

M.Sc. Medical Lab Technology

**Faculty of Allied
Health Sciences**

2019-20

M. SC. (MEDICAL LABORATORY TECHNOLOGY)							
FIRST SEMESTER		Theory		Practical		Total	Credit
Subject Code	Nomenclature	External	Internal	External	Internal		
05160101	Physical & Analytical Biochemistry	60	40	--	--	100	4
05160102	Physical & Analytical Biochemistry - Practical	--	--	30	20	50	2
05160103	Cellular Pathology	60	40	--	--	100	4
05160104	Cellular Pathology - Practical	--	--	30	20	50	2
05160105	General Microbiology & Bacteriology	60	40	--	--	100	4
05160106	General Microbiology & Bacteriology - Practical	--	--	30	20	50	2
05160107	Human Physiology	60	40	--	--	100	4
	Total	240	160	90	60	550	22
SECOND SEMESTER							
05160201	Metabolism & Enzymology	60	40	--	--	100	4
05160202	Metabolism & Enzymology - Practical	--	--	30	20	50	2
05160203	Clinical Pathology	60	40	--	--	100	4
05160204	Clinical Pathology - Practical	--	--	30	20	50	2
05160205	Immunology & Virology	60	40	--	--	100	4
05160206	Immunology & Virology - Practical	--	--	30	20	50	2
05160207	Research Methodology, Biostatistics & Hospital Management	60	40	--	--	100	4
	Total	240	160	90	60	550	22
THIRD SEMESTER							
05160301	Clinical & Applied Biochemistry	60	40	--	--	100	4
05160302	Clinical & Applied Biochemistry - Practical	--	--	30	20	50	2
05160303	Blood Banking, Histopathology & Cytology	60	40	--	--	100	4
05160304	Blood Banking, Histopathology & Cytology - Practical	--	--	30	20	50	2
05160305	Parasitology & Mycology	60	40	--	--	100	4
05160306	Parasitology & Mycology - Practical	--	--	30	20	50	2
05160307	Molecular Biology	60	40	--	--	100	4
	Total	240	160	90	60	550	22
FOURTH SEMESTER							
05160401	Dissertation	--	--	180	120	300	12

SEMESTER I

PAPER - 1

PAPER CODE -

PHYSICAL AND ANALYTICAL BIOCHEMISTRY

UNIT 1:

General introduction to laboratory equipments and instruments. Glasswares, balances, centrifuges, incubator, hot air oven, water bath. Brief description of Colorimetry and photometry and its laboratory tests – end point reaction and rate of reaction methods. Fluorometry. Flame photometry, electrophoresis, densitometer, blotting techniques. Chromatography – types. Polymerase chain reaction. Flow cytometry.

UNIT 2:

Automation, advantages of auto analyzers, continuous flow analyzers, discrete auto analyzer – types (semi automated and fully automated).

UNIT 3:

Electrolytes: Definition, ionisation of weak acids, weak bases pH, Henderson Hasselbach equation. Buffer systems – definition, titration curve of weak acids, buffering capacity, physiological buffers, respiratory and metabolic acidosis and alkalosis.

UNIT 4:

Organisation and quality control in the laboratory, cleaning of glassware, biomedical waste management

PRACTICALS

1. Preparation of various solutions and buffers
2. Acid base titration
3. Colour reactions of proteins, carbohydrates and lipids
4. Validation of Lambert's and Beer's law and derivation of standard curve in colorimetry.
5. Separation of plasma from anti coagulated blood and separation of serum from clotted blood.
6. Standardization of colorimeter, photometer, and spectrophotometer.
7. Determination of unknown concentration of coloured solutions by photometric method.
8. Introduction to working of a semi-auto analyser and fully automated chemistry analysers.
9. Thin layer chromatography
10. HPLC
11. Serum protein electrophoresis
12. R_f value of amino acids

SEMESTER I

PAPER 2

PAPER CODE -

CELLULAR PATHOLOGY

Unit 1-

Cell Structure and functions: various cell organelles with functions. Basic structure of Blood cells. Development and classification of blood cells. The extra cellular matrix, collagen, elastin, fibrillin, fibronectin, laminin etc

Unit 2- Cellular adaptation: Overview of cell injury, mechanism of cellular injury, necrosis and apoptosis, pathological classification, cellular regeneration and repair , control of cell growth and wound healing.

