Syllabus For B.Sc. in Medical Laboratory Technology (B.Sc.-MLT) Academic Programme

Duration:

3 years & 6 months internship

B.Sc. in Medical Laboratory Technology (B.Sc.-MLT) First Year

GENERAL PATHOLOGY & GENERAL MICROBIOLOGY Subject Code : MLT-101

Min. Hrs - Theory : 100 Hrs. & Practical : 100 Hrs.

THEORY

GENERAL PATHOLOGY

1. Cell Injury and Cellular Adaptations.

- a) Normal Cell
- b) Cell Injury- types of cell injury, etiology of cell injury, morphology of cell injury, cellular swelling.
- c) Cell death : types- autolysis, necrosis, apoptosis & gangrene.
- d) Cellular adaptations-atrophy, hypertrophy, hyperplasia & dysplasia.

2. Inflammation

- a) Acute inflammation vascular event, cellular event, inflammatory cells.
- b) Chronic Inflammation general features, granulomatous inflammation, tuberculoma.

3. Haemodynamic Disorders :

Oedema, hyperemia, congestion, haemorrage, circulatory disturbances, thrombosis, ischaemia & infarction.

4. Neoplasia :

Definition, how does it differ from hyperplasia, difference between benign tumor and malignant tumor.

5. Healing

Definition, different phases of healing, factors influencing wound healing.

GENERAL MICROBIOLOGY

1. General characters and classification of Bacteria.

2. Characteristics of Bacteria

Morphology - Shape, Capsule, Flagella, Inclusion, Granule, Spore.

3. Growth and Maintenance of Microbes

Bacterial division, Batch Culture, Continuous culture, bacterial growth- total count, viable count, bacterial nutrition, oxygen requirement, CO₂ requirement, temperature, pH, light.

4. Sterilization and Disinfection.

Physical agents- Sunlight, Temperature less than 100^oC, Temperature at 100^oC, steam at atmospheric pressure and steam under pressure, irradiation, filtration.

Chemical Agents- Alcohol, aldehyde, Dyes, Halogens, Phenols, Ethylene oxide.

5. Culture Media

Definition, uses, basic requirements, classification, Agar, Peptone, Transport Media, Sugar Media, Anaerobic Media, Containers of Media, Forms of Media

6. Staining Methods

Simple, Grams staining, Ziehl-Neelsen staining or AFB staining, Negative Impregnation

Collection and Transportation of Specimen General Principles, Containers, Rejection, Samples- Urine, Faeces, Sputum, Pus, Body fluids, Swab, Blood.

8. Care and Handling of Labortory Animals

Fluid, Diet, Cleanliness, Cages, ventilation, Temperature, Humidity, handling of Animals, Prevention of disease.

Disposal of Laboratory/Hospital Waste Non-infectious waste, Infected sharp waste disposal, infected non-sharp waste disposal.

PRACTICAL

GENERAL PATHOLOGY

- 1. Components & setting of the Compound microscope.
- 2. Focusing of object.
- 3. Use of low & high power objectives of microscope.
- 4. Use of oil immersion lens.
- 5. Care and Maintenance of the microscope.
- 6. Different types microscopy
 - Dark field microscopy
 - Fluorescence Microscopy
- 7. Electronic Microscopy in brief.

GENERAL MICROBIOLOGY

- 1. Preparation of swabs/sterile tubes & bottles.
- 2. Preparation of smear.
- 3. Staining.: Gram & Ziehl -Neelsen staining.
- 4. Identification of Culture media.
- 5. Identification of instruments.
- 6. Identification of common microbes.

HEMATOLOGY Subject Code : MLT-102 Min. Hrs. - Theory :80 Hrs. & Practical : 80 Hrs.

THEORY

1.	He	matological Disorders		
	a.	Classification of Anemia	:	Morphological & etiological.
	b.	Iron Deficiency Anemia	:	Distribution of body Iron, Iron Absorption,
				causes of iron deficiency, lab findings.
	c.	Megaloblastic Anemia	:	Causes, Lab findings.
	d.	Hemolytic Anemia	:	Definition, causes, classification & lab findings.
	e.	Bone Marrow	:	Cell composition of normal adult Bone marrow,
				Aspiration, Indication, Preparation & Staining,
				Special Stain for Bone Marrow -Periodic Acid
				Schiff, Sudan Black, Myeloperoxidase.
	f.	Leukemia	:	Classification, Blood Picture, Differentiation of
				Blast Cells.

