**MEWAR UNIVERSITY, GANGRAR (RAJ.)**

**B.Sc. Medical Laboratory Technology (BMLT)**

**BMLT-3rd Semester OF BMLT**

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| **S.NO.** | **Current Sub Code** | **Subjects** | **Contect Hrs Per week** | **Credit Hrs** | **Internal Assessment /Evaluation** | **External examination/viva-voce** | **Grand Total** |
| **L** | **T** | **P** | **Assig/lab record** | **Teachers evaluation** |
| 1 | BMLT-301 |  Clinical Biochemistry III | 4 |   |   | 4 | 35 | 15 | 50 | 100 |
| 2 | BMLT-302 |  Medical Microbiology III | 4 |   |   | 4 | 35 | 15 | 50 | 100 |
| 3 | BMLT-303 | Haematology & Blood BankingIII | 4 |   |   | 4 | 35 | 15 | 50 | 100 |
| 4 | BMLT-304 | Technical Methods in Microbiology | 4 |   |   | 4 | 35 | 15 | 50 | 100 |
| 5 | BMLT-305 | English Language and General Awareness-III {ELGA-III} | 1 |   |   | 1 |   |   | 25 | 25 |
| 6 | BMLT-306 | Environmental Science & Health  | 4 |   |   | 4 | 35 | 15 | 50 | 100 |
| 7 | BMLT-307 | Clinical Biochemistry Lab III |   |   | 3 | 2 | 15 | 10 | 25 | 50 |
| 8 |  BMLT-308 | Medical Microbiology -LabIII |   |   | 3 | 2 | 15 | 10 | 25 | 50 |
| 9 |  BMLT-309 | Haematology & Blood Banking Lab -III |   |   | 3 | 2 | 15 | 10 | 25 | 50 |
|   | Total |   | 21 |   | 11 | 27 |   |   |   | 675 |

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**B. Sc Medical Laboratory Technology**

**BMLT {3rd Semester}**

**[BMLT-301]: CLINICAL BIOCHEMISTRY-III**

**UNIT-1:**

 **Blood, Urine chemistry:**

1. Blood chemistry (Its constituents)
2. Urine chemistry (Its constituents)

**UNIT-II:**

 **Biomolecules:**

1. Carbohydrate: Structure , Metabolism & disorder of carbohydrate
2. Lipids: Structure , Metabolism & disorders lipids.
3. Protein : Introduction , structure and urea cycle

**UNIT-III:**

 **Vitamins, Enzymes and Biophysics:**

1. Vitamins: sources, functions, deficiency, requirements,
2. Enzymes: Introduction, Activation energy, classification, activity, specificity, kinetics v max, Km, Michaelis Menten equation
3. Nucleic acid: Structure , function , type

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 **B. Sc Medical Laboratory Technology**

**BMLT {3rd Semester}**

**[BMLT-307]:CLINICAL BIOCHEMISTRY PRACTICAL -III**

**PRACTICALS:**

1. Qualitative analysis of carbohydrates, proteins, amino acids.
2. Estimation blood sugar and Blood Urea
3. Quantitative test for urine glucose and GTT.
4. Urine bile salt & bile pigment
5. Urine ketone bodies

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**B. Sc Medical Laboratory Technology**

**BMLT {3rd Semester}**

**[BMLT-302]: MEDICAL MICROBIOLOGY III**

**Unit-1:**

 **Mycology**

1. Introduction of Mycology. Terms & Classification
2. Lab Diagnosis of Fungal Infections
3. Mycology
4. Superficial Mycoses Malsezzia furfur, T.nigra, T.pidera
5. Subcutaneous Mycoses: Mycetoma; Rhinosporidium; Sporotrichosis
6. Dermatophytes
7. Systemic Mycoses: Histoplasmosis; Blastomycosis; Coccidiodosis; Paracoccidiodosis
8. Opportunistic Fungi: Aspergillosis; Penicillosis; Zygomycosis; Pneumocystis; Mycotoxins

**UNIT-II:**

Introduction of immunology:

1. Inniate immunity and Acquired immunity
2. Introduction of Antigen and Antibody : Mechanism antigen & antibody reaction(Agglutiation , Precipitation , ELISA , RIA , Complement fixation test and Immunofluroscient test )
3. Mechanism of T-cell , B-cell and Introduction of cell & organ of immune system.

