மனோன்மணியம் சுந்தரனார் பல்கலைக்கழகம்

MANONMANIAM SUNDARANAR UNIVERSITY

SYLLABUS FOR ADVANCED DIPLOMA IN DIAGNOSTIC LAB TECHNOLOGY PROGRAM OFFERED THROUGH DIRECTORATE OF VOCATIONAL EDUCATION (COMMUNITY COLLEGES AND VOCATIONAL SKILL DEVELOPMENT CENTRES) FROM 2019 – 2020

கல்விசார் நிலைக்குழுக் கூட்டம்

MEETING OF THE STANDING COMMITTEE ON ACADEMIC AFFAIRS HELD ON FRIDAY THE 28th JUNE 2019.

Program Code: 5116

ADVANCED DIPLOMA IN DIAGNOSTIC LAB TECHNOLOGY
மேம்பட்ட நோய் கண்டறி ஆய்வக பட்டயம்

SCHEME OF EXAMINATION

Subject code	Title of the Course	Credit	Hours	Passing Minimum
Semester I				
C19DC11/E19DC01	Anatomy and Physiology	6	90	40/100
C19DC12/E19DC02	Blood Transfusion and Blood Banking	6	90	40/100
C19DC13/E19DC03	Clinical Haematology	6	90	40/100
C19CE10/E19CE10	Communicative English	6	90	40/100
C19DCP1/E19DCP1	Practical I-Lab in Analytical Biochemistry and Haematological Techniques	4	120	40/100
Semester II				
C19DC21/E19DC04	Clinical Microbiology	6	90	40/100
C19DC22/E19DC05	Clinical Biochemistry	6	90	40/100
C19LS23/E19LS05	Life Skill	6	90	40/100
C19DCIP/E19DCIP	Industrial Visit and Internship	10	150	40/100
C19DCP2/E19DCP2	Practical II-Lab in Analytical Biochemistry II	4	120	40/100
Semester III				
C19DC31/E19DC06	Principles of Laboratory Management & Medical Ethics	6	90	40/100
C19DC32/E19DC07	Histopathology	6	90	40/100
C19DC33/E19DC08	Clinical Pathology	6	90	40/100
C19DC34/E19DC09	Standard Operating Procedures and Safety Practices	6	90	40/100
C19DCP3/E19DCP3	Practical III-Lab in Microbial Techniques	4	120	40/100
Semester IV				
C19DC41/E19DC10	Modern Instrumentation in Diagnostic Lab	6	90	40/100
C19DC42/E19DC11	Bio-Medical Waste Management	6	90	40/100
C19DC43/E19DC12	Clinical Endocrinology & Toxicology	6	90	40/100
C19DCP4/E19DCP4	Practical IV-Lab in Endocrinology, Cancer Diagnosis & Molecular Diagnosis	4	120	40/100
C19DCPW/E19DCPW	Project Work	10	150	40/100

Eligibility for admission: Pass in 10th std examination conducted by the Govt. of Tamil Nadu Board of Secondary Education, Government of Tamil Nadu or any other equivalent examination.

Examination: Passing Minimum for each Course is 40%. Classification will be done on the basis of percentage marks of the total marks obtained in all the Courses and as given below:

- 40 % but less than 50 % - Third class
- 50 % but less than 60 % - Second class
- 60 % and above - First class

Theory Paper

Internal Marks-25
External Marks-75

SYLLABUS

Semester I

Course I	:	Anatomy and Physiology
Course II	:	Blood Transfusion and Blood Banking
Course III	:	Clinical Haematology
Course IV	:	Communicative English
Course V	:	Practical I-Lab in Analytical Biochemistry and Haematological Techniques

Semester II

Course VI	:	Clinical Microbiology
Course VII	:	Clinical Biochemistry
Course VIII	:	Life Skill
Course IX	:	Industrial Visit and Internship
Course X	:	Practical II-Lab in Analytical Biochemistry II

Semester III

Course XI	:	Principles of Laboratory Management & Medical Ethics
Course XII	:	Histopathology
Course XIII	:	Clinical Pathology
Course XIV	:	Standard Operating Procedures and Safety Practices
Course XV	:	Practical III-Lab in Microbial Techniques

Semester IV

Course XVI	:	Modern Instrumentation in Diagnostic Lab
Course XVII	:	Bio-Medical Waste Management
Course XVIII	:	Clinical Endocrinology & Toxicology
Course XIX	:	Practical IV-Lab in Endocrinology, Cancer Diagnosis & Molecular Diagnosis
Course XX	:	Project Work

(Semester Pattern for Community College Only)

SEMESTER I
COURSE I
(C19DC11/E19DC01)ANATOMY AND PHYSIOLOGY

UNIT I **18 Hrs**

GENERAL ANATOMY

Typical animal cell (Structure & Function) –primary tissues (Classification & function) Skeletal System-Digestive System- Functions of stomach-composition of gastric juice-Pancreatic Juice-Bile and Digestion of food by different Enzymes-Absorption and Defecation.