2. Basic Hematological Techniques

- a. Characteristics of good technician
- b. Preparation of specimen collection material.
- c. Lab. request form.
- d. Basic steps for drawing a blood specimen by veinipuncture. Complications of veinipuncture.
- e. Patient after care
- f. Specimen rejection criteria for blood specimen
- g. Hemolysis of blood
- h. Blood collection by skin puncture (Capillary Blood)
- i. Arterial puncture.
- j. Deciding specimen types and selection of -
 - Anticoagulant- EDTA, Citrate, Oxalate, Heparin, sodium fluoride.
- k. Separation of serum
- l. Separation of plasma
- m. Changes in blood on keeping
- n. Maintenance of specimen identification
- o. Transport of the specimen.
- p. Effect of storage on Blood Cell Morphology
- q. Universal precautions

PRACTICAL

- 1. Basic requirements for hematology laboratory.
- 2. Glasswares for Hematology.
- 3. Equipments for Hematology.
- 4. Anticoagulant vial prepration.
- 5. Complete Blood Counts.
- 6. Determination of Hemoglobin.
- 7. TRBC Count by Hemocytometers.
- 8. TLC by Hemocytometer.
- 9. Differential Leukocyte count.
- 10. Determination of Platelet Count.
- 11. Determination of ESR by wintrobes.
- 12. Determination of ESR by Westergeren's method.
- 13. Determination of PCV by Wintrobes.
- 14. Erythrocyte Indices- MCV, MCH, MCHC.
- 15. Reticulocyte Count.
- 16. Absolute Eosinophil Count.
- 17. Morphology of Red Blood Cells.

FUNDAMENTALS OF ANATOMY & PHYSIOLOGY Subject Code : MLT-103 Min. Hrs. - Theory :100 Hrs. & Practical : 100 Hrs.

THEORY

ANATOMY :

1. General Anatomy

- a) Cell structure & function
- b) Tissue
 - Epithelium
 - Connective
 - Sclerous
 - Muscular
 - Nervous
- c) Lymphatic System

2. Systemic

Basic Features of :

- a) Cardiovascular system
- b) Respiratory system
- c) Digestive system
- d) Excretory system
- e) Genital (Male & Female) system
- f) Nervous system

PHYSIOLOGY

- 1. Cell : Structure & function
- 2. Blood
 - a) Blood cells
 - b) Haemoglobin
 - c) Blood groups
 - d) Coagulation Factors
 - e) Anaemia & Immunoglobulins

3. Cardiovascular system

Heart rate, cardiac cycle, cardiac output, blood pressure, hypertension, radial pulse

4. Respiratory System

- a) Ventilation
- b) Functions
- c) Lungs Volumes and capacities

5. Gastrointestinal System

Process of digestion in various parts

6. Endocrinology

- a) List of Endocrine Glands
- b) Hormones : Their secretion and functions (in brief)
- 7. Excretion system
 - a) Structure of nephron
 - b) Urine formation
- 8. Central Nervous System
 - a) Parts
 - b) Sliding Filament Theory
 - c) Neuro Muscular Junction
 - d) Wallerian Degeneration
 - e) Motor Nervous system
 - Upper motor neuron system
 - Lower motor neuron system
 - f) Sensory nervous system
 - g) Sympathetic Nervous system
 - h) Parasympathetic nervous system
- 9. Skin Function & Structure

10. Muscular System

Classification of muscles & their functions

11. Special Senses - Eye & ear (in brief)

PRACTICAL

ANATOMY

- 1. Identification and description of all anatomical structures.
- 2. The learning of Anatomy is by demonstration only through dissected parts, slides, models, charts etc.
- 3. Demonstration of dissected parts (upper extremity, lower extremity, thoracic & abdominal viscera, face and brain).
- 4. Demonstration of skeleton articulated and disarticulated.

PHYSIOLOGY

- 1. Measurement of pulse, blood pressure.
- 2. Elicitation of Reflexes & jerks.
- 3. Identification of blood cells by study of peripheral blood smear.

BASICS OF BIOCHEMISTRY, CLINICAL PATHOLOGY, INSTRUMENTS & REAGENTS Subject Code : MLT-104 Min. Hrs. - Theory :100 Hrs. & Practical : 100 Hrs.

