

**JIS UNIVERSITY**

**[Syllabus for Bachelor of Medical Laboratory Technology (BMLT) Course]**

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**SYLLABUS FOR THE  
BACHELOR OF MEDICAL LABORATORY TECHNOLOGY  
(BMLT) COURSE**



**81, Nilgunj Road, Jagarata Pally, Deshpriya Nagar, Agarpara, Kolkata-  
700109**

**West Bengal**

# **JIS UNIVERSITY**

## **[Syllabus for Bachelor of Medical Laboratory Technology (BMLT) Course]**

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### **B.M.L.T.**

### **Bachelor of Medical Laboratory Technology**

**Duration:** 3 Years (6 semesters)

**Level:** Graduation

**Type:** Degree

**Eligibility:** 10+2 (Science)

**B.M.L.T. or Bachelor in Medical Laboratory Technology** is an undergraduate Medical Lab Technologist Programme. Bachelor in Medical Laboratory Technology program aims to provide the aspirant with sufficient knowledge and skills to carry out routine laboratory diagnostic procedures and some sophisticated laboratory diagnostic procedures. The course deals with new advances in Management of Laboratories, instrumentation etc. The duration of the course is three years and it is career orienting in nature and its syllabus is divided into six semesters.

#### **Bachelor in Medical Laboratory Technology Eligibility**

Students should have passed in class 12th in Science with minimum 50% (45% for SC/ST) or equivalent CGPA from a recognized board.

#### **Bachelor in Medical Laboratory Technology Course Suitability**

Candidates should have possessed a good analytical judgment and the ability to work under pressure. They also have a close attention to detail which is essential for Medical Laboratory Technicians because small differences or changes in test substances or numerical readouts can be crucial to a diagnosis. Students should have normal color vision are highly desirable, and able to handle automated laboratory equipment, computer skills are important.

#### **How is Bachelor in Medical Laboratory Technology Course Beneficial?**

Bachelor in Medical Laboratory Technology course offers skill and knowledge progress in applying medical standards and technical standards for assessing a lab test. The program will help the aspirants to work in the research area as assistants. After passing their graduation they can go for further master's degree than for research work; they can also become teachers in schools.

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### **Bachelor in Medical Laboratory Technology Employment Areas**

Clinics

Commercial Laboratories

Hospitals

Nursing Homes

Public Health Facilities

### **Bachelor in Medical Laboratory Technology Job Types**

Junior Technical Executive

Lab Medicine Technician

Laboratory Technician

R&D Contractual Lab Assistant

System Analyst

X-Ray Technician

### **Advance Courses in Bachelor in Medical Laboratory Technology**

Post Graduate Diploma in Medical Laboratory Technology

M.Sc. (Medical Lab Technology)

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Syllabus of Medical Lab Technology as proposed by JIS University will be as follows. The courses will be distributed in six (6) semesters.

| <b>Year I</b>  |                                  |
|----------------|----------------------------------|
| <b>Sr. No.</b> | <b>Subjects of Study</b>         |
| 1              | Human Anatomy and Physiology     |
| 2              | General Microbiology             |
| 3              | Pathology                        |
| 4              | General Biochemistry             |
| 5              | Fundamentals of Computer Science |
| 6              | Communication for Professionals  |
| 7              | Human Anatomy and Physiology (P) |
| 8              | General Microbiology (P)         |
| 9              | Pathology (P)                    |
| 10             | General Biochemistry (P)         |

| <b>Year II</b> |                                               |
|----------------|-----------------------------------------------|
| <b>Sr. No.</b> | <b>Subjects of Study</b>                      |
| 1              | Biomedical Waste Management                   |
| 2              | Bacteriology, Immunology and Parasitology     |
| 3              | Clinical Biochemistry                         |
| 4              | Hematology and Blood Banking                  |
| 5              | Basic and Clinical Pharmacology               |
| 6              | Health education and health communication     |
| 7              | Community Medicine                            |
| 8              | Bacteriology, Immunology and Parasitology (P) |
| 9              | Clinical Biochemistry (P)                     |
| 10             | Hematology and Blood Banking (P)              |

| <b>Year III</b> |                                                  |
|-----------------|--------------------------------------------------|
| <b>Sr. No.</b>  | <b>Subjects of Study</b>                         |
| 1               | Histotechnology                                  |
| 2               | Virology, Mycology and Applied Microbiology      |
| 3               | Essentials of Medical Pharmacology               |
| 4               | Histopathology and Cytopathology Techniques      |
| 5               | Biomedical Techniques, Lab Management and Ethics |
| 6               | Diagnostic Molecular Biology                     |
| 7               | Virology, Mycology and Applied Microbiology (P)  |
| 8               | Histopathology and Cytopathology Techniques (P)  |
| 9               | Diagnostic Molecular Biology(P)                  |
| 10              | Hospital Training                                |

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## [Syllabus for Bachelor of Medical Laboratory Technology (BMLT) Course]

The syllabus shall come into effect from the academic year 2019-20 under JIS University. The course of study for BMLT shall include semester wise theory and practical as given in table I to VII. The no. of hours to be devoted to each theory and practical course in any semester shall not be less than shown in table I to VII.

### COURSE STRUCTURE

#### 1<sup>ST</sup>YEAR

#### SEMESTER-I

| Sl. | Course Code | Subject                                    | Period |   |   | Credit      |
|-----|-------------|--------------------------------------------|--------|---|---|-------------|
|     |             |                                            | L      | T | P | Total       |
| 1   | BML-101     | Human Anatomy and Physiology-I (Theory)    | 3      | - | - | 3           |
| 2   | BML-102     | Pathology-I (Theory)                       | 3      | - | - | 3           |
| 3   | BML-103     | General Microbiology-1 (Theory)            | 3      | - | - | 3           |
| 4   | BML-104     | Biochemistry-1 (Theory)                    | 3      | - | - | 3           |
| 5   | BML-105     | Communication for Professionals (Theory)   | 3      | - | - | 3           |
| 6   | BML-191     | Human Anatomy and Physiology-I (Practical) | -      | - | 3 | 2           |
| 7   | BML-192     | Pathology-I (Practical)                    | -      | - | 3 | 2           |
| 8   | BML-193     | General Microbiology-I (Practical)         | -      | - | 3 | 2           |
| 9   | BML-194     | Biochemistry-I(Practical)                  | -      | - | 3 | 2           |
| 10  | BML-181     | Skill-X                                    | -      | - | - | 1           |
| 11  | BML-182     | Seminar and GD                             | -      | - | - | 1           |
|     |             | Total                                      |        |   |   | 23 + 2 = 25 |

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## [Syllabus for Bachelor of Medical Laboratory Technology (BMLT) Course]

### SEMESTER-II

| Sl. | Course Code | Subject                                      | Period |   |   | Credit    |
|-----|-------------|----------------------------------------------|--------|---|---|-----------|
|     |             |                                              | L      | T | P | Total     |
| 1   | BML-201     | Human Anatomy and Physiology- II (Theory)    | 3      | - | - | 3         |
| 2   | BML-202     | Pathology-II (Theory)                        | 3      | - | - | 3         |
| 3   | BML-203     | General Microbiology-II (Theory)             | 3      | - | - | 3         |
| 4   | BML-204     | Biochemistry-II (Theory)                     | 3      | - | - | 3         |
| 5   | BML-205     | Fundamentals of Computer Science (Theory)    | 3      | - | - | 3         |
| 6   | BML-291     | Human Anatomy and Physiology- II (Practical) | -      | - | 3 | 2         |
| 7   | BML-292     | Pathology-II (Practical)                     | -      | - | 3 | 2         |
| 8   | BML-293     | General Microbiology-II (Practical)          | -      | - | 3 | 2         |
| 9   | BML-294     | Biochemistry-II (Practical)                  | -      | - | 3 | 2         |
| 10  | BML-281     | Skill-X                                      | -      | - | - | 1         |
| 11  | BML-282     | Seminar and GD                               | -      | - | - | 1         |
|     |             | Total                                        |        |   |   | 23+2 = 25 |

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## [Syllabus for Bachelor of Medical Laboratory Technology (BMLT) Course]

