

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: 21BCCCBM13

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: Water and Buffers

(10 Hrs.)

Water as a biological solvent, Introduction to Different types of waters such as Potable water, Purified Water, Distilled Water, Deionized Water, RO Water.

Different Types of Waters used in the pharmaceutical industry - Water for Injection, water for Vaccines.

Total dissolved salts (TDS), BOD, COD, Buffers, biologically important buffers, measurement of pH, the biological relevance of pH, pKa value

UNIT - II: Carbohydrates

(10 Hrs.)

Carbohydrates: Classification, monosaccharides, D and L designation, open-chain and cyclic structures, epimers and anomers, mutarotation, reactions of carbohydrates (due to functional groups - hydroxyl, aldehyde, and ketone). Glycosides .

Structure and biological importance of disaccharides (sucrose, lactose, maltose)

Structural polysaccharides (cellulose, chitin, pectin), storage polysaccharides

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

(10 Hrs.)

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 and structures 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, liposomes.

UNIT-IV: Amino Acids and Proteins

(10 Hrs.)

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

Proteins:

Classification based on solubility, shape, and function. Determination of 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., Hemoglobin and Myoglobin).

UNIT-V: Nucleic acids and porphyrins

(8 Hrs.)

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

Porphyrins: Structure and Classification of porphyrins, protoporphyrin, Porphobilinogen, Properties of Porphyrins, Metalloporphyrins –heme, cyanocobalamin, and chlorophylls.

Skill / Hands -on (12 Hrs.)

- Calculation of Molarity, Normality.
- Making Dilutions
- Preparation of Reagents and Solutions
- Structure practicing sessions

Co-curricular Activities

- Schematize the structures
- Class Tests
- Quiz
- Assignment

Prescribed Text Books

1. Biochemistry 3rd Edition 2006 by Satyanarayana , Chakrapani 3rd revised
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 Text Books

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. Biochemistry, A problem Approach, 2nd Edn. Wood, W.B. Addison Wesley
1981.
4. Principles of Biochemistry White -A, Handler, Pand Smith E.L. Mc Grew Hill.
5. Fundamentals of Biochemistry by Donald Voet (1999).

MARIS STELLA COLLEGE (AUTONOMOUS), VIJAYAWADA-8
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SYLLABUS

Subject: Biochemistry

Semester: I

Course Title: Qualitative Analysis-Practical

Course Code: 20BCP1QA12

No. of Hrs:30

LTP: 002

Credits:2

Objectives

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

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

.List of Practical

1. 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. Estimation of total sugars by Anthrone method.
4. Preparation of Osazones and their identification.
5. Qualitative identification of amino acids -histidine, tyrosine, tryptophan, cysteine, arginine.

6. Qualitative Identification of lipids - solubility, saponification, Acrolein, Bromine test (Unsaturation), Salkowski test.
7. Isolation of DNA from tissue.
8. Estimation of RNA by Orcinol 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.
3. 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.

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.
3. 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.
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
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SYLLABUS

Subject: Biochemistry

Semester: II

**Course Title: Biophysical Techniques
& Microbiological Methods**

CourseCode:21BCCCBT23

No. of Hours: 60

LTP: 400

Credits: 3

Objectives

- To Impart knowledge about the principles of biophysical instrumentation and microbial methods.
- To Incorporate theoretical and practical knowledge of principles and working of biophysical instrumentation.
- To know the usage of Instrumentation for analyzing/Separation of biochemically active compounds.

Course outcomes

At the end of the course, the student will be able to

CO1: Explain the different types and construction of different biophysical Instruments

CO2: Summarize the working principles of biophysical Instruments and microbiological methods

CO3: Describe different biophysical techniques and microbiological methods

CO4: Apply Biophysical techniques and Microbiological methods

Unit - I: Cell homogenization and centrifugation

(10 Hrs.)

Introduction to types of Cells & Cell Lysis, methods of tissue homogenization:(Potter-Elvehjem, mechanical blender, sonicator and enzymatic). Centrifugation techniques, principles, and applications - differential, density gradient.

Ultracentrifugation - preparative and analytical.

Unit - II: Chromatographic techniques

(10 Hrs.)

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 - principle, resins, the action of resins, experimental techniques, applications, separation of metal ions; Affinity chromatography. Introduction to HPLC .

Unit - III Spectroscopy (10 Hrs.)

Electromagnetic radiation, Introduction to Absorption & Emission spectroscopy Beer-Lambert's law.

Colorimetry, Spectrophotometry, spectrofluorimetry , and flame photometry.

Unit - IV: Electrophoresis and tracer techniques (10 Hrs.)

Electrophoresis - types of Electrophoresis principles and applications polyacrylamide (native and SDS), and agarose gel electrophoresis, Isoelectric focusing (IEF), Immunoelectrophoresis – types and applications.

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

Unit - V: Microbiological Methods (10 Hrs.)

