

**UNIVERSITY POLYTECHNIC  
BIT, MESRA**

# **SYLLABUS**

## **SEMESTER-III**

### **BMLT**

**(w.e.f 2018 batch)**

**UNIVERSITY POLYTECHNIC  
BIT, MESRA**

**Course Structure**

**BMLT**

**w.e.f 2018 Batch**

<b>Third Semester</b>					
<b>Course No</b>	<b>Subject</b>	<b>Theory</b>	<b>Tutorial</b>	<b>Lab.</b>	<b>Credit</b>
BMT 3101	Clinical Chemistry – II	3	01	0	4
BMT 3103	Biomedical Instrumentations	2	01	0	3
BMT 3105	Digital Electronics System	2	01	0	3
BMT 3107	Medical Microbiology	3	01	0	4
BMT 3109	Instrumentation & Measurement System	2	01	0	3
BMT 3011	Environmental Science	2	0	0	Non-Credit
BMT 3102	Clinical Chemistry Lab.-I	0	0	3	1.5
BMT 3104	Instrumentation Lab.	0	0	3	1.5
BMT 3106	Digital Electronics Lab	0	0	3	1.5
BMT 3108	Microbiology Lab.-I	0	0	3	1.5
BGA 3002/3004/3006/3008	PT & Games/NSS/NCC/CA	0	0	2	1
	<b>Periods per week</b>	14	5	14	
	<b>Total Credit</b>	-	-	-	24
	<b>Total periods per week</b>	-	-	-	<b>33</b>

# UNIVERSITY POLYTECHNIC BIT, MESRA

## BMLT (Semester III)

### BMT 3101CLINICAL CHEMISTRY-II

#### **OBJECTIVE:**

1. Students will understand the effect of starvation on carbohydrate, protein and lipid metabolism.
2. Students will be able to understand the biochemical functions and metabolism of inorganic constituents.
3. To get knowledge of biochemical aspect of diet, role of vitamins and co-enzymes.
4. To make students able to understand the chemistry and functions of various hormones.
5. Students will have knowledge of measurement of radioactivity, applications of Radioisotopes, hazardous effects of radioisotopes, radiation safety and protection.

#### **Module-I: Starvation and Body Metabolism**

Adaptation of Carbohydrate Metabolism under Starvation

Adaptation of Protein Metabolism under Starvation

Adaptation of Lipid Metabolism under Starvation

Changes in Water and Electrolytes, Organ Interrelationship during Starvation

#### **Module-II: Metabolism of some Inorganic Constituents and water**

Sodium, Potassium and Chlorine, Calcium, Phosphorous, Iron, Magnesium, Iodine, Sulphur, Copper, Zinc, Manganese, Cobalt, Molybdenum, Fluorine, Water balance

#### **Module-III: Energy Metabolism**

General Biochemical Aspects of Diet, Classification of Vitamins, Biochemical Functions & Metabolism of Vitamins, Significance Various Coenzymes of different vitamins

#### **Module-IV: Chemistry and Functions of Hormones**

Pituitary hormones, Thyroid and parathyroid hormones, Pancreatic hormones, Adrenal hormones, Gonadal hormones.

#### **Module-V: Radioisotopes**

Definition of Radioactive Isotopes, Tracer Technique, Detection and Measurement of Radioactivity, Applications of Radioisotopes, Hazardous effects of Radioisotopes, Radiation safety and Protection.

#### **References:**

1. A.K. Murroy, D.K. Granner, P.A. Mayers and V.W. Rodwell, "Harper's Review in Biochemistry", Prentice Hall of India Ltd. New Delhi.
2. R.W. Tietz (Ed.), "Fundamental of Clinical Chemistry" W.B. Saunders Co., Philadelphia USA.
3. R.J. Henry, D.C. Cannon, J.W. Winkelman, "Clinical Chemistry (Principles and Techniques)": Harper & Row Publishers.
4. Agarwal, "Text Book of Biochemistry", Goel Publishing House.
5. R.L. Nath, "A Text Book of Medicinal Biochemistry", New Age International Publishers.
6. Jayaraman: "Laboratory Manual in Biochemistry," Wiley Eastern Ltd., New Delhi.
7. Satyanarayan: "Biochemistry," Book & Allied (P) Ltd.
8. Singh: "Practical manual of Biochemistry," 4<sup>th</sup> ed., CBS Publishers & Distributors.

**UNIVERSITY POLYTECHNIC  
BIT, MESRA  
BMLT (Semester III)**

**BMT 3103 BIOMEDICAL INSTRUMENTATION**

**OBJECTIVE:**

1. To impart knowledge for interdisciplinary and applied technology.
2. With respect to design consideration, to understand the standard structure of biomedical instrumentation systems.
3. To understand the aspect of applications of different devices.
4. To learn the technicality associated with instrumentation and design of basic biosignal and imaging equipment.
5. To understand the aspects for safety and hazards associated with biomedical instruments.

**Module-I:**

**Introduction to Biomedical Instrumentation**

Types of Measurements, Factors in Making Measurement, Problem in Measuring a Living System, Safety and Management of Biomedical Equipment.

**Module-II:**

**Bio-Signal Equipment**

Electrocardiography, Electromyography, Electroencephalography, Electrooculography, Holter Recorder, Stress Test and Phonocardiography

**Module-III:**

**Physiological Assist Devices**

Pacemakers, Defibrillators, Anesthesia Machine, Mechanical Ventilator, Heart Lung Machine, Nerve and Muscle Simulator, Beside Monitor, Spirometer, Pulse Oximeter, Blood Pressure Measurement.

**Module-IV:**

**Pathological / Laboratory Equipment**

Principle and Operation of Cell Counters and Biochemical Analyzers, Colorimeter, Spectrophotometer, Spectrofluorometer, pH meter, Elisa reader, Glucometers.

**Module-V:**

**Biomedical Imaging devices**

Principle and Operation of X-ray Machine. CT-Scan Machine, Ultrasound Machine, MRI, Gamma Camera, SPECT, PET and Endoscope.

**References:**

1. J.J. Karr & J.M. Brown, "Introduction to Biomedical Technology", Prentice Hall
2. R. S. Khandpur, "Handbook of Biomedical Instrumentation", Tata McGraw-Hill
3. L. Crownwell, "Biomedical Instrumentation and Measurement", Prentice-Hall
4. M. Arumugham, "Biomedical Instrumentation", Anuradha Publications.

**UNIVERSITY POLYTECHNIC  
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BMLT (Semester III)**

**BMT 3105 DIGITAL ELECTRONICS SYSTEM**

**OBJECTIVE:** The students will be able to:

1. Know the fundamental principles of Digital circuits
2. Familiar with available IC chips.
3. Understand number systems, logic gates, flip-flops, registers and counters.
4. Simplify logic functions.
5. Identify and differentiate between various types of memories.
6. Describe working of multivibrators and simple linear wave shaping techniques.

**Module-I: Boolean algebra and logic gates**

Features of logic algebra, postulates of Boolean algebra, Theorems of Boolean algebra. Boolean function. Derived logic gates: Exclusive-OR, NAND, NOR gates, their block diagrams and truth tables. Logic diagrams from Boolean expressions and vice-versa, Converting logic diagrams to universal logic. Positive, Negative and mixed logic, Logic gate conversion.

**Module-II: Logic gates and families**

TTL logic gate characteristics. TTL subfamilies. MOS & CMOS logic families, Realization of logic gates in RTL, DTL, ECL, C-MOS & MOSFET, Interfacing logic families to one another.

**Module-III: Minimization techniques**

Minterm, Maxterm, Karnaugh Map, Kmap upto 4 variables, Simplification of logic functions with K-map, conversion of truth tables in POS and SOP form.

**Module-IV: Combinational systems**

Combinational logic circuit design, half and full adder, subtractor. Binary serial and parallel adders. BCD adder. Binary multiplier.

Binary to Gray decoder, BCD to decimal, BCD to 7-segment decoder. Multiplexer, Demultiplexer, Encoder. Octal to binary, BCD to excess-3 encoder.

Diode switching matrix. Design of logic circuits by multiplexers, encoders, decoders and demultiplexers.

**Module-V: Sequential systems**

Latches, Flip-flops, R-S, D, J-K, Master Slave flip flops. Conversions of flip-flops, Counters: Synchronous & Asynchronous ripple and decade counters, Modulus counter, Skipping state counter, Counter design, State diagrams and state reduction techniques, Ring counter, Counter applications, Registers: Buffer register, Shift register.

