MALLA REDDY VISHWAVIDYAPEETH

SCHOOL OF ALLIED AND PUBLIC HEALTH SCIENCES AND TECHNOLOGY

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Hyderabad-500055
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Program

Master of Science (M.Sc.)

Medical Lab Technology

2025

MALLA REDDY VISHWAVIDYAPEETH

SCHOOL OF ALLIED AND PUBLIC HEALTH SCIENCES AND TECHNOLOGY

MASTER OF MEDICAL LAB TECHNOLOGY

COURSE STRUCTURE

I year I semester

S.NO	SUBJECT CODE	SUBJECT	L	T	P	C	Max. Marks		
							INT	EXT	TOTAL
1	MLH27210101	Research Methodology and Biostatistics	3	-	-	3	40	60	100
2	MLH27210102	Immunology	2	-	-	2	40	60	100
3	MLH27210103	General & Nutritional Biochemistry	3	-	2	4	40	60	100
4	MLH27210104	General Microbiology	2	-	-	2	40	60	100
5	MLH27210105	Haematology	2	-	-	2	40	60	100
6	MLH27210106	General Pathology	2	-	-	2	40	60	100
7	MLH27210107	QC in Clinical Lab	2	-	-	2	40	60	100
8	MLH27210108	Clinical Postings - I	-	-	6	3	40	60	100
TOTAL			**16**	**-**	**8**	**20**	**320**	**480**	**800**

I year II semester

S.NO	SUBJECT CODE	SUBJECT	L	T	P	C	Max. Marks		
							INT	EXT	TOTAL
1	MLH27210201	Molecular Biology & Applied Genetics	2	-	-	2	40	60	100
2	MLH27210202	Immunopathology & Clinical pathology	3	-	2	4	40	60	100
3	MLH27210203	Biomedical Techniques & laboratory Management	3	-	-	3	40	60	100
4	MLH27210204	Clinical Biochemistry-I	3	-	-	3	40	60	100
5	MLH27210204P	Clinical Biochemistry-I Practical	-	-	4	2	40	60	100
6	MLH27210205	Applied Biochemistry-I	3	-	-	3	40	60	100
7	MLH27210206	Clinical Postings - II	-	-	6	3	40	60	100
TOTAL			**14**	**-**	**12**	**20**	**280**	**420**	**700**

II year III semester

S.NO	SUBJECT CODE	SUBJECT	L	T	P	C	Max. Marks		
							INT	EXT	TOTAL
1	MLH27210301	Clinical Biochemistry - II	3	-	2	4	40	60	100
2	MLH27210302	Applied Biochemistry - II	3	-	-	3	40	60	100
3	MLH27210303	Parasitology, mycology, virology	3	-	-	3	40	60	100
4	MLH27210304	Applied Histopathology & cytology	2	-	2	3	40	60	100
5	MLH27210305	Clinical Postings - III	-	-	14	7	40	60	100
TOTAL			**11**	**-**	**18**	**20**	**200**	**300**	**500**

II year IV semester

S.NO	SUBJECT CODE	SUBJECT	L	T	P	C	Max. Marks		
							INT	EXT	TOTAL
1	MLH27210401	Thesis/Research Project	-	-	16	8	40	60	100
2	MLH27210402	Internship	-	-	24	12	40	60	100
TOTAL			**-**	**-**	**40**	**20**	**80**	**120**	**200**

1.1 Post Graduate Programme

Sl. No.	Course	Duration	Eligibility for admission
1	M.Sc. Medical Lab Technology	2 years	Passed BSc in Medical Lab Technology or equivalent examination of a recognized Indian University or a duly constituted Board with pass marks (50%).

1.2. Medium of Instruction:

English shall be the medium of instruction for all subjects of study and for examinations.

1.3. Duration of the Course

Duration details are mentioned under clause no. 1.1 of this booklet.

1.4 Examination Regulations

1.4.1 Attendance: 75% of attendance (physical presence) is mandatory.

Medical leave or other types of sanctioned leaves will not be counted as physical presence. Attendance will be counted from the date of commencement of the session to the last day of the closing of attendance before the final examination.

1.4.2 Internal Assessments:

Exam pattern for internal assessment in each semester will be

(a) Short questions 3 nos. each carrying 5 marks (i.e. 3 x 5=15 marks). Two such internal examinations will be conducted.

(b) Continuous assessment of the student will be done. Students' overall attendance, performance in class, behaviour of the student, presentations, extra-curricular activities etc will be assessed. Continuous assessment carries 10 marks.

(d) Thus, a total of 40 marks for the internal examination. (15+15+10=40 marks). A candidate should secure a minimum of 40% marks in the internal assessment in each subject to be eligible to appear for the University examination

(e) For value added courses, only internal examination will be conducted. The assessment comprised of five assignments/presentations/case presentations each carrying 10 (i.e. 5 x 10 = 50 marks). Final examination will be for 50 marks with 5 questions each carrying 10 marks (5 x 10 = 50 marks). The minimum pass is 40% marks.

