

KRISHNAGURU ADHYATMIK VISVAVIDYALAYA,

NASATRA, SARTHEBARI, BARPETA, ASSAM-781307

www.kav.ac.in

CURRICULUM FOR DIPLOMA IN MEDICAL LABORATORY TECHNOLOGY

(ACADEMIC YEAR 2025-26)

COURSE NAME: DIPLOMA in (MEDICAL LABORATORY TECHNOLOGY)

DURATION OF COURSE: TWO YEARS

FULL-TIME/PART-TIME: FULL-TIME

IMPLEMENTATION FROM: 2025

1. Diploma in Medical Laboratory Technology

Medical Laboratory Technology, also known as clinical laboratory sciences, is an allied health/ paramedical profession, which is concerned with the diagnosis, treatment and prevention of disease through the use of clinical laboratory tests. Doctors rely on laboratory technologies to detect, diagnose and treat diseases. DMLT courses covers the basics of preclinical subjects such as Biochemistry, Pathology, Microbiology and Blood Banking Medical Laboratory Technologists (MLT) do these tests by analyzing body fluids, tissues, blood typing microorganism screening, chemical analyses, cell counts of human body etc.

2. Duration of Course

The Diploma in Medical Laboratory Technology Course is proposed to be 2 years diploma course.

3. Eligibility Criteria for Admission

The students shall be admitted as per the admission criteria and qualification prescribed in the Notification issued by the Board of Management of KRISHNAGURU ADHYATMIK VISVAVIDYALAYA from time to time.

4. Medium of Instructions

The Medium of instruction during the course and for the university examination shall be in English.

5. Examination Scheme

The examination for the first and second shall ordinarily be held twice in the months of May/June and November/December by the Institute as per University rules.

Annual Examination shall be held in AUG/SEP and supplementary within 6 months of annual examination.

The examination in theory/practical shall be held at the end of the 1st academic year (1stYear) and the end of 2nd academic year (2ndYear) with one internal and one external examiners.

Date of examination and appointment of examiner will be made by the Board of Management on recommendation of Faculty of Medical Sciences.

The examination for the first, second year of Diploma in Medical Laboratory Technology Course would be held according to the prescribed syllabus.

6. Rules of Examination for Diploma in Medical Laboratory Technology Course:

The students shall submit his/her application for admission to the examination to Controller of Examinations KAV through the Principal of the on the prescribed form with the required fee (the last date of which will be updated on university website after notification issued from Board of Management time to time).

The candidates will be given 25 marks for theory and 15 marks for practical as internal assessment in each subject on the basis of their performance during the year. That a

Candidate be eligible to appear in the examination provided he/she secured a minimum of 35% marks in internal assessment in theory and practical.

There will be fresh internal assessment and compulsory attendance for the students for the examination in which he/she has failed at the time of subsequent examination in that subject.

The students will not be allowed to appear in the examination unless he/she attends 75% of the total theory and practical in each subject separately.

Director Principal of the college is empowered to condone the shortage of attendance of lectures to the extent of 5% lectures delivered in each course of theory and practical.

A student will be deemed to have passed in the examination if he/she passes in each subject separately.

In case of students joining late owing to the late admission with the approval of the Vice- chancellor, their lecturers are to be counted from the date of joining. Deficiency in studies should be made up by attending special classes for them at the level of Head of the Department.

7. **First Year Diploma in Medical Laboratory Technology Examination:**

The First Year **Diploma in Medical Laboratory Technology** examination shall be in the following subjects and candidate shall be required to pass all the subjects:-

Diploma Part– I

Paper	Subject	Theory			Practical			Grand Total
		Marks	Internal Assessment	Total	Marks	Internal	Total	
Paper-I	Basic Principles of Biochemistry	75	25	100	35	15	50	150
Paper-II	Fundamentals of Histopathology and Cytology	75	25	100	35	15	50	150
Paper-III	Basic Techniques in Laboratory Hematology, Blood Banking and Clinical Pathology	75	25	100	35	15	50	150
Paper-IV	General Microbiology, Immunology	75	25	100	35	15	50	150
	Basics of Computer	----	-----	-----	----	----	----	---

Note. The Examination in the subject of Basics of Computer will be conducted at college level and marks will be sent to University for final inclusion in the result.

GradingSystem

MarksRange	81-100	76-80	71-75	61-70	51-60	41-50	31-40	0-30
Grade	A+	A	B+	B	C+	C	D	E

8. **Second Year Diploma in Medical Laboratory Technology Examination:**

The First Year Diploma in Medical Laboratory Technology Examination shall be open to a person who has previously passed the Second Year Diploma in Medical Laboratory Technology Examination of this University.

Diploma Part–II

S. No.	Subject	Theory			Practical			Grand Total
		Marks	Internal	Total	Marks	Internal Assessment	Total	
Paper-I	Analytical Biochemistry and Metabolism	75	25	100	35	15	50	150
Paper-II	Basic Cellular Pathology, Allied Techniques, Cytology and Histopathology	75	25	100	35	15	50	150
Paper-III	Fundamentals of Hematology	75	25	100	35	15	50	150
Paper-IV	Systemic Microbiology including Bacteriology, Virology, Mycology and Parasitology	75	25	100	35	15	50	150

9. Promotion and Number of Attempts allowed

A candidate who fails in all the subjects in the First Year Diploma in Medical Laboratory Technology examination shall not be promoted to Second Year class.

A Candidate who fails in one more or more subjects will be given four attempts including first attempt as a regular candidate, plus one mercy chance at the discretion of the Vice-Chancellor, at six monthly intervals. However, he/she will have to clear all these attempts within 4 years of admission to the said course.

The candidate who will absent himself/herself from the examination will be deemed to have been failed in that subject.

A candidate who passes in atleast one subject of University level First Year Diploma in Medical Laboratory Technology examination will be permitted to attend classes of Second Year. However, the candidate will be required to pass in all subjects of 1st Year examination atleast 6 months before the final examination of 2nd Year examination.

