Post Graduate Diploma in Medical Lab Technology

(Duration One Year)

Post-Graduate Department of Zoology
Vinoba Bhave University
Hazaribag
Semester - I

Paper DMLT: 01 Fundamentals of medical laboratory technology Credit – 04

i) Introduction to Clinical laboratory
Basic laboratory principles – Code of Conduct of medical laboratory personnel. The use of the laboratory – Basic laboratory principles – code of conduct of medical laboratory personnel – Organization of clinical laboratory and role of medical laboratory technician – safety measures – Medical Laboratory professional and professionalism in laboratory workers – clinic born infection and personnel hygiene.

ii) Common Laboratory Equipment’s

iii) Basic Steps for Drawing A Blood Specimen

iv) Preparation of Reagents & Quality Control

v) Manual & Automation in Clinical Laboratory

Fundamentals of Medical Laboratory Technology (Practical)

1. Handling common laboratory equipment’s
2. Preparation of various reagents.
3. Responsibilities of a technician in the maintenance of the analyzers.
4. Use and care of microscopes.
5. Using of autoclave hot air oven, other common laboratory equipment etc.
6. Disinfection practices in laboratory and wards.
7. Assay for disinfection.
8. Practical use of automated pipettes.
9. Demonstration working with different auto analyzes.
10. Practice of various quality control measures followed to maintain quality of the laboratory.
11. Specimen collection, identification, transport, delivery and preservation.

Reference Books.
i) **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.

ii) **Cardio Vascular System**
Brief account on composition blood – function of blood elements – blood group and Rh typing, Coagulation of blood. Blood vessels, Structure and functions of various parts of the heart & its function, Venous pulse, ECG, Cardiac cycle & Blood pressure.

iii) **Lymphatic System**
Lymph, Lymph mode & lymphatic channel.
**Acquaintance to:** Lymphomas, Hodgkins disease, Non Hodgkin lymphoma, Adenitis, Lymphadenopathy, Lymphangitis.

iv) **Respiratory System**
Structure & function of lungs, Physiology of breathing, Lung volume & capacity.
Acquaintance to: Asthma, Chronic obstructive pulmonary disease, Emphysema, Chronic bronchitis, Pneumonia, TB, Pulmonary edema, Cystic fibrosis, pneumoconiosis-silicosis etc, Sudden infant death syndrome, Heimlich manoeuvre, Rhinitis

v) **Digestive System**
Name and various parts of digestive system Liver, Spleen, gall bladder, Pancreas, Buccal Cavity, tongue, tonsil, Pharynx, Oesophagus, Stomach, intestine etc. – Physiology of digestion and absorption.
Acquaintance to: Dental caries, Periodontal disease, Halitosis, Peptic ulcer, Diverticular disease, Hernia, Inflammatory bowel disease, Gastroentritis, Hemorrhoids/Fissure/Fistula, Peptic ulcer, Hepatitis, Gallbladder stone,

vi) **Urinary System**
Structure and function of kidneys, its role in urine formation, ureter, urinary bladder, Micturition.
Acquaintance to: Dialysis, Cystoscopy, Urinary incontinence, Urinary tract infection, Glomerulonephritis, Nephrotic syndrome, Renal failure, Polycystic kidney disease.

vii) **Reproductive System**
Anatomy & Physiology of Male & Female reproductive system, menstrual cycle, Placenta, Parturition & lactation, Contraceptives.
**Acquaintance to:** Cryptorchidism, Ovarian cyst, Polycystic ovarian disease, Breast tumor/cancer, uterine prolapse, Hysterectomy, episiotomy, Menorrhagia, Amenorrhea, Prostate disorders, Erectile dysfunction, Endometrosis, Cervical cancer, Vasovaginal candidiasis, Sexually transmitted disease(Chlamydia, AIDS, Gonorrhrea, Syphilis, Genital wart, Genital herpes), Colposcopy, Culdoscopy, Endocervical curettage.

viii) **Musculo-Skeletal System**
Classification of bones & joints, Study of structure of Human skeleton. Study of skeletal muscle, Physiology of muscle contraction.
Acquaintance to: Rheumatism, Arthritis, Rheumatoid arthritis, Osteoarthritis, Gouty arthritis, Bursitis, Tendinitis, Sprain,

ix) **Nervous System**

Acquaintance to: Poliomyelitis, Hemiplegia, Cerebral palsy, multiple sclerosis, epilepsy, Tay-Sachs disease, Headache.

x) **Ear, Nose, Throat and Eye**
Elementary knowledge of structure – functions of organs of taste, smell, hearing & vision.