1.4.3 University Examinations (External):

a) University Examination shall be conducted at the end of every semester.

b) A candidate who satisfies the requirement of attendance and internal assessment marks, as stipulated by the University shall be eligible to appear for the University Examination.

c) Examination will be of 3 hours duration (for theory). The question pattern for those subjects without practical examination (60 marks) will be (a) Three essay questions out of which the student should answer

2 questions each carrying 10 marks (i.e. 2 x 10 = 20 marks) (b) Eight short note questions out of which the student should attempt six questions, each carrying 5 marks (6 x 5 = 30 marks). (c) Ten very short questions each carrying 1 mark (i.e. 10 x 1 = 10 marks). Thus, a total of 60 marks.

d) The question pattern for practical examination (a) Spotters/major practical/minor practical/case presenting/Viva/practical/log record.

The minimum pass for internal assessment is 40% and for the University Examination is 50%. i.e. a student should score a total of 50% (adding the internal and external examination) to pass in each subject.

SEMESTER I

RESEARCH METHODOLOGY AND BIOSTATISTICS L/T/P/C

3/-/-/3

RESEARCH METHODOLOGY

Introduction to research; Types of research; Defining a research question; Qualitative study designs; Quantitative study; Type I and type II bias; Study design: types

Case study, Case series, longitudinal cohort, Pre post design, Time series design, repeated measures design, Randomized control design.

Sampling design, calculating minimum sample size based on design

Measurement: Properties of measurement: reliability, validity, responsiveness, MCID.

Outcome measures: Use of outcome measures in rehabilitation research

Research Methods: Designing methodology, Reporting results, Type I and Type II bias.

Communicating research.

Evaluating published research: looking at the evidence

Introduction to evidence-based practice, evaluating evidence

Asking clinical questions

Translating of evidence into practice: strategies

Use of clinical practice guidelines, clinical pathways, prediction rules to inform practice.

BIOSTATISTICS

Descriptive Statistics and measurement variability; Inferential
Statistics; Comparison of group means: T test; Analysis of variance;
Multiple comparison tests
Parametric and non-parametric tests
Correlations
Regression
Analysis of frequencies: Chi square
Statistical measure of validity and reliability
Factorial Design analysis
Power analysis – Determining sample size, Epidemio logical Measures–Rate, Ratio, Proportion,
Incidence and prevalence, Relative risk, Risk ratio, Odds ratio
Application of various statistical software.

RECOMMENDED TEXT BOOKS

1. Statistical methods in Biology by Bailey, N.T.J
2. Statistical methods by Gupta, S.P
3. Research Methodology by Kumar, R

IMMUNOLOGY

L/T/P/C
2/-/-/2

UNIT 1 INTRODUCTION

- History of immunology
- Innate immune system-properties and mechanism, non-specific defense system, inflammation.
- Adaptive immune system-properties and mechanism, cells involved, MHC and its role.

UNIT 2 CELLS AND ORGANS OF THE IMMUNE SYSTEM

- Hematopoeisis
- Cells of the immune system: Lymphoid cells, mononuclear phagocytes, granulocytic cells.
- Primary lymphoid organ: thymus, Bone marrow.
- Lymphatic system Describe blood-lymph circulation and lymphatics.
- Secondary lymphoid organ: Lymph node, Spleen, Mucosal-associated lymphoid tissues (oral, nasopharyngeal, gut-associated, reproductive), CALT.

UNIT 5 DEVELOPMENT OF T CELL AND B CELL

- Generation, maturation, activation, proliferation and differentiation

UNIT 3 B-CELL AND T-CELL RESPONSES

- Antigens: antigenicity, factors influencing immunogenicity, epitopes, Hapten.
- Antigen processing and presentation.
- Immunoglobulins / antibodies: Structure and function, anotibody mediated effector functions, antibody classes and their biological role, antigenic determinants on Igs (allotype, isotype, idiotype).

UNIT 4 T-LYMPHOCYTE

- Classification (Th1,Th2, αβ and γδ T cells)
- Markers of T-cell-MHC, CD3, CD4, TCR
- Compare and contrast molecular and cellular features od T cell receptor (TCR) to B cells receptor (Ig molecule)

UNIT 6 COMPLEMENT SYSTEM

- Complement activation
- Classical complement pathway
- Alternate complement pathway
- Infectious agents and products that activate complement
- Biological effects mediated by complement
- Effects of complement on the immune system.
- Significance of complement at oral mucosal surfaces.

UNIT 7

- Hybridoma technology and Mab and its applications. Antibody diversity.
- Cytokines.