Candidate who passes in one or more subjects of Second Year Diploma in Medical Laboratory Technology examination shall be exempted from appearing in these subject at a subsequent examination, but the candidate must pass the examination in a maximum of four attempts including first attempt, as a regular candidate plus one mercy chance at the discretion of the Vice-Chancellor, at six monthly intervals. However, he/she will have to clear all these attempts within 4 years of admission to the said course.

10. Appointments of Examiners:

There shall be two examiners – One internal and one external.

Professor & head of the Department shall be Convener. The Examiner at least 3 years post PG teaching experience in that specification field will be appointed as Internal Examiner.

The external examiner shall be appointed from other Universities at least 3 years post PG teaching experience in that specification field.

11. Paper Setting and moderation of Question Papers

The questions papers for 1st Year and 2nd Year will be set under the direction of Controller of Examinations.

Each Question Paper covering entire course consists of seven questions out of which six questions carry 10 Marks and one question carry 15 marks.

12. Evaluation of Answer Books

The answer books shall be got evaluated by putting fictitious roll numbers thereon or spot evaluation (Table marking) or any other method under the direction of the Controller of Examinations.

13. Minimum Pass Marks

During all the three annual examinations in each subject paper the candidate shall have to obtain 50% in theory, practical & internal assessment taken together.

The successful candidates shall be classified into divisions as under:-

- a. Those who obtain 60% or more marks First Division.
- b. Those who obtain 50% or more marks but below 60% marks Second Division.
- c. A candidate who will obtain 75% or more marks of the total marks in any subject shall be declared to have obtained distinction in that subject provided he/she passed in all the subjects of the courses in all the parts in the first attempt.
- d. A candidate is eligible to appear in the examination provided he/she secures a minimum of 35% marks in internal assessment in theory and practical separately.

14. Grace Marks

There shall be no provision for grace marks.

15. Declaration of Result

The results will be tabulated and declared by the Controller of Examination's office.

16. Award of Diploma

On successfully passing the Second Year Diploma in Medical Laboratory Technology examination the students shall be awarded the diploma of Diploma in Medical Laboratory Technology.

SYLLABUS–DIPLOMA IN MEDICAL LABORATORY TECHNOLOGY

Course Distribution: **First Year**

Subject	Theory Hours	Practical and Training Hours	Total Hours
Anatomy, Physiology a) Anatomy b) Physiology			
Biochemistry	64	256	320
Fundamentals of MLT & Microbiology	64	256	320
Fundamentals of Histopathology/ Histotechnology and Cytology	60	250	310
Basic Techniques in Laboratory Haematology and Clinical Pathology	60	250	310
Total	248	1012	1260

Second Year

Subject	Theory Hours	Practical and training Hours	Total Hours
Biochemistry	64	256	320
Basic Cellular Pathology, Allied Techniques, Cytology and Histopathology	60	250	310
Fundamentals of Hematology, clinical pathology and Blood Banking	60	250	310
Microbiology	64	256	320
Total	248	1012	1260

SYLLABUS FOR DIPLOMA IN MEDICAL LABORATORY 1st YEAR

Curriculum & Syllabus

1.ANATOMY & PHYSIOLOGY

Module1: Introduction to anatomy

Scope of Anatomy and Physiology– Definitions and Terms in Anatomy and Physiology- Structure and function of human cell – Elementary tissues of human body – Brief account on Composition of Blood – Functions of blood elements – Blood Group and coagulation of blood.

Module2: Cardio Vascular System

Structure and function of various parts of the heart, arterial and venous system, brief account on common cardiovascular disorders

Module3: Respiratory System

Various parts of respiratory system and their functions, Physiology of Respirations

Module4: Digestive System

Names and various parts of digestive system–Liver, Spleen, Gall Bladder, Pancreas, Buccal Cavity, Pharynx, Oesophagus, Stomach, Intestine etc. physiology of digestion and absorption

Module 5: Urinary System

Various parts of urinary system and its function- structure and function of kidneys–physiology of urine formation – pathophysiology of renal disease and edema

Module6: Reproductive System

Physiology and anatomy of male & female reproductive system – Prostate & Uterus & Ovaries etc.

Module7: Musculoskeletal System

Classification of bones & joints, Structure of skeleton – structure of skeletal muscle- physiology of muscle contraction

Module8: Nervous System

Various parts of nervous system- Brain and its parts- functions of nervous system – Spinal Cord & Nerves

Module9: Endocrine System

Endocrine glands, their hormones and functions – Thyroid, Parathyroid, Suprarenal, Pituitary, Pituitary and Thymus

Module10: Haemopoietic and Lymphatic System

Name of the blood vessels & Lymph gland locations

Module11: Surface Anatomy & Surface Marking of Human Body

Practical's

- Study of Human Skeleton parts with skeletal models.
- Study with charts and models of all organ systems mention above.
- Microscopic slides examination of elementary human tissues, cells.

REFERENCES

1. Solomon. E.A.,(2008)Introduction to Human Anatomy and Physiology 3rd Ed, Saunders: St Louis.
2. Chaurasia, B.D, & Garg K.,(2012) Human Anatomy Regional and Applied CBS Publications : New Delhi

3. T.S Ranganathan –A textbook of Human Anatomy
4. Fattana, Human anatomy (Description and applied) Sauder's & C P Prism Publishers, Bangalore – 1991

PAPER-I: BASIC PRINCIPLES OF BIOCHEMISTRY (1STYEAR)

RATIONALE

The students are imparted basic training of theoretical and practical aspects in the field of clinical biochemistry. The students are made to learn the technique of collection of clinical samples and their processing along with recording of data. The students will also obtained the basic knowledge of chemistry and metabolism of various metabolites which are routinely estimated in different diseases so that a clear understanding of the different test is obtained. The students are also given basic training in safety measures, quality control and automation. The students are imparted basic training of theoretical and practical aspects in the field of clinical biochemistry. The students are made to learn the techniques of collection of clinical sample and their processing along with recording of data. The students will also obtain the basic knowledge of chemistry and metabolism of various metabolites which are routinely estimated in different disease so that a clear understanding of the different tests is obtained. The students are also given training in safety measures, quality control and automation.