UNIT II **18 Hrs**

RESPIRATORY AND DIGESTIVE SYSTEMS

Nose-Trachea-Bronchi Lungs and Pleura-Digestive System-Alimentary canal (different parts)-Liver-Gall Bladder-Pancreases.

UNIT III **18 Hrs**

UROGENITAL SYSTEM

Different parts of urinary system-Different parts of Male & Female genital -System (Internal & External Genitalia) Special Senses& General Sensibilities- Eye & Vision-Ears-Hearing & Equilibrium-Excretory System-Functions of Kidney-Nephron and Function of Skin.

UNIT IV **18 Hrs**

NERVOUS & REPRODUCTIVE SYSTEMS

Brain & Spinal Cord - Autonomic Nervous System-Head & Neck-Thorax- Abd. & Pelvis- Surface Anatomy-Reproductive System-Name of primary and accessory organs in male and female-Name of secondary sexual characters in male and female-Function of ovary-formation of ova, menstrual cycle- Functions of Testes- Fertilization Vasectomy and tubectomy.

UNIT V **18 Hrs**

CIRCULATORY SYSTEM

Heart-Blood Vessels-Lymphatic –Spleen & Thymus. Blood- Groups-Composition and general function of blood- Description of blood cells - normal counts & function-Anticoagulants-Cerebrospinal Fluid-Formation-Composition & function of lymph-Endocrine-glands- Names of the endocrine gland and the hormone secreted by them-Major actions of such Hormones.

Reference books:

1. Maggie Norris, Donna Rae Siegfried. 2011. Anatomy and Physiology For Dummies John Wiley & Sons
2. Gerard J. Tortora, Bryan H. Derrickson. 2008. Principles of Anatomy and Physiology John Wiley & Sons.
3. Elaine N. Marieb, Lori A. Smith.2016. Laboratory Manual for Anatomy and Physiology. Pearson Education,
4. Elaine Nicpon Marieb.1989.Human Anatomy and Physiology Laboratory Manual,Benjamin/Cummings Publishing Company, 1989

COURSE II
(C19DC12/E19DC02) BLOOD TRANSFUSION AND BLOOD BANKING

Objective:

- To understand the basics of blood transfusion and blood banking

Learning Outcome:

- Will understand the blood grouping tests
- Will understand the blood donor selection criteria
- Will know the blood collection and processing techniques
- Will able to do compatibility tests, antibody screening and identification
- Will understand the blood components separation storage and transportation procedures.
- Will know the various agencies in blood donor and blood banking.

UNIT I **18 Hrs**

Biochemistry and Physiology of Blood

Definition, Functions, Composition: Erythrocyte leucocyte and thrombocyte, Blood Haemoglobin, Methods and procedure for Haemoglobin test, ESR, PCV, Buffy coat, Total RBC Count, total WBC count, Differential WBC count, Total Eosinophil count, Total Platelet count.

UNIT II **18 Hrs**

Quantitative and Qualitative Disorders of blood cells

Detailed study about Blood Coagulation factors, Bleeding Time, Clotting time, Prothrombin time. Anaemia:Definition, Types Of anaemia. Leukaemia Definition, Classification, Detailed Study with Lab finding for Myeloid Leukaemia (Acute & Chronic). Lymphatic Leukaemia (Acute & Chronic) Special topic: Abnormal forms of RBC, Haemophilia

UNIT III **18 Hrs**

Blood Grouping and Blood Transfusion

Blood Grouping: Principle, Reagents, Methods and Procedure of Red Blood Cell and Serum Grouping with interpretation, Rh Typing, Importance Antigen, Antibody, Agglutination, Antigen - Antibody in different Blood Group, Sub Group of 'A' and 'AB', Bombay 'O' Blood Group, Preparation of RBC suspension. Blood transfusion: Types and indications of various blood transfusion, Universal donor / recipient.

UNIT IV **18 Hrs**

Blood Collection and Compatibility Test

Criteria for selection, screening procedures, risks and management of donor complications, Blood collection procedures: vein puncture and finger prick, Anticoagulants used in Blood Bank, Pilot blood containers, Storage of donor blood, Basic procedures and Techniques for compatibility testing

UNIT V **18 Hrs**

Blood transfusion hazards and their management

Nature, Types, and Investigation: Reaction investigation procedure with interpretation. Management of transfusion reactions Antiglobulin (Coomb's) Test, Haemolytic Disease of Newborn (HDN), Transmittable diseases Hepatitiss, HIV Syphilis, Malaria - Detection and outline of their management.

Reference Books

1) Blood groups in Man R.R. Race & R sanger Black well Scientific Publication, Oxford, 8th Edn.
2) Modern Blood Banking & Transfusion Practices D.N. Pottiglio F.A. Davis Company, Philadelphia, 1983
3.Practical Haematology, Shirley Mitchell Lewis, Barbara J. Bain, Imelda Bates Dacie And Lewis 10th Ed, Churchill Livingstone/Elsevier.
4. Hematology: principles and procedures Barbara A. Brown 6th Ed Lea & Febiger.
5. Hematology: Clinical Principles and Applications Bernadette F. Rodak, George A. Fritsma, Kathryn Doig (2007) 3rd Ed, Elsevier Health Sciences.

