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DETAILED SYLLABUS

FOR

DISTANCE EDUCATION

Under Graduate Diploma Program

**DIPLOMA IN
MEDICAL LABORATORY TECHNOLOGY
(DMLT)**

(SEMESTER SYSTEM)

COURSE TITLE: DIPLOMA IN MEDICAL LABORATORY TECHNOLOGY

DURATION : 2 YEAR

MODE : SEMESTER

FIRST SEMESTER

<i>COURSE TITLE</i>	<i>Paper Code</i>	<i>MARKS</i>				
		<i>THEORY</i>		<i>PRACTICAL</i>		<i>TOTAL</i>
		<i>INTERNAL</i>	<i>EXTERNAL</i>	<i>INTERNAL</i>	<i>EXTERNAL</i>	
ANATOMY	DMLT/S/110	40	60	40	60	200
PATHOLOGY	DMLT/S/120	40	60	40	60	200
BIOCEMISTRY	DMLT/S/130	40	60	40	60	200
MICROBIOLOGY	DMLT/S/140	40	60	40	60	200
COMMUNICATION SKILLS	DMLT/S/150	40	60	40	60	200

SECOND SEMESTER

<i>COURSE TITLE</i>	<i>Paper Code</i>	<i>MARKS</i>				
		<i>THEORY</i>		<i>PRACTICAL</i>		<i>TOTAL</i>
		<i>INTERNAL</i>	<i>EXTERNAL</i>	<i>INTERNAL</i>	<i>EXTERNAL</i>	
PHYSIOLOGY	DMLT/S/210	40	60	40	60	200
PATHOLOGY	DMLT/S/220	40	60	40	60	200
BIOCHEMISTRY	DMLT/S/230	40	60	40	60	200
MICROBIOLOGY	DMLT/S/240	40	60	40	60	200
COMPUTER SKILLS	DMLT/S/250	40	60	40	60	200

THIRD SEMESTER

<i>COURSE TITLE</i>	<i>Paper Code</i>	<i>MARKS</i>				
		<i>THEORY</i>		<i>PRACTICAL</i>		<i>TOTAL</i>
		<i>INTERNAL</i>	<i>EXTERNAL</i>	<i>INTERNAL</i>	<i>EXTERNAL</i>	
ANATOMY	DMLT/S/310	40	60	40	60	200
PATHOLOGY	DMLT/S/320	40	60	40	60	200
BIOCHEMISTRY	DMLT/S/330	40	60	40	60	200
MICROBIOLOGY	DMLT/S/340	40	60	40	60	200
COMMUNICATION SKILLS	DMLT/S/350	40	60	40	60	200

FOURTH SEMESTER

<i>COURSE TITLE</i>	<i>Paper Code</i>	<i>MARKS</i>				
		<i>THEORY</i>		<i>PRACTICAL</i>		<i>TOTAL</i>
		<i>INTERNAL</i>	<i>EXTERNAL</i>	<i>INTERNAL</i>	<i>EXTERNAL</i>	
PHYSIOLOGY	DMLT/S/410	40	60	40	60	200
PATHOLOGY	DMLT/S/420	40	60	40	60	200

BIOCHEMISTRY	DMLT/S/430	40	60	40	60	200
MICROBIOLOGY	DMLT/S/440	40	60	40	60	200
COMPUTER SKILLS	DMLT/S/450	40	60	40	60	200

Maximum Time : 3hrs

University Assessment – 60%

Total marks :100

Internal Assessment – 40%

Minimum Pass Mark – 40%

FIRST SEMESTER

DMLT/S/110

ANATOMY

COURSE CONTENTS – THEORY

1) Introduction of Bones of the Human Body of :

- Upper Limb : clavicle, scapula, humerus, radius, ulna, carpus, metacarpus & phalanges
- Lower Limb : hipbone, femur, tibia, fibula, tarsus, metatarsus & phalanges
- Skull : name the bone of skull and sutures between them.
- Thorax : ribs and their articulations
- Vertebral Column : cervical, thoracic, lumber, sacral and cocasial vertebrae

2) Surface Markings of the Body :

