

MNPE-09425068494

**Karnataka State Open
University**

Manasagangotri, Mysore-6

Syllabus

**Diploma in Medical Laboratory
Technician**

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Diploma in Medical Laboratory Technician

ELIGIBILITY - 10th Class pass under 10+2 system.

COURSE PERIOD: 1 YEAR

TOTAL MARKS: 1000

TOTAL SEMESTER: 2

SEMESTER I

SUBJECT TITLE	SUBJECT CODE	MARKS		
		Theory	Practical	Total
ANATOMY AND PHYSIOLOGY	DML-101	50	50	100
LAB MANGEMENT AND INSTRUMENTATION	DML-102	50	50	100
HAEMATOLOGY AND BLOOD BANKING	DML-103	50	50	100
CLINICAL PATHALOGY	DML-104	50	50	100
PRACTICAL	DML-105		100	100

SEMESTER II

SUBJECT TITLE	SUBJECT CODE	MARKS		
		Theory	Practical	Total
BIOCHEMISTRY AND TECHNIQUES OF BIOCHEMISTRY	DML-201	50	50	100
MICROBIOLOGY : DETAILED TECHNIQUES OF CLINICAL MICROBIOLOGY	DML-202	50	50	100
HISTOPATHOLOGY TECHNIQUE AND CYTOLOGY	DML-203	50	50	100
COMPUTER APPLICATION	DML-204	50	50	100
PRACTICAL	DML-205		100	100

Program Structure (Face to Face)

1ST SEMESTER		
CODE	COURSE TITLE	CREDITS
DML 101	ANATOMY AND PHYSIOLOGY	4
DML 102	LAB MANGEMENT AND INSTRUMENTATION	4
DML 103	HAEMATOLOGY AND BLOOD BANKING	4
DML 104	CLINICAL PATHALOGY	4
DML 105	PRACTICAL	2
TOTAL CREDIT		18

2ND SEMESTER		
CODE	COURSE TITLE	CREDITS
DML 201	BIOCHEMISTRY AND TECHNIQUES OF BIOCHEMISTRY	4
DML 202	MICROBIOLOGY : DETAILED TECHNIQUES OF CLINICAL MICROBIOLOGY	4
DML 203	HISTOPATHOLOGY TECHNIQUE AND CYTOLOGY	4
DML 204	COMPUTER APPLICATION	4
DML 205	PRACTICAL	2
TOTAL CREDIT		18

DETAILED SYLLABUS

SEMESTER I

DML 101 : ANATOMY AND PHYSIOLOGY

Total Credit : 4

Block 1

Unit 1

Introduction of Anatomy and Physiology

- Brief description of Anatomy
- Brief description of Physiology
- Terms used in Anatomy
- System of the body

Unit 2

- The body fluids
- Tissue fluids exchange
- Odema and Swelling

Unit 3

- Cell structure
- Cell division
- Function of Cell
- Reproduction

Unit 4

Brief Description

- Ear
- Nose
- Eyes

Block 2

Unit 1

- Introduction of Tissue
- Function of Tissues
- Types of Tissue
- Introduction of Cartilages
- Bone structure and growth

Unit 2

- Short notes on surface Anatomy
- Introduction of skeleton
- Gross and minute structure of bone

Unit 3

- Brief description of Axial skeleton
 - A) Skull
 - B) Vertebral column
 - C) Sternum
 - D) Hyoid Bone

Unit 4

- The appendicular skeleton
 - A) Upper limb
 - B) Lower limb
- Classification of bone

Block 3

Unit1

Cardiovascular System

- A) Anatomy and Physiology of Heart,
- B) Define and function of Veins and arteries in the circulatory system
- C) Circulation-systematic and pulmonary (In brief).
- D) Brief review of chamber of Heart- the cardiac cycle

Unit 2

Digestive System

- A) Physiology and Anatomy of mouth, pharynx, stomach, small intestine, large intestine, Absorption of food and its excretion.
- B) Role of Bile in Digestion and Excretion
- C) Brief description of Liver and function

Unit 3

Respiratory System

- A) Brief description of Larynx, Trachea and Lungs.
- B) Respiratory movement and rate of Respiration

