Maharaja Ranjit Singh Punjab Technical University
Bathinda-151001

FACULTY OF PHARMACY

SYLLABUS

FOR

M.SC. (MEDICAL LAB TECHNOLOGY)

(2 YEARS PROGRAMME)

2023 BATCH ONWARDS

SCHEME

1st Semester		Contact Hrs.			Marks			Credits
Subject Code	**Subject**	**L**	**T**	**P**	**Int.**	**Ext**	**Total**	
MMLTS3-101	Clinical Biochemistry	3	1	0	40	60	100	4
MMLTS3-102	Human Anatomy and Physiology	3	1	0	40	60	100	4
MMLTS3-103	Immunology, Vaccinology and Transplantation Technology	3	1	0	40	60	100	4
MMLTS3-104	Clinical Microbiology	3	1	0	40	60	100	4
MMLTS3-105	Clinical Hematology & Blood Banking Technology	3	1	0	40	60	100	4
MMLTS3-106	Immunology, Vaccinology and Transplantation Technology-Lab	0	0	4	60	40	100	2
MMLTS3-107	Clinical Microbiology-Lab	0	0	4	60	40	100	2
TOTAL		**15**	**5**	**8**	**320**	**380**	**700**	**24**

2nd Semester		Contact Hrs.			Marks			Credits
Subject Code	**Subject**	**L**	**T**	**P**	**Int.**	**Ext**	**Total**	
MMLTS3-201	Diagnostic Biochemistry& Organ Function Test	3	1	0	40	60	100	4
MMLTS3-202	Histopathologyand Morbid Anatomy Techniques	3	1	0	40	60	100	4
MMLTS3-203	Cytology & Cytogenetic	3	1	0	40	60	100	4
MMLTS3-204	Human Genetics & Human Genome	3	1	0	40	60	100	4
MMLTS3-205	Diagnostic Biochemistry& Organ Function Test- Lab	0	0	4	60	40	100	2
MMLTS3-206	Histopathology and Morbid Anatomy Techniques-Lab	0	0	4	60	40	100	2
MMLTS3-207	Cytology & Cytogenetic-Lab	0	0	4	60	40	100	2
MMLTS3-208	Diagnostic Microbiology& Immuno Haematology-Lab	0	0	4	60	40	100	2
MMLTS3-209	Human Genetics & Human Genome-Lab	0	0	4	60	40	100	2
TOTAL		**12**	**4**	**20**	**460**	**440**	**900**	**26**

3rd Semester. Choose any one specialization
SPECIALIZATION Degree will be awarded in the following categories:

M.Sc. MLT (Hematology)
i . Clinical Hematology Non Neoplastic
ii Clinical Hematology Neoplastic
iii Immunohematology & Advanced Hematologic Techniques

3rd Semester		Contact Hrs.			Marks			Credits
Subject Code	**Subject**	**L**	**T**	**P**	**Int.**	**Ext**	**Total**	
MMLTS3-301	Clinical Hematology (Non Neoplastic)	3	1	0	40	60	100	4
MMLTS3-302	Clinical Hematology (Neoplastic)	3	1	0	40	60	100	4
MMLTS3-303	Immuno Pathology & Advanced Hematologic Techniques	3	1	0	40	60	100	4
MMLTS3-304	Immuno Hematology-Lab	0	0	4	60	40	100	2
TOTAL		**9**	**3**	**4**	**180**	**220**	**400**	**14**

M.Sc. MLT (Clinical Biochemistry)
i Advances in Biochemical Sciences
ii Intermediary Metabolism & Metabolic Disorders
iii Diagnostic Enzymology

3rd Semester		Contact Hrs.			Marks			Credits
Subject Code	**Subject**	**L**	**T**	**P**	**Int.**	**Ext**	**Total**	
MMLTS3-305	Advances in Biochemical Sciences	3	1	0	40	60	100	4
MMLTS3-306	Intermediary Metabolism & Metabolic Disorders	3	1	0	40	60	100	4
MMLTS3-307	Diagnostic Enzymology	3	1	0	40	60	100	4
TOTAL		**9**	**3**	**0**	**120**	**180**	**300**	**12**