COURSE III

(C19DC13/E19DC03)CLINICAL HAEMATOLOGY

UNIT I **18 Hrs**

Collection of Blood Samples ABO Blood Grouping Procedure: Slide or Tile Method-Tube Method-Microplate Method-Micro-Typing System (Diamed/Bioview)-Automated or Semi-Automatic Instrumentation-Obtaining peripheral Blood Smear Staining of Blood Smear Obtaining Cell Counts – RBC-WBC-Platelets both manual and automated Absolute Eosinophils Count.

UNIT II **18 Hrs**

Estimation of Haemoglobin Packed Cell Volume-Erythrocyte Indices Reticulocyte Count Differential Count Bleeding Time Clotting Time

UNIT III **18 Hrs**

Glucose Determination: Oxidase Method Of Glucose Determination - The Colormetric Method--Ortho- Toluidine - The Glucose Tolerance Test (GTT) - Estimation of Serum Creatinine Biuret Method Bromocresol Green Method Modified Reitman & Frankel Method King & King Method.

UNIT IV **18 Hrs**

Jaundice - Biochemical tests - Unconjugated Hyperbilirubinaemia (Retention Jaundice -Haemolytic (Pre-hepatic Jaundice) - Non haemolytic - Conjugated Hyperbilirubinaemia (Regurgitation Jaundice) Lipid profile - Total lipids – Phospholipids Sackett's Method Estimation of Serum HDL cholesterol Method of Fiske and Subbarow Caraway's Method of Estimation - Hyperuricaemia – Hypouricaemia

UNIT V **18 Hrs**

Bile Salts: Hay'sTest - For Bile Pigments - Fouchet'sTest Collection- Appearance-Analysis of Cerebrospinal fluid- Synovial Fluid- Pleural Fluid- Pericardial Fluid-Peritoneal Fluid- Seminal Fluids- Needle aspiration Cytology- Discharge from any site.

References

1. Medical Laboratory Techniques, Mukharji, Vol - I, II & III, 5th Edn. Tata McGrawHill, Delhi.
2. Laboratory Technology (Methods and interpretation) Ramanic Sood, 4th Ed. J.P. Bros, New Delhi
3. Short text book of Medical Laboratory for technician Satish Gupta J.P. Bros, New Delhi

COURSE IV

(E19CE10/C19CE10)COMMUNICATIVE ENGLISH

1. **Basic Grammar**:
   a. Review of grammar
   b. Remedial study of grammar
   c. Simple sentence
   d. Word passive voice etc.
2. **Bubbling Vocabulary**:
   a. Synonyms
   b. Antonyms
   c. One – work Institution
3. **Reading and Understanding English**
   a. Comprehension passage
   b. Précis – writing
   c. Developing a story from hints.
4. **Writing English**
   a. Writing Business letters.
   b. Paragraph writing
   c. Essay writing
   d. Dialogue writing
5. **Speaking English**
   a. Expressions used under different circumstances
   b. Phonetics

Reference

1. V.H.Baskaran – "English Made Easy"
2. V.H.Baskaran – "English Composition Made Easy"

   (Shakespeare Institute of English Studies, Chennai)
3. N.Krishnaswamy – "Teaching English Grammar"

   (T.R.Publication, Chennai)
4. "Life Skill" – P.Ravi, S.Prabakar and T.Tamzil Chelvam,

   M.S.University, Tirunelveli.

COURSE V
(C19DCP1/E19DCP1)PRACTICAL I-LAB IN ANALYTICAL BIOCHEMISTRY & HEMATOLOGICAL TECHNIQUES

Motion - Ova, Cyst, Tropozoite by wet smear preparation using normal saline and lugol's iodine solution, Motion occult blood, microfilaria and Malarial Parasites - Identification in Stained blood smear, Special topic: ECG

SPECIAL TOPIC:

Haematuria, Pregnancy Test.

Blood group and Rh(D) Factor test by open slide method and test tube method, compatibility test (both major and minor) by saline technique for all available donors and patients.

Blood Glucose(GOD/POD) Blood/urine urea(Di acetyl Manoxime method), serum/urine creatinine (Alkaline Picrate Method), serum total cholesterol (Enzymatic Method), serum Total proteins (Bicrt Method), serum Albumin (Bromo cresol Greendye Method), serum Acid/Alkaline Phosphatase, serum Bilirubin, Glucose toterance test.

Urine Specific gravity, Urine Albumin (Heat Coagulation Method), Urine Glucose (Benidict's Method), Urine Acetone (Nitroprusside Method), Urine Bile Salt (Hays Method), Urine Bile Pigments (Fouchest's Method), Microscopic Examination, Parasites, Pregnancy test (Latex Method), Urine reaction, Occult blood in Urine, Urobilinogen test

SEMESTER II
COURSE VI
(C19DC21/E19DC04) CLINICAL MICROBIOLOGY

UNIT I **18 Hrs**

Microscopy

Parts and principles of simple microscope- compound microscope-phase contrast microscope**.**

UNIT II **18 Hrs**

Systemic Bacteriology

Definition-Classification-Staphylococcus-Streptococcus-Micrococci-Pneumococcus-Neisseria-Corynebacteria-Bacillus-Clostridium-Enterobacteriaceae-Klebsiella-Escherichia coli-Proteus-Salmonella-Shigella-Pseudomonas-Spirochetes.

