Re-Accredited by NAAC with 'A' Grade
VEER NARMAD SOUTH GUJARAT UNIVERSITY
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વીર નર્મદ દક્ષિણ ગુજરાત યુનિવર્સિટી
યુનિવર્સિટી કેમ્પસ, ઉધના-મગદલ્લા રોડ, સુરત - ૩૯૫ ૦૦૭, ગુજરાત, ભારત.
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-: પરિપત્ર :-

વિજ્ઞાન વિદ્યાશાખા હેઠળની સંલગ્ન મેડીકલ ટેકનોલોજી વિષય ચલાવતી અનુસ્નાતક કોલેજોના આચાર્યશ્રીઓને જણાવવાનું કે, શૈક્ષણિક વર્ષ ૨૦૧૯–૨૦ થી અમલમાં આવનાર PGDMLTનો અભ્યાસક્રમ અંગે મેડીકલ ટેકનોલોજી વિષયની અભ્યાસસમિતિની તા.૩૦/૦૪/૨૦૧૯ની સભાનાં ઠરાવ ક્રમાંકઃ ૨ અન્વયે કરેલ નીચેની ભલામણ વિજ્ઞાન વિદ્યાશાખાની તા.૦૨/૦૫/૨૦૧૯ ની સભાનાં ઠરાવ ક્રમાંક : ૩૦ અન્વયે સ્વીકારી એકેડેમિક કાઉન્સિલને કરેલ ભલામણ એકેડેમિક કાઉન્સિલએ તેની તા.૦૭/૦૬/૨૦૧૯ ની સભાના ઠરાવ ક્રમાંકઃ ૫૭ અન્વયે સ્વીકારી મંજૂર કરેલ છે. તેની જાણ સંબંધકર્તા શિક્ષકો અને વિદ્યાર્થીઓને કરવી, તદ્ઉપરાંત તેનો અમલ કરવો.

મેડીકલ ટેકનોલોજી વિષયની અભ્યાસસમિતિની તા.૩૦/૦૪/૨૦૧૯ ની સભાનાં ઠરાવ ક્રમાંકઃ ૨

:: આથી ઠરાવવામાં આવે છે કે, પેટાસમિતિએ તૈયાર કરેલ PGDMLTનો શૈક્ષણિક વર્ષ ૨૦૧૯–૨૦ થી અમલમાં આવનાર અભ્યાસક્રમ સર્વાનુમતે મંજુર કરી તે મંજૂર કરવા વિજ્ઞાન વિદ્યાશાખાને ભલામણ કરવામાં આવે છે.

વિજ્ઞાન વિદ્યાશાખાની તા.૦૨/૦૫/૨૦૧૯ ની સભાનાં ઠરાવ ક્રમાંક : ૩૦

:: આથી ઠરાવવામાં આવે છે કે, પેટાસમિતિએ તૈયાર કરેલ PGDMLTનો શૈક્ષણિક વર્ષ ૨૦૧૯–૨૦ થી અમલમાં આવનાર અભ્યાસક્રમ સ્વીકારી તે મંજૂર કરવા એકેડેમિક કાઉન્સિલને ભલામણ કરવામાં આવે છે.

એકેડેમિક કાઉન્સિલની તા.૦૭/૦૬/૨૦૧૯ ની સભાનાં ઠરાવ ક્રમાંકઃ ૫૭

:: આથી ઠરાવવામાં આવે છે કે, વિજ્ઞાન વિદ્યાશાખાએ તેની તા. ૦૨/૦૫/૨૦૧૯ ની સભાના ઠરાવ ક્રમાંક : ૨૯ અન્વયે ભલામણ કરેલ શૈક્ષણિક વર્ષ ૨૦૧૯–૨૦ થી અમલમાં આવનાર PGDMLTનો અભ્યાસક્રમ સ્વીકારી મંજૂર કરવામાં આવે છે.

બિડાણઃ ઉપર મુજબ

ક્રમાંક : એકે./પરિપત્ર/૧૦૪૫૧/૧૯
તા. ૨૧–૦૬–૨૦૧૯

ઈ.ચા. કુલસચિવ

પ્રતિ,

૧) વિજ્ઞાન વિદ્યાશાખા હેઠળની મેડીકલ ટેકનોલોજી વિષય ચલાવતી સ્નાતક કોલેજોના આચાર્યશ્રીઓ .
૨) અધ્યક્ષશ્રી, વિજ્ઞાન વિદ્યાશાખા
૩) પરીક્ષા નિયામકશ્રી, પરીક્ષા વિભાગ, વી. ન. દ. ગુ. યુનિવર્સિટી, સુરત.
૪) પી.જી. વિભાગ, વી. ન. દ. ગુ. યુનિવર્સિટી, સુરત.

...તરફ જાણ તેમજ અમલ સારૂ.

P.G.DIPLOMA

IN

MEDICAL LABORATORY TECHNOLOGY

Post Graduate Diploma in Medical Laboratory Technology (PGDMLT) is a one year Post-Graduate (Post B.Sc.) course.

1. Title of the Course: P.G. Diploma in Medical Laboratory Technology (PGDMLT)

2. Eligibility: Candidate should have a B.Sc. degree of Veer Narmad South Gujarat University, Surat with (A) or (B) or equivalent qualification of other recognized University.

(A)Microbiology, Chemistry (Biology at F.Y.B.Sc. level), Botany, Zoology, Medical Technology, Biosciences, Biochemistry, Life sciences or Biotechnology as the principal subjects

(B) B.Pharm, B.Physio, M.B.B.S, BDS,BAMS, BHMS, B.sc Nursing, B.sc Optometry

3. Admission: Admission to the course should be done once in a year. The course will begin in the month of July, each year (After declaration of B.Sc. results of Universities) and will extend over two academic terms – July to October and November to April.

3. Learning objectives:

1. To have theoretical and practical knowledge about principles, procedures, interpretation and preparation of reagents for routine clinical laboratory investigations performed for laboratory diagnosis of various human diseases, so that after completion of the course the candidate may be able to perform routine clinical laboratory investigations in any clinical laboratory.

