



DHANALAKSHMI SRINIVASAN UNIVERSITY
Samayapuram, Trichirapalli.

SCHOOL OF ALLIED HEALTH SCIENCE

**B.Sc – Medical Lab Technician (MLT) – 4 Years Course
(Batch : 2022-2023)**

CURRICULUM & SYLLABUS
2022 Onwards

B.Sc - MLT – 4 Years Course (Batch : 2022-2023)

COURSE OF INSTRUCTION

Sl. No	Subjects
I YEAR	
1	Paper I - Anatomy and Physiology
2	Paper II - General Biochemistry
3	Paper III - Physics & Principles of Instrumentation
4	Paper IV – English
5	Paper V – Introduction to Computer
6	Clinical Posting
II YEAR	
1	Paper I – Histopathology and Cytology Techniques
2	Paper II – Biochemistry – I
3	Paper III – Clinical Pathology and Basic Haematology
4	Paper IV – Microbiology I (General Bacteriology, Immunology, Parasitology, and Entomology)
6	Clinical Posting
III YEAR	
1	Paper I - Coagulation and Transfusion Medicine
2	Paper II - Biochemistry – II
3	Paper III - Microbiology – II (Systematic Bacteriology, Virology, Mycology, Advanced Serology)
4	Clinical Posting
IV YEAR	
1	Internship

**B.Sc - MEDICAL LAB TECHNOLOGY (MLT)
(4 Years Pattern)**

PROGRAMME EDUCATIONAL OBJECTIVE (PEO)

- To Serve as a best roles in the clinical laboratory profession such as technical, educational, research and administrative.
- To analyze medical professional theory, literature and apply that information in work.
- Students undergo training in all fields of laboratory medicine such as Biochemistry, Microbiology, Pathology and Blood bank departments and Laboratories.
- Students understand and perform special biochemical analysis, stains and smears, cytology, histopathology.
- Student's expertise to work under different specialties of Laboratory Medicine and contribute in NABL accreditation program.
- Students practices to ensure the accuracy and reliability of laboratory information.
- Students gain knowledge to Interpret, implement, and comply with laws, regulations, standards.

PROGRAMME OUTCOME (PO)

- To assess the basic principles of hematology, occupational exposure to blood borne pathogens, hazard communication and other safety protocols applicable to the hematology laboratory.
- Attain fundamental knowledge of theory and principles related to laboratory medicine.
- Students are expected to have an understanding of basic physiology to disease processes to normal and abnormal laboratory result.
- To interact with the patient and other health care professionals to provide quality patient care.
- The Programme will propagate the students into Medical Lab technologist, academic researchers, biochemical technologist which could produce them as Medical Lab specialists.

COURSE WORK – I YEAR

PAPER I – ANATOMY AND PHYSIOLOGY (22MLT01)

ANATOMY

Course Outcome :

- To gain information about the anatomical structures organ in the body parts.
- To get knowledge on Human skeleton, Macroscopical structure, exact exterior location of an organ, measurement techniques.
- To attain clinical aspects relate to study of bones, different parts of bones, digestive system and excretory system.

Hours: Theory: 60 Hrs; Practicals:50 Hrs

THEORY:

Sl. No	CONTENT
1	General Anatomy : Introduction to anatomical terms and organization of the human body. Tissues – Definitions, Types, characteristics, classification, location, functions and formation.
2	Systemic Anatomy: Musculoskeletal system: Bones – types, structure, Axial & appendicular skeleton. Bone formation and growth, Joints – classification and structure. Types and structure of muscles. Movements at the joints and muscles producing movements.
3	Nervous System: <ul style="list-style-type: none"> • Structure of Neuroglia andneuronsParts and classification • CNS – Structure of Brain and spinal cord and their functions. • PNS - Cranial nerves and spinal nerves • ANS - Sympathetic and Parasympathetic
4	Cardiovascular System: Circulatory system – Structure of the Heart, Structure of Blood Vessels – arterial andvenous system. Lymphatic System : Gross and microscopic structure of lymphatic tissue.
5	Respiratory System: Parts, Nasal cavity and Paranasal air sinuses, trachea, Gross and microscopicstructure of lungs, Diaphragm and Pleura.
6	Digestive System: Parts, Structure of Tongue, Salivary glands, stomach, Intestines, Liver, Pancreas.
7	Urinary System: Parts, structure of Kidney, Ureters, Urinary Bladder and Urethra.
8	Reproductive System: Parts of the system. Gross structure of both male and female reproductive organs.
9	Endocrine System: Gross structure of Pituitary, Thyroid, Parathyroid, Pancreas, Adrenal glands.
10	Special Senses: Structure of Skin, Eye, Nose, Tongue (Auditory and Olfactory apparatus)
11	Anatomical Techniques : Embalming of human cadaver, Museum Techniques, Basic principles ofKaryotyping.

LIST OF PRACTICAL EXERCISE:

1. Study of Human skeleton
2. Study of all the system with models
3. Histological study of all the systems
4. Hematoxylin and eosin staining of given paraffin section.