UNIT III **18 Hrs**

Mycology

Classification of Fungus- Laboratory Diagnosis - Collection and transport of Specimen- Direct Microscopy-Classification of pathogenic Fungi:- Superficial Mycoses- Subcutaneous Mycoses-Systemic Mycoses-Opportunistic Mycoses.

UNIT IV **18 Hrs**

Virology

General properties of virus-Laboratory diagnosis of viral infections: Hepatitis virus-Human Immunodeficiency Virus-Polio Virus-Rabies Virus.

UNIT V **18 Hrs**

Parasitology

General Parasitology-Classification of parasites: Protozoa-Technical terms – parasite-Medical Parasitology-Host-Vector-Pathogen-Commensal-Ova-Cyst-Trophozoite-Cestode-Trematode-Nematode parasites- life cycle Pathogenicity- Lab Diagnosis and Morphology with Diagram of Entamoeba histolytica- Entamoeba coli-Giardia lamblia-Trichromonas vaginalis-Leishmania species- Malarial Parasites (Plasmodium Species)-Tapeworms-Round Worm-Hookworms-Microfilarial worms.

Reference books:

1. Gerad J. Tortora, Berdell R. Funke, Christine L case, Microbiology: An introduction, Eight Edition, Publishers Benjamin Cummings.
2. Prescott, Harley and Klein's Microbiology 7th Ed Authour: Joanne M Wiley, Christopher J Woolverton, Linda M Sherwood.
3. Sherris Medical MicroBiology: An introduction to infectious diseases By Kenneth J Ryan, C George Ray, Publishers Mc Graw-Hill Medical.
4. Pelczar, M.I., and Reid, R.D. (2009) Microbiology, 5th Ed., McGraw Hill Inc., New York.

COURSE VII
(C19DC22/E19DC05) CLINICAL BIOCHEMISTRY

UNIT I **18 Hrs**

INSTRUMENT

Detailed study about Photoelectric colorimeter- pH meter- Centrifuge-Analytical balance-Flame photometer- Analytical Balance-Use and Maintenance-cleaning of new and used glassware-Pipettes and test tubes.

UNIT II **18 Hrs**

ANALYTICAL PREPARATION OF SOLUTION REAGENTS

Definitions, types-Solute-Solvent-pH-Buffer-preparation of Phosphate Buffer Saline (PBS); Use and storage of buffer solution-Concentration of Solutions: Molarity-Normality-ppm-Dilution methods of Solution-Storage of Chemicals and Reagents- Safe Use Flammable Chemicals-Corrosive Chemicals- Toxic- Harmful and Irritating Chemicals- Oxidizing Chemicals-Explosive Chemicals-Carcinogens-Indicator-Oxidation-Reduction.

UNIT III **18 Hrs**

BIO-CHEMICAL TEST PROFILE

Liver Function tests-Renal Function Tests-Heart Function Tests-Pancreatic Function Tests-Diabetes-Jaundice-Lipids-Proteins.

UNIT IV **18 Hrs**

ROUTINE BIO-CHEMICAL TESTS

Blood Glucose-Blood / Urine Urea-Serum Bilirubin-Serum / Urine Creatinine-Glucose Tolerance Test-Serum total Cholesterol and high Density Lipoproteins-Serum total Proteins / Albumin / Globulin-SGOT-SGPT-Serum Alkaline / Acid Phosphatase- Serum Uric acid-Blood Urea Nitrogem Serum Calcium-Serum Amylase. Proteinuria Glucose-Ketone Bodies, Bile Pigments, Urobilinogen, Urobilin-Porphyrins- Haematuria-Iron-Calcium-Iodine-Flourine in Urine.

UNIT V **18 Hrs**

ELECTROLYTE TEST

Electrolytes with test procedure for photoelectric colorimetric method-(Na, K, Cl)- Quality control.

Reference books:

1. Instrumental Methods of Analysis. 6th Edition by H.H. Willard, L.L. Merritt Jr. and others. 1986. CBS Publishers and Distributors.
2. Instrumental Methods of Chemical Analysis. 1989 by Chatwal G and Anand, S. Himalaya Publishing House, Mumbai.
3. A Biologists Guide to Principles and Techniques of Practical Biochemistry. 1975 by Williams, B.L. and Wilson

COURSE VIII
(C19LS23/E19LS05) LIFE SKILL

I Life Coping or adjustment

(a) External and internal influence in one's life
(b) Process of coping or adjustment
(c) Coping with physical change and sexuality
(d) Coping with stress, shyness, fear, anger far live and criticism.

II Attitude

(a) Attitude
(b) Self acceptance, self – esteem and self actualization
(c) Positive thinking

III Problem Solving

(a) Goal Setting
(b) Decision Making
(c) Time Management and stress Management.