2. To have theoretical and practical know-how in advanced newer techniques so that trained personnel can apply these wherever facilities exist.

The learner at the end of the course will –

- Be able to work as technician in laboratories attached to hospitals under the supervisions of senior officers like Biochemist, Microbiologist or Pathologist.
- They may be employed in a small laboratory functioning independently or attached to a doctor's clinic. Nature of the job dictates that the candidate should give more emphasis on learning of practical skills along with a basic knowledge of the subject.
- Be able to carry out the routine tests in all these fields personally. He / She will maintain effective quality control and provide the patient with reliable reports.
- Will acquire the necessary oriental knowledge and practical skill expected of him for the fulfillment of above objectives.

- Acquire theoretical knowledge and practical skill leading to further specialization in the elective field.
- Process information and ensure quality control as appropriate to routine laboratories
- Upgrade knowledge and skills in a changing healthcare scenario
- Appreciate and follow the ethical standards of the profession and will demonstrate qualities of honesty and accuracy towards his work and sympathy towards the suffering patients.

4. Duration: One Year (Full Time)

5. Pattern: Annual

6. Medium of Instruction: English

7. Structure of the Course:

i. Total number of papers: THEORY: 4; PRACTICAL: 4

A student offering this course will study Papers I, II, III, IV & Practicals based on these papers.The teaching per week for 4 papers is 16 hours & there are 16 hours per week for practicals.

ii. Pattern of Examination: The examination shall be held for 700 marks.

The total marks of papers are 280 for University examination, distributed as 70 of each paper of 3 hours duration & the internal evaluation is of 120 marks distributed as 30 of each paper. The total marks of practicals are 210 for University examination, distributed as 54 for practical paper-I & practicals papers II, III, & IV are each of 52 marks. The internal evaluation for practical is of 90 marks distributed as 24, 22, 22, & 22 for practical based on Paper I, II, III & IV respectively. The University examination for practicals based on paper I is of 12 hours distributed over a period of 2 days & for practicals based on paper II, III, & IV are of one day each & 6 hours per day.

Theory examination for four subjects shall be conducted on separate days. Practical examination for four subjects will be conducted on five consecutive days.

University examination for DMLT will be conducted at the end of the course i.e. after completion of two academic terms. For failed candidates, midterm examination will be conducted in month of October or November.

iii. Nature of Question Paper (Theory): For university examination there shall be a question paper of 70 marks and three hours duration, for each subject. The paper shall be of following nature –PAPER STYLE

Paper No (Code) & Name of Paper; Section: Name of subject (35 Marks)

Q-1. Objective type Question (Multiple Choice/True or False/Short Answer type from all 6 Units(5 out of 6) 05 Mark.

Q-2. Descriptive Questions from Unit 1& 2(2 out of 3) 10 Marks

Q-3. Descriptive Questions from Unit 3& 4 (2 out of 3) 10 Marks

Q-4. Descriptive Questions from Unit 5& 6 (2 out of 3) 10 Marks

iv. Teaching and Examination hours break up:

PAPER NO.	PAPER CODE	TITLE OF THE PAPER/NAME OF THE SUBJECT	TOTAL MARKS			UNIVERSITY EXAM DURATION (HRS)	NO. OF LECTURES (1 HOUR DURATION) PER WEEK
			External	Internal	Total		
1	DMLT 1	Microbiology & Immunology	70	30	100	3	4
		Practical in Microbiology & Immunology	54	24	78	6X2=12	4
2	DMLT 2	Clinical Pathology & Parasitology	70	30	100	3	4
		Practical in Clinical Pathology & Parasitology	52	22	74	6	4
3	DMLT 3	Haematology & Blood Banking	70	30	100	3	4
		Practical in Haematology & Blood Banking	52	22	74	6	4
4	DMLT 4	Fundamentals in Medical Laboratory technology & Clinical Biochemistry	70	30	100	3	4
		Practical in Fundamentals in Medical Laboratory technology & Clinical Biochemistry	52	22	74	6	4
Total			490	210	700		32

v. Standard of Passing:

a. Candidate must obtain 40 % marks in theory papers and practical papers separately.

b. There will be a separate head of passing for theory papers and practical. If candidate fails in one of the heads, he / she has to reappear only for the failed head.

c. Training – The candidate has to complete the training in any recognized clinical laboratory or institute or hospital, of a period of minimum 30 days in each of the practical subject.

vi. Qualification of the Examiners:

All examiners on the University panel for theory and practical should have Master degree in the subject/ relevant subject. There will be two examiners (Preferably one internal and one external) for practical examination in each subject.

Introduction:

Medical laboratory Technology/Medical Technology is the branch of science which deals with all the clinical laboratory investigations on clinical samples for laboratory diagnosis of various diseases. Blood, tissue and body fluids are analyzed and examined for various types of foreign organisms and abnormalities. This information is then used by the medical team to make decisions regarding a patient's medical care. 85% of all medical decisions are based on the results of clinical laboratory investigation reports.

Medical Laboratory Science is an important subject in the field of Medicine. In each system of Medicine, diagnosis of disease is a primary step because no treatment is possible without a proper diagnosis. It is the Medical Laboratory Technocrat, who performs this important task by various scientific tools and techniques. In today‘s modern world of technology, the diagnosis, treatment & prognosis of various diseases depends upon the results of investigations carried out in a clinical laboratory. Thus, these professionals play a key role in the field of health care. Medical Laboratory Science has played a significant role in the advancement in the field of Medicine, especially in past few decades. As modern medicine becomes more of a team effort, the Medical Laboratory Scientist/Technologist is an important member and integral part of the Medical team.

Definition of Medical Laboratory Science:

“A medical laboratory professional (also referred to as a Medical Laboratory Technologist, a Clinical Laboratory Scientist or Clinical Laboratory Technologist) is a healthcare professional who performs chemical, hematological, immunologic, microscopic and microbiological diagnostic analyses on body fluids such as blood, urine, sputum, stool, cerebrospinal fluid (CSF), peritoneal fluid, pericardial fluid, and synovial fluid, as well as other specimens. Medical laboratory scientists work in clinical laboratories at hospitals, reference laboratories, biotechnology laboratories and non-clinical industrial labs.”