DETAILED CONTENTS

THEORY :

1. Chemistry Of Carbohydrates

Introduction: Definition, functions, classification, Types (Monosaccharide, Disaccharide, Oligosaccharide & Polysaccharide).

2. Chemistry Of Proteins

Introduction, Definition and classification of amino acids, Functions and classification of proteins.

3. Chemistry Of Lipids

Lipids (Essential fatty acids/triacylglycerol/phospholipids):-Introduction: Definition, functions, Classification, types (Simple, Complex, Derived, Miscellaneous, Neutral Lipids).

4. Heme Metabolism

Bilirubin Metabolism, Formation and excretion of bilirubin, Formation of bile pigments, Conjugated and unconjugated bilirubin

5. Principle and procedures of serum bilirubin estimation (Direct&Indirect)

Van den bergh test

6. Jaundice and its clinical aspects.

7. Vitamins and minerals

PRACTICAL TOPICS

1. Introduction to biochemistry (4 hrs)
 - Definition
 - Importance of Biochemistry
 - SI Units and their use
 - Volumetric apparatus and their calibration
2. Handling and maintenance of Balance, Centrifuge, Colorimeter, ion Selective electrode and flucmeter
3. Preparation of various anticoagulants and specimen collection vials/containers
4. Collection of blood by various methods including vacutainer system
5. Preparation of different protein precipitating agents, PFF preparation
6. Qualitative Estimation Of Normal and Abnormal urine components.
7. Quantitative Estimation of blood glucose/sugar (Folin-Wu method, O-toluidine method and enzymatic method)
8. Serum urea estimation
9. Serum creatinine estimation
10. Serum uric acid estimation
11. Plasma and serum protein estimation
12. Estimation of electrolyte levels of Na^+ , K^+ and Cl^- by flame photometer and kit method.

TRAINING TOPICS

1. Cleaning and storage of laboratory, glass and plastic ware (8hrs)
 - Cleaning and care of laboratory glass and plasticware
 - Different cleaning agents (soaps, detergents, chromic acid)
 - Methods of cleaning and storage
2. Standardization of glassware

3. Important instruments; principle, working, handling and care of (18hrs)
- Balance (Analytical, electrical/ electronic)
 - Centrifuge
 - Colorimeter
 - Spectrophotometer
 - Ion selective electrodes
 - Glucometer
4. Anticoagulants
- Definition
 - Types
 - Uses
 - Merits and Demerits
5. Blood fractions
- Preparation of Serum
 - Preparation of Plasma
6. Collection and preservation of clinical specimens
- Blood
 - Urine
 - Stool
 - Other Body fluids
7. Separation of serum and plasma
8. Solutions: Definition, Preparation of solutions, Molarity, Molality, Normality.
9. pH Measurement, pH indicators, Buffers solutions, pH meter
10. Principle and methods of estimation
- Reference values
 - True and apparent sugar
 - Renal threshold
 - Important and Performance of ST/GTT
 - Clinical importance of blood sugar, ST/GTT
11. Reference values and Clinical importance of various parameters.
12. Preparation of all types of reagents.

RECOMMENDED BOOKS

1. Textbook on Biochemistry for DMLT & Paramedical courses. Dr IClements.
2. A Procedure Manual for Routine Diagnostic Tests Vol.I and III by KL Mukerjee; Tata McGraw Hill publishers, New Delhi
3. Biochemistry estimations by F. J. Baker

PAPER-II: FUNDAMENTALS OF HISTOPATHOLOGY AND CYTOLOGY

HISTOPATHOLOGY AND CYTOLOGY-I (FirstYear)

RATIONALE

This part of the subject is aimed at introducing the students to the various types of tissue preparations and developing expertise in the students to cut very thin tissue sections from tissue blocks and facilitate visualization using various stains and dyes. Cytology part aims at exposing the students to the latest advancements in cytological investigations.

DETAILED CONTENTS

Theory

1. Introduction and definition of:
 - Histology
 - Histopathology
 - Biopsy
 - Autopsy
 - Autolysis
 - Putrefaction
2. Preparation of Tissue (Different Methods of Preparation of Tissue)
 - Unfixed Tissue preparations
 - Imprint methods – Impression Smears
 - Teased preparation
 - Squashed preparation
 - Frozen section
 - Fixed Tissue preparations (introduction only)
 - Paraffin embedding
 - Celloidin embedding
 - Gelatin embedding
3. Reception, recording, labeling and preservation of histological specimen.
4. Fixation (Histological Specimens)
 - Classification of fixatives
 - Composition of various fixatives
 - Advantages and disadvantages
5. Processing (by Paraffin Technique)
 - Dehydration
 - Clearing/De alcoholization
 - Infiltration and impregnation
 - Paraffin embedding
 - Automation: Histokinete (automatic tissue processor) - its types, working, care and maintenance.
6. Microtome
 - Microtomy
 - Types

Advantages and disadvantages

Working principle, care and maintenance

7. Microtome Knives

Various types of knives

Sharpening of knives

- Honing technique
- Stropping technique
- Automation: Automatic knife sharpener—uses, care and maintenance
- Stropping technique
- Uses of abrasives and lubricants

Section Cutting

Rough cutting

Fine cutting

Use of tissue floatation bath

Use of various adhesive media and lifting of sections to the slide

Errors/cutting faults in sections and their remedies

8. Theory of staining (Routine)

Dye Chemistry

Principle and mechanism of routine stain (Haematoxylin and Eosin)

Various steps of staining (Haematoxylin and Eosin)

- Hydration
- Nuclear Staining
- Differentiation
- Blueing
- Counterstaining
- Dehydration
- Clearing and Mounting
- Results

Automation: Use of automatic stainer and coverslipper

9. Mountants

Various types of mounting media (aqueous, resinous)