M.Sc. MLT (Clinical Microbiology)
i General Issues in Clinical Microbiology
ii Diagnostic Microbiology
iii Instrumentation & Techniques in Medical Microbiology

3rd Semester		Contact Hrs.			Marks			Credits
Subject Code	**Subject**	**L**	**T**	**P**	**Int.**	**Ext**	**Total**	
MMLTS3-308	General Issues in Clinical Microbiology	3	1	0	40	60	100	4
MMLTS3-309	Diagnostic Microbiology	3	1	0	40	60	100	4
MMLTS3-310	Instrumentation & Techniques in Medical Microbiology	3	1	0	40	60	100	4
TOTAL		**9**	**3**	**0**	**120**	**180**	**300**	**12**

4th Semester		Contact Hrs.			Marks			Credits
Subject Code	**Subject**	**L**	**T**	**P**	**Int.**	**Ext**	**Total**	
MMLTS3-401	Project work	0	0	40	60	340	400	20
Total							**400**	**20**

The candidate shall undergo internship in relevant department. The internship report shall be submitted to the parent institute & Viva-Voce examination shall be conducted by external expert.

or

The candidates will be supervised by the concerned faculty & the project report will be submitted to the institute. The Viva-Voce examination shall be conducted by external expert.

Overall Marks / Credits

Semester	Marks	Credits
1st	700	24
2nd	900	26
3rd	300/400	12/14
4th	400	20
Total	**2300/2400**	**82/84**

FIRST SEMESTER

CLINICAL BIOCHEMISTRY

Subject Code: MMLTS3-101 **L T P C** **(Duration: 60hrs)**
3 1 0 4

Course Objectives:

- The course aims to provide the students with analytical and presentational skills. This will be achieved in methods and skills lectures, classes and seminars, and small group teaching.
- The student will participate in: Two journal clubs which guide the student through a detailed analysis of a research paper.

Course Outcomes:

- Understand biochemistry at the atomic level, draw molecules and reaction mechanisms perfectly.
- Understand in detail about amino acid structures, types of amino acids, classifications, structure of proteins and types of proteins

UNIT 1 (15 Hrs)

Principles of the assay procedures for biological materials - Blood sugar and its metabolism - Estimation of blood sugar i) God-Pod method ii) Folin-Wu method iii) Orthotoluidine method - Metabolism of protein - Estimation of total protein i) BCG method ii) Biuret method - Estimation of serum albumin i) BCG method - Serum Creatinine estimation i) Jaffe's method Lipid profile: Fat, definition, important biological fats, cholesterols, clinical significance of cholesterol. Methods of estimation and the normal levels i) Serum cholesterol a) CHOD/ POD method b) Wybengo and Nileggis method ii) LDL Cholesterol iii) HDL cholesterol CHOD/ POD method iv) Triglycerides method GOP/ PA method Serum Electrolytes: (Their importance and normal blood values) i) Na+ ii) K+ iii) Ca++ - T3,T4,TSH(Thyroid Stimulating hormone)

UNIT 2 (15 Hrs)

Clinical significance, Principle of estimation - Bilirubin general, types and jaundice - Liver function test i) Bilirubin estimation (Mally evlen method, Jendrassik and Grof method, direct spectrophotometric method) ii) Alkaline phosphatase and acid phosphatase estimation by King"s method iii) SGOT, SGPT Reatam frank method. ALP, PT etc. - Glucose tolerance test (G.T.T.), Importance, Principle and techniques of GTT - Insulin tolerance test - Gastric juice analysis - Xylose absorption test - Analysis of calculi - Cerebrospinal fluid (CSF) - Composition and function of CSF - Clinical significance of CSF analysis - Estimation of sugar and protein in CSF.

UNIT 3 (15 Hrs)

Automation in urine chemistry - Physical and chemical examinations of urine samples; Qualitative tests for inorganic urinary ingredients. - Common qualitative and quantitative test of urine - Quality control of clinical investigation - Automation in clinical biochemistry laboratory - Laboratory organization, management and maintenance of record - Normal and abnormal levels - Clearance test for renal function - Protein properties - Protein structure - Total protein estimation - Protein purification.