Unit 4

Urinary System

- A) Structure and functions of Kidney, Uretures, Bladder, Urethra and Nephrons.
- B) Composition of normal urine.
- C) Related Diseases- Cystitis, Nephritis, Pyelonephritis
- D) Disorder of micturition, renal failure, uraemia

Block 4

Unit 1

Endocrine Organs

- A) Pituitary gland
- B) Thyroid gland
- C) Parathyroid gland
- D) Introduction and function of Pancreas
- E) Brief description and function of adrenal gland and Thymus gland

Unit 2

Reproductive System

- A) Introduction
- B) Puberty
- C) The menopause
- D) Pelvic cavity
- E) The female organs of generation
- F) The genito- urinary Tract in the male

Unit 3

Central nervous system

- A) Brain, Spinal cord and Meninges with its functions

Unit 4

Blood and their components

- A) Define blood
- B) Composition of blood
- C) Summary of the function of blood
- D) Haemopoiesis

DML102 : LAB MANGEMENT AND INSTRUMENTATION

Total Credit : 4

Block 1

Unit 1

- Introduction of Laboratory
- Functions and types of Laboratory
- A standardized clinical Laboratory setup

Unit 2

- Code of conduct of Laboratory personnel
- Safety in Laboratory
- Responsibilities of the students
- Important instructions to minimize infection for Laboratory workers

Unit 3

- Handling of Biomedical waste

- Management of Biomedical waste
- Content of First-Aid kit
- Medico- legal problems

Unit 4

- Types of glass ware items
- Care and maintenance of glassware items
- Reuse of Laboratory glassware by the sterilization procedure
- Preparation of Reagent- N/10 HCL, Sulfuric acid, Normal saline, Drabkin Reagent, Hydrogen peroxide.

Block 2

Unit 1

Microscope

- Introduction
- Types of Microscope
- Components of Microscope
- Use of Microscope
- Routine maintenance, cleaning and precautions of Microscope

Unit 2

Centrifuge

- Principle of centrifuge
- Types
- Components
- Installing
- Safety precaution
- Care and Maintenance

Unit 3

Incubator

- Introduction
- Principle
- Types
- Components
- Uses
- Safety precaution
- Care and Maintenance

Unit 4

Balance

- Sensitivity
- Types
- Components
- Uses
- Safety precaution

F) Care and maintenance

Block 3

Unit 1

- A) Cleaning of glassware and reusable syringe and needles
- B) Cleaning non-disposable specimen containers
- C) Cleaning and maintenance of other Laboratory equipments
- D) Measurement and dispensing liquids

Unit 2

Disposal of Laboratory waste

Incineration

- A) Introduction
- B) Making of Incinerator
- C) Uses
- D) Burial of disposable materials

Unit 3

Precautions to prevent accidents
First Aid in the laboratory accidents
Quality assurance in the laboratory

Unit 4

Needle sticks Injuries

- A) Safe use of needle
- B) Name the diseases transmitted through needle stick injury
- C) Prevention from needle stick injury

Block 4

Unit 1

- A) Brief description of Decontamination and Disinfection
- B) Common causes of fires in the laboratory

Automatic dispenser and diluters

- A) Definition
- B) Types of Automatic dispenser and diluter
- C) Uses
- D) Care and maintenance

Unit 2

Colorimeter

- A) Introduction
- B) Working principle
- C) Components
- D) Care and maintenance

Unit 3

Hot air oven and water bath

- A) Introduction
- B) Working principle
- C) Components
- D) Care and maintenance

Unit 4

Hot plate & magnetic stirrer/syringe and needle destroyer

- A) Introduction
- B) Working principle
- C) Components
- D) Care and maintenance

DML 103 : HEMATOLOGY AND BLOOD BANKING

Total Credit : 4

Block 1

Unit 1

- Introduction of Clinical Hematology
- Apparatus & Instruments used in Hematology Lab
- Definition of Blood
- Composition of Blood & their functions

Unit 2

- Hematopoiesis
- Leucopoiesis
- Erythropoiesis
- Thrombopoiesis
- Normal sites and site for poiesis
- Life span of RBC, WBC & Platelet