- Nine regions of the abdomen
- Four quadrants of the Hip

3) Introduction of different Vital Organs :

A) Respiratory Organs :

- Nasopharynx
- Oropharynx
- Larynx
- Trachea
- Bronchi
- Lungs (and their lobular segments)
- Thoracic cavity
- Pleura and Pleural cavity

B) Circulatory Organs

- Anatomical position of the heart
- Pericardium of the heart
- Chambers of the heart
- Great vessels of the heart
- Valves of the heart

C) Digestive Organs :

- Tongue
- Teeth
- Oral cavity
- Pharynx
- Oesophagus
- Stomach

- Small intestine
- Stomach
- Small intestine
- Large intestine and its colons

PRACTICAL :

Labeled Diagrams of different organs and bones

Vivo

DMLT/S/120

PATHOLOGY

COURSE CONTENTS –

1. The Cell in health and disease

- a. Introduction of pathology
- b. Cellular structure and metabolism
- c. Inflammation – Acute and Chronic
- d. Derangement of Body Fluids and Electrolytes
 - Types of shocks
 - Ischaemia
 - Infection
- e. Neoplasia – Etiology and Pathogenesis

2. Introduction of hematology

- a. Formation of Blood
- b. Erythropoiesis
- c. Leucopoiesis
- d. Thrombopoiesis
- e. Collection of Blood
- f. Anticoagulants
- g. Red cell count – Haemocytometer, Methods and Calculation
- h. WBC Count – Methods
- i. Differential Leucocytes Count (DLC) –
Morphology of White Cells, Normal Values
Romanowsky Stains : Staining procedures
Counting Methods, Principle of staining
- j. Hb estimation - Method
Colorimetric Method
Chemical Method
Gasometric Method

S. G. Method
Clinical Importance

Practical :

- I.
 - Collection of Sample
 - Hb estimation
 - TLC and DLC
 - RBC Count
 - Peripheral blood film – staining and study of Malarial Parasite
- II. Laboratory management – Sample Collection, Labeling, Transport, Screening, Reporting and Dispatch of Reports.

DMLT/S/130

BIOCHEMISTRY

COURSE CONTENTS :

1. Introduction of Biochemistry
2. Elementary knowledge of inorganic chemistry : - Atomic weight, molecular weight, equivalent weight, acid, bases.
3. Definition and preparation of solutions : - Percent solution, Molar solution, Normal solution and Buffer Solution etc.
4. Definition and preparation of Regent.
5. Unit of measurement
6. Elementary knowledge of organic chemistry
 - Organic compounds
 - Aliphatic and Aromatic
 - Alcohols, Aldehydes, Ketones, Amines, Esters, Phenol etc
7. pH indicators : pH paper, universal and other indicators, pH measurement : different methods.

Practical

Introduction and usage of Glassware and Instruments

Glassware :

- Composition of Glass
- General glass wares

Instruments :

- Balance
- Hot plate and Magnetic stirrer
- Centrifuges

- Incubators
- Constant temperature bath
- Colorimeter : Principle, Function
- Photometer
- Photometry

DMLT/S/140

MICROBIOLOGY

COURSE CONTENTS :

I. Introduction and brief history of Microbiology

- Historical Aspect
- Relationship of Micro-organism to men
- Micro-organism in Disease and Health

II. Requirement and uses of common Laboratory Equipments

- Incubator, Hot Air Oven, Water Bath
- Anaerobic Jar, Centrifuge, Autoclave
- Microscope
- Glassware – Description of Glassware, its use, handling and care

III. Sterilization :

- Definition
- Classification and General Principle of Sterilization
- Autoclave – its structure, functioning, control and indicator

IV. Antiseptics & Disinfectants

- Definition
- Types
- Mode of Action
- Uses

V. Collection, Transportation and processing of clinical samples for Microbiological investigations

Practical :

Demonstration of washing of instruments

A) Instructions for paper-setter

1. The question paper will consist five sections namely A, B, C, D and E.
2. Each of the sections A, B, C and D will contain two questions and candidates have to attempt at least one question compulsorily from each section. Each section carry 15% of the total marks
3. Section E will comprise of 10-15 short answers type questions, which will cover the entire syllabus and will carry 40% of the total marks.