TEXT BOOKS RECOMMENDED:

Latest editions of the following books

1. Human Anatomy by Inderbir Singh
2. Ross & Wilson Anatomy & Physiology in Health & Illness by Waugh (A)
3. Text Book of Human histology by Inderbir Singh
4. Theory and Practice of Histological Techniques by Bancroft (JD)
5. Human Genetics by Gangane (SD)

TEACHING LEARNING ACTIVITIES:

1. The course content in Anatomy will be covered by:
2. Interactive Lectures
3. Practical
4. Demonstrations
5. Seminars
6. Assignments

I Year- MLT

PAPER I – ANATOMY AND PHYSIOLOGY (22MLT01)

PHYSIOLOGY

Theory:60 Hrs ; Practical: 50 Hrs

A brief account of function will be covered system wise. Main emphasis will be laid on the principles underlying various techniques or procedure to study functions of isolated organs and intact system/human body.

Course Outcome :

- To understand basic of physiology, physiological principles, analyze various problems related to physiology.
- To gain knowledge on Reproductive Systems, Endocrine system and Excretory System.
- To attain clinical aspects with correlate study of physiology of human body, parameters associated with human blood.

Sl. No.	CONTENT
1	BLOOD : Components, haematocrit, ESR, blood volume measurements. RBC, WBC & platelet counts, names of developmental stages of RBC, functions and fate of RBC. Functions of WBC and platelets. Basis of blood coagulation. Blood groups – ABO & Rh
2	MUSCLE : Structure in brief, mechanism of muscle contraction, isotonic and isometric contractions, energy sources of muscle contractions, motor unit.
3	GASTRO INTESTINAL TRACT : Functional anatomy of G.I.T, functions of G.I secretions, principles of secretion and movements of GIT.
4	KIDNEY: Structure of Nephron, measurement and regulation of GFR, mechanism of urine formation. Clearance tests & values of insulin, PAH and urea clearance.
5	ENDOCRINES: Names of endocrine glands & their secretions, functions of various hormones, Brief account of endocrine disorders.
6	REPRODUCTION: Reproductive cycle in female including menstrual cycle, pregnancy, parturition, lactation. Male sex hormones and spermatogenesis. Basis of contraception.
7	CARDIO VASCULAR SYSTEM: Anatomy of heart, cardiac cycle, heart sounds, definitions of cardiac output, stroke volume, principles of measurements of cardiac output. ECG – methods of recording and ECG waves. Normal values of blood pressure, heart rate and their regulation in brief.
8	RESPIRATION: Principles of respiration, respiratory muscles, lung volumes and capacities, collection and composition of inspired alveolar and expired airs. Transport of oxygen and carbon dioxide. Brief account of respiratory regulation. Definition of hypoxia, Cyanosis, asphyxia. Methods of artificial respiration.
9	NERVE, CENTRAL NERVOUS SYSTEM: Structure of neuron, nerve impulse, myelinated and non-myelinated nerve. Brief account of resting membrane potential, action potential and conduction of nerve impulse.

	Neuro-muscle transmission. Various parts of nervous system, C.S.F., Functions of muscle spindle and motor tracts including reflexes , cutaneous receptors, joint receptors, sensory pathways. Ascending reticular formation, EEG, functions of cerebellum, basal ganglia, thalamus & hypothalamus, vestibular apparatus and functions.
10	AUTONOMIC NERVOUS SYSTEM : Divisions and functions.
11	SPECIAL SENSES: VISION: Structure of eyeball, retina, visual pathway, accommodation, visual acuity, error of refraction, color vision. HEARING: Brief account external, middle and inner ear, hearing tests. TASTE & SMELL: receptors, pathways, method of transduction.

LIST OF PRACTICAL EXERCISES:

1. Study of appliances for amphibian practical. Simple muscle curve, effect of temperature on SMC, Genesis of fatigue, frog cardiogram.
2. Study of appliances for haematology practical. Making blood smear, staining and use of microscope for identifying, blood cells. Preparation of diluting fluids for RBC and WBC counts. Principles of haemocytometry., RBC and WBC counts, DLC, platelet count, BT,CT, ESR, Hb estimation.
3. Working principles and recording of chest movements with stethograph, ECG, Blood pressure, radial pulse with physiograph.
4. Spirometry –recording of lung volumes and capacities.
5. Identification of instruments used in study of cardio vascular system, respiratory system, nervous system and special senses.
6. Mosso's ergography, Perimetry, Tests of hearing.

TEXT BOOKS RECOMMENDED

Latest editions of the following books:

1. Textbook of Medical Physiology by G.K. Pal.
2. Review of Medical Physiology by Ganong.
3. Samson Wrights Applied Physiology.
4. Text book of Medical Physiology by Guyton(AC)
5. Text book of Medical physiology by A.B. Das Mahapatra.

TEACHING LEARNING ACTIVITIES:

The course content in Physiology will be covered by:

1. Interactive Lectures
2. Group Discussions
3. Practical
4. Demonstrations
5. Seminars
6. Assignments

I Year- MLT
PAPER – II GENERAL BIOCHEMISTRY (22MLT02)

Course Outcome :

- To understand structure, properties, biochemical role of carbohydrates, Proteins, Lipids, Nucleic acids, enzymes, Vitamins, Minerals.
- To analyze the clinical role of various biomolecules involved in biochemical pathways.
- To understand the basic principles, instrumentation to analyse various samples.

