- 4. Textbook of clinical Biochemistry by Tietz et al.

MARIS STELLA COLLEGE (AUTONOMOUS), VIJAYAWADA

(Affiliated to Krishna University, Machilipatnam)

SYLLABUS

Subject: BiochemistrySemester: IVCourse Title: Microbiology, Immunology
& Molecular BiologyCourse Code: 20BCCCMB43

No. of Hours: 60

LTP:400

Credits:3

Objectives

- To understand the concepts of different interdisciplinary fields
- To acquire basic knowledge about the Molecular Biology
- To impart knowledge of Immunology
- To provide information on Microbiology
- To emphasize the importance of other applied fields biochemistry

Course Outcomes

CO1: Outline the different interdisciplinary fields

- CO2: Identify the microorganisms involved in different biological processes
- **CO3:** Explain the biological processes
- CO4: Understand the different organisms and biological processes

UNIT – I: Microbiology

(10 Hrs.)

Introduction to microbiology, Introduction to Bergey's Manual of Systematic Bacteriology, Bacterial structure: Cell wall, cell membrane, Flagella, Fimbriae, nucleoid region, growth curve.

Introduction to viruses, plant viruses: Tobacco mosaic virus (TMV), Tomato spotted wilt virus (TSWV), and animal viruses: Retroviruses structure, life cycle (Lytic and Lysogenic)

UNIT – II: Nitrogen Fixation

The Nitrogen cycle, non -biological and biological nitrogen fixation, photosynthesis pigments, Photosystems: I & II, mechanism Nitrogenase system. Utilization of nitrate ion, Ammonia incorporation into organic compounds.

Synthesis of glutamine and regulatory mechanism of glutamine synthase.

(10 Hrs.)

UNIT – III: Applied Biochemistry

Fermentation Technology: Batch, continuous culture techniques, principle, types of fermenters. Pasteur effect. Industrial production of chemicals - alcohol, acids (citric acid), solvents (acetone), antibiotics (penicillin)

Enzyme Technology: Immobilization of enzymes and cells, industrial applications, enzymes in Bioremediation.

UNIT – IV: Immunology

Organs and cells of the immune system. Innate and acquired immunity, Cell-mediated and humoral immunity (T -cells and B -cells). Immunoglobulins, the structure of Ig G . and Epitopes / antigenic determinants. haptens. Adjuvants.

Monoclonal antibodies. Antigen-antibody reactions - Precipitations, agglutination, Complement Fixation. Blood group antigens. Immunodiagnostics - ELISA. Vaccines and their classification: Traditional vaccines live attenuated, dead, modern vaccines recombinant and peptide vaccines. Outlines of hypersensitivity reactions.

Unit- V: Molecular biology

DNA replication, transcription, and repair leading and lagging strands, Okazaki fragments, inhibitors of DNA replication.

Protein synthesis - Genetic code, translation, inhibitors of protein synthesis. Outlines of cloning technology, plasmids, vectors, restriction enzymes, PCR, applications of cloning in agriculture, industry, and medical fields.

Skill / Hands on

- 1. Memorize the Genetic code of all 20 amino acids
- 2. Identification of the genetic basis of a particular blood group
- 3. Immobilization techniques of cell and Enzymes
- 4. Charts showing Connecting the lysogenic and lytic cycles of viral replication

Co-curricular Activities

- 1. Schematic models of DNA replication, protein synthesis process
- 2. Assignments
- 3. Schematic representations through Charts

(10 Hrs.)

(10 Hrs.)

(10 Hrs.) ki

(10 Hrs.)

Prescribed Textbooks

- 1. Immunology And Medical Microbiology, R.P. Singh 2019, Kalyani Publishers
- 2. Industrial Microbiology L. E. Casida ,J. R., New Age International Publishers.

Reference text Books

1. Bergey's Manual of Systematic Bacteriology Vlumes 1 -5

2. Roitt's Essential Immunology, 12th Edition ,2011Peter J. Delves & Seamus J Martin

& Dennis R. Burton & Ivan M. Roitt., Wily Blackwell.