### 2<sup>ND</sup>YEAR

### SEMESTER III

| Sl. | Course Code | Subject                                            | Period |   |   | Credit    |
|-----|-------------|----------------------------------------------------|--------|---|---|-----------|
|     |             |                                                    | L      | T | P | Total     |
| 1   | BML-301     | Hematology and Blood Banking-I(Theory)             | 3      | - | - | 3         |
| 2   | BML-302     | Clinical Biochemistry-I (Theory)                   | 3      | - | - | 3         |
| 3   | BML-303     | Basic and Clinical Pharmacology (Theory)           | 3      | - | - | 3         |
| 4   | BML-304     | Health education and health communication (Theory) | 3      | - | - | 3         |
| 5   | BML-305     | Biomedical Waste Management (Theory)               | 3      | - | - | 3         |
| 7   | BML-391     | Hematology and Blood Banking-I(Practical)          | -      | - | 3 | 2         |
| 8   | BML-392     | Clinical Biochemistry-I (Practical)                | -      | - | 3 | 2         |
| 9   | BML-381     | Skill-X                                            | -      | - | - | 1         |
| 10  | BML-382     | Seminar and GD                                     | -      | - | - | 1         |
|     |             | Total                                              |        |   |   | 19+2 = 21 |

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## [Syllabus for Bachelor of Medical Laboratory Technology (BMLT) Course]

### SEMESTER IV

| Sl. | Course Code | Subject                                               | Period |   |   | Credit   |
|-----|-------------|-------------------------------------------------------|--------|---|---|----------|
|     |             |                                                       | L      | T | P | Total    |
| 1   | BML-401     | Hematology and Blood Banking-II(Theory)               | 3      | - | - | 3        |
| 2   | BML-402     | Clinical Biochemistry-II (Theory)                     | 3      | - | - | 3        |
| 3   | BML-403     | Bacteriology, Immunology and Parasitology (Theory)    | 3      | - | - | 3        |
| 4   | BML-404     | Community Medicine (Theory)                           | 3      | - | - | 3        |
| 5   | BML-491     | Hematology and Blood Banking-II (Practical)           | -      | - | 3 | 2        |
| 6   | BML-492     | Clinical Biochemistry-II (Practical)                  | -      | - | 3 | 2        |
| 7   | BML-493     | Bacteriology, Immunology and Parasitology (Practical) | -      | - | 3 | 2        |
| 8   | BML-481     | Skill-X                                               | -      | - | - | 1        |
| 9   | BML-482     | Seminar and GD                                        | -      | - | - | 1        |
|     |             | Total                                                 |        |   |   | 18+2 =20 |



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## [Syllabus for Bachelor of Medical Laboratory Technology (BMLT) Course]

3<sup>rd</sup> YEAR

SEMESTER V

| Sl. | Course Code | Subject                                                 | Period |   |   | Credit      |
|-----|-------------|---------------------------------------------------------|--------|---|---|-------------|
|     |             |                                                         | L      | T | P | Total       |
| 1   | BML-501     | Virology, Mycology and Applied Microbiology (Theory)    | 3      | - | - | 3           |
| 2   | BML-502     | Histopathology and Cytopathology Techniques (Theory)    | 3      | - | - | 3           |
| 3   | BML-503     | Histotechnology (Theory)                                | 3      | - | - | 3           |
| 4   | BML-504     | Clinical enzymology and automation (Theory)             | 3      | - | - | 3           |
| 5   | BML-591     | Virology, Mycology and Applied Microbiology (Practical) | -      | - | 3 | 2           |
| 6   | BML-592     | Histopathology and Cytopathology Techniques (Practical) | -      | - | 3 | 2           |
| 9   | BML-581     | Skill-X                                                 | -      | - | - | 1           |
| 10  | BML-582     | Seminar and GD                                          | -      | - | - | 1           |
|     |             | Total                                                   |        |   |   | 16 + 2 = 18 |

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### SEMESTER VI

| Sl. | Course Code | Subject                                                   | Period |   |   | Credit    |
|-----|-------------|-----------------------------------------------------------|--------|---|---|-----------|
|     |             |                                                           | L      | T | P | Total     |
| 1   | BML-601     | Diagonostic Molecular Biology (Theory)                    | 3      | - | - | 3         |
| 2   | BML-602     | Essentials of Medical Pharmacology (Theory)               | 3      | - | - | 3         |
| 3   | BML-603     | Biomedical Techniques, Lab Management and Ethics (Theory) | 3      | - | - | 3         |
| 4   | BML-691     | Diagonostic Molecular Biology (Practical)                 | -      | - | 3 | 2         |
| 5   | BML-692     | Hospital Training                                         | -      | - | - | 6         |
| 6   | BML-681     | Skill-X                                                   | -      | - | - | 1         |
| 7   | BML-682     | Seminar and GD                                            | -      | - | - | 1         |
|     |             | Total                                                     |        |   |   | 17+2 = 19 |

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## **SYLLABUS FOR BACHELOR OF MEDICAL LABORATORY TECHNOLOGY (BMLT)**

**BMLT  
1<sup>ST</sup> YEAR**

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### **SEMESTER I**

**BML 101: HUMAN ANATOMY AND PHYSIOLOGY-I (THEORY)**

**45 Hours**

#### **Course Content**

##### **Unit -1**

Terminology and General Plan of the Body, Body Parts and Areas, Terms of Location and Position, Body Cavities and Their Membranes, Dorsal cavity, Ventral cavity, Planes and Sections

##### **Unit –II**

Cells: Structure, function and location, Prokaryotic and eukaryotic cells, Cell organelles, Cell division. Tissue, Types, Structure, Location and Function of Epithelial Tissue, Connective Tissue, Muscle Tissue, Nerve Tissue, Membranes, Glandular tissue. The Integumentary System: structure and function of The Skin, Subcutaneous Tissue

##### **Unit-III**

Cell physiology: Structure, membrane, transport across cell membrane, Active, Passive, Organization of the Body, Body Composition, Body Fluid Volumes and its measurement, Diffusion, Osmosis, Tonicity, Homeostasis

##### **Unit-IV**

Blood-composition, function, cellular component & their function, haemoglobin & anaemia, blood groups and coagulation. Lymphatic system-Composition & function of lymph, lymphatic tissue, Immunity with the role of thymus

##### **Unit-V**

Musculoskeletal System: Basic anatomy of important muscles and bones, Structure of skeletal muscle. Muscle contraction and relaxation.

##### **Unit-VI**

Cardiovascular system-general arrangement, heart, arteries, veins and capillaries, heart structure and function, cardiac cycle, heart sounds, heart rate, blood pressure, mechanism of circulation, definition of hypertension & shock

##### **Unit-VII**

Respiratory system: parts of respiratory system, mechanism of respiration, pulmonary function, pulmonary circulation, lungs volume, Gas transport between lungs and tissues, Definition of hypoxia, dyspnoea, cyanosis, asphyxia and obstructive airways diseases

**BML 191: HUMAN ANATOMY AND PHYSIOLOGY-I (Practical)**

**3 Hours/week**

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1. Demonstration of Major organs through models and permanent slides.
2. Demonstration of parts of circulatory system from models.
3. Demonstration of parts of respiratory system from models.
4. Demonstration of structural differences between skeletal, smooth and cardiac muscles.
5. Demonstration of various bones
6. Demonstration of various joints
7. To measure pulse rate
8. To measure blood pressure
9. Demonstration of ECG
10. To perform Hemoglobin by Sahli's Method
11. To perform Hemoglobin by CMG method.

### **Recommended Books (Latest Editions)**

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**BML 102: PATHOLOGY I (Theory)**

**45 Hours**

### Course content

#### Unit I

Introduction & History of pathology, Basic definitions and familiarization with the common terms used in pathology, Causes and mechanisms of cell injury, reversible and irreversible injury, Introduction of hyperplasia, hypoplasia, hypertrophy, atrophy, metaplasia, necrosis and apoptosis

#### Unit II

General features of acute and chronic inflammation: Vascular changes, cellular events, Cells and mediators of inflammation, Phagocytosis and its mechanism

#### Unit III

Tissue Renewal and Repair, healing and fibrosis, cirrhosis, introduction of oedema, hyperaemia, congestion, haemorrhage, haemostasis, thrombosis, embolism, infarction, shock and hypertension.