UNIT 4 (15 Hrs)

Immunochemical techniques - General principles - Production of antibodies - The precipitation reaction in gels; Immunodiffusion(ID) - Radio immunoassay(RIA) - Enzyme-Linked

immunoassay(ELISA) - Fluorescent immunoassay(FIA) Molecular biology techniques - Introduction and structure of nucleic acid - Function of nucleic acid - Isolation of nucleic acid - Physical analysis of DNA - Isolation of specific nucleic acid and sequences. nit-V Protein and enzyme techniques - Enzyme nomenclature - Steady state enzyme kinetics - Enzyme assay techniques - Immobilized enzymes Centrifugation Techniques -Basic principles of sedimentation -Centrifuges and their use Electrophoretic technique General principles and introduction to - Electrophoresis of proteins - Electrophoresis of nucleic acid Chromatographic techniques General principles and introduction to - Low pressure column chromatography - High performance liquid chromatography(HPLC) - Partition chromatography - Ion-exchange chromatography - Gas-liquid chromatography(GLC) - Thin layer chromatography(TLC) - Paper chromatography.

Books Recommended:

- Biochemistry by Lubert Stryer -W.H.Freeman and company New York
- Lehninger's- 3rd edition. Principles of Biochemistry – Lehninger, Nelson. D.L.,
- Harper Illustrated Biochemistry – Murray R.K. Grannar, D.K. Mayes-P.A. Eral 28th edtion
- Medical Biochemistry – N.V. Bhagavan -Academic Press 4th edition 2002.
- Text Book of Biochemistry – A.S. Saini, C.B.S Publishers and distributors 2nd edition.
- Tietz fundamentals of Clinical Chemistry – Burtis. C.A. Ashwood E. R. 3rd, 4th editions
- Tietz Text book of Clinical Chemistry and molecular diagnostics – Burtis. C.A. Ashwood E. R. 3rd,4th and 5th editions
- Varley's Practical Clinical Biochemistry 4th, 5th, 6th editions
- Text Book of Biochemistry with Clinical Correlations – Devlin T.M. Wiley Liss, New York 6th Edition
- Clinical Physiology of Acid-Base balance and Electrolyte disorders – Rose. B.D – Mcgraw-HillInternational edition New York 4th edition
- Methods in Bio-Statistics for Medical students – Mahajan. B.K. Jaypee brothers MedicalPublishers, New Delhi.
- Clinical Chemistry – Theory analysis and Correlation – Kalpan. L.A. 4th edition
- Principles of Biochemistry -4th edition; Lehninger, Nelson, Cox.

HUMAN ANATOMY AND PHYSIOLOGY

Subject Code: MMLTS3-102 **L T P C** **(Duration: 60hrs)**
3 1 0 4

Course Objectives:

- This course introduces the students to the basics of cell and its components.
- Explore the intricacies of human anatomy and physiology to grasp how the body's systems work in harmony to maintain homeostasis and support life.
- Gain proficiency in identifying anatomical structures and explaining their physiological roles, enabling a deeper comprehension of health, disease, and medical intervention

Course Outcomes:

- Demonstrate a thorough understanding of human anatomical structures and their relationships, enhancing diagnostic skills and medical interpretations.
- Explain physiological principles and mechanisms, enabling the prediction of how the human body responds to various internal and external stimuli.
- Integrate interdisciplinary knowledge to appreciate the holistic nature of the human body, encouraging collaborative approaches for improved patient care and health outcomes.

UNIT 1(15Hrs)

Nervous system, Organization of nervous system, neuron, neuroglia, classification and properties of nerve fibre, electrophysiology, action potential, nerve impulse, receptors, synapse, neurotransmitters. Central nervous system: Meninges, ventricles of brain and cerebrospinal fluid. Structure and functions of brain (cerebrum, brain stem, cerebellum), spinal cord (gross structure, functions of afferent and efferent nerve tracts, reflex activity)

UNIT 2(15Hrs)

Respiratory system: Anatomy of respiratory system with special reference to anatomy of lungs, mechanism of respiration, regulation of respiration, lung volumes and capacities transport of respiratory gases, artificial respiration, and resuscitation methods.

Urinary system: Anatomy of urinary tract with special reference to anatomy of kidney and nephrons, functions of kidney and urinary tract, physiology of urine formation, micturition reflex and role of kidneys in acid base balance, role of RAS in kidney and disorders of kidney.