**UNIT-III:**

Introduction of Viral diseases: Introduction , Morphology , Cultivation , Pathogenesis and laboratory diagnosis of Pox virus , adenovirus , Herpes virus , Picorna virus , Hepatitis virus , Orthomexovirus , Paramexovirus , Rabdo and Retro virus .

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**B. Sc Medical Laboratory Technology**

**BMLT {3rd Semester}**

**[BMLT-308]: MEDICAL MICROBIOLOGY PRACTICAL III**

**PRACTICALS:**

1. Slide culture technique

2. KOH mount

3. Identification of fungal cultures:

a. Colony characteristics and Microscopic examination of Candida, Cryptococcus,

Trichophyton, Microsporum, Aspergillus niger, Asp fumigatus, Rhizopus, Fusarium,

Penicillium.

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 **B. Sc Medical Laboratory Technology**

 **BMLT {3rd Semester}**

**[BMLT-303]: Haematology & Blood BankingIII**.

**Unit-1:**

 **Hematology**

1. Haematopoiesis: Stem cells, formed elements and their functions; Anticoagulants used in various hematological studies.
2. Anaemia: Introduction , Classification & Laboratory diagnosis.
3. Routine hematological tests and normal values:
4. Determination of Hemoglobin and Hematocrit
5. Enumeration of RBC, WBC & Platelets
6. Absolute Eosinophil count
7. Reticulocyte count
8. Calculation of Red cell Indices
9. Preperation of staining of blood film for morphology of red cells and differential count

**Unit-2:**

**Hemostasis and Coagulation:**

1. Normal homeostasis & mechanism of blood coagulation
2. Collection of blood and anticoagulants used in coagulation studies
3. Investigation of haemostatic mechanism-BT, CT, PT, APTT
4. Assay of clotting factors
5. FDP , D-DIMER & DIC.
6. Platelet function tests

**Unit-3:**

 **Blood Banking technology:**

* 1. **Introduction of blood group system:** ABO blood group, Rh blood group system & Other blood group **.**Donorselection , Types of donor , Process of blood donation , Various types of anticoagulants use in blood band ,Separation of Blood Component technique and Storage of blood, Blood transfusion reaction .
	2. **Compatability testing :** Combs test (Direct & indirect test), Cross

match(Minor & major cross mathc) and Du testPrinciples of Blood transfusion Blood donor selection ,Methods of bleeding donors

 Blood containers, anitcoagulants and storage of blood

 COOMB’S test and it’s significance

 Screening of blood for infective material

 Blood components, preparation & component therapy

 Autologous transfusion

 Transfusion reactions and work up

 Blood bank organisation, standards, procedures, techniques & quality control.

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 **B. Sc Medical Laboratory Technology**

**BMLT {3rd Semester}**

**[BMLT-309]: HAEMATOLOGY & BLOOD BANKING PRACTICAL - III**

**PRACTICALS:**

1. Determination of Hemaglobin and Hematocrit
2. Red blood cell count
3. Total white blood cell count
4. Platelet count
5. Differential count of white blood cells
6. Absolute Eosinophil count
7. Reticulocyte count
8. Calculation of red cell indices
9. Determination of ESR
10. Determmination of BT, CT, Whole blood clotting time
11. Determination of PT and PTT
12. Blood smear preparation and staining
13. ABO blood group
14. Rh Blood group

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 **B. Sc Medical Laboratory Technology**

**BMLT {3rd SEMESTER}**

**[BMLT-304]: Technical methods in Microbiology**

**Unit I**

* Collection of Microbial sample: Respiratory specimen , nasal washing, sputum . nasal swab , pleural fluid . Urine sample. Specimen from genital area & gastrointestinal system
* Transport & storage of microbial sample , Transport Media

* Aerobic & anaerobic culture method :Maclntosh Filde’ , pure culture technique
* Microbial Population : Viable count and total count methods , Turbidometric method, Qubec Counter

**Unit II**

* Storage of Microbial Culture: Subcultering , Lypholozation , Liquid Nitrogen and other techniques.
* Bacterial Identification Method : Bile Solubility test , CAMP Test, Carbohydrate Fermentation test, IMViC Test , Coagulase & Catalase test.
* Antimicrobial Susceptibility test: MIC, Agar & broth dilution method , Disc diffusion method & Sterility testing
* Bacteriological Examination of Water, Milk, Food, and Air