RECOMMENDED TEXT BOOKS

- Janeway's Immunobiology by Ken Murphy, Paul Travers, Mark Walport,
- Kuby Immunology by Jenni Punt, Sharon A. Stranford, Patricia P. Jones, Judith A. Owen
- Roitt's Essential Immunology

GENERAL AND NUTRITIONAL BIOCHEMISTRY

L/T/P/C

3/-/2/4

UNIT – I

- Structure of Cell and intracellular organelles.
- Chemistry of Carbohydrates, Carbohydrate Metabolism: Glycolysis, TCA cycle, Glycogen, Gluconeogenesis, blood glucose regulation, diabetes mellitus.

UNIT – II

- Chemistry of lipids, Lipid Metabolism: Synthesis and breakdown of fatty acids, ketone bodies, DKA Cholesterol, bile acids, lipoproteins, atherosclerosis.

UNIT -III

- Proteins: Structure, classification, properties, functions and Separation techniques.
- Protein Metabolism: Synthesis and breakdown of amino acids, urea cycle, specialized products from amino acids.

UNIT – IV

- Nucleic Acids: Structure, classification, properties, functions and Separation techniques.
- Molecular Biology: Structure and functions DNA, organization and replication, transcription, protein synthesis.

UNIT – V

- Enzymes: Classification, factors that alter enzymes catalyzed reaction,
  Michaelis - Menten Equation, Competitive and non-competitive inhibition of enzyme reactions, regulation of enzyme activity, Isoenzymes-separation and identification, plasma enzymes in clinical diagnosis, Coenzymes.

UNIT-VI

- Bioenergetics and Oxidative phosphorylation, free energy-exergonic and endergonic reaction, high energy phosphates, components of electron transport chain mechanism of ATP production, Chemiosmotic theory, inhibitor of respiratory chain.

UNIT-VII

- Nutritional requirements of carbohydrates, proteins and lipids.
- Deficiency states of carbohydrates, proteins and lipid.
- RDA, Nutritional requirements of vitamins (fat and water soluble) - Structure, functions, deficiency states, dietary source.
- Nutritional requirements of macro and microelements- functions, deficiency states, dietary source & RDA.

PRACTICALS:

- Normal and abnormal constituents of Urine
- Qualitative analysis and identification of Glucose, proteins, urea and creatinine

RECOMMENDED TEXT BOOKS

1. Textbook of biochemistry by U. Sathyanarayana
2. Lehninger Principles of Biochemistry by David L. Nelson and Michael M. Cox.

GENERAL MICROBIOLOGY

L/T/P/C
2/-/-/2

UNIT I

- Introduction and history of microbiology
- Classification of microorganism and structure of bacteria
- Microscopy and types of microscopy

UNIT II

- Nutrition, growth and multiplication of bacteria, bacteria growth curve
- Culture medias
- Culture method

UNIT III

- Classification of sterilization and disinfection
- Sterilization: different methods of sterilization, principles and use of equipment's of sterilization – hot air over & autoclave in detail.
- Disinfection: commonly used chemical disinfectant and their uses

UNIT IV

- Immunology – classification and types
- Antigen
- Antibody
- Antigen-antibody reaction
- Hypersensitivity reactions
- Immunization schedule

UNIT V

- Infection – definition, types, sources and mode of transmission.
- Hospital acquired infections
- Types of infectious diseases – outbreak, endemic, epidemic, pandemic.

UNIT VI

- Biomedical waste management: principles & practices
- Standard precautions
- Hand hygiene technique and body fluids spill management
- Needle stick injury management.

RECOMMENDED TEXT BOOKS

- Ananthanarayan and Paniker's Textbook of Microbiology
- Prescott's Microbiology

HAEMATOLOGY

L/T/P/C

2/-/-/2

UNIT 1

- Haematopoesis: Origin, development, function and fate of blood cells.
- Erythropoiesis: Origin, Development of RBCs, biosynthesis of Hb, control of erythropoiesis
- Disorders of Red blood cells, erythrocyte indices, red cell inclusion bodies and structure disorders,

UNIT 2

- Anaemia, defrinition, pathophysiology, classification – morphologic and etiologic classification and clinical features. Investigations in a case of anaemia.
  1. Morphologic: microcytic, hypochromic anaemia, macrocytic anaemia.
  2. Haemolytic anaemias: definition, classification, clinical features.
  3. Inverstigation to establish a case of hemolytic anaemia.
- Aplastic anemia. Pancytopenia, anemia due to abnormal globin synthesis.
- Polycythaemia.

UNIT 3 DISORDERS OF WHITE BLOOD CELLS

- Leucocytosis, leucopenia, leukaemoid reaction, myelodysplastic syndrome (MDS).
- Leukaemias – definition, etiology, clinical features.
- Classification – [French QAmerican British – FAB classification] Lab investigations.
- Cytochemistry of acute leukaemis
- Chronic myeloid leukaemia – clinical presentation, investigations.
- Chronic lymphocytic leukaemia.