Acquaintance to: Cataract, Glaucoma, Conjunctivitis, Trachoma, Labyrinthine disease, Meniere’s disease, Otitis media, motion sickness.

xi) **Endocrine System**
Endocrine glands their hormones and functions – Thyroid, Parathyroid, suprarenal, Pituitary and Thymus.

Acquaintance to: Cretinism, Myxedema, Exophthalmic goiter, Tetany, Addison’s disease, Cushing’s Syndrome, Adrenogenital syndrome, Pheochromocytomas, Diabetes mellitus, Hyperinsulinism.

**Practicals**

i) Study of Human Skeleton Parts with Skeletal Models.

ii) Study with charts and models of all organ systems mentioned above.

**Reference Books:**

3. T.S. Ranganathan – A text book of Human Anatomy
5. W. F. Ganong - Review of Medical Physiology
DMLT: 03 Biochemistry (Theory)

1. Elementary knowledge, handling, maintenance, and care of analytical instruments like
   a. Centrifuge
   b. Balance
   c. Colorimeter.
   d. Spectrophotometer.
   e. Microscope.

2. Definition, classification and biomedical importance of carbohydrates, proteins and lipids.


4. Vitamins & minerals- Fat soluble vitamins (A,D,E,K), Water soluble vitamins, Principle elements-(Ca, P, Mg, Na, K, Cl, Fe, lead, copper & S. Trace elements (Iodine, Selenium, zinc), Caloric value of food, Basal metabolic rate, Respiratory Quotient, Balanced diet-Kwashiorkar, Marasmus.

5. Hormones- Classification, Pituitary, Thyroid, Adrenal, Gonadal Hormone, GI hormone, Pancreatic hormone.

6. Acid & Bases- Definition, PH, Buffers, Normality, Molarity, Molality, Renal control of acid base balance, Clinical causes of acid base imbalances, Respiratory acidosis, Respiratory alkalosis, Metabolic acidosis, Metabolic alkalosis.

Biochemistry (Practical)

1. Qualitative test of monosaccharides (Glucose & Fructose).
   a. Molisch’s test.
   b. Barfoed test.
   c. Benedict’s test.
   d. Seliwanoffs test.
   e. Osazone test.

2. Qualitative tests of Proteins.
   a. Isoelectric precipitation test.
   b. Heat coagulation test.
   c. Colour test

3. Qualitative test of lipids
   a. Solubility test.
   b. Emulsification test.
   c. Sponification

REFERENCE BOOKS.

I. BIOCHEMISTRY.

1. Review of Physiological Chemistry, Harold Harper A,
2. Biochemistry- U satyanarayana
DMLT: 04 Microbiology

1. Introduction to Microbiology, Morphological classification of Bacteria.
2. Culture media, types of media, special media.
3. Sterilization and Disinfection (Physical and Chemical methods)
4. Morphology and Pathogenicity of-
   a) Gram positive cocci- Staphylococci, Streptococci,
   b) Gram negative cocci- Neisseria
   c) Gram positive bacilli- Corynebacterium, Actinomy, Listeria, Bacillus, Clostridia, Mycobacterium tuberculosis and Mycobacterium leprae.
   d) Gram negative bacilli- Pseudomonas, Vibrio, Aerononas, Plesiomonas, Brucella, Haemophilus, Bordetella, Chlamydia, Spirochaetes, Rickettsia, Mycoplasm Salmonella, Shigella,Vibrio
5. Preservation of stock cultures & Antimicrobial susceptibility test.

