SINGHANIA UNIVERISITY

RAJASTHAN

DETAILED SYLLABUS

Under Graduate Degree Program

(B.Sc. MLT)

B.Sc.MLT (MEDICAL LABOATORY TECHNOLOGY)

(YEARLY PROGRAMME)

B.Sc.MLT (Medical Laboratory Technology)

COURSE TITLE : BMLT

DURATION : 3 YEAR

TOTAL DEGREE MARKS : 3000

FIRST YEAR

COURSE TITLE	PAPER CODE	MARKS		
		Theory	Practical	Total
ANATOMY	BMLT—110	100	100	200
PATHOLOGY	BMLT —120	100	100	200
BIOCHEMISTRY	BMLT —130	100	100	200
MICROBIOLOGY	BMLT – 140	100	100	200
PHYSIOLOGY	BMLT – 150	100	100	200
			TOTAL	**1000**

SECOND YEAR

COURSE TITLE	PAPER CODE	MARKS		
		Theory	Practical	Total
ANATOMY	BMLT —210	100	100	200
PATHOLOGY	BMLT —220	100	100	200
BIOCHEMISTRY	BMLT —230	100	100	200
MICROBIOLOGY	BMLT – 240	100	100	200
PHYSIOLOGY	BMLT – 250	100	100	200
			TOTAL	**1000**

THIRD YEAR

COURSE TITLE	PAPER CODE	MARKS		
		Theory	Practical	Total
Preventive &social medicine	BMLT —310	100	100	200
PATHOLOGY	BMLT —320	100	100	200
BIOCHEMISTRY	BMLT —330	100	100	200
MICROBIOLOGY	BMLT – 340	100	100	200
LAB MANAGEMENT	BMLT —350	100	100	200
			TOTAL	**1000**

BMLT – 110 **ANATOMY**

Maximum Time : 3 hrs University Assessment -70%

Total marks :100 Internal Assessment – 30% Minimum Pass Mark – 40%

COURSE CONTENTS – THEORY

1) **Introduction of Bones of the Human Body of :**
   - Upper Limb : clavicle, scapula, humerus, radius, ulna, carpus, metacarpus & phalanges
   - Lower Limb : hipbone, femur, tibia, fibula, tarsus, metatarsus & phalanges
   - Skull : name the bone of skull and sutures between them
   - Thorax : ribs and their articulations
   - Vertebral Column : Cervical, thoracic, lumbar, sacral and coccyx vertebrae
2) Nine regions of the abdomen
3) **Introduction of different Vital Organs :**

A) Respiratory Organs : (Brief description)

- Nasopharynx
- Oropharynx
- Larynx
- Trachea
- Bronchi
- Lungs (and their lobular segments)
- Thoracic cavity
- Pleura and Pleural cavity

B) Circulatory Organs : (Brief description)

- Anatomical position of the heart
- Pericardium of the heart
- Chambers of the heart
- Great vessels of the heart
- Valves of the heart

C) Digestive Organs : (Brief description)

- Tongue
- Teeth
- Oral cavity
- Pharynx
- Oesophagus
- Stomach
- Small intestine
- Large intestine and its colons

PRACTICAL :

Labeled Diagrams of different organs and bones

Vivo

BMLT – 120 **PATHOLOGY**

Maximum Time : 3 hrs University Assessment - 70%

Total marks :100 Internal Assessment – 30% Minimum Pass Mark – 40%

COURSE CONTENTS –

1) The Cell in health and disease

   a. Introduction of pathology
   b. Cellular structure and metabolism
   c. Inflammation – Acute and Chronic
   d. Derangement of Body Fluids and Electrolytes
      - Types of shocks
      - Ischaemia
      - Infection
   e. Neoplasia – Etiology and Pathogenesis

2) Introduction of hematology

   a. Formation of Blood
   b. Erythropoiesis
   c. Leucopoiesis
   d. Thrombopoiesis
   e. Collection of Blood
   f. Anticoagulants
   g. Red cell count – Haemocytometer, Methodsand Calculation
   h. WBC Count -- Methods
   i. Differential Leucocytes Count (DLC)--
      Morphology of White Cells, Normal Values
      Rananocostry Stains : Staining procedures
      Counting Methods, Principle of staining
   j. Hb estimation – Method
      Colorimetric Method
      Chemical Method
      Gasmetric Method
      S.G. Method
      Clinical Importance