Microscopy: Basic principles of light microscopy, phase contrast, fluorescent microscope and electron microscope their applications, isolation and culturing and preservation of microbes, Gram 's staining (Gram -positive and Gram -negative bacteria), spore staining (Endospore staining), Hanging drop method (motility). Sterilization techniques - Physical methods, Chemical methods, Applications of Sterilization in Food & Pharmaceutical Industry.

Skill / Hands -on (10 Hrs.)

- Schematize the Construction of different Biophysical Instruments
- Different separation techniques for analyzing and separating biologically active compounds
- Basic microbial Techniques -Sterilization techniques, medium preparation
- Basic method of bacterial Staining

Co-curricular Activities:

- Structure practicing sessions
- Class Tests
- Quiz
- Assignment

Prescribed Text Books

1. Textbook of Biophysical Chemistry – Nath & Upadhyaya., Himalaya publications
2. Outlines of Biochemistry, 5th Edition by E E Conn, PK Stumpf 693. John Wiley and Sons, New York. 1987
3. Biochemistry Prof. U. Satyanarayana, 3rd revised Edition:2006, Arunabha Sen, books and allied (P)Ltd, 8/1Chintamoni Das lane, Kolkata 700009.

Reference Text Books

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.
3. Leininger Principles of Biochemistry SEVENTH EDITION David L . Nelson Madison Michael M. Cox.

MARIS STELLA COLLEGE (AUTONOMOUS), VIJAYAWADA – 8
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SYLLABUS

Subject: Biochemistry

Semester: III

**Course Title: Enzymology
& Intermediary Metabolism**

Course Code:20BCCCIM33

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 K_m and V_{max} 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 (10 hrs.)

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.

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 (5hrs.)

Schematize the metabolic reactions

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

Co-curricular Activities: (5hrs.)

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

Prescribed Textbooks

1. Biochemistry 3rd Edition 2006 by Satyanarayana, Chakrapani 4th 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
3. 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

1. 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.

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SYLLABUS

Subject: Biochemistry

Semester: III

Course Title: Enzymology-Practical

Course Code:20BCP3EN32

No. of hours: 30

LTP 002

Credits: 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.
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 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

Semester: IV

**Course Title: Microbiology, Immunology
& Molecular Biology**

Course 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

(10 Hrs.)

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.

UNIT – III: Applied Biochemistry**(10 Hrs.)**

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**(10 Hrs.)**

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**(10 Hrs.)**

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**(10 Hrs.)**

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

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 Volumes 1 -5
2. Roitt's Essential Immunology, 12th Edition ,2011 Peter J. Delves & Seamus J Martin & Dennis R. Burton & Ivan M. Roitt., Wiley 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.

MARIS STELLA COLLEGE (AUTONOMOUS), VIJAYAWADA
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SYLLABUS

Subject: Biochemistry

Semester: IV

**Course Title: Physiology, Nutrition
& Clinical Biochemistry**

Course Code: 20BCCCCB43

No. of Hours: 60

LTP: 400

Credits: 3

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 (10 Hrs.)

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.

UNIT - III: Nervous System and Endocrinology (10 Hrs.)

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 (10 Hrs.)

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 (10 Hrs.)

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

Co-curricular Activities

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

Prescribed Books

1. Biochemistry 3rd Edition 2006 by Satyanarayana, Chakrapani 3rd revised.
2. Essentials of Food and Nutrition, Vol. I & II, M.S. Swaminathan.
3. Text Book of Biochemistry with clinical correlations. Thomas M. Devlin (John Wiley).
4. Harper's Review of Biochemistry, Murray et al (Longman).
5. Biochemical aspects of human disease – R.S. Elkeles and A.S. Tavit. (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.
3. 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 – 8

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SYLLABUS

Subject: Biochemistry

Semester: IV

Course Title: Applied Biochemistry – Practical

Course Code: 20BCP5AB42

No. of Hours: 30

LTP: 002

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).

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SYLLABUS

Subject: Biochemistry

Semester: IV

Course Title: Clinical Biochemistry – Practical

Course Code: 20BCP4CB42

No. of Hours: 30

LTP: 002

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. Saunders Company, 1984).

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SYLLABUS

Subject: Biochemistry

Semester: V/VI

Course Title: Diagnostic Biochemistry Course Code: 20BCSEC31DB3

No.Hrs. 45

LTP: 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 (9 Hrs.)

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 (9 Hrs.)

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 (9 Hrs.)

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.

Unit IV: Immunological tests (9 Hrs.)

Immunodiffusion techniques - Single diffusion in one dimension (RIA) Double diffusion (Ouchterlony). Immunoglobulin testing & Immuno-electrophoresis -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.

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(Affiliated to Krishna University, Machilipatnam)

SYLLABUS

Subject: Biochemistry

Semester: V/VI

Course Title: Diagnostic Biochemistry -Practical

Course Code: 20BCP631DB2

No. of Hours: 45 Hrs.

LTP: 003

Credits: 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

(30 Hrs.)

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

(15 Hrs.)

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.

MARIS STELLA COLLEGE (AUTONOMOUS), VIJAYAWADA
(Affiliated to Krishna University, Machilipatnam)

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 (9 Hrs.)