UNIT 3(15Hrs)

Endocrine system: Classification of hormones, mechanism of hormone action, structure and functions of pituitary gland, thyroid gland, parathyroid gland, adrenal gland, pancreas, pineal gland, thymus and their disorders.

Digestive system: Anatomy of GI tract with special reference to anatomy and functions of stomach, (Acid production in the stomach, regulation of acid production through parasympathetic nervous system, pepsin role in protein digestion) small intestine and large intestine, anatomy and functions of salivary glands, pancreas and liver, movements of GIT, digestion and absorption of nutrients and disorders of GIT. Energetics Formation and role of ATP, Creatinine Phosphate and BMR.

UNIT 4(15Hrs)

Reproductive system anatomy of male and female reproductive system, Functions of male and female reproductive system, sex hormones, physiology of menstruation, fertilization,

spermatogenesis, oogenesis, pregnancy and parturition
Blood clotting: Chemistry of blood coagulation and coagulation disorders

Suggested Readings:

1. Essentials of Medical Physiology by K. Sembulingam and P. Sembulingam. Jaypee Brothers medical publishers, New Delhi.
2. Anatomy and Physiology in Health and Illness by Kathleen J. W. Wilson, Churchill Livingstone, New York
3. Physiological basis of Medical Practice - Best and Tailor. Williams & Wilkins Co, River view, MI, USA

IMMUNOLOGY, VACCINOLOGY AND TRANSPLANTATION TECHNOLOGY

Subject Code: MMLTS3-103 **L T P C** **(Duration: 60hrs)**
3 1 0 4

Course Objectives:

The Course aims to facilitate critical decision-making in vaccinology by providing participants with a comprehensive overview of the various aspects of vaccinology (immunology, vaccine development, clinical trials, regulatory processes, vaccine-specific issues including new vaccines, vaccination strategies and policies, programme implementation.

Course Outcomes:

An education in cell biology will impart knowledge to the students to understand origins of cells and the generation of cell diversity, as well as the common features of cellular structure and function – how they obtain energy, synthesize new molecules, communicate, proliferate and survive. It will also emphasis on the fundamental importance of cell biology in modern science, particularly in relation to cell technologies and health.

UNIT 1 (15 Hrs)

Immune system and immunity: History of immunology, composition and function of cells and organs involved in immune system. Immune responses: evolution of immune response, immunological tolerance, active and passive immunization, innate immunity and acquired immunity. Determinants of innate immunity: Species and strains, individual differences, Influence of age, hormonal influence, nutritional factors and mechanical barriers and surface secretions, Non-specific immune mechanisms: surface defenses, tissue defenses, opsonization, inflammatory reactions, hormone balance.

UNIT 2 (15 Hrs)

Antigens and antibodies: Antigens – structure and properties, types-iso and allo haptens, adjuvant, antigens specificity. Immunoglobulin-Structure, heterogeneity,, types and subtypes, properties (Physiochemical and biological).Theories of antibody production. Complement: - structure, components, properties and functions of different components, complement pathways and biological consequences of complement activation. Antigen-antibody reactions: in vitro methods- agglutinations, precipitation, complement fixation, immunofluorescence, ELISA, Radio immunoassay (RIA)

UNIT 3 (15 Hrs)

Lymphocytes, their subpopulation, their properties and functions, membrane bound receptors of lymph cells, Helper T cells in immune response. Development and differentiation of B and T cells .Mechanism of cell mediated immunity, immune tolerance to self-antigens. Synthesis of antibodies and antibody diversity, Hybridoma technology. Immunogenetics: Blood groups and transplantation antigens, Major Histocompatibility complex and tumour immunology: structure and functions and disease association of MHC and HLA-system. Gene regulation and Ir-genes. HLA and tissue transplantation, graft versus host reaction and rejection, Immune suppression-specific and non-specific, Autoimmunity-theories, mechanisms and diseases. Tumour immunology-tumour specific antigens, mmune response to tumour.

UNIT 4 (15 Hrs)

Hypersensitivity reactions: Antibody mediated-type I anaphylaxis, type II antibody dependent cell cytotoxicity, tytpe III immune complex mediated reactions, Type IV cell mediated hypersensitivity reactions. Defects in immune system: Primary and secondary defects, defects in complements, defective phagocyte mechanisms, Allergy, Immunoprophylaxis-types of vaccines and vaccine production, monoclonal antibodies and hybridoma technology.