Unit 3- Neoplasia : Types of cancer, differentiation and anaplasia, cancer epidemiology , molecular basis of cancer, basis of multistep carcinogenesis, aetiology of cancer, carcinogens – classification and mode of action, laboratory diagnosis of cancer, molecular profiling of cancer.

Unit 4- Genetic disorders: mutations, types of mutations, disease due to defective repair mechanism, Mendelian disorders, sex chromosomes related disorders, diseases caused by change in structural proteins- Marfan syndrome, Ehler’s syndrome, Danlos syndrome. Diseases caused by mutations in receptors proteins: Familial hypercholesterolemia, diabetes, protein energy malnutrition. Cytogenetics disorders: Down syndrome, Klienfleter syndrome, Turner syndrome, Fragile X syndrome. Paediatric disease , congenital anomalies, respiratory distress syndrome of new born, Necrotising enterocolitis , sudden death syndrome, cystic fibrosis. Fluorescent in-situ hybridisation for identification of chromosomal abnormalities.

Unit 5 - Hemodynamic disorders: Hyperemia and congestion, haemorrhage , hemostasis, thrombosis, coagulation cascades, DIC, embolism, pulmonary thromboembolism, systemic thromboembolism, fat embolism, infarction.

Unit 6- Environmental pollution : Air pollution, water pollution, and soil pollution, injury by chemical agents, injury by therapeutic and nontherapeutic agents : lead, carbon monoxide, alcohol and drug abuse, injury by physical agents. Exogenous estrogen and oral contraceptive pills side effects.

Unit 7- Hematopoiesis : origin , development and fate of blood cells. Erythropoiesis origin , development of RBC, biosynthesis of Hb, control of Erythropoiesis. Leucopoiesis – Granulocytes and agranulocytes and platelets. Mechanism of normal hemostasis. Mechanism and stages of coagulation, factors. Instruments in haematology and haematological stains.

Unit 8- Acute inflammation: Vascular and cellular events , chemical mediators, inflammatory cells, systemic effects of inflammation, general inflammatory markers, CRP, ASO.

PRACTICAL

1. Basic microscopy
2. Hb estimation – Sahli’s method
3. Peripheral Blood film (PBF)- Preparation, staining with Leishman’s stain and examination/identification of the RBC, WBC (Differential) and Platelets
4. Cell counts by Neubauer chamber (RBC,WBC and platelet)
5. ESR and PCV estimation
6. BT/CT determination
7. ABO/Rh blood grouping – slide method, forward and reverse grouping
8. Urine examination – physical, chemical examination for glucose, proteins, bile salts, bile pigments (bilirubin and urobilinogen), ketone bodies and occult blood.
9. Semen analysis, physical and counting in Neubauer’s chamber
10. Automation in haematology.

SEMESTER I

PAPER 3

PAPER CODE -

GENERAL MICROBIOLOGY AND BACTERIOLOGY

General Microbiology:

Unit 1:

- History and Pioneers in Microbiology: Contributions of Antony Van Leeuwenhoek, Louis Pasteur, Joseph Lister, Robert Koch (Koch's Postulates),
- Bacterial Taxonomy: Nomenclature and classification of microbes (in brief)

Unit 2:

- Microscopy, Stained preparation, Size & Shape and arrangement
- Morphology of bacteria: Structures of a bacterial cell and their functions
- Physiology of Bacteria: Nutrition, Gaseous requirement, temperature requirement and other growth requirements
- Sterilization and Disinfection
- Culture media and Culture methods
- Identification of Bacteria and their Antibiotic sensitivity testing
- Antimicrobial agents: Mechanism of Actions
- Bacterial metabolism: Oxidation, Fermentation