#### Unit IV

Protein energy malnutrition, deficiency diseases of vitamins and minerals, nutritional excess and imbalances. Role and effect of metals (Zinc, Iron and Calcium) and their deficiency diseases, Aetiology and pathophysiology of diabetes, arteriosclerosis, myocardial infarction, respiratory diseases (COPD), Parkinson disease, Infectious Diseases: pathogenesis & overview of modes of infections, prevention and control with suitable examples like Typhoid, Dengue

#### Unit V

Cancer: Definitions, nomenclature, characteristics of benign and malignant neoplasm, metastasis, Carcinogens and cancer, concept of oncogenes, tumour suppressor genes, DNA repair genes and cancer stem cells.

**BML 102: PATHOLOGY-I (Practical)**

**3 Hours/week**

1. Haemoglobin by CMG method.
2. To perform Total RBC count.
3. To perform total leucocyte count.
4. To perform differential leucocyte count.
5. To perform PCV
6. To calculate Red cell indices.
7. To perform total platelet count.
8. To perform bleeding time.
9. To perform clotting time.

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10. To study about CSF examination.
11. Microscopic examination of urine
12. Examination of urine
13. Examination of sputum

### **Recommended Books (Latest Editions)**

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**BML 103: GENERAL MICROBIOLOGY-I (Theory)**

**45 Hours**

### Course content

#### Unit-I

Development of microbiology as a discipline, Contributions of Anton von Leeuwenhoek, Louis Pasteur, Robert Koch, Joseph Lister, Alexander Fleming, Edward Jenner, Introduction to bacterial taxonomy, Classification of Bacteria, Morphology based on size, shape, arrangement, motility, flagella, spores, capsules, cell wall, plasma membrane, pili, and ribosomes.

#### Unit-II

Microscopy: Study of compound microscope – magnification, numerical aperture, resolution and components of microscope. Dark ground illumination, care of microscope and common difficulties micrometry. Bright Field Microscope, Dark Field Microscope, Phase Contrast Microscope, Fluorescence Microscope, Transmission Electron Microscope, Scanning Electron Microscope

#### Unit-III

Cell size, shape and arrangement, cell-wall, composition and detailed structure of Gram-positive and Gram-negative cell walls, Cell Membrane: Structure, function and chemical composition of bacterial cell membranes. Cytoplasm: Ribosome, mesosomes, inclusion bodies, nucleoid, chromosome and plasmids, Endospore: Structure, formation

#### Unit-IV

General safety measures used in Microbiology laboratory, Sterilization and disinfection: Various physical methods of sterilization – heat, UV radiation, ionizing radiation, filtration, characters affecting sterilization, autoclave control and sterilization indicators. Biomedical waste management in a Medical Microbiology laboratory: Types of the waste generated, Segregation, Treatment, Disposal

#### Unit-V

Antiseptics & Disinfectants: Definition, types and properties, mode of action, use, qualities of good disinfectants. Chemical disinfectants – phenol and its compounds, alcohol, halogen, heavy metals and quaternary ammonium compounds, aldehyde, gaseous compound. use and abuse of disinfectants. Precautions while using the disinfectants.

**BML 193: GENERAL MICROBIOLOGY-I (Practical)**

**3 Hours/week**

1. Demonstration of Autoclave and sterilization of media
2. Demonstration of Laminar air flow and media preparation
3. Preparation of culture plates
4. Demonstration of Centrifuge.
5. Demonstration of hot air Oven and sterilization of glassware's
6. Demonstration of Incubator and preservation of cultures
7. Preparation of media



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8. Antibiotic sensitivity test.

### **Recommended Books (Latest Editions)**

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**BML 104: BIOCHEMISTRY-1 (Theory)**

**45 Hours**

### Course content

#### Unit-I

Carbohydrate – Definition, Source, Classification, Functions and Importance, Physiological importance of major type of carbohydrates. Carbohydrate metabolism – Glycolysis, HMP shunt, TCA cycle, Glycogenesis, Glycogenolysis, Neoglucogenesis, Blood sugar level

#### Unit-II

Protein – Definition, Source, Classification, Function and Importance of major type of proteins. Protein metabolism – Transamination, Transmethylation, Deamination, Urea synthesis, Inborn error of metabolism.

#### Unit-III

Lipids - Definition, Source, Classification, Function of major type of lipids. Saturated and Unsaturated type of fatty acids, Essential fatty acids and their importance. Phospholipids and their importance. Lipid metabolism – Fatty acid oxidation, Ketone bodies, Metabolism of cholesterol, Arteriosclerosis and Obesity.

#### Unit-IV

Enzymes : Definition, Classification of enzyme, Cofactor & Coenzymes, Concept of active sites and general mode of action of enzymes, units for measuring enzyme activity, factor affecting enzyme activity, factor responsible for abnormal enzyme secretion

#### Unit-V

Nucleic acids: Structure, Function and types of DNA and RNA, Nucleotides, Nucleosides, Nitrogen bases, purines and pyrimidines and role of Nucleic acid.

#### Unit-VI

Vitamins: classification, function and disease associated with vitamins. Minerals and ions: Requirement, function and biological importance of Calcium, Iron, Iodine, Zinc, Phosphorus, Copper, Sodium and Potassium

**BML 194: BIOCHEMISTRY-I (Practical)**

**3 Hours/week**

1. To determine protein by Biuret method.
2. To perform protein test by various methods.
3. Physical examination of urine
4. Urine sugar determination by Benedict's method.
5. Protein by heat and acetic method
6. Bile salt, Bile pigments and Urobilinogen determination

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7. Determination of Ketonebodies
8. Determinationofvariousparametersofurine byuristikmethod.
9. Preparation ofhemolysate
10. To identifycarbohydrates in given solution by various methods.

### **Recommended Books (Latest Editions)**

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**BML 195: COMMUNICATION FOR PROFESSIONALS (Theory)**

**45 Hours**

### **Course content**

1. Introduction: Meaning of Communication; Role of Communication in Business; Basic elements of the Communication process, level of Communication, forms, models and media of Communications, Verbal and non-verbal Communication-functions and types. Barriers to effective Communication.
2. Grammar: Subject verb agreement, tense, voice, improvement of sentences, rearrangement of sentences. Vocabulary: usage, synonyms, antonyms.
3. Comprehension
4. Forms of Writing: The Essay, The Précis, The Report, The Proposal, The C.V. and Job
5. Application letter. The Presentation.
6. Role Playing
7. Group Discussion

### **Recommended Books (Latest Editions)**

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### **SEMESTER II**

**BML 201: HUMAN ANATOMY AND PHYSIOLOGY-II (THEORY)**

**45 Hours**

#### **Course content**

##### **Unit-I**

Digestive system: basic anatomy of esophagus, stomach, small intestine, large intestine liver, gall bladder, pancreas

##### **Unit-II**

Gastrointestinal physiology: Organs of GIT and their structure & function, secretion digestion, absorption and assimilation, gastrointestinal hormones, physiology of digestion of carbohydrates, proteins & lipids, Structure & function of liver, spleen, gall bladder & pancreas, Jaundice, Cirrhosis & Pancreatitis

##### **Unit-III**

Endocrine system: Different hormones in endocrine system. Action of pituitary, thyroid, parathyroid, adrenal and gonadal hormones. Body temperature regulatory process in human role of endocrine and nervous system.

##### **Unit-IV**

Neurophysiology: Reflex system, automatic nervous system, parts of brain and function of each part. Nerve tract and their role.

##### **Unit-V**

Special senses: Structure of retina, rhodopsin and iodopsin cycle, visual tract, accommodation. Auditory tract, mechanism of audition. Structure of taste bud, taste pathway, Olfaction and its physiology.

##### **Unit-VI**

Renal physiology: Structure and function of renal system. Urine formation, micturition, renal clearance test, renal buffer system.

##### **Unit-VII**

Reproductive system: Male and female reproductive organs, Gametogenesis, Ovulation, Menstrual Cycle.