THEORY

Chemistry of carbohydrates & their related metabolsim -Introduction, definition, classification, biomedical importance & properties. Brief outline of meatbolism : Glycogenesis & glycogenolysis (in brief), Glycolysis, citric acid cycle & its signifiance,

HMP shunt & Gluconeogenesis (in brief), regulation of blood glucose level.

2. Amino acids - Definition, classification, essential & non essential amino acids.

3. Chemistry of Proteins & their related metabolism -

Introduction, definition, classification, biomedical importance.

Metabolism :

Transformation, Decarboxylation, Ammonia formation & transport, Urea cycle, metabolic disorders in urea cycle, catabolism of amino acids especially Phenylalanine, Tyrosine & Tryptophan, Creatine, Creatinine, Proteinuria.

4. Chemistry of Lipids & their related metabolism -

Introduction, definition, classification, biomedical importance, essential fatty acids. Brief out line of metabolism :

Beta oxidation of fatty acids, fatty liver, Ketosis, Cholesterol & it's clinical significance, Lipoproteins in the blood composition & their functions in brief, Atherosclerosis.

5. Enzymes -

Introduction, definition, classification, coenzymes, isoenzymes, properties, factors affecting enzyme action, enzyme inhibition, diagnostic value of serum enzymes - Creatinine kinase, Alkaline phosphatase, Acid phosphatase, LDH, SGOT, SGPT, Amylase, Lipase, Carbonic anhydrase etc.

6. Acid base balance concepts & disorders - pH, Buffers, Acidosis, Alkalosis

7. Hyperglycemia & hypoglycemia -

Diabetes mellitus - definition, types, features, gestation diabetes mellitus, glucose tolerance test, glycosurias,

Hypoglycemia & its causes

PRACTICAL

1- Introduction

Aim, basis, interpretation, safety in clinical biochemistry Laboratory

- 2- Laboratory organisation Instruments, glassware, sample collection & specimen labeling, routine tests, anticoagulants, reagents, cleaning of glassware, isotonic solution, standardization of methods, preparation of solution & interpretation of result, normal values.
- 3- Identification of Carbohydrates (qualitative tests).
- 3- Identification of Proteins (qualitative tests).
- 4- To study general properties of the enzyme (Urease) & Achromatic time of Salivary amylase.
- 5- Urine analysis normal & abnormal constituents of urine.
- 6- CSF & Semen Analysis Gross & Microscopic.
- 7- Glucose tolerance test & Glycosylated haemoglobin.
- 8- Centrifugation : Principle, types & applications.
- 9- Chromatography : Definition, types, RF value, description of paper chromatography & applications.
- 10-Uses, Care and Maintenance of various instruments of the laboratory.

ENGLISH (Not for university Examination) Min. Hrs - Theory : 40 Hrs.

- 1. Introduction:
- Study techniques, Organisation of effective note taking and logical processes of analysis and synthesis, the use of the dictionary, enlargement of vocabulary& effective diction.
- 2. Applied Grammar: Correct usage, the structure of sentences, the structure of paragraphs.
- Written Composition: Precise writing and summarising, writing of bibliography, enlargement of vocabulary.
- Reading and comprehension Review of selected materials and express oneself in one's words, enlargement of vocabulary.
- 5. The study of various forms of composition paragraph, essay, letter, summary, practice in writing.
- Verbal communication: Discussions and summarization, debates, oral reports, use in teaching.

COMPUTER (Not for university Examination) Min. Hrs - Theory : 30 Hrs., Practical : 30 Hrs.

- 1. Basics of computer
- 2. Hardware and software
- 2. Input and output devices
- 3. Operating system DOS, etc
- 4. Internet-

Email, social networking, application in medicine, browsing journals and article using internet.

B.Sc. in Medical Laboratory Technology (B.Sc.-MLT) Second Year BLOOD BANK PROCEDURES & HEMOGLOBINOPATHIES Subject Code : MLT-201 Min. Hrs. - Theory : 80 Hrs. & Practical : 80 Hrs.