Bacteriology:

Unit 3:

- Morphology, Cultural Characteristics, Pathogenesis (in brief) Laboratory Diagnosis of following bacteria:
 - *Staphylococcus*, *Streptococcus* including *Pneumococcus*, *Neisseria*, *Micrococcus*, *Bacillus*, *Corynebacterium*, *Clostridium*.
 - *Enterobacteriaceae*, *Vibrios*, *Pseudomonas*, *Brucella*, *Haemophilus*, *Bordetella*
 - *Spirochaetes*,
 - *Chlamydiae*, *Rickettsiae*.
 - *Mycobacteria*
 - *Lactobacillus*, *Bacteroides*, *Fusobacterium* and *Leptotrichia*, *Actinobacillus*, *Pasteurella*, *Francisella*, *Ureaplasma*, *Actinomycets*, *Nocardia*, *Listeria*,

Applied Microbiology and Recent advances

Unit 4:

- Aetiology and Laboratory diagnosis of Respiratory infections, Urinary tract infections, Pyrexia of unknown origin, Meningitis, Sepsis, Septicemia, Diarrhoeal diseases & food poisoning.
- Prevention and Control of Hospital acquired infections
- Immunoprophylaxis: Types of vaccines and schedule of vaccination.
- Principal and Practice of Hospital waste disposal
- Recent advances in diagnostic microbiology: Automation, Nucleic acid based detection methods.

- Epidemiology of common infectious diseases and Newer vaccines
- Bio-terrorism

PRACTICALS

- Aseptic practices in laboratory and safety precautions
- Preparation of stains viz. Gram, Alberts, Ziehl Neelsen (ZN) etc. and performing of staining.
- Preparation and pouring of media – Nutrient agar, Blood agar, Mac Conkey agar, Sugars, Serum sugars, TSI, Robertsons cooked meat, Lowenstein Jensens, Sabouraud dextrose Agar.
- Quality control of media, reagents etc.
- Operation and quality control of Autoclave, hot air oven and Inspissator.
- Washing and sterilization of glassware (Plugging and packing)
- Disposal of contaminated materials like cultures.
- Care and maintenance of common laboratory equipments like water bath, centrifuge, refrigerators, incubators, etc.
- Identification of Bacteria of Medical Importance upto species level
- Care and operation of Microscopes viz. Light and Fluorescent microscopes.
- Methods for the preservation of bacteria, Maintenance of stock cultures.
- Tests for motility: hanging drop preparation

SEMESTER I

PAPER 4

PAPER CODE -

HUMAN PHYSIOLOGY

UNIT 1

Blood - Composition and functions of blood, plasma proteins and their functions, erythropoiesis, leukopoiesis, thrombopoiesis, Structure and synthesis of haemoglobin. Properties and function of haemoglobin. Haemoglobin derivatives. Blood coagulation mechanism.

UNIT 2

Introduction to Digestive system – physiology and function of Salivary secretions, stomach, pancreas, liver and gall bladder, small intestine, large intestine, digestion and absorption of carbohydrates, fats and proteins in GI tract. Introduction to Cardio vascular system – physiology and anatomy of heart, cardiac cycle, arterial blood pressure.

UNIT 3

Physiology and anatomy of Respiratory system – mechanism of respiration,
General introduction to endocrine system – function of pituitary gland, thyroid gland, parathyroid gland, adrenal cortex, adrenal medulla, pancreas, thymus and pineal gland.
Organisation of Nervous system – synapses, central nervous system and autonomic nervous system.

UNIT 4

Physiology and anatomy of Reproductive system, Excretory system- Structure of nephron, formation of urine (glomerular filtration, tubular reabsorption of glucose, water and electrolytes), tubular secretion, role of kidneys regulation of blood pressure, Regulation of body temperature – normal range and factors affecting body temperature.