Advantages and Disadvantages

10. Various Terms associated with staining

Solvents

Mordants

Metachromasia

Accelerators

Progressive and regressive staining

Use of controls in staining and their significance

11. Cell

Definition and function

Structure

12. Exfoliative Cytology

Introduction

Preparation of vaginal & cervical smears

Collection and Processing of specimen for cytology

- Urine

- Sputum
- CSF (CerebroSpinal Fluid)
- Other fluids

13. Fixation (Cytological Specimen)

Definition

Various types of Cytological fixatives

Advantages and Disadvantages

14. Cytological Staining

Principle, Technique and interpretation of results in

- Papanicolaou staining
- MayGrunwald & Giemsa staining
- Haematoxylin and Eosin staining

15. Role of Laminar air flow and cytotechnician in cytology

LIST OF PRACTICALS

1. Reception of specimen, labeling and preserving the specimen
2. Preparation of various smears by unfixed methods
 - Imprint smears
 - Teased smears
 - Squashed smears
3. Preparation of different fixatives with special emphasis on preparation of formaline based fixatives.
4. Preparation of paraffin blocks from various tissue pieces and labeling with emphasis on orientation
5. Handling of microtome
6. Sharpening of microtome knives
7. Preparation of blocks for fine cutting
 - Rough cutting
 - Trimming
8. Practice of fine section cutting
9. Practice of lifting of sections on the slides
10. Performing H&E staining on sections
11. Mounting and labeling of tissue section using various mounting medias
12. Demonstration of cell
13. Processing of urine samples for malignant cells
14. Processing of sputum sample for malignant cytology
15. To perform PAP stain on given smear
16. To perform MGG stain on given smear
17. To perform H&E on given smear

PAPER-III: BASIC TECHNIQUES IN LABORATORY HEMATOLOGY, BLOOD BANKING AND CLINICAL PATHOLOGY

RATIONALE

The training in hematology is imparted to enable the students to know the principle of tests, methodology of routine as well as advanced procedures being carried out in the laboratory by using routine as well as sophisticated instruments. He should also be able to carry out routine clinical laboratory investigation (blood, urine etc). Stress is also given in use of safety measures in the laboratory

DETAILED CONTENTS

Theory

1. Introduction to haematology
Various apparatus used in haematology labs.
Precautions to be taken while working in a lab.
Role of technician in infection control
2. Apparatus and Instruments
Parts, functions, principle, maintenance and working of microscope, centrifuge machine, water bath, hot air oven and incubator, blood counter, blood mixture.
3. Haemopoiesis
Erythropoiesis, leucopoiesis, thrombopoiesis
Definition, composition and functions of blood
Factor effecting/Contributing haemopoiesis
4. Anticoagulants
Definition and various types of anticoagulants along with their mode of action their preparation with merits and demerits of each
5. Diluting fluid (Hb, TLC, Platelets, RBC count) Uses, preparation and composition.
6. Collection and preservation of blood
Collection of blood; venous and capillary
Various equipment used for collection of blood samples
Safety measures at the time of sampling and collection
Preservation and disposal of processed blood samples
Changes on stored blood
7. Romanowsky stains
Theory and preparation
Choice of slide and spreader and preparation of blood film
Characteristics of good film preparation
Staining procedure
Effects of pH on staining

LIST OF PRACTICALS

1. Demonstration of various parts of centrifuge; its functioning and care
 2. Demonstration of various parts of microscope its functioning and care
 3. Cleaning and drying of glass and plasticware
 4. Preparation of various anticoagulants
 5. Collection of venous and capillary blood
 6. Preparation of the stains and other reagents
 7. Preparation of peripheral blood film (PBF)
 8. To stain a peripheral blood film by Romanowsky stain
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8. Haemoglobinometry
Formation of haemoglobin, function and its degradation
Types of haemoglobin

- Various methods of estimation with specific reference to cyanmethaemoglobin method.
9. Haemocytometry
 - Various counting chambers
 - Methods of counting of RBC, WBC and platelets, their calculation and reference values.
 - Errors involved in haemocytometry and means to minimize them
 10. Differential leucocyte counting (DLC)
 - Preparation and staining of bloodfilm
 - Performance of DLC
 - Normal values and significance of DLC
 - Blood cell morphology in health and disease
 11. Quality Assurance in haematology such as accuracy, precision etc.
 12. Automation in haematology such as bloodcell counters

LIST OF PRACTICALS

1. Preparation of peripheral blood film and recognition of different cellular components
2. Preparation and standardization of stains (leishman and giemsa)
3. Preparation of thick and thin blood smear
4. Haemoglobin Estimation by Oxy-Hb and Cyanmethaemoglobin method
5. Counting of RBC
6. Counting of WBC
7. Platelet counting
8. Absolute eosinophil counting
9. Study of morphology of normal RBC and WBC with the help of stained slide
10. To study abnormal morphology of RBC with the help of stained slide
11. To study abnormal morphology of WBC with the help of stained slide
12. To study abnormal morphology of platelet with the help of stained slide

PAPER– IV: GENERAL MICROBIOLOGY& IMMUNOLOGY

(INCLUDING GENERAL BACTERIOLOGY, VIROLOGY, MYCOLOGY, PARASITOLOGY & IMMUNOLOGY)

Rationale:

The students undergoing training of medical laboratory technology are given the knowledge of basic morphological features of bacteria, their staining characters, sterilization methods, preparation of culture media, biochemical test for identification of bacteria and their anti- microbial sensitivity tests. They are also taught safety measures in microbiology.

Detailed content:

THEORY

1. Introduction & brief history of Microbiology- Louis Pasteur, Robert Koch, Joseph Lister, Paul Ehrlich, Edward Jenner.
2. Microscope
 - Principles, functioning, care of microscopes - Light microscope, Dark ground microscope, Phase contrast microscope, Fluorescent microscope, Electron microscope.

3. Principals and methods of sterilization and disinfection
4. Preparation uses and standardization of culture media
5. Antibiotic susceptibility test.
6. Principles of staining methods and preparation of reagents.

Bacteriology

1. Introduction to Bacteriology
2. General characteristics and classification of bacteria
3. Growth and nutrition of Bacteria
4. Identification of bacteria

Immunology

1. Introduction to immunology
2. Immunity
3. Antigens, Antibodies

Mycology

1. Introduction to mycology
2. Classification of fungi
3. Classification of fungal diseases
4. Lab diagnosis of fungi

Virology

1. General properties of viruses including Size, shape, symmetry, Cultivation of viruses by various methods, inclusion body
2. Classification of viruses by various methods
3. Lab diagnosis of viral infections, including collection, transportation processing and storage of various samples.