Suggested Readings

- Ivan M. Roitt, J. Brostoff and D. K. Male, Immunology, Gower Medical Publishing, London.1993.
- Clark WR, The experimental foundations of modern immunology. John Wiley and Sons Inc. New York. 1991.
- Janis Kuby, Immunology, II edition. W. H. Freeman and Company, New York. 1993.
- Janeway Travers, Immunobiology- the immune system in health and disease. Current Biology Ltd. London, New York. 3rd ed.,1997.
- Peter J. Delves, Ivan M. Roitt, Encyclopedia of Immunology; Academic Press. 2 nd Ed., 1998.
- Chapel H and Halbey M, Essentials of Clinical Immunology. ELBS. 1986.
- Leslie Hudson and Frank C. Hay. Practical Immunology. Blackwell Scientific Publication. 3rd ed., 1989. 22 | Page Vels institute of science, technology and advanced studies document on locf im

IMMUNOLOGY, VACCINOLOGY AND TRANSPLANTATION TECHNOLOGY LAB

Subject Code: MMLTS3-106 **L T P C** **(Duration: 60hrs)**
0 0 4 2

Course Objective:

The Course aims to facilitate critical decision-making in vaccinology by providing participants with a comprehensive overview of the various aspects of vaccinology (immunology, vaccine development, clinical trials, regulatory processes, vaccine-specific issues including new vaccines, vaccination strategies and policies, programme implementation.

Course Outcome:

An education in cell biology will impart knowledge to the students to understand origins of cells and the generation of cell diversity, as well as the common features of cellular structure and function – how they obtain energy, synthesize new molecules, communicate, proliferate and survive. It will also emphasis on the fundamental importance of cell biology in modern science, particularly in relation to cell technologies and health.

Practicals:

a. Interferon induction-isolation and assay
b. Development of monoclonal antibodies by hybridoma technology
c. Production of poly clonal antibodies and testing-immunodiffusion
d. Immunoelectrophoresis, crossed antigen-antibody electrophoresis, ELISA, RIA, Immunoblotting
e. Immunofluorescence, agglutination, rosette–formation, Complement fixation
f. Antigen induced T cell proliferation.
g. Generation of cytotoxic T lymphocyte

Suggested Readings

- Ivan M. Roitt, J. Brostoff and D. K. Male, Immunology, Gower Medical Publishing, London.1993.
- Clark WR, The experimental foundations of modern immunology. John Wiley and Sons Inc. New York. 1991.
- Janis Kuby, Immunology, II edition. W. H. Freeman and Company, New York. 1993.
- Janeway Travers, Immunobiology- the immune system in health and disease. Current Biology Ltd. London, New York. 3rd ed.,1997.
- Peter J. Delves, Ivan M. Roitt, Encyclopedia of Immunology; Academic Press. 2 nd Ed., 1998.
- Chapel H and Halbey M, Essentials of Clinical Immunology. ELBS. 1986.

CLINICAL MICROBIOLOGY

Subject Code: MMLTS3-104 **L T P C** **(Duration: 60hrs)**
3 1 0 4

Course Objective:

- Medical microbiology is a subject where basic knowledge of microbiology is in focus. In the course one learns more about medical microbiology with a focus on bacteriology and virology.
- Introduction to bacteriology includes the structure and properties of bacteria, both as a normal flora and as a pathogen.

Course Outcome:

- Upon completion of this course students should be able to: Make decisions about the pathogenicity of organisms associated with human infections.
- Apply appropriate microbiology laboratory techniques, methodologies, instruments and equipment in accordance with current laboratory safety protocol.

UNIT 1 (15Hrs)

Systemic Bacteriology 1. Introduction to Systematic Bacteriology 2. Basic trends of classification scope and importance of systematic bacteriology 3. Moropholgical staining, culture, biochemical characteristics, lab diagnosis etc. of the following: Staphylococci and Micrococci; Streptococci and Pneumocci; Corynebacterium Diptheriae; Enterobacteriacae- I (E.coli, Klebsiella and Enterobactor) , Enterobacteriacae-II (Salmonella, Shiegella and Proteus); Pseudomonas; Vibriocholerae; Neisseria and Haemophilus; Mycobacteria; Brucella; Bordetella; Clostridia; Leptospira; Mycoplasma; Ricketssia; Chalmydla.