**Unit III**

* Serological test: Agglutination., precipitation , CFT, TORCH Pofile , RPR,VDRL,ASO,
* Automation in Microbiology lab
* Care & use of Experimental Animal : Animal House , animal selection, Health hazards in animal house

Cultivation of virus: cell culture. Animal inoculation , and embryoneted

egg , Cytopathic effect and Diagnostic method

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**B. Sc Medical Laboratory Technology**

**BMLT {3rd Semester}**

 **BMLT-305 ENGLISH LANGUAGE AND GENERAL AWARENESS-V**

**Teaching Hours:40**

**Unit I:** Transcription of words into IPA

**Unit II:**Intonation, Stress and weak form of words

**Unit III**:Listening and hearing and types of listening

**Unit IV: Lis**tening skill

**Unit V :**Listening skills

**World and Indian Geography**

**Unit I:** Universe, Planets and Climatic Condition

Unit II : Geography of India

Unit III: Global Facts and Figures

Unit IV: States of India

Unit V: Indian Infrastructure

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**B. Sc Medical Laboratory Technology**

**BMLT {3rd semester}**

**[BMLT-309]: ENVIRONMENTAL SCIENCE &HEALTH-III**

**Unit-1: Introduction to Environment & water:**

* 1. Introduction to Environment and Health
	2. Sources, health hazards and control of environmental pollution
	3. Water:
1. The concept of safe and wholesome water.
2. The requirements of sanitary sources of water.
3. Understanding the methods of purification of water on small scale and large scale.

**Unit-2: Quality of water & Domestic refuse:**

* 1. Various biological standards, including WHO guidelines for third world countries.
	2. Concept and methods for assessing quality of water.
	3. Domestic refuse, sullage, human excreta and sewage their effects on environment and health, methods and issues related to their disposal.

**Unit-3: Awareness of standards of housing and arthropods**

1. Awareness of standards of housing and the effect of poor housing on health.
2. Role of arthropods in the causation of diseases, mode of transmission of arthropods borne diseases, methods of control

**MEWAR UNIVERSITY, GANGRAR (RAJ.)**

**B.Sc. Medical Laboratory Technology (BMLT)**

**BMLT-4th Semester Syllabus**

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| BMLT 4TH SEMESTER  |
| **S.NO.** | **Current Sub Code** | **Subjects** | **Contect Hrs Per week** | **Credit Hrs** | **Internal Assessment /Evaluation** | **External examination/viva-voce** | **Grand Total** |
| **L** | **T** | **P** | **Assig/lab record** | **Teachers evaluation** |
| 1 | BMLT-401 |  Clinical Biochemistry IV | 4 |   |   | 4 | 35 | 15 | 50 | 100 |
| 2 | BMLT-402 |  Medical Microbiology IV  | 4 |   |   | 4 | 35 | 15 | 50 | 100 |
| 3 | BMLT-403 | Histopathology & Cytology  | 4 |   |   | 4 | 35 | 15 | 50 | 100 |
| 4 | BMLT-404 | Research & Biostatics I | 4 |   |   | 4 | 35 | 15 | 50 | 100 |
| 5 |  BMLT-405 | Computer Application & Data Base Management I  | 4 |   |   | 4 | 35 | 15 | 50 | 100 |
| 6 |  BMLT-406 | ELGA IV | 1 |   |   | 1 |   |   | 25 | 25 |
| 7 | BMLT-407 |  Clinical Biochemistry Lab IV |   |   | 3 | 2 | 15 | 10 | 25 | 50 |
| 8 | BMLT -408 |  Microbiology Lab IV |   |   | 3 | 2 | 15 | 10 | 25 | 50 |
| 9 | BMLT-409 | Histopathology & Cytology Lab  |   |   | 3 | 2 | 15 | 10 | 25 | 50 |
|   | Total |   | 21 |   | 9 | 27 |   |   |   | 675 |
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**B. Sc Medical Laboratory Technology**

**BMLT {4th Semester}**

**[BMLT-401]:CLINICAL BIOCHEMISTRY-IV**

**UNIT-I:**

**DNA and RNA:** Introduction & metabolism.Neucleotide , Necleoside, and purine ,pyramidin (present in DNA.RNA)

**Biophysics**: surface tension, osmolarity and viscosity. Plasma membrane

**UNIT-II:**

 **Spectroscopy, MPNB, Nutrition and Special investigations:**

Photometry, spectrometry, turbidometry, flame photometry and atomic absorption spectroscopy. MPNB - Urea, Uric Acid, Create nine of these importance, Nutrition Special investigations, Demontstration - Serum electrophoresis, Immunoglobulin, Drug estimation