I. Hematology :

- ESR
- Methods
- Factors – Affecting ESR

- Normal Values
- Importance
- RBC – Indices
- ❖ WBC
- Platelets

II. Body Fluids :

(a) Urine :
- Method of Collection
- Normal Constitutents
- Physical Examination
- Chemical Examination

(b) Stool Examination :
- Method of Collection
- Normal Constituents and appearance
- Abnormal Constituents (Ova, Cyst)

(c) C.S.F. Examination
- Physical Examination
- Chemical Examination
- Microscopy
- Cell 1 Count
- Staining

(d) Semen Analysis
- Collection
- Examination
- Special Tests

Practical : Urinek, Stool, Semen and C.S.F. – Collection, Handling, Examinations

(a) Absolute Eosinophil Count, PCV, RBC indices, ESR Estimation, Platelt Count
- Collection of Sample
- Hb estimation
- TLC and DLC
- RBC Count
- Peripheral blood film – staining and study of Malarial Parasite

II. Laboratory management – Sample Collection, Labeling, Transport, Screening, Reporting and Dispatch of Reports.

BMLT – 130 **BIOCHEMISTRY**

Maximum Time : 3 hrs **University Assessment -70%**

Total marks :100 **Internal Assessment – 30% Minimum Pass Mark – 40%**

COURSE CONTENTS –

1. Introduction of Biochemistry
2. Elementary knowledge of inorganic chemistry: - Atomic weight, molecular weight, equivalent weight, acid, bases.
3. Definition and preparation of solutions: Percent solution, Molar solution, Normal Solution and Buffer Solution etc.
4. Definition and preparation of Regent.
5. Unit of measurement
6. Elementary knowledge of organic chemistry
    - Organic compounds
    - Aliphatic and Aromatic
    - Alcohols, Aldehydes, Ketones, Amines, Esters, Phenol etc
7. Ph indicators : pH paper, universal and other indicators, pH measurement : different methods.
    1. Aim and Scope of Biochemistry
    2. Collection and Recording of Biochemical Specimen, separation of serum/plasma preservation and siposal of Biological materal.
    3. Chemical examination of urine : Qualitative, Sugar, Protein, Bile Salt, Bile Pigment, Ketones Bodies
    4. Chemical examination of Stool : Occult Blood.
    5. Chemical examination of other Body Fluids : CSF, Plural Fluids, Ascitic Fluid etc.
    6. Laboratory management and Maintenance of Records.

Practical :

- Urine Examination physical, Chemical, Microscopic, Biochemistry
- Stool Examination
- Body Fluids : Physical and chemical examination CSF, Pleural Fluids, and Ascitic fluid

Introduction and usage of Glassware and Instruments

Glassware :

- Composition of Glass
- General Glass wares

Instruments :

- Balance
- Hot Plate and Magnetic stirrer
- Centrifuges
- Incubators
- Constant temperature bath
- Colorimeter : Principal, Function
- Photometer
- Flame Photometry

BMLT – 140 MICROBIOLOGY

Maximum Time : 3 hrs University Assessment -70%
Total marks :100 Internal Assessment – 30% Minimum Pass Mark – 40%
COURSE CONTENTS –

I. Introduction of brief history of Microbiology
- Historical Aspect
- Relationship of Micro-organism to men
- Micro-organism in Disease and Health

II. Requirement and uses of common Laboratory Equipments
- Incubator, Hot Air Oven, Water Bath
- Anaerobic Jar, Centrifuge, Autoclave
- Microscope
- Glassware – Description of Glassware, its use, handling and care

III. Sterilization :
- Definition
- Classification and General Principal of Sterilization
- Autoclave – its structure, functioning, control and indicator

IV. Antiseptics & Disinfectants
- Definition
- Types
- Mode of Action
- Uses

V. Collection, Transportation and processing of clinical samples for Microbiological Investigations

Bacteriology
- Definition
- Bacteria – General characteristics of Bacteria
- Classification and morphology of Bacteria
- Structure of Cell, Capsule, Flagella, and Spore
- Growth of Bacteria
- Nutrition of Bacteria