SEMESTER II

PAPER 1

PAPER CODE -

METABOLISM AND ENZYMOLOGY

UNIT 1:

Enzymes: definition and classification, enzyme as catalysts, enzyme specificity, factors affecting enzyme activity, Enzyme kinetics, Enzyme inhibitors, co enzymes, isoenzymes, Determination of enzymes – comparison of endpoint reaction and rate of reaction methods.

UNIT 2:

Carbohydrates - Definition, function, classification. Properties and digestion of carbohydrates. Metabolism – Glycolysis, glycolgenesis, glycogenolysis, Citric acid cycle, Hexose monphosphate shunt (HMP), Gluconeogenesis. Electron transport system, Regulation of blood glucose, diabetes, Diabetic profile test, lab test for blood (plasma) glucose determination, glucose tolerance test.

UNIT 3:

Proteins – structure and classification, functions of protein, Types of proteins, Amino acid metabolism, urea cycle and its associated defects. Proteinuria and its causes, Lab determination of protein in body fluids. Aminoacidurias

UNIT 4:

Biochemistry of lipids, digestion and absorption of lipids. Lipid metabolism, lipo protein, dislipidemia, lipid profile.

UNIT 5:

Non protein nitrogenous molecules, Metabolism of nucleotides - nucleosides and nucleotides, Purine and pyrimidine.

UNIT 6:

Heme metabolism and associated disorders.

PRACTICALS

1. Kinetic properties of enzymes
2. Quantitative analysis of various parameters (protein, glucose, AL, ALT, cholesterol, creatinine, urea).
3. Calculation of clearance (urea and creatinine)
4. Glucose tolerance test.
5. Biochemistry of various body fluids (pleural, pericardial, CSF)
6. Diabetic profile including glycated haemoglobin.
7. Organ function tests: LFT, KFT, lipid profile.
8. Analysis of abnormal urine and its applications

SEMESTER II
PAPER 2
PAPER CODE -
CLINICAL PATHOLOGY

Unit 1

Fetal and neonatal physiology and pediatric diseases : Growth and functional development of the fetus, adjustment of the infant to extrauterine life, special functional problem in the neonate, problems of prematurity, congenital anomalies, perinatal infections, syndromes of the new born, immune hydrops, tumours and tumour like lesions of infancy and childhood.

Unit II

Cervical cancer, uterine and ovarian cancers, gestational trophoblastic neoplasia. Sexually transmitted diseases – syphilis, gonorrhoea, trichomoniasis, human papilloma virus infection. Diseases during pregnancy – placental inflammations and infections, ectopic pregnancies, gestational trophoblastic diseases and eclampsia.

Unit III

Red blood cells disorders : basic aspects of anemia - definition, pathophysiology, classification and clinical features. Investigation of anemia in general.

Microcytic hypochromic anemias: Iron deficiency anemia – iron metabolism, causes of iron deficiency, clinical features and laboratory investigation.

Macrocytic anaemias : Megaloblastic anaemia - etiology, clinical features, lab investigations. Non - megaloblastic anaemia. Pernicious anemia.

Normocytic normochromic anemia: anemia in systemic disorders, (acute blood loss, renal failure, liver disorders).

Disorders of haemoglobin : structure of haemoglobin and synthesis, normal and abnormal haemoglobins, haemoglobinopathies (thalassemia and sickle cell anemia).

Haemolytic anemias: definition, pathogenesis, classification, clinical features, lab investigation.

Aplastic anemia: pancytopenia.

Polycythemia – classification, clinical features and lab investigation.

Unit IV

WBC disorders: Leukemoid reaction, myelodysplastic syndrome (MDS) – definition, clinical features, peripheral smear and bone marrow findings.

