SHRI GOVIND GURU UNIVERSITY

GOVERNMENT POLYTECHNIC CAMPUS,
GADUKPUR, GODHRA,
DIST: PANCHAMAHAL, GUJARAT-389001.

SYLLABUS & ORDINANCE OF

POST GRADUATE DIPLOMA IN MEDICAL LABORATORY TECHNOLOGY
(P.G.DMLT) COURSE

ACADEMIC YEAR 2018-19 ONWARDS

1. COURSE OBJECTIVE –

1. Knowledge and skills about care & maintenance of laboratory equipments.
2. Proficiency of administrative procedures in the laboratory.
3. Knowledge and skills of collection of various samples for laboratory examination.
4 knowledge and skills about preparation of reagent and anticoagulant used in laboratory.
5. Proficiency in basic characteristics of pathogenic organisms.
6. knowledge and skills of processing of microbiological specimen.
7 Proficiency about various stain used in microbiology.
8 Knowledge and skills about various test used to identify bacteria.
9. Knowledge and skills for preparation of various types of media.
10.Knowledge and skills about basic mycology investigation procedures.
11. Knowledge and skills in parasitological investigation.
12. Knowledge and skills of hematology:
a) Proficiency of counting of blood cells
(b) Proficiency in blood coagulation mechanism and skills of various coagulation tests.
(C) Knowledge and skills in various special test (e.g. Osmatic fragility, LE cell Phenomena).
(d) Knowledge and skills about sophisticated equipment of hematology
(e) Proficiency in Leukaemia and anaemia.
13. Knowledge and skills of various serological. immunological test and ELISA reader.
14. Knowledge and skills of collection, preservation and processing of histopathological and cytological samples.
16. Knowledge and skills about biochemical procedures and parameters
17. Proficiency and skills about blood banking.

2. ELIGIBILITY FOR ADMISSION

A Candidate for admission to the Post Graduate Diploma in Medical Laboratory Technology(PGDMLT) must have passed the B Sc. Degree Examination of any University with Medical Laboratory Technology or Medical Technology in clinical Laboratory Technology) / Microbiology/ Bio Chemistry/ Zoology / Botany/ Chemistry / Bio- Technology /Environment Science / Genetics / Bioinformatics / B. Sc. (Home Science) (Food and Nutrition) /B. Sc (Home Science) (Food Science and Quality Control) (Vocational) or B. Sc (Industrial Microbiology) (Vocational), B.Sc (Fire and Safety), B. Sc (Agri.), Graduate in Dairy Science & Technology B. Pharm., B.H.M.S.,B.A.M.S., B.P.T., any Graduate course in Nursing (B.Sc. Nursing)

3. DURATION OF COURSE:

- The course of study for the Diploma in Medical Laboratory Technology shall be a of one Year duration.

4. MEDIUM OF INSTRUCTION AND EXAMINATION:

- In this course the medium of instruction will be English and the medium of examination will be English.

5. EXAMINATION

- There will be one University Examination at the end of academic Year.
- **Passing Marks of Examination:**
  The passing marks of examination would be 50% for each subject. The candidate has to pass in theory and practical examination separately.

  a. The candidate should pass separately in two heads i.e In Theory (Theory plus Viva voce plus Internal Assessment) and also in Practical (with 50% marks).
  b. The candidate has to pass separately in each subject in internal assessment examination (with 50% marks) in order to be eligible to appear in university examination.
  C. A candidate has to keep the minimum attendance of 80% in Theory and Practical separately.

- **Scheme of examination:**

Paper	subject	Theory		Practical		Total
		External	Internal	External	Internal	
Paper-1	Clinical Biochemistry	80	20	80	20	200
Paper-2	Medical Microbiology	80	20	80	20	200
Paper-3	Clinical Pathology & Blood Banking	80	20	80	20	200
Paper-4	Haematology & Histopathogogy	80	20	80	20	200
						800

- For the purpose of internal assessment the Institute will conduct at least one test in each term.