IV Computers

(a) Introduction to Computers
(b) M.S.Office
(c) Power Point

V Internet

(a) Introduction to internet
(b) E – mail
(c) Browsing

References:

1) Life Skill Programme course I & II by Dr. Xavier Alphona MCRDCE Publications. R.K.Mutt Road, Chennai – 28
2) ஆளுமை பண்பு வளர்த்தல் மற்றும் தகவல் தொடர்பு by M.Selvaraj Community College,Palayamkottai
3) "Life Skill" –P.Ravi, S.Prabahar & T.Tamil Chelvam, M.S. University, Tirunelveli

COURSE IX
(C19DCIP/E19DCIP) INDUSTRIAL VISIT

Students shall be taken for an visit to the an NABL Accreditation Diagnostic Laboratory and observe to various labs /Department wherein they can also undergo practical training. Know the quality policy and procedures practiced in the labs ad method of sample collection, methods of labeling , methods of analysis and reporting procedures. Student's has to submit an report to the teacher on the observation of visit.. The faculty shall submit the assessment records of each student .Marks will be awarded out of 100.

COURSE X
(C19DCP2/E19DCP2) PRACTICAL II-LAB IN ANALYTICAL BIOCHEMISTRY II

SPECIAL TOPIC:

Haematuria, Pregnancy Test.

Blood group and Rh(D) Factor test by open slide method and test tube method, compatibility test (both major and minor) by saline technique for all available donors and patients.

Blood Glucose(GOD/POD) Blood/urine urea(Di acetyl Manoxime method), serum/urine creatinine (Alkaline Picrate Method), serum total cholesterol (Enzymatic Method), serum Total proteins (Bicrt Method), serum Albumin (Bromo cresol Greendye Method), serum Acid/Alkaline Phosphatase, serum Bilirubin, Glucose toterance test.

Urine Specific gravity, Urine Albumin (Heat Coagulation Method), Urine Glucose (Benidict's Method), Urine Acetone (Nitroprusside Method), Urine Bile Salt (Hays Method), Urine Bile Pigments (Fouchest's Method), Microscopic Examination, Parasites, Pregnancy test (Latex Method), Urine reaction, Occult blood in Urine, Urobilinogen test

SEMESTER III
COURSE XI
(C19DC31/E19DC06)PRINCIPLES OF LABORATORY MANAGEMENT & MEDICAL ETHICS

Objectives

- The students will be made aware of the basic ethics, good lab practices including awareness/ safety in a clinical lab.
- Students would be competent enough to understand sample accountability, quality management system, biomedical waste management, calibration and validation of clinical laboratory instruments, Laboratory Information system (LIS), Hospital Information system (HIS) and financial management.

UNIT I **18 Hrs**

Ethical Principles and standards for a clinical laboratory professional duty to the patient-duty to colleagues and other professionals-Good Laboratory Practice (GLP)-Introduction to Basics of GLP and Accreditation-Aims of GLP and Accreditation-Advantages of Accreditation-Brief knowledge about National and International Agencies for clinical laboratory accreditation.

UNIT II **18 Hrs**

Awareness/Safety in a clinical laboratory-General safety precautions-HIV: pre- and post-exposure guidelines-Hepatitis B & C: pre- and post-exposure guidelines-Drug Resistant Tuberculosis Patient management for clinical samples collection-transportation and preservation-Sample accountability-Purpose of accountability-Methods of accountability.

UNIT III **18 Hrs**

Sample analysis: Introduction-factors affecting sample analysis-reporting results, basic format of a test report-reported reference range-clinical alerts-abnormal results-results from referral laboratories-release of examination results-alteration in reports.

UNIT IV **18 Hrs**

Quality Management system: Introduction-Quality assurance-Quality control system, Internal and External quality control-quality control chart Biomedical Introduction and importance of calibration and Validation of Clinical Laboratory instrument Ethics in Medical laboratory Practice-Ethics in relation to Pre-Examination procedures-Examination procedures-reporting of results-preserving medical records Procurement of equipment and Inventory Control.

UNIT V **18 Hrs**

Audit in a Medical Laboratory-Introduction and Importance-NABL & CAP-Responsibility-Planning-Horizontal-Vertical and Test audit-Frequency of audit-Documentation.

References

1. Teitz,(2007),Fundamentals of Clinical Chemistry,6th edition, Elsevier Publications
2. Bishop(2013),Clinical Chemistry,7th edition, Wiley Publications
3. Henry's Clinical Diagnosis and Management by Laboratory Methods,(2011),22nd edition, Elsevier

COURSE XII
(C19DC32/E19DC07) HISTOPATHOLOGY

UNIT I **18 Hrs**

FIXATION

Principles of Histology and its application-Principles of tissue fixation-Preparation of different fixatives: formaldehyde-Paraformaldihyde-methanol-acetone-decalcification-Detection of end point.