3.Kubey ,7th Edition, Judith A. Owen ,Jenni Punt ,Sharon A. ,Patricia P. Jones Stanford University, W. H. Freeman and Company • New York

4. Essentials of Molecular Biology, David Freiffelder, Narosa Publishing house New Delhi, 1990.

SYLLABUS

Subject: Biochemistry Course Title: Clinical Biochemistry – Practical No. of Hours: 30 LTP: 002

Semester: IV Course Code: 20BCP4CB42 Credits: 2

Objectives

- To Learn LFT, RFT, and determination of biological components
- perform biochemical tests,

Course Outcomes

CO1: Diagnose and monitor diseased conditions

CO2: Examine to compare the normal versus diseased condition

List of Experiments

- 1. Determination of vitamin C by 2, 6 -dichlorophenol indophenol method.
- 2. Estimation of iron by Wong 's method.
- 3. Urine Analysis of albumin, sugars, and ketone bodies
- 4. Estimation of Serum Albumin-Globulin ratio
- 5. Estimation of serum bilirubin
- 6. Estimation of SGOT(AST), SGPT(ALT), GGT
- 7. Estimation of Serum/Urinary Creatinine
- 8. Determination of Serum Inorganic Phosphorus (Fiske and SubbaRow method)

Prescribed Textbooks

- 1. Varley's Practical Clinical Biochemistry Ed. Alan W. Gowenlock (Heinemann Medical Books, London, 1988).
- 2. An introduction to practical biochemistry. David T. Plummer, Tata Mac Grew Hill.

Reference Book

1. Clinical diagnosis and management by Lab methods (John Bernard Henry, W. B. Salunders Company, 1984).

MARIS STELLA COLLEGE (AUTONOMOUS), VIJAYAWADA - 8

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SYLLABUS

Subject: Biochemistry Course Title: Applied Biochemistry – Practical No. of Hours: 30 LTP: 002 Semester: IV Course Code: 20BCP5AB42 Credits: 2

Course Objectives

- To Learn basic applied biochemical Techniques
- To Enhance Knowledge of Immunochemical Techniques
- To Impart knowledge on the sensitivity of organisms to various antibiotics

Course Outcomes

CO1: Analyse biological samples **CO2:** Understand the different biological processes

List of Practical

- 1. Demonstration of amylase production
- 2. Antibiotic sensitivity by paper disc method.
- 3. Immobilization of enzyme and testing its activity
- 4. Single radial Immunodiffusion Assay -Mancini method
- 5. ABO Blood grouping
- 6. Isolation of plasmid from bacteria
- 7. Demonstration of PCR reaction in a thermal cycler.
- 8. Spotters.

Prescribed Textbooks

- 1. Varley's Practical Clinical Biochemistry Ed. Alan W. Gowenlock (Heinemann Medical Books, London, 1988).
- 2. Wilson and Walker's Principles and Techniques of Biochemistry and Molecular Biology. Andreas Hoffman and Samuel Cloekie.
- 3. An introduction to practical biochemistry. David T. Plummer, Tata Mac Grew -Hill.

Reference Books

1. Clinical diagnosis and management by Lab methods (John Bernard Henry, W.B. Salunders Company, 1984).

SYLLABUS

Subject: Biochemistry		Semester: V/VI
Course Title: Biostatistics		Course Code: 20BCSEC22BS3
No. of Hours:45	LTP:300	Credits: 3

Objectives

- To explain the basic concepts of biostatistics
- To impart knowledge about the concept of hypothesis testing to make a statistical decision
- To enable express their knowledge from a scientific point of view

Course Outcomes

CO1: Apply the principles of biological data management in real-life situations.

CO2: Correlate with the other sciences.

CO3: Understand the nature of variability

CO4: Define some hypothesis testing concepts.

Unit I: Introduction to Biostatistics

Introduction, and terms used in biostatistics, Importance of biostatistics in biological science. statistical analysis methods -Mean, Standard Deviation, Regression, Hypothesis Testing, Sample Size Determination.