**References:**

1. M. Morris Mano, "Digital Design", 4th Edition, Prentice Hall of India Pvt. Ltd., 2008.
2. John.M Yarbrough, "Digital Logic Applications and Design", Thomson Learning, 2006.
3. Donald P. Leach and Albert Paul Malvino, "Digital Principles and Applications", 6th Edition, TMH, 2006.
4. Thomas L. Floyd, "Digital Fundamentals", 10th Edition, Pearson Education Inc, 2011
5. Donald D. Givone, "Digital Principles and Design", TMH, 2003.

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BMLT (Semester III)**

**BMT 3107 MEDICAL MICROBIOLOGY**

**OBJECTIVE:**

1. Students will be able to explain the general and specific structure of microorganism
2. The course will provide basic understanding of various types of cells and organisms.
3. Students will be able to understand how to grow and control microorganisms.
4. The course will provide the conceptual basis for understanding pathogenic microorganism and particularly address the fundamental mechanisms of their pathogenicity.
5. Student will be able to explain to prevent infectious diseases including infection control measures.

**Module-I: Introduction to microbiology**

History, role of microbiology in health and diseases, Difference between Eucaryotic and prokaryotic cells. Classification of microorganisms: Three kingdom, five Kingdom, three domain system, Numerical taxonomy, Autotrophic and heterotrophic classification, Different types of bacteria including cyanobacteria, Gram positive and Gram Negative bacteria, Archeobacteria, actinomycetes and rickettsia.

**Module-II: Cultivation, staining & control of micro-organisms**

Culture media and its different types, principles of different types of staining, including gram staining and acid fast staining, Anaerobic cultivation, isolation and inoculation, separation of pure cultures from mixed cultures. Principles and methods of sterilization, Physical, Chemical and Mechanical methods of sterilization, uses and mode of action of various disinfectants and antiseptics.

**Module-III: Structure & physiology of bacterial cell**

Bacterial cell structure including cell wall, plasma membrane, capsule, flagella, fimbriae, pilli, endospores, mesosome, ribosome, nucleoid, plasmid and transposable elements. Nutrition in bacteria, methods of uptake of nutrients by the cell, growth factors, factors affecting growth, growth curve, and mathematics of growth

**Module-IV: Human pathogenic bacteria and lab diagnosis**

Definition of diseases: Epidemic, Endemic, Pandemic. Bacterial infections including Tuberculosis, Diphtheria, Meningitis, Whooping cough, Pneumonia, Enteric fever, cholera, leprosy, syphilis, Urinary tract infections, Gonorrhoea etc.

**Module-V: Human pathogenic fungi and lab diagnosis**

Introduction of fungi, symbiotic relationship and classification, fungal infections including Superficial dermatophyte fungal infections, Candidiasis, Pulmonary infections, Eye and ear fungal infections. Definition and types of Nosocomial infections.

**References:**

1. Harley, Klein and Prescott, textbook of microbiology, Tata McGraw Hill
2. Pelczar, Chan & Kreig, Microbiology, Tata McGraw Hill.
3. Salle AJ, "Fundamentals of Principles of Bacteriology", Tata McGraw Hill.
4. Purohit, Microbiology, Agrobios India.
5. Dubey & Maheshwari, "Textbook of Microbiology", S.Chand

**BMLT (Semester III)**

**UNIVERSITY POLYTECHNIC  
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BMT 3109 INSTRUMENTATION AND MEASUREMENT SYSTEM**

**OBJECTIVES:** Students will be able to:

1. Know the basics of Measurement and Measurement systems
2. Understand the principles and operation of digital instruments
3. Understand the principles and operation of sensor and switches
4. Selecting the appropriate instrument for measurement
5. Know about the CRO, display devices, plotters and printers
6. Understand the principles and operation of actuators, data acquisition system, Data Loggers and PLC

**Module-I: Measurement**

Methods of Measurement, Elements of a generalized Measurement system, Applications of Measurement system, Classification of Instruments, Performance characteristics: static and dynamic, Standard and their classification, Error and types of error

**Module-II: Digital Instruments:**

Introduction, D/A Conversion, A/D Conversion, Digital Voltmeters: Ramp Technique, Dual slope integrating type DVM, Integrating type DVM, Successive Approximation type DVM, Digital Multimeter, Frequency counter

**Module-III: Sensors**

classification of Sensors, Smart sensor, Ultrasonic sensors, Sonar, Ultrasonic flow meters, Biosensors, Biomedical sensors, Proximity switches, Photoelectric switches, Limit switches, Level Switches, Flow Switches, Temperature and flow switches

**Module-IV: Cathode Ray Oscilloscope:**

CRT, Block diagram of CRO, Voltage and Frequency Measurement using CRO, Introduction to storage CRO. Display Devices: LED, LCD, X-Y Plotters, Printer: Inkjet Printers, Inkjet Technologies, Laser Printers, Laser Printer Technologies

**Module-V: Actuators:**

Pneumatic actuator, Hydraulic actuator, Electric Actuators, Single Channel data acquisition system, Data Loggers, Programmable Controllers, Programmable Logic Controller (PLC), PLC Programming, Ladder Diagram, PLC communications and Networking, PLC selection, PLC installation, Advantages of using PLCs

**References:**

1. A.K. Sawhney, "A course in Electrical and Electronic Measurements and Instruments", Dhanpat Rai & Co. Publication
2. H.S. Kalsi "Electronic Instrumentation", TMH
3. Curtis D. Johnson, "Process Control Instrumentation Technology", Prentice Hall
4. D.V.S Murty, "Transducers and Instrumentation", PHI
5. Ron Gilster, "PC Hardware" TMH
6. S K Singh, "Industrial Instrumentation and control", TMH
7. Stamatiou Manesis, George Nikolakopoulos, "Introduction to industrial automation", CRC Press

**UNIVERSITY POLYTECHNIC  
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BMLT (Semester III)**

**BMT 3011 ENVIRONMENTAL SCIENCE**

**OBJECTIVE:**The main aim of Environmental Science is to make the students acquainted with various types of pollution hazards, which are becoming more critical every day and also acquire the knowledge to participate in solving environmental problems for green earth.

Students will be able to understand:

1. Importance of Environmental Science as well as biogeochemical cycles and food chain
2. Composition and function of various segments of environment
3. Water pollution, various pollutants, their toxic effects and water treatment process
4. Classification, toxic effects and sources of air pollutants and their control measures
5. Brief introduction to Noise Pollution, Soil Pollution and radiation pollution

**Module-I:**

**Multidisciplinary nature of Environmental Science & Ecology**

Definition & importance of Environmental Science.

Ecosystem, basic structure of an ecosystem (abiotic and biotic components), nutrient and biogeochemical cycles (carbon cycle, nitrogen cycle, and hydrological cycle), food chain, food web.

**Module-II:**

**Segments of environment**

Atmosphere, hydrosphere, lithosphere, soil profile and composition of soil, biosphere.

**Module III**

**Water Pollution & Waste water treatment**

Water resources, sources of water pollution, various pollutants, their toxic effect, potability of water, rain water harvesting, primary and secondary waste water treatment (Trickling filter & Activated sludge process).

**Module IV**

**Air Pollution**

Classification of air pollutants, toxic effects, sources and their control measures like ESP, catalytic converter and bag house filter.

**Module V:**

A brief introduction to Noise Pollution, Soil Pollution and radiation pollution.

**References:**

1. A.K Dey, "Environmental Chemistry", New Age International
2. Deswal & Deswal, "A basic course in Environmental studies, Dhanpat Rai & Co"
3. B. K. Sharma, "Environmental pollution", Krishna Prakashan Media (P) Ltd.
4. C.S.Rao, "Environmental pollution and control", New Age International
5. S.V.S. Rana, "Essentials of ecology & environmental Sciences", Goel Publishing, New Delhi.



# **UNIVERSITY POLYTECHNIC BIT, MESRA**

**BMLT (Semester III)**

**BMT3102 CLINICAL CHEMISTRYLAB I**

## **List of Experiments**

1. To determine the Titrable acidity of Urine.
2. To determine Glucose content in Urine.
3. To determine Calcium content in Urine.
4. To determine Chloride content in Urine.
5. To determine Creatinine content in Urine.
6. To determine Glucose in Blood.
7. To determine Cholesterol in Blood.
8. To determine Calcium content in Blood.
9. To determine Urea content in Blood.
10. To determine Uric acid in Blood.
11. Estimation of Protein by Lowrys method.
12. Estimation of Serum Albumin

## **References:**

1. Plummer D.T , "Introduction to Practical Biochemistry" TATA Mc Graw Hill Publishing House
2. E.J Silva & Maryne, "Clinical Chemistry in Diagnosis & Treatment"
3. B. Raghu, "Practical Biochemistry for Medical Students"
4. G. Rajagopal & BD Toora, "Practical Biochemistry"
5. U. Satyanaryana, "A Book of Clinical Chemistry".