Virology :
- Definition
- General Introduction of Virus
- Physiochemical characteristic of Viruses
- Diseases caused by different Virus and mode of infection

Parasitology :
- Definition
- General Characteristics of Parasite
- Classification of Parasite
- Mode of transmission

Fungus :
- Definition
- Structure
- Classification

Practical :
Staining – Type of Staining, Principal, Procedure and Interpretation

BMLT – 150 **PHYSIOLOGY**

Maximum Time : 3 hrs **University Assessment -80%**
Total marks :100 **Internal Assessment – 20% Minimum Pass Mark – 40%**

COURSE CONTENTS

Brief Description of various organs systems:

1. Cell :
    - **Definition**
    - **Structure and functions the cytoplasmic Organelles**
    - **Reproduction : Meiosis, Mitosis**
2. The important physic-chemical laws applied to physiology
    - Diffusion
    - Osmosis
    - Bonding
    - Filtration
    - Dialysis
    - Surface Tension
    - Adsorption
    - Colloid
3. Fundamentals of different Organ Systems in brief.
    - Cardiovascular System
    - Respiratory System
    - Digestive System
    - Excretory System
    - Reproduction System
    - Endocrine System
    - Lymphatic System
    - Practical
    - Viva and diagrams of different Vital Organs

Practical :

Viva and diagrams of different Vital Organs

BMLT
IIrd year

BMLT – 210 **ANATOMY**

Maximum Time : 3 hrs University Assessment - 70%

Total marks :100 Internal Assessment – 30% Minimum Pass Mark – 40%

COURSE CONTENTS

Introduction of various vital organs

(A) Reproductive Organs : (In Brief)
- Male & Female Conads : Testes, Epididymis, Ovary, Fallopian Tube, Uterus, Vagine etc.
- Introduction of male Genital Organs
- Introduction of female Genital Organs

(B) Liver and Spleen :
- Introduction
- Anatomical Position

(C) Gall bladder
- Introduction Anatomical position.

(D) Excretory Organs ;
- Cortex and medulla of kidney
- Ureter
- Urinary Bladder
- Urethra (male and female)

PRACTICAL

Labeled Diagrams of different organs and bones

Viva

BMLT – 220 **PATHOLOGY**

Maximum Time : 3 hrs **University Assessment -70%**
Total marks :100 **Internal Assessment – 30%**
Minimum Pass Mark – 40%

COURSE CONTENTS

(a) Human blood group antigens and antibodies

(b) ABO Blood group systems
- Sub. – group
- Source of antigens and types of antibodies

(c) Rh Blood group System
- Types of Antigen
- Mode of Inheritance
- Types of Antibodies

(d) Erythroblastosis fatclis

(e) Blood Collection

- Selection and screening of donor
- Collection of blood
- Various anticoagulants
- Sotrage of Blood
- Changes in Blood on Sotrage

COOMB'S Test
- Direct and Indirect Test
- Titration of Antibody

HISTOPATHOLOGY (Theory and Practical)

a) Fixation of tissues
- Classification of Fixatives

b) Tissue Processing
- Collection
- Steps of fixation

c) Section Cutting
- Microtome and Knives
- Techniques of Section Cutting
- Mounting of Section
- Frozen Sections

d) Decalcification
   - Fixation
   - Declacification
   - End Point

e) Staining Dyes and their properties, H & E Stain, Special Stains

IMMUNOLOGY AND SEROLOGY

Hormones –

- Thyroid Hormones
- Growth Mhormones
- Insulin

Glycosylated Hemoglobin

COOMB'S Test

- Direct and Indirect Test
- Titration of Antibody

HISTOPATHOLOGY (Theory and Practical)

a) Fixation of tissues
   - Classification of Fixatives

b) Tissue Processing
   - Collection
   - Steps of fixation

c) Section Cutting
   - Microtome and Knives
   - Techniques of Section Cutting
   - Mounting of Section
   - Frozen Sections

d) Decalcification
   - Fixation
   - Declacification
   - End Point

e) Staining Dyes and their properties, H & E Stain, Special Stains

PRACTICAL :