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### **BML 291 HUMAN ANATOMY & PHYSIOLOGY-II (Practical)**

**3 Hours/week**

1. Demonstration of digestive system from models.
2. Demonstration of excretory system from models.
3. Demonstration of nervous system from models.
4. Structure of eye and ear
5. Demonstration of various parts of male & female reproductive system from models

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**BML 202: PATHOLOGY-II (THEORY)**

**45 Hours**

### Course content

#### Unit- I

Hemoglobin, structure, function and types, Hemoglobinometry, Haemoglobin estimation by various methods, advantages and disadvantages, physiological and pathological variations of blood parameters, Hemocytometry, visual and electronic method, Neubauer counting chamber, RBC count, WBC count, Platelets count, absolute eosinophil count, principle, procedure, calculation, significance, precautions involved during counting, absolute count of various WBCs. Physiological and pathological change in values, Erythrocyte sedimentation rate, manual and automated method, factors affecting ESR, packed cell volume, red cell indices (MCV, MCH, MCHC), Physiological and pathological variations in value

#### Unit-II

Complete blood count, determination by automated method and significance of each parameter, Reticulocyte count, routine examination of CSF, semen, sputum and stool.

#### Unit –III

Mechanism of coagulation, coagulation factors, Bleeding time, clotting time, platelet count, protamine sulphate test, clot retraction test

#### Unit-IV

Introduction to immuno hematology and blood banking technology, antigen, antibody complements, ABO & Rh blood group system, method of determination, other blood group system, Donor selection, blood collection, anticoagulants, additive systems, blood bags, its labelling, storage and transportation

#### Unit- V

Uses, care & maintenance and calibration of Coulter counter, coagulometer, automatic ESI analyzer, urine analyzer, point of care testing. Pre and Post analytical variables, automation in hematology

**BML- 292 PATHOLOGY-II (LAB)**

**3Hours/Week**

1. To perform ELISA test. To perform TB IgG & IgM test
2. To perform Dengue IgG & IgM test
3. To demonstrate agglutination reaction.
4. To perform RA test
5. To perform WIDAL test
6. To study about intrauterine contraceptive devices.

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7. To demonstrate microscopic structure of bones with permanent slides.
8. To demonstrate microscopic structure of muscles with permanent slides.



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**BML 203: GENERAL MICROBIOLOGY-II (THEORY)**

**45Hours**

### Course content

#### Unit-I

Lab organization, management, recording of results and quality control in Medical Microbiology Lab. Safety measures in Microbiology Laboratory, Occurrence of labinfections, route of infections in laboratory, safety measures precaution in use of pathogens in teaching.

#### Unit-II

Host pathogen interaction: Definitions - Infection, Invasion, Pathogen, Pathogenicity, Virulence, Toxigenicity, Carriers and their types, Opportunistic infections, Nosocomial infections. Transmission of infection

#### Unit-III

Principle, working, use, care & maintenance of Laminar air flow, Centrifuge, Autoclave, hot air Oven, Incubator, Colony Counter, Muffle Furnace, Mac-intos Field-jaretc. Sterility testing of I/v fluids, Collection, transportation and processing of I/v fluids for bacterial contamination, Recording the result and interpretation

#### Unit-IV

Hospital acquired infection, Specimen collection from patients, clinics and hospitals, Specimen collection for epidemiological investigations, role of microbiology laboratory in control of nosocomial infection

Antimicrobial agents and Antibiotics: Introduction, mechanism of action, classification and uses, Antibiotic susceptibility testing in bacteriology, Culture medium used for Antibiotic susceptibility testing, Preparation and standardization of inoculums, Control bacterial strains, Description, morphology, cultural characteristics, pathogenicity, cultural characteristics, clinical features and lab diagnosis of Staphylococcus, Streptococcus, Pneumococcus, Neisseria, Bordetella, Choice of antibiotics MIC and MBC: Concepts and methods for determination. Various methods of Antibiotic susceptibility testing with special reference to Stokes and Kirby-Bauer method

#### Unit-V

Description, morphology, cultural characteristics, pathogenicity, cultural characteristics clinical features and lab diagnosis of Clostridia, Escherichia coli, Salmonella, Shigella, Proteus, Vibrio, Pseudomonas, Spirocheates, Chlamydia, Actinomyces, Rickettsia, Yersenia, Brucella, Description, morphology, cultural characteristics, pathogenicity, cultural characteristics, clinical features and lab diagnosis of Vibrio, Pseudomonas, Spirocheates, Chlamydia, Actinomyces, Rickettsia, Yersenia, Brucella, Introduction of Mycology Definition, general properties and classification Cutaneous mycoses, Systemic mycoses Opportunistic mycoses Culture and laboratory test for fungus.

**BML 293: GENERAL MICROBIOLOGY-II (Practical)**

**3Hours/Week**

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1. To perform HIV Tridot test.
2. To perform radial immune-diffusion test.
3. To perform immune-precipitation method.
4. To perform HBsAg rapid test.
5. To perform ASO test
6. Introduction of Allergy panel
7. Mantoux test
8. Grossing of tissue
9. To perform tissue processing by manual method.
10. To perform section cutting of paraffin embedded tissue.
11. To fix the smear on glass slide.
12. To perform hematoxylin and eosin staining.
13. To perform PAS staining.
14. To perform AFB staining.

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**BML- 204 BIOCHEMISTRY-I (THEORY)**

**45HOURS**

### Course Content

#### Unit-I

Introduction to Clinical Biochemistry and role of Medical Lab Technologist , ethics, responsibility, safety measure and hazards in clinical biochemistry lab and first aid in laboratory accidents.

Glassware's & plastic ware's used in lab, calibration of volumetric apparatus, cleaning& care and maintenance

#### Unit II

Principle, working, care & maintenance and calibration of Weighing balance, Hotplate, Magnetic stirrer, Centrifuges, Incubator, Hot air oven, Colorimeter,

Spectrophotometer, Water distillation plant, Deionizers Henderson Hassel balch equation, pH paper, pH meter, method of pH measurement

#### Unit-III

Preparation of solution and reagents, normal solution, molar solutions, percent solution, buffer solution, dilutions, w/v, v/v, standard solution, aqueous solutions, concepts of acid and base

Units of measurement: SI unit, reference range, conversion factor, units for measurement of bio metabolite, enzymes, protein, drugs, hormones, vitamins

#### Unit-IV

Specimen collection and processing of blood, urine & CSF, separation of serum and plasma, deproteinization of sample, Handling of specimens for testing, preservation of specimen, transport of specimen, factors affecting the clinical results, effect of storage on sample

#### Unit- V

Physical, chemical and microscopic examination of urine, Bence Jones Proteinuria and its clinical significance, qualitative test of urine for reducing sugars, protein, ketone bodies, bile Salt, bile pigments, urobilinogen, occult blood, uric acid, urea and Creatinine, quantitative estimation of 24 hrs urine for protein and their clinical significance.

**BML- 294 BIOCHEMISTRY-II (LAB)**

**3Hours/Week**

1. To study general laboratory safety rules.
2. To demonstrate glasswares, apparatus and plasticwares used in laboratory.
3. Collection of blood sample

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4. To separate serum and plasma.
5. Preparation of different percentage solutions
6. Preparation of normal and molar solutions. (0.1 N NaOH, 0.2N HCl, 0.1 M  $\text{H}_2\text{SO}_4$ )
7. Demonstration of photocolourimeter
8. Demonstration of spectrophotometer
9. Demonstration of pH meter
10. Deproteinization of blood sample

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**BML-205 FUNDAMENTALS OF COMPUTER SCIENCE (THEORY)**

**45HOURS**

### **Course Content**

1. Introduction
2. MS Windows(Windows '98 SecondEdition)
3. Desktop, creation of folders and shortcuts, features of Windowsexplorer
4. MS Office packages – Word, Excel, PowerPoint, basic skills in using these tools

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**B.M.L.T.**

**2<sup>ND</sup> YEAR**

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### **SEMESTER III**

#### **BML-301 HEMATOLOGY AND BLOOD BANKING-I (THEORY) 45HOURS**

##### **Unit –I**

RBCs, formation, morphology, cytoskeleton, anisocytosis, poikilocytosis, metabolism, role of 2, 3- BPG and oxygen dissociation curve. Anaemia and its classification, Morphological and etiological, pathogenesis, laboratory investigations and management, Iron deficiency anaemia, metabolism of iron, pathogenesis, laboratory investigations and management, principle and procedure of special test Megaloblasticaemia, pernicious anaemia, pathogenesis, laboratory investigations

##### **Unit-II**

Haemoglobin, its synthesis and types, normal and abnormal hemoglobins, extravascular and intravascular hemolysis. Haemolyticaemia, pathogenesis and laboratory investigations, principle and procedure of special test, G-6-PD

##### **Unit –III**

Leukopoiesis, Stages of Leukocyte Maturation, Features of Cell Identification, leucocytosis and leucocytopenia, neutrophilia, eosinophilia, basophilia, monocytosis, lymphocytosis, neutropenia, lymphopenia, causes and significance, toxic granulation, Morphological alterations in neutrophil, effect of HIV on blood cell parameter

##### **Unit-IV**

Overview of hemostasis and coagulation, Stages of platelets development, Primary and Secondary hemostasis, Role of platelets, Role of coagulation factors, Coagulation inhibitory system, Fibrinolysis

##### **Unit-V**

General blood picture, estimation of iron, TIBC, Transferrin, Ferritin, Plasma haemoglobin, Vit. B12, Folic acid, FIGLU test, Schilling test, Parietal cell antibodies, G-6-PD, Osmotic fragility test, Heinz bodies, Perls Prussian staining, Platelet count, Platelet aggregation test, PT, INR APTT, Mixing experiments in PT and APTT, Thrombin time.