THEORY

S. No	CONTENT
1	Role of Medical Laboratory technologists – ethics of laboratory practice. Laboratory safety – Common lab accidents their prevention and their first aid. General laboratory layout as applicable to biochemistry.
2	Laboratory glassware and its uses – Types of pipettes, calibration of pipettes, cleaning of glassware.
3	Preparation of solutions – units of weights and volume, Calculation of concentration and methods of expressing concentration of solution. Types of water, their properties, uses and method of production.
4.	Basic and elementary concepts of chemistry and properties of carbohydrates as applicable to the human body.
5	Basic and elementary concepts of chemistry and properties of lipids as applicable to the human body.
6	Basic and elementary concepts of chemistry and properties of proteins & amino acids as applicable to the human body.
7	Basic and elementary concepts of chemistry and properties of nucleic Acids as applicable to the human body,
8	Basic concepts of principles of nutrition and nutrients macro and micro nutrients. Vitamins & Minerals. Vitamins- Fat soluble vitamins , Water soluble vitamins sources, Biochemical role, RDA, deficiency manifestations Minerals – Calcium, Phosphorous, Iron, Copper, Zinc, Magnesium, Manganese, Iodine.
9	Working Principles and application of photometry, and atomic absorption, Spectrophotometry.
10	Fundamental concepts of biophysical phenomena like osmosis, dialysis, colloidal state, viscosity, absorption, osmotic pressure, surface tension and their application in relation to the human body.
11	Definition, basic concepts of classification mechanism of action and properties of enzymes, factors influencing enzyme action.
12	Definition and basic concepts of acids, bases, indicators and buffer, their application in laboratory.
13	Elementary concepts of radioactivity, radioisotopes, their application in medicines and agriculture isotopic dilution analysis, radioactivity counting techniques.
14	Working principles Types and applications of Electrophoresis – Paper, Agarose Gel, Cellulose Acetate and PAGE.
15	Working principles, types and applications of Chromatography - Paper Chromatography, TLC, Ion Exchange, Affinity Gel, Filtration, Gas Chromatography and HPLC.
16	Working principles, types and application of centrifugation

LIST OF PRACTICAL EXERCISES:

Uses of Analytical balance, preparation and standard solution,

1. General reactions and identification of carbohydrates glucose, fructose, maltose, lactose and starch.
2. General reaction of proteins, colour reaction and precipitation of proteins- albumin, casein, gelatin, peptone.
3. Acidimetry and alkalimetry
4. pH determination using colorimetric methods and using pH meter.
5. Simple tests for identification of food constituents.
6. Qualitative analysis of milk, egg.
7. Effects of temperature, pH, substrate concentration on enzyme activity.
8. Demonstration on Electrophoresis, Chromatography and Radioactivity Counting.

TEXT BOOKS RECOMMENDED

Latest editions of the following books:

1. Medical laboratory Procedure Manual (T-M) by K.L. Mukerjee 1987, Vol.I, II & III Tata McGraw Hill Publication.
2. Text book of Medical Biochemistry by Ramakrishna
3. Text Book of Clinical chemistry by Norbert Teitz
4. Principles and Techniques of Practical Biochemistry by Wilson and Walker.
5. Clinical Chemistry - Principle and techniques by Rj Henry, Harper & Row Publishers.
6. Text Book Biochemistry by Vasudevan and Sree Kumari.

I Year - MLT
PAPER III - PHYSICS (22MLT03)

Course Outcome :

- To understand basic principle of Light Optics and Electro Magnetic Radiation.
- To know and understand mechanism of Fluids
- To understand basic principle, various types of biomedical instruments of clinical lab.