**UNIT-III:**

1. **Metabolic Disorder: G**enetic and acquired disorder of carbohydrate Metabolism, protein metabolism,
2. **Hemoglobin Metabolism :** synthesis of hemoglobin and their catabolism
3. Introduction of organ function test : Liver, cardiac, renal

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 **B. Sc Medical Laboratory Technology**

**BMLT {4th Semester}**

**[BMLT-407]: CLINICAL BIOCHEMISTRY practical-IV**

**PRACTICALS:**

1. Qualitative screening test for normal and abnormal urine sample.
2. Estimation of non-protein nitrogenous compounds of blood: Blood urea, Creatinine, Creatinine clearance test (CCT)
3. Protein precipitation, dialysis and separation of proteins, electrophoresis of serum, CSF and urine proteins.

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**B. Sc Medical Laboratory Technology**

**BMLT {4th Semester}**

**[BMLT-402]: MEDICAL MICROBIOLOGY IV**

**Unit-1:**

 **Parasitology**

1. Protozology: Entamoeba histolytica; Balantidium coli; Giardia; Toxoplasma; Malaria; Leishmania.Thick & thin smear for blood parasite.
2. Helminthology: Cestodes - Taenia, Echinococcus, D.latum, H.nana;Trematodes - Schistosoma, Fasciola; Nematodes – Ascaris, hookworm, Strongyloides, Trichuris, Trichinella, Dracunculus, Filarial worms. Stool examination, different technique for intestinal parasoite,

**UNIT-II:**

 **Miscellaneous microorganism:**

Introduction , Morphology , Cultivation , Pathogenesis and laboratory diagnosis: of Actinomycetes , Nocardia , Mycoplasma , Rickettsia , Chlaamydia , Spirochaetes

**Unit-3**

 **1.**  **Miscellaneous Viruses:**

 Introduction , Morphology , Cultivation , Pathogenesis and laboratory diagnosis of Corona virus , filovirus , Slow virus (Prion , Viriod) , Oncogenic virus

2. TORCH Profile, VDRL ,RPR , WIDAL,CRP,ASO, Immunoelectophoresis, principal procedure & clinical significance of these test

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**B. Sc Medical Laboratory Technology**

**BMLT {4th semester}**

**[BMLT-408]:MEDICAL MICROBIOLOGY practical IV**

**PRACTICALS:**

 **Parasitology**

Stool examination

 a. Saline mount

 b. Iodine mount

 **Virology**

Demonstration of embryonated egg inoculation

Virology exercise: Spots test, ELISA (HBv, HCV, HIV)

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 **B. Sc Medical Laboratory Technology**

 **BMLT {4th Semester}**

**[BMLT-403]:** **Histopathology & Cytology-IV**

**Unit-1:**

**Histopathology:**

1. Introduction to Histopathology, Receiving of Specimen in the laboratory Techniques, Mounting Techniques–various Mount
2. Introduction of Microtome and their types.
3. Microtome, Knives, Knife sharpeners and Ultra microtome
4. Freezing microtome and Cryostat
5. Grossing technique, Preparation of paraffin sections & Various types of fixatives

Decalcification, Immunohistochemistry

**Unit-II:**

**Manual and Automatic Tissue process**:

 1. Basic steps for tissue processing & Preparation of tissue section

1. Routine paraffin section cutting
2. Frozen section and Cryostat section studies
3. **Routine staining procedure techniques**: Special stains for Carbohydrates, Connective tissue, Nervous tissue, Bone tissue, Collage fibers, Elastic, Fibers, Lipids, Organisms, fungi, parasites, pigments , Nucleic acid & Cytoplasmic constituent and their demonstration
4. **Mounting techniques**: Various mounts and mounting techniques

 6. **Microscope& others techniques**:

1. Electron Microscope Scanning electron microscope, Dark ground and Fluorescent microscope
2. Museum technology
3. Maintenance of records and filing of slides