B) Instructions for candidates

1. Candidates are required to attempt one question each from sections A, B, C and D of the question paper and the entire section E.
2. Use of non-programmable scientific calculator is allowed

SECTION A**1. Corresponding : (Official, Business And Personal)**

One Letter from each category (Official, Business and Personal) may be set in the examination paper and the students be asked to write one of them.

SECTION B**2. Grammar**

A brief review of easy form of tenses. Conversion of direct narration into indirect form of narration and vice versa (only simple sentences). Punctuation.

SECTION C**3. Essay**

Preferably on scientific topic from the given outlines. The paper setter may be instructed to give a choice of attempting one out of three topics. The question paper may provide the outlines. The essay will be of 250 to 300 words. The examiner may select three topics one from each of the following.

- (i) Science
- (ii) Technology
- (iii) General.

SECTION D**Written Communication**

report, notices, agenda notes, business correspondence preparation of summery & prices.

SECOND SEMESTER

DMLT/S/210

PHYSIOLOGY

COURSE CONTENTS

1. Cell :

- Definition
- Structure and functions the cytoplasmic Organelles
- Reproduction : Miosis, Mitosis

2. The important physico-chemical laws applied to physiology

- Diffusion
 - Osmosis
 - Bonding
 - Filtration
 - Dialysis
 - Surface Tension
 - Adsorption
 - Colloid

3. Fundamentals of different Organ Systems

- Cardiovascular System
- Respiratory System
- Digestive System
- Excretory System
- Reproduction System
- Endocrine System
- Lymphatic System
- Pracitcal
- Viva and diagrams of different Vital Organs

PRACTICAL

Viva and diagrams of different Vital Organs

COURSE CONTENTS

I. Hematology :

- ESR
- Methods
- Factors – Affecting ESR
- Normal Values
- Importance
- RBC – Indices
- Platelets

II. Body Fluids :

- a) Urine :
 - Method of Collection
 - Normal Constituents
 - Physical Examination
 - Chemical Examination
- b) Stool Examination :
 - Method of Collection
 - Normal Constituents and appearance
 - Abnormal Constituents (Ova, Cyst)
- c) C.S.F. Examination
 - Physical Examination
 - Chemical Examination
 - Microscopy
 - Cell Count
 - Staining
- d) Semen Analysis
 - Collection
 - Examination
 - Special Tests

PRACTICAL :

- a) Urine, Stool, Semen and C.S.F. – Collection, Handling, Examinations
- b) Absolute Eosinophil Count, PCV, RBC indices, ESR Estimation, Platelet Count

COURSE CONTENTS

1. Aim and Scope of Biochemistry
2. Collection and Recording of Biochemical Specimen, separation of serum/plasma preservation and disposal of Biological material.
3. Chemical examination of urine : Qualitative, Sugar, Protein, Bile Salt, Bile Pigment, Ketones Bodies
4. chemical examination of Stool : Occult Blood.
5. Chemical examination of other Body Fluids : CSF, Pleural Fluid, Ascitic Fluid etc.
6. Laboratory management and Maintenance of Records.

PRACTICAL :

- Urine Examination Physical, Chemical, Microscopic, Biochemistry
- Stool Examination
- Body Fluids : Physical and chemical examination CSF, Pleural Fluid, and Ascitic fluid

COURSE CONTENTS

Bacteriology

- Definition
- Bacteria – General characteristics of Bacteria
- Classification and morphology of Bacteria
- Structure of Cell, Capsule, Flagella, and Spore
- Growth of Bacteria
- Nutrition of Bacteria

Virology :

- Definition
- General Introduction of Virus
- Physiochemical characteristic of Viruses
- Diseases caused by different Virus and mode of infection

Parasitology :

- Definition
- General characteristics of Parasite
- Classification of Parasite
- Mode of transmission

Fungus

- Definition
- Structure
- Classification

PRACTICAL:

Staining – Type of Staining, Principle, Procedure and Interpretation

A) Instructions for paper-setter

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3. Section E will comprise of 10-15 short answers type questions, which will cover the entire syllabus and will carry 40% of the total marks.