Duration in Hours : Theory: 60 Hrs

THEORY

S. No	CONTENT
1.	<p>REVIEW OF PHYSICS :</p> <p>Balance physical & chemical balance. Sensitivity of balance use and care of the balance, mass –volume- specific gravity- units and measurements- properties of matter – viscosity of both fluids- diffusion and osmosis – dynamics- motion – types centripetal force and centrifugal force. application centrifuge principle and parts applications in medicine preventive maintenance ph meter parts and principle cell counter – basic principle.</p>
2.	<p>HEAT:</p> <p>Basic concept of quantity of heat . Definition and measurement of above concept of temperature thermometry, thermostat, thermocouple relevant to clinical laboratory, thermal capacity specific heat capacity, calorimetric techniques calorific values of food and fuel kinetic theory of gases- assumptions. Applications laws of thermodynamics water bath- parts, care and usage. Incubator- parts, preventive maintenance and use of refrigerators techniques. Types of refrigerators- cooling; cycle production of low temperature vapour absorption change of stage, latent heat; cooling by evaporation.</p>
3.	<p>Light and optics:</p> <p>While light color spectrum wavelength frequency dispersion reflection refraction critical angle – total internal reflection. Lasers –types- focal length-magnification power- spherical and chromatic aberrations – filters- spectrometer- principle and parts- applications microscopes. Types of microscopes- simple – compound – phase contrast-polarizing – fluorescent- dark field-electron microscope-parts and care of the microscope.</p>
4.	<p>Sound:</p> <p>Production and propagation – velocity wave length frequency- ultrasound- properties & problems and application in clinical field.</p>
5.	<p>Review of electricity and electronics:</p> <p>Electricity: Determination of power, energy, AC & DC current- resistance – volts,- ohm’s law- cycles – earthing- fuse- transformers types- tum ratio- transformers and stabilizers- uninterrupted power supply(UPS)- electrolysis- basic concept. electrolytes application in medicine , distillation apparatus parts and principle. Medical electronics semi conductors- principles of diodes- rectifiers- oscillators- photoelectric emission integrated circuits.</p>
6.	<p>Radioactivity:</p> <p>Basis of radioactivity decay constant decay series – artificial radioactivity – radioisotopes-isotopes used in medicine – blood indicator (Gamma chamber)- detectors- non chamber- GM count scintillation chamber – liquid scintillation counter-electromagnetic radiations – spectrum – ionizing radiation – types charged. Particle radiation – electron beam- its properties – radiation protection- and basic principles of radiation protection- personnel monitoring devices (TLD,Film badge).</p>

I Year- MLT

PAPER – IV ENGLISH (22MLT04)

Duration in Hours : Theory: 50 Hrs

The course is designed to enable students to enhance ability to comprehend spoken and written English (and use English) required for effective communication in their professional work. Students will practice their skills in verbal and written English during clinical and classroom experience.

Course Outcome :

- At the end of the course, the student will develop
- Ability to speak and write grammatically correct English Effective skill in reading and understanding the English language Skill in reporting

THEORY

S. No	CONTENT
	COURSE CONTENT COMMUNICATION <ul style="list-style-type: none">• Communication at the work place• Human needs and communication “Mind mapping” Information communication
	COMPREHENSION PASSAGE <ul style="list-style-type: none">• Reading purposefully Understanding• What is read Drawing conclusion Finding and analysis
	EXPLAINING <ul style="list-style-type: none">• How to explain clearly• Explaining procedures Giving directions
	WRITING BUSINESS LETTERS <ul style="list-style-type: none">• How to construct correctly• Formal language• Address Salutation• Body and Conclusion
	REPORT WRITING <ul style="list-style-type: none">• Reporting an accident• Reporting what happened at a session• Reporting what happened at a meeting

I Year- MLT

PAPER V - INTRODUCTION TO COMPUTERS (22MLT05)

Duration in Hours : Theory: 50 Hrs

OBJECTIVES

- Demonstrate skill in the use of MS Office, MS Excel and MS Power point
- Demonstrate use of internet and Email

Course outcome :

- Creating and Managing Professional Documents using Word. Presenting and Managing Data effectively using Excel Creating and Managing presentations using Power point
- Communicate and Manage tasks, contacts and Appointments Using OfficeOutlook
- Introduction to Digital Life Style

THEORY

S. No	CONTENT
1.	TYPING TEXT IN MS WORD <ul style="list-style-type: none">• Inserting tables in a document.• Formatting the text – using different font sizes, bold, italics Bullets and numbering. Pictures, file insertion• Aligning the text and justify. Choosing paper size Adjusting margins• Header and footer, Inserting page No's in a document Printing a file with options• Using spell check and grammar
2.	CREATING TABLE IN MS-EXCEL <ul style="list-style-type: none">• Cell editing – Using formulas and functions Manipulating data with excel• Using sort function to sort numbers and alphabets\• Drawing graphs and charts using data in Excel – Auto formatting – Inserting data from other worksheets.
3.	PREPARING NEW SLIDES USING MS- POWERPOINT <ul style="list-style-type: none">• Inserting slides – Slidetransition and animation – Using templates• Different text and font sizes – Slides with sounds – Inserting clip arts, pictures, tables and graphs– Presentation using wizards.
4.	INTRODUCTION TO INTERNET <ul style="list-style-type: none">• Using search engine – Google search – Exploring the next using Internet Explorer and Navigator – Uploading and Download of files and images• E-mail ID creation Sending messages – Attaching files in E-mail• Typing a text and aligning the text with different formats using MS-Word• Inserting a table with proper alignment and using MS-Word• Create mail merge document using MS-word to prepare greetings for 10 friends• Preparing a Slide show with transition, animation and sound effect using MS PowerPoint• Customizing the slide show and inserting pictures and tables in the slides using MS PowerPoint• Creating a worksheet using MS-Excel with data and use of functions Using MS-Excel prepare a worksheet with text, date time and data Preparing a chart and pie diagrams using MS-Excel• Using Internet for searching, uploading files, downloading files and creating e-mail ID
5.	METHODS OF TEACHING : Lecture cum discussion, Demonstration, Practical work record

II Year – MLT

Paper – I HISTOPATHOLOGY AND CYTOLOGY TECHNIQUES (22MLT06)

Hours : 60 ; Practical's : 70

Course Outcome (CO):

- At the end of the course the student will be able to fix, process, embed tissues and make sections for microsection studies.
- Students will also be competent to make routine cytological preparation.