- COOMB'S Test
- Anti D Titr

Blood gruping
Tube Method
Slide Method

- COOMB'S Test
- Anti D Titre

BMLT – 230 **BIOCHEMISTRY**

Maximum Time : 3 hrs University Assessment - 70%

Total marks :100 Internal Assessment – 30% Minimum Pass Mark – 40%

COURSE CONTENTS

1. Carbohydrates :-
   - Introduction
   - Importance
   - Classification
   - Properties
   - Estimation of Glucose
   - Clinical Significance
2. Protein : -
   - Introduction and Physiological importance
   - Amino acids
   - Essential amino acids
   - Classification
   - Denaturation of Proteins
   - Estimation of Total protein, Albumin, Globilin, A/G Ratio
3. Introduction, Properties and function of important hormones
4. Enzymes and Co-enzymes
   - Introduction and difference
   - Functions
   - Estimation of important enzymes
     i. SGOT (AST)
     ii. SGPT (ALT)
     iii. Alkaline Phosphatase
     iv. Acid Phosphatase
     v. Amylase, lactate dehydrogenase
     vi. CPK, CPK-MB

PRACTICAL :

Method of estimation of glucose : Benedicts Reaction, Glucose oxidase

Method of estimation of Protein, Albumin

BMLT – 240 **MICROBIOLOGY**

Maximum Time : 3 hrs University Assessment - 70%

Total marks :100 Internal Assessment – 30% Minimum Pass Mark – 40%

COURSE CONTENTS

Staining of Bacteria :

1. Composition and preparation of staining
2. Principal and Procedure of Bacteriological stain
   - Gram's Stain
   - Ziehl-Neelsen Stain
   - Albert Stain
   - Spore and Negative Stain

Cultivation of Micro-organism :

- Introduction and uses of culture
- Classification o f culture media
- Composition of common of Laboratory culture media
- Special media and preparations
- Techniques of inculation and isolation
- Antimicrobial sensitivity
- Anaerobic cultivation techniques

Isolation of Viruses in Laboratory by tissue culture

- Cell and tissue culture technology
- Embryonated Egg
- Principles of animal cell culture and their use in Virology

Different staining techniques used in Virology
Principle of different serological test used in Virology
Mode of Transmission of Viral agents
Prevention of Viral disease

1) Immunity in Viral infection Immunology
   - Definition
   - Immunity : Definition and Classification
   - Antigen
   - Antibodies – Immunoglobulin
   - Antigen and antibody reaction
   - Structure and function of immune system
   - Immune response

- Hypersensitivity

2) I Principal & Procedure of Serological Tests.
   - CRP, Brucella, Agglutination, ASO, WIDAL
   - Cold agglutination, VDRL, TPHA

   (i) Advanced techniques in Microbiology ELISA, RIA etc.
   (ii) Epidemiological Markers of Micro-organism serotyping
   (iii) Preparation & Standardization of Antigen and Antisera
   (iv) Preparation & Standardization of vaccine and immunization
3) I) General Introduction, life cycle, mode of transmission, pathogenicity, and lab diagnosis of various Protozoa.
   (ii) Entamoeba Hisolytica
   (iii) Entamoeba coli
   (iv) Giardia lamblia
   (v) Trichomonas Vaginalios
   (vi) Leishmenia donovani

4) (i)Sprozoa
   - Malaria Parasite
   - Toxoplasma Gondii

   (ii) Balatidium Coli

5) General Introduction life cycle, mode of transmission, pathogenicity and lab diagnosis of various Helminths :

(i) Cestodes or Tapeworms :
   - Taenia solium
   - Taenia sagnata
   - Hymenolepis nana
   - Echincoccus granulosus

(ii) Trematodes of Flukes :
   - Fasciola hepatica
   - Fasciola gigantica
   - Gestrodiscoides hominis

(iii) Nematodes :
   - Trichinella spiralis
   - Trichuris trichiura
   - Ancylostoma duodenale
   - Enterobjus vermicularis
   - Ascaris lumbricoides

PRACTICAL :