Leukemias : definition, classification – FAB and WHO of acute leukemias, diagnostic criteria, cytochemicalstaining and immunophenotyping.

Chronic leukemia: classification, diagnostic criteria, clinical feature and lab investigation.

Myeloproliferative disorders: classification, clinical features, lab investigations, chronic myeloid leukemia in detail.

Lymphoproliferative disorders : chronic lymphocytic leukemia in detail.

Plasma cell disorders: classification. Plasma cell myeloma – definition, clinical features, lab investigations.

Unit V

Hemorrhagic disorders: definition, pathogenesis, clinical features and classification of vascular, platelet disorders, coagulation disorders and fibrinolysis.

Platelet disorders: quantitative- thrombocytopenia, ITP – classification, clinical featuresand bone marrow findings in ITP.

Qualitative platelet disorders - thrombocytosis- definition, etiology and lab investigations.

Coagulation disorders inherited : Haemophilia A & B, Von – Willebrand’s disease, acquired vitamin K deficiency, liver diseases, DIC

Investigations of haemorrhagic disorders: tests of vascular and platelet function – bleeding time, clotting time, platelet count, platelet aggregation studies.

Test for coagulation disorders: screening tests (first line tests) – prothrombin time, activated thromboplastin time (APTT), thrombin time. Second line test: coagulation factors assay, urea solubility test for factor XIII, factor VIII, inhibitor study, fibrinogen assay.

Thrombotic disorders: classification- inherited and acquired. Clinical features, investigations of thrombotic disorders (protein C, protein S, PT-III, Factor V)

Antiphospholipid antibody syndrome- definition, clinical features, lab investigation.

Bone marrow examination- aspiration and Trepshine biopsy and staining

Automation in hematology

Unit VI

Collection, transport, preservation and processing of various clinical specimens.

Urine examination – physical, chemical andmicroscopic urine analysis by Strip method

Body fluids: CSF – specimen collection, normal composition and clinical significance, routine examination (physical and cytological examination)

Other fluids: pleural, pericardial and peritoneal fluids, synovial and gastric fluids - Brief description with routine examination

Semen analysis and pregnancy test.

Practical

1. Coomb's test (direct and indirect)
2. Urine : microscopic examination and automation in urine analysis
3. Reticulocyte count: preparation, staining examination and corrected retic count.
4. Semen analysis: microscopic examination and methylene blue staining for morphology
5. Pregnancy test
6. Body fluid analysis (CSF, pleural and peritoneal/ascetic fluid)- physical, chemical and microscopic examination
7. Sickling test for sickle cell anemia
8. Osmotic fragility test
9. LE cell preparation and examination
10. PT and APTT test
11. BT/CT with clot lysis and clot retraction time
12. Automation in urine analysis

SEMESTER II

PAPER 3

PAPER CODE -

IMMUNOLOGY AND VIROLOGY

Immunology:

Unit 1:

- Immunity (Innate and Acquired) Antigens
- Antigen
- Antibody

Unit 2: Antigen and antibody reactions

- General Features of antigen-antibody reaction Precipitation, Agglutination
- Complement Fixation
- Immunofluorescence, RIA, EIA Western Blot

Unit 3:

- Structure and function of Immune system: (In brief)
- Major Histocompatibility Complex
- Immune Response: Humoral Immune response, Primary & secondary immune response, Cellular Immune Response.
- Hypersensitivity
- Autoimmunity and Immunodeficiency Diseases
- Transplantation immunology: Classification of transplants, Allograft reaction,
- Factors favouring allograft survival, Graft-vs-host reaction

Virology

Unit 4:

- General Properties of viruses
- Nomenclature and Classification of viruses

Unit 5:

- Morphology: virus structure and Virus replication
- Virus host interactions
- Bacteriophage,

Unit 6:

- Morphology, life cycle, laboratory diagnosis of:
 - Herpes viruses, Mumps, measles, Rubella virus Influenza viruses, Paramyxoviridae
 - Polio, Hepatitis viruses, Rabies virus
 - Human immunodeficiency viruses, Oncogenic viruses
 - Epidemiology of viral infections Pox viruses, Echo and Coxsackie viruses, Enteric viruses other than Polio virus Rhinoviruses.
 - Adenoviruses and Corona viruses.
 - Anti viral agents and viral vaccines

PRACTICALS

- Serological tests – ELISA for HIV, HBsAg, HCV
- Collection of blood by venipuncture, separation of serum and preservation of serum.
- Performance of serological tests viz. Widal, VDRL/RPR.
- Enzyme linked immunosorbant assay: HIV, HBsAg, HCV.
- Latex agglutination tests: RA, CRP.
- Rapid tests HIV.

SEMESTER II

PAPER 4

PAPER CODE -

BIO STATICS AND HOSPITAL MANAGEMENT

UNIT CONTENTS

Introduction and Some Basic Concepts:

Sample and population. Statistical definitions. Random sampling. Testing of hypothesis. Statistical tools for collection, presentation and analysis of data relating to causes and incidence of diseases.

Measurement of central tendency.

Measures of variation. Frequency distribution.

Concept of Probability:

Laws of Probability. Probability Distribution

Binomial, Normal and Chi-square distribution

Commonly used procedures and test of significance and estimation

Correlation and regression

Test of significance namely Z test, T test, Chi square test, F test

Analysis of variance.

Research Statistics:

Research Statistics pertaining to medical laboratory technology

Testing the efficacy of manufacturing drugs

Medicines and injections for curbing and controlling specific diseases

Statistical analysis of instrumental data and comparison of various biological techniques used in hospitals.

Health care – an overview:

Functions of Hospital administration

Modern techniques in Hospital management

Challenges and strategies of Hospital management

Administrative Functions–

Planning, Organizing, Staffing, Leading and Controlling Organizational Structure,

Motivation and leadership.

Designing health care organization.

Hospital Management:

Medical record, House-keeping services.

Laboratory performance.

Management of biomedical waste.

Total patient care – indoor and outdoor.

Nursing and ambulance resources, Evaluation of hospital services. Quality assurance.

SEMESTER III

PAPER 1

PAPER CODE

CLINICAL AND APPLIED BIOCHEMISTRY

UNIT I

Kidney function test – laboratory test aiding in the evaluation of kidney function, kidney functions, Diseases of the kidneys

Liver function test – clinical manifestation of liver diseases, liver functions, Metabolism of bile pigments, bile acids, Jaundice,

Heart diseases, cardiac injury panel tests, markers of myocardial infarction – creatine kinase MB, Myoglobin, Troponin complex, Cardiac troponins T and I.

Thyroid function test

UNIT II

Hormones - classification and general features, mechanism of hormone action. Hormonal disorders – thyroid gland, pituitary gland, hypothalamus, adrenal gland, hormones of gonads, clinical chemistry of menstrual cycle and pregnancy.

UNIT III

Electrolytes and mineral metabolism – sodium, potassium, chlorine, calcium, importance of trace elements. Laboratory determination of calcium, inorganic phosphorus and electrolytes, Biochemistry of – Cancer, proto oncogenes and tumour markers, molecular techniques.

UNIT IV

Vitamins and toxic elements in health and disease. Deficiency disorders of vitamins

PRACTICALS

1. Principle, working, standardization and calibration of ELISA.
2. Standardization and calibration of various instruments such as semi-auto analyser, fully automated analyser, CLIA, ISE analyser.
3. Quality control in the laboratory- external and internal preparation of SOPs and application of westgerald's rules.
4. Hormonal analysis including thyroid profile and infertility profile on ELISA and CLIA.
5. Arterial blood gas analysis and interpretation.
6. DNA extraction, PCR and RT PCR
7. Analytical electrophoresis
8. Quantification of tumour marker, bone markers and anemia profile.
9. Estimation of vitamin D and Vitamin B₁₂