Parasitology

1. Introduction to parasitology- Direct and indirect life cycle, host, symbiosis, commensalism.
2. General characters, classification of protozoa of medical importance.
3. Protozoology –Definition, Morphology, Classification of protozoal parasites
4. Helminthology – Definition, Classification, Difference between cestodes, trematodes and nematodes
5. Morphology, lifecycle, pathogenicity and lab, diagnosis of intestinal protozoa:-
Entamoeba histolytica, Entamoeba coli, Giardia intestinalis, Balantidium coli, Free living amoebae, Cryptosporidium, Isospora and Microsporidium.
6. Morphology, lifecycle, pathogenicity and lab.Diagnosis of haemoprotozoa:-
— Genus Plasmodium,
— Genus Leishmania

LIST OF PRACTICALS

1. Demonstration of safety rules (universal precautions) in a microbiology laboratory.
2. Preparation of cleaning agents and techniques of cleaning of glass and plasticware.
3. Sterilization by autoclave and hot air oven.
4. Sterilization by filtration (Seitz)
5. Handling and use of Compound microscope
6. Staining techniques: Gram, Albert's, Ziehl –Neelson's
7. KOH preparation
8. Demonstration of motility (Hanging drop method)
9. Preparation and sterilization of various culture media (Nutrient agar, Nutrient broth, Blood agar, Chocolate agar, Mac-Conkey agar, Lowenstein-Jensen Media).
10. Aerobic and anaerobic culture methods
11. Antimicrobial susceptibility testing by Stokes disc diffusion method
12. Biochemical testing (Carbohydrate utilization tests, Catalase, Oxidase, Coagulase, Indole, MR
13. Stool examination: Methods of collection, transportation and processing of stool samples for intestinal protozoa
14. Collection, handling, storage of samples for viral diagnosis.

BASICS OF COMPUTERS

Theory : 30 hours

Practicals: 30 hours

THEORY

Introduction to computer– I/O devices–memories–RAM and ROM– Different kinds of ROM – kilobytes, MB, GB their conversions – large computer – Medium, Micro, Mini computers - Different operating system – Networking – LAN, WAN, MAN (only basic ideas)

Typing text in MS word – Manipulating text – Formatting the text – using different font sizes, bold, italics – Bullets and numbering – Pictures, file insertion – Aligning the text and justify – choosing paper size–adjusting margins –Header and footer, inserting page No's in a document –Printing a file with options– Using spell check and grammar–Find and replace –Mail merge –inserting tables in a document.

Creating table in MS-Excel– Cell editing–Using formulas and functions–Manipulating data with excel – Using sort function to sort numbers and alphabets – Drawing graphs and charts using data in excel – Auto formatting – Inserting data from other worksheets.

Preparing new slides using MS- POWERPOINT – Inserting slides – slide transition and animation–Using templates–Different text and font sizes–slides with sounds–Inserting clip arts, pictures, tables and graphs – Presentation using wizards.

Introduction to Internet – Using search engine – Google search – Exploring the net using Internet Explorer and Navigator–Uploading and Download of files and images–E-mail ID creation – Sending messages – Attaching files in E- mail.

Role of Computers in the Healthcare:-HIS, Medical Equipment, Pharmacy in inventory management, Patient record maintenance.

PRACTICAL

- Typing a text and aligning the text with different formats using MS-Word
- Inserting a table with proper alignment and using MS-Word- Create mail merge document using MS-word to prepare greetings for 10 friends
- Preparing a slides how with transition, animation and sound effect using MS Powerpoint
- Customizing the slideshow and inserting pictures and tables in the slides using MS powerpoint
- Creating a work sheet using MS-Excel with data and sue of functions Using MS Excel prepare a worksheet with text, date time and data Preparing a chart and pie diagrams using MS-Excel
- Using Internetforsearching,uploadingfiles,downloadingfilescreatinge-mailID

2NDYEAR

PAPAR-I: ANALYTICAL BIOCHEMISTRY AND METABOLISM

RATOINALE

The students are imparted basic training of theoretical and practical aspects in the field of clinical biochemistry. The students are made to learn the techniques of collection of clinical samples and their processing along with recording of data. The student will also obtain the basic knowledge of chemistry and metabolism of various metabolites which are routinely estimated in different diseases so that a clear understanding of the different tests is obtained. The students are also given basic training in safety measures, quality control and automation. The students are imparted basic training of theoretical and practical aspects in the field of clinical biochemistry. The students are made to learn the technique of collection of clinical samples and their processing along with recording of data. The student will also obtain the basic knowledge of chemistry and metabolism of various metabolites which are routinely estimated in different diseases so that a clear understanding of different tests is obtained. The students are also given basic training in safety measures, quality control and automation.

DETAILED CONTENTS

Theory

1. Metabolism Of Carbohydrates

Outline of Glycolysis, outline of TCA, outline of Gluconeogenesis outline of Glycogen metabolism (Glycogenesis, Glycogenolysis, Glycogenstorage disease, Hormonal regulation) Outline of HMP (Biomedical importance and metabolic disorder and regulation), GTT.

2. Metabolism of Proteins

Oxidative and nonoxidative deamination, Transamination and decarboxylation, Transamidation, Transport and function of ammonia, Urea cycle with inborn errors of metabolism; Outline of metabolism, Specialised products and inborn errors of glycine,

Phenylalanin, Tyrosine, Tryptophan, Methionine, Cysteine, Cystine and Histidine, Branch chain amino acids, Creatinine metabolism

3. Metabolism of Lipids

Outline of B fatty acid oxidation along with inborn errors, Outline of fatty acids synthesis, Outline of Cholesterol: Synthesis, Catabolism, Regulation, Inborn errors and atherosclerosis, Outline of Lipoproteins, Ketosis, Lipid Peroxidation and role of antioxidants.