THEORY

1. Blood Grouping

- Introduction
- Human Blood Group system
- ABO Subgroups
- Red Cell Antigen
- Natural Antibodies
- Rh System
- Rh Antigens & Rh Antibodies
- Hemolytic Disease of Newborn & Prevention
- Principal of Blood grouping, antigen-antibodyreaction.
- Agglutination, Haemagglutination, Condition required for antigen antibody reaction.
- Blood grouping techniques, Cell grouping, Serum grouping.
- Methods for ABO grouping. Slide & Tube Method, Cell grouping, Serum grouping, Rh grouping by slide & tube method.
- Difficulties in ABO grouping.
- Rouleaux formation, how it interfere with Blood grouping.
- Auto agglutinins.
- Antiserum used in ABO test procedures, Anti –A, Anti-B Anti- AB Antiserum.
- Inheritance of the Blood groups.
- Control, A&B Cells preparation, Auto control.
- Medical applications of Blood groups.

2. Blood Transfusion

- Principal & Practice of blood Transfusion.
- Blood Transfusion service at District level.
- Guide lines for the use of Blood, Appropriate use of Blood, Quality Assurance.
- Antilogous Blood Transfusion practices.
- Objectives of Quality Assurance in Blood Transfusion services, Standard operating procedures for usage, donation & storage of blood, screening of donor, compatibility testing, safety, procurement of supplies.

3. Blood Donation

- Introduction
- Blood donor requirements
- Criteria for selection & rejection
- Medical history & personal details
- Self-exclusion.
- Health checks before donating blood.
- Screening for TTI.

4. Blood Collection

- Blood collection packs.
- Anticoagulants.
- Taking & giving sets in Blood transfusion.
- Techniques of collecting blood from a doctor.
- Instructions given to the donor after blood donation.
- Adverse donor reaction.

5. Testing Donor Blood

- Screening donor's blood for infectious agents HIV, HCV, HBV, Trepanoma palladium, Plasmodium, HTLV.
- Bacterially contaminated Blood.

6. Blood Donor Records

- Blood donation record book.
- Recording results.
- Blood donor card.

7. Storage & Transport

- Storage of blood.
- Changes in blood after storage.
- Gas refrigerator.
- Lay out of a blood bank refrigerator
- Transportation.

8. Maintenance of Blood Bank Records

- Blood bank temperature sheet.
- Blood bank stock sheet.
- Blood transfusion request form.

9. Compatibility Testing

- Purpose
- Single tube compatibility techniques using AHG reagent.
- Emergency compatibility testing.
- Difficulties in cross matching.
- Labeling & Issuing cross- matched blood.

10. Blood Components

- Collection of blood components for fractional transfusion.
- Platelets packed Red Cell, Platelet rich Plasma, Platelets concentrate.
- Preparation of concentrated (packed) Red cells.
- Techniques of preparation.

11. Blood Transfusion Reactions

- Investigation of a Transfusion reaction.
- Hemolytic transfusion reaction.
- Actions to take when transfusion reaction occurs.

PRACTICAL

• Blood grouping & Cross Matching

ENDOCRINOLOGY, TUMOR & CANCER MARKERS Subject Code : MLT-202 Min. Hrs. - Theory : 60 Hrs. & Practical : 140 Hrs.

THEORY

ENDOCRINOLOGY

- 1. Introduction
- 2. Difference between hormones and enzymes.
- 3. Classification of hormones.
- 4. Regulation and general mechanism of action of hormones.
- 5. Pituitary gland & hypothalamus
- Hormones of the Anterior Pituitary- Growth hormone, Prolactin, Gonadotropin, Follicle Stimulating hormone, Leuteinizing Hormone, Thyroid stimulating hormone (TSH), Adrenocorticotropic hormone (ACTH)
- 7. Hormones of neurohypophysis- Oxytocin, Antidiuretic hormone (ADH)
- 8. Hormones of the Thyroid gland- chemistry and normal physiology, Thyroid disorders-goiter, myxodema, autoimmune thyroiditis, tumors of the thyroid gland, hyperthyroidism, Graves disease, Calcitonin, Parathyroid Hormone (PTH)
- Adrenocortical hormones-synthesis and secretion, Aldosterone & its function, Addisons disease, Glucocorticoids & functions, Mineralocorticoids & functions, Cortisol & functions, Cushing's syndrome, Conn's syndrome.
- 10. Adrenal medulla-metabolism of catecholamines
- Hormones of the gonads Testosterone, Estrogens, Progesterone, their synthesis and functions.
 Human Chorionic Gonadotropin (HCG), hormone, menstrual cycle, Menopause
- 12. Hormone of pancreas Insulin- its metabolic effects on carbohydrates, fats & protein, control of insulin secretion, Glucagon- functions, metabolic effects, blood glucose regulation, Diabetes Mellitus, Somatostatin.
- 13. Hormone of kidney Renin