Unit II: Sampling techniques

Introduction, sample vs population, types of sampling - Simple Random Sampling, Stratified Random Sampling, Convenience Sampling Quota Sampling, sample size, sampling error, Evaluating information from sample.

Unit III Regression

Introduction, types, Introduction to regression analysis and its use. Parametric tests (z-test, t-test, and F-test) and non-parametric tests (Chi-square test, One-way, and two-way ANOVA)

(9 Hrs.)

(9 Hrs.)

Unit IV Correlation

Introduction, types, Concept of Pearson Correlation, statistical significance. Interpretation of correlation and Regression. - bivariate and multivariate Multivariate Techniques:

Unit V Application of statistical methods

In different fields of Biology, Pharmaceutical sciences, medicine, agriculture, and nutrition. healthcare genetics

Prescribed Text Books

1. Biostatistics: Concepts and Applications for Biologists, 2015, Brian Grad Williams.

- 2. Banerjee PK. Introduction to Biostatistics. S. Chand.
- 3. Rashidi H, Buehler KL. (2005)

4. Principles of Biostatistics, M. Pagano and K. Gauvreau (2000); Duxbury Thomas learnings.

2. Analysis of Biological Data, M. Whitlock and D. Schluter (2009); Roberts and company publishers.

SYLLABUS

Subject: Biochemistry Course Title: Biostatistics - Practical No. of Hours: 45 Hrs. LTP: 003

Semester: V/VI Course Code:20BCP722BS2 Credits: 2

Objectives

- To impart knowledge, make sense of all of that available data.
- To learn basic statistical calculations.

Course Outcomes

CO1: Deriving general laws from small samples.

CO2: Identify data relating to variable/variables.

List of Practical

- 1. Calculation of Mean, Median. Mode and Standard deviation
- 2. Construction of Bar, line, Pie diagram and Histogram
- 3. Problems on Hypothesis testing Z-test, t -test, Chi-square test
- 4. Analysis of data by non-parametric tests
- 5. One-way ANOVA test.

Skill/Hands-on: Field Work/Mini Project

- 1. Training students by industrial/technical experts. Identification of different analysis instruments, their handling, and operational techniques with safety and security.
- 2. Visit nearby Biostatistics organizations and private firms.

Reference Text Books

- 1. Principles of Biostatistics, M. Pagano and K. Gauvreau (2000); Duxbury Thomas learnings.
- 2. Analysis of Biological Data, M. Whitlock and D. Schluter (2009); Roberts and company publishers.

(30 Hrs.)

(15 Hrs.)

SYLLABUS

Subject: Biochemistry Course Title: Clinical Endocrinology No. of Hours: 45 Hrs. LTP:300 Semester: V/VI Course Code: 20BCSEC32CE3 Credits: 3

Objectives

- To instill deeper knowledge on biochemical aspects of Hormonal activity.
- To create awareness in students on hormonal disorders and their effects.
- To enhance the understanding of students on Endocrine glands, their secretions, and their influence at different stages of life span.

Course Outcomes

CO1: Acquire knowledge on hormone activations both at hypo and hyper levels.

CO2: Identify the disease caused by impaired endocrine glands and hormonal actions.

CO3: Analyse the pathological conditions of the patients based on clinical reports.

CO4: Realize the importance of hormones in reproductive biology

Unit I Hormones and Hormone Action (9 Hrs.)

Introduction, Definition, Principles of Endocrinology, Hormone classes, Principles of Hormone Action, Hormone signaling, Genetics of Endocrinology.

Unit II Hypothalamus and pituitary Hormones (9 Hrs.)

Hypothalamus and Pituitary-Neuroendocrinology & Disorders of the Neurohypophysis pituitary – its pathohysiology and tests for its condition ,pituitary Masses and Tumors.

Unit III: Thyroid Hormones (9 Hrs.)

Thyroid Physiology and Diagnostic Evaluation of Patients with Thyroid Disorders, Hyperthyroid Disorders, Hypothyroidism and Thyroiditis, Nontoxic Diffuse Goiter, Nodular Thyroid Disorders, and, Euthyroid sick syndrome.