UNIT II **18 Hrs**

PROCESSING OF TISSUES

Neutralization and processing of tissues (dehydration and rehydration)- Nuscum Techniques–manual tissue processing-automated tissue processing-paraffin embedding and different techniques for embedding-Preparation of paraffin blocks.

UNIT III **18 Hrs**

SECTIONING

Microtome and its parts-Handling and care of microtome-sharpening and selection of razors and section cutting-Preparation of 1 micron thin section-frozen section/cryostat.

UNIT IV **18 Hrs**

STAINING

Theory of staining -Common & special stains – Preparation of common stains. H & E-congored-methyle violet- Leishman stain- Giesma- Papiaicolau-VG-PAS-PASM-Papanicolaous staining technique/MCC staining-staining techniques.

UNIT V **18 Hrs**

MOUNTING & OBSERVATION

Different mounting solutions and protocols-Mounting of museum specimens-Microscoping observation-record keeping-indexing of slides-Histological observation of different tissues: skin-lungs-liver-urinogenetal and gastrointestinal tissues.

Reference books:

1. Guy Orchard, Brian Nation. 2011. Fundamentals of Biomedical Science: Histopathology, Oxford University Press, Oxford.
2. Ivan Damjanov. 1996. Histopathology: A Color Atlas and Textbook eds Williams & Wilkins.
3. Mary C. Bowling 1967 Histopathology laboratory procedures: of the Pathology Anatomy Branch of the National Cancer Institute, Publishers National Cancer Institute (U.S.).
Pathologic Anatomy Branch

COURSE XIII
(C19DC33/E19DC08) CLINICAL PATHOLOGY

UNIT I **18 Hrs**

SPECIMEN COLLECTION

Reception of patients-Phlebotomy and aftercare of patients-collection of different clinical materials-Blood-PUS-stool-sputum-semen-CSF-storage and Transportation of different clinical materials to different laboratories.

UNIT II **18 Hrs**

EXAMINATION OF URINE & STOOL

Parts of urinary system-importance of urine exam-Normal and abnormal contents of urine sample-Types of urine sample-urine collection and Preservatives.

Stool examination- indication-collection-container of Stool sample-transport-preservation of stool samples-physical examination and its significance-chemical examination and its significance-microscopic examination and its significance.

UNIT III **18 Hrs**

EXAMINATION OF SPUTUM

Sputum collection-container of Sputum sample-transport-storage of Sputum-examination-physical-chemical and microbial examinations and its significance.

UNIT IV **18 Hrs**

SEMEN ANALYSIS

Semen collection, container of semen sample-transport-storage of semen-examination- physical-chemical and microbial examinations and its significance.

UNIT V **18 Hrs**

EXAMINATION OF Cerebrospinal Fluid (CSF)

Collection of CSF-container of body fluids-transport of sample preservation of CSF-Examination of CSF and other body Fluids- fluid analysis-examination- physical-chemical and microbial examinations and its significance.

Reference books:

1. Bhattacharya.K. & G.K. Chakraborty, Ganendrakumar Chakravarti. 1978 .A Handbook of Clinical Pathology: Diagnosis, Laboratory. Academic Publishers.
2. Daniel D. Mais. 2013. Practical Clinical Pathology. American Society for Clinical Pathology
3. Hugh Anthony Clegg. 1955. Clinical pathology in general practice. J.B. Lippincott,

COURSE XIV
(C19DC34/E19DC09) STANDARD OPERATING PROCEDURES AND SAFETY PRACTICES

UNIT I **18 Hrs**

SAFE HANDLING OF CHEMICALS AND EQUIPMENT

Operation and maintenance of laboratory equipments-Handling & cleaning of glassware (test tubes-slides petridishes pipettes-beakers, Rashes-funnels, syinges etc)-Collection & transport of clinical specimens-Receipts-Labeling-recording and dispatching clinical specimens-Keeping records after final computerization-Conversant with S.I. unit system for reporting-Conversant with Fundamental Chemistry.

UNIT II **18 Hrs**

SANITATION AND HYGIENE

Demonstrate knowledge of Good Laboratory Practices (GLPs)-Good Manufacturing Practices (GMPs) and Fire Safety-Statistical quality control-Using emergency equipment and Safety planning.

UNIT III **18 Hrs**

FIRST AID AND BASIC LIFE SUPPORT

Objectives of first aid-wounds and bleeding-dressing and bandages-pressure and splints-supports etc-shock-insensibility-asphyxia-convulsion-resuscitation-uses of suction apparatus-drug reactions-prophylactic measures-administration of oxygen, electric shock-burns-scalds –hemorrhage-pressure points-compression band. Fractures splints bandaging, dressing foreign bodies-poisons-Introduction to BLS-indication for BLS and the process of BLS-recovery position

UNIT IV **18 Hrs**

CHEMICAL SPILLS

Toxic/hazardous chemical spills- Cleanup procedures for chemical spills-hazardous chemical contact with the skin- safety procedures- maintenance of Emergency eye wash/safety showers - usage of Chemical Splash Goggles- Mouth pipetting or siphoning is forbidden- hazardous waste disposal.

UNIT V **18 Hrs**

DISPOAL OF LABORATORY WASTE

Introduction to laboratory Waste-Types of laboratory Waste-Collection of laboratory Waste-identification of all types of Treatment and Safe Disposal of laboratory Waste-non infectious waste-infected sharp waste-infected non sharp waste disposal-incineration process.

Reference books:

1. Frank R. Spellman. 1998. Safe Work Practices for the Environmental Laboratory: Technology & Engineering; CRC Press.
2. Sword. I.P. & A.W. Waddell. 2012Standard Operating Procedures Analytical Chemistry and Metabolism. Springer Science & Business Media
3. Prudent Practices in the Laboratory: Handling and Management of Chemical Hazards, Updated Version. 2011. Published by National Research Council, Division on Earth and Life Studies, Board on Chemical Sciences and Technology, Committee on Prudent Practices in the Laboratory: An Update

COURSE XV
(C19DCP3/E19DCP3) PRACTICAL III-LAB IN MICROBIAL TECHNIQUES

List of Exercises

- Preparation and sterilization of Nutrient Media,
- Inoculation Techniques, Pure culture, Sub culture,
- To perform Gram staining
- To perform Acid fast staining (Zeihl Neelsen staining)
- To perform Indian ink staining
- To perform Hanging drop method
- Demonstration of capsule
- Staining of bacterial spores
- Demonstration of Autoclave and sterilization of media
- Demonstration of Laminar air flow and media preparation
- Preparation of culture plates
- Demonstration of Centrifuge.
- Demonstration of hot air Oven and sterilization of glassware's
- Demonstration of Incubator and preservation of cultures
- Preparation of media
- Antibiotic sensitivity test.
- Microscopic examination of urine
- Examination of urine
- Examination of sputum
- To perform HIV Tridot test.

SEMESTER IV

COURSE XVI

(C19DC41/E19DC10) MODERN INSTRUMENTATION IN DIAGNOSTIC LAB

Course Objectives

- To gain knowledge on the modern instruments and techniques used in diagnostic lab.
- Will Understand the principles and application of spectrophotometric and Calorometric equipments.
- Will Know the types of auto analyzers.
- Will Understand the Principles and applications of electrophoresis and Chromatography.
- Will Know the radio assay and Immuno assay
- Will understand the modern molecular techniques in disease diagnosis.

UNIT I **18 Hrs**

Spectro Photomentry

Principles and application of Spectro Photomenter-Colorimeters-flame Photometers-fluro cytometry.

UNIT II **18 Hrs**

Auto analyzers

Principles and application of auto analyzer- Semi auto analyzer – Batch analyzer- Random assays- Auto analyzer.

UNIT III **18 Hrs**

Electrophoresis and Chromatography

Chromatography and its applications in diagnosis- (Paper Chromatography-Thin layer Chromatography-HPLC-Gas liquid Chromatography-Ion exchange Chromatography)- Electrophoresis Basic Principles and types- Electrophoresis of Proteins and nucleic acids- Hemoglobin-Immunoglobulin's Iso enzymes-Application of electrophoresis in Clinical Diagnosis.

UNIT IV **18 Hrs**

Immuno assay and Radio assay

Immuno assay – ELISA, RIA, FIA, FACS – Radio Isotopes, Radio activity-Instruments for Radio activity measurement application of radio Isotopes in Clinical biochemistry, blood volume-red cell volume-plasma volume-red cell lifespan-platelet lifespan.

Unit V **18 Hrs**

Molecular Diagnostics

Instrumentation to Chromosomes-HS Structure and disorder-Karyotyping-Chromosomal Studies in Hematological disorders (PBLC and Marrow)FISH - Nucleic acid amplification testing- PCR Principle – types-applications -Thermal cycler-RT PCR-reverse transcriptase PCR-(RT-PCR)-Nested PCR.

Reference

1. Teitz (2007) fundamental of Clinical Chemistry, 6th edition – Elsevier Publications.
2. Wilson & Walker, Practical Biochemistry 2nd edition
3. Singh & Sahni (2008) Introductory Practical Biochemistry 2nd edition Alpha Science.
4. Hentry's Clinical Diagnosis and management by laboratory methods (2011), 22nd edition. Elsevier.

COURSE XVII
(C19DC42/E19DC11) BIO-MEDICAL WASTE MANAGEMENT

Objectives:

To understand the methods and legal of Hospital waste management

Learning Outcome:

1. Will understand the biomedical waste Management
2. To know the procedures of record Keeping of Waste disposal
3. Will understand the health issues in handling biomedical waste
4. To understand the legal aspects of Hospital waste disposal and management

UNIT I **18 Hrs**

Present Scenario

Bio-medical waste – Concepts and Perceptions-Waste Generation-Segregation-Disposal

UNIT II **18 Hrs**

Planning and Objectives of BMW Management-Survey-Policies and Perspectives of BMW Management.

UNIT III **18 Hrs**

Record Keeping-Management of Bio-medical Waste-Technologies for Treatment for BMW-Criteria for selecting appropriate Medical Waste Technologies.

UNIT IV **18 Hrs**

Training-Occupational Safety and Health Issues.

UNIT V **18 Hrs**

Legal Aspects and Environment Concern-Implementation of Action Plan-Approaches to Common Regional facility.

Reference Books:

1. The Book of Hospital Waste Management: Dr. D.B. Acharya& Dr. Meeta Singh (Minerva Press, New Delhi)
2. Hospital Waste Management & its Monitoring: Madhuri Sharma (Jaypee Brothers, Medical Publishers (P) Ltd. New Delhi)

COURSE XVIII
(C19DC43/E19DC12) CLINICAL ENDOCRINOLOGY & TOXICOLOGY

Objective:

- This paper is framed to provide basic knowledge of hormones & toxic substances with their determination techniques as well as related disorders to detect hormones and toxic substances in blood samples and also understand the basis of endocrine disorders.

UNIT-I **18 Hrs**

Hormones Mechanism of action

Hormones-Classification of hormones-organs of endocrine system their secretion and function-regulation of hormone secretion-Mechanism of action.

UNIT-II **18 Hrs**

Thyroid function test:

Thyroid hormones- biological function- hypothyroidism- hyperthyroidism- Determination of T3- T4- TSH- FT3- FT4- TBG- Disorder associated with thyroid dysfunction.

UNIT-III **18 Hrs**

Infertility profile:

LH- FSH- TSH- Estrogen- Progesterone- Total Testosterone- Free testosterone- DHEA-S- 17- Ketosteroids- Prolactin- their estimation and clinical significance- reference range- hypo and hyper secretion- Triple Test

UNIT-IV **18 Hrs**

Growth hormone:

ACTH- Aldosterone- Cortisol their estimation and clinical significance- reference range- hypo and hyper secretion

UNIT-V **18 Hrs**

Toxicology:

Introduction to toxicology Alcohol poisoning- Lead poisoning- Zinc poisoning- Mercury poisoning drugs abuse- screening procedure for drug screening- Spot tests- hair and urine test- Immunoassay for drugs.

References

1. Teitz,(2007),Fundamentals of Clinical Chemistry,6th edition,Elsevier Publications
2. Bishop(2013),Clinical Chemistry,7th edition, WileyPublications
3. Henry's Clinical Diagnosis and Management by Laboratory Methods,(2011),22nd edition, Elsevier
4. D M Vasudevan, (2011),Text book of Medical Biochemistry,6th edition Jaypee Publishers
5. M N Chatterjea & Rana Shinde,(2012),Text book of Medical Biochemistry,8th edition,Jayppe Publications
6. Singh & Sahni,(2008),Introductory Practical Biochemistry,2nd edition, Alpha science
7. Lehninger,(2013),Principles of Biochemistry,6th edition, W H Freeman

COURSE XIX
(C19DCP4/E19DCP4) PRACTICAL IV- LAB IN ENDOCRINOLOGY, CANCER DIAGNOSIS & MOLECULAR DIAGNOSIS

ENDOCRINOLOGY:
1. Estimation of T3
2. Estimation of T4
3. Estimation of TSH
4. Estimation of FSH
5. Estimation of LH
6. Estimation of hCG
7. Estimation of Cortisol
8. Estimation of Progesterone
9. Estimation of Testosterone

TUMOR & CANCER MARKERS:
1. Estimation of Alpha feto proteins (AFP)
2. Estimation of Carcino embryonic antigen (CEA)
3. Estimation of CA- 125
4. Estimation of Prostate specific antigen (PSA)

IMMUNO ASSAY & MOLECULAR DIAGNOSIS
1. Demonstration of principle and working of: Colorimeter, spectrophotometer, flame photometer, PCR (Polymerase Chain Reaction),
2. Demonstration of polyacrylamide Gel Electrophoresis of a biological sample.
3. Demonstration of polyacrylamide Gel Electrophoresis of a biological sample.
4. Auto-analyzer
5. coulter-counters.
6. Demonstration of osmometry.
7. Demonstration of RIA(Radio-Immunoassay)
8. Demonstration of DOT ELISA (Enzyme Linked Immunosorbent Assay)

OTHER ELISA TESTS
1. Test for HIV
2. Test for Hepatitis B (HBsAg)
3. Test for Hepatitis (HCV)
4. Malaria antigen
5. Tuberculosis-lgG/IgM

COURSE XX
(C19DCPW/E19DCPW) INTERNSHIP IN MULTISPECIALTY HOSPITAL/ DIAGNOSTIC LABORATORY

Students shall be deputed to a Multispecialty Hospital having NABL Accredidated laboratory with various labs or Department wherein they shall undergo practical training of handling patients, collection and processing of blood, urine, sputum stool and body fluids samples.

Identification of patient's particulars based on CR number, Lab Number and transfer of samples from collection centres to different labs. Process of performing various tests in different labs. Each student is required to maintain a logbook of the various posting.

Student's performance shall be evaluated on continuous basis by the faculty posted in various sections. The faculty shall submit the assessment records of each student posted in his/her section on monthly basis to the HOD. Marks will be awarded out of 100.