- **Award of class:**

1. The successful candidates who obtain overall at least 50% or more but less than60% marks in the total of Internal assessment & the University examination will be place in Second Class.
2. The successful candidates who obtain overall at least 60% or more but less than 70% marks in the total of Internal assessment & the University examination will be place in First Class.
3. The successful candidates who obtain overall at least 70% or more marks in the total of Internal assessment & the University examination will be declared to have passed the examination in First Class with Distinction.

6. MINIMUM REQUIREMENT FOR THE PGDMLT COURSE.

(a) There should be a own Hospital of the trust of minimum 50 bed or should have MOU with other Hospital to run the PGDMLT course.

(b) There should be following Infrastructure facilities to conduct PGDMLT with the trust.

Sr. No.	**Particulars**	**Reqiured Area in Sq.Mt.**
1	Administrative Office	50
2	Class Room	80
3	Laboratory	60
4	Library	80
5	Boy's Common Room & Girl's Common Room	30

(c) Requirements of Staff :

Sr. No.	**Particulars of Staff**	**Minimum Educational Qualification**	**Required No.**
1.	Teaching Staff	Bachelor in Medical Lab. Technology (BMLT), Msc.MLT, DMLT with Three Years Experience, Any Medical Graduate (M.B.B.S., B.H.M.S., B.A.M.S.), One M.D. (Patho.) must be in Teaching Faculty.	04
2.	Laboratory Technician	B.Sc. DMLT	01
3.	Administrative staff	H.S.C.	01

(d) Requirements of Instruments and Equipments.

Sr. No.	Name of Item	Required Quantity
1	Microscope (medical)	10
2	Esr equipment- westergren tube with stand	10 each
3	Haematocrit tubes	10
4	Auto analyser or semi analyser	01
5	Sahli haemoglobinometer	10
6	Haemocytometer	10
7	Computer with Accessory	01
8	Glassware like pipette, beakers, burettes, wire gauge with asbestos, center hot plate, stove, syringes, burners, rubber tubing stand clamps, flash etc...	As Required
9	Hot air oven (50 c) for special standing	01
10	Centrifuge machine electric rotofix	01
11	Water wath electric	01
12	Cell counter	01
13	Different stains	As Required
14	Different reagents	As Required
15	Incubator	01
16	Autoclave	01
17	Anaerobic apparatus	01
18	Stopwatch 1/2 sec.	02
19	Ph meter	As Required
20	Refrigerator	01
21	Colony counter	01
22	Material for preparation of media	As Required
23	Colorimeter	01
24	Different chemicals	As Required

Detailed Syllabus

PAPER I: CLINICAL BIOCHEMISTRY UNIT:1 Introduction & General aspects

- Introduction to Clinical Biochemistry
- Study of weights, volumes and Units, Inter-conversion of units, Measurements, Preparation of solution, Normal range
- Different anticoagulants used in Clinical Biochemistry, its application and Mechanism of action.
- Hazards in the Laboratory.

UNIT:2 Instrumentation

Automation in Clinical Biochemistry laboratory

Electrophoresis, Chromatography, Colorimeter, Spectrophotometer, ELISA, RIA, Flame photometer

UNIT:3 General Biochemistry of Carbohydrates

Classification, Boimedical importance, properties (chemical & physical)

Carbohydrate Metabolism (In brief) : Glycolysis, TCA, HMP shunt, Regulation of blood sugar, GTT, Diabetes

UNIT:4 General Biochemistry of Proteins

Amino acids, Peptides, Classification & Properties of Plasma proteins, Immunoglobulins,

Protein metabolism : Transamination, Deamination, Urea cycle, Phenyl ketonuria, Alkaptonuria.

UNIT:5 General Biochemistry of Lipids

Lipids: Definition, Classification, Properties, Phospholipids.

Lipid metabolism : Cholesterol, Lipoproteins, VLDL, LDL, HDL, Atherosclerosis, Ketosis, Lipid Profile

UNIT:6 Nucleic acids

Nucleotides : Nucleic acids, Functions (In Brief), Purine catabolism, Uric acid: Formation, Estimation, Interpretation, Gout

UNIT:7 Hemoglobin

Hemoglobin structure, Hbs, Thalassemia

Hemoglobin : Synthesis (In brief) Porphyrias, Heme breakdown, Bilirubin, Jaundice, Lab. diagnosis

UNIT:8 Enzymes

Enzymes : Definition, Classification, Factors affecting enzyme activity, Inhibition, Diagnostic use of Enzyme

UNIT:9 Minerals & Vitamins

Minerals : Calcium, Iron, Phosphorus, Iodine, Sodium & Potasium.