UNIT 4

- Plasma cell disorders: classification. Plasma cell myeloma: definition, clinical classification, investigations.
- Myelo proliferative disorders: general features, classification and investigations.
- Lympho proliferative disorders: general features, classification, investigations.
- Bone marrow examination

UNIT 5 HAEMORRHAGIC DISORDERS

- Definition – pathogenesis, clinical feature, classification,- vascular disorders, platelet disorders, coagulation disorders, fibrinolysis.

- Normal haemostasis.
- Investigation of haemorrhagic disorders
- Tests of vascular and platelet aggregation studies.
- Tet of coagulation disorder.

RECOMMENDED TEXT BOOKS

- Williams Hematology
- Wintrobe's Clinical Hematology
- Dacie and Lewis Practical Haematology

GENERAL PATHOLOGY

L/T/P/C

2/-/-/2

UNIT I

- Introduction to pathology
- General introduction to pathology, cell injury and necrosis, gangrene
- Apoptosis and sub-cellular responses to cell injury
- Cellular responses to growth and differentiation, intracellular accumulations, pathologic calcification
- Acute and chronic inflammation, morphologic patterns of acute and chronic inflammation

UNIT II

- Normal constituents of blood, their structure and functions
- Collection of blood samples.
- Various anticoagulant used in haematology
- Haemotology estimation, different methods and normal values
- Hemoglobin estimation, different methods and normal values
- RBC count
- WBC count
- Platelet count
- Neoplasia, nomenclature, characteristics of benign and malignant neoplasms
- Molecular basis of cancer, oncogenes and cancer, protein products of oncogenes
- Activation of oncogenes, point mutation, chromosomal rearrangements, gene amplification, cancer.

UNIT III

- Introduction to blood banking
- Blood group system: ABO & RH system
- Methods of blood grouping: forward & reverse
- Donor selection criteria
- Collection and processing of blood for transfusion.

UNIT IV

- Collection, transport, preservation and processing of various clinical specimens.
- Urine
- CSF
- Stool
- Sputum
- Body fluids
- Urine examination- collection & preservation. Physical, chemical and microscopic examination for abnormal constituents.

- Infectious diseases, new and emerging infectious diseases, categories of infectious diseases in brief, special techniques for diagnosing infections.
- Tuberculosis-etiology, pathogenesis and lab diagnosis

- Leprosy – etiology, pathogenesis and lab diagnosis
- HIV – epidemiology, pathogenesis and lab diagnosis

RECOMMENDED TEXT BOOKS

- Robbins and Cotran Pathologic Basis of Disease
- Harsh Mohan's Textbook of Pathology

QUALITY CONTROL IN CLINICAL LAB

L/T/P/C

2/-/-/2

UNIT – I

Laboratory Operation:

Selection and evaluation of methods: Basic concepts, accuracy-reference methodology systematic error, analytical range, sensitivity and speciality, detection limit, interferences within run-precision, recovery.

UNIT-II

Assessing method acceptability:

- Establishment and use of reference value
- Clinical laboratory information-computer system, micro-computer applications laboratory information systems, future use of computers.

UNIT-III

Laboratory Management and Safety:

Health care delivery and financial strategies for manged care, financial management, human resource management and space and facility management, Lab safety-safety program, safety equipments, chemical hygiene plan. Hazards in the laboratory-identification of hazards, chemical hazards, clinical hazards, electrical hazards, biology hazards. Prevention of hazards.

UNIT-IV

Quality management: Fundamentals, total quality management, total testing process, control of pre-analytical and analytical variables, control of analytical quality using stable control materials, external quality assessment, documentation of reports, proficiency testing new quality initiatives.

UNIT-V

Laboratory safety: Fire, chemical, radiation and infection control (body substance precautions0, hazardous waste and transport of hazardous materials.

UNIT-VI

- Professional ethics
- Quality Assurance: total quality management, development and monitoring of performance indicators.

RECOMMENDED TEXT BOOKS

1. Textbook of Medical Laboratory Technology by Praful B. Godkar, Darshan P. Godkar

2. Quality Control in Laboratory edited by Sarwar Zaman

CLINICAL POSTINGS I

L/T/P/C

-/-/6/3

- Biochemistry Lab
- Microbiology lab
- Pathology lab
- Blood bank

MOLECULAR BIOLOGY AND APPLIED GENETICS

L/T/P/C

2/-/-/2

UNIT-I

- DNA- structure, types, coiling and supercoiling, topoisomerases, replication, Satellite DNA. Organization of prokaryotic and eukaryotic genome, Chromosome analysis, chromosome banding, FISH, CGH, flow, cytometry, cell cycle, mitosis and meiosis.