Unit 3

- Collection of Blood – Collection of capillary & Venous Blood
- Difference between Venous and Capillary Blood
- Types of Anticoagulants
- Hematological values for normal adults

Unit 4

Estimation of Hemoglobin

- Define Hemoglobin
- Functions of Hemoglobin
- Types of Determination in Laboratory
- Working principle of Hemoglobin by different methods.
- Normal value
- Physiological and Pathological variation of Hemoglobin
- Causes of Anemia

Block 2

Unit 1

Estimation of Total Leucocyte count

- Definition
- Composition of Turke's fluid (WBC Diluting Fluid)
- Reagents and Materials required
- Procedure and calculation
- Normal value and clinical significance

Unit 2

Total Red Blood Cell Count

- Principle
- Composition of Hayem's Fluid (RBC diluting Fluid)
- Apparatus and materials
- Procedure and calculation
- Observation and Results
- Normal value, Physiological and Pathological variation

Unit 3

The packed Cell Volume (PCV, Hematocrit, HCT)

- Define PCV
- Principle
- Apparatus and Material
- Procedure
- Observation and Results
- Normal value and clinical significance

Unit 4

Erythrocyte Sedimentation Rate (ESR)

- Introduction of ESR
- Principle
- Apparatus and Material
- Procedure
- Observation and Results
- Normal value and clinical significance
- Causes of Rapid increase and Rapid Decrease of ESR

Block 3

Unit 1

Normal Blood Standard (Absolute corpuscular values and indices)

- Relevance
- Apparatus & Materials
- Calculation
- Mean Corpuscular Hemoglobin
- Mean Corpuscular Volume
- Mean Corpuscular Hemoglobin
- Mean Corpuscular Hemoglobin concentration
- Normal values and clinical significance

Unit 2

- Making of Peripheral Blood Smear
- Staining of thin & thick Blood film
- Type of Staining & their composition
- Requirements for staining procedure
- Morphology of RBCS, WBCS, Platelets (Normal and Abnormal)

Unit 3

Test for sickle Cell anemia

- Principle
- Material and reagent
- Method
- Microscopic examination

Unit 4

Brief Description

- Leukemia
- Anemia
- Sickle Cell Anemia
- Hemophilia

Block 4

Unit 1

- Introduction of Blood systems
- Blood Grouping ABO – Rh
- Cross matching

Unit 2

- Coomb's Tests (Direct and Indirect)
- Collection of Blood from the donor
- Instruction given to the Donor after Blood Donation

Unit 3

- Transport and Storage of Blood

- Preparation and use of Whole Blood
- Changes in Blood after Storage

Unit 4

- Blood transfusion reactions
- Risk assessment for AIDS and Serum Hepatitis
- Quality control in Blood Bank

DML 104 : CLINICAL PAHTALOGY

Total Credit : 4

Block 1

Unit 1

Urine Analysis

- Composition of Urine
- Collection of Urine Specimen
- Preservation of Urine
- Additional information

Unit 2

- Physical examination of Urine
- Chemical examination
- Microscopic examination
- Clinical significance
- Pregnancy test

Unit 3

Stool Analysis

- Composition of stool
- Specimen collection
- Precautions after collection
- Inspection of stool (Physical examination)

Unit 4

- Chemical examination of stool
- Microscopic examination
- Abnormal consistency and expected reasons
- Abnormal color and possible reasons

Block 2

Unit 1

Semen Analysis

- Introduction of Semen
- Collection of Semen Specimen
- Precautions during collection

- Storages of Semen

Unit 2

- Physical examination of Semen
- Chemical examination
- Microscopic examination
- Morphology of normal and abnormal sperm

Unit 3

- Introduction of CSF
- Composition
- Collection and processing of CSF specimen
- Important precautions

Unit 4

- Physical examination of CSF
- Chemical examination
- Microscopic examination
- Clinical Significance

Block 3

Unit 1

Sputum Analysis

- Composition of Sputum
- Collection of sputum specimen
- Preservation

Unit 2

- Physical examination of urine
- Staining Bacteria in a culture by Gram's Staining Method
- AFB staining method
- Microscopic examination

Unit 3

Give the clinical condition, abnormal finding in sputum

- A) Quantity
- B) Color
- C) Consistency & appearance
- D) Odour

Unit 4

Write the normal, abnormal finding & clinical significance of following cells in sputum