SEMESTER III

PAPER 2

PAPER CODE

BLOOD BANKING, HISTOPATHOLOGY AND CYTOLOGY

Unit I

Blood banking (immunohematology)

Instruments in blood banking

Blood groups – genetics (ABO and Rh system), Bombay blood group

Techniques of blood typing and cross matching

Coomb's test – techniques and application of Coomb's test

Du tests

Haemolytic disease of the newborn – causes and lab investigation

Donor selection and tapping of a donor

Blood storage

Screening of donor

Principles of blood transfusion

Diseases transmitted through blood

Lab investigation prior to blood transfusion

Screening of blood for infective material.

Blood component therapy

Transfusion reactions and investigations

Quality control in blood banking

Unit II

Histopathology: instruments and reagents in histopathology

Histopathology techniques: grossing, tissue processing, fixatives, decalcification, microtomy, general staining procedure, slide adhesives, fixatives and stains used.

Frozen section

Brief introduction to immunohistochemistry

Quality control in histopathology

Unit III

Cytology

Instruments , techniques and stains in cytology

Exfoliative cytology

Cytology of body cavity fluids (effusions)

Fine needle aspiration cytology (FNAC)

Quality control in cytopathology

PRACTICAL

1. Cytology – various techniques in FNAC and staining
2. Cytology of body fluid
3. Bone marrow aspiration/ biopsy techniques with staining/ examination of normal marrow contents
4. Histopathology – grossing, processing, block making, cutting, staining and mounting etc
5. Surgical histopathology protocol – registration, tissue accession, gross room, histopathology lab, HP reports, quality control
6. Special stains – H and E, Giemsa, pap stain and various other special stains for specific components (amyloid, carbohydrate, connective tissues, lipids and micro organisms)
7. Blood banking – component separation and antibody titre
8. Plasma haemoglobin
9. Haemosidrinuria
10. Fetal haemoglobin
11. Electrophoresis of various haemoglobin
12. Investigations of G6PD deficiencies
13. Automation in histopathology and cytology and blood banking

Advanced experiments/investigations

14. Immunofluorescence – fluorescent microscopy, electron microscope, enzyme histochemistry
15. Immunohistochemistry
16. Cytogenetics, karyotyping and diagnostic molecular pathology
17. Flow cytometry
18. Computers in pathology lab
19. Image analysis and morphometry

SEMESTER III

PAPER 3

PAPER CODE

PARASITOLOGY AND MYCOLOGY

Parasitology

Unit 1: Protozoa & Helminthology

- Morphology, life cycle, laboratory diagnosis of:
 - *Entamoeba*, *Giardia*, *Trichomonas*, *Leishmania*, *Trypanosoma*,
 - *Plasmodium*,
 - *Toxoplasma*, *Coccidian parasite*.
 - *Taenia*, *Echinococcus*, *Hymenolepis*, *Schistosomes*,
 - *Trichuris*, *Strongyloides*, *Ancylostoma*,
 - *Ascaris*, *Enterobius*, *Wuchereria bancrofti*

Mycology

Unit 2:

The morphology and reproduction in fungi.

Classification of fungi Morphology, diseases caused and lab diagnosis of:-

1. Opportunistic fungi - Cryptococcus, Candidiasis, Aspergillus, Zygomycetes.
2. Fungi causing superficial mycoses- Ptyriasis versicolor, Tinea Nigra, Piedra Dermatophytes
3. Subcutaneous mycoses – Mycetoma, Rhinosporidium, Sporothrix, Dematiaceous fungi
4. Dimorphic fungi – Histoplasma, Blastomyces, Chromoblastomycosis and Penicillium
5. Anti-mycotic agents

PRACTICALS

- Collection of specimens for Mycology
- Direct Examination of specimens by KOH, Gram, Lactophenol Cotton Blue stains.
- Isolation and identification of common laboratory contaminants, dermatophytes and others of medical importance (Yeasts, dematiaceous fungi) on Sabouraud's Dextrose agar, Chrom Agar etc
- Maintenance of stock culture.
- Special techniques like Wood's Lamp examination, hair baiting, hair perforation, and slide culture.
- Examination of faeces for parasitic ova and cysts etc. by direct and concentration methods (Salt flotation and Formol-Ether methods).
- Examination of blood for protozoa and helminths by wet mount, thin and thick stained smears. Performance of stains – Leishman, Giemsa.