4. Renal Function Tests

- 1 Renal clearance test-Principles and Procedures
- 2 Clinical importance

5. Quality Assurance in Biochemistry as per National Standards

6. Internal quality assurance

7. External quality assurance

Training

1. Urine Analysis

- a. Normal composition of urine and its properties
- b. Clinical importance of Urine analysis
- c. Qualitative analysis of proteins, sugar, bile salts, bile pigments, Urobilinogen and blood.
- d. Detailed discussion on glycosuria and albuminuria
- e. Ketone bodies.

2. Stool Chemistry

- a. Physical characteristics and chemical composition of stool
- b. Significance of presence of blood and excess fat in stool
- c. Occult blood detection

3. Cerebrospinal fluid

- a. Composition and functions of CSF
- b. Methods of determination of proteins, sugar and chloride in CSF
- c. Reference values
- d. Clinical importance

4. Biological fluids

Formation, composition and significance of biological fluids (peritoneal, pleural, synovial, ascetic fluid and gastric juice)

5. Electrophoresis

- a. Theory
- b. Principles and procedure of paper, gel electrophoresis, method of elution
- c. Clinical importance

6. Chromatography

- a. Theory of Chromatography, separation between stationary and mobile phases
- b. Principle and procedure of Paper chromatography
- c. Importance of chromatography

7. Automation in Biochemistry

8. Thyroid function tests

Functions of thyroid

Principle, reference values and clinical importance of T₃, T₄ and TSH

List of Practicals

Quantitative Estimation Of:

1. Serum Bilirubin estimation
2. Phosphorus estimation
3. Calcium estimation
4. Renal clearance tests
5. SGOT estimation
6. SGPT estimation
7. ALP estimation
8. ACP estimation
9. Total cholesterol estimation
10. Triglyceride estimation
11. Estimation of HDL and calculation of VLDL and LDL
12. Urinary protein and creatinine estimation (24hr)
13. Estimation of serum amylase
14. Analysis of urine for sugar and proteins (qualitative and quantitative)
15. Detection of ketone bodies in urine
16. Detection of haematuria
17. Detection of bile pigments, bile salts and urobilinogen
18. Occult blood test for stool specimen
19. Estimation of glucose, Total proteins, globulins and chloride in CSF
20. Demonstration of electrophoresis (Paper electrophoresis)
21. Demonstration of chromatography (Paper chromatography)

INSTRUCTIONAL STRATEGY

Teachers should lay emphasis on concepts and principles while covering the subject contents. In the practical work, the students should be given opportunity to do practical work individually.

Visits to hospital/medical colleagues should be planned to demonstrate the processes. It is important to make use of models and audio visual aids to show specific processes. Experts should be invited to deliver lecture on specific topics and share their experiences.

RECOMMENDED BOOKS

1. A Procedure Manual for Routine Diagnostic Tests, Vol. I, II and III by KL Mukherjee; Tata MC Graw Hill Publishers, New Delhi
2. Practical Clinical Biochemistry by Varley; Heinmann Publishers, Oxford
3. A textbook of Medical Laboratory Technology by P Godkar; Bhalani Publishers, Mumbai
4. Medical Laboratory Sciences Theory and Practice by J Ochaie and A Kolhatkar, Tata McGraw Hill

PAPER-II: BASIC CELLULAR PATHOLOGY, ALLIED TECHNIQUES, CYTOLOGY AND HISTOPATHOLOGY

HISTOPATHOLOGY AND CYTOLOGY–II (Second Year)

DETAILED CONTENT

Theory

1. Light Microscope
 - Principles of light microscope
 - Various parts of microscope
 - Uses of microscope
 - Cleaning and maintenance of microscope
 - Various attachments of light microscope (introduction only)
 - Polarizing
 - Dark field
 - Phase contrast
 - Fluorescent
2. Special stains
 - Principle, significance and interpretation of different types of stains
 - PAS
 - Silver impregnation stain–Reticulin fibre
 - Ziehl Neelson's–for AFB and Leptrae
 - Masson's trichrome stain
 - Pearl's Prussian Blue– Iron
 - OilRed O – fat
 - Gram's stain–Gram+ve and Gram –ve
3. Decalcification
 - Process of decalcification
 - Various types of decalcifying methods
 - Their mechanism, advantage, disadvantage and applications
 - Assessment of decalcification
4. Handling of fresh histological tissues (Frozen Section)

- Reception and processing of frozen tissue
- Freezing microtome and cryostat
- Advantages and dis-advantages of freezing microtome and cryostat
- Working, care, maintenance of freezing microtome and cryostat
- Frozen section cutting
- Staining
 - Rapid H&E
 - Fat stain
- Mounting of frozen section
- 5. Museum Techniques
 - Introduction to museum with emphasis on importance of museum
 - Reception, fixation and processing of various museum specimens
 - Preparation of mounting solutions
 - Technique of mounting specimen
 - Care of mounted specimen
 - Cataloguing of museum specimen
- 6. Autopsy
 - Introduction to autopsy technique
 - Use of autopsy
- 7. Malignant Cells
 - Characteristics
 - Differences from normal cell
- 8. Hormonal Assessment
 - Introduction
 - Uses
- 9. Sex Chromatin (Barr bodies)
 - Introduction
 - Collection of sample
 - Staining
 - Interpretation
- 10. Aspiration Cytology
 - Principle of FNAC(Fine Needle Aspiration Cytology)
 - Indications of FNAC
 - Uses of FNAC
 - Staining Techniques
 - MGG (May-Grunwald–Giemsa)
 - PAP (Papanicolaou Stain)
 - H&E (Haematoxylin & Eosin Stain)
- 11. Cytological special stains Principle, Technique & Interpretation of
 - PAS (Periodic Acid Schiffs reagent Stain)
 - Zeihl Neelson's (ZN) Stain (AFB)
- 12. Advancement
 - Automation in Cytology-Use of Cytospin
 - Immunohistochemistry: Principle and Role
 - Immunohistochemistry: Antigen & Antibody binding
 - Immunohistochemistry: Retrieval
 - Immunohistochemistry: Procedure
 - Immunohistochemistry: Interpretation