UNIT-II

- Transcription and Translation: Factors involved, RNA processing, types of RNA, genetic code, Lac operon, Tryptophan operon, regulation in eukaryotes, gene dosage and gene amplification, generation of antibody diversity.

UNIT-III

- Mutation: spontaneous, incluced, point mutation and silent mutation, frame-shift mutation, physical and chemical mutagens, molecular basis, site directed mutagenesis significance of mutagenesis, DNA repair, isolating mutants, Ames test.

UNIT-IV

- Recombinant DNA Technology: necessary elements-enzymes and their properties. DNA ligase, DNA modifying enzymes, cloning vectors plasmids, cosmids, bacteriophages, shuttle vectors, expression vectors, construction of rDNA and cloning strategies-various methods, genemoic libraries (eg. Using phage vectors). cDNA libraries, introduction of rDNA into host methods, restriction maps and sequencing.

UNIT-V

- Genetics in Medicine: Haemoglobin and haemoglobinopathies, phenylketonuria, alkaptonuria, homocystinuria, Lesch-Nyhan syndrome, genetics for cancer, Down's syndrome, Di-george syndrome, Klinefelter's syndrome, Turner's syndrome, hermaphroditism, cystic fibrosis, haemophilia, prenatal diagnosis of genetic diseases, application of recombinant DNA technology in medicine- PCR, RFLP, DNA finger printing, therapeutic proteins, transgenic organisms, gene therapy, human genome project.

RECOMMENDED TEXT BOOKS

- Molecular Biology of the Cell by Alberts B, Johnson A, Lewis J, Raff M, Roberts K and Walter P
- Lewin's Essential Genes
- Molecular Biology: Principles and Practice by Michael M. Cox, Jennifer Doudna, and Michael O'Donnell.

IMMUNOPATHOLOGY AND CLINICAL PATHOLOGY

L/T/P/C

3/-/2/4

UNIT 1 IMMUNOPATHOLOGY

- Mechanism of Ab-mediated inactivation: direct and indirect
  eg. Diabetes mellitus, thyroid diseases, pernicious anemia, infertility, haemophilia, myasthenia gravis.
- Immune deficeincy disorders
- Immunohaematologic diseases: transfusion reactions, erythroblastosis foetails, agranulocytosis, thrombocytopenic purpura
- Immune complex reactions: arthus reaction, serum sickness
- Connective tissue diseases: Arteritis, SLE, rheumatic fever, rhematoid arthritis,
- Atopic anaphyllactic reactions: reaginic antibody, anaphylaxis, atopic allery – factors involved, asthma, hay fever, food allergy, insect allergy, atopic eczma, delayed hypersensitivity reactions, contact dematitis,
- Autoallergic diseases: encephalomyelitis, multiple sclerosis, oorchitis, thyroiditis, sjogren’s syndrome.
- Granulomatous reactions: Infectious diseases like tuberculosis, leprosy.
- Autoimmune diseases-organ specific and systemic.
- Clinical transplantation-Kidney, Bone marrow, Heart.
- Immunology of AIDS, Tumour and Tumour markers.
- Immunohaematology- Campatibility testing.
- Different types of Ag-Ab reactions, Principle and Application

UNIT 2 CLINICAL PATHOLOGY

- Quality control in clinical pathology, concepts of quality of care, quality improvement approaches, quality improvement tools, introduction to NABH guidelines.
- Urine-sample collection & storage, physical and chemical properties and urine microscopic examination.
- Semen analysis – collection, count, motility and morphology, CASA.
- Examination of body fluids, CSF, peritoneal, pleural and pericardial fluids, synovial and other body fluids.
- Equipment relevant to lab haematology, clinical pathology and transfusion medicine including microscope: light phase contrast, interference, fluorescence, polarization and electron microscopy (principle, parts and its application) Dark ground microscopy, phase contrast microscopy.
- Automated and semi-automated urine analyser, automated coagulation analyser, platelet aggregometry and thromboelastogram.

PRACTICALS:

- Urine examination, physical, chemical and microscopic. Urine examination by strip method. Urine test for haemosiderin pigment.
- Stool examination – concentration method.
- Sputum examination – microscopic and AFB staining and eosinophils.
- Examination of cerebrospinal fluid
- Pregnancy test.
- Examination of semen.

RECOMMENDED TEXT BOOKS

- Robbins and Cotran Pathologic Basis of Disease
- Janeway's Immunobiology
- Essentials of Clinical Pathology

L/T/P/C
3/-/-/3

UNIT -1

General Laboratory Techniques and procedures: Chemicals and related substance, general laboratory supplies, volumetric equipments and its calibration, centrifuges, balances and weighing, concept of solute and solvent, buffer solutions and their actions, physical and chemical units, units of measurements, safety measures.

UNIT-2

Specimen collection and processing: Collection and preservation of blood, urine and other body fluids, sources of biological variations, pre-analytical variables.