Unit IV Reproductive Hormones

Hormonal Contraception and fertility control- current approaches Testicular Diseases in men, Sexual Dysfunction in Men and Women, Menstrual Disorders and Pelvic Pain, The Menopause Transition and Postmenopausal Hormone Therapy.

Unit V Variation in Hormones in life span (9 Hrs.)

Endocrine changes in pregnancy, Endocrinology of fetal development, Normal and aberrant growth, Hormonal changes in Puberty. Hormonal Imbalance and Hormone Level Testing.

Co-Curricular Activities

- 1. Assignments.
- 2. chart preparations.
- 3. Group discussions on case studies.
- 4. Student seminars.

Prescribed Text Books

- Clinical Endocrinology 2021 (The Clinical Medicine Series Book 25) by C. G. Weber M.D.
- 2. Endocrinology Thomas Fox, Antonia Brooke, Bijay Vaidya.

Reference Text Books

- 1. Endocrinology, 3-Volume Set. Leslie Degroot, J. Larry Jameson.
- 2. Williams Textbook of Endocrinology, 12th Edition by Melmed.

(9 Hrs.)

SYLLABUS

Subject: Biochemistry Course Title: Clinical Endocrinology -Practical No. of Hours: 45 Hrs. LTP: 003

Semester: V/VI Course Code: 20BCP732CE2 Credits:2

Objectives

- To make students aware of the different hormone assays.
- To impart knowledge about hormone-specific assays.

Course Outcomes

CO1: Acquire knowledge of performing different enzyme assay.

CO2: Understand the biochemical basis of hormone-specific assay.

List of Practical

- 1. Assay of thyroxine (T4), and triiodothyronine (T3). Thyroid Stimulating Hormone.
- 2. Assay of Human chorionic gonadotropin (hCG).
- 3. Assay of FSH.
- 4. Assay of Prolactin.
- 5. Assay of Estradiol and Testosterone.

Skill/Hands-on: Field Work/Mini Project

- Training students by technical experts.
- · Identification of different analysis instruments, their handling, and operational techniques with safety and security.
- Visit a nearby Diagnostic Laboratory.

Prescribed Textbooks

- 1. Handbook of Diagnostic Endocrinology,3rd Edition,2020.
- 2. Endocrinology: Adult and Pediatric, 7thEdition Volume-2.

(15 Hrs.)

(30 Hrs.)

SYLLABUS

Semester: V/VI Subject: Biochemistry Course Title: Diagnostic Biochemistry Course Code: 20BCSEC31DB3 No.Hrs. 45 I TP: 300 Credits 3

Objectives

- To equip students with adequate technical skills in Biochemical diagnosis.
- To impart knowledge on the procedures of Clinical and diagnostic laboratories.

Course Outcomes

CO1: Acquire knowledge of the principles of Biochemical diagnostic tests.

CO2: Understand their use in assessing health conditions.

CO3: Analysis of samples using biochemical tests.

CO4: Utilize different techniques to draw improved inferences.

Unit I Lab Safety and Hazards

Elementary Knowledge of Clinical Laboratory Safety and Laboratory hazards. Factors affecting the Diagnostic accuracy, importance of ethics, accuracy, and Precision in a diagnostic process, Good Laboratory Practices and Good Clinical Practice (GCP)

Unit II: Sampling Techniques

Clinical Sampling, Specimen handling, transport, preservation, and disposal. Collection of biological fluids: Blood, urine, and cerebrospinal fluid. Reference Range. Quality control and Quality assurance.

Unit III: **Biochemical Markers**

Cardiac biomarkers - Troponins, Markers of Altered Thyroid Status - low-density lipoprotein (LDL) cholesterol reading, biochemical markers of bone BAP, turnover, inflammatory markers -IL-6, Insulin resistance (IR) markers - TG/HDL.

(9 Hrs.)

(9 Hrs.)

(9 Hrs.)

