

**CURRICULUM FOR**

**Diploma in**

**MEDICAL LAB TECHNOLOGY**

Skill Based Programme  
*approved by*  
University Grants Commission, New Delhi  
**National Skill Qualification Framework (NSQF)**

WITH EFFECT FROM  
ACADEMIC YEAR 2021-2022

**CKM ARTS AND SCIENCE COLLEGE**  
**(Affiliated to Kakatiya University)**  
**WARANGAL, TELANGANA STATE, INDIA**

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## Diploma in Medical Lab Technology

### SEMESTER PATTERN

Sem	Code	Theory/ Practical	Course Title	Credits	Marks		
					Internal	External	Total
I	AECC-I	Theory	English Communication	4	-	50	50
	DMLT-I		Fundamentals of Medical Laboratory Technology	4	20	80	100
	DMLT-II		Human Anatomy & Physiology	4	20	80	100
	DMLT-III		Biochemistry	4	20	80	100
	DMLT-IV		Microbiology	4	20	80	100
	DMLT-P1	Practical	Fundamentals of MLT & Human Anatomy and Physiology	3	-	50	50
	DMLT-P2		Biochemistry & Microbiology	3	-	50	50
	DMLT-S1	Seminar	Seminar/Project	4	-	50	50
	<b>TOTAL</b>				<b>30</b>	<b>80</b>	<b>520</b>

Sem	Code	Theory/ Practical	Course Title	Credits	Marks		
					Internal	External	Total
II	AECC-II	Theory	Environmental Science	4	-	50	50
	DMLT-V		Hematology & Blood banks	4	20	80	100
	DMLT-VI		Immunology & Serology	4	20	80	100
	DMLT-VII		Histopathology & Histotechniques	4	20	80	100
	DMLT-VIII		Pathology & Parasitology	4	20	80	100
	DMLT-P3	Practical	Hematology, Immunology & Serology	3	-	50	50
	DMLT-P4		Histopathology, Pathology & Parasitology	3	-	50	50
	DMLT-S2	Seminar	Seminar/Project	4	-	50	50
<b>TOTAL</b>				<b>30</b>	<b>80</b>	<b>520</b>	<b>600</b>

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### SEMESTER - I

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#### PAPER-I: FUNDAMENTALS OF MEDICAL LABORATORY TECHNOLOGY (Theory)

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#### UNIT-I Introduction to Clinical laboratory

- 1.1 Basic laboratory principles – Code of Conduct of medical laboratory personnel.
- 1.2 Organization of clinical laboratory.
- 1.3 Role of medical laboratory technician and safety measures.
- 1.4 Medical Laboratory professional and professionalism in laboratory workers.

#### UNIT-II Common Laboratory Equipment's

- 2.1 Incubator, Hot Air Oven, Water Bath, Centrifuge, Autoclave, Spectrophotometer.
- 2.2 Fundamentals of Microscopy.
- 2.3 Glassware used in Medical Lab, handling and care
- 2.4 Colorimeter and Blood cell counter.

#### UNIT-III Basic Steps for Drawing a Blood Specimen

- 3.1 Requirement of Blood Collection – Blood collection, Phlebotomy, Sampling errors.
- 3.2 Collection and preservation of biological fluids – Anticoagulants.
- 3.3 Preservation of samples – chemical preservatives.
- 3.4 Process of analyzing the specimens and the laboratory report.

#### UNIT-IV Manual & Automation in Clinical Laboratory

- 4.1 Types of analyzers – semi-auto analyser, Batch analyzer.
- 4.2 Steps in the automated systems responsibilities of a technician in the maintenance of the analyzers.
- 4.3 ELISA technique.
- 4.4 ELISA plate reader and washer.

#### Reference Books.

- Fichbach, 2005 Manual of Lab and Diagnostic Tests, Lippincott Willams Wilkins, NewYork.
- Gradwohls, 2000 Clinical Laboratory Methods and Diagnosis (Ed) Ales C. SonnEnwirth and Leonard Jarret, M.D.B.O, NewYork.
- J. Ochei and Kolhatka, 2002 Medical Laboratory Science Theory And Practice, Tata McGraw Hill, NewDelhi.
- Kanai L. Mukharjee, 2007 Medical Laboratory Technology, Tata McGrawHill

*Dr. Estari Mamidala*  
Chairman  
Board of Studies in Zoology  
Department of Zoology  
Kakatiya University  
Warangal-506009