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 (9 Hrs.)

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)

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.

MARIS STELLA COLLEGE (AUTONOMOUS), VIJAYAWADA-8
(Affiliated to Krishna University, Machilipatnam)

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

(30 Hrs.)

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

(15 Hrs.)

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.

**MARIS STELLA COLLEGE (AUTONOMOUS), VIJAYAWADA-8
(Affiliated to Krishna University, Machilipatnam)**

SYLLABUS

Subject: Biochemistry

Semester: V/VI

Course Title: Bioinformatics

Course Code: 20BCSEC12BI3

No. of Hours: 45 Hrs.

LTP:300

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 (9 Hrs.)

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

Unit IV Bioinformatics Tools (9 Hrs.)

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.

**MARIS STELLA COLLEGE (AUTONOMOUS), VIJAYAWADA-8
(Affiliated to Krishna University, Machilipatnam)**

SYLLABUS

Subject: Biochemistry

Semester: V/VI

Course Title: Bioinformatics – Practical

Course Code: 20BCP712BI2

No. of Hours: 45 Hrs.

LTP: 003

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

(30 Hrs.)

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

(15 Hrs.)

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.

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 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.

MARIS STELLA COLLEGE (AUTONOMOUS), VIJAYAWADA-8
(Affiliated to Krishna University, Machilipatnam)

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 (9 Hrs.)

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 (9 Hrs.)

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.

Unit V Research Ethics and IPR (9 Hrs.)

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.

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SYLLABUS

Subject: Biochemistry

Semester: V/VI

Course Title: Research Methodology - Practical Course Code: 20BCP621RM2

No. of Hours: 45 Hrs.

LTP: 003

Credits: 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

(30 Hrs.)

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

(15 Hrs.)

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

Prescribed Book

1. 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

MARIS STELLA COLLEGE (AUTONOMOUS), VIJAYAWADA-8
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SYLLABUS

Subject: Biochemistry

Semester: V/VI

Course Title: Clinical Endocrinology

Course Code: 20BCSEC32CE3

No. of Hours: 45 Hrs. LTP:300

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 pathophysiology 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 (9 Hrs.)

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

1. 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.

MARIS STELLA COLLEGE (AUTONOMOUS), VIJAYAWADA
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SYLLABUS

Subject: Biochemistry	Semester: V/VI
Course Title: Clinical Endocrinology - Practical	Course Code: 20BCP732CE2
No. of Hours: 45 Hrs.	Credits:2
	LTP: 003

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 **(30 Hrs.)**

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 **(15 Hrs.)**

- 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, 7th Edition Volume-2.

MARIS STELLA COLLEGE (AUTONOMOUS), VIJAYAWADA-8
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SYLLABUS

Subject: Biochemistry

Semester: V/VI

Course Title: Forensic Biochemistry

Course Code: 20BCSEC11FB3

No. of Hours: 45

Credits: 3

Hrs.

LTP:300

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

(9 Hrs.)

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

(9 Hrs.)

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.

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 (9 Hrs.)

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.

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.
2. 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

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

13. _____ are the short fragments of nucleotides involved in DNA amplification of DNA
14. Individual variation in a given trait will track the _____ of the mean trait value.
15. Each single nucleotide polymorphism represents a difference in _____ nucleotide base pair(s).
16. Full form of STR is _____.
17. Forensic _____ includes the study of body fluids like saliva.
18. Restriction enzymes cut DNA at specific points known as _____.
19. High performance liquid chromatography (HPLC) is an important forensic technique, often used in cases involving _____.
20. Gas Chromatography (GC) used in Forensic _____ screening to determine if a deceased person has ingested drugs or alcohol prior to death.

SECTION-B

Answer any FOUR questions

4X8=32M

21. Write the organization of positions in Forensic Science Laboratories.
22. Discuss briefly the history of Forensic Science.
23. Explain the process of monoclonal antibody production.
24. Give an account of different types of evidence found at the crime scene of rape.
25. Enlist the principles and laws of Forensic Science.
26. Summarize the Enzymes used in Forensic Science Enumerate steps of citric acid production

SECTION-C

Answer any FOUR questions

4X12=48M

27. Enumerate the branches of Forensic Science with their area of study.
28. Highlight the major projects of physical science Labs.
29. Analyse the differences among PCR-based typing methods.
30. Enlist the different divisions involved in solving a Forensic case.
31. Discuss briefly Short Tandem Repeat (STR) Markers, Position of Forensic STR Markers on Human Chromosomes.
32. Describe the ethics in Forensic Science with the help of case studies.

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MARIS STELLA COLLEGE (AUTONOMOUS), VIJAYAWADA-8
(Affiliated to Krishna University, Machilipatnam)

SYLLABUS

Subject: Biochemistry

Semester: V/VI

Course Title: Forensic Biochemistry Practical

Course Code:20BCP611FB2

No. of Hours: 45 Hrs.

LTP: 003

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

(30 Hrs.)

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

(15 Hrs.)

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.,

Reference Textbook

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