Immunodiffusion techniques - Single diffusion in one dimension (RIA) Double diffusion (Ouctorlony). Immunoglobulin testing & Immunoelectrophoresis -serum test. Radioimmunoassays, Immunofluorescence assays, Immuno-enzyme Assays (EIA).

Unit V Serological Tests

(9 Hrs.)

HLA (human leukocyte antigens) typing, Precipitation Tests -Ring test, Flocculation tests, neutralization tests, hemagglutination- inhibition tests, and chemiluminescence immunoassays.

Co-Curricular Activities

- 1. Assignments.
- 2. chart preparations.
- 3. Group discussions on case studies.
- 4. Student seminars.

Prescribed Text Books

1. Tietz Textbook of Clinical Chemistry and Molecular Diagnostics, 5th Edition

Carl A.Burtis Ph.D., Edward R. Ashwood MD, David E. Bruns MD.

2. A Quick Guide to Clinical Biochemistry, Buthaina Al-Balushi, Mohamed Essa.

Reference Text Books

- 1. Clinical Chemistry Fundamentals and Laboratory Techniques, Donna Larson EdD MT(ASCP)DLM.
- 2. Tietz Fundamentals of Clinical Chemistry, 5th Edition, Carl A. Burtis Ph.D., Edward R.Ashwood MD.

SYLLABUS

Subject: BiochemistrySemester: V/VICourse Title: Diagnostic Biochemistry -PracticalCourse Code: 20BCP631DB2No. of Hours: 45 Hrs.LTP: 003Credits: 2

Objectives

- To impart skills in instrument handling.
- To highlight the importance of sample handling.

Course Outcomes

CO1: Understand various tests involved in sample analysis.

- **CO2:** Analysis of Blood parameters.
- **CO3:** Interpret the results based on the test.

List of Practical

- 1. Sampling and Handling of Biological samples.
- 2. Serum Lipid Profile Tests.
- 3. Haematological Analysis- ESR, Clotting time, and HbA1C.
- 4. Insulin Resistance Test.
- 5. Immunoglobulin testing

Skill/Hands-on: Field Work/Mini Project

- 1. Training students by industrial/technical experts.
- 2. Identification of different analysis instruments, their handling, and operational techniques with safety and security.
- 3. Visit nearby Diagnostic Labs.

Prescribed Textbooks

- 1. A Manual of Lab & Diagnostic Tests, Eighth Edition, CH, a Wolters Kluwer Business.
- 2. Clinical Chemistry: Practical Laboratory Diagnosis of Disease by David N. Bailey.

(30 Hrs.)

(15 Hrs.)

SYLLABUS

Subject: Biochemistry Course Title: Bioinformatics No. of Hours: 45 Hrs. LTP:300 Semester: V/VI Course Code: 20BCSEC12BI3 Credits: 3

Objectives

- To Impart knowledge of Bioinformatics methods.
- To correlate theoretical and practical knowledge on principles and applications of Bioinformatics Tools.

Course Outcomes

- **CO1**: Understand the importance of Bioinformatics in Research.
- **CO2:** Acquire knowledge to retrieve data from the available databases.
- CO3: Analyse the data by using bioinformatic tools.
- **CO4:** Skills to collect, process, and obtain biological information.

Unit-I Bioinformatics

(9 Hrs.)

Bioinformatics – Fundamentals, Historical Background, Introduction, Importance, programming languages in Bioinformatics Scope -Genomics, Proteomics, and Drug Designing, Applications of Bioinformatics – Medicine, Drug discovery, Veterinary Science, Crop improvement Gene Therapy, evolutionary studies, and Biotechnology.

Unit II Biological databases and Data retrieval (9 Hrs.)

Introduction to biological database- Primary, Secondary and composite database, Nucleic acid database - NCBI, EMBL.DDBJ), Protein database -PDB, Swiss-Prot, TrEMBL, Metabolic pathway database – KEGG pathway, MetaCyc.