Demonstration :-

Slide Agglutination

- VDRL
- VIDAL
- ASO
- CRP
- Stool Examination
- Physical
- Microscopic Demonstration of Ova, Cyst, Pus, Cells
- Hanging Drop Examination

1. Staining : ZN Staining of M.T.B. and M. Lepra, Albert Staining
2. Culture
    - Types of Media
    - Preparation
    - Inoculation
    - Colony Characteritic
    - Staining and Antibiotic Sensitivity

BMLT – 250 **PHYSIOLOGY**

Maximum Time : 3 hrs **University Assessment - 70%**

Total marks :100 **Internal Assessment – 30% Minimum Pass Mark – 40%**

COURSE CONTENTS

Brief description of various vital organ system:

1. Blood
   - Definition
   - Composition
   - Function
2. Formation of different type of blood cells
   - Erythrocytes
   - Leucocytes
   - Thrombocytes
3. Mechanism of Blood Clotting
4. Cerebrospinal Fluid
   - Formation
   - Composition
   - Function
5. Special Senses in brief
   - Hearing
   - Taste
   - Smell
   - Touch
   - Sight

PRACTICAL :

Viva and diagrams of Corpuscles

BMLT
IIIrd year

BMLT – 310 Preventive & Social Medicine

Maximum Time : 3 hrs **University Assessment -70%**
Total marks :100 **Internal Assessment – 30%**

Minimum Pass Mark – 40%

COURSE CONTENTS

1. Concept of Health and Disease
   - Definition of Health
   - Positive Health
   - Concept of Well – being
   - Concept of Disease
   - Natural History of Disease
   - Concept of Prevention

2. Health Programs in India
   - National Vector Born Disease Program
   - National Anti Malaria Program
   - National Eradication Program
   - Revised National T.B. control Program

3. Brief information of national Rural Health Mission

4. Nutrition and Health
   - Carbohydrate
   - Vitamins
   - Protein
   - Minerals
   - Other trace elements

5. Environmental Health

6. Hospital Waste Management
   - Definition
   - Sources of healthcare waste
   - Healthcare waste generation
   - Health hazards of Healthcare Wastes
   - Treatment of Disposal Technologies for Healthcare Waste

7. Communication for Health Education
   - Definition
   - The communicate process
   - Type of Communication
   - Health Communication
   - Health Education

BMLT – 320 PATHOLOGY

Maximum Time : 3 hrs **University Assessment -80%**
Total marks :100 **Internal Assessment – 20%**

Minimum Pass Mark – 40%

COURSE CONTENTS

I. Anemia's :

(a) Definition and classification of Anemia
(b) Laboratory Diagnosis of

- Iron Deficiency Anemia
- Megaloblastic Anemia
- Post Heamorrhagic Anemia
- Thalessemia Syndrome

II. Haemorrhagic Disorders – Definition and Classification

- Haemostasis and Coagulation Factors
- Investigations and Lab Diagnosis

III. Leukemia Disorders--

- Definition and Classification
- Lab Diagnosis

IV. Hormones -- Techniques

- ELISA
- RIA

V. Cytology

- Fine needle Aspiration Technique
- Staining
- Papanicaloav Staining Technique

PRACTICAL :

- Bleeding Time, Clotting Time, PT,APTT,TT, Platelet Count & Platelet Function Test
- Sickle Cell preparation
- Reticulocyte Count
- Osmotic Fragility Test
- Brie Marrow Smears Preparation
- ELISA Demonstration
- LE Cell Preparation

BMLT – 330 BIOCHEMISTRY

Maximum Time : 3 hrs **University Assessment -70%**

Total marks :100 Internal Assessment – 30%

Minimum Pass Mark – 40%

COURSE CONTENTS

I. Liver Function Test :
- Introduction
- Type of Jaundice
- Detection of Bilirubin

II. Haemorrhagic Disorders – Definition and Classification

III. Water and Minerals Metabolism:
- Dehydration
- Calcium
- Phosphorus
- Sodium
- Potassium
- Cloride
- Iron
- Iodine
- And their physiological function and diseased state.