Practical

1. Staining
   a) Gram staining technique.
   b) Acid fast staining (Z-N)
   c) Alberts staining
2. Motility by hanging drop method.
3. Cultivation of UTI isolates.
4. Identification of bacterial culture
   a. Colony characteristic.
   b. Morphological characteristic.
   c. Interpretation of biochemical reaction.
5. Antibiotic sensitivity test
6. Limitations of following tests
   a. Widal
   b. ASO
   c. CRP
   d. RPR/VDRL/TRUS
   e. RA.
   f. HbsAg & anti HIV detection.
7. ELISA & its modification
8. Laboratory investigation of immune deficiency patient & HIV patient.
9. Hospital infection and its laboratory investigation.

Reference books

Microbiology.

2. Text Book of Microbiology by Chakraborty.
4. Mackie & Mc Carthey - Medical Microbiology,
5. Ananthansarayana, R., Jayaram Punkar - Test Book of Microbiology,
DMLT: 05 Elementary Clinical Biochemistry (Theory)/Pathology

1. Introduction to clinical chemistry
   Definition of biochemistry, The use of biochemical tests.
2. Photometry
3. Manual vs Automation in clinical laboratory
   Types of analyzer- Semi autoanalyzer, Batch analyzer, Random Access autoanalyzer, Steps in the automated systems, Responsibilities of a technician in the maintenance of the semi autoanalyzer.
4. Electrophoresis & Chromatography
   Introduction & General principle of electrophoresis, Types of electrophoresis- Applications, Separation of serum proteins by Agar gel electrophoresis.
   Chromatography Technique: General principle, Classification of chromatography, Chromatographic techniques-Adsorption, Chromatography- thin layer, Chromatography- gas liquid, Chromatography-ion exchange, Chromatography- Gel filtration, Chromatography- Affinity.
   Role of enzymes in clinical practice: Marker enzymes in myocardium- GGT(Gamma Glutamyl transpeptidase test), CK & CKMB(Creatine phosphokinase-MB test), LDH(Lactate dehydrogenase test), Troponin T& I test.
6. Organ function tests:
   Evaluation of organ function test: Assessment & clinical manifestation of renal, hepatic, pancreatic & gastric function.
   Gastric analysis: Composition of gastric juice, Fractional test meal.

Practical

Clinical Biochemistry

1. Diagnostic test of urine; collection & preservation, physical characteristic.
3. Abnormal constituents of urine.
   (a) Qualitative test for sugar, Albumin, Micro albumin, ketone bodies, blood, bile salts and pigments
   (b) Determination of sugar, albumin
   (c) Test for lactosuria, Pentosuria, fructosuria etc.
   a) Collection and preservation of blood, b) Blood glucose test, c) G.T.T. d) Glycosylated Hemoglobin. (HbA1C)
   b) Determination of serum urea; uric acid; creatinine
   c) Estimation of total protein (Biuret Method) and estimation of serum albumin & serum globulin.
   d) Estimation of serum phosphorus, Sodium, Potassium & Calcium.
   e) Estimation of Total Iron binding capacity (TIBC), amylase, lipase.
5. Determination of SGOT and SGPT,
6. Determination of Phosphatase (Acid & Alkaline)
7. Serum bilirubin Total & Direct.
8. Estimation of serum lipids: Cholesterol, Triglyceride, Phospholipid, HDL, VLDL & LDL.
9. Estimation of other body fluid.
   a. Gastric juice: HCl,
   b. Bile pigment, Bile salt
   c. Free and total Acidity
   d. Gastric function test.

REFERENCE BOOKS.

Biochemistry


Pathology

1. Text book of pathology by Mohan Harsh
4. Pathophysiology by Lippincott.
**DMLT:06 Immunology/Haematology/Blood bank technology**

**Immunology.**

1. Immunity - Introduction. Types of immunity, Antigen & Antibody and complement system.
2. Antigen-antibody reaction and common serological reaction.
3. Hypersensitivity & Histocompatibility
4. Humoral and cell mediated immunity.
5. Auto immunity and Auto-immune diseases

**Haematology/Blood bank technology.**

1. Introduction to Haematology & Blood cells
2. Collection of blood - ways of collection.
3. Anticoagulants
4. ESR
5. Haematocrit - Packed cell volume (PCV)
6. Red cell Indices - MCV, MCH, MCHC.
7. Sickle cell preparation.
10. Anticoagulants & Storage of blood.
11. Cell separation, and transfusion of various components of blood.
13. Haemolytic disorder of Newborn & exchange transfusion.
14. Organisatiion, operation and administration of blood bank.