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BMLT (Semester III)**

**BMT3104INSTRUMENTATIONLAB**

**List of Experiments**

1. Study of DSO
2. Study of Function Generator
3. Measurement of Voltage and Frequency using CRO
4. Measurement of R, L and C using LCRQ meter
5. Measurement of resistance using Wheatstone Bridge
6. Measurement of low value resistance using Kelvin Bridge
7. To determine characteristics of Photovoltaic cell
8. To determine characteristics of Photoconductive cell
9. To determine characteristics of IC temperature sensor
10. To determine characteristics of Platinum RTD
11. Measurement of Capacitance using Wien's Bridge
12. Measurement of Inductance using Maxwell's Bridge
13. Measurement of displacement using LVDT
14. Measurement of weight using Strain gauge trainer
15. To determine characteristics of PIN Photodiode
16. To determine characteristics of Phototransistor
17. To determine characteristics of Platinum RTD
18. To determine characteristics of NTC Thermistor
19. To determine characteristics of K type Thermocouple

**UNIVERSITY POLYTECHNIC  
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BMLT (Semester III)**

**BMT 3106 DIGITALELECTRONICS LAB.**

**List of Experiments**

1. Verification of basic Logic gates
2. Verification of Universal logic gates and realization of basic gates
3. Design and implementation of code converters using logic gates  
(i) BCD to excess-3 code and vice versa (ii) Binary to gray and vice-versa
4. Prove DE – Morgan’s 1st theorem.
5. Prove DE – Morgan’s 2nd theorem.
6. Design and realization of S.R. flip-flop using IC 7400.
7. Design and realization of J.K. flip-flop using IC 7400.
8. Design and realization of a 4-bit magnitude comparator using IC 7485.
9. Design and realization of a parity bit checker using IC 7486.
10. Design and realization of parity bit generator using IC 7486.
11. Design and implementation of 4 bit binary Adder/ Subtractor and BCD adder using IC 7483
12. Design and implementation of Multiplexer and De-multiplexer using logic gates
13. Design and implementation of encoder and decoder using logic gates
14. Construction and verification of 4 bit ripple counter and Mod-10 / Mod-12 Ripple counters
15. Design and implementation of 3-bit synchronous up/down counter
16. Implementation of SISO, SIPO, PISO and PIPO shift registers using Flip- flops.

**UNIVERSITY POLYTECHNIC  
BIT, MESRA  
BMLT (Semester III)**

**BMT 3108MICROBIOLOGY LAB-I**

**OBJECTIVE:**

- To demonstrate basic microbiology laboratory techniques that will allow students to investigate the structure and physiology of microorganism

**List of Experiments**

1. Introduction to the use of laboratory instruments and safety precautions.
2. Physical agents of control by moist heat and dry heat.
3. Mechanical agents of control UV radiation.
4. To prepare basic liquid media (broth) for routine cultivation of bacteria.
5. Preparation of basic solid media, Agar slants and Agar deep tubes for routine cultivation of microorganism.
6. To obtain pure culture of bacteria by streak plate method.
7. To obtain pureculture of bacteria by spread plate method.
8. To obtain pure culture of bacteria by pour plate method.
9. To obtain pure culture of microorganism by subculturing techniques.
10. Preparation of bacterial smears.
11. To perform gram staining of bacteria.
12. Counting bacterial colonies by coulter colony counter.

**References:**

1. Mackie and McCartney, "Practical medical microbiology", Elsevier publication.
2. P. Gunasekaran, "Laboratory manual in microbiology", New age publication
3. K.R. Aneja, "Experiments in microbiology and Biotechnology", New age publication.

**UNIVERSITY POLYTECHNIC  
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**SYLLABUS**

**SEMESTER-IV**

**BMLT**

**UNIVERSITY POLYTECHNIC  
BIT, MESRA**

**Course Structure  
BMLT**

**w.e.f 2018 Batch**

<b>Fourth Semester</b>					
<b>Course No</b>	<b>Subject</b>	<b>Theory</b>	<b>Tutorial</b>	<b>Lab.</b>	<b>Credit</b>
BMT 4101	Applied Microbiology	3	1	0	4
BMT 4103	Hematology – II	3	1	0	4
BMT 4105	Histopathology	3	1	0	4
	<b>Elective I</b>	3	1	0	4
	<b>Elective II</b>	3	1	0	4
BMT 4102	Microbiology Lab.-II	0	0	3	1.5
BMT 4104	Hematology Lab.-II	0	0	3	1.5
BMT 4106	Histopathology Lab I	0	0	3	1.5
	<b>Elective Lab</b>	0	0	3	1.5
	<b>List of Elective</b>				
BMT 4107	Parasitology & Cytology (Group I)	3	1	0	4
BMT 4109	Immunopathology (Group I)	3	1	0	4
BMT 4108	Parasitology Lab (Group I)	0	0	3	1.5
BMT 4111	Bio-signal acquisition System (Group II)	3	1	0	4
BMT 4015	Introduction to Microprocessors and Microcontrollers (Group II)	3	1	0	4
BMT 4016	Microprocessor and Microcontrollers Lab (Group II)	0	0	3	1.5
	<b>Periods per week</b>	15	5	12	-
	<b>Total Credit</b>	-	-	-	26
	<b>Total periods per week</b>	-	-	-	32

**UNIVERSITY POLYTECHNIC  
BIT, MESRA  
BMLT (Semester IV)**

**BMT 4101 APPLIED MICROBIOLOGY**

**OBJECTIVES:**

1. Applied microbiology is a scientific discipline that deals with the application of microorganisms and the knowledge about them.
2. Students will be able to distinguish between control and preventive measures
3. Students will be able to understand microbiology of surrounding including air, water and food
4. This course will provide the understanding how the microorganisms are connected to us in everyday activity.
5. Students will be able to apply applications of microbes at industrial level.

**Module-I: Chemotherapeutic agents and vaccines**

Chemotherapeutic and prophylactic agents, Antibiotics, general characteristics, mode of action of various antibiotics including Penicillin, Ampicillin, Cephalosporin, Bacitracin, Vancomycin, Streptomycin. Vaccines and their different types including killed and live attenuated vaccines, Antifungal & antiviral drugs

**Module-II: Microbiology of air and food**

Introduction, microorganisms found in air, methods of purification and testing of laboratory air. Microbiology of food: Microorganism found in food, primary sources of food poisoning, mycotoxins in food stuffs and various preventive measures.

**Module-III: Microbiology of water**

Biological characteristics of water, BOD and COD, microorganisms found in water, microbiology of sewage, Sewage and its treatment including primary, secondary and tertiary treatment, disinfection of water.

**Module-IV: Microbiology in Fermentation Technology**

General methods of production of alcohols, organic acids, antibiotics with reference to ethanol, citric acid, acetic acid, penicillin, streptomycin and tetracycline. Preservation of industrial microbes and lyophilization.

**Module-V: Algae and protozoa**

Morphology and cultivation, cell structure, different classes of algae and protozoa. Introduction of parasites. Control measures and Testing of disinfectant, principle and methods of Rideal Walker test and Chick-martin test

**References:**

1. Hugo & Russell, "Pharmaceutical Microbiology", Wiley Blackwell Publication.
2. Stansbury PF & Whitaker A., "Principles of Fermentation Technology", Elsevier.
3. Pelczar, Chan & Kreig, "Microbiology" Tata McGraw Hill.
4. Dubey & Maheshwari, Textbook of Microbiology, S.Chand.
5. Prescott, Harley & Klein textbook of microbiology. McGraw Hill Education

**UNIVERSITY POLYTECHNIC  
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BMLT (Semester IV)**

**BMT 4103 HEMATOLOGY II**

**OBJECTIVE:**

1. Students will be able to prepare and stain bone marrow smears.
2. To be conversant with synthesis and degradation of hemoglobin.
3. To be proficient with abnormal hemoglobin and their identification.
4. Students will be able to prepare and stain blood film.
5. Students will get acquainted with mechanism of hemostasis.

**Module-I:**

**Bone Marrow**

Bone Marrow aspiration, composition and function, Staining of bone marrow smears and preparation of histopathological sections.