Vitamins (In brief) : A,D,E, K,B12,Folic acid & Vitamin C (In brief)

UNIT:10 Function Test

Liver Function tests: Introduction, function of liver, type of investigations carried out, normal range and interpretation of results

Renal function tests: Functions of kidneys, Various renal function tests including clearance tests and interpretation of results.

Thyroid function tests: Estimation of T-3, T-4, TSH, Interpretation of results. pH, Blood buffers, Acid-base balance, Anionic gap
Quality Control: Internal and External

Nice To Know:

UNIT:11 Nutrition

Principles of nutrition, Balance diet, BMR. Kwashiorkor and marasmus

UNIT:12 Molecular biology

Molecular biology (In brief) : Replication, transcription, DNA recombinant technology, Blot techniques, PCR

PAPER II: GENERAL & CLINICAL MICROBIOLOGY

MUST KNOW:

UNIT 1: HISTORY & CLASSIFICATION

History and Pioneers in Microbiology: Contributions of Antony Van Leeuwenhoek, Louis Pasteur, Joseph Lister, Robert Koch (Koch's Postulates)

Bacterial Taxonomy: Nomenclature and classification of microbes (in brief)

UNIT 2: MORPHOLOGY

Microscopy, Stained preparation, Size & Shape

Morphology of bacteria: Structures of a bacterial cell and their functions

Physiology of Bacteria: Nutrition, Gaseous requirement, temperature requirement and other growth requirements

UNIT 3: GENERAL MICROBIOLOGY

Sterilization and disinfection

Culture media

Culture methods

Identification of Bacteria: biochemical tests

Antibiotic sensitivity testing

UNIT 4: IMMUNOLOGY

Immunology

Infection, Immunity, Antigen, Antibody,

Antigen-Antibody reactions (General features, Precipitation, Agglutination, Complement fixation test, Immunofluorescence, Radio Immunoassay, ELISA),

Complement system,

Hypersensitivity

UNIT 5: SYSTEMIC MICROBIOLOGY

Staphylococcus, Streptococcus, Pneumococcus, Neisseria, Corynebacteria, Clostridia, Coliforms, Proteus, Salmonella, Shigella, Vibrio, Pseudomonas, Haemophillus, *Mycobacteria, Spirochaetes*

UNIT 6: MYCOLOGY

Morphological Classification of fungi

Laboratory diagnosis of Fungal Infections

UNIT 7: PARASITOLOGY

Morphology, life cycle, laboratory diagnosis of following parasites:

Protozoa:

Entamoeba, Giardia, Trichomonas, Leishmania, Plasmodium

Helminthology

Cestodes:

Taenia, Echinococcus

Nematodes:

Trichuris, Ancylostoma,

Ascaris, Enterobius, Wuchereria bancrofti(filaria)

UNIT 8: VIROLOGY

General Properties of Virus: Morphology, Replication & cultivation of viruses

Disease caused, Laboratory diagnosis & prevention of

Hepatitis viruses

HIV

UNIT 9: CLINICAL / APPLIED MICROBIOLOGY

Collection, Transportation & Culture of

Sputum and other respiratory specimens

Urine

Faeces

Blood

CSF and other body fluids

Hospital-acquired infections & Laboratory Hazards

Disposal of Biomedical waste

Quality control in Diagnostic Microbiology

Automation in Diagnostic Microbiology

Paper – III : Clinical Pathology & Blood Banking

Clinical Pathology

MUST KNOW

Urine Examination: Physical, Chemical and Microscopic

Stool examination : Gross, chemical & microscopic

CSF Examination

Semen examination

NICE TO KNOW

Sex chromatin determination.