##### **Unit- VI**

Aplastic anaemia, Anaemia of chronic disorders, Sideroblasticaemia, Haemolytic Anaemia, etiology, pathogenesis, clinical features, laboratory investigations, Bone marrow examination, composition & functions, aspiration techniques, processing and staining

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### Unit-VII

Hemoglobinopathies, qualitative and quantitative, Sickle cell anaemia, sickle cell trait, etiology, pathogenesis, clinical features, and laboratory investigations, Disease management and prognosis, Sickling test, Thalassaemia, classification, etiology, pathogenesis, clinical features, laboratory investigations, haemoglobinelectrophoresis

### **BML-391 HEMATOLOGY AND BLOOD BANKING-I (LAB)      3HOURS/WEEK**

1. General blood picture
2. Determination of red cell indices
3. Demonstration of hypochromic microcytic slide.
4. Determination of G-6-PD
5. Differential Leukocyte Count.
6. Absolute leucocyte count
7. Demonstration of toxic granulation of neutrophil
8. To perform PT and Calculate INR
9. To perform APTT
10. To perform sickling test
11. Determination of Plasma Hemoglobin
12. To perform reticulocyte count.



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### **BML-302 CLINICAL BIOCHEMISTRY-I (THEORY)**

**45HOURS**

#### **Unit-I**

Introduction to Clinical Biochemistry and role of Medical Lab Technologist, ethics, responsibility, safety measure and hazards in clinical biochemistry lab and first aid in laboratory accidents. Glassware's & plastic ware's used in lab, calibration of volumetric apparatus, cleaning & care and maintenance

#### **Unit II**

Principle, working, care & maintenance and calibration of Weighing balance, Hotplate, Magnetic stirrer, Centrifuges, Incubator, Hot air oven, Colorimeter, Spectrophotometer, Water distillation plant, Deionizers Henderson Hassel balch equation, pH paper, pH meter, method of pH measurement,

#### **Unit-III**

Preparation of solution and reagents, normal solution, molar solutions, percent solution, buffer solution, dilutions, w/v, v/v, standard solution, aqueous solutions, concepts of acid and base. Units of measurement: SI unit, reference range, conversion factor, units for measurement of bio metabolite, enzymes, protein, drugs, hormones, vitamins

#### **Unit-IV**

Specimen collection and processing of blood, urine & CSF, separation of serum and plasma, deproteinization of sample, Handling of specimens for testing, preservation of specimen, transport of specimen, factors affecting the clinical results, effect of storage on sample

#### **Unit- V**

Physical, chemical and microscopic examination of urine, Bence Jones Proteinuria and its clinical significance, qualitative test of urine for reducing sugars, protein, ketone bodies, bile Salt, bile pigments, urobilinogen, occult blood, uric acid, urea and Creatinine, quantitative estimation of 24 hrs urine for protein and their clinical significance.

### **BML-392 CLINICAL BIOCHEMISTRY-I (LAB)**

**3HOURS/WEEK**

1. To identify carbohydrates in given solution by various methods.
2. To determine protein by Biuret method.
3. To perform protein test by various methods.
4. Physical examination of urine
5. Urine sugar determination by Benedict's method.
6. Protein by heat and acetic method
7. Bile salt, Bile pigments and Urobilinogen determination
8. Determination of Ketone bodies
9. Determination of various parameters of urine by uristick method.

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### **BML- 303 BASIC AND CLINICAL PHARMACOLOGY (THEORY)**

**45HOURS**

#### **Unit-1**

General Pharmacology: Pharmacology; Different branches of Pharmacology; Routes of drug administration; Absorption, Distribution, Metabolism and excretion of drugs; General mechanism of drug action; Animal used in experiments; Animal handling and ethics; Bioassay procedures; Instruments used in Pharmacology; Basics of Clinical trials.

#### **Unit- II**

Drugs Acting on CNS: General anesthetics; Anxiolytic and hypnotic drugs; Psychotropic agents; Epilepsy and Anticonvulsant drugs; Narcotic analgesics and antagonists; Centrally acting muscle relaxation and anti-parkinsonism agents; Analgesics; antipyretics; anti-inflammatory agents and Central nervous system stimulant; Local anesthetics.

#### **Unit III**

Drugs Acting on ANS: Autonomic nervous system and neurohumoral transmission; Cholinergic or parasympathetic drugs; Anticholinergic or parasympathomimetic drugs; BACHELOR OF MEDICAL LAB. TECHNOLOGY-BMLT Adrenergic or sympathomimetic drugs; sympatholytic drugs; Drugs acting on autonomic ganglion; Neuromuscular blockers.

#### **Unit IV**

Drugs Acting on Respiratory System: Bronchodilators; analeptics; Nasal decongestants, expectorants; antitussive agents.

#### **Unit V**

Drugs acting on Cardiovascular System: Antiarrhythmic drugs; Cardiotonics; Antianginal drugs; Antihypertensive drugs; Drugs used in atherosclerosis.

#### **Unit VI**

Drugs Acting on Blood and Blood Forming Organs: Haematinics – Iron (Fe); Coagulants; Anticoagulants; Blood and plasma expanders.

#### **Unit VII**

Hormones and Hormone Antagonists: Antithyroid drugs; Hypoglycaemic agents; Sex hormones and oral contraceptives; Corticosteroids.

#### **Unit VIII**

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Opioid Analgesics: Endogenous opioid peptides; Opioid receptors; Effects of clinically used opioids; Morphine and related opioid agonists; Acute opioid toxicity; Opioid agonist & antagonist; Therapeutic uses of opioid analgesics.

### **Unit IX**

Drug Addiction and Drug Abuse: Drug dependence; Physical dependence on Drugs;

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### **BML- 304 HEALTH EDUCATION & HEALTH COMMUNICATION(THEORY) 45HOURS**

#### **Unit I:**

- Health Education: Principles & Objectives, Levels of Health Education, Educational Methods, Evaluation & Practice of Health Education in India.
- Health Counseling: Introduction, Theories, Process & Techniques.
- Health Care Reporting, Role of NIC & Other Bodies, Research in Health Education

#### **Unit II:**

- Health Communication: Basic Concept & Principles of Communication, Definition, Purpose, Types of Communication
- Communication Process, Directions of Communication: Upward, Downward, Lateral, Factors influencing Communication, Barriers of Effective Communication, How to overcome the Barriers
- Models of communication: Aristotle Model, Shannon and Weaver model, Schramm Model, Laegans Model, Fano Model, Litterer's Model, Westly Maclean's Model.

#### **Unit III**

Mass communication & Role of Media in health education

- Information Communication Technologies (ICT) in health care and awareness. (Telemedicine & e-health, community radio)
- Future trends in information and communications systems:

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### **BML-305 BIOMEDICAL WASTE MANAGEMENT (THEORY)**

**45HOURS**

**Unit 1:** Present Scenario

Bio-medical waste – Concepts and Perceptions, Waste Generation, Segregation , Disposal

**Unit 2:**

Planning and Objectives of BMW Management, Survey, Policies and Perspectives of BMW Management

**Unit 3:**

Record Keeping, Management of Bio-medical Waste, Technologies for Treatment for BMW, Criteria for selecting appropriate Medical Waste Technologies

**Unit 4:**

Training, Occupational Safety and Health Issues

**Unit 5:**

Legal Aspects and Environment Concern, Implementation of Action Plan, Approaches to Common Regional facility

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### SEMESTER IV

#### **BML-401 HEMATOLOGY AND BLOOD BANKING-II(THEORY)**

**45HOURS**

##### **Unit-I**

Leukemia and its classification, WHO and FAB classification, AML, ALL, CML, CLL, its etiology, clinical features, laboratory investigations Cytochemistry involved in diagnosis of various types of leukemia.