LIST OF PRACTICALS

1. Demonstration of various parts of light microscope (Mechanical & Optical)
2. Demonstration of cryostat
3. Processing of tissue for frozen section
4. Staining and mounting of frozen section using H&E stain (rapid method), Oil Red “O”.
5. Preparation of various mounting reagents for museums specimens
6. Demonstration and care of autopsy instruments
7. Demonstration of malignant cell
8. Preparation, Staining and interpretation of buccal smear
9. Preparation of dry smear and wet smear
10. To perform Pap stain
11. Fixation of smears and staining with MGG
12. Immunohistochemistry

RECOMMENDED BOOKS

1. Theory and Practice of Histological Technique by JohnD. Bancroft, Churchill Livingstone, London
2. Laboratory Practices in Surgical Pathology by Shameen Shariff. JayPee Publishing House, New Delhi

PAPER-III: FUNDAMENTALS OF HEMATOLOGY

HAEMATOLOGY-II (SecondYear)

DETAILED CONTENTS

Theory

1. Erythrocyte sedimentation rate (ESR) and packed cell volume (PCV)
 - Introduction
 - Various methods of estimation of ESR and PCV and their merits and demerits
 - Factors involved in ESR
 - Interpretation of results
2. Red Cell indices (Mean Corpuscular Values) – MCV, MCH, MCHC Theory, reference range, calculation and interpretation
3. Supravital stain and reticulocyte counting
 - Introduction
 - Principle and procedure of staining and calculation
 - Reference values and interpretation
 - Variation in Physiological Values
4. Anemias
 - Definition and classification
 - Laboratory diagnosis of:
 - (a) Iron deficiency anaemia

- (b) Megaloblastic anaemia
- (c) Haemolytic anaemia
- (d) Aplastic anaemia

5. Tests of Various Hemolytic Anaemias

Principle and procedure

Clinical importance

Foetal Haemoglobin

Osmotic Fragility Test

G-6PD Test

Sickling Test

LIST OF PRACTICALS

1. ESR estimations (wintrobe and westergren) in blood
2. Determination of PCV (wintrobe and capillary) in blood
3. Counting of Reticulocyte in blood
4. To perform red cell fragility test on blood
5. To perform Sickling test on blood
6. Estimation of foetal haemoglobin by alkali denaturation test
7. Estimation of plasma haemoglobin and G₆PD (MRT)

Theory

6. Introduction to normal haemostasis

Theories of blood coagulation

Platelets and their role in haemostasis

Bleeding disorders and related diseases

Principles, clinical importance, reference values and methods of: prothrombin time, prothrombin time index (PTI) International normalized ratio (INR), Activated Partial Thromboplastin time (APTT)– bleeding time (BT), Hess test, clotting time (CT), and clot retraction test (CRT)

7. Bone– marrow

Composition and function of bone-marrow

Aspiration of bone- marrow by various methods

Preparation, staining and examination of bone-marrow smears

Iron staining (Perls' reaction)

Significance of bone-marrow examination

8. Leukemia

Definition of leukemias

Classification (FAB)

Laboratory diagnosis of various leukemias

9. LE Cell phenomenon

Phenomenon of L E cell, its differentiation from tart cell

Demonstration of LE cell by various methods

Clinical importance

10. Processing of biological fluids and interpretation of results such as semen, CSF, pleural and ascitic fluids, urine

LIST OF PRACTICALS

1. Determination of bleeding time by Ivy's and Dukes method
2. Determination of clotting time by Lee and white and capillary method
3. Determination of prothrombin time, index and INR (International Normalised Ratio)
4. Determination of Activated Partial thromboplastin time (APTT)
Demonstration of Hess test
5. Performance of Clot retraction test
6. Demonstration of LE Cell
7. Processing of biological body fluids

RECOMMENDED BOOKS

1. Practical Pathology, P. Chakraborty, New Central Book Agency (P) Ltd New Delhi.
2. Medical Lab Technology Methods and Interpretations. Ramneek Sood. Jaypee Publishing Company, New Delhi
3. Practical Pathology. K Uma Chaturvedi, Tejinder Singh. Arya Publishing, New Delhi.

TRANSFUSION MEDICINE-II (Second Year)

(Blood Banking)

RATIONALE

Blood transfusion has become a life saving procedure in modern medical sciences. To avoid any mistake, the students must understand to learn the blood bank procedures, such as ABO & Rh blood grouping carefully and accurately. He must also have an adequate knowledge of cross matching both major and minor procedures as well as selection of a suitable donor. He should be competent enough to collect blood and its long-term preservation for safe blood transfusion.

DETAILED CONTENTS

1. Historical introduction to Transfusion medicine (blood banking)
2. Development of ABO antigen in red cells
3. Glassware used in Blood Banking
Types of glassware and cleaning agents used
Cleaning of new and used glassware/ plasticware
Care of glassware/ plasticware
4. Anticoagulants used in blood bank
Types and composition of various anticoagulants
Advantages and disadvantages of various anticoagulants
5. Screening of blood donors for:

MP
VDRL
HIV
HbsAg
HCV

6. Antigen and Antibody
 - Definition of antigen and antibody
 - Classification of antigens and antibodies.
7. ABO Blood Group System
 - Antigens and antibodies involved
 - Principle and procedure of ABO blood grouping
 - Various other subgroups A1, A2, A1B, A2B
8. The Rh Blood Group System
 - Antigen and antibody involved
 - Principle and procedure of Rh grouping
 - Variant of D antigen (Du)
9. Coombs Test
 - Direct coombs test (principle, procedure, importance and application)
 - Indirect coombs test (principle, procedure, importance and application)
10. Cross Matching
 - Types of cross matching
 - Various methods and their procedures
11. Blood Collection and storage
 - Screening of blood donor and characteristics of ideal blood donor.
 - Blood collection procedure
 - Transportation and storage
12. Various blood components (Packed cells, Fresh frozen plasma, Cryoprecipitate, PRP (Platelet rich plasma)
 - Preparation
 - Preservation
13. Blood Transfusion reactions