Unit III Sequence Alignment Tools

Molecular Sequence Alignment Tools - Local and Global Alignment, Pairwise and multiple sequence alignment, BLAST (Basic Local Alignment Search Tool).

Unit IV **Bioinformatics Tools**

Genscan. Expasy, Codon plot, FASTA, Online PCR, Primer- 3 and, Gene Cards,

Unit V **Phylogenetic Analysis** (9 Hrs.)

Phylogenetic tree, History, Purposes of the phylogenetic tree, Parts of a phylogenetic tree, Types of a phylogenetic tree, Phylogenetic tree construction, Applications of phylogenetic tree • Construction of phylogenetic tree – CLUSTALW.

Co-Curricular Activities

- 1. Assignments.
- 2. Chart preparations on KEGG pathways.
- 3. Group discussions on analysis of data.
- 4. Student seminars.

Prescribed Textbooks

- 1. Essential Bioinformatics Jin Xiong, Cambridge University Press.
- 2. Bioinformatics Methods and Applications: Genomics Proteomics And Drug Discovery 3Rd Ed. Authors, S. C. Rastogi, Parag Rastogi, Namita Mendiratta.
- 3. Bioinformatics Basics: Applications in Biological Science and Medicine. Hooman H. Rashidi, Lukas K. Buehler CRC Press/Taylor & Francis Group.

Reference Textbooks

- 1. Lesk MA. (2002) Introduction to Bioinformatics. Oxford University Press.
- 2. Bioinformatics for Dummies,2nd Edition, Jean Michel Claverie, Cedric Notredame.Wiley Publishing Inc.

(9 Hrs.)

(9 Hrs.)

SYLLABUS

Subject: Biochemistry Course Title: Bioinformatics – Practical No. of Hours: 45 Hrs. LTP: 003

Semester: V/VI Course Code: 20BCP712BI2 Credits: 2

Objectives

- To Impart knowledge practical use of Bioinformatics methods.
- To Apply principles of theoretical knowledge of Bioinformatics Tools in practical.

Course Outcomes

- **CO1**: Make use of skills to Retrieve, identify and align the sequences for research purpose
- **CO2:** Align and Construct Phylogenetic tree from the given sequences to identify related and unrelated species

List of Practical

- 1. Exploration of the resources available in NCBI Genbank entry, FASTA
- 2. Biological Database searching with heuristic algorithm: BLAST.
- 3. Retrieval and analysis of a sequence from database
- 4. Pair-wise and multiple sequence alignment and creating a Phylogenetic tree
- 5. Conversion of nucleotide sequence into its protein sequence and vice-versa.

Skill/Hands-on: Fieldwork/Mini Project

- 1. Training students by mini-Projects.
- 2. Identification of different analysis software.
- 3. Visit nearby Bioinformatics laboratories or research organizations, private firms, etc.

Prescribed Text Books

1. Essential Bioinformatics Jin Xiong, Cambridge University Press.

(30 Hrs.)

(15 Hrs.)

- 2. Bioinformatics Methods and Applications: Genomics Proteomics And Drug Discovery 3Rd Ed. Authors, S. C. *Rastogi*, Parag *Rastogi*, Namita Mendiratta.
- Bioinformatics Basics: Applications in Biological Science and Medicine. Hooman
 H. Rashidi, Lukas K. Buehler CRC Press/Taylor & Francis Group.

Reference Text Books

- 1. Lesk MA. (2002) Introduction to Bioinformatics. Oxford University Press.
- 2. Bioinformatics for Dummies,2nd Edition, Jean Michel Claverie, Cedric Notredame. Wiley Publishing Inc.

SYLLABUS

Subject: Biochemistry Course Title: Research Methodology No. of Hours: 45 Hrs. LTP:300 Semester: V/VI Course Code:20BCSEC21RM3 Credits: 3

Objectives

- To impart knowledge on the appropriate research problem.
- To understand the principles of systematic research and predict the outcome.
- To evaluate, organize and conduct research (advanced project) more appropriately.