Other body fluids examination

Quality control in Clinical Pathology

Blood Banking

MUST KNOW

Immunohematology of red cell and blood group systems

Apparatus used in blood banking, its care and cleaning

Record keeping

Methods of ABO and Rh blood grouping

Screening of a blood donor, tapping of blood donor

Cross matching tests

Storage of blood

Coomb's test

Blood component therapy

NICE TO KNOW

Antibody titrations

Blood transfusion reactions

Quality control in Blood Banking

Paper – IV: Hematology & Histopathology

Hematology

MUST KNOW

Vein puncture

Instruments used in hematology

Common anticoagulants and their use

Composition of blood cellular elements, functions of blood

Estimation of Hemoglobin

Methods and counting of red blood cells, white blood cells, platelets and reticulocytes.

Estimation of erythrocyte sedimentation rate, packed cell volume, blood indices

Preparation of blood films, staining methods and preparation of different stains and diluting fluids

Study of blood smear examination for red blood cells, different white blood cells, normal and abnormal cells, platelets, and parasites.

Studies for blood coagulation and haemostasis

Sickling tests, red cell fragility test and LE cell test. Foetal Hemoglobin

Estimation and Hemoglobin electrophoresis.

Basics of automated Blood Cell counters

NICE TO KNOW

Quality control in Hematology

Born Marrow Examination

Laboratory diagnosis approach on Anemias, Leukemias, and Bleeding disorders.

Unit: 2. Histopathology/Cytology

MUST KNOW

- introduction to Histology
- Handling Biopsy Specimen
- Instruments in Histopathology
- Fixation & common fixatives
- Tissue processing: dehydration, clearing, embeddi ng, methods of tissue processing: automated & manual, Preparation ob block.
- The manipulation and use of microtomes, Microtom knives and methods of sharpening. Paraffin block, section cutting, picking up sections, drying sections,
- Staining : principle of staining, preparation and use of Hematoxyline and eosin stain.
- Mounting,
- Frozen section apparatus: a theoretical knowledge of its application, construction and use.
- Diagnostic Cytology: preparation of smears and Pa panicolaou stain.

NICE TO KNOW

1. Quality control in Histopathology

- Methods in common use for decalcification
- recognition and correction of faults·in section cutting
- Preservation of slides and blocks

List of Practials/skills

1.Pathology:
Students should be able to perform:

Haematology :

1. Microscopy
2. Collection of Blood
3. Preparation of bulbs for collection
4. Blood cell counter
5. Estimation of Hemoglobin
6. RBC count
7. PCV & RBC indices
8. Platelet count
9. Total WBC count
10. Differential count
11. Peripheral smear
12. Reticulocyte count
13. ESR
14. Sickling tests
15. Bleeding time & Clotting time

Clinical Pathology
1. Urine Exam. R & M
2. Stool R & M
3. Semen examination R & M
4. CSF Exam. R & M

Blood Banking
1. Blood Group
2. CM Tests
3. Du Tests
4. Comb's Tests,
5. Antibody Tests

Histopathology & cytology

Must acquire
1. Preparation of fixatives
2. Haematoxylin and eosin

Nice to acquire:

1. Logging of tissue processing
2. Paraffin embedding
3. Section cutting
4. Staining
5. Mounting
6. Pap Stain.

2. Biochemistry:

Students should be able to perform:

Must acquire

1. Preparation of standard solution, molar solution and other reagents
2. analysis of normal and abnormal urine
3. Estimation of blood /serum glucose by various methods
4. GTT
5. Estimation of total protein and A/G ratio
6. Electrophoresis of plasma proteins
7. Electrophoresis of lipoproteins
8. Estimation of total cholesterol and its fractions
9. Estimation of calcium
10. Estimation of phosphorous
11. Estimation of Creatinine
12. Estimation of urea
13. Estimation of uric acid
14. Estimation of AST
15. Estimation of ALT
16. Estimation of alkaline phosphatase
17. Estimation of Bilirubin , direct , total
18. Auto analyzers
19. Electrolyte analyzer
20. Arterial blood gas analyzer
21. Chemiluminance equipment
22. Spectrophotometer

Nice to acquire:

1. Estimation of iron and TIBC
2. Chromatography

3. Microbiology:

Students should be able to perform:

Bacteriology

Must acquire

1. Aseptic practices in laboratory and safety precautions.
2. Preparation and pouring of media – Nutrient ag ar, Blood agar, Mac Conkey agar, Sugars, Serum sugars, TSI, Sabouraud dextrose.
3. Operation of autoclave, hot air oven, distillation plant, filters like Sietz and membrane and sterility tests.
4. Washing and sterilization of glassware (Plugging and packing)
5. Disposal of contaminated materials like cultures.
6. Quality control of media, reagents etc.
7. Care and maintenance of common laboratory equipments like water bath, centrifuge, refrigerators, incubators, etc.
8. Performance of antimicrobial suceptibility testing e.g. Kirby-Bauer,

9. Collection of specimens for Microbiological investigations such as Blood, Urine, Pus (Swabs),
10. Identification of Bacteria of Medical Importance upto species level
11. Preparation of stains viz. Gram, Ziehl Neelsen (ZN) etc. and performing of staining.
12. Care and operation of Microscopes viz. Light and Fluorescent microscopes.
13. Preparation, examination, and interpretation of direct smears from clinical specimens, viz. Sputum for AFB: ZN, Slit smears for *M. leprae* by modified ZN staining,
14. Quantitative analysis of urine by pour plate method and semi-quantitative analysis by standard loop test for finding significant bacteruria.
15. Plating of clinical specimens on media for isolation, purification, identification and quantitation purposes.
16. Methods for the preservation of bacteria, Maintenance of stock cultures.
17. Tests for motility: hanging drop preparation

Nice to acquire:

1. Techniques of anaerobiosis, anaerobic jars, evacuation and filling with CO_2 and H_2.
2. Preparation of stains viz., capsules, spores etc. and performing of staining.
3. Skin tests like Mantoux.
4. Special tests-Bile solubility, chick cell agglutination, sheep cell haemolysis, niacin and catalase tests for mycobacterium, satellitism, CAMP test, catalase, slide agglutination tests.
5. Culture and Antimicrobial susceptibility tests for mycobacteria.

Immunology

Must acquire :

1. Collection of blood by venipuncture, separation of serum and preservation of serum for short and long periods.
2. Performance of serological tests viz. Widal, VDRL/RPR
3. Enzyme linked immunosorbant assay: HIV, HBsAg, HCV
4. Latex agglutination tests: RA, CRP,
5. Rapid tests (Immunochromatography or Flow through type) HIV .

Nice to acquire:

1. Performance of serological tests viz. Brucella tube agglutination, Weil-Felix, cold agglutination, indirect haemagglutination, Paul-Bunnel, Rose-Waaler, IFA.

Mycology

Must acquire

1. Direct Examination of specimens by KOH, Gram, Kinyoun's, Giemsa, Lactophenol Cotton Blue stains.

Parasitology:

Must acquire

1. Performance of stains – Leishman, Giemsa.
2. Examination of faeces for parasitic ova and cysts etc. by direct and concentration methods (Salt flotation and Formol-Ether methods).

3. Examination of blood for protozoa and helminths by wet mount, thin and thick stained smears.

Nice to acquire:

1. Identification of common arthropods and other vectors viz., Mosquito, sand-fly, Ticks, Mite, Cyclops.
2. Collection of specimens.
3. Preservation of parasites-mounting, fixing, staining, etc.
4. Serodiagnosis of parasitic infection.

Virology:

Must acquire

- Serological tests – ELISA for HIV, HBsAg, HCV

Nice to acquire:

RPHA for HBsAg, Haemagglutination Inhibition for Influenza, and Haemadsorbtion for parainfluenza.
Chick Embryo techniques – inoculation and harvestin g.

SUGGESTED BOOKS :

- Dr. Praful B. Godkar,Text Books of Medical Laboratory Technology
- Anathanarayana & Panikar – A Text Book of Medical Microbiology
- P. Chakraborthy- A Text Book of Parasitology
- Vasudevan & Shreekumar : Biochemistry for Medical students
- Dacie, Practical Haematology
- K.Laxminarayan : Histological techniques
- Dr. Mukherjee, Medical Laboratory Technology, Volume I , II & II
- Silvertone : Introduction to Medical Lab. Technology
- Manual for Clinical Pathology by Sabitry Sanyal
- Harper's Biochemistry