**Practical**

1. Haemoglobin estimation by Sahli’s method.
2. R.B.C. count.
3. TLC
4. DLC & Leishman's staining
5. Platelet count
6. Reticulocyte count.
7. Bleeding time, clotting time.
8. Preparation & examination of blood smear (Peripheral smear)
11. Agglutination, Precipitation & Complement fixation reaction.
12. Widal test
14. ASO test.(Measurement of antibodies against streptolysin O, a substance produced by Streptococcus bacteria)
15. Wasser man test (antibody test against syphilis)
16. Mantoux test for TB.
17. i) Donor’s screening and selection.
   a) Identification,
   b) Recording Hemoglobin estimation,
   c) Grouping and typing of donor’s blood,
d) Ruling out transfusion transmitted diseases. Screening of HbS, Ag, HIV, HCV, HBV, Trepanoma, Palladium, Plasmodium, HTLV, Rapid kit method.
e) Cross matching of blood samples. Compatibility test, Direct & indirect Coomb’s test- Principle involved & method used.

ii) Drawing of blood.
   a) Aspesis,
   b) Reassurance,
   c) Venipuncture and Collection,
   d) Care of donor

iii) Blood Storage & transport
   a) Anticoagulant preparation,
   b) Recording the details of storage of blood,
   c) Maintenance, cleaning of various equipments used in blood bank

18. Laboratory investigation of immuno deficiency patient & HIV patient.

Field Work: - Visit to: - Reference blood group centre, Blood Bank.

Reference Books Immunology.

1. Roitt’s Essential Immunology by Ivan Roitt & Peter J Delves, Oxford, Backwill science publication London. 10e.
4. Kuby Immunology 4 Ed.
5. Immunology by Tizard

Reference Books Hematology

1. Wintrobe’s clinical hematology by John P. Greer.
2. Essential hematology by Victor Hoffbrand, Paul A. H. Moss(Willey Black well)
3. Rodak’s hematology by Elaine Keohane, Larry Smith, Jeanine Walenga.

Reference Books Blood Bank Technology

1. Modern Blood Banking & Transfusion Practices by Denise & M. Harmening
2. Text Book Of Blood Banking & Transfusion Medicine by Sally V. Rudmann.
3. Mollison’s Blood Transfusion in Clinical Medicine by Klein, Mollison’s.
5. Blood Bank Technology by Williams & Williams.
DMLT:07 Histotechnology/Laboratory Management & Ethics

1. Cells, Tissues & their function.
2. Methods of examination of tissue and cells
3. Fixation of tissue.
   a) Simple fixatives
   b) Cytological fixatives
   c) Histochemical fixatives
4. Tissue processing.
   a) Collection of specimen
   b) Labeling and fixation
   c) Dehydration
   d) Clearing
   e) Impregnation
   f) Embedding.
5. Section Cutting.
   a) Microtomes and microtomes knives
   b) Techniques of section cutting
   c) Mounting of sections
   d) Frozen section.
   a) Dyes and their properties
   b) Basic theory of staining,
   c) Staining technique with haematoxyline and eosin
   d) Common special stains.
7. Cytopathology
   a) Pap staining.
   b) Fine needle aspiration cytology (FNAc)

Laboratory Managements & Ethics.

1. Role of laboratory in Health care, delivery.
   A. Human health & Diseases.
      a) Types of diagnosis,    b) Process of diagnosis.
   B. Laboratory at different levels

2. Laboratory services in the health, delivery system in India.
   A. The health administration system in India.
      a) At the National level,    d) At the village level
      b) At the state level,    e) Voluntary Health organizations in India,
      c) At the district level,    f) Health programmes in India.

3. Laboratory planning.
   a. General principles.
   b. Laboratory goal.
   c. Operational data.
      i) Market potential,    ii) Hospital Laboratory relation,
      iii) Competitions,    iv) Laboratory trends.
   d. Planning at different levels.
   e. Planning for a basic health laboratory.