Education of the medical laboratory professional

When developing any education programme, it is necessary that programme planning should be outcome-based and should meet local and national manpower requirements. It should also provide personal satisfaction and career potential for the professionals with supporting pathway in the development of the profession. One of the major changes is the shift from a focus based on traditional theoretical knowledge, to askills-and competencies-based education and training. Optimal education/training requires that the student is able to integrate knowledge, skills and attitude in order to be able to perform a professional act adequately in a given situation. Thus, the following curriculum is prescriptive, aims to focus on a skills- and competencies-based approach for learning and is designed accordingly to standardize the content across the nation.

SUBJECT CODE: DMLT 1: PAPER – I: MEDICAL MICROBIOLOGY & IMMUNOLOGY

SECTION – I: MEDICAL MICROBIOLOGY

Rationale: The Medical Microbiology course has been formulated to impart basic and medically relevant information on the microbes. The microbial structure, growth and development, methods and role of sterilization in the context of study of microbes are included. The pathogenic microbes and the diseases caused by them are included to broaden the perspective of the subject. This course will also focus on mechanisms of microbial pathogenesis and the host response, and the scientific approaches that are used to investigate these processes. Lastly the course deals with the problem of emerging antimicrobial resistance with reference to known pathogens.

Unit	Topics	Content/ Fundamental Concepts
1.	INTRODUCTION TO CLINICAL MICROBIOLOGY	1.1 EVOLUTION AND HISTORY OF MICROBIOLOGY: ➢ Definition ➢ History ➢ Discovery of microorganisms ➢ Contributions of Louis Pasteur and Robert Koch in Medical Microbiology. 1.2 CLASSIFICATION OF MICROORGANISMS: ➢ General characteristics of prokaryotes & eukaryotes ➢ Morphological classification of bacteria ➢ Introduction to Bacterial cell structures 1.3 MICROSCOPY ➢ Introduction and history ➢ Types of microscopes:Principles & Components a) Light microscope b) DGI c) Fluorescent d) Phase contrast e) Electron microscope: Transmission/ Scanning ➢ Importance and applications of dyes, stains, fixatives, mordent and intensifiers.

2.	PURE CULTURE STUDY	2.1Types of media: Principle, composition and use ➢ Nutrient Agar ➢ MacConkey Agar ➢ Eosin Methylene Agar ➢ CLED Agar ➢ W B Agar ➢ Kings Agar ➢ MSA ➢ PSA 2.2 Methods of Cultivation ➢ Broth, slant and Stab ➢ Enrichment technique 2.3 Methods of Isolation 2.4 Preservation
3.	STERILIZATION AND DISINFECTION	3.1 Sterilization ➢ Introduction and Definition ➢ Principles and applications 3.2 Physical Methods ➢ Heat ➢ Radiation ➢ Filtration 3.3 Chemical methods ➢ Alcohol ➢ Phenol & phenolic compounds ➢ Hypochlorite ➢ ETO ➢ β- propionolactone

		3.4 Ideal characteristics and mode of action of Disinfectants 3.5 Antibiotic susceptibility test by disk diffusion technique
4.	LABORATORY DIAGNOSIS OF INFECTIOUS DISEASES	4.1 Collection, preservation, transport, processing and disposal of following clinical samples for culture ➢ Blood ➢ Throat ➢ Sputum ➢ Pus ➢ Urine ➢ Stool ➢ C.S.F ➢ Other body fluids
5	CLINICAL BACTERIOLOGY	5.1 Identification of microorganisms by morphological, cultural and biochemical characteristics ➢ *Staphylococcus aureus* ➢ *Bacillus cereus* ➢ *Escherichia coli* ➢ *Klebsiella spp.* ➢ *Enterobacter aerogenes* ➢ *Proteus vulgaris* ➢ *Salmonella spp.* ➢ *Pseudomonas aeruginosa* 5.2 Pathogenesis and laboratory diagnosis of microbial disease ➢ TB ➢ Syphilis ➢ Diphtheria ➢ Food poisoning ➢ Typhoid ➢ Leptospirosis 5.3 Nosocomial Infections 5.4 Automation

		➢ BACTEK ➢ VITEK
6	CLINICAL MYCOLOGY & VIROLOGY	5.1 Mycology ➢ Introduction of Mycosis ➢ Morphology of fungi ➢ Specimen collection & diagnostic methods of fungal infection 5.2 Virology: Morphology, Pathogenesis and Laboratory diagnosis of ➢ Hepatisis ➢ AIDS ➢ Dengue ➢ Chikunguinea

REFERENCE BOOKS:

1. Godkar P B.Text book of Medical Laboratory Technology, 2nd Edn.2003 Bhalani Publication.
2. Ananthnarayan R. and Jayram Paniker C.K. Text book of Medical Microiology,5th Edn. Orient Longman, Madras.
3. Mackie and McCartney Medical Microbiology. A Guide to Laboratory Diagnosis and control of Infection.13th ed., J.P.Duguid, B.P.Marmion and R.H.A.Swain, The English Language Book Society and Churchil Company.
4. Cheesbrough Monica ,District laboratory practice in tropical countries VOL-1 & 2, , Cambridge University Press.
5. Prescott M,Harley John P., Microbiology, 8th edition, Lansing, Donald A. Klein, McGraw Hill.
6. A text bool of Microbiology and immunology, 2nd Edition, Subhash Chandra Parija, ELSEVIER, a division of Reed Elsevier India Private Ltd.
7. Modi H.A.,Elementary Microbiology,Fundamentals of Microbiology,Vol-1,Akta Prakashan,Nadiad
8. Mukharjee K.L. (1999),*Medical Laboratory Technology*,Vol II, 2nd ed .,Tata MacGraw Hill.

SECTION – II: IMMUNOLOGY

Rationale: The students will learn how to analyze various clinical patients samples, for estimation of different components which are the cause of the immune disease or are the diagnostic/prognostic markers. This subject gives information about various clinically important cells of immune system,

lymphoid organs, antigen, antibody, Ag-Ab. reactions, transplant immunology etc. & automation techniques.

Unit	Topics	Content/ Fundamental Concepts
1.	IMMUNITY	1.1 Introduction 1.2 Classification of immunity a) Innate immunity b) Acquired immunity c) Active & Passive immunity d) Cell mediated immunity e) Humoral immunity 1.3 Organs and cells of immune system
2.	ANTIGEN & ANTIBODY	2.1 Antigens a) Defination, Characterstics ,Properties of antigen b) Classification of antigens. c) Types of Antigen- Haptens and Epitopes 2.2 Antibodies/ Immunoglobulins a) Defination, Characterstics,properties,Structure & Types of immunoglobulins b) Monoclonal Antibodies and their production c) Polyclonal antibody
3.	ANTIGEN-ANTIBODY REACTION	3.1 Defination, Mechanism and Factors affecting antigen –antibody reactions. 3.2 Principle, procedure and applications of various antigen antibody reactions a) Precipitation b) Agglutination c) Fluorescent – antibody technique d) RIA e) Enzyme linked immunosorbent assay (ELISA) f) Complement fixation test 3.3 Immunochromatograghy

4.	COMPLEMENT & VACCINES	4.1 Introduction, types & functions of complement system. 4.2 Introduction & types of vaccine. 4.3 Vaccination Schedule in India
5	IMMUNOLOGICAL DISORDER	5.1 Hypersensitivity: Classification and Immunological basis 5.2 Auto-immunity: Mechanisms and classification of auto immune disorders 5.3Immunodeficiency: Immunological basis of Primary and secondary Immunodeficiency Diseases
6	ADVANCED DIAGNOSTIC TECHNIQUES	6.1Blotting Techniques 6.2 Nucleic acid amplification test(NAT) 6.3 Chemilumenescence.

REFERENCE BOOKS:

1. Ananthnarayan R.and Jayram Paniker C.K. Text book of Medical Microiology,5th Edn. Orient Longman, Madras.
2. Godkar P B.Text book of Medical Laboratory Technology, 2nd Edn.2003 Bhalani Publication.
3. Roitt I.M.,Essential Immunology, 6 th Edn. ELBS, London
4. Talwar G. P.,A Hand book of Practical Immunology,1st Edn. Vikas Publishing House.
5. Owen,Judith A. ,PuntStanford,Sharon A.,Jones,Patricia P., Kuby Immunology.,7th ed.Macmillan Higher education Pub.

PRACTICAL BASED ON PAPER-1
SECTION-I:MEDICAL MICROBIOLOGY

1. Study of Compound Microscope.
2. Cleaning, Neutralization and preparation of glassware for sterilization.
3. Examination of living Bacteria.
    a) Wet mount preparation
    b) Hanging – drop technique.
    c) Semisolid stab agar test.
4. (A) Staining of the bacterial cell
    a) The Simple Stain

b) The Negative Stain.

(B) Differential Staining

a) The Gram Stain

b) The Acid fast Staining.

(C) Special Staining

a) The Spirocheate Stain

b) The Metachromatic Granules Stain.

c) The spore Stain

d) The Capsule Stain

5. Study of some important biochemical reactions.

a) Indole Test.

b) Methyl red Test.

c) V.P. Test.

d) Citrate Utilization Test.

e) H_2S Production (2% peptone)

f) Study of TSI slants with different

g) Fermentation of Sugars

h) Test for enzyme activity-Oxidase, Catalase, Coagulase, Urease,

6. Preparation of media, pH adjustment and preparation of buffers

(A) Bacteriological Media

a) Nutrient agar

b) MacConkey' agar

c) EMB agar

d) Wilson & Blair's agar for Salmonella sp.

e) CLED medium for Urinary Tract Infection.

f) King's medium for Pseudomonas sp.

g) Manitol Salt agar for *Staphylococcus* sp.

(B) Mycological Media

a) Potato – dextrose agar.

b) Glucose Yeast Extract agar.

c) Sabouraud's agar

7. Pure culture study of the following cultures.

(i) *Bacillus cereus*

(ii) Staphylococcus aureus

(iii) Escherichia coli

(iv) Enterobacter aerogenes(Klebsiella mobillis)

(v) Klebseilla pneumoniae

(vi) Proteus vulgaris

(viii)Salmonella typhi / paratyphi A / paratyphi B

(ix) Pseudomonas aerugenosa

7. Demonstration of common fungi - Penicillin, Aspergillus, Rhizopus, Mucar, Yeast.

8. Isolation and identification of aerobic and anaerobic bacterial/pathogens from pathological specimens.

9. Antimicrobial susceptibility testing by Kirby-Bauer method

SECTION-II: IMMUNOLOGY

Diagnostic tests:

1. ICT/Dot immunoassay/ Flow through assay for HIV Ab
2. ICT/Dot immunoassay/ Flow through assay for HBs Ag
3. ICT/Dot immunoassay/ Flow through assay for HCV Ab
4. Slide / Tube/ Strip / Cassette, Dot immunoassay test for typhoid
5. Slide test for syphilis/Flow through /Spot/ Immunodot for Syphillis
7. Slide / Strip / Cassette test for Pregnancy
8. Latex test for Rheumatoid arthritis
9. Latex test for C-Reactive protein
10. Latex test for Anti Streptolysin O(ASO).
11. Leptospirosis ICT (Demonstration)
12. Chickungunya ICT (IgG,IgM) (Demonstration)

VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT
REVISED SYLLABUS FOR P.G.DIPLOMA IN MEDICAL LABORATORY TECHNOLOGY

SUBJECT CODE: DMLT 2: PAPER – II: CLINICAL PATHOLOGY & PARASITOLOGY

SECTION – I: CLINICAL PATHOLOGY

Rationale: The candidates are imparted basic training of theoretical and practical in the field of clinical pathology.The training in this subject enables the students to carry out routine clinical laboratory investigation (urine, stool, sputum etc.). The candidates are made to learn collection of clinical samples and their processing along with basic histopathological technique and recording of data.

Unit	Topics	Content/ Fundamental Concepts
1.	URINE ANALYSIS	1.1 Formation of urine and its composition 1.2 Indications,Collection, Preservation & Transportation of Urine specimen. 1.3 Routine Examination -Physical, Chemical & Microscopic. 1.4 Correlation of urinary findings in various diseases. 1.5 Automated Urine Analysis & Reagent Strip Method 1.6 Pregnancy Test
2.	STOOL ANALYSIS	Indication, Collection, Preservation, Transportation of stool Routine - Physical, Chemical & Microscopic Examination of stool Significance of presence of blood and excess fat in stool. Occult blood – Detection Concentration methods for detection of intestinal parasites
3.	SEMEN ANALYSIS	3.1 Formation of semen 3.2 Indication, Collection, Preservation, Transportation of semen specimen 3.3 Physical, Chemical & Microscopic Examination as per WHO Recommendation. 3.4 Medico – legal significance of Semen examination.
4.	CEREBROSPINAL FLUID	4.1 Formation of C.S.F. 4.2 Composition of CSF. 4.3 Collection, Preservation & Transportation of C.S.F. 4.4 Physical, Chemical & Microscopic Examination. 4.5 Correlation of Abnormal C.S.F. findings in various diseases.

5	EXAMINATION OF BODY FLUIDS & SPUTUM	Formation ,Composition, Indications, Significance, Collection, Preservation, Transport and Routine Examination of 5.1 Pleural 5.2 Peritoneal 5.3 Pericardial 5.4Synovial fluid 5.5 Gastric Juice 5.6 Sputum
6	HISTOPATHOLOGY TECHNIQUES	6.1Introduction to Histotechnology 6.2 Types of fixatives uses. 6.3 Decalcification 6.4 Basic concept of tissue processing. 6.5 Microtomy & Types of Microtome 6.6 Principle & Procedure of Staining techniques: H &E, PAP 6.7 Automated tissue processing 6.8 Museum- Technique & Specimen preservation. 6.9 FNAC

REFERENCE BOOKS:

1. Godkar P. B. (2014). *Textbook of Medical Laboratory Technology*, 3rd ed., Bhalani Publishing house.

2. Ochei J. & Kolhatkar A. 2000, *Medical Laboratory Science: Theory & Practice,* Tata McGraw Hill Pub.

3. Mukharjee K.L. (1999),*Medical Laboratory Technology,*Vol II, 2nd ed .,Tata MacGraw Hill.

4. Mohan H. (2005). *Textbook of Pathology,* 5th ed., Jaypee Brothers Medical publishers (P) LTD.

5. Sood R. (1994) *Medical Laboratory Technology*, 4th ed., Jaypee Brothers.

6. Kawthalkar S M, Essential of Clinical Pathology,2nd ed., Jaypee Brothers.

SECTION – II: MEDICAL PARASITOLOGY

Rationale: The candidates undergoing training medical laboratory technology are made to learn the techniques of collection of samples, their processing and identification of various parasitic pathogens, using different procedures with special reference to their habitat, morphology, life cycle and their isolation, identification for diagnostic purpose.

Unit	Topics	Content/ Fundamental Concepts
1.	GENERAL PARASITOLOGY	1.1 Introduction to Medical Parasitology with respect to terms used in Parasitology 1.2 General characteristics and Classification of Parasite 1.3 Types of Parasite and Types of Host 1.4 Host –Parasite Relationship 1.5 Mode of transmission 1.6 Laboratory Diagnosis of Parasitic Infection
2.	PROTOZOOLOGY-I	Morphology, Life cycle,Mode of infection and Laboratory diagnosis 2.1 *Entamoeba histolytica* 2.2 *Trichomonas vaginalis* 2.3 *Naegleria fowleri* 2.4 *Acanthamoeba* species
3.	PROTOZOOLOGY -II	Morphology, Life cycle ,Mode of infection and Laboratory diagnosis 3.1 *Leishmania donovani* 3.2 *Giardia lamblia* 3.3 *Plasmodium falciparum & Plasmodium vivax* 3.4 *Toxoplasma gondii*

4.	CESTODES	Morphology, Life cycle , Mode of infection and Laboratory diagnosis 4.1 General characteristics of Cestodes 4.2 *Taenia saginata* 4.3 *Taenia solium* 4.4 *Echinococcus granulosus*
5	TREMATODES	Morphology, Life cycle , Mode of infection and Laboratory diagnosis 5.1 General characteristics of Trematodes 5.2 *Schistosoma haematobium* 5.3 *Schistosoma mansoni* 5.4 *Schistosoma japonicum*
6	NEMATODES	Morphology, Life cycle,Mode of Transmission and Laboratory diagnosis 6.1 General characteristics of Nematodes 6.2 *Trichuris trichiura* 6.3 *Strongiloides stercoralis* 6.4 *Anchylostoma duodenale* 6.5 *Enterobius vermicularis* 6.6 *Ascaris lumbricoides* 6.7 *Wuchereris bancrofti and Brugiya malayi.*

REFERENCE BOOKS:

1. Chatterjee K.D. (2009). *Parastology: Protozoology and Helthminthology in Relation to Clinical Medicine,* 13th ed., CBC Publishers & Distributors Pvt Ltd
2. Arora D.R. and Arora B. (2004). *Medical Parasitology*, 2nd ed., CBC Publishers & Distributors Pvt Ltd.
3. Godkar P. B. (2014). *Textbook of Medical Laboratory Technology*, 3rd ed., Bhalani Publishing house.
4. Ichhpujani RL and Bhatia Rajesh. *Medical parasitology.*3rd ed., JP
5. Chakraborty P. *Text book of Medical Parasitology*, 2nd ed., JP

PRACTICAL BASED ON PAPER-II

SECTION-I:CLINICAL PATHOLOGY

1. Routine Urine Analysis: Physical, Chemical, Microscopic examination. & Reagent Strip Method
2. Routine Stool Analysis: Physical, Chemical, Microscopic examination.
3. Routine Cerebrospinal Fluid Analysis: Physical, Chemical, Microscopic examination.
4. Routine Sputum examination: Physical, Microscopic
5. Routine Gastric Juice Analysis: Chemical examination of gastric juice.
6. Routine Semen Analysis: Physical, Chemical, Microscopic examination.
7. Routine Body fluids - Peritoneal, Pleural, Pericardial, Synovial (each separately): Physical, Chemical, Microscopic examination.
8. Cutting, Fixation and processing of tissues (Demonstration).

   Staining – (i) Haematoxylin and Eosin for paraffin sections.

   (ii) PAP Stain for cytology.

SECTION-II:PARASITOLOGY

1 Routine stool examination for detection of intestinal parasites with concentration methods: (Demonstration)

a) Saline preparation
b) Iodine preparation
c) Floatation method
d) Centrifugation method
e) Formal ether method
f) Zinc sulphate method

2. Identification of adult worms, Tapeworm segments ,ova, cysts, and larvae of parasite from charts/photographs/models/slides

3. Malarial Parasite Microscopy:

i. Preparation of thin and thick blood smears
ii. Staining of smears
iii. Examination of smears for malarial parasites (*P. vivax* and *P. falciparum*)
iv. Demonstration of various stages of life cycle of malarial parasites from stained slides

4. Malaria Rapid diagnostic test (RDT/ICT)

5.Test for Filarial parasite (slide/demonstration)

SUBJECT CODE: DMLT 3: PAPER – III: HAEMATOLOGY & BLOOD BANKING

SECTION – I:HAEMATOLOGY

Rationale: The training in this subject is imparted to enable the students to carry out routine clinical laboratory investigation in haematology or related to blood. They should be able to provide technical help for selected sophisticated hematological techniques with adequate knowledge of various principles.

Unit	Topics	Content/ Fundamental Concepts
1.	INTRODUCTION TO HAEMATOLOGY	1.1 Definition, composition and functions of blood. 1.2 Collection & Storage of blood:venous and capillary. 1.3 Various equipment used for collection of blood samples 1.4 Anticoagulants: Definition and various types along with their mode of action, uses, methods of preparation merits and demerits of each. 1.5 Formation of blood: Erythropoiesis, Leucopoiesis, Thrombopoiesis.
3.	HAEMOGLOBIN & HAEMOGLOBIN OPATHIES	2.1Definition, types, structure of Hb 2.2Hb Estimation: Different methods-(a) Colorimetric Method, (b) Sahli's Method, and (c) Specific Gravity Method. 2.3 Clinical importance, Normal ,abnormal values and Physiological variations 2.4 Haemoglobinopathies: Abnormalities of Haemoglobin Molecule. Sickle Cell Anaemia &Thalassemia 2.5 Tests for Haemoglobinopathies: Screening test : Sickling test, DTT, NESTROF Confirmative test: Electrophoresis & HPLC
3.	RED BLOOD CELLS & ANAEMIAS	1.1 RBC count: Normal, abnormal values, and Physiological variations 1.2 Morphology of normal and abnormal Red Blood Cells. 1.3 Reticulocyte count 1.4 Erythrocyte Sedimentation Rate (ESR), 1.5 Haematocrit: Pack Cell Volume(PCV) and Various Blood indices; their brief description 1.6 Anemia: Definition and classification of anemia; factor causing anemia a) Iron & B-12 deficiency anaemia. b) Aplastic anaemia c) Haemolytic anaemia & Sideroblastic anaemia. d) G-6PD deficiency anaemia.

4.	WHITE BLOOD CELLS & LEUKAEMIAS	4.1 Total White Blood Cell Count : Normal and abnormal values 4.2 Differential WBC Count :- Normal, abnormal values and physiological variation; Preparation of peripheral blood smear, Staining by different methods. 4.3 Introduction and general Classification of Leukaemias. Acute & Chronic Myeloid Leukaemias.
5	HAEMOSTASIS & BLOOD COAGULATION	5.1 Coagulation Factors, Mechanism of Blood Coagulation. 5.2 Coagulation disorders, Haemophilia A & Haemophilia B 5.3 Platelet disorders and Platelet count. 5.4Coagulation defect test – a) Bleeding time (BT), b) Clotting time(CT), c) Prothrombin time (PT), d) Activated Partial Thromo Plastin time (APTT), e) Thrombin time f) Fibrinogen g) D- dimer h) Fibrin degradation product.
6	AUTOMATION & QUALITY CONTROL IN HEMATOLOGY	6.1 Basic concepts of automation in Haematology with special reference to: a) Blood cell counter b) Coagulometer 6.2 Quality control in Hematology.

REFERENCE BOOKS:

1. Godkar P.B, Textbook of MLT, 3rd edition, Bhalani Publications.
2. Mukherjee .L. K , Medical Laboratory Technology,Vol.1-3, 3rd edition, Tata McGraw Hill
3. Wintrobe's Clinical Haematology, 14th edition, Lippincott Williams & Wilkins
4. De Gruchy's Clinical Haematology in Medical Practice, Sixth edition, Wiley Publications
5. Sood Ramnik, Text book of Medical Laboratory Technology, 5th edition, Jaypee Publications
6. Dacie & Lewis Practical Haematology, 12th edition, Elsevier Publications

SECTION – II: BLOOD BANKING

Rationale: The candidates are taught the skill of blood collection from donors and preventive measures against communicable diseases. They should be able to perform different investigations, preservation and interpretation.