**Module-II:**

**Hemoglobin**

Synthesis, composition, function and degradation of hemoglobin.

**Module-III:**

**Abnormal Hemoglobin**

Various forms of hemoglobin, Abnormal hemoglobin, Methods of identification of hemoglobin.

**Module-IV:**

**Cytochemical staining procedures**

Cytochemical staining procedures in various hemopoietic disorders, Types of blood film, Parts of blood film, Qualities of good blood film, Methods of preparations of blood film, Precautions in preparation of blood film, Various stains used and their method of preparation

**Module-V:**

**Haemostatis**

Hemostatic mechanism, theories of blood coagulation, physicochemical properties of coagulation factors, screening coagulation process, quantitative assay of coagulation factors.

**References:**

1. Baker et al: An introduction to medical laboratory technology, Elsevier.
2. Charles F. Seiverd: Hematology for medical technologists, Lea & Febiger
3. Arthur Simmons: Technical hematology, Lippincott,
4. Thomson J: Blood coagulation and homeostasis, CBS Publisher,



**UNIVERSITY POLYTECHNIC  
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BMLT (Semester IV)**

**BMT 4105 HISTOPATHOLOGY**

**OBJECTIVE:**

The student will be able to:

1. To understand the theoretical prospects of cytology.
2. To know the microscopic examination of tissue in order to study the manifestation of disease.
3. To understand the decalcification and their methods.
4. It also refers to the examination of biopsy or surgical specimen.
5. It is also help to know the useful and accurate diagnosis

**Module-I:**

**Cytology**

Introduction of cell growth, cell injury, cell death, cell adaptations, intracellular accumulations and cell aging, Acute and chronic inflammation, Fibrosis and related term, Wound healing, methods and related aspects.

**Module-II:**

**Histopathology and their techniques**

Introduction to histopathology and their techniques, Tissue preparation and processing including; fixation, dehydration, clearing, embedding, routine & special staining techniques, mounting, microscopy and interpretations.

**Module-III:**

**Application of sectioning in histopathology and their observation**

Applications of microtome and their various types, Introduction and role of cryotomy, Application of microscope and electron microscope for histopathological and other forms of studies.

**Module-IV**

**Decalcification and other process for bone**

Introduction and essentiality of decalcification, Method of decalcification and their advantage and disadvantages.

**Module-V: Biopsy**

Introduction of biopsy, Method of biopsy including their advantages, Application of biopsy or surgical specimen during pathological studies.

**References**

1. Harsh Mohan, "Pathology Practical Book", IInd Edition, Jaypee Brothers Medical Publishers (P) Ltd., 2007.
2. Bancroft and Stevens, "Theory and practice of histological techniques", Churchill Livingstone
3. Cullings, "Cellular Pathology Techniques", Butterworth-Heinemann

**UNIVERSITY POLYTECHNIC  
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BMLT (Semester IV)**

**BMT4102 MICROBIOLOGY LAB II**

**OBJECTIVE:**

To demonstrate essential microbiological techniques and to show students the impact of microbes on our daily life and their central role in nature.

**List of Experiments:**

1. Preparation of pure culture of various gram positive and gram negative bacteria.
2. To differentiate gram positive and gram negative bacteria by differential staining.
3. Isolation of microorganism from various sources like Air, water and soil.
4. Identification of unknown fungus by lacto phenol cotton blue staining methods.
5. Scotch tape preparation for studying morphology of fungi
6. Effect of different PH on microbial growth.
7. Effect of different incubation temperature on microbial growth.
8. Effect of different salt concentration on microbial growth.
9. Effect of dyes on gram positive bacteria.
10. Isolation of microorganism from Rhizosphere and phyllosphere.
11. Evaluation of Alcohol effectiveness as an antiseptic.
12. Evaluation of antiseptic by Filter paper disc method.

**References:**

1. Mackie and McCartney, "Practical medical microbiology", Elsevier publication.
2. P. Gunasekaran, "Laboratory manual in microbiology", New age publication
3. K.R. Aneja, "Experiments in microbiology and Biotechnology", New age publication.

# **UNIVERSITY POLYTECHNIC BIT, MESRA**

## **BMLT (Semester IV)**

### **BMT 4104 HEMATOLOGY LAB II**

#### **List of Experiments**

1. Staining of bone marrow smear and preparation of histopathological sections.
2. Experiments on identification and estimation of abnormal hemoglobin.
3. Quantitative assay of coagulation factors.
4. Various methods of demonstration of LE cell phenomenon.
5. Measurement of hemoglobin pigments by Sahlis method
6. Measurement of hemoglobin pigments by Cyanmethemoglobin method
7. Estimation of prothrombin time
8. Estimation of activated partial thromboplastin (APTT) time
9. Investigations of G6PD deficiency
10. Sickling test
11. Osmotic fragility test
12. Demonstration of hemosiderin urine
13. Blood smear preparation and staining
14. Calculation of red cell indices

#### **References:**

1. Baker et al: An introduction to medical laboratory technology, Elsevier.
2. Charles F. Seiverd: Hematology for medical technologists, Lea & Febiger
3. Arthur Simmons: Technical hematology, Lippincott,
4. Thomson J: Blood coagulation and homeostasis, CBS Publisher,
5. Harsh Mohan, Pathology Practical Book, Jaypee Brothers.

# **UNIVERSITY POLYTECHNIC BIT, MESRA**

## **BMLT (Semester IV)**

### **BMT 4106 HISTOPATHOLOGY LAB- I**

#### **List of Experiments**

1. To study and draw the structure of various Histopathological apparatus.
2. To demonstrate the working principle of various microtome in histopathology laboratories.
3. To demonstrate the method of sacrificing of Wistar rat and specimen accessioning.
4. Demonstration of gross histopathological examination and fixation of given tissue sample.
5. To perform the dehydration of the given tissue sample.
6. To perform the process of clearing on the given tissue sample.
7. To perform the impregnation process of given tissue sample.
8. To perform embedding process of the given tissue sample.
9. To perform the sectioning of given tissues by using microtome.
10. To perform routine staining of the given tissue sample by using hematoxyline & eosin stain.
11. To perform routine staining of the given tissue sample by using Congo red & silver nitrate or other stains.
12. To perform the Microscopical studies by using microscope and LICA

#### **References**

1. Harsh Mohan, "Pathology Practical Book", IInd Edition, Jaypee Brothers Medical Publishers (P) Ltd., 2007.
2. Bancroft and Stevens, "Theory and practice of histological techniques", Churchill Livingstone
3. Cullings, "Cellular Pathology Techniques", Butterworth-Heinemann

# UNIVERSITY POLYTECHNIC BIT, MESRA

## BMLT (Semester IV)

### BMT 4107 PARASITOLOGY AND CYTOLOGY (ELECTIVE)

#### OBJECTIVES:

1. Students will be able to understand pathology and diagnose the diseases on the cellular level.
2. Students will be conversant with the basic knowledge of the parasitic infections of humans.
3. They will learn how parasites gain access to, and survive within their hosts.
4. Students will be able to understand and control parasitic infections.
5. Students will be able to differentiate between normal and abnormal cells.

#### **Module-I:Parasites**

Definition and classification. General characteristics, classification of protozoa of medical importance, different types of protozoa, General properties, different types and classification of Helminthes.

#### **Module-II:Protozoa**

Morphology, life cycle, symptoms, pathogenicity, laboratory diagnosis and treatment of intestinal protozoa: *Entamoeba histolytica*, *Giardia lamblia* and blood and tissue protozoa: *Leishmania*, *Trypanosoma*

#### **Module-III:Malaria**

Identification of different plasmodium species, morphology, life cycle, symptoms, pathogenicity, different types of Schizogony, Lab diagnosis, culture techniques, treatment of malaria, different types of malaria.

#### **Module IV:Nematodes and Cessode**

Disease, morphology, life cycle, symptoms, pathogenicity, lab diagnosis, treatment and culture techniques of various Nematodes including *Ascaris*, *Enterobius*, *Stroglyoids*, *Ancylostoma* and various cessode including different species of *Taenia*, *H. nana.*, *D. latum*, Lab diagnosis of infections like hydatid cysts and cysticercosis.

#### **Module V:Cytology**

Basis of detection of malignant and pre-malignant lesions, different types of cytology: Exfoliative, Fine needle aspiration cytology(FNAC) and imprint cytology, hormonal assessment in cytology techniques.