Theory

1. Introduction to histopathological techniques
2. Reception of specimens.
3. Fixation-formalin fixation.
4. Tissue Processing and embedding.
5. Section cutting.
6. Mounting and staining.
7. Theory of H&E staining.
8. Theory of EM fixing, processing & cutting.
9. PAS staining, principle & uses.
10. Reticulin, PTAH, Van Giesson
11. Amyloid stain, pearl stain
12. Melanin bleach & masson's Fontana
13. Theory of immune histo chemistry
14. Theory of molecular techniques
15. PAP staining, principles & uses
16. Cytology

Theory :

1. Principles of exfoliative cytology
2. Fixation of smears
3. Pap staining & identification of cells in a normal vaginal smear.
4. Preparation of smear for fine needle aspiration cytology

Practical's

1. Grossing and bit taking, tissue processing, Embedding & preparation of blocks
2. Section
3. Cutting. use & care of microtome H&E
4. Staining. Decalcification methods
5. PAS staining, principle & uses.
6. Reticulin stain, PTAH stain, Van Giesson stain, Amyloid stain , parl stain
7. Melanin bleach & masson's Fontana
8. AFB staining(TB and Leprosy)
9. Frozen section & care of cryostat
10. Pap staining, MGG staining for fnac
11. Museum techniques
12. Preparation of mounting medium & mounting of specimen.

TEXT BOOKS :

Recent editions of

1. Cellular pathology by Culling.
2. Theory and practical of histological techniques by Bancroft
3. Medical Laboratory technology by Lynch.

II Year – MLT

PAPER – II BIOCHEMISTRY – I (22MLT07)

Hours : 60 ; Practical's : 70

Course Outcome (CO) :

- To familiarize the student with the metabolism of carbohydrates, proteins, lipids & the relevant diagnostic tests.
- Introduction to hormones, purines, pyrimidines & mineral metabolism. Electrophoresis in clinical biochemistry, haemoglobin & porphyrias.

Theory

1. Carbohydrates, digestion & absorption, metabolism of glucose, glycolysis, glycogen formation & breakdown, glycogen storage disease, maintenance of blood sugar levels, hormonal influence, diabetes mellitus, interconversion of monosaccharides.
2. Digestion of proteins, urea synthesis, creatine synthesis & degradation, Transamination, metabolism of amino acids
3. Lipids-digestion&absorption of lipids, synthesis of fatty acids, oxidation of fatty acids, cholesterol synthesis, introduction to eicasanoids, prostaglandins-
4. Purines and pyrimidine metabolism.
5. Hormones: Role of biologically important hormones. Pituitary hormones,thyroid, adrenal cortex and medulla and sex hormones. Mechanism of control diseases and biochemical tests for under and over production.
6. Mineral metabolism: regulation of blood level; consequences of excess and deficiency of calcium, phosphate, and iron.
7. Haemoglobin and porphyrias : Structure of haem, biosynthesis , porphyrias , catabolism of haem, hemoglobin quaternary structure, structure of myoglobin ,transport of gases, oxygen dissociation of curves, isohydric transport of CO₂ fetal Hb, carboxy haemoglobin, methaemoglobin.
9. Electrophoresis of serum, urine and CSF
10. Usefulness in diagnosis, different patterns observed and function of acute phase reactants.
11. Formation and composition of cerebrospinal fluid in disease.

PRACTICAL'S

1. Estimation of serum urea, Creatinine , uric acid calcium and phosphorus.
2. Demonstration of sodium and potassium estimation by flame
3. photometer and ion selective electrodes .
4. Demonstration of serum electrophoresis.
5. Review of estimation of glucose , total protein , albumin and cholesterol.
6. Qualitative urine analysis ,protein , glucose , 5-hydroxy indole acetic acid(%HIAA), total porphyrins.
8. Coproporphyrin, urobilinogen, bilirubin.

TEXT BOOKS RECOMMENDED

Latest editions of the following books:

1. Medical laboratory Procedure Manual (T-M) by K.L. Mukerjee 1987, Vol.I, II & III TataMcGraw Hill Publication.
2. Text book of Medical Biochemistry by Ramakrishna
3. Text Book of Clinical chemistry by Norbert Teitz
4. Principles and Techniques of Practical Biochemistry by Wilson and Walker.
5. Clinical Chemistry - Principle and techniques by Rj Henry, Harper & Row Publishers.
6. Text Book Biochemistry by Vasudevan and Sree Kumari.

II Year – MLT

Paper – III CLINICAL PATHOLOGY & BASIC HAEMATOLOGY (22MLT08)

Hours : 60

Practicals : 70

Course Outcome (CO):

- Should have a clear understanding of haemoglobins.
- Should know basic disorders related to quantitative and qualitative abnormalities of red cells, WBC and platelets.
- Should know laboratory techniques used in diagnosis of the above and disorders.
- Should have an introduction to automated technique in haematology.
- Should be introduced to basic molecular diagnostics.
- Should be aware of the importance of the examination of urine, stool, and other body fluids and be able to examine these specimens and report on basic abnormalities.