A) Neutrophils
C) Eosinophils

B) Lymphocytes
D) Erythrocytes

Block 4

Unit 1

- Reuse of glass container, Pasteur pipette, graduate pipette & other glassware items
- Sterilization Procedure
- Safety & precaution in clinical pathology department

Unit 2

- Labeling of samples
- Registration of specimen and preparation of monthly record
- A sample stock card

Unit 3

Reagent preparation

- Benedict's reagent
- Ehrlic's reagent
- Sulphosalicylic acid
- Fouchet's reagent
- 10 % (V/V) formalin saline

Unit 4

Gastrointestinal contents

- Normal saliva constituents
- Normal gastric constituents
- Abnormal gastric constituents
- Normal gastric constituents in infant and children

DML 105 : PRACTICAL

Total Credit : 2

Block 1

Unit 1

- Identification of bones skull, upper limb, and lower limb

Unit 2

- Collection of Venous Blood
- Collection of Capillary Blood
- Making of thin & thick smear

- Staining procedure of smear (field stain, Leishman's stain, and giemsa's stain) for DLC

Unit 3

- Determine Hemoglobin by Sahli's and Cyanmet Hemoglobin method
- Determine Total leucocyte count
- Determine RBC count
- Determine Platelet count
- Determine ESR by westergren's method, wintrobe's method and PCV by wintrobe's method

Unit 4

Operation of clinical equipments

- Microscope, Centrifuge, incubator, Hot air oven, autoclave, colorimeter, hot plate with magnetic stirrers, water bath and vortex shaker

Block 2

Unit 1

Urine Analysis

- Determine sugar in urine (Benedict's test)
- Determine bile salt and bile pigment
- Determine albumin
- Determine occult blood in urine
- Determine urobilinogen in urine

Unit 2

- Qualitative estimation of occult blood in stool
- Procedure of Ph- Reaction of stool
- Preparation of stool specimen slide for microscopic examination
- Identification of ova and cyst

Unit 3

Staining technique

- Sputum for a AFB stain (Ziehl – Neelsen stain)
- Gram stain
- Identification of Gram positive and Gram negative organism

Unit 4

- Identification of normal and abnormal sperm
- Collection of semen specimen
- Determination of fructose in semen

SEMESTER II

DML 201 : BIOCHEMISTRY AND TECHNIQUES OF BIOCHEMISTRY

Total Credit : 4

Block 1

Introduction

Unit – 1

Bioenergetics, Entropy, Enthalpy & their basic introduction,

Unit – 2

Concept of free energy, Thermodynamics 1st & 2nd Law.

Unit-3

Carbohydrate Structure, properties,, chemical reactions & functions.

Unit-4

Amino Acids Essential & non Essential amino acids with structure & function.

Block 2

Unit-1

Proteins Primary, Secondary, tertiary & quaternary (Overview).

Unit-2

Lipids Structure, Classification & properties, Enzymes: Classification, enzyme action & their mechanism.

Unit-3

Carbohydrates intermediate metabolism, glycogen synthesis, glycogenolysis, gluconeogenesis & glycolysis.

Unit-4

TCA, HMP, and its regulations Disorders of carbohydrates metabolism related to each cycle (inborn error of metabolism).

Block 3

Proteins

Unit-1

Different metabolic pathway of amino acid.

Unit-2

The flow sheet of amino acids oxidation.

Unit-3

Transamination, oxidativedeamination and pathways leading to acetyl co-A.

Unit-4

Decarboxylation of Amino acids, formation of nitrogenous excretion products.
Urea cycle and ammonia excretion.

Block 4

Biochemical aspects of Hormone

Unit-1

Hormone receptors and intracellular messengers, Adenylate cyclase, protein kinase and phosphodiesterase.

Unit-2

Role of Insulin, glucagon's, epinephrine and their mechanism .Various endocrine and regulatory systems mediated by cyclic AMP.

Vitamin

Unit-3

Fat and Water soluble and their deficiency.

Unit-4

Mineral metabolism Minor and Major (cu, Fe, Ca, Mg & P) Inborn error of Nucleic acids metabolism.