TUMOR & CANCER MARKERS:

- 1. Introduction.
- 2. The Carcinogens-definition.
- Oncogene-definition-Mechanism of action of Oncogenes (outline).
- 4. Characteristics of growing tumor cells-general and morphological changes, biochemical changes.
- 5. Tumor Markers-Introduction and definition
- 6. Clinical applications of tumor markers.
- 7. Enzymes as tumor markers, Alkaline Phosphatase (ALP), Creatine kinase (CK), Lactate dehydrogenase (LDH), Prostatic acid phosphatase (PAP), Prostate specific antigens (PSA).
- 8. Hormones as tumor markers (introduction of each type in brief).
- 9. Oncofetal antigens.
- 10. Alpha feto protein (AFP)
- 11. Carcino embryonic antigen (CEA)
- 12. Squamous cell carcinoma (SCC) antigen.
- 13. Carbohydrate markers (brief introduction of each type) CA 15-3, CA 125

- 14. Blood group antigen (brief introduction of each type) CA 19-9, CA 50, CA 72-4, CA 242
- 15. Bladder cancer markers (introduction in brief) -Bladder tumor antigen (BTA)
- 16. Fibrin- Fibrinogen degradation product (FDP).
- 17. Nuclear matrix protein (NMP22).
- Biomarkers still in research (introduction in brief)-Telomeres, TRAP assay, hyaluronic acid and Hyaluronidase

PRACTICALS

ENDOCRINOLOGY

- 1. Estimation of T3
- 2. Estimation of T4
- 3. Estimation of TSH
- 4. Estimation of FSH
- 5. Estimation of LH
- 6. Estimation of hCG
- 7. Estimation of Cortisol
- 8. Estimation of Progesterone
- 9. Estimation of Testosterone

TUMOR & CANCER MARKERS:

- 1. Estimation of Alpha feto proteins (AFP)
- 2. Estimation of Carcino embryonic antigen (CEA)
- 3. Estimation of CA- 125
- 4. Estimation of Prostate specific antigen (PSA)

OTHER ELISA TESTS

- 1. Test for HIV
- 2. Test for Hepatitis B (HBsAg)
- 3. Test for Hepatitis (HCV)
- 4. Malaria antigen
- 5. Tuberculosis-lgG/IgM

CLINICAL BIOCHEMISTRY Subject Code : MLT-203 Min. Hrs. - Theory : 100 Hrs. & Practical : 100 Hrs.

THEORY

1- Photometry-

Definition, laws of photometry, absorbance, transmittance, absorption maxima, instruments, parts of photometer, types of photometry–colorimetry, spectrophotometry, flame photometry, fluuorometry, choice of appropriate filter, measurements of solution, calculation of formula, applications.

2- Water & Mineral Metabolism-Distribution of fluids in the body, ECF & ICF, water metabolism, dehydration, mineral metabolism, macronutrients (principal mineral elements) & trace elements.

Liver Functions & their Assessment Based on: 1- Carbohydrate metabolism 2-Protein metabolism 3- Lipid metabolism 4 Measurements of serum enzyme levels 4-Bile pigment metabolism, Jaundice, its types and their biochemical findings.

4- Renal Function Tests Various Tests, GFR & Clearance

- 5- Immunodiffusion Techniques, Radioimmunoassay & ELISA-Principles & Applications.
- 6- Electrophoresis Principle, Types & Applications.
- 7- Polymerase Chain Reaction -Principle & Applications
- 8- Autoanalysers -

Principle & Applications

9- Vitamins-

Fat & water soluble vitamins, sources, requirement, deficiency disorders & biochemical functions.

10- Cardiac Profile -

In brief Hypertension, Angina, Myocardial Infarction, Pattern of Cardiac Enzymes in heart diseases

11- Different methods of Glucose Estimation-

Principle advantage and disadvantage of different methods

12- Different methods of Cholesterol Estimation-

Principle, advantage and disadvantage of different methods.