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### SEMESTER - I

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#### PAPER-II: HUMAN ANATOMY & PHYSIOLOGY (Theory)

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#### UNIT-I Introduction to Anatomy & Cardio Vascular System

- 1.1 Scope of Anatomy and Physiology, Definitions and Terms in Anatomy and Physiology.
- 1.2 Structure and function of human cell – Elementary tissues of human body.
- 1.3 Brief account on composition blood, function of blood elements, blood group and Rh typing, Coagulation of blood.
- 1.4 Structure and functions of various parts of the heart & its function & Blood pressure

#### UNIT-II Respiratory System and Digestive System

- 2.1 Structure & function of lungs.
- 2.2 Physiology of breathing, Lung volume & capacity
- 2.3 Name and various parts of digestive system Liver, Spleen, gall bladder, Pancreas, Buccal Cavity, tongue, tonsil, Pharynx, Oesophagus, Stomach, intestine etc.
- 2.4 Physiology of digestion and absorption.

#### UNIT-III Excretory System & Reproductive System

- 3.1 Structure and function of kidneys.
- 3.2 Role of kidney in urine formation, ureter, urinary bladder, Micturition.
- 3.3 Anatomy & Physiology of Male & Female reproductive system.
- 3.4 Menstrual cycle, Contraceptives

#### UNIT-IV Nervous System and Endocrine System

- 4.1 Introduction to Nervous System
- 4.2 Central Nervous System structure and function
- 4.3 Peripheral Nervous system structure and function
- 4.4 Endocrine glands their hormones and functions – Thyroid, Parathyroid, suprarenal, Pituitary and Thymus.

#### Reference Books:

- Solon on E.A. (2008) Introduction to Human Anatomy and Physiology 3rd Ed. Saunders: St Louis.
- Chaurasia, B.D. &Garg, K., (2012) Human Anatomy Regional and Applied CBS Publications: New Delhi
- T.S. Ranganathan – A text book of HumanAnatomy
- Fattana, Human anatomy (Description and applied) Saunders & C. D. P. Publishers, Bangalore– 1991
- W. F. Ganong - Review of Medical Physiology

  
**Dr. Esther Mamidala**  
Chairman  
Board of Studies in Zoology  
Department of Zoology  
Kakatiya University  
Warangal-506009

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### SEMESTER - I

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#### PAPER-III: BIOCHEMISTRY (Theory)

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#### UNIT-I : Specimen Collection

- 1.1 General approach to Patient identification.
- 1.2 Types of Specimens
- 1.3 Method of specimen collection, Storage, transport and disposal.
- 1.4 Anticoagulants-E.D.T.A, Dipotassium salts of EDTA, Double oxalate, single oxalate, sodium citrate, Sodium Fluoride, heparin

#### UNIT-II : Introduction to Laboratory Apparatus

- 2.1 Pipettes-different types (Graduated, volumetric, Pasteur, Automatic etc.) and Measuring Cylinders.
- 2.2 Calibration of glass pipettes, Burettes, Beakers, Petri dishes, depression plates. Cuvettes for calorimetry.
- 2.3 Flasks–different types-Volumetric, round bottomed, Erlenmeyer conical etc. Funnels –different types, use.
- 2.4 Bottles: Reagent bottles –graduated and common, Wash bottles –different types, Specimen bottles etc.

#### UNIT-III : Solutions and Dilutions

- 3.1 Acid, base, salts and buffers, Indicators and their Functions.
- 3.2 Preparation of a stock standard and working standard.
- 3.3 Proper method of dilution of a solution or a laboratory sample. Serial dilutions of samples.
- 3.4 Normality, molality, molarity. Preparation of Molar solutions and Percent solutions.

#### UNIT-IV : Instruments

- 4.1 Water bath and pH meter Use, care and maintenance.
- 4.2 Oven & Incubators: Use, care and maintenance.
- 4.3 Centrifuges. Definition, Principle, Svedberg unit, centrifugal force, centrifugal field, rpm. Different types of centrifuges, Use care and maintenance of a centrifuge. •
- 4.4 Colorimeter and spectrophotometer - Parts, diagram. Use, care and maintenance. •

#### Reference Books:

- Review of Physiological Chemistry, Harold Harper A,
- Biochemistry- U satyanarayana
- Text book of biochemistry- By Vasudevan.
- Biochemistry – by Lippincott.