DML 202 : MICROBIOLOGY : DETAILED TECHNIQUES OF CLINICAL MICROBIOLOGY

Total Credit : 4

Block 1

Unit 1

Instruments for Microbiology Lab

Autoclave

Pressure Cooker

Hot Air Oven

Incubator

Bacterial colony counter

Unit 2

Historical aspect of Microbiology
Definition of Decontamination and disinfections
Sterilization

Unit 3

Effect of Temperature, Ph and atmosphere for bacterial growth
Define media and their types
Cultural characteristics

Unit 4

Preparation of culture media
Method of inoculation
Specimen collection

Block 2

Unit 1

Cultivation of bacteria
Reproduction of growth of bacteria
Microbial metabolism

Unit 2

Glycolysis & TCA
Bacterial genetics
Fungi mold and yeast

Unit 3

Algae
Virus of bacteria

Unit 4

Stain preparation
Gram Stain
AFB Stain

Block 3

Classification of bacteria

Unit-1

On bacilli of differential staining Gram's, Stain .(its modification) ZN .Stain (its modification)

Unit-2

On basis of their structure, Pre –remit of sample collections-general & disease specific their processing & storage,

Unit-3

Identification of bacteria on basis of cultural characteristics ,morphological , & serological features.

Unit-4 Features Staphylococcus & streptococcus including pneumococci, Family Enterobacteriaceae, Haemophilus, Bordetella, Corynebacterium, Neisseria, Treponema, Leptospira, Mycoplasma, Chlamydia & Triagents.

Block 4

Unit 1

Characteristic diagnostic serological tests in diseases

Typhoid, Tuberculosis, VDRL, TPHA, HIV For AIDS

Urology General morphology & ultra structure of virus and growth cycles

Unit 2

Introduction to clinical microbiology

Public health, diagnostic testing, pharmaceutical sales, and basic research and development

Unit 3

Mechanisms of Microbial Pathogenicity

Microbial pathogenicity including both overt microbial factors and complex interactions with the host that produce symptoms of disease

The cellular, biochemical, molecular, and genetic bases for modern understanding of microbial disease will be included

Unit 4

Epidemiology of Infectious Disease

The causes, distribution, control, and prevention of infectious disease in human populations.

Basic epidemiological concepts, including study design, analysis, and modeling of infectious disease data, establishing causal relationships, detecting confounding factors

Reference Books:-

1. Basic Clinical Laboratory Techniques - Paperback (July 10, 2007) by Barbara H. Estridge, Anna P. Reynolds, and Norma J. Walters
2. Clinical Laboratory Microbiology: A Practical Approach (MyHealthProfessionsKit Series) - Hardcover (Apr. 2, 2010) by Karen Kiser, William Payne, and Theresa Taff
3. Cumulative Techniques and Procedures in Clinical Microbiology (CUMITECH Series, #1-#15) - Ring-bound (1974) by John C. Sherris

DML 203 : HISTOPATHOLOGY TECHNIQUE AND CYTOLOGY

Total Credit : 4

Block 1

Unit 1

Introduction of Histopathology
Reception
Registration

Unit 2

Fixation of Specimen before grossing
Fixatives – their merit and demerit
Grossing of specimen

Unit 3

Labeling of tissues
Decalcification

Unit 4

Dehydration
Clearing
Impregnation
Manual processing schedule

Block 2

Unit 1

Brief description of Automatic tissue changers
Autotechnicon processing schedule
Replacement of processing fluid

Unit 2

Embedding of tissue specimens
Trimming of block

Unit 3

Define Microtome
Types of Microtome's
Types of Knives
Sharpening of knives

Unit 4

Preparation of section
Section cutting
Frozen Section
Staining Procedure

Block 3

Unit 1

Routine staining procedures

Method of staining when hematoxylin is used

Preparation of Harri's Alum hematoxylin

Preparation of mayer's hematoxylin

Unit 2

Counter stain for hematoxylin stain

Z.N. stain for AFB

Crystal violet amyloid stain

Unit 3

Introduction of Cytology

Three important application of Gynaecological Cytology

Unit 4

Define fine needle aspiration cytology

Requirement for the FNAC

Aspiration of intrathoracic masses (Lung, Liver, Prostatic)