IV. Gastric Juice
- Importance
- Constituents
- Collection

COURSE CONTENTS :

1. Special Profiles :
   - Glucose Tolerance Test
   - Insulin Tolerance Test
   - Gastric analysis
   - Xylose absorption Test
   - Clearance Test for Renal Function
2. Analysis of Calcult
3. Introduction of
   - Chromatography
   - Electrophoresis
   - Radio immunoassay (RIA)
   - ELISA
4. Electrometric determination of sodium (Na+) and potassium (K+)

5. Quality control of clinical investigation and Automation in clinical biochemistry.
6. Cardiac enzymes CPK, CPK MB, LDH, Troponin

PRACTICAL :

- Revision of all Biochemical Tests
- Demonstration of Chromatography and Electrophoresis
- ELISA and RIA

Method of estimation of Bilirubin

Method of estimation of SGOT, GPT, Alk Po4 Acid Po4

BMLT – 340 **MICROBIOLOGY**

Maximum Time : 3 hrs **University Assessment -70%**
Total marks :100 **Internal Assessment – 30%**

Minimum Pass Mark – 40%

COURSE CONTENTS

1. Study of systematic Bacteriology:
   - Actinomycites
   - Streptococci
   - Staphylogocci
   - Pneumococci
   - Corynebacteria
   - Escherichia
   - Klebsiella
   - Enterobacter
   - Proteus
   - Salmonella
   - Shigella
   - Pseudomonas
   - Vibro
   - Haemophilus
   - Mycobacterium
   - Brucella
   - Clostridia
   - Treponema
   - Niesseria
   - Leptospira
   - Mycoplasma
   - Ricketessia
   - Clamydia
   - Tuberculosis, Leprosy, Plague, Anthrax, Typhus fever, syphilis, Gonorrhea and other STD's
   - Serological Tests-Widal, ASO, LFT, CRP, Rosewaller, brucella agglutination, cold agglutiration,
   - VDRL, TPHA, PTA-ABS
   - Lab diagnosis of fungal infections Superficial dermatophyte fungal infections, Candidiases,
   - creptococosis, Pulmonary
   - infections, Mycetoma, other deep mycotic infections, subcutaneous fungal infections
   - subcutaneous fungal infections\
   - Bacteriological examination of water, milk, good and air.
   - Nosocomial infections and sterility testing of I/V fluids and processing of

various samples for hospital infections.

- IMMUNOLOGY

Mycology

1. Interdiction of Anaerobic culture media name of
2. Identification of Fungi
   - Growth
   - Characteristics
   - Diseases caused by Fungi
3. Laboratorial Management and Stock Maintenance of Microbiology Laboratory

PRACTICAL :

- Biochemical Test used for identification of bacteria
- Lab diagnosis of Fungi
- Smear preparations
- KOH solution
- Fungus Culture :-

a. Media

b. B. Colony Characters of various fungi

Staining characters of different type of Bacteria Identification of type

colony growth Biochemical character of Organism

BMLT – 350 LABORATORY MANAGEMENT

Maximum Time : 3 hrs **University Assessment -70%**
Total marks :100 **Internal Assessment – 30%**

Minimum Pass Mark – 40%

COURSE CONTENTS :

1. Laboratory Planning
   - General Principles
   - Planning at different levels
   - Planning for Hospital Lab Services
   - Section for a Hospital Laboratory
   - Space requirement
2. Laboratory management Technique
   - General Principle
   - Component and function of Laboratory
   - Staffing the Laboratory
   - Job Specification
   - Work Schedule
3. Care of Laboratory Glassware, Equipments, Instruments and Chemical etc.
   - General Principle
   - Care and Cleaning of Glassware
   - Care of equipment and instruments
   - Lab chemicals, their proper use and care
   - Labeling
4. Laboratory Safety
   - General Principle
   - Laboratory hazards
   - Safety programs
   - First Aid
5. Quality Control of Laboratory
6. Stores Organization
   - Introduction
   - Function
   - Organization and Structure
   - Duties
   - Type of Store
   - Goods inward Store
   - Main Store
   - Main Records
7. Relationship with other function value analysis
8. Store/Office use stationary

   - Material Receipts Advice Form
   - Goods inwards Note Form
   - Material requisition Form

- Bin Card
- Electrophoresis Technique – Protein & Heamoglobin
- High performance liquid Chromatography
- Micro column technique