#### **References:**

1. Dey & Dey: Medical Parasitology, New central book agency.
2. Gold Smith: Tropical medicines and parasitology. Appleton & Lange Publishers.
3. Paniker, Text book of medical parasitology, Jaypee brothers.
4. Harsh Mohan, Textbook of Pathology, Jaypee brothers.

**UNIVERSITY POLYTECHNIC  
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BMLT (Semester IV)**

**BMT 4109 IMMUNOPATHOLOGY (ELECTIVE)**

**OBJECTIVE:** The student will be able to:

1. To provide the theoretical skills in outline the defense mechanism against disease.
2. To provide the knowledge of blood related complications and their aspects.
3. To understand the essentiality of blood transfusion and their complications.
4. To develop the skill to overcome the complications of antenatal care and hemolytic disease.
5. To understand the process of kidney transplantation and chances of their complications.

**Module-I:**

**Immunology:**

Introduction of Immunity, immunization, immune system, vaccine, vaccination and related terms, Hypersensitivity reactions, allergy, infections and their precautions.

Autoimmune disease, prevention and their cure, Immunological disease and their chances of contaminations.

**Module-II:**

**An overview on the theory of blood groups**

Theoretical aspects of blood and their importance, Importance of ABO groups and Rhesus blood grouping systems, Clinical significance of blood group and other types of blood groups.

**Module-III:**

**The method of blood collection and transfusion**

Standard method of blood collections, Blood processing, storage and chances of contaminations, Blood transfusion and various immunological aspects of blood transfusion.

**Module-IV:**

Antenatal care and hemolytic disease of the new born

Guide the women about prenatal and postnatal care and prevention, Essential nutritional supplement need to advice during pregnancy, Chances of complications, precautions and related immunological issues.

**Module-V:**

**Kidney transplant**

Possibilities and chances of complication during kidney transplantations, Best possibility of recipient and donor, role of cross matching, Importance of tissue typing during kidney transplant.

**References:**

1. Reference manuals in immunology and immunopathology Samter's Immunologic disease, 6<sup>th</sup> Edition, 2001.
2. Remingtons Pharmaceutical Sciences, 17<sup>th</sup> Edition.
3. Stainer and Graham, "General Microbiology", Wheelers & Painter.
4. Pharmacopoeia of India: Vol. I & II, IV<sup>th</sup> Edition. 1996, Controls of Publication, Govt. of India.
5. Vyas & Dixit, "Pharmaceutical Biotechnology", 1<sup>st</sup> Edition. CBS Publisher, 1996.
6. Carters. Ed.: "Coopers & Gun's Tutorial Pharmacy", 6<sup>th</sup> Edition. CBS Publisher, 1972.

**UNIVERSITY POLYTECHNIC  
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BMLT (Semester IV)**

**BMT 4108 PARASITOLOGY LAB (ELECTIVE LAB)**

**List of Experiments**

1. Introduction to Laboratory Instruments & Safety precautions.
2. Macroscopic examination of Adult worms, Cysts, Tissues for Routine examination.
3. Saline and Iodine preparations for Protozoal cysts & Trophozoite
4. Concentration procedures for Protozoal cyst & Trophozoite.
5. Concentration procedures of Helminthic Ova & Cysts.
6. Examination, Identification of Ova & Cysts of Medical importance.
7. Processing for preparation of Antigens for Casson's test.
8. Examination & Processing of Cysticercosis cysts.
9. Serological & Immunological tests used in Parasitology.
10. Differentiation of various Mosquitoes, Flies and Worms.
11. Experiments based on Electrophoretic techniques & Gel diffusion.
12. Preparation & Standardization of various parasitic antigens, antisera.

**References :**

1. Mackie & McCartney, "Practical Microbiology"
2. Gunasekharan, "Laboratory Manual of Microbiology"
3. Fleck & Moody, "Diagnostic Techniques of Medical Parasitology"
4. Halls & Sohanz, "Immuno diagnosis of Parasitic diseases"

# UNIVERSITY POLYTECHNIC BIT, MESRA

## BMLT (Semester IV)

### BMT 4111 BIOSIGNAL ACQUISITION SYSTEM (ELECTIVE)

#### **OBJECTIVE:**

1. To impart knowledge on biomedical signal acquisition.
2. To learn the technicality associated with instrumentation and design of basic biosignal recording equipment.
3. To record and analyse the safety and hazards associated with biosignal recording.
4. To record and interpret the characteristics of different biosignals.
5. To troubleshoot the artefacts while recording biosignal.

#### **Module-I:**

##### **Signal and Noises**

Generation of resting and action potential, polarization and depolarization, rhythmicity of cardiac potential, Types of bio-signals and its sources.

#### **Module-II:**

##### **Transducers**

Biomedical Sensors and electrodes, Transducers for biomedical application, Recording problems and its remedy.

#### **Module-III:**

##### **Signal Conditioning**

Different types of biomedical amplifiers and their principles of operation. Application of filters in conditioning of biosignals.

#### **Module-IV:**

##### **Telemetry System**

Radio telemetry system, Portable telemetry system, Land-line telemetry system, ECG and other physiological telemetry system.

#### **Module-V:**

##### **Different types of Biorecorders and Medical Display System**

Types of XY chart recorder and principle of operation, different types of cameras used for image recording systems, functional numerical display, central monitoring console

#### **References:**

1. J.J. Karr & J.M. Brown, "Introduction to Biomedical Technology", Prentice Hall
2. R. S. Khandpur, "Handbook of Biomedical Instrumentation", Tata McGraw-Hill
3. L. Crownwell, "Biomedical Instrumentation and Measurement", Prentice-Hall



**UNIVERSITY POLYTECHNIC**  
**BIT, MESRA**  
**BMLT (Semester IV)**

**BMT 4015 INTRODUCTION TO MICROPROCESSORS AND MICROCONTROLLERS**  
**(ELECTIVE)**

**OBJECTIVE:** The students will be able to:

1. Describe the basic architecture of a microprocessors based system.
2. Develop a minimum system with 8085 microprocessors.
3. Describe architecture and operation of microcontroller 8051.
4. Develop assembly language programs using instruction set of 8051.
5. Explain various applications of microprocessors and microcontrollers.

**Module-I:**

**Introduction:** The 8085 and 8086 architecture, memory, I/O Devices, Logic devices for interfacing, Memory, Interfacing, addressing modes, Instructions, programming techniques.

**8085 and 8086 instructions:** Looping, counting and Indexing, Data Transfer and Arithmetic instructions, Counters and Time Displays, stacks & subroutines, conditional call and return instructions.

**Module-II:**

**Interrupts:** The 8085 and 8086 Interrupt, vectored interrupts, additional I/O concepts and processes, serial I/O & data communication.

**General purpose programming peripheral devices:** 8255 Programmable peripheral interface, Interfacing keyboard and Seven Segment display. The 8254 programmable Interval timer, the 8259 programmable Interrupt controller. 8257 DMA controller.

**Module-III:**

**Introduction to Intel 8051**

Architecture of 8051/8031 Microcontroller, Pin details, I/O Port structure, Memory Organization, Special Function Registers (SFRs), External Memory Instruction Set; Addressing Modes, Instruction types: Timer operation, Serial Port operation, Interrupts.

**Module-IV:**

**Assembly/C programming for Micro controller:** Assembler directives, Assembler operation, Compiler operations, De bugger, Simulator. **Design and Interface:** Examples like: keypad interface, 7- segment interface, LCD, stepper motor. A/D, D/A, RTC interface.

**Module-V:**

Biomedical Applications of Microprocessors and Microcontrollers: Applications in Computed Radiography, Applications in Computed Tomography, Applications in ECG, Applications in EEG, Applications in EMG and Applications in Patient Monitoring Systems.

**References:**

1. Ramesh C Gaonkar, "Microprocessor & Application", Penram International Publishing
2. Yu-Cheng Liu, Glenn A. Gibson, "Microcomputer Systems: The 8086 / 8088 Family - Architecture, Programming and Design", Second Edition, Prentice Hall of India, 2007.
3. Douglas V. Hall, "Microprocessors and Interfacing, Programming and Hardware", TMH, 2012
4. Microprocessor & Microcontroller by B Ram
5. Md. Ali Mazidi, "The 8051 Microcontroller and Embedded Systems", PHI.