Course Outcomes

- **CO1:** Understand the primary and secondary data sources and fundamental principles for doing research
- **CO2:** Identify the possible research area
- **CO3:** Learn to write a research project proposal (for grants).
- CO4: Acquire the skills of research design, collection, and analysis

Unit I Research Methods

(9 Hrs.)

Concept of the applied and basic research process, need of research, criteria of good research, Types of research – Descriptive Analytical, Fundamental, Quantitative Qualitative, Conceptual, Empirical. Stages involved in research.

Unit II Formulation of Research Problem (9 Hrs.)

Defining and formulating the research problem, selecting the problem, the necessity of defining the problem, the importance of literature review in defining a problem, literature review-primary and secondary sources, reviews, monographs, patents, research databases, web as a source, , development of a working hypothesis.

Unit III Data Collection and Analysis Tools

Preparations before conducting research, Methods of data collection - Interviews, Questionnaires and surveys, Observations. Documents and records, Focus groups, Oral histories, Analysis Methods-Review of hypothesis testing procedures, Factor analysis, Cluster analysis, and Introduction to Statistical analysis packages available: Microsoft Excel.

Unit IV Writing Research

Types of research documents, writing and formatting of report, presentation, interpretation, art of oral presentation, format of publications in research journals; Journal Impact factor, h-index, and i-10 index.

Research Ethics and IPR Unit V

Ethics-ethical issues, ethical committees; IPR- intellectual property rights and patent laws, copyrights, trademarks.

Co-Curricular Activities

- 1. Assignments.
- 2. Designing a study.
- 3. Formulation of Questionnaire.
- 4. Student seminars.

Prescribed Text Books

- 1. Cooper D R, Schindler P S and Sharma J K (2012); Business Research Methods, McGraw Hill Education.
- 2. Bryman and Bell; Business Research Methods, Oxford University Press
- 3. Malhotra, Naresh (2007); Market Research, Prentice Hall of India.

Reference Text Books

- 1. Panneerselvam R(2006); Research Methodology, Prentice Hall of India.
- 2. Garg, B.L., Kapadia, R., Agarwal, F. and Agarwal, U.K., 2002. An introduction to Research Methodology.
- 3. Satarkar, S.V., 2000. Intellectual property rights and Copyright. Ess Ess Publications.

(9 Hrs.)

(9 Hrs.)

(9 Hrs.)

SYLLABUS

Subject: BiochemistrySemester: V/VICourse Title: Research Methodology - Practical Course Code: 20BCP621RM2No. of Hours: 45 Hrs.LTP: 003Credits: 2

Objectives

- To apply theoretical knowledge in practice.
- To gain basic knowledge on project writing and presentation of the proposal.

Course Outcomes

- **CO1:** Evaluate hypothesis through testing.
- **CO2:** Compute, document, analyse and summarize their findings.

List of Practical

- 1. Design a Questionnaire for Survey on a particular research topic.
- 2. Formulation of hypothesis.
- 3. Writing a Project Proposal.
- 4. Identify and rectify common problems encountered when preparing the Research Report.
- 5. Presentation of Research Project proposal.

Skill/Hands-on: Field Work/Mini Project

- 1. Training students by experts.
- 2. Identification of Research problem.
- 3. Dealing with ethical challenges.

Prescribed Book

- Research Methods: A Practical Guide for Students and Researchers by Willie Tan.
- 2. Reference Book

Research Methodology: A Practical and Scientific Approach by Vinayak Bairagi

(30 Hrs.)

(15 Hrs.)

SYLLABUS

Subject: Biochemistry Course Title: Forensic Biochemistry No. of Hours: 45 Hrs. LTP:300

Semester: V/VI Course Code: 20BCSEC11FB3 Credits: 3

Objectives

- To impart basic knowledge and skills on Biochemical forensic investigation methods.
- To promote critical thinking.
- To understand the importance of probabilistic reasoning.