1. Overview of haematopoiesis.
2. Regulation of erythrocyte production, distribution, morphology, kinetics of haemoglobin synthesis structure function, normal and abnormal.
3. Anemias- definition, classification and approach to diagnosis and diagnostic tests.
4. Polycythemias
5. WBC production, distribution, morphology, kinetics.
6. Neoplastic and non neoplastic disorders of WBC. Classification and lab diagnosis of leukemias, chronic myeloproliferative disorders and other malignant disorders of the haemopoietic system.
7. Platelet- production, distribution, morphology, kinetics.
8. Quantitative and qualitative abnormalities and inherited and acquired disorders of platelets.
9. Introduction to automation in haematology, principle, advantages, cautions, basic interpretation of histograms.
10. Basic principle and techniques in molecular diagnostics with special reference to haematological disorders.
11. Composition of urine, collection & preservation, changes in relation to various diseases
12. Different types of dip sticks available pros & cons
13. Cavity fluids-transudate, exudates & abnormalities in disease state
14. Semen analysis
15. Non parasitological examination of stools including blood
16. Quality assurance

PRACTICALS

1. Preparation & examination of thin, thick, & wet blood films
2. Staining of blood smears by romanowsky stains
3. Supravital staining & reticulocyte count
4. Bone marrow smears & staining
5. Iron stain, Peroxides stain
6. Recognizing & reporting of blood pictures, normal & abnormal
7. Methods of measuring haemoglobin
8. Total RBC, WBC, Platelet count, Differential WBC count, Absolute eosinophil count
9. Recognition of blood parasites
10. Packed cell volume Investigation of haemolytic anaemia including osmotic fragility, alkali denaturation, sickle cell preparation, haemoglobin electrophoresis, kleihauer preparation, acid hemolysis test
14. LE cell preparation.

CLINICAL PATHOLOGY

Urine

- Composition of urine
- Collection & preservation of urine
- Changes in composition of urine in relation to various diseases
- Principles of dry chemistry

PRACTICALS

- Complete urine analysis
- Chemical-protein, reducing substance, ketone
- bodies, blood pigments Sediments
- Use of dip sticks in urine analysis
- Cavity fluids & miscellaneous specimens
- Extra vascular fluids, normal composition of transudate & exudates
- CSF & alteration in diseases
- Semen analysis
- Non parasitological examination of stool including occult blood
- Quality control –urine & extra vascular fluids
- Practicals
- Examination of CSF & reporting
- Cavity fluids & reporting
- Semen analysis
- Stool occult blood

TEXT BOOKS RECOMMENDED:

Recent editions of

1. Cellular pathology by Culling.
2. Theory and practical of histological techniques by Bancroft
3. Medical Laboratory technology by Lynch.

PAPER – IV MICROBIOLOGY - I (22MLT09)
(General Bacteriology, Immunology, Parasitology, and Entomology)

Hours : 70
Practicals : 100

Course Outcome (CO) :

- To give knowledge on the basic principles of bacteriology, immunology, parasitology and Entomology.
- To understand the nature of pathogenic microorganisms, pathogenesis, laboratory diagnosis, transmission, prevention and control of diseases.

General Bacteriology

Unit - 1

- Brief history of Microbiology with special reference to the contributions of Louis Pasteur, Robert Koch and others.
- Morphology and Physiology of Bacteria
- Classification and growth requirement of Bacteria
- Principles and uses of different kinds of Microscope

Unit - 2

- Sterilization and disinfection – decontamination procedures
- Stains – Gram’s Stain, ZN Stain and special stain
- Common Laboratory equipments
- Incubator, Hot Air Oven, Water Bath – Anaerobic jar, Centrifuge, Autoclave –
- Biosafety cabinet -Microscopes – Types and Fundamentals of Microscopy,
- Resolution and Magnification, Light Microscopy, Electron Microscopy, Dark field Microscopy – Glassware – Description of Glassware, its use, handling and care.
- Basic Principles of Bacterial genetics.
- Cultivation methods, Isolation and identification of Bacteria
- Antibiotic susceptibility testing.

Unit – 3

- Collection, Transportation and Processing of Clinical Samples for Microbiological techniques.
- Sources and modes of transmission of infection with prevention of hospital acquired infection
- Prevention and control of Laboratory -Acquired infections
- Biosafety-Standard precautions- Accidental needle stick injury-PEP
- Definition of Epidemic, Endermic, Pandemic and sporadic outbreak of diseases.
- Virulence factors of Bacteria

PRACTICALS

- Handling of microscope, staining methods.
- Preparation of media, Bacterial culture inoculation and identification methods ,
- Antibiotic susceptibility testing.
- Preservation of cultures, anaerobic cultivation methods
- Washing and sterilization of glassware, handling of equipment
- Maintenance of quality control
- Antibiotic susceptibility testing

IMMUNOLOGY

Unit – 1

- Immunity – Classification, active immunity, passive immunity, innate immunity, humoral and cell mediated immunity, immunization schedule

Unit – 2

- Antigen, antibody definition, examples. Antigen – antibody reaction – principles and their application in the diagnosis of infectious diseases and Autoimmune diseases.