PRACTICAL

(By Colorimeter / Spectrophotometer)

- 1. Blood urea estimation
- 2. Serum creatinine estimation
- 3. Serum uric acid estimation
- 4. Serum total protein estimation
- 5. Serum albumin estimation
- 6. Serum globulin estimation
- 7. Serum glucose estimation
- 8. Total cholesterol estimation
- 9. HDL cholesterol (direct) estimation.
- 10. LDL cholesterol (direct) estimation
- 11. Triglyceride estimation
- 12. Serum Bilirubin total estimation
- 13. Serum Bilirubin direct estimation
- 14. Serum amylase estimation
- 15. Serum GOT (AST) estimation
- 16. Serum GPT (ALT) estimation
- 17. Alkaline phostase estimation
- 18. Acid phosphatase estimation
- 19. Serum sodium estimation
- 20. Serum potassium estimation
- 21. Serum chloride estimation
- 22. CK-NAC estimation

IMMUNOLOGY, SEROLOGY & PARASITOLOGY Subject Code : MLT-204 Min. Hrs. - Theory : 100 Hrs. & Practical : 100 Hrs.

THEORY

IMMUNOLOGY & SEROLOGY

1.	Immunity	- Definition and classification	
		- General Principles of Innate & Acquired Immunity.	
2.	Immune Response	- Humoral immunity & cell mediated immunity.	
3.	Antigen	- Definition, classes, properties.	
4.	Antibodies/Immunoglobul	lins - Definition, Properties, Sub types of Immunoglublines	
5.	Antigen/Ab Reaction/Sero	logical Refractions -	
6.	Features of antigen/antibo	dy Reaction-	
		- Precipitation	
		- Agglutination	
		- Complement fixation test	
		- Neutralization	
		- Opsonization	
		- Immune adherence	
		- Immuno fluorescence	
		 Immuno electron microscopic test 	
7.	Structure and functions of Immune System		
		- Parts of Immune system	
		- T/B cells, other cells & their functions	
8.	Hyper sensitivity Reaction	15	
		- General Principles of different types of hypersensitive	
		reactions i.e., type 1, 2, 3, 4.	
		- Auto immune disorders	
9.	ELISA		
10.	Vaccination	- Schedule & Vaccines	

PARASITOLOGY

- 1. Definition parastism, HOST, Vectors etc.
- 2. Classification of Parasites .
- 3. Phylum Protozoa- general Pathogenic and non pathogenic protozoa.
- 4. Phylum Nemathelminths/Round words (Nematoda).
- 5. Phylum Platyhelminths class-Cestoda, class-Trematoda.
- 6. Lab diagnosis of parasitic infections.

Protozoa :

iii.

- i. Intestinal Amoebae
 - a. E. Histolytica : Life cycle, Morphology, Disease & Lab Diagnosis
 - b. E. coli : Life cycle, Morphology, Disease & Lab Diagnosis
- ii. Flagellates of intestine/genitalia
 - a. Giardia lamblia : Life cycle, Morphology, Disease & Lab Diagnosis
 - b. Trichomonas vaginalis : Life cycle, Morphology, Disease & Lab Diagnosis Malarial Parasite
 - a. Plasmodium vivax : Life cycle, Morphology, disease & lab diagnosis
 - b. Differences between P. vivax, P. malaria, P. falcipaum & P.ovale.

Nematodes :

Intestinal Nematodes :

- a. Ascaris : Life cycle, Morphology, disease & lab diagnosis
- b. Brief discussion about Enterobius vermicularis (Thread worm) and Ancylostoma duodenale (Hook worm)

Tissue Nematodes :

W. Bancrofti - Life cycle, Morphology, Disease & Lab Diagnosis

Phylum Platyhelminths

- a. Cestodes T. solium, T. saginata & E. granulosus. (in brief)
- b. Trematodes S. haematobium & F. hepatica (in brief)

PRACTICAL

IMMUNOLOGY & SEROLOGY

- WIDAL Test
- VDRL Test,
- RA Test
- CRP Test
- Pregnancy Test & HIV Test

PARASITOLOGY

- Stool examination.
- Identification of different ova & cysts in stool samples.

B.Sc. in Medical Laboratory Technology (B.Sc.-MLT) Third Year

HISTOPATHOLOGY & CYTOLOGY TECHNIQUES Subject Code : MLT- 301 Min. Hrs. - Theory : 80 Hrs. & Practical : 80 Hrs.