  
**Dr. Estari Mamidala**  
Chairman  
Board of Studies in Zoology  
Department of Zoology  
Kakatiya University  
Warangal-506009

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### SEMESTER - I

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#### PAPER-IV: MICROBIOLOGY (Theory)

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#### UNIT-I : General Microbiology: Microscopy

- 1.1 Light microscope,
- 1.2 Dark field,
- 1.3 Phase contrast microscopy,
- 1.4 Fluorescent & Electron microscopy

#### UNIT-II: Sterilization and Disinfection

- 2.1 Physical Methods of Sterilization
- 2.2 Chemical Methods of Sterilization
- 2.3 Methods of Disinfection
- 2.4 Bacterial growth, Nutrition and Metabolism of Bacteria

#### UNIT-III : Bacterial Culture

- 3.1 Culture Media & Transport Media
- 3.5 Sample collection and transport Methods
- 3.6 Aerobic, Anaerobic bacterial culture techniques
- 3.7 Smear preparation and staining methods

#### UNIT-IV : Morphology and Classification of Microorganisms

- 4.1 Bacteria-Morphology, classification, Human infection caused by bacteria
- 4.2 Viruses-Morphology, classification and Human infection caused by Viruses
- 4.3 Fungi-Morphology, Classification and Human infection caused by Fungi
- 4.4 Parasites-Morphology, classification and Human infection caused by parasite.

#### Reference Books:

- Medical Microbiology by Patric R. Murray, Ken S. Rosenthal, Michael A.Pfaller.
- Text Book of Microbiology by Chakraborty.
- Microbiology An introduction by Tortora Funk, Case 12ed.
- Mackie & McCarthey - Medical Microbiology,
- Ananthansarayana, R., JayaramPumkar - Test Book of Microbiology,

  
**Dr. Estari Mamidala**  
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### SEMESTER - I

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#### PAPER-DMLT-P1: FUNDAMENTALS OF MLT & HUMAN ANATOMY AND PHYSIOLOGY (PRACTICAL)

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1. Handling common laboratory equipment's
2. Responsibilities of a technician in the maintenance of the analyzers.
3. Use and care of microscopes.
4. Using of autoclave hot air oven, other common laboratory equipment etc.
5. Practical use of automated pipettes.
6. Demonstration working with different autoanalyzers.
7. Specimen collection, identification, transport, delivery and preservation
8. Study of Human Skeleton Parts with Skeletal Models.
9. Study with charts and models of all organ systems.
10. Demonstration of Different tissues and organs through permanent slides

  
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### SEMESTER - I

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#### PAPER-DMLT-P2: BIOCHEMISTRY & MICROBIOLOGY (PRACTICAL)

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1. Qualitative test of monosaccharides (Glucose & Fructose).
2. Qualitative test for ketone bodies, bile salts & pigments.
3. Qualitative tests for identification of carbohydrates, proteins and lipids.
4. Effect of pH and Temperature on salivary amylase activity.
5. Study of permanent histological sections of Mammalian Endocrine glands - pituitary, thyroid, pancreas, adrenal gland.
6. Estimation of total protein by Lowry's method.
7. Staining - Gram staining technique.
8. Antibiotic sensitivity test.
9. ELISA & its modification
10. Diagnostic tests of urine for isolation & identification of pathogenic bacteria

  
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### SEMESTER - II

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#### PAPER-V: HAEMATOLOGY & BLOOD BANKING (Theory)

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#### UNIT-I Introduction to Clinical laboratory

- 1.1 Introduction to Haematology & Blood Cells
- 1.2 Anemia and its classification
- 1.3 Hemoglobin importance, Normal and abnormal hemoglobin's
- 1.4 Overview of hemostasis, Primary and secondary hemostasis

#### UNIT-II

- 2.1 Bone marrow transplantation
- 2.2 Stem cells, cord blood stem cells, cord blood banking
- 2.3 Collection of blood samples, types of anticoagulants
- 2.4 Complete hemogram, different methods of hemoglobin screening and estimation.

#### UNIT-III

- 3.1 Blood group –ABO system, Rh typing
- 3.2 Cross matching, Coomb's test,
- 3.3 ESR, Haematocrit - Packed cell volume (PCV)
- 3.4 Red cell Indices - MCV, MCH, MCHC.