SEMESTER III

PAPER 4

PAPER CODE

MOLECULAR BIOLOGY

UNIT I:

Secondary and tertiary Structure of DNA and RNA, Locked nucleic acids, role of locked nucleic acid in therapeutics, SiRNA, Micro RNA, Role of micro RNA in gene regulation, Isolation of nucleic acids, Qualitative and quantitative estimation of nucleic acids, Recombinant DNA Technology, Applications of recombinant DNA, Polymerase chain reaction, application of PCR in Diagnostics of pathogens identification, Site directed mutagenesis, RAPD, RFLP & DNA finger printing, DNA Foot Printing, Mobility shift assay, Promoter & Reporter assay, Yeast Two hybrid systems, antisense-RNA technology, chromosomal walking, gene therapy and recombinant vaccines.

UNIT-2:

Nucleic Acid analysis, Extraction, purification and analysis of mRNA from eukaryotic cells, methods for synthesis of double strand cDNA, Expression profiling, Transcriptome analysis, RT PCR and Real Time PCR, Rapid DNA sequencing techniques like Sanger's dideoxynucleotide, partial ribonucleotide substitution, Maxam and Gilbert's method, pyrosequencing and single molecule sequencing, Genome, Genome sequencing, DNA Sequence Characterization (Open reading frames, promoters, coding frames)

UNIT-3:

Molecular diagnostics, Viral load monitoring, window period, Role of molecular diagnostics in present diagnostic area, Benefits of molecular diagnostics over serological diagnostics tests, Ethical issues related to molecular diagnostics, role of Molecular diagnostics in Blood banking, Basic techniques used in molecular diagnostics, future of molecular diagnostics,

UNIT-4:

Molecular diagnostic of various viral diseases: HIV type -1, HIV type II, HPV, Various hepatitis strains, Influenza (H1N1) , sample preparation, various steps

required for viral infection analysis and Viral load monitoring, Molecular diagnostics of bacterial infections; Mycobacterium tuberculosis, Shwenella typhus, Pathogenic E Coli, sample preparation and pathogen detection. Prenatal diagnostics of various genetic disorders

SEMESTER IV

DISSERTATION

The research project is to be carried out over a period of approximately 5 to 6 months. Each student will select research project in consultation with their respective supervisors. The projects will be selected such that a student can reasonably be expected to make an original contribution to the chosen area of research within the time period allotted. The purpose of the project is to provide the student with training in academic research and acquisition of practical skills, including the design of a research project, planning of experiments, dealing with practical problems, recording, presenting and analyzing the data.

Unit I- Thesis Proposal Development

Through regular meetings, the student and advisor will discuss this literature in detail and the topic for research project will be finalized in the third semester.

Unit II- Thesis proposal

Each student must submit to the university with the signed approval of the advisor, a thesis proposal defining the thesis project, the methods and design of the experiments needed and plans for completion of the project in the third semester.

Unit III – Thesis preparation

This is involving preparation of the thesis. The thesis must include a cover page, table of contents, introduction, review of literature, materials and methods, observations, results and discussion and final conclusions section summarizing the outcome of the project. The master chart comprising the details of experiments performed will be attached. The student should submit a draft of the thesis to the advisor by the end of the fourth semester. Four copies of the completed thesis duly certified by the supervisor will be submitted to the controller of examinations as per ordinance of Faculty of Allied Health Sciences.