PRACTICALS

Demonstration of agglutination precipitation, ELISA and Rapid Diagnostic Tests-Point of Care tests

PARASITOLOGY

Unit – I

- Classification of Parasites
- Protozoa – amoeba, flagellates, sporozoa, ciliates
- Opportunistic parasitic infections

Unit – 2

- Helminthes – cestodes, trematodes

Unit – 3

- Helminthes – nematodes and diagnostic methods in Parasitology

PRACTICALS

- Stool examination for ova and cysts
- Concentration methods
- Peripheral blood smear examination
- Special staining methods

ENTOMOLOGY

Unit - 1

- Insects – Commonly used Nomenclature, classification and characteristics

Unit - 2

- Classification, Morphology, Life cycle, Pathogenesis and Laboratory identification of Mosquitoes, Flies, House Fly, Tsetse Fly, Sand Fly

Unit - 3

- Classification, Morphology, Life cycle, Pathogenesis and Laboratory identification of Cockroaches, Fleas, Lice, Bugs, Reduviid bugs, Bed bugs, Ticks, Mites, Cyclops

PRACTICALS

Laboratory identification of the common Medically important insects – Larvae and Adults.

TEXT BOOKS RECOMMENDED: Latest editions of the following books:

1. Medical Microbiology by R. Cruickshanketal , vol.I ELBS
2. Mackie & McCarty Practical Medical Microbiology, Edited by J.G. College et al vol. II, Churchill, Livingstone, London
3. Medical Laboratory Manual for Tropical Countries, Vol. II: Microbiology, by Monica Cheesbrough ELBS.
4. Baily & Scott's Diagnostic Microbiology Edited by Sydney M. Finegold, C.V. Mos by Company, London.
5. Text book of practical Microbiology by S.C. Parija.
6. Text book of Parasitology by K.D. Chatterjee, Chatterjee medical Publishers, Calcutta.
7. Parasitic diseases in man by Richard Knight English Language Book Society.(ELBS).

III Year - MLT

PAPER – I COAGULATION & TRANSFUSION MEDICINE

Hours : 60
Practicals : 70

Course Outcome (CO) :

- Students should understand the Coagulation & transfusion medicine with normal coagulation cascade, inhibitors & normal fibrinolysis.
 - To get be familiar with the common congenital & acquired coagulation factor deficiencies, their pathogenesis, inheritance patterns, clinical features.
 - To understand the principles of immunohaematology & be competent to handle routine blood bank organisation & procedures.
1. Principles of coagulation & hemostasis
 2. Sample collection, preparation & storage for hemostasis test
 3. Lab diagnosis of bleeding disorders including platelet function abnormalities
 4. All overview of hyper coagulable states % lab investigations for the same.
 5. DIC- an overview & lab investigations for the same
 6. Automation in the coagulation lab.
 7. Quality assurance in the coagulation lab

PRACTICALS:

1. Clotting time.
2. Clot retraction & clot lysis
3. Bleeding time
4. PT
5. APTT correction studies
6. factor assays
7. platelet function tests

Immunohaematology

1. Principles of blood groups & antigen antibody reactions
2. Genetics in blood banking
3. ABO & Rh blood group systems
4. Other red cell antigens & their antibodies- clinical significance
5. Red cell compatibility testing
6. Coombs tests- significance
7. Antibody identification
8. Hemolytic disease of new born
9. Blood donor selection, screening
10. Transfusion transmitted diseases & their lab diagnosis
11. Blood collection & preservation including cryopreservation
12. Blood components, preparation, indications, storage and autologous transfusions.
13. Transfusions in transplantation, neonatology.
14. Blood substitutes
15. Blood donor motivation
16. Auditing in blood banks.
17. Quality assurance in blood banking practices
18. HLA- theory importance in transplantation, disease associations & basic techniques used in tissue typing.

PRACTICAL:

1. Blood collection & preservation using different anticoagulants&
2. Preservative solutions.
3. Component preparation
4. ABO grouping
5. Rh typing
6. Antibody direction & titration
7. Coombs test
8. Compatibility testing- cross matches
9. Investigation of tranfusion reactions
10. Investigation of hemolytic disease of new born
11. HBsAg & HIV antibody testing in blood bank.

TEXT BOOKS RECOMMENDED:

Latest editions of the following books:

1. Transfusion Medicine and Hemostasis, Clinical and Laboratory Aspectsm, 3rd Edition, 2018, Beth Shaz, Christopher Hillyer, Morayma Gil.
2. Essentials of Hematology by Haufbrand .
3. Practicals in Hematology by J.V. Dacie.
4. Medical Laboratory Technology by Lynch.
5. Wintrobe's clinical Hematology

III Year - MLT
PAPER – II BIOCHEMISTRY – II

Hours : 60 ; Practical's : 70

Course Outcome (CO) :

- To know the course well familiar with the investigations of liver & renal disorders,
- To understand the knowledge of biochemistry of enzymes, lipid profile, gastric analysis, DNA structure, synthesis, transcription, protein synthesis & metabolism, etiology of cancer, tumor markers & formation of CSF will be covered.
- Students will also be introduced to the principles of automation and diagnostic kits including immune assays