#### UNIT-IV

- 4.1 Complications of blood transfusion & remedial action.
- 4.2 Haemolytic disorder of Newborn & exchange transfusion.
- 4.3 Organization, operation and administration of blood bank.
- 4.4 Blood transfusion & transfusion reactions

  
**Dr. Estari Mamidala**  
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Board of Studies in Zoology  
Department of Zoology  
Kakatiya University  
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***Reference Books : Hematology***

1. Wintrobe's clinical hematology by John P. Greer.
2. Essential hematology by Victor Hoffbrand, Paul A. H. Moss (Wiley Blackwell)
3. Rodak's hematology by Elaine Keohane, Larry Smith, Jeanine Walenga.
4. Hematology, Immunology & Infectious disease by Robin K. Ohls, Akhil, Maheshwari.
5. Hematology at a glance by Atul B. Mehta, Victor Hoffbrand.

***Reference Books : Blood Bank Technology***

1. Modern Blood Banking & Transfusion Practices by Denise & M. Harming
2. Text Book of Blood Banking & Transfusion Medicine by Sally V. Rudmann.
3. Mollison's Blood Transfusion in Clinical Medicine by Klein, Mollison's.
4. Essentials of Blood grouping & Clinical Application by K. P. Ranganathan.
5. Blood Bank Technology by Williams & Williams.
6. Blood Transfusion- A guide to formation & Operation of transfusion devices by C. L. Bowley

  
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### SEMESTER - II

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#### PAPER-VI: IMMUNOLOGY & SEROLOGY (Theory)

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#### UNIT-I

- 1.1 Introduction to Hematology & Blood Cells
- 1.2 Immunity - Introduction. Types of immunity, Antigen-antibody reaction.
- 1.3 Hypersensitivity & Histocompatibility
- 1.4 Humoral and cell mediated immunity.

#### UNIT-II

- 2.1 Auto immunity and Auto-immune diseases
- 2.2 Immune deficiency diseases and its investigations (HIV).
- 2.3 Antigen-antibody reaction (agglutination, precipitation),  
Immunoassays-ELISA
- 2.4 Cells of Immune system-phagocytic cells, T-cells, B-cells, CD markers

#### UNIT-III

- 3.1 Introduction of MHC.
- 3.2 HLA antigen and HLA typing importance
- 3.3 Monoclonal and polyclonal antibodies
- 3.4 Rheumatological diseases, etiology and pathogenesis and lab investigations (RA test)

#### UNIT-IV

- 4.1 Antibody structure, function and types
- 4.2 Complement system and complement fixation test.
- 4.3 Diagnosis of Syphilis-VDRL test
- 4.4 Diagnosis of Typhoid – Widal test

#### Reference books

- Roitt's Essential Immunology by Ivan Roitt & Peter J Delves, Oxford, Blackwell science publication London.10e.
- Elgert: Immunology understanding the immune system, John Willy & Sons, Inc. Publication, New York 1996.
- Abbas et al. Cellular & Molecular Immunology (3rd Ed.) W.B. Saunders Company, 2000.
- Kuby Immunology 4 Ed.
- Immunology by Tizzard

  
**Dr. Estari Mamidala**  
Chairman  
Board of Studies in Zoology  
Department of Zoology  
Kakatiya University  
Warangal-506008

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### SEMESTER - II

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#### PAPER-VII: HISTOPATHOLOGY & HISTOTECHNIQUES (Theory)

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#### UNIT-I

- 1.1 Introduction to histopathology, cytology & histotechniques
- 1.2 Laboratory organization
- 1.3 Care & maintenance of equipments used in histotechnology lab
- 1.4 Safety measure in histotechnology lab reception, recording, labelling and transportation of tissue specimens

#### UNIT-II

- 2.1 Cells, Tissues & their function.
- 2.2 Methods of examination of tissue and cells
- 2.3 Fixation of tissue - Simple fixatives, Cytological fixatives, Histochemical fixatives
- 2.4 Tissue processing.

#### UNIT-III

- 3.1 Collection of specimen, Types of specimens and disposal of specimen.
- 3.2 Labeling and fixation – Dehydration, Clearing, Impregnation, Embedding.
- 3.3 Section Cutting - Microtomes and microtomes knives, Techniques of section cutting, Mounting of sections, Frozen section.
- 3.4 Staining-Dyes and their properties, Basic theory of staining,, Staining technique with haematoxyline and eosin, Common, special stains.

#### UNIT-IV

- 4.1 Cytopathology – Pap staining, Fine needle aspiration cytology (FNAC).
- 4.2 General principles of First aid, safety measures, mechanical, electrical, chemical, biological and radioactive
- 4.3 Ethics & General Principles
- 4.4 Laboratory communication, general principles and Public relations.