Block 4

Unit 1

Advantage of the procedure of the FNAC

Limitations

Papanicolaou's Method of staining smears

Unit 2

Requirement of Cytology Laboratory Setup

Preparation of MGG Stain

Preparation of Papanicolaou's stain

Unit 3

Explain the Auto stainer in brief

Material & reagent for MGG stain & Papanicolaou's Stain

Staining procedure of MGG stain & Papanicolaou's Stain

Unit 4

Use of ultrasound in FNAC

Use of B-Scanning display

Advantages

Disadvantages

DML204 : Computer Applications

Total Credit : 4

Block 1

Unit 1

Explanation & Characteristic of Computer

Input
Output
Storage unit
CPU, Computer System

Unit 2

Central Processing Unit

Control Unit
Arithmetic unit
Instruction set
Register
Processor Speed

Unit 3

Memory

Storage Evaluation Criteria
Memory Organization & Capacity
RAM & ROM

Unit 4

Secondary Storage Devices

Magnetic Disk
Floppy and Hard Disk
Optical Disks CD-ROM
Mass Storage Devices

Block 2

Input Devices & Output Devices

Unit 1

Keyboard
Mouse
Trackball
Joystick
Scanner
Optical Mark Reader

Unit 2

Bar-Code reader
Magnetic Ink character Reader

Digitizer
Card Reader
Voice Recognition, Web Cam & Video Cameras etc.

Unit 3

Monitors
Printers (Dot Matrix, Inkjet & Laser Printers)
Plotters

Unit 4

Computer Output Micro file (COM)
Multimedia Projector

Block 3

Operating Systems & Word Processing

Unit 1

An overview of different version of windows
Basic Windows elements
File management through windows

Unit 2

Using defragmenter, Entertainment, Games, Calculator, imaging-Fax, Notepad,
Paint, Word pad.
Recycle Bin, Windows, Explorer, Creating Folder, Icons

Unit 3

Word processing concepts
Saving, Closing, opening an existing document
Selecting text, Editing text
Finding and replacing text
Printing documents

Unit 4

Creating and Printing merged documents, Mail Merge
Character and Paragraph Formatting, Page Design and Layout

Block 4

Unit 1

Editing and Proofing Tools; Checking and correcting spellings
Handling
Creating Tables and Charts
Document Templates and Wizards

Unit 2

Presentation Package

Creating opening and saving presentations
Creating the look of your presentation
Working in different views, working with slides
Adding and formatting Text, Formatting paragraphs

Unit 3

Checking spelling and correcting Typing mistakes
Making notes, pages and Handouts
Drawing and working with objects

Unit 4

Adding clip art and other pictures
Designing slides show
Running and controlling a slide show
Printing presentations

DML205 : PRACTICAL

Total Credit : 2

Block 1

Microbiology / Histopathology / Cytology

Unit 1

Operation of instruments (Autoclave, Hot Air Oven, Bacterial colony counter)
Instructions given to the patients for culture specimen
Specimen collection (urine, sputum, Pus Swabs, Throat and Nasal smear)

Unit 2

Dispatch of specimen for culture (Sputum specimen and throat specimen)
Registration of specimens
Preparation and Fixation of smears

Unit 3

Staining Technique
A) Gram Staining
B) Staining with Albert Stain for the detection of corynebacterium diptheriae)
C) Staining with Zeihi – Neelsen stain for the detection of acid fast bacilli

Unit 4

Method of Inoculation (Streak plate method)
Antibiotic sensitivity tests
Identification of gram positive/gram negative organisms and acid fast bacilli

Block 2

Unit 1

- Preparation of Tissue
- Preparation of Section
- Technique of Frozen Section

Unit 2

- Preparation of different stains for Histopathology Technique
- Procedure of staining
- Operation of microtome
- How to sharp the Knives

Unit 3

- List of required material for FNAC
- Procedure of Aspiration of Intrathoracic Masses(Lung,Liver and Prostatic)
- Procedure of Transcutaneous Aspiration for Palpable Lesion

Unit 4

- Preparation of May grunwald Giemsa's stain and staining techniques
- Automatic staining and staining method
- Preparation of papanicolaou's stain