4. Laboratory organization.
   a. General principles
   b. Components & functions of laboratory.
c. Staffing the laboratory.

d. Job descriptions.

e. Job Specifications.

f. Work schedule.

5. Care of laboratory glassware, equipment and chemicals.
   a. General principles.
   b. Making simple glass wares in the laboratory.
   c. Laboratory chemicals their proper use and care.
   d. Proper storage.
   e. Labeling.

6. Specimen handling.
   a. General principles
   b. Collection techniques and containers for specimen.
   c. Types of specimens.
   d. Specimen entry.
   e. Specimen transport.
   f. Specimen transfer and distribution & reassignment.
   g. Specimen Disposal.
   h. Specimen preservation.

8. Laboratory safety
   a. General principles.
   b. Inter-departmental communications.
   c. Public Relations.
      a) Patients,
      b) Physicians,
      c) Nursing staff,
      d) Sales representatives,
      e) Other personal.
   d. Request and Report forms.
   e. First aid.
   f. Safety measures.
      (i) Mechanical
      (ii) Electrical
      (iii) Chemical
      (iv) Biological
      (v) Radioactive.

   i) Procurement,
   ii) Identification and correspondence of materials with sources,
   iii) Inventory control and analysis,
   iv) Inspection and storage,
   v) Records & reports,
   vi) Cast control
   vii) Purchase and utilization of supplies.

10. Ethics General Principles.
    The project / field work involving visit to at least 10 different institutions / pathology labs, / Hospitals units related to the subjects and critical analysis of these Units should be submitted for diploma course.

Field Work: - Visit to different hospitals and laboratories. i.e.

Medical college/Dental college/Sadar Hospital
Reference Books

HISTOTECHNOLOGY.

1. Hand Book of Histopathological and Histochemical Technique C.F.A. Culling
3. Theory and Practice of Histological Technique. John D. Baneroff and Alan Steven,
5. A Manual for Histologic Technician. Aun Preece, J
9. WHO technical manual of Laboratory technology.
11. Todd’s Clinical diagnosis of laboratory method.
DMLT:08 BASICS OF COMPUTER SCIENCE

COURSE OBJECTIVE: On completion of the course the students will be able to

1. Comprehend the parts of a computer and the different operating systems
2. Utilize the MS word for typing letters and text.
3. Effectively use features in MS Word to manipulate text and insert pictures and various fonts.
4. Perform basic mathematical operations in a spreadsheet
5. Prepare and use effectively a Power Point Presentation.
6. Utilize the internet for web searches and e-mail.
7. Appreciate the contribution of HIS to the healthcare industry
8. Describe the uses of the hospital information system

BASIC COMPUTER

1. Introduction to the Computer: Parts of a Computer I/O devices – memories – RAM and ROM. Networking – LAN, WAN, MAN (only basic ideas)


3. Introduction to Microsoft Excel: It is used primarily to enter, edit, format, sort, perform mathematical computations, save, retrieve and print numeric data.


5. Introduction to the Internet: Define about the World Wide Web & brief history. Using search engine and beginning Google search – Exploring the next using internet explorer and Navigator - uploading and Download of files and images - E-mail Id creation – sending message – Attaching files in E-mail.

6. Introduction to the Hospital Information System: Define of Hospital Information system, architecture of a HIS, aim and uses of HIS, Types of HIS Benefits of using a hospital information system.

BASIC OF COMPUTER (Practical’s)

1. Introduction of Microsoft Word.
   Type a text document, save the document. Align the text with different formats using Microsoft Word. Inserting a table ensuring proper alignment of the table using MS Word.
2. Microsoft Excel.
The generic term for the type of program that allows for entering, analyzing, and calculating data. Arrangement of selected data alphabetically or numerically. Perform basic mathematical operations in a spreadsheet

3. Microsoft Power Point
Preparation of a slide show with transition, animation and sound effect using MS-Power Point. Customizing the slide show by inserting pictures and tables in the slides using MS-PowerPoint.

4. Introduction to the Internet.
Create and e-mail account. Use Internet to search for a subject of Internet.

REFERENCES: