

**Maulana Abul Kalam Azad University of Technology, West Bengal**  
(Formerly West Bengal University of Technology)  
**Syllabus for B. Sc. In Medical Lab Technology**  
(Effective for Academic Session 2018-2019)

**B.Sc. MLT- IV Semester**

**Course/Paper: Pathology-II**

**Course Code: BML-401**

**Learning Objective:** The unique preposition of this paper is that the students learn the basic techniques with clotting mechanism, blood banking techniques and automation.

**Unit- I**

Hemoglobin, structure ,function and types , Hemoglobinometry , Haemoglobin estimation by various methods, advantages and disadvantages, physiological and pathological variations on 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 changes in values

Erythrocyte sedimentation rate, manual and automated method, factor 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 ESR analyzer, urine analyzer, point of care testing.  
Pre and Post analytical variables, automation in hematology

**Learning Outcome:** Students can perform the various type of tests involved in hematology, immunohematology, coagulation profile and can handle automated instruments.

**Suggested Readings:**

1. Godkar.B. Praful,(2016) Textbook of MLT,3<sup>rd</sup> edition,Bhalani Publications
2. Singh Tejinder,(2014),Atlas & Textbook of Haematology,3<sup>rd</sup> edition,Avichal Publications
3. Ochei J & Kolhatkar A(2000),Medical Laboratory Science: Theory & Practice, 3<sup>rd</sup> edition,Mcgraw Hill Education
4. Mukherjee .L.K(2017), Medical Laboratory Technology,Vol.1-3,3<sup>rd</sup> edition, Tata Mcgraw Hill
5. Sood Ramnik,(2015), Text book of Medical Laboratory Technology,2<sup>nd</sup> edition, Jaypee Publications

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**Course/Paper: Clinical Haematology-II**  
**Course Code: BML-402**

**Learning Objective:** This paper encompasses the basic study and understanding of the various haematological disorders as well as their laboratory investigations.

**Unit- I**

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

**Unit-II**

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, haemoglobin electrophoresis

**Unit-III**

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-IV**

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- V**

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

**Learning Outcome:** This course made the students competent enough to perform various laboratory test related to acute and chronic haematological disorders.

***Suggested Readings:***

1. Wintrobe's Clinical Hematology, (2014), 13<sup>th</sup> edition, Lippincott Williams & Wilkins
2. De Gruchy's Clinical Haematology in Medical Practice, (2012), Sixth edition, Wiley Publications
3. Dacie & Lewis Practical hematology, (2011), 11<sup>th</sup> edition, Elsevier Publications
4. R N Makroo, (2009), Compendium of Trasfusion medicine, 2<sup>nd</sup> edition, Career Publications

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**Course/Paper: Microbiology-II**  
**Course Code: BML-403**

**Unit-I**

Lab organization, management, recording of results and quality control in Medical Microbiology Lab. Safety measures in Microbiology Laboratory, Occurrence of lab infections, 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, Toxicogenicity, 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-jar etc. 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

**Learning Outcome:** Students would be able to identify and differentiate bacteria and fungus in biological samples.

***Suggested Readings***

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1. Ananthanarayan R. and Paniker C.K.J. (2009) Textbook of Microbiology. 8th edition, University Press Publication
2. Adelberg's Medical Microbiology. 26th edition. McGraw Hill Publication
3. Goering R., Dockrell H., Zuckerman M. and Wakelin D. (2007) Mims' Medical Microbiology. 4<sup>th</sup> edition. Elsevier
4. Willey JM, Sherwood LM, and Woolverton CJ. (2013) Prescott, Harley and Klein's Microbiology. 9th edition. McGraw Hill Higher Education
5. Brooks G.F., Carroll K.C., Butel J.S., Morse S.A. and Mietzner, T.A. (2013)
6. Adelberg's Medical Microbiology. 26th edition. McGraw Hill Publication
7. Goering R., Dockrell H., Zuckerman M. and Wakelin D. (2007) Mims' Medical Microbiology. 4<sup>th</sup> edition. Elsevier
8. Willey JM, Sherwood LM, and Woolverton CJ. (2013) Prescott, Harley and Klein's Microbiology. 9th edition. McGraw Hill Higher Education

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**Course/Paper: Immunology & Serology-II**

**Course Code: BML-404**

**Learning Objective:** This paper will provide knowledge of serological techniques, autoimmune disorders their markers and vaccines.

**Unit- I**

Western blotting, Immunodiffusion, Immunoelectrophoresis, 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 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

**Learning Outcome:** Students will able to carry out differential diagnosis of disease by the help of serological techniques.

***Suggested Readings:***

1. Abbas AK, Lichtman AH, Pillai S. (2007). Cellular and Molecular Immunology. 6th edition Saunders Publication, Philadelphia.
2. Delves P, Martin S, Burton D, Roitt IM. (2006). Roitt's Essential Immunology. 11th edition Wiley- Blackwell Scientific Publication, Oxford.
3. Goldsby RA, Kindt TJ, Osborne BA. (2007). Kuby's Immunology. 6th edition W.H. Freeman and Company, New York.
4. Murphy K, Travers P, Walport M. (2008). Janeway's Immunobiology. 7th edition Garland Science Publishers, New York.
5. Peakman M, and Vergani D. (2009). Basic and Clinical Immunology. 2nd edition Churchill Livingstone Publishers, Edinberg.
6. Richard C and Geiffrey S. (2009). Immunology. 6th edition. Wiley Blackwell Publication.

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**Course/Paper: Histopathology & Histotechniques-II**  
**Paper Code: BML-405**

**Learning Objective:** This paper aims to understand the principle, procedure & demonstration of various tissue constituents and advance tools.

**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, Weigert Resorcin 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

**Learning Outcome:** Students would be able to perform various staining techniques and understand principle and application of various techniques.

***Suggested Readings:***

1. Bancroft's Theory and Practice of Histological Techniques, 7th Edition, Elsevier Publications
2. Harshmohan (2017), Textbook of Pathology, 7<sup>th</sup> edition, Jaypee Publications
3. Godkar.B. Praful,(2016) Textbook of MLT, 3<sup>rd</sup> edition, Bhalani Publications
4. C F A Culling,(1974), Handbook of Histopathological and Histochemical Techniques: Including Museum Techniques, 3<sup>rd</sup> edition, Butterworths Publishers

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**Practical syllabus**

**BML-491 (Clinical Haematology-II)**

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

**BM-492 (Fundamentals of Microbiology, Immunology & Serology-II)**

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
8. Antibiotic sensitivity test.
9. Microscopic examination of urine
10. Examination of urine
11. Examination of sputum
12. To perform HIV Tridot test.
13. To perform radial immunodiffusion test.
14. To perform immunoprecipitation method.
15. To perform HBsAg rapid test.
16. To perform ASO test
17. To perform ELISA test.
18. To perform TB IgG & IgM test
19. To perform Dengue IgG & IgM test
20. To perform typhidot test.
21. Introduction of Allergy panel
22. Montoux test

**BML-493 (Histopathology & Histotechniques-II)**

1. Grossing of tissue
2. To perform tissue processing by manual method.
3. To perform section cutting of paraffin embedded tissue.
4. To fix the smear on glass slide.
5. To perform hematoxylin and eosin staining.
6. To perform PAS staining.
7. To perform AFB staining.