**UNIVERSITY POLYTECHNIC  
BIT, MESRA  
BMLT (Semester IV)**

**BMT 4016 MICROPROCESSORS AND MICROCONTROLLERS LAB  
(ELECTIVE LAB)**

**List of experiments**

1. (a) Write an ALP to add two 8-bit numbers; sum being of 8 Bits. (b) Write an ALP to add two 8-bit numbers; sum may be of 16 Bits.
2. Write an ALP to subtract two unsigned numbers, store the result in memory location XX90H. How would you determine the result obtained is straight binary number or 2's complement? Verify with examples.
3. Write an ALP to multiply two 8-bit numbers, product being of 16 bits.
4. Write an ALP to arrange a data array in ascending and descending order.
5. Write an ALP for 2-bit BCD to BINARY conversion and BINARY to BCD conversion.
6. Write an ALP for block transfer of data.
7. Write an ALP for addition of two 16-bit numbers, sum may be of 16 bits or more.
8. Write an ALP to find the largest number in a data array.
9. Six bytes of data are stored in memory locations starting at 2050H. Add all the data bytes. Use register B to save any carries generated, while adding the data bytes. Store the sum at two consecutive memory locations 2070H & 2071H. Write an ALP for the above mentioned problem statement.
10. Register BC contains 2793H, and registers DE contain 3182H. Write an ALP to add these two 16-bit numbers, and place the sum in memory locations 2050H & 2051H.
11. Development and execution of the program for sending data on port lines.
12. Development and execution of the program for arithmetic operation and time delay.
13. Development and execution of the program for input and output operation.
14. Development and execution of the program for interface LEDs to particular port.
15. Development and execution of the program to generate a square wave on port.
16. Development and execution of the program for logical operators and data conversion.

**UNIVERSITY POLYTECHNIC  
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**SYLLABUS**

**SEMESTER-V**

**BMLT**

**UNIVERSITY POLYTECHNIC  
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**Course Structure  
BMLT**

**w.e.f 2018 Batch**

<b>Fifth Semester</b>					
<b>Course No.</b>	<b>Subject</b>	<b>Theory</b>	<b>Tutorial</b>	<b>Lab.</b>	<b>Credit</b>
BMT 5101	Clinical Chemistry –III	3	1	0	4
BMT 5103	Forensic Medicine & Ethics	3	1	0	4
BMT 5105	Material Management	2	1	0	3
	Elective I	3	1	0	4
	Elective II	3	1	0	4
BMT 5102	Clinical Chemistry Lab.-II	0	1	2	2
BMT 5014	Bacteriology & Serology Lab.	0	1	2	2
BMT 5106	Histopathology Lab.-II	0	1	2	2
	Elective Lab	0	1	2	2
	<b>List of Elective</b>				
BMT 5107	Serology & Virology (Group I)	3	1	0	4
BMT 5015	Hematology & Blood Banking (Group I)	3	1	0	4
BMT 5016	Hematology & Blood Banking Lab (Group I)	0	1	2	2
BMT 5111	Clinical Instrumentation (Group II)	3	1	0	4
BMT 5113	Biomedical imaging Devices and Concept (Group II)	3	1		4
BMT 5112	Clinical Instrumentation Lab (Group II)	0	1	2	2
	<b>Periods per week</b>	14	09	08	-
	<b>Total Credit</b>	-	-	-	27
	<b>Total periods per week</b>	-	-	-	<b>31</b>

**UNIVERSITY POLYTECHNIC  
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BMLT (Semester V)**

**BMT 5101 CLINICAL CHEMISTRY-III**

**OBJECTIVE:**

1. Students will understand the mechanism and types of detoxification.
2. To make them conversant with organ function and their tests.
3. Students will get acquainted with the applications of antimetabolites in cancer treatment.
4. To have knowledge of inborn errors of carbohydrate, protein, lipid and nucleic acid metabolism.
5. To be able to understand the biochemistry of HIV, Alzheimer's disease, Parkinson's disease and thalassemias.

**Module-I: Detoxification**

Definition of Detoxification, Types of Detoxification, Mechanisms/Phases in Detoxification  
Enzymes involved in Detoxification.

**Module-II: Functions of organs and their Tests**

Functions of Liver: Tests based on secretory function of liver, Tests based on conjugation function of liver, Tests based on Carbohydrate Metabolic function in liver, Tests based on Lipid Metabolic function in liver, Tests based on Protein Metabolic function in liver, Tests based on Iron Metabolic function in liver.

Renal Function Test: Hormonal regulation of kidney function, Tests on the function of the upper G.I.T., Tests on the function of the lower G.I.T., Thyroid Function Test,

**Module-III: Antimetabolites**

Definition of Antimetabolites, Types of antimetabolites and their mechanism of actions  
Applications of antimetabolites in Cancer Therapy

**Module-IV: Inborn Errors**

Errors in Carbohydrate, Protein, Lipids, Amino acids and Nucleic acid metabolism.  
Errors in Protein metabolism, Errors in Lipids metabolism, Errors in Nucleic acid metabolism.

**Module V: Biochemical aspects of some special diseases**

HIV, Parkinsonism, Alzheimers, Thallasamia etc.

**References:**

1. A.K. Murroy, D.K. Granner, P.A. Mayers and V.W. Rodwel, "Harper's Review in Biochemistry: I": Prentice Hall of India Ltd. New Delhi.
2. R.W. Tietz (Ed.), "Fundamental of Clinical Chemistry" W.B. Saunders Co., Philadelphia USA.
3. R.J. Henry, D.C. Cannon, J.W. Winkelman, "Clinical Chemistry (Principles and Techniques)", Harper & Row Publishers.
4. Agarwal's, "Text Book of Biochemistry", Goel Publishing House.
5. R.L. Nath, "A Text Book of Medicinal Biochemistry", New Age International Publishers.
6. Harrow & Mazur, "Text book of Biochemistry," W.B. Saunders, Philadelphia.
7. Jayaraman: "Laboratory Manual in Biochemistry," Wiley Eastern Ltd., New Delhi.
8. Satyanarayan: "Biochemistry," Book & Allied (P) Ltd., Reprint 2000.
9. Singh: "Practical manual of Biochemistry," 4<sup>th</sup> ed., CBS Publishers & Distributors, 2001.

# UNIVERSITY POLYTECHNIC BIT, MESRA

BMLT (Semester V)

## BMT 5103 FORENSIC MEDICINE AND ETHICS

### OBJECTIVES:

The student will be able to:

1. The application of medical knowledge to investigate the crime, particularly in establishing the cause of injury or death.
2. To understand the basic need and set up of forensic science laboratory.
3. To understand the drug dependence and their cure and managements
4. To know about the poison and their way of preventions
5. To understand the various medico-legal and judicial systems in determining the termination of pregnancy act.

### **Module-I: Legal and Ethical Aspects of Medicine Forensic Medicine and related terms.**

Explain about ethics, Medical ethics, jurisprudence and related terms, Introduction about Civil and criminal cases, Autopsies and their types.

### **Module-II:**

#### **Setup of Forensic Science laboratory and examination of biological fluids, traces evidences and other materials.**

Application and explanation of different sections of forensic science laboratory, For trace examination and others; chromatography, electrophoresis, spectrophotometry etc., Different methods for biological and other types of body fluids.

### **Module-III: Drug dependence, Abuse and their complications.**

Introduction of drug, Drug Abuse, Drug resistance, dependence, tolerance and related terms, List of drug dependent drug and their serious consequences, Sign, symptoms, cure and their prevention of drug dependence

### **Module-IV:**

#### **Food Poison & Poisoning in general by various substances and their complications.**

Introduction of poisoning, food poisoning and their sign, symptoms and prevention, Details of various types of poisoning like; Mushrooms, vegetables, soybeans, bacteria and forms of poisoning substances and their complications, Methods of poisoning control, precaution, prevention and their treatment.

### **Module-V: Medico-legal Aspects of Medical Termination of Pregnancy (MTP Act).**

Objective and historical background of Medical Termination of Pregnancy, Condition on which termination of pregnancy not possible, Where, when and who will terminate pregnancy

### References:

1. Dr. P.V. Chandha, "Hand Book of Forensic Medicine & Toxicology", Jay Pee Brothers, 85-A, Karnala Nagar, Delhi – 110007.
2. Principle of Forensic Medicine by Apurba Nandy, New Central Book Agency (P) (Ltd.), 8/1, Chintamani Das Lane, Calcutta – 9.

# UNIVERSITY POLYTECHNIC BIT, MESRA

## BMLT (Semester V)

### BMT 5105 MATERIALS MANAGEMENT

#### **OBJECTIVE:**

1. To make students understand how to control materials
2. To be proficient with procedures of purchasing.
3. To have knowledge of inventory control.
4. To be able to manage stores.
5. To be aware of safety issues in handling materials.

#### **Module-I:**

##### **Concept of Material Management**

Importance, objective and Significance of material management, Scope of materials management, Classification of material management, Materials control.

#### **Module-II:**

##### **Purchasing**

Basic ideas of purchasing, purchasing vs procurement, Objective and principles of purchasing, Purchasing function and Purchase procedure.

#### **Module-III:**

##### **Inventory Control**

Basic principles of inventory control, Fixation of stock level, Concept of EOQ, Inventory control through ABC analysis

#### **Module-IV:**

##### **Store Management**

An overview of Stores management, location – different types of stores – methods of storing – safety and security of materials – stores equipment – materials handling equipment, Stores system and procedures. Store records.

#### **Module-V:**

##### **Materials Handling**

Principles of Materials handling system, Materials handling equipment's, Safety Issues

#### **References:**

1. P. Gopalkrishna & M. Sunderasan, "Materials management in Integrated Approach", PHI Learning Pvt.Ltd.
2. Donald W.Dobler, Lamar Lee Jr, David N.Burt,"Purchasing and Materials Management",McGraw Hill.
3. AK Dutta, "Materials Management Inventory Control and Logistics",Prentice Hall Of India.

**UNIVERSITY POLYTECHNIC  
BIT, MESRA  
BMLT (Semester V)**

**BMT-5102 CLINICALCHEMISTRY LAB II**

**List of Experiments**

1. Estimation of Alkaline Phosphatase.
2. Estimation of Acid Phosphatase.
3. Estimation of Serum Amylase.
4. Estimation of SGOT.
5. Estimation of SGPT.
6. Estimation of Malate Dehydrogenase.
7. Estimation of Catalase Enzymes.
8. Estimation of Ascorbic acid oxidase.
9. Estimation of Lactate Dehydrogenase
10. Analysis of Gastric Secretion.
11. Estimation of Serum Uric acid
12. Estimation of Peroxidase.

References:

1. Dr. Rajagopal & Dr. B.D Toora , “Practical Biochemistry” Ahuja Publishing House
2. K.P Sinha , “Manual of Practical Biochemistry”,Scientific Book Company.
3. E.J Silva & Maryne ,”Clinical Chemistry in Diagnosis”CRC Press,
4. Wooton I.D.P & Freeman , H “Microanalysis in Medical Biochemistry”, Churchill Livingstone London
5. S.P Singh, “Practical Manual of Biochemistry”,CBS Publishers & Distributors Pvt. Ltd.



# UNIVERSITY POLYTECHNIC BIT, MESRA

## BMLT (Semester V)

### BMT 5014 BACTERIOLOGY AND SEROLOGY LAB

#### OBJECTIVE:

- Students will become proficient at laboratory skills and safety procedures
- Students will be able to isolate and identify unknown microorganism from clinical samples

#### List of Experiments

1. Identification of bacteria by staining and biochemical test.
2. To perform catalase test.
3. Bacteriological examination of sputum specimen.
4. To perform IMViC test- Indole production test.
5. Methyl red and Voges- prosekauer test.
6. Citrate utilization test.
7. Fermentation of Carbohydrates.
8. Antibiotic sensitivity assay
9. To perform phenol-coefficient test (Rideal Walker test).
10. Preparation of buffer for serological tests.
11. To perform Widal test to diagnose Typhoid.
12. Rapid detection of HbsAg.
13. Rapid detection of Malaria.
14. Determination of ABO blood group and Rh factor..

#### References:

1. Mackie and McCartney: Practical medical microbiology, Elsevier publication.
2. P. Gunasekaran, Laboratory manual in microbiology, New age publication
3. K.R. Aneja, Experiments in microbiology and Biotechnology, New age publication.

# UNIVERSITY POLYTECHNIC BIT, MESRA

## BMLT (Semester V)

### BMT 5106 HISTOPATHOLOGY LAB- II

#### List of Experiments

1. To study the various chemicals and reagent applying in histopathology laboratories.
2. To demonstrate the method of sacrificing of Wistar rat and specimen accessioning.
3. Demonstration of gross histopathological examination and fixation of the specimen (Wister rat/chicken/guinea pig) .
4. To perform the dehydration of the given specimen.
5. To perform the process of clearing on the given specimen.
6. To perform the impregnation process of given specimen.
7. To perform embedding process of the given specimen.
8. To perform the sectioning of given specimen by using microtome.
9. To perform routine staining of the given specimen sample by using hematoxylene & eosin stain.
10. To perform routine staining of the given specimen sample by using congo red & silver nitrate or other stains.
11. To perform the Microscopical studies by using microscope and LICA
12. Demonstration of ferrous iron in tissue by Turnn blue reactions.

#### References

1. Harsh Mohan, "Pathology Practical Book", IInd Edition, Jaypee Brothers Medical Publishers (P) Ltd., 2007.
2. Bancroft and Stevens, "Theory and practice of histological techniques",Churchill Livingstone
3. Cullings, "Cellular Pathology Techniques",Butterworth-Heinemann

# UNIVERSITY POLYTECHNIC BIT, MESRA

## BMLT (Semester V)

### BMT 5107 SEROLOGY AND VIROLOGY (ELECTIVE)

#### **OBJECTIVE:**

1. To provide the student with a theoretical understanding of immunology
2. To develop skills to enable the student to perform tests routinely performed in a clinical diagnostic immunology laboratory.
3. Student will be able to understand the structure and life cycle of viruses as well as viral evolution
4. To understand the mechanisms of host immune responses and pathogenesis of viral infections

#### **Module-I:**

##### **Immunity**

Introduction of serology, History of immunology, classification of various types of immunity, Antigen. structure, function and different types of antibody. Primary and secondary responses, different types of immune cells, their structure and functions.

#### **Module II:**

##### **Non-specific immunity**

Introduction and mechanisms of different barriers of innate immunity: anatomical barriers, inflammation, chemical barriers, phagocytosis. Complement and Interferon response.

#### **Module-III: Specific immunity**

Major histocompatibility complex (MHC), CD, antigen presentation and processing, humoral and cell mediated response, cells of specific response including marker and receptors.

#### **Module IV: Serological and immunological diagnosis**

Antigen- Antibody reactions, agglutination and its types, precipitation, flocculation, neutralization, complement fixation test, interferon response, gel diffusion, immune electrophoresis. Widal test, VDRL, RA test, CRP test, Paul Bunnell test, Weil Felix reaction.

#### **Module-V: Virology**

General characteristics, structure, types ( Bacteriophage, Virion, Viroid, Virusoid & Prions) , classification (DNA & RNA virus), and life cycle of viruses. Collection, transport, processing and storage of samples for viral diagnosis. Inoculation of fertile eggs by various routes and techniques and their various incubation methods. Serological tests used in virology including Haem-agglutination inhibition, single radial haemolysis, ELISA, RIA, immune fluorescence.

#### **References:**

1. Kuby, "Immunology", W.H. Freeman & company.
2. Prescott, Harley & Klein " Textbook of microbiology", McGraw Hill Education
3. Pelczar , Chan & Kreig , "Microbiology", McGraw Hill Education
4. S.J. Flint, "Principles of virology", American Society for Microbiology
5. Ramnik Sood, "Textbook of Medical Laboratory Technology", Jaypee brothers.

**UNIVERSITY POLYTECHNIC  
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BMLT (Semester V)**

**BMT 5015 HEMATOLOGY AND BLOOD BANKING(ELECTIVE)**

**OBJECTIVE:**

1. Students will have knowledge of various investigations required for diagnosis of anemia and leukemia.
2. To make students able to perform investigations required for assessment of bleeding disorders.
3. To be conversant with etiology and mechanism of Disseminated Intravascular Disorder (DIC)
4. To be proficient with applications of cytogenetic studies
5. Students will have knowledge of cross-matching and compatibility tests required before blood transfusion.

**Module-I:**

**Anemia and Leukemia**

Definition and classification of anemia, Laboratory investigation procedures of megaloblastic anemia and iron deficiency anemia (IDA).

Definition and classification of leukemia, Laboratory investigation procedures of Leukemia.

**Module-II:**

**Laboratory Techniques of assessing bleeding disorders**

Platelet functions and their interpretations, Various methods of bleeding time determinations

Various methods of bleeding time determinations, Prothrombin time (PT) determination

Activated Partial Thromboplastin Time (APTT) determination.