THEORY

- 1. Introduction to Histopathology, expfoliative Cytology.
- 2. Basic steps for Tissue Processing- Fixing, Embedding, Microtomy, Staining, Mounting, methods of decalcifications.
- 3. Laboratory requirements for Histopathology & Cytology Chemicals & Reagents
- 4. Equipments Microscope, Microtome -Types, Uses, Parts, different types of microtome knives, care & maintenance. Automated tissue processor components, working & precautions during use, Tissue floating bath.
- 5. Staining Methods
 - a. Hematoxylin & Eosin stain, Hematoxylin Types, methods of preparation, staining, Eosin Method of preparation.
 - b. Reticulin stain
 - c. PAP staining- components & methods.
- 6. Museum Techniques
 - a. The mounting of pathological specimens Introduction., Preparation of specimen, Fixation of specimen- Kaiserling solution-1 & Kaiserling solution-2
 - b. Precaution taken for the Fixation of Specimens.
 - c. Storage of Specimens.
 - d. Mounting of Museum Specimens.
 - e. Routine Mounting of Specimens.
 - f. Filling and Scaling.

PRACTICAL

Parts of microtome Tissue processing

H&E staining

4. PAP staining.

COAGULATION STUDIES Subject Code : MLT- 302 Min. Hrs. - Theory : 80 Hrs. & Practical : 80 Hrs.

THEORY

- 1. Hemostasis Definition, Basic concept and principle, Basic steps involved in Hemastosis.
- 2. Coagulation
 - a. Basic Physiology, coagulation factors.
 - b. Mechanism of blood coagulation.
 - c. Extrinsic Pathway.
 - d. Intrinsic Pathway.
 - e. Regulators of blood coagulation.
- 3. Testing of blood coagulation
 - a. Bleeding Time, Duke's method.
 - b. Clotting Time- Capillary tube method & Lee white's method.
 - c. PT, aPTT, TT
 - d. Clot retraction time
 - e. Determination of fibrinogen.
- 4. Quality Assurance for routine Heamostasis Laboratory
 - a. Introduction.
 - b. Sample collection technique (Phelbotony)
 - c. Sample preparation, Anticoagulant used, Importance of use of Sodium Citrate.
- 5. Role in Diseases, Bleeding disorders
 - a. Platelet disorder Thrombocytopenias causes including aplastic anemia.
 - b. DIC
 - c. IT P
 - d. Hemophilia

PRACTICAL

- 1. Precautions to prevent hemolysis
- 2. Storage of blood specimens
- 3. Bleeding time & clotting time estimation
- 4. Prothrombin time estimation
- 5. aPTT (activated partial thromboplastin time) estimation.
- 6. Clot retraction time.

SYSTEMIC BACTERIOLOGY, MYCOLOGY & VIROLOGY Subject Code : MLT- 303 Min. Hrs. - Theory : 120 Hrs. & Practical : 80 Hrs.

THEORY

SYSTEMIC BACTERIOLOGY

Study of -

Staphylococcus, Streptococcus, Pneumococcus, Neisseira gonorrhoea, Neisseira meningitis, Cornybacterium diptheriae, Mycobaterium, Clostridium, E.coli, Klebsiella, Salmonella, Proteus, Pseudomonas, Vibrio & Spirochaetes with reference to their :

- Morphology, cultural characteristics, biochemical reaction, pathogenesis/disease caused & lab diagnosis.

MYCOLOGY

- Morphology and Structure of fungi
- Classification of fungi
- Nutrition and cultivation of fungus
- Cutaneous & Sub cutaneous and Systemic Mycosis (in brief)
- Lab diagnosis of fungal Infections
- Opportunistic fungal infections

VIROLOGY

- General characters of viruses
- Classification of viruses
- Lab diagnosis of viral infections
- Cultivation of viruses
- Bacteriophages.
- Retro viruses HIV, Hepatitis virus, Pox virus,
- Picrona virus Polio
- Orthomyxo virus Influenza
- Arbo virus Chikungunya, Dengue
- Herpies and Adeno virus

PRACTICAL

SYSTEMIC BACTERIOLOGY

- 1. Culture Techniques
- 2. Composition of culture media
- 3. Preparation of media
- 4. Identification of media & their uses
- 5. Culture methods & identification of common bacteria on media.
- 6. Antibiotic sensitivity testing.