  
**Dr. Estari Mamidala**  
Chairman  
Board of Studies in Zoology  
Department of Zoology  
Kakatiya University  
Warangal-506009

### ***Reference Books***

- Hand Book of Histopathological and Histochemical Technique C.F.A.Culling
- Introduction of Medical Labotaroy Technology F.J. Baker and R.E.Silverton.
- Theory and Practice of Histological Technique. John D. Baneroft and Alan Steven,
- An Introduction to Histotechnology. Geoffrey G.Brown.,
- A Manual for Histologic Technician. AunPreece,J
- Hand book of MLT by V.H.Talib.
- Hand book of MLT by R.Sood.
- Hand book of MLT byMukherjee.
- WHO technical manual of Laboratorytechnology.
- WHO technical manual of Blood banking transfusionmedicine.
- Todd's Clinical diagnosis of laboratorymethod.



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Chairman  
Board of Studies in Zoology  
Department of Zoology  
Kakatiya University  
Warangal-506009

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### SEMESTER - II

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#### PAPER-VIII: PATHOLOGY & PARASITOLOGY (Theory)

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#### UNIT-I

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

#### UNIT-II

- 2.1 Role of hematology in diagnosis of various diseases.
- 2.2 General features of acute and chronic inflammation: Vascular changes, cellular events, Cells and mediators of inflammation.
- 2.3 Phagocytosis and its mechanism
- 2.4 Tissue Renewal and Repair, healing and fibrosis, cirrhosis.

#### UNIT-III

- 3.1 Introduction of oedema, hyperaemia, congestion, haemorrhage, haemostasis, thrombosis, embolism, infarction, shock and hypertension
- 3.2 Infectious Diseases: pathogenesis & overview of modes of infections.
- 3.3 Prevention and control of infectious diseases with suitable examples like Typhoid, Dengue, coronavirus.
- 3.4 Cancer: Definitions, nomenclature, characteristics of benign and malignant neoplasm

#### UNIT-IV

- 4.1 Definition of parasite and general characteristics of parasite
- 4.2 Classification and mode of parasitic transmission\
- 4.3 Life cycle, pathogenicity of *Entamoeba histolytica*, *Leishmania donovani*.
- 4.4 Life cycle and pathogenicity of malaria parasite,

#### Reference books

- Harsh Mohan, Text book of pathology.
- P. Godkar , Text book of medical laboratory Technology
- V.H Talib, A hand book of Medical laboratory Technology, CBS Publishers & distributors, New Delhi.Suggested Reading 1.Rabbins&Cotran, Pathologic Basis & Diseases
- Robbins,(2012), Text book of Pathology, 3rd edition, Elsevier Publications

*Dr. Estar Mamidala*  
Chairman  
Board of Studies in Zoology  
Department of Zoology  
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### SEMESTER - II

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#### PAPER-DMLT-P3: HEMATOLOGY, IMMUNOLOGY AND SEROLOGY (PRACTICAL)

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- 1 Haemoglobin estimation by Sahli's method.
- 2 R.B.C. count.
- 3 TLC, DLC & Leishman staining
- 4 Platelet count
- 5 Bleeding time, clotting time.
- 6 Preparation & examination of blood smear (Peripheral smear).
- 7 Determination of Blood group: ABO and Rh-factor.
- 8 Recording Hemoglobin estimation,
- 9 Grouping and typing of donor's blood,
- 10 **Field Work: - Visit to: -** Reference blood group centre, Blood Bank.

  
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#### PAPER-DMLT-P4: HISTOTECHNIQUES, PATHOLOGY AND PARASITOLOGY (PRACTICAL)

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- 1 Demonstration & Identification of blood cells.
- 2 Collection of blood by finger prick ( Lancet)
- 3 Collection of blood by vacutainer
- 4 Preparation of blood smears
- 5 Staining of blood smears and identification of blood cells
- 6 Demonstration of glass wares and equipment used in histopathology lab.
- 7 Tissue processing and sectional cutting by manual method.
- 8 Hematoxylin, Eosin staining, Mounting and preservation of slide.
- 9 PAS staining.
- 10 AFB staining
- 11 **Field Work: - Visit to: -** Reference blood group centre, Blood Bank.

The project / field work involving visit to at least 10 different institutions / pathology labs. / Hospitals units related to the subjects and critical analysis of these Units should be submitted for diplomacourse.

**Field Work: -**Visit to different hospitals and laboratories. i.e. Medical College/Dental college/Sadar Hospital

  
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