Course Outcomes

- **CO1:** Understand the underlying principles of DNA for use in forensic studies
- CO2: Develop scientific temper on DNA
- **CO3:** Analyse and evaluate forensic problems using biochemical methods
- CO4: Identify and suggest means for forensic problems

Unit I Introduction

Basic principles and their significance. Branches of forensic Science. History & development of Forensic science. Nature and scope of forensic science. The organizational structure of Forensic Science Laboratories at the central & State level. Ethics in Forensic science.

Unit II DNA Biology

Principles of DNA structure - DNA in the cell, Organisation of Information in the cell, Identification of DNA information, DNA variation (SNP), Short Tandem Repeat (STR) Markers, Position of Forensic STR Markers on Human Chromosomes, paternity testing, DNA evidence.

(9 Hrs.)

(9 Hrs.)

Unit III DNA technology in Forensic Science (9 Hrs.)

Introduction, individual Variation in DNA, DNA Typing- Genetic basis of DNA typing structure and function of DNA, technological basis of DNA typing - Restriction Fragment Length Polymorphisms, PCR-based typing methods such as RAPD, AFLP, STR.

Unit IV Forensic Biochemical Analysis

Enzymes used in Forensic Science -Restriction enzymes, Phosphatases, DNA polymerases, and DNA ligases, and their forensic significance, Forensic Serology – Blood, Saliva, Urine, Bone, Teeth, Hair, and other body fluids. Forensic Immunology – ELISA, blood group-specific ABH substances.

(9 Hrs.)

Unit V Techniques used in Biochemical Investigation (9 Hrs.)

Use of Thin-layer chromatography -TLC, Gas Chromatography (GC), High-Performance Liquid Chromatography (HPLC), Ultraviolet and visible spectrophotometer, and Immunoassays in Forensic analysis.

Co-Curricular Activities

- 1. Assignments.
- 2. Chart preparations.
- 3. Group discussions on case studies.
- 4. Student seminars.

Prescribed Text Books

- 1. Essential Forensic Biology, Second Edition, Alan Gunn, Wiley-Blackwell, 2009.
- Ethics in Forensic Science: Professional Standards for the Practice of Criminalistics by Peter D. Barnett.
- 3. The Biological Evidence Preservation Handbook: Best Practices for Evidence Handlers. Susan Ballou Mark Stolorow Melissa Taylor.

Reference Text Books

- Nelson, D. L. & Cox, M. M. Lehninger Principles of Biochemistry. Freeman, 5th ed, 2008.
- 2. Principles of Forensic Medicine and Toxicology by Rajesh Bardale.

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SYLLABUS

Subject: Biochemistry Course Title: Forensic Biochemistry Practical No. of Hours: 45 Hrs. LTP: 003 Semester: V/VI Course Code:20BCP611FB2 Credits: 2

Objectives

- To teach the basic techniques for analysis of evidence.
- To demonstrate DNA profiling techniques.

Course Outcomes

CO1: Apply the different types of techniques that make use of DNA for analysing Forensic sample

CO2: Analysis of sample found as evidence.

List of Practical

- 1. Extraction and purification of DNA from various samples Hair, Saliva, dried blood samples
- 2. Analysis of DNA sample RFLP
- 3. Demonstration of DNA Amplification technique AFLP.
- 4. Determination of Blood group substances in body fluids.
- 5. Radio Immunoassay

Skill/Hands-on: Field Work/Mini Project

- 1. Training students by industrial/technical experts.
- 2. Identification of different analysis instruments, their handling, and operational techniques with safety and security.
- 3. Visit nearby Forensic laboratories or research organizations, private firms, etc.

Prescribed Textbooks

1. Molecular cloning: A laboratory manual, 2nd edition: by J. Sambrook, EF Fritsch and T.Maniatis, Cold Spring Harbor Laboratory Press, 1989.

3. Practical Immunology, Fourth Edition Frank C. Hay Ph.D., Olwyn M.R. Westwood Ph.D.,

(30 Hrs.)

(15 Hrs.)

Reference Textbook

Advanced Methods in Molecular Biology and Biotechnology, A practical Lab Manual.Khalid Z.Masood, Sameena Maqbool, and Rovidh Saba Rasool.