Clinical biochemistry

1. Liver functions including bile pigment metabolism & bile salts.
2. Acid base balance including blood gas analysis & renal function tests
3. Lipoprotein metabolism
4. Gastric function tests
5. Enzymes of clinical importance
6. Principles & basic methods of automation
7. Principles of available diagnostic kits
8. Theory of competitive immuno assay, immunometric assay & immune turbidometry
9. DNA structure, replication, transcription & protein bio synthesis. Structure of DNA, nucleoproteins, introns, exons. Replication, DNA polymers, cell cycle, repair enzymes, linear damage & repair, restriction endo nucleases, messenger RNA transcription, elongation, termination, post transcriptional processing, transfer RNA, protein synthesis, genetic code, translation, initiation, elongation, termination, post translational processing, inhibitors of protein synthesis, mitochondrial DNA & RNA, operon hypothesis
10. Overview of some inborn errors of metabolism
11. Diagnostic usefulness of recombinant DNA technology. Defects arising from genetic mutations in familial hypercholesterolemia, cystic fibrosis, amino acid disorders, organic acidurias & Galactosemia & fructose intolerance.
12. Biochemistry of cancer: Etiology of cancer, mutagens, carcinogens, selected tumor markers, alpha feto protein, CEA, PSA, beta-HCG, VMA, tumor markers in myeloma, Bence Jones proteins, beta-2-microglobulin

PRACTICALS

Estimation of the following in serum

- SGOT, AST
- SGPT, ALT
- ALP
- Total & direct bilirubin
- Uric acid
- Cholesterol
- Fibrinogen
- Urine protein
- Introduction to the concept of southern, northern, western blots, PCR techniques, therapeutic drug monitoring
- Review of estimation of Glucose, Urea, Creatinine, Total protein, albumin, Calcium, phosphate, Sodium, potassium, Urine qualitative bilirubin & urobilinogen

TEXT BOOKS RECOMMENDED:

Latest editions of the following books:

- a) Medical Laboratory procedures Manual (T-M) by K.L. Mukherjee, Vol.I, II, III.
- b) A manual of laboratory Diagnostic tests Fischback
- c) Practical clinical Biochemistry , Harold Varley.
- d) Tietz's Text book of clinical chemistry – by N.Tietz Latest edition W.E. Saunders company.
- e) Clinical chemistry – Theory, Analysis, Correlation by Kaplan.
- f) Principles and Techniques of biochemistry and molecular biology by Keith Wilson & Walker.
- g) Lippincott's illustrated reviews Biochemistry by Pamela C. Champe.
- h) Text book of Biochemistry by D.M. Vasudevan and Sreekumari
- i) Todd-Sanford Clinical Diagnosis by laboratory Methods.

III Year – MLT

PAPER – III MICROBIOLOGY –II (SYSTEMATIC BACTERIOLOGY, VIROLOGY, MYCOLOGY, ADVANCED SEROLOGY)

Hours : 60 ; Practicals : 70

Course Outcome (CO) :

- To know the students a sound knowledge of pathogenic microbes, laboratory diagnosis.
- To get the basic understanding of virology, mycology, & advanced serological techniques.

Systematic bacteriology:

- Morphology, isolation, identification of pathogens, cocci, bacilli, spirochetes, vibrio, mycobacteria
- Actinomycetes, laboratory diagnosis. Principle of anti microbial therapy antibiotic
- susceptibility,

Mycology - common pathogenic fungi of skin, sub cutaneous tissue & deep organs opportunistic fungi laboratory diagnosis.

Basic virology- General properties of viruses, common viral diseases, Herpes viruses, Myxo viruses, Polio virus, Hepatitis viruses, Rabies virus, Arbo virus, Haemorrhagic fever, HIV virus – transmission-collection Transport, and Processing- Virology

Practical's

- Maintenance of stock culture
- Identification of pathogenic organisms
- Methods of collection of clinical material for culture-urine, blood, CSF, throat swab, faeces, body fluids, Respiratory samples, Septic samples, Environmental sampling-
- Theatre sterilisation, Air sampling, Water analysis
- Separation of sera, preservation & transport for serological test.
- Preparation of antibiotic discs& antibiotic susceptibility test.
- Basic techniques of collections of specimens for direct examination of pathogenic
- fungi KOH lactophenol cotton blue method
- Cultivation of fungi
- Basic techniques of collection & transport of specimens for serological tests
- Diagnosis of viral infections- isolation& serological test
- Advanced serological techniques- ELISA, immunoelectrophoresis,
- Molecular Techniques-DNA Extraction, PCR Techniques.

TEXT BOOKS RECOMMENDED

Latest editions of the following books:

1. Text Book of Parasitology by K.D. Chatterjee, Chatterjee medical Publishers, Calcutta.
2. Text book of Medical Parasitology by S.C. Parija.
3. Parasitic diseases in man by Richard Knight English Language Book Society (ELBS)
Medical Microbiology by R. Cruickshanketal, Vol.I ELBS