**Module-III:**

**Disseminated Intravascular Coagulation (DIC) and Fibrinolysis**

Etiology of DIC, Mechanism of DIC, Laboratory investigation of disseminated intravascular coagulation, Mechanism of fibrinolysis: tests for fibrinolysis.

**Module-IV:**

**Cytogenetic Studies**

Definition of Cytogenetics, Techniques available for cytogenetic studies

Application of cytogenetic studies

**Module-V:**

**Blood Bank**

Introduction, Blood Grouping and Rh typing, Cross matching & Compatibility testing

**References:**

1. Baker et al, " An introduction to medical laboratory technology", Elsevier.
2. Charles F. Seiverd, "Hematology for medical technologists", Lea & Febiger
3. Arthur Simmons, "Technical hematology", Lippincott,
4. Thomson J: Blood coagulation and homeostasis, CBS Publisher,

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BMLT (Semester V)**

**BMT 5016 HEMATOLOGY AND BLOOD BANKING LAB  
(ELECTIVE LAB)**

**List of Experiments**

1. Laboratory investigation procedures of megaloblastic anemia
2. Laboratory investigation procedures of iron deficiency anemia (IDA)
3. Laboratory investigation of hemolytic anemia
4. Laboratory techniques for assessing bleeding disorders
5. Laboratory investigation of disseminated intravascular coagulation
6. Experiment based on laboratory techniques available for cytogenetic studies
7. Experiment based on test for fibrinolysis.
8. Experiment based on Cytochemical staining process
9. Estimation of platelets in blood
10. Estimation of Reticulocyte count
11. Estimation of absolute eosinophil count (AEC)
12. Morphological identification of red blood cells.
- 13.** Determination of blood groups and Rh factors by various methods
- 14.** Laboratory investigation of transfusion reaction
- 15.** Coomb's test

**References:**

1. Baker et al: An introduction to medical laboratory technology, Elsevier.
2. Charles F. Seiverd: Hematology for medical technologists, Lea & Febiger
3. Arthur Simmons: Technical hematology, Lippincott,
4. Thomson J: Blood coagulation and homeostasis, CBS Publisher,
5. Harsh Mohan, Pathology Practical Book , Jaypee Publishers

**UNIVERSITY POLYTECHNIC**  
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**BMLT (Semester V)**

**BMT 5111 CLINICAL INSTRUMENTATION(ELECTIVE)**

**OBJECTIVE:**

1. To impart knowledge for interdisciplinary science and technology.
2. To learn and understand the procedure for biomedical instrumentation systems.
3. To understand the aspect of clinical applications of different devices.
4. To record and interpret the characteristics of different biosignals.
5. To understand the safety and hazards associated with biomedical systems.

**Module-I: Clinical Cardiology**

Electrocardiography, patient preparation for ECG recording, Electrode placement of electrodes, distinguishing the artifacts in ECG recording and their removal, stress testing; interpretation of ECG signals for clinical diagnosis; defibrillator and cardiac pacing.

**Module-II: Clinical Electroencephalography**

EEG, Different type of Machine and their electrical characteristics placement of electrodes, different artifacts in EEG and their removal, Montages for EEG, types of conducting paste for recording and their preparation, effects of different climatic conditions on recording of EEG, interpretation of EEG signals for clinical diagnosis.

**Module-III: Clinical Electromyography**

EMG, single unit and compound myography, types of electrodes and important signal characteristics of EMG; Nerve and muscle conduction: MNCV, SNCV, F wave, H reflex, blink reflex, VEP, BAER, SSEP test.

**Module-IV:**

**Clinical Therapeutic and Intensive-care**

Instruments Electro-shock therapy instrumentation, Polygraph, Bio feed-back Instrument, Lie detector instrument; Central monitoring system for intensive care unit, different types of diathermy, physiotherapy and surgical diathermy and their different electrodes for cutting and coagulation.

**Module-V:**

**Special Clinical Devices and System**

Devices applied in auditory, ophthalmic and dental clinics; Types of ambulances and their accessories; Types of hazards in a hospital and their mitigation.

**References:**

1. Praveen J. Kumar and Michael Clark, "Clinical Medicine", ELBS.
2. Operating Manual of Neuroperfect, Medicaid Systems
3. Operating Manuals of ECG machine, TMT machine, Biofeedbacks machine, Diathermies machine.
4. J.J. Karr & J.M. Brown, "Introduction to Biomedical Technology", Prentice Hall
5. R. S. Khandpur, "Handbook of Biomedical Instrumentation", Tata McGraw-Hill
6. L. Crownwell, "Biomedical Instrumentation and Measurement", Prentice-Hall

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BMLT (Semester V)**

**BMT5113 BIOMEDICAL IMAGING DEVICES AND CONCEPT  
(ELECTIVE)**

**OBJECTIVE:**

1. To impart knowledge for interdisciplinary science and technology.
2. To understand the physics of medical imaging systems.
3. To understand the aspect of applications of different imaging modalities.
4. To learn the technicality associated with imaging instrumentation.
5. To learn the room design and safety procedures with imaging.

**Module-I:**

**X-ray Techniques**

X-ray Generation and Interaction with Matter, Concept of Dose Selection, Parameters Affecting the Quality of Image, X-ray Tube and Machine, CT-Scan and Generations, Contrast Media Application in X-ray Imaging. Dark Room and Film Processing.

**Module-II:**

**Ultrasound**

Interaction with Matter, Different Modes of Operation, Construction of Ultrasonic Transducer, Ultrasonic Probes and their Selection, Gel, Knology.

**Module-III:**

**Magnetic Resonance Imaging**

Concept of MRI, Type of Magnets, Charging of Liquid Helium and Charging of Magnet, Radio Frequency Interference and its Prevention, Installation of MRI, Patient Preparation and Selection of Coil, Contrast Application and its Hazard Management.

**Module-IV:**

**Nuclear Medicinal Techniques**

Radioisotope, Radiopharmaceuticals, Scintillation, Gamma Camera, SPECT, PET, Clinical Applications.

**Module-V:**

**Safety and Precaution**

Radiation Dose, Personal Dosimetry Techniques, Radiation Detectors and Counters.

**References:**

1. X-ray Diagnosis and Imaging by L.C. Gupta, Abhitabh Gupta; JAPEE Brothers Medical Publisher (P) Ltd., Delhi.
2. Ultrasound Physics & Instrumentation, Davind Hykes, Wayne R. Hedrick, Dale E. Starchman, Churchill Livingstone, N.Y.
3. Hand Book for X-ray Technician by Palmer, W.H.O. Publication.
4. Radiological Procedure by Chapman, Elsevier.
5. Handbook for Technicians: Darkroom Procedure by Palmar, W.H.O. Publication.

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BMLT (Semester V)**

**BMT 5112 CLINICAL INSTRUMENTATION LAB II  
(ELECTIVE LAB)**

**List of Experiment**

1. To study and calculate body mass index and its correlation with human health.
2. To study different types of electrodes and sensors used in bio-potential recordings.
3. To study and measure non-invasive blood pressure using sphygmomanometer.
4. To analyse the characteristics of different types of electrolytic medium between electrode and body.
5. To record and analyse bipolar electrocardiogram.
6. To record and analyse surface electromyogram.
7. To record and analyse vertical and horizontal eye ball activity.
8. To study and analyse electrical and mechanical cardiac activities using phonocardiography.
9. To record bipolar and monopolar electroencephalogram and analyse delta, theta, alpha and beta bands.
10. To study and analyse haemodynamic activity using pulse plethysmography.
11. To record and analyse electrodermal activity or galvanic skin response.
12. To study and perform lie detector test.

**References:**

1. J.J. Karr & J.M. Brown ,“Introduction to Biomedical Technology”,Prentice Hall
2. R. S. Khandpur, “Handbook of Biomedical Instrumentation”,Tata McGraw-Hill
3. L. Crownwell, “Biomedical Instrumentation and Measurement”,Prentice-Hall
4. W. J. Tompkins, “Biomedical Digital Signal Processing”,Prentice Hall .
5. D C Reddy, “Biomedical Signal Processing: Principles and Techniques,MCGRAW-HILL”.



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**SYLLABUS**

**SEMESTER-VI**

**BMLT**

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**Course Structure  
BMLT**

**w.e.f. 2018 Batch**

<b>Sixth Semester</b>					
<b>Course No</b>	<b>Subject</b>	<b>Theory</b>	<b>Tutorial</b>	<b>Lab.</b>	<b>Credit</b>
BMT 6001	Clinical Internship Project	-	-	-	<b>16</b>
BMT 6002	Seminar	-	-	-	<b>3</b>