MYCOLOGY & VIROLOGY

- 1. Culture Media used for fungus.
- 2. Fungal culture
- 3. Methods of lab diagnosis & virus.

QUALITY LABORATORY MANAGEMENT & AUTOMATION Subject Code : MLT- 304 Min. Hrs. - Theory : 60 Hrs. & Practical : 140 Hrs.

THEORY

AUTOMATION

- 1. Automation Introduction, meaning, advantages, history
- 2. Continuous flow analyzers
- 3. Single channel continuous flow analyzers-advantages, disadvantages
- 4. Multi channel flow analyzers
- 5. Discrete auto analyzers basic features, types, semi automated, fully automated
- 6. Batch analyzers
- 7. Random access analyzers (RAA)
- 8. Component steps in fully automated analyzers
- 9. Auto analyzers based on immunoassay techniques, Micro particle enzyme immunoassay (MEIA)
- 10. Various random access analyzers Hitachi- 704, BM/Hitachi 717
- 11. Centrifugal analyzers, ASCA
- 12. Dry chemistry analyzers
- 13. Dimension RxL clinical chemistry system
- 14. The Heterogeneous Immunoassay module components
- 15. Beckman Array 360 system
- 16. Mini Vidas analyzers
- 17. Immulite automated immunoassay analyzers
- 18. Latest trends in Automation, Biochips, Lab on a chip (LoC), Nanosensorsadvantages and disadvantages, PCR & its applications.

QUALITY LABORATORY MANAGEMENT

- 1. Introduction to Quality control
- 2. Total quality management framework
- 3. Quality laboratory processes, Quality assurance, Quality assessment, Quality control, Quality planning and Quality improvement
- 4. Costs of conformance and non conformance, appraisal costs, prevention costs
- 5. Internal quality control, basic steps, sources of error and their correction methods, CAPA corrective action & preventive action
- 6. Sources of variation in laboratory results
- 7. Quality control charts, Levy- Jennings and Cusum charts
- 8. External quality control
- 9. Quality control programme, intrinsic and extrinsic and random errors
- 10. Current trends in laboratory accreditation, ISO certificate, West guard Rules
- 11. Demonstration of various methods of quality control.

PRACTICAL

CLINICAL BIOCHEMISTRY

(By Semiautoanalyzer / Fully automated analyzer)

- 1. Estimation of Cholesterol
- 2. Estimation of HDL Cholesterol
- 3. Estimation of LDL Cholesterol
- 4. Estimation of Triglycerides
- 5. Estimation of LDH

- 6. Estimation of Glucose
- 7. Estimation of Bilirubin (Total, Direct, Total + Direct)
- 8. Estimation of SGPT
- 9. Estimation of SGOT
- 10. Estimation of Acid Phosphatase
- 11. Estimation of Alkaline Phosphatase
- 12. Estimation of Iron
- 13. Estimation of Creatinine
- 14. Estimation of Urea
- 15. Estimation of Uric acid
- 16. Estimation of CK-MB
- 17. Estimation of CK-NAC
- 18. Estimation of Chlorides
- 19. Estimation of Sodium
- 20. Estimation of Potassium
- 21. Estimation of Hexagon Troponin+
- 22. Estimation of Phosphorus
- 23. Estimation of TIBC
- 24. Estimation of Albumin
- 25. Estimation of Calcium
- 26. Estimation of Hemoglobin
- 27. Estimation of Magensium
- 28. Estimation of Blood Urea Nitrogen

ENDOCRINOLOGY, TUMOR AND CANCER MARKERS (By ELISA Reader)

ENDOCRINOLOGY

- 1. Estimation of T3
- 2. Estimation of T4
- 3. Estimation of TSH
- 4. Estimation of FSH
- 5. Estimation of LH
- 6. Estimation of hCG
- 7. Estimation of Cortisol
- 8. Estimation of Progesterone
- 9. Estimation of Testosterone

TUMOR AND CANCER MARKERS

- 1. Estimation of Alpha feto proteins (AFP)
- 2. Estimation of Carcino embryonic antigen (CEA)
- 3. Estimation of CA -125
- 4. Estimation of Prostate specific antigen (PSA)

OTHER ELISA TESTS

- 1. Test for HIV
- 2. Test for Hepatitis B (HBsAg)
- 3. Test for Hepatitis (HCV)
- Malaria antigen
- 5. Tuberculosis-lgG/IgM