LIST OF PRACTICALS

1. Washing and sterilization of glassware
2. Performing ABO blood grouping by following method:
 - Direct
 - Tube Test
 - Indirect(reverse)
 - Subgroup
3. Performing- Rh grouping by following techniques:
 - Slide
 - Tube technique
4. Performance of Coombs Test
 - Direct
 - Indirect
5. Cross Matching (compatibility testing)
 - Major
 - Minor
6. Preparation of anticoagulants

- ACD (Acid Citrate Dextrose)
- CPD (Citrate Phosphate Dextrose)
- CPDA (Citrate Phosphate Dextrose Analine)

RECOMMENDED BOOKS

1. Introduction to Modern Lab Technology by F J Baker, Butterworth, Heinemann Publishers Oxford
2. Modern Blood Banking and Transfusion Practices by Denise M Harmering, JayPee Brothers, New Delhi

PAPER-IV: Systemic Microbiology Including Systemic Bacteriology/ Virology/ Mycology/ Parasitology

RATIONALE

The students undergoing training of medical laboratory technology learn the knowledge of basic morphology, staining, culture, biochemical characteristics and lab-diagnosis of pathogenic bacteria. In addition to this, they are also made aware about the examination of bacteria present in milk and water.

DETAILED CONTENTS

THEORY

Systemic Bacteriology

To study Morphology, culture characters, Biochemical reactions, pathogenicity, lab diagnosis and anti microbial sensitivity testing of the following organisms:-

1. Staphylococci including Micrococci
2. Genus-Streptococcus.
3. Genus-Neisseria
4. Genus-Corynebacterium, Mycobacterium
5. Family Enterobacteriaceae
6. Pseudomonas, vibrio, Hemophilus,
7. Aerobic and anaerobic spore forming organisms i.e Genus Bacillus & Clostridium
8. Nonsporing anaerobes
9. Spirochaetes,

Mycology

Brief Studyof:-

1. Superficial mycosis including– Dermatophytes.
2. S/C mycosis:- Mycetoma, Rhinosporidiosis
3. Candida
4. Cryptococcus

Virology

1. Brief knowledge about:-
Rabies virus, Poliovirus, Hepatitis Viruses, HIV, Arbo viruses,

Parastilology:

1. Study of intestinal and tissue nematodes
 - Ascaris lumbricoides
 - Ancylostoma duodenale
 - Trichiuris trichura
 - W.Bancrofti
 - Enterobius vermicularis.
 - Taenia

Immunology

1. Antigen- Antibody reaction
2. Hypersensitivity
3. Autoimmunity

PRACTICALS

1. Identification of various bacteria by studying colony characters, Gram's staining, Biochemical reactions, special tests for particular isolate.
2. Collection, transportation of clinical samples, processing including culture of following clinical samples for identification of pathogens- Urine, Stool, Sputum, Throat swabs, Pus and Pus swabs, Blood, Skin, Eye and Ear swabs and CSF
3. Identification of pure bacterial cultures of common pathogens.
4. Bacteriological examination of water and milk samples.
5. Methods of collection and processing of hair, nail, skin, pus, sputum samples for fungal examination.
6. Identification of fungi by KOH preparation, Gram's staining.
7. LCB mount preparation.
8. Germ tube test for Candida albicans.

9. Laboratory organization, management, recording of results and quality control in Microbiology.

RECOMMENDED BOOKS

1. Textbook on Microbiology for DMLT & Paramedical courses.
2. Textbook on Microbiology Dr CP Baveja
3. Medical parasitology, DR Arora
4. Essentials of Practical Microbiology
5. Textbook on Microbiology Ananthanarayan & Panikar
6. Textbook of Medical Microbiology by Cruickshank Vol. I and II
7. Medical Laboratory Science by Jockie and Kolhatkar, Tata Mc Graw Hill.

MEDICAL LABORATORY MANAGEMENT-IV(B)

RATIONALE

The students are taught techniques of planning a clinical laboratory. They are also supposed to be taught how to procure chemicals, reagents and equipment. The students are imparted special training in maintaining laboratory equipment, the preventive maintenance and daily upkeep. They are also given training for the maintenance of stocks and inventory. They are also given knowledge of recording results, interpretation, quality control and reproducibility. Students also learn how to communicate effectively.

DETAILED CONTENTS

1. Introduction, Layout, Facility of Lab

Role of medical laboratory technology in total health care, principles of management, techniques of planning, physical facilities/equipment – layouts and design

2. Laboratory Organization

Laboratory organization, operation, job description, evaluation, performance

3. Material Required

Material management, procurement, financial resources, importing, inventory, control and analysis, inspection, storage etc

4. Quality Assurance

Analytical control, Internal and external quality assurance in clinical laboratories, precision, accuracy, standard deviation as per national standards

5. Safety Precaution

Safety measures in clinical laboratories (microbiology, haematology, biochemistry, histopathology and cytology, transfusion medicine), Disposal of Biomedical waste.

6. Human Relations and Motivation

Inter-personal relations, inter and intradepartmental relations and their importance, concept and importance of motivation-drives and incentives; intrinsic and extrinsic motivation

7. Managing Psychological self

- Stress
- Emotions
- Anxiety

8. Leadership

Concept, types, qualities of good leader

9. Medical Ethics and Code of Conduct

Ethics and code of conduct - legal aspects – confidentiality malpractice/ negligence; legal implications, lawsuits, consumer protection and insurance for professional health hazards

RECOMMENDED BOOKS

1. Medical Laboratory Technology by Praful B Godkar; Bhalani Publishing House, Mumbai (India)
2. Text Book of Medical Laboratory Technology by FJ Baker; Butterworths Heinmann Publishers, Oxford
3. Text Book of Medical Laboratory Technology by KL Mukherjee Vol I, II and III; Tata McGraw Hill Publishers, New Delhi
4. Medical Lab Technology by Ramnik Sood, JayPee Brothers, NewDelhi
5. Ditrect Laboratory Practice in Tropical Countries by Monica Chesbrough, Churchill Living stone.