UNIT-3

Analytical Techniques: Photometry, Spectrophotometry, flame emission Spectrophotometry, atomic absorption Spectrophotometry, fluorimetry, nephelometry, turbidimetry, flow cytometry

Radioactivity- radioisotopes, half-life units, Geiger Mueller counter, gamma counter and scintillation.

Electrochemistry – potentiometry, biosensors.

Chromatography – Theory, description of techniques of various types of chromatography, paper chromatography, HPLC.

Electrophoresis – Theory, description of techniques of various types of electrophoresis, technical considerations, capillary electrophoresis.

Immunochemical techniques – basic concepts, antigen-antibody binding qualitative methods, quantitative methods.

Centrifuge – basic principles, types of centrifuges and their applications.

Protein purification.

UNIT -4

Recombinant DNA technology – PCR, western blotting, northern blotting and southern blotting, FISH.

Automation: Concepts, automation of analytical processes, integrated automation for clinical laboratory, automation of point of care analyzers.

UNIT -5

- Preparation of operating budgets; general aspects of financial management of laboratories
- Cost-analysis (tests and instruments); justification of providing new services or rejecting existing ones; lease and purchase decision analysis; delegation of budget responsibilities, work load statistics.
- Laboratory safety: Fire, chemical, radiation and infection control (body substance

precautions), hazardous waste and transport of hazardous materials.

- Maintenance of records: Procedure manuals, ward manuals, quality control programs, patient data retrieval.
- Personnel management: Personnel policy manual; job descriptions; labor, supervision relations; conducting job interviews; motivation, recognizing job distress syndrome; delegation to a laboratory manager.
- Hospital organization; interactions between the laboratory service and the rest of the hospital.
- Professional ethics.
- Quality assurance; total quality management; development and monitoring of performance indicators.

RECOMMENDED TEXT BOOKS

- Wilson and walker's principles and techniques of biochemistry and molecular biology.
- Bishop's techniques and principles of molecular biochemistry.

CLINICAL BIOCHEMISTRY I

L/T/P/C

3/-/-/3

UNIT -1

- Disorders of carbohydrate metabolism
- Abnormalities of proteins in plasma
- Disorders of plasma lipids and lipoproteins
- Diabetic panel test.
- Glucose tolerance test (GTT) importance and principle and techniques of GTT
- Insulin tolerance test
- Gastric juice analysis
- Water and Electrolyte balance and imbalance: sodium, potassium, chloride, CO_2 (HCO_3 -), total and ionized Calcium, phosphorus (inorg.), magnesium.
- Bile pigment metabolism and Pathophysiology of jaundice
- Enzymes and Iso-enzymes of clinical Importance-Alkaline phosphates, acid phosphates, SGOT, SGPT, CPK and LDH.
- Clearance test for urine function.
- Qualitative and quantitative test of urine.

RECOMMENDED TEXT BOOKS

- Lippincott's illustrated biochemistry
- Harper's illustrated review of biochemistry

CLINICAL BIOCHEMISTRY I - PRACTICALS

L/T/P/C

-/-/4/2

1. Estimation of SGOT in blood sample
2. Estimation of SGPT in blood sample
3. Estimation of alkaline phosphatase in blood sample
4. Estimation of acid phosphatase in blood sample
5. Estimation of bilirubin in blood sample
6. Estimation of Na+, K+ & Ca++
7. Estimation of common parameters in urine

RECOMMENDED TEXT BOOKS

- Lehninger Principles of Biochemistry
- Harper's Illustrated Biochemistry

L/T/P/C

3/-/-/3

UNIT I ACUTE PHASE PROTEINS

Diagnosis & clinical significance of C-reactive proteins, Alpha fetoproteins, Alpha 1 antitrypsin, Alpha 2 Macroglobulin, Haptoglobin, Ceruloplasmin.

UNIT II BIOCHEMISTRY OF AIDS

HIV genes & gene products, Biochemical changes during HIV infection, diagnosis & precautions.

UNIT III AGEING

Biochemistry of ageing, Alzheimer's disease, Prions, Beta-amyloid

UNIT IV BLOOD & DISORDERS

Biochemical derangement in anemia, Conditions associated with abnormal acid base status, Abnormal electrolytes composition of the blood, Diagnosis of acid base disorders.

UNIT V CLINICAL TOXICOLOGY

History of Toxicology, Concept & Scope of toxicology, Factors modifying action of poisons, fatal dose, house hold plants, house old chemicals, agricultural chemicals.

Drugs of abuse – Amphitamine, Cannabissativa, Cocaine, Lysergic acid, Diethylamide, Mescaline, Methaqualone, Phincyclidine, Nutmeg, Asthma powder, Tolatile nitrites, Poisones mushrooms.