Unit	Topics	Content/ Fundamental Concepts
1.	BLOOD GROUP SYSTEM –I & II	1.1 ABO blood Group system, subgroup of ABO, Variants of ABO blood group system. 1.2 Rh blood group system. 1.3 Serological techniques for detection of ABO & Rh antigens. 1.4 Gel technique for blood grouping and serological Techniques. 1.5 AHG test. 1.6 Other Blood Group systems 1.7 Importance of Atypical antibodies, their detection and clinical significance
2.	BLOOD COLLECTION &COMPONENT PREPARATION	2.1 Screening of Donor 2.2 Phlebotomy of Blood Donor 2.3 Storage and transportation of blood 2.4 Mandatory screening tests-HIV1&HIV2, HBsAg, HCV, RPR & Malaria. 2.5 Component preparation: a) Red cell concentrate b) Fresh Frozen Plasma c) Cryoprecipitate d) Platelet concentrate 2.6 Introduction of apheresis and Single donor platelet (SDP)
3.	COMPATIBILITY TESTING AND ISSUE OF BLOOD FOR TRANSFUSION	3.1 Compatibility testing and special methods of routine and emergency cross match 3.2 Problems and Trouble shooting in grouping and Cross matching 3.3 Discrepancies in ABO grouping 3.4 Selection of Blood/Blood Components for Transfusion

4.	TRANSFUSION REACTION AND HDN	4.1 Types of Transfusion reaction 4.2 Investigation of Transfusion reaction. 4.3 Hemolytic disease of Newborn due to ABO, Rh or Other blood group incompatibility
5	AUTOMATION AND BIOSAFETY IN BLOOD BANKING	5.1 Automation in Blood collection 5.2 Automation in blood grouping , Cross matching 5.2 Bio safety and Biomedical waste management
6	QUALITY CONTROL IN BLOOD BANKING	6.1 QC of reagents-Parameters, Quality Requirements and frequency 6.2 QC of Blood Components- Parameters, Quality Requirements and frequency

REFERENCE BOOKS:

1. Denise Harmening ,Modern Blood banking and Transfusion Practices, 6th Edition 2012.
2. Saran RK., Transfusion Medicine Technical Manual, ed, 2nd ed, Directorate General of Health Service (DGHS), Ministry of Health & Family Welfare, 2003.
3. Mollison PL,Engelfriet CP and Marcela Contreras: Blood Transfusion in Clinical Medicine. 12th edition, Blackwell Science, 2014
4. Makroo R.N., Compendium of Transfusion Medicine, Practice of Safe Blood Transfusion,
5. Technical Manual, American Association of Blood Banks, 1996.
6. Technical Manual, American Association of Blood Banks, 2014
7. Wintrobe.M.M.,Clinical Haematology, Kothari's Indian Edition.
8. Dacei J.A & Lewis S.M. Practical Haematology. The English Language Book Society. 8th ed., ELBS
9. Choudhury Nabajyoti,Bharucha Zarin Soli., A Textbook on Laboratory and Clinical Transfusion Medicine. Volume 2: Basics of Blood Bank Practices (Process Control), 2017

PRACTICAL BASED ON PAPER III

SECTION-I:HAEMATOLOGY
1. Methods of Blood Collection and Anticoagulants
2. Haemoglobin estimation: Sahli's method and Cyanmethaemoglobin method.
3. Total R.B.C.
4. Total W.B.C. Count.

5. Differential Count.
6. Platelet Count.
7. Reticulocyte Count
8. E.S.R.
9. Packed cell volume/ Determination of Haematocrit.
10. Bleeding time, Whole Blood Coagulation time and Prothrombin time.
11. Osmotic fragility test –single tube test.
12. Preparation of various stains & reagents for hematology test
13. Sickling test.- Slide Test, DTT

SECTION – II: BLOOD BANKING.

1. ABO (Forward) and RH grouping by slide method.
2. ABO (Forward) and RH grouping by Tube method.
3. Reverse grouping
4. Direct Antiglobulin Test (DAT)
5. Indirect antiglobulin test (IAT)
6. Tests for Weak D testing by albumin and indirect antiglobulin technique
7. Anti A/ Anti B titer
8. Anti D titration by albumin and indirect antiglobulin technique
9. Cross matching by saline, albumin and IAT
10. Test for HBsAg (Hepatitis B surface Antigen) ELISA and Rapid Test.
11. Test for HIV / HCV Antibodies (ELISA and Rapid Test)
12. Visit to a Blood Bank.

VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT

REVISED SYLLABUS FOR P.G.DIPLOMA OF MEDICAL LABORATORY TECHNOLOGY

SUBJECT CODE: DMLT 4: PAPER – IV: CLINICAL BIOCHEMISTRY

SECTION – I: LABORATORY INSTRUMENTATION AND FUNDAMENTAL OF CLINICAL BIOCHEMISTRY

Rationale: The main objective of the subject is to impart the knowledge of apparatus, units, equipment, and volumetric analysis in the laboratory of clinical Biochemistry. The students are also given basic training in safety measures quality control and automation.

Unit	Topics	Content/ Fundamental Concepts

1.	BASICS OF CLINICAL LABORATORY	1.1 Introduction to Medical Laboratory Technology a) Role of Medical lab Technologist b) Ethics and responsibility 1.2 Safety measures for Mechanical, Electrical, Chemical, Radioactive and Biological hazards; Universal safety precautions. 1.3 First aid 1.4 Units of Measurements 1.5 Reagent Grade Water 1.6 Types and Preparation of Solutions 1.7 Acid, Base, p^H, Indicators, Buffer and Buffering action 1.8 Introduction to laboratory accreditation (NABL)
2.	LABORATORY INSTRUMENTS- I	Principle, Component, Operations , Maintenance and Applications of 2.1 Balance 2.2 P^H Meter 2.3 Centrifuge 2.4 Water Distillation Apparatus
3.	LABORATORY INSTRUMENTS- II	Principle, Component, Operations , Maintenance and Applications of 3.1 Colorimeter 3.2 Spectrophotometer 3.3 Flame Photometer 3.4 Turbidiometer