##### **Unit-II**

Qualitative and quantitative disorders of platelets, hypercoagulable test, Disorders of secondary hemostasis, hemophilia and its lab diagnosis, Von- Willebrand disease, Disseminated intravascular coagulation, thrombosis, Disorder of fibrinogen, test for bleeding & coagulation disorders, correction, studies for factor deficiency, quantitative factor assay

##### **Unit- III**

LE cells, its demonstration and significance, lupus anticoagulants, Blood parasites, Malaria, Trypanosomes, Filariasis, Leishmania

##### **Unit-IV**

Basic Principles of Blood Banking, Antigen, Antibody, naturally occurring antibody, Complement, ABO & Rh blood group system, Methods of blood group determination, Forward and Reverse grouping, Slide & Tube method, Gel method.

##### **Unit-V**

Other blood group system such as Lewis, MNS, Kell Duffy etc. Anticoagulants and preservative used in blood bank, Donor selection criteria, Blood collection and processing

##### **Unit-VI**

Transfusion transmissible infectious disease screen, Coomb's test, Cross matching, Compatibility testing, Antibody Screening & Identification, Grading of Reaction/Agglutination

##### **Unit-VII**

Blood components and its preparation, preservation, storage and transportation. Indications for different blood component transfusion, Blood transfusion reaction and its type, HDN Introduction of stem cell banking and bone marrow transplantation.

##### **Unit-VIII**

Apheresis, indications of hemapheresis, plasmapheresis, plateletspheresis, plasmapheresis Quality control of reagents, equipments, blood components used in transfusion medicine. Role of NACO, Indian Red Cross Society, DGHS and blood transfusion services.

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### **BML-491 HEMATOLOGY AND BLOOD BANKING-II (LAB) 3HOURS/WEEK**

1. Staining of bone marrow
2. To perform sickling test.
3. To determine fetal haemoglobin
4. To perform Heinz bodies
5. Demonstration of leukemic slides
6. To perform LAP scoring
7. To determine total platelet count
8. To perform PT
9. To perform APTT
10. To perform thrombin time.
11. To perform D-dimer test.
12. To determine fibrinogen conc.
13. General blood picture
14. To demonstrate malarial slide
15. Haemoglobin electrophoresis
16. Demonstration of hemoparasites like trypanosomes, Filaria, Malaria

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### **BML-402 CLINICAL BIOCHEMISTRY- II(THEORY)**

**45HOURS**

#### **Unit-I**

Introduction to enzymes, Classification of Enzymes, Isoenzymes, Concept of lock and key and induced fit theory, concept of activation energy and binding energy. Factors affecting enzyme activity

#### **Unit-II**

Coenzyme: Classification, various types and function, structure of NAD<sup>+</sup>, NADP<sup>+</sup>, FAD and FMN, PPP. Units for measuring enzyme activity, factors affecting enzyme level in serum/plasma. Clinical assay & its type, kinetic assay and end point assay for the enzymes

#### **Unit-III**

Enzyme kinetics, the Michaelis-Menten equation and its physiological significances, Enzyme Inhibition, types of inhibitors of enzyme

#### **Unit-IV**

Isoenzymes, their tissue distribution and clinical significance: ALT, AST, ALP, GGT, CPK, CK-MB, LDH, Troponin, Myoglobin, Amylase, Lipase, ACP

#### **Unit-V**

Basic Concepts of Automation, principle, working and maintenance of various clinical chemistry analyzers, point of care testing, Hospital Laboratory Management

### **BML-492 -CLINICAL BIOCHEMISTRY-II (LAB)**

**3HOURS/WEEK**

1. Preparation of hemolysate
2. To determine T<sub>3</sub> conc. in serum sample.
3. To determine T<sub>4</sub> conc. in serum sample.
4. To determine TSH conc. in serum sample.
5. To determine LH conc. in serum sample.
6. To determine FSH conc. in serum sample.
7. To determine Prolactin conc. in serum sample.
8. To determine TSH conc. in serum sample.
9. To perform TRIPLE test.
10. Demonstration of male and female infertility test.
11. Beta HCG



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### **BML-403 BACTERIOLOGY, IMMUNOLOGY AND PARASITOLOGY(THEORY) 45HOURS**

#### **Unit-I**

Historical background, general concepts of the immune system, innate and adaptive immunity; active and passive immunity; primary and secondary immune response. Cell and organs of immune system, Phagocytosis.

#### **Unit-II**

Antigens and haptens: Properties, foreignness, molecular size, heterogeneity, B and T cell epitopes; T dependent and T independent antigens. Antibodies: Historical perspective of antibody structure; structure, function and properties of the antibodies; different classes, subclasses and biological activities of antibodies; concepts of antibody diversity, isotype, allotype, Introduction of hybridoma technology, monoclonal antibodies, polyclonal antibody

#### **Unit-III**

Mechanism of humoral and cell mediated immune response. Introduction of Major Histocompatibility Complex, organization of MHC and inheritance in humans; Antigen presenting cells, antigen processing and presentation, Complement system and complement fixation test.

#### **Unit-IV**

Laboratory tests for demonstration of antigen – antibody reaction such as agglutination, precipitation, ELISA, RIA, Immunofluorescence,

#### **Unit-V**

Rheumatological diseases, etiology and pathogenesis and lab investigations

#### **Unit-VI**

Introduction of parasites, host, zoonosis, host parasites relationship, sources of infection, mode of infection, pathogenesis, immunity in parasitic infection

Lab diagnosis- Entamoeba histolytica, Malarial Parasites, Leishmania, Trypanosomes, their morphology, life cycle, pathogenesis, clinical features and lab diagnosis.

Helminthology: Introduction and classification, Taenia solium, Taenia Saginata, Fasciola, Ascaris, Wuchereria bancrofti their morphology, life cycle, pathogenesis, clinical features and lab diagnosis. Hookworm, Trichuris. Dracunculus their morphology, life cycle, pathogenesis, clinical features and lab diagnosis

#### **Unit-VII**

Diagnostic methods in Parasitology: Introduction, Examination of stool, urine, blood, Culture methods, Immunological diagnosis and serology

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### **BML-493 BACTERIOLOGY, IMMUNOLOGY AND PARASITOLOGY (LAB) 3HOURS/WEEK**

1. Demonstration of Microscope and its parts
2. Demonstration of glassware used in microbiology.
3. Demonstration of autoclave and sterilization of glasswares.
4. Demonstration of Hot air oven and sterilization of glasswares.
5. To perform Gram staining
6. To perform Acid fast staining (Ziehl-Neelsen staining)
7. To perform Indian ink staining
8. To perform Hanging drop method
9. Demonstration of capsule
10. Staining of bacterial spores
11. To demonstrate agglutination reaction.
12. To perform RA test
13. To perform WIDAL test
14. To perform RPR test.
15. To perform CRP test.

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### **BML-404 COMMUNITY MEDICINE(THEORY)**

**45HOURS**

#### **Unit I**

Natural History of Disease: Determinants of health, multi – factorial causation of disease host, agent, and environment relationship primary, secondary and tertiary levels of prevention with examples related to few diseases of national importance.

#### **Unit II**

Mode of Transmission of Disease: Air – borne, vector and vehicle transmission; Methods of control with examples for control of each mode.

#### **Unit III**

Disinfection: Disinfection of the infective materials received in the Laboratory by using the appropriate disinfection methods, at the health centre level.

#### **Unit IV**

Health Services: Brief description of organization of health services at the centre and state levels; Primary Health Care - Definition, components and principles of primary health care; Health for all indicators; Primary Health Centre - The functions, staffing pattern and the role of laboratory technicians in primary Health Centre.

#### **Unit V**

National Programmes of Health and Disease Eradication /Control: Health Programmes Family Welfare Programme, National Programme for water supply and sanitation, Nutritional Programmes, Immunization and universal immunization programme; Disease Eradication programme - Leprosy & Guinea worm; Disease control programmes - Tuberculosis, Malaria, Filariasis, S.T.D, Goitre, Cholera and other diarrhoeal diseases and National Programme for prevention of blindness including trachoma.