B) Instructions for candidates

1. Candidates are required to attempt one question each from sections A, B, C and D of the question paper and the entire section E.
2. Use of non-programmable scientific calculator is allowed

SECTION A**1. Familiarization with Operating System**

Introduction to computer Operating System (Dos, Windows'95),
Introduction to Dos structure, system files, batch files & configuration files,
Booting the system from floppy & hard disk,
Brief Introduction to Dos internal & external commands,
Familiarization with windows structures, its use and application.

SECTION B

2. Preparation of Documents Through Word Processing ,Idea of text editors like Microsoft word, write etc., Opening a document., Preparing documents, inserting diagrams & tables, Editing document.

- (a) Character, word and Line Editing.
- (b) Margin Setting, Paragraph alignment.
- (c) Block Operations.
- (d) Spell Checker
- (e) Saving a document.

SECTION C

3. Information Presentation for Decision Making Using Spread Sheet: (Excel/Lotus 1 -2-3), Applications of spread sheet, Structure of spread sheet, Preparing spread sheet for simple data and numeric operations, Using formulae in spread sheet operations, Making Tables, sorting and querying. Creation of graphs, Pie charts, bar charts, Printing reports.

SECTION D**4. Computer aided Drafting (CAD)**

Making simple drawings using features of CAD and confirming the drafting specifications,
Saving and retrieving drawings.
Dimensioning, Lettering, Plotted drawing.

THIRD SEMESTER

DMLT –310

ANATOMY

COURSE CONTENTS

A) Reproductive Organs :

- Male and Female Gonads : Testes, Epididymis, Ovary, Fallopian Tube, Uterus, Vagina etc.
- Introduction of male Genital Organs
- Introduction of female Genital Organs

B) Liver and Spleen :

- Introduction
- Anatomical position
- Gall bladder

C) Excretory Organs ;

- Cortex and medulla of Kidney
- Ureter
- Urinary Bladder
- Urethra (male and female)

D) Muscles :

- Introduction, Origin and Insertion, Function

PRACTICAL

Labeled Diagrams of different organs and bones

Vivo

COURSE CONTENTS

- a) Human blood group antigens and antibodies

- b) ABO Blood group systems
 - Sub. – group
 - Source of antigens and types of antibodies

- c) Rh Blood group System
 - Types of Antigen
 - Mode of Inheritance
 - Types of Antibodies

- d) Other Blood group Antigens

- e) Blood Collection
 - Selection and screening of donor
 - Collection of blood
 - Various anticoagulants
 - Storage of Blood.
 - Changes in Blood on Storage

PRACTICAL :

Blood grouping
Tube Method
Slide Method

COURSE CONTENTS

1. Carbohydrates : -

- Introduction
- Importance
- Classification
- Properties
- Estimation of Glucose
- Clinical Significance

2. Protein : -

- Introduction and Physiological importance
- Amino acids
- Essential amino acids
- Classification
- Denaturation of Proteins
- Estimation of Total protein, Albumin, Globulin, A/G Ratio

3. Introduction, Properties and function of important hormones

4. Enzymes and Co-enzymes

- Introduction and difference
- Functions
- Estimation of important enzymes
 - i) SGOT (AST)
 - ii) SGPT (ALT)
 - iii) Alkaline Phosphatase
 - iv) Acid Phosphatase
 - v) Amylase, lactate dehydrogenase.
 - vi) CPK, CPK-MB

PRACTICAL :

Method of estimation of glucose : Benedicts Reaction, Glucose oxidase

Method

Method of estimation of Protein, Albumin.