**Unit-III:**

1. **Cytology** –
2. Normal cell structure, function, cytologic criteria of malignancies.
3. Types of specimen, methods of collection and preparation of cell block
4. Different fixatives and method of fixation

iv) Staining:

a) Papanicoloau’s stain- Principle, preparation and staining techniques

 b) May Grunwald Giems stain

 c) Shorr’s stain

 d) Aceto orcin stain

 e) Sex chromatin

 f) FNAC g) Hormonal assessment with cytological technique

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 **B. Sc Medical Laboratory Technology**

**BMLT {4th semester}**

**[BMLT-409]: Histopathology & Cytology PRACTICAL-IV**

**PRACTICALS:**

1)Staining by Hematoxylin & Eosin and other special stains

1. Blood smear preparation and staining
2. Osmotic fragility test
3. Sickling test
4. LE cells estimation.
5. Tissue processing
6. Section cutting
7. Grossing technique
8. Preparation of cell block
9. PAP Staining
10. Special staining

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**B. Sc Medical Laboratory Technology**

**BMLT {4th Semester}**

 **BMLT-406 ENGLISH LANGUAGE AND GENERAL AWARENESS-IV**

**Teaching Hours:40**

**Unit I:** Clause analysis of a sentance

**Unit II:**Classification of sentence

**Unit III**: Synthesis of sentences

**Unit IV:** How to avoid comma splice, misplaced and dangling modifiers and other such mistakes

**Indian economy**

**Unit I:** planning Commission and five years Plan

Unit II : Public Finance and Fiscal Policies

Unit III: Indian economic Set Up

Unit IV: Understanding Infrastructure for business Set up

Unit V: Legal and financial Understanding

**B. Sc Medical Laboratory Technology**

**BMLT {4th Semester}**

 **BMLT-404 RESEARCH & BIO STATISTICS**

**Unit I**

Introduction to basic statistical concepts: Definition, Limitations, functions, distrust and applications of statistics, Sources of data, Collection of data, Primary and secondary data, methods of collecting primary data, sources of secondary data. Understands statistical terms.Possesses knowledge and skill in the use of basic statistical and research methodology.

Importance of the study of statistics.Branches of statistics. Statistics and health science including nursing. Parameters and estimates. Descriptive and inferential statistics. Variables and their types. Measurement scales.

**Unit II**

Classification and tabulation of statistical data, Diagrammatic and graphical representation of statistical data, graphs of frequency distribution, histogram, frequency polygon and ogives. Measure of Central Tendency Need for measures of central tendency

**Unit III**

Measure of Variability, Need for measure of dispression. The range, the average deviation, The variance and standard deviation.Calculation of variance and standard deviation ungrouped and grouped. Properties and uses of variance and SD.

**B. Sc Medical Laboratory Technology**

**BMLT {4th Semester}**

 **BMLT-405 Computer Application & Data Base Management IV**

**Teaching Hours: 40**

**UNIT1**

Define computer, its generation, characteristics of computer, block diagram of computer, measures, types of computer, software, its type like System software & user designed application software, CPU, RAM and SSD, computer languages,Computer in medical electronics.

**UNIT2**

HARDWARE:- Definition. Input output devices: input devices (keyboard, point and draw devices, data scanning devices, digitizer, electronic card reader, voice recognition devices, vision-input devices).

Output Devices: -

* Monitor (visual Display Unit)
* Pointers
* Screen Image Projector
*
* Printers: -
	+ Laser Printer
	+ Dot Matrix Printer
	+ Color Printer
	+ Line Printer
	+ InkjetPrinter
* Plotter
* Sound System
* Voice response systems

**UNIT3**

Processor and memory: The Central Processing Unit (CPU), main memory. Storage Devices: sequential and direct access devices, magnetic tape, magnetic disk, optical disk, mass storage devices.

Computer networks: introduction, types of network (LAN, MAN, WAN, Internet, Intranet), network topologies (star, ring, bus, mesh, tree, hybrid), components of network.

**UNIT4**

Operating System: Introduction of Operating System: introduction, operating system concepts, types of operating system.

Introduction to MS-DOS: History of DOS, features of MS-DOS, MS-DOS Commands (internal and external).

Introduction of windows: History, features, desktop, taskbar, icons on the desktop, operation with folder, creating shortcuts, operation with windows (opening, closing, moving, resizing, minimizing and maximizing, etc.).

Reference books:

1. Microsoft Word by Rajeev Chawla 2. Computer and Introduction by V.K. Jain