#### **Unit VI**

Demography & Population Control: The factors influencing population growth, death rate, birth rate and methods of contraception.

#### **Unit VII**

Biostatistics: Application of statistical principles in history; Presentation of data, calculation of mean, median and mode, range and standard deviation and their significance; Significance of 'T' test, Chi square values.

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### **Unit VIII**

Environmental Sanitation: Methods of water purification and disinfection, collection of water samples, their transport and bacteriological analysis; Methods of excreta disposal.

### **Unit VIII**

Health Education: Definition, principles, objectives, purpose, types and AV aids;  
Communication - definition, process and types, Behavioral change communication; IEC (Information education and communication) - aims, scope, concept and approaches; Inter personal relationship - Co-ordination and co-operation in health education with other members of the health team; Teaching and learning process, concept, characteristics of learner and educator; Role and skill of health professional in Health Education

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**B.M.L.T.**

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### **SEMESTER V**

#### **BML-501 VIROLOGY, MYCOLOGY AND APPLIED MICROBIOLOGY-I (THEORY) 45HOURS**

##### **Unit- I**

Western blotting, Immunodiffusion, Immuno-electrophoresis, Hypersensitivity and its types  
Introduction to Allergy and its laboratory test

##### **Unit-II**

Introduction of transplant immunology, graft rejection, tissue typing for kidney and bone marrow transplant, Laboratory test for transplant

##### **Unit -III**

Autoimmune disorders, pathogenesis, organ specific and systemic autoimmune disorders and its markers such as parietal cell antibody, anti-sperm antibody, lupus anticoagulants, anti-mitochondrial antibody, ANA, ds DNA, HLA-B27, ASMA, anti CCP

##### **Unit-IV**

Immunological disorders: primary and secondary immunodeficiency, SCID, AIDS, Tumour, types of tumours, Various Tumour Markers, their significance and method of estimation.

##### **Unit-V**

Vaccines, classification and applications, Active and passive immunization, Immunoprophylaxis schedule in neonates, children and in pregnancy

##### **Unit VI**

Nature and Properties of Viruses, Introduction: Discovery of viruses, nature and definition of viruses, general properties, concept of viroids, virusoids, satellite viruses and Prions. Structure of Viruses: Capsid symmetry, enveloped and non-enveloped viruses

Isolation, purification and cultivation of viruses, Viral taxonomy: Classification and nomenclature of different groups of viruses, Modes of viral transmission: Persistent, non-persistent, vertical and horizontal. Viral multiplication and replication strategies: Interaction of viruses with cellular receptors and entry of viruses. Assembly, maturation and release of virions

##### **Unit- VII**

Poxviruses, Herpesviruses, hepatitis viruses, retroviruses-HIV, Picorna viruses, rhabdoviruses, orthomyxoviruses and paramyxoviruses, TORCH profile, Symptoms, mode of transmission, prophylaxis and control of Polio, Herpes, Hepatitis, Rabies, Dengue, HIV, Influenza with brief description of swine flu, Ebola, Chikungunya, Japanese Encephalitis

##### **Unit VIII**

Introduction to oncogenic viruses, Types of oncogenic DNA and RNA viruses, concepts of

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oncogenes and proto-oncogenes, prevention & control of viral diseases, antiviral compounds and their mode of action, interferon and their mode of action, General principles of viral vaccination

### **BML-591 VIROLOGY, MYCOLOGY AND APPLIED MICROBIOLOGY-I (LAB) 3 HOURS/WEEK**

1. Leishman staining for malarial parasites
2. Demonstration of permanent slide of Trichuris, Ascaris and Hookworm
3. Saline wet mount for observing ova and eggs of parasites.
4. Iodine wet mount for observing ova and eggs of parasites.
5. Concentration of stool samples by floatation method
6. Zinc sulphate conc. Method for stool sample
7. Demonstration of various parasites by permanent slides.
8. Concentration of stool sample by sedimentation method
9. Serological diagnosis of Leishmania
10. Aldehyde Choprastest for Kala Azar
11. To perform HBsAg/ Australia Ag by rapid method
12. To perform HBsAg by ELISA
13. To perform HIV Tridot method.
14. To perform HIV by ELISA
15. To perform TORCH profile
16. Demonstration of PCR HBV
17. Demonstration of PCR HIV Viral load

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### **BML-502 HISTOPATHOLOGY AND CYTOPATHOLOGY TECHNIQUE (THEORY) 45HOURS**

#### **Unit-I**

Staining of carbohydrates: preparation of Schiff reagent, PAS staining, Alcian blue, staining of glycogen, Amyloid, other staining method. Connective tissue & its staining: Trichrome staining, verhoeff stain, WeigertResorcin stain, Gordon's and Sweet stain, Gomori's method, von Geison stain,PTAH stain

#### **Unit-II**

Demonstration of minerals and pigments in tissue sample, Demonstration and identification of lipids, Demonstration of enzymes, diagnostic application and the demonstration of phosphatases, dehydrogenases, oxidases and peroxidases, Demonstration of microorganism on tissue specimens, Bacteria, AFB, Actinomyces, spirochetes, fungi

#### **Unit-III**

Demonstration of nucleic acids, Processing and staining of bone marrow sample. Fixation, Processing and section cutting of bones, eye ball, Techniques in neuropathology: Neurons staining, Myelin, Neuropathology lab specimen handling

#### **Unit-IV**

Demonstration of sex chromatin, Museum techniques, Electron microscopy: Principle and working, fixation, processing and staining of tissue Fluorescence Microscope: Principle and working

#### **Unit- V**

Immunohistochemistry: principle, types, applications, antigen retrieval, APAAP, PAP Staining, Quality control in histopathology

#### **Unit-VI**

Microtome, its type and working, various type of microtome, Microtome knives, its type and knife sharpening, Section cutting, fault and remedies, Section adhesive

#### **Unit-VII**

Cryostat, frozen sections of fresh, fixed and unfixed tissue, freeze drying, rapid frozen sections and staining for emergency diagnosis, Dye chemistry, Stains and dyes, natural dye, acidic dye, basic dye, neutral dyes, fluorescence dye, mordant, accelerators, accentuators, metachromasia, metachromatic dyes

#### **Unit- VIII**

Progressive, regressive, vital, supravital staining, types of hematoxylin, Haematoxylin and eosin staining, use of control sections in tissue staining, mounting and mounting media, advantages & disadvantages, refractive index



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### **BML-592 HISTOPATHOLOGY AND CYTOPATHOLOGY TECHNIQUES (LAB) 3HOURS/WEEK**

1. Demonstration of glass wares and equipment used in histopathologylab.
2. To prepare alcohol of differentconcentration.
3. To prepare formalin from stocksolution.
4. To sharp knife by honing andstropping.
5. Grossing oftissue
6. To perform tissue processing by manualmethod.
7. To perform section cutting of paraffin embeddedtissue.
8. To fix the smear on glassslide.
9. To perform hematoxylin and eosinstaining.
10. Preparation of various cytologicalfixatives
11. Preparation of various stains used incytology
12. Preparation ofsmear
13. To perform PAPstaining
14. To perform Giemsa staining on fluidsampl
15. To prepare cellsuspension
16. Processing of various fluidsamples

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## [Syllabus for Bachelor of Medical Laboratory Technology (BMLT) Course]

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### **BML-503 HISTOTECHNOLOGY (THEORY)**

**45HOURS**

#### **Unit-I**

Cell: basic structure and function, cell organelles, cell cycle, Benign and Malignant tumors, Instruments used in cytology, preparation of buffers, stains, Microscopy: Light, compound, phase contrast, fluorescence

#### **Unit-II**

Introduction of histopathology, cytology & histotechniques, laboratory organization, care & maintenance of equipments used in histotechnology lab, Safety measures in histotechnology lab Reception, Recording, Labelling and transportation of tissue specimens, Basic concepts of fixation and various types of fixative used in histopathology and cytopathology

#### **Unit-III**

Tissue and its types, Location and function, Grossing of tissues, whole mount, sections, smears, tissue processing and its steps, manual and automated method, components & principle of automatic tissue processor. Decalcification, decalcification methods, types of decalcifying fluid, Processing of bones and teeth, Embedding media, its type and properties