COURSE CONTENTS**Staining of Bacteria :**

1. Composition and preparation of Staining
2. Principle and Procedure of Bacteriological stain
 - Gram's Stain
 - Ziehl-Neelsen Stain
 - Albert Stain
 - Spore and Negative Stain

Cultivation of Micro-organism :

- Introduction and uses of culture
- Classification of culture media
- Composition of common of Laboratory culture media
- Special media and preparations
- Techniques of inoculation and isolation
- Antimicrobial sensitivity
- Anaerobic cultivation techniques

Isolation of Viruses in Laboratory by tissue culture

- Cell and tissue culture technology
- Embryonated Egg
- Principles of animal cell culture and their use in Virology

Different staining techniques used in Virology

Principle of different serological test used in Virology

Mode of Transmission of Viral agents

Prevention of Viral disease

Immunity in Viral infection

PRACTICAL

1. Staining : ZN Staining of M. T. B. and M. Lepra, Albert Staining
2. Culture
 - Type of Media
 - Preparation
 - Inoculation
 - Colony Characteristic
 - Staining and Antibiotic Sensitivity

A) Instructions for paper-setter

1. The question paper will consist five sections namely A, B, C, D and E.
2. Each of the sections A, B, C and D will contain two questions and candidates have to attempt at least one question compulsorily from each section. Each section carry 15% of the total marks
3. Section E will comprise of 10-15 short answers type questions, which will cover the entire syllabus and will carry 40% of the total marks.

B) Instructions for candidates

1. Candidates are required to attempt one question each from sections A, B, C and D of the question paper and the entire section E.
2. Use of non-programmable scientific calculator is allowed

SECTION A**1. Precis and Comprehension**

Precis writing of simple passages from the prescribes text book. The passage selected should be from the textbook. The passage selected should be such as easily lends to surrounding. The passage should be of 100 to 150 words. In order to test comprehension a few questions on the passage may be set

SECTION B**2. Communication Techniques**

Importance of communication

One way and two way communication

Essentials of good communication

Methods of communication, oral, written and non-verbal

Barriers to communication

Techniques of overcoming barriers

Concept of effective communication

All forms of written communications including drafting reports, notices, agenda notes, business correspondences, preparation of summaries and précis, telegrams, circulars, representations. Press release and advertisements

Telephonic communications

SECTION C**4. Technical Report Writing**

Technical report writing from the given outlines, a choice to attempt one out three to be given in the examination. The question paper shall provide the required outlines

SECTION D**5. Equivalent Terminology**

150 popular administrative and technical terms in English with their equivalent words in regional language or in Hindi.. These terms shall be officially prescribed and sent to the paper as well.

Practice of writing personal resume and writing application for job/ employment

FOURTH SEMESTER

DMLT –410

PHYSIOLOGY

COURSE CONTENTS

1. Blood
 - Definition
 - Composition
 - Function
2. Formation of different type of blood Cells
 - Erythrocytes
 - Leucocytes
 - Thrombocytes
3. Mechanism of Blood Cltting
4. Cerebrospinal Fluid
 - Formation
 - Composition
 - Function
5. Special Senses
 - Hearing
 - Taste
 - Smell
 - Touch
 - Sight

PRACTICAL :

Viva and diagrams of Corpuscles

COURSE CONTENTS :

IMMUNOLOGY AND SEROLOGY

Hormones -

- Thyroid Hormones
- Growth Mhormone
- Isulin

Glycosylated Hemoglobin

COOMB'S Test

- Direct and Indirect Test
- Titration of Antibody

HISTOPATHOLOGY (Theory and Practical)

a) Fixation of tissues

- Classification of Fixatives

b) Tissue Processing

- Collection
- Steps of fixation

c) Section Cutting

- Microtome and Knives
- Techniques of Section Cutting
- Mounting of Sections
- Frozen Sections

d) Decalcification

- Fixation
- Declacification
- End Point

e) Staining Dyes and their properties, H & E Stain, Special Stains

PRACTICAL :

- COOMB'S Test
- Anti D Titre

COURSE CONTENTS :

1. Lipids : -

- Introduction and functions
- Classification
- Steroids
- Metabolism
- Estimation : Total lipids, HDL, LDL, VLDL, Total cholesterol, Triglyceride
- Clinical significance

2. Principle of Assay procedures for biological material and estimation of kidney function tests.

- Urea
- Uric acid
- Creatinine

3. Electrolytes :

- Function
- Properties
- Estimation of Essential electrolytes : Sodium, potassium, calcium, chloride and phosphorus etc.
- Clinical Importance

4. Genetics

- DNA, RNA Structure
- Gene coding
- Transcription & Translation
- Genetic Disorders

PRACTICAL :

Method of estimation of urea

Method of estimation of Creatinine

Method of estimation of Cholesterol

COURSE CONTENTS :

I) Immunology

- Definition
- Immunity : Definition and Classification
- Antigen
- Antibodies – Immunoglobulin
- Antigen and antibody reaction and clinical importance
- Structure and function of immune system
- Immune response
- Hypersensitivity

2) i. Principle & procedure of Serological Tests.