RECOMMENDED TEXT BOOKS

- U.Sathyanarayana – textbook of biochemistry
- Rafi MD textbook of biochemistry

CLINICAL POSTINGS- II

L/T/P/C

-/-/6/3

Students should be posted in,

- Biochemistry lab.
- Pathology lab.
- Blood bank.
- Molecular biology lab
- Microbiology lab

SEMESTER III

CLINICAL BIOCHEMISTRY - II

L/T/P/C

3/-/2/4

- Pancreatic function tests.
- Thyroid function tests.
- Liver function tests.
- Quality control – Internal & External quality control.
- Hazards in the clinical biochemistry.
- Handling & Disposal of infected, Dangerous radioactive materials.
- Gas transport, pH regulation, Buffer system of plasma, Acid- Base balances and Its maintenance.
- TUMOR BIOMARKERS
  - The definition, classification, biochemistry, and distribution of tumor markers, both protein and carbohydrate, including, but not limited to, prostate-specific antigen, calcitonin, human chorionic gonadotropin, αfetoprotein, carcinoembryonic antigen CA 15-3, CA 125, and CA 19-9.
  - Recent developments in identifying proteomic patterns for cancer detection.
- PEDIATRIC CLINICAL BIOCHEMISTRY
  - Problems of specimen collection; capillary specimens.
  - Reference range differences in infants and children: Those that vary significantly with age and sex (inorganic phosphorus, creatinine, alkaline phosphatase, aspartate aminotransferase, creatine kinase).
  - Special problems in pediatrics: Respiratory distress syndrome, gastrointestinal disease (fat absorption, disaccharide intolerance, protein-losing neonatal

PRACTICALS:

- Electrophoresis of serum proteins.
- Determination of serum thyroxin binding capacity.
- Determination of serum bicarbonate.
- T3,T4 and TSH

RECOMMENDED TEXT BOOKS

- Lippincott's illustrated biochemistry
- Harper's illustrated review of biochemistry

APPLIED BIOCHEMISTRY - II

L/T/P/C

3/-/-/3

UNIT 1. DRUG METABOLISM

• The differences between phase I and phase II drug metabolism reactions

• Various consequences of competing metabolic pathways to modulate both the efficacy and toxicity of administered medications

• Frequent inter individual variability drug-metabolizing enzymes and its impact on the variability of drug response

UNIT 2. TOXICOLOGIC SYNDROMES

• The pathophysiological basis and be able to recognize the five major toxicologic syndromes (cholinergic, anticholinergic, sympathomimetic, opiate, and sedativehypnotic).

• Formulation of toxicologic differential diagnosis and designing a clinical laboratory testing protocol for each of the syndromes

• The basic therapeutic approach to each syndrome

UNIT 3. LABORATORY EVALUATION AND MANAGEMENT OF OVERDOSED OR POISONED PATIENTS

• The National Academy of Clinical Biochemistry guidelines for Emergency

Toxicology:

• The important differences between urine and blood (including serum and plasma) for monitoring and detection of drugs / xenobiotics.

• Designing and implementing standardized STAT panels of laboratory tests for Evaluation of overdosed/poisoned patients.

• The toxicologic profiles of specific agents, including acetaminophen, salicylates, alcohols and glycols, barbiturates, tricyclic antidepressants, carbonmonoxide, organophosphates and carbamate, digoxin lead, iron, and cyanide.

• The general supportive measures, the role of alkalinization, the importance of specific antidotes, and the variable efficacy of exchange transfusion hemodialysis, plasmapheresis, and charcoal hemoperfusion of blood in the management of specific agents.

UNIT 4. METABOLIC REGULATION & INBORN ERRORS OF REGULATION

Vitamins:

Chemistry, absorption, metabolism, biochemical roles, requirements, deficiency, estimation of vitamins.

Minerals:

Absorption, biochemical roles, requirements, deficiency manifestation of bulk, trace and ultra-trace elements, effect of toxic metals, measurement of serum minerals like Zn, Cu, Na, K, Cl, Mg, Mn, Ca, P, I, Fe,Se, Iron binding capacity, transferring and ferritin, Ceruloplasmin.

Hormones:

Mechanism of action of hormones, hormone receptors, signal transduction, cyclic AMP, cyclic GMP, biosynthesis of Adrenal and Thyroid hormones, hormonal regulation of gene expression, hormonal disorders.

Inborn errors:

Carbohydrate metabolism, lipid metabolism, protein and amino acid metabolism. Nucleic acid metabolism, vitamins and mineral metabolism, hormone metabolism.