4.	ELECTROPHORESIS & CHROMATOGRAPHY	4.1 Electrophoresis: a) Principle b) Factors Affecting Electrophoresis c) Support Media d) Types Of Electrophoresis: PAGE & SDS 4.2 Chromatography a) Principle b) Types c) Applications
5	AUTOMATION IN BIOCHEMISTRY	5.1 Types Of Biochemistry Analyzer a) Continuous Flow Analysers b) Discrete Chemistry Analysers c) Centrifugal Analysers d) Dry Chemistry Analysers 5.2 Advantages and Disadvantages Of Automation 5.3 Blood Gas Analysers
6	QUALITY CONTROL	6.1 Analytical Variables: ➢ Accuracy, Precission and Reliability ➢ Standard and Control ➢ Sensitivity and Specificity ➢ Types of Error ➢ Mean, Standard Deviation, Co-Efficient Of Variation and Central Tendency 6.2 Internal and External Quality Control 6.3 Preparation Of Quality Control Charts ➢ Levy-Jenning Chart And Gaussian Curve ➢ Cusum Chart 6.4 Westguard Multirule Chart 6.5 Various Ways of Maintaining Quality Control

REFERENCE BOOK

1. P.B. Godkar, 2014, *Textbook of Medical Laboratory Technology*, 3rd ed., Bhalani Publishering House, Mumbai, India.
2. Ochei J. & Kolhatkar A. 2000, *Medical Laboratory Science: Theory & Practice*, Tata McGraw Hill Pub.
3. Wilson K. & Walker J., *Practical Biochemistry: Principles & Technique*, 5 ed., Cambridge University Press.
4. Tambwekar S., Handbook of Quality Assurance in Laboratory medicine., BI
5. Veerakumari L., Bio Instrumentation., MJP

SECTION – II:CLINICAL BIOCHEMISTRY

Rationale: The candidates are imparted specialized training of theory and practical in the field of clinical biochemistry. The students will learn how to analyze various clinical patients samples, for estimation of different components which are the cause of the disease or are the diagnostic/prognostic markers. This subject gives information about various clinically important enzymes & learn special biochemical investigations e.g. LFT, RFT, etc.

Unit	Topics	Content/ Fundamental Concepts
1.	CARBOHYDRATES	1.1 Definition, Classification, Functions of Carbohydrates. 1.2 Digestion, absorption of Carbohydrates. 1.3 Regulation of blood glucose & its importance, 1.4 Hyperglycemia, Hypoglycemia 1.5 Diabetes & Diabetic Profile. 1.6 Blood Glucose estimation & Glucose Tolerance Test Glucocylated Hb
2.	PLASMA PROTEINS	2.1 Definition, Classification , Functions of Plasma Proteins 2.3 Plasma Proteins estimations. 2.4 Clinical significance plasma protein; Bence-Jones' Proteins and Cryoglobulins.

3.	LIPIDS AND LIPOPROTEINS	3.1 Lipid: Definition, Classification , Functions, Essential Fatty Acids 3.2 Lipoproteins: Classification and its Separation methods 3.3Important Lipid Profile Tests- cholesterol, triglyceride, Lipoproteins, phospholipids and its significance in various disorders.
4.	CLINICAL ENZYMOLOGY AND ENDOCRINOLOGY	4.1 Definition, Classification, Factors affecting enzyme activity, Isoenzymes and Coenzymes. 4.2 Clinical Enzymology: Therapeutic, diagnostic and analytical uses of enzymes 4.3 Estimation Methods and Diagostic Importance of Enzymes & Isoenzymes: a) Phosphatases b) Transaminases c) Lactate Dehydrogenases d) Creatine Kinase e) Amylase f) Lipase g) Gama Glutamyl Transferase 4.4 HORMONES: a) Types and biochemical functions. b) Determination of T3, T4, TSH.
5	FUNCTION TESTS	5.1 Liver Function Tests 5.2 Renal Function Tests 5.3 Cardiac Function Tests
6	ELECTROLYTES AND VITAMINS	6.1 Minerals and Electrolytes determination and clinical Significance ➢ Sodium ➢ Potassium ➢ Chloride ➢ Calcium ➢ Phosphorus ➢ Iron & TIBC 6.2 Vitamins ➢ Brief Classification and Clinical Significance

		➢ Determination of Vitamin B_{12} and D_3.

REFERENCE BOOK

1. P.B. Godkar, 2014, *Textbook of Medical Laboratory Technology*, 3rd ed., Bhalani Publishering House, Mumbai, India.
2. Ochei J. & Kolhatkar A. 2000, *Medical Laboratory Science: Theory & Practice,* Tata McGraw Hill Pub.
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6. Harold Varley, 1990, *Practical Clinical Biochemistry* , Indian Edition, Anold Heinemann.
7. Satyanarayan, U. Chakrapani, Biochemistry, 3rd edition, Books & Allied Pvt Ltd Kolkatta.

PRACTICAL BASED ON PAPER IV

SECTION – I: LABORATORY INSTRUMENTATION AND FUNDAMENTAL OF CLINICAL BIOCHEMISTRY

1. Operation of - pH meter, Single pan Balance, Spectrophotometer, Colorimeter, Autoanalyzer ,Centrifuge.

SECTION – 1I : CLINICAL BIOCHEMISTRY

Preferably all the test should be done on semi Auto analyser.

1. Blood Glucose/Sugar estimation and GTT.
2. Blood Cholesterol – Free & Total HDL Cholesterol, LDL Cholesterol.
3. Serum Triglyceride
4. Serum Total Protein and Serum Albumin and A/G ratio
5. Microalbumin test
6. Blood/Urine Urea.
7. Blood /Urine Creatinine.
8. Blood /urine Uric Acid
9. Serum Calcium / Ionized Calcium
10. Serum Phosphorus
11. Serum potassium
12. Serum Sodium
13. Serum Chloride

14. Serum Iron, and TIBC (Total Iron Binding Capacity)
15. Serum Bilirubin.
16. Serum Alkaline Phosphatase.
17. Serum Acid Phosphatase.
18. S.G.O.T
19. S.G.P.T.
20. LDH
21. CPK
22. Serum Amylase.
23. Serum Lipase
24. Serum Protein Electrophoresis and Lipoprotein electrophoresis (Demonstration).
25. Cardiac Troponin T (Demonstration)
26. Cardiac Troponin I (Demonstration)
27. T3 ,T4, TSH ELISA (Demonstration)