- BIDAL, CRP, Brucella, Agglutination, ASO
- Cold agglutination, VDRL, TPHA
 - i) Advanced techniques in Microbiology ELISA, RIA etc
 - ii) Epidemiological Markers of Micro-organism serotyping
 - iii) Preparation & Standardization of Antigen and Antisera
 - iv) Preparation & Standardization of vaccine and immunization

3) i) General introduction, life cycle, mode of transmission, pathogenicity, and lab diagnosis of various Protozoa.

- ii) Entamoeba Histolytica
- iii) Entamoeba coli
- iv) Giardia lamblia
- v) Trichomonas Vaginalis
- vi) Leishmania donovani

4) i) Sprozoa

- Malaria Parasite
- Toxoplasma Gondii
- ii) Balatidium Coli

5) General introduction life cycle, mode of transmission, pathogenicity and lab diagnosis of various Helminths :

i) Cestodes or Tapeworms :

- Taenia solium

- *Taenia saginata*
- *Hymenolepis nana*
- *Echinococcus granulosus*

ii) Trematodes of Flukes :

- *Fasciola hepatica*
- *Fasciola gigantica*
- *Gastrodiscoides hominis*

iii) Nematodes :

- *Trichinella spiralis*
- *Trichuris trichiura*
- *Ancylostoma duodenale*
- *Enterobius vermicularis*
- *Ascaris lumbricoides*

PRACTICAL :

Demonstration :

Slide Agglutination

- VDRL
- VIDAL
- ASO
- CRP
- Stool Examination
- Physical
- Microscopic Demonstration of Ova, Cyst, Pus Cells
 - Hanging Drop Examination

A) Instructions for paper-setter

The question paper will consist of five sections A, B, C and D. Sections A, B and C will have two questions from the respective sections of the syllabus and will carry 15% marks each. Section D will have 10-20 short answer type questions which will cover the entire syllabus uniformly and will carry 40% marks in all.

B) Instructions for candidates

1. Candidates are required to attempt one question each from sections A, B and C of the question paper and the entire section D.
2. Use of non-programmable scientific calculator is allowed.

SECTION A

Input and Output units: Their functional characteristics, main memory, cache memory read only memory, overview of storage devices – floppy disk, hard disk, compact disk, tape.
Computer Networks and Communication: Network types, Network topologies, Network communication devices, Physical communication media, TCP/IP.
Internet and its Applications: E-mail, Telnet, FTP, WWW, Internet chatting

SECTION B

Word Wide Web (www) - History, Working, Web Browsers, Its functions, Concept of Search Engines, Searching the Web, HTTP, URLs, Web Servers, Web Protocols.
Web Publishing - Concepts, Domain name Registration, Space on Host Server for Web site, HTML, Design tools, HTML editors, and Image editors, Issues in Web site creations & Maintenance

SECTION C

Html - Concepts of Hypertext, Versions of HTML, Elements of HTML syntax, Head & Body Sections, Building HTML documents, Inserting texts, Images, Hyperlinks, Backgrounds and Color controls, Different HTML tags, Table layout and presentation, Use of font size & Attributes, List types and its tags, Use of Frames and Forms in web pages. Overview of MS FrontPage, Macromedia Dream weaver, and other popular HTML editors, designing web sites using MS FrontPage (using at least FrontPage 2000)

Reference:-

1. D.H.Sanders, "Computers Today", McGraw Hill, 1988.
2. T.N. Trainer, "Computers" (4thEdition) McGraw Hill, 1994.
3. P.T. Joseph, S.J., "E-Commerce An Indian Perspective (Second Edition)", Prentice Hall of India