#### **Unit-IV**

Instruments and equipments used in cytology Fixation and Fixatives used in cytology, Adhesive and mounting media, Cell block and cytospin technique, Staining such as PAP, Diff-quick, MGG, H&E, Shorr staining, significance of PAP-HPV, Destaining and restaining of slides, Cover slipping

#### **Unit-V**

Aspiration and exfoliative cytology, Patient preparation, Sample collection, Fixation, Processing and Staining FNAC, collection, processing of sample and staining, on site quick staining procedure

#### **Unit-VI**

Pap staining, Progressive & Regressive, Hormonal cytology in different age groups, Collection and processing of sputum, BAL, CSF, Pleural, peritoneal and pericardial fluid, Gynaecologic sample

#### **Unit-VII**

Sex chromatin demonstration, Introduction of Immunocytochemistry, different markers and its applications, Automation in cytology, Liquid based preparation & automated screening device

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### **BML-504 CLINICAL ENZYMOLOGY & AUTOMATION (THEORY) 45HOURS**

#### **Unit-I**

Introduction to enzymes, Classification of Enzymes, Isoenzymes, Concept of lock and key and induced fit theory, concept of activation energy and binding energy. Factors affecting enzyme activity

#### **Unit-II**

Coenzyme: Classification, various types and function, structure of NAD<sup>+</sup>, NADP<sup>+</sup>, FAD and FMN, PPP. Units for measuring enzyme activity, factors affecting enzyme level in serum/plasma. Clinical assay & its type, kinetic assay and end point assay for the enzymes

#### **Unit-III**

Enzyme kinetics, the Michaelis-Menten equation and its physiological significances, Enzyme Inhibition, types of inhibitors of enzyme

#### **Unit-IV**

Isoenzymes, their tissue distribution and clinical significance: ALT, AST, ALP, GGT, CPK, CK-MB, LDH, Troponin, Myoglobin, Amylase, Lipase, ACP

#### **Unit-V**

Basic Concepts of Automation, principle, working and maintenance of various clinical chemistry analyzers, point of care testing, Hospital Laboratory Management

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### **SEMESTER VI**

#### **BML-602: ESSENTIALS OF MEDICAL PHARMACOLOGY(THEORY) 45HOURS**

##### **Unit-I**

Hormones, Classification of hormones, organs of endocrine system their secretion and function, regulation of hormone secretion, Mechanism of action

##### **Unit-II**

Thyroid function test: Thyroid hormones, biological function, hypothyroidism, hyperthyroidism, Determination of T<sub>3</sub>, T<sub>4</sub>, TSH, FT<sub>3</sub>, FT<sub>4</sub>, TBG, Disorder associated with thyroid dysfunction.

##### **Unit-III**

Infertility profile: LH, FSH, TSH, Estrogen, Progesterone, Total Testosterone, Free testosterone, DHEA-S, 17-Ketosteroids, Prolactin, their estimation and clinical significance, reference range, hypo and hyper secretion, Triple Test

##### **Unit-IV**

Growth hormone, ACTH, Aldosterone, Cortisol their estimation and clinical significance, reference range, hypo and hyper secretion

##### **Unit-V**

Introduction of Toxicology, Alcohol poisoning, Lead poisoning, Zinc poisoning, Mercury poisoning drugs abuse, screening procedure for drug screening, Spot tests, hair and urine test, Immunoassay for drugs.

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### **BML-603: BIOMEDICAL TECHNIQUES, LAB MANAGEMENT AND ETHICS(THEORY)**

**45HOURS**

#### **Unit-I**

Chromatography, its principle, types and applications. Paper Chromatography, Thin layer chromatography, HPLC, Gas liquid chromatography, Ion exchange chromatography and their application in diagnosis.

#### **Unit-II**

Basic Principle of electrophoresis, Paper electrophoresis, Gel electrophoresis, PAGE, SDS-PAGE, Agarose gel electrophoresis, buffer systems in electrophoresis. Electrophoresis of proteins and nucleic acids, haemoglobin, immunoglobulin's, isoenzymes Applications of electrophoresis in clinical diagnosis.

#### **Unit-III**

Centrifugation, fixed angle and swinging bucket rotors, RCF and sedimentation coefficient, differential centrifugation, density gradient centrifugation and Ultracentrifugation.

#### **Unit-IV**

Radioisotopes, Radioactivity, instruments for radioactivity measurement, applications of radioisotopes in clinical biochemistry

#### **Unit-V**

Immunoassay: ELISA, RIA, FIA, FACS and their applications in clinical diagnosis.

#### **Unit-VI**

Ethical Principles and standards for a clinical laboratory professional duty to the patient, duty to colleagues and other professionals, Good Laboratory Practice (GLP), Introduction to Basics of GLP and Accreditation, Aims of GLP and Accreditation, Advantages of Accreditation, Brief knowledge about National and International Agencies for clinical laboratory accreditation

#### **Unit-VII**

Awareness/Safety in a clinical laboratory, General safety precautions. HIV: pre- and post-exposure guidelines, Hepatitis B & C: pre- and post- exposure guidelines, Drug Resistant Tuberculosis. Patient management for clinical samples collection, transportation and preservation, Sample accountability, Purpose of accountability, Methods of accountability

#### **Unit-VIII**

Sample analysis: Introduction, factors affecting sample analysis, reporting results, basic format of a test report, reported reference range, clinical alerts, abnormal results, results from referral laboratories, release of examination results, alteration in reports

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### **Unit-IX**

Quality Management system: Introduction, Quality assurance, Quality control system, Internal and External quality control, quality control chart, Biomedical Introduction and importance of calibration and Validation of Clinical Laboratory instrument, Ethics in Medical Laboratory Practice, Ethics in relation to Pre-Examination procedures, Examination procedures, reporting of results, preserving medical records, Procurement of equipment and Inventory Control,

### **Unit-X**

Audit in a Medical Laboratory, Introduction and Importance, NABL & CAP, Responsibility, Planning, Horizontal, Vertical and Test audit, Frequency of audit, Documentation

**BML- 601 DIAGNOSTIC MOLECULAR BIOLOGY(THEORY)**

**45HOURS**

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### **Unit I**

Basic transcription apparatus, Initiation, elongation and termination of transcription, Eukaryotic Transcription of mRNA, tRNA and rRNA, types of RNA polymerases, transcription factors Introduction of translation

### **Unit-II**

Nucleic acid amplification testing, PCR, Principle, Types, applications, Thermal cycler, RT-PCR, reverse transcriptase PCR, Nested PCR

### **Unit-III**

Blotting techniques, southern blotting and Western blotting  
Introduction to chromosomes, its structure and disorder, Karyotyping, Chromosomal studies in hematological disorders (PBL and Bone marrow), FISH

### **Unit-IV**

Radioisotopes and its application in measurement of blood volume, determination of red cell volume and plasma volume, red cell lifespan, platelet lifespan, radiation hazards and its prevention disposal of radioactive material  
Introduction and applications of Flow cytometry, Stem cell banking, Prenatal Diagnosis

### **Unit-V**

Nucleic Acids, DNA, RNA, composition, structure, types, denaturation and renaturation of DNA, chemistry of DNA synthesis, general principles of replication, enzyme involved in DNA replication  
– DNA polymerases, DNA ligase, primase, telomerase and other accessory proteins.

## **BML691 -DIAGNOSTIC MOLECULAR BIOLOGY(LAB) 3HOURS/WEEK**

1. Isolation of DNA
2. Separation of DNA by Agarose gel electrophoresis
3. Demonstration of thermal cycler and PCR.
4. HIV test by Western Blotting
5. To perform karyotyping
6. Demonstration of PCR HLAB-27
7. Demonstration of PCR HIV
8. Demonstration of PCR MTB

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### **BML-692 : HOSPITAL INTERNSHIP AND PROJECT**

Students shall be deputed to various labs of Pathology department wherein they shall undergo practical training of handling patients, collection and processing of blood, urine, sputum stool and body fluids samples.

Identification of patient's particulars based on CR number, Lab Number and transfer of samples from collection centres to different labs. Process of performing various tests in different labs. Each student is required to maintain a logbook of the various posting.

Student's performance shall be evaluated on continuous basis by the faculty posted in various sections. The faculty shall submit the assessment records of each student posted in his/her section on monthly basis to the HOD. Marks will be awarded out of 100.