RECOMMENDED TEXT BOOKS

- U.Sathyanarayana – textbook of biochemistry
- Rafi MD textbook of biochemistry

PARASITOLOGY, MYCOLOGY, VIROLOGY

L/T/P/C
3/-/-/3

UNIT I

- Introduction to parasitology: definitions, history, significance; host–parasite relationships; zoonoses; epidemiology of parasitic diseases

- Morphology, structure, life cycle, pathogenesis of medically important protozoa (e.g. Plasmodium spp., Leishmania, Trypanosoma, Entamoeba histolytica, Giardia, Trichomonas); Classification – protozoa-amoeba, flagellates, sporozoa, ciliates.
- Opportunistic parasitic infection

UNIT 2

- Helminths – cestodes, termatodes.
- Helminths – nematodes and diagnostic methods in parasitology
- Life cycles, pathology, diagnosis; vectors / arthropods (ticks, lice, mosquitoes, etc.)
- Diagnostic methods: Sample collection & preservation; staining (Wright, Giemsa, etc.); concentration techniques for stool, blood; serological methods; molecular diagnostics (PCR, etc.)

UNIT 3

- Introduction; classification of fungi; fungal cell structure and physiology; dimorphism; fungal nutrition and growth
- General properties of fungi
- Cultivation methods
- Laboratory methods of diagnosing fungal infection
- Superficial, cutaneous, subcutaneous, systemic, opportunistic fungi; examples: Candida, Aspergillus, Cryptococcus, Histoplasma, Blastomyces, Coccidioides
- Mycotoxins
- Opportunistic fungi in immunocompromised patients; fungal zoonoses; molecular diagnostics in mycology; molecular epidemiology;

UNIT 4

- Nature of viruses: structure, classification (ICTV), replication cycles; virus–host interactions; pathogenesis; immune responses to viruses
- Virus Diagnostics: Sample collection, preservation; isolation & culture; cell culture, embryonated egg, animal models; detection techniques: microscopy, antigen / antibody assays (ELISA, immunofluorescence etc.), molecular methods (PCR, RT PCR), viral load assays
- Classfication and general properties of viruses - interferon, inclusion bodies
- Cultivation of viruses and laboratory diagnostic methods of viral diseases
- Pox virus, herpes virus, myxoviruses, picorna virus
- Rabies, arbo viruses, hepatitis, HIV, viruses causing gastroenteritis, prion diseases, miscellaneous viruses.

RECOMMENDED TEXT BOOKS

- Prescott's Microbiology
- Ananthanarayan and Paniker's Textbook of Microbiology

L/T/P/C

2/-/2/3

UNIT I

- Histotechniques:
    - Introduction to histotechnology
    - Fixation
    - Decalcification
    - Criteria of a good decalcification followed selection of tissue, fixation and decalcification, neutralization of acid and through washing.
    - Various types pf decalcifying fluids: organic & inorganic acid, chelating agents, use of ion-exchange resigns and electrophoretic decalcification and treatment of hard tissues which are not calcified.
    - Processing of various tissues for histological examination
    - Dehydration, clearing, infiltration and routine timing schedule for manual or automatic tissue processing.
    - Components & principles of various types of automatic tissue processors.
- Embedding:
    - Definition & various types of embedding media.
    - Introduction regarding equipment used for sectioning microtome knives, sharpening of microtome knives, honing, stropping, various types of microtome and their apllications
    - Principles and staining techniques of;
        - Routine – haemotoxylin and eosin
    - Special stains, stain for micro-organisms, stains for hemosiderin, stains for neutral lipids.

UNIT 2

- Enzyme histochemistry and immunoenzyme techniques
- Immunohistochemistry and the various immune histochemical stains in the diagnosis of various disorders
- Immunofluorescence – principles and applications, FISH, tissue micro array, cryostat, frozen techniques.
- Tissues of special interest – nervous system, hard tissue.
- Miscellaneous cells
- Endocrine cells

UNIT 3

- Cytology techniques including liquid based cytology, cell block preparation
- Quantitative methods

UNIT 4

- Micro incineration
- Autoradiography
- Museum techniques
- Specimen photography and photomicrography

-/-/4/2

PRACTICALS:

- Tissue processing
- Section cutting
- H & E staining
- Special stains
- PAP staining
- Cryostat
- Frozen techniques
- IHC

RECOMMENDED TEXT BOOKS

- Bancroft's theory and practice of histological techniques 8th edition
- Handbook of histopathological and histochemical techniques. C.F.A.Culling

CLINICAL POSTINGS - III

L/T/P/C

-/-/14/7

Students should be posted in,

- Biochemistry lab.
- Pathology lab and Histopathology lab
- Molecular biology lab
- Microbiology lab.

SEMESTER IV

THESIS/RESEARCH PROJECT

L/T/P/C

/-/-/16/8

In project/thesis, the students should be able to:

- Independently conduct research
- Critically analyze findings with scientific methodology
- Contribute to evidence-based practice and innovations in cardiovascular imaging

INTERNSHIP

L/T/P/C

-/-/24/12

During internship, students should be posted in;

- Biochemistry lab.
- Pathology lab and Histopathology lab
- Molecular biology lab
- Microbiology lab.