UNIT 2 (15Hrs)

Bacteriological examinations of water, milk, food and air Bacterial pathogenicity i) Definitions of pathogenicity , pathogenesis and virulence ii) Sources of infection iii) Modes of spread of infections iv) Types of infections Nosocomial infections: Introduction, common types of nosocomial infections, survelliance (Bacteriological) and control of nosocomial infections. Specimen processing i)Blood ii) sputum iii) throat swab iv) Nasopharyngeal swab v) swab (Pus-wound) vi) urine vii) genital discharges and swabs viii) C.S.F. and other body fluids ix) Stool and rectal swab.

UNIT 3 (15Hrs)

Medical Mycology • General characteristics, morphology and reproduction of medically important fungi. • Classification of medically important fungi • Fungi causing superficial mycoses, subcutaneous mycosis and systemic infection • Antimycotic agents • Antifungal chemotherapy • Preparation of culture media for fungi and culture techniques SDA, Corn Meal agar, Rice Starch Agar, slide cultures etc • Staining of fungi and preparation, storing and processing of samples (KOH Preparation, Lactophenol Cotton Blue etc) • Contaminants and opportunistic fungi. Methods of culturing and assaying of viruses Classification of viruses Replication of DNA, RNA +ve RNA–ve viruses, retroviruses Viral vaccines: conventional: killed / attenuated; DNA; peptide; recombinant proteins. Introduction to Medical Parasitology: La diagnosis of parasites in stool; blood body fluids. Diagnostic tests of identification of parasites.

UNIT 4 (15Hrs)

Sterilization techniques: biohazards; containment facilities, BSL 2, 3, 4 Bacterial and viral vectors Biological warfare agents Mode of action of antibiotics and antiviral: molecular mechanism of drug resistance (MDR) Hospital-acquired infections (nosocomial), immune compromised states Water and waste management for water-bom diseases Investigations and handling of epidemic

Suggested Readings

- Ananthnarayanan. R & C. K. Jeyaram Panicker, Textbook of Microbiology,;Orient Longman. Ed.8; 2006.
- David Greenwood, Richard B. Slack John F. Peutherer Medical Microbiology, Churchill Livingstone, London. 16th Edn., 2002.
- Baron EJ, Fine Gold S.M; Diagnostic Microbiology. Blackwell Scientific Systems. 1995. 44 | Page VELS INSTITUTE OF SCIENCE, TECHNOLOGY AND ADVANCED STUDIES DOCUMENT ON LOCF IMMUNOLOGY & MICROBIOLOGY
- J.G. Colle, A.Simmons, A.G. Fraser, B.P. Marmion, Mackie & McCartney Practical Medical Microbiology, Elsevier.Ed.14; 2006.
- Topley & Wilson, Topley & Wilson's Principles of Bacteriology, Virology & Immunity, Vol III; Bacterial Diseases, Edward Arolla, London. Ed.8; 1990.
- Jagadish Chandar, 1996; A Textbook of Medical Mycology; Interprint, New Delhi.
- Alexopoulos C.J, Introductory Mycology; John Wiley & Sons Inc, N.Y. 1992.
- H.C. Dube , Introduction to Fungi, Vikas Publishing House. Ed.3; 2005.
- D.R. Arora & B.R. Arora Medical Parasitology, CBS Publishers & Distributors, New Delhi. 1st Edn., 2002.
- Subhas Chandra Parija, Medical Parasitology, 2nd Edn., 2009 MLT 504: Human Physiology

CLINICAL MICROBIOLOGY-LAB

Subject Code: MMLTS3-107 **L T P C** **(Duration: 60hrs)**
0 0 4 2

Course Objective:

- Medical microbiology is a subject where basic knowledge of microbiology is in focus. In the course one learns more about medical microbiology with a focus on bacteriology and virology.
- Introduction to bacteriology includes the structure and properties of bacteria, both as a normal flora and as a pathogen.

Course Outcome:

- Upon completion of this course students should be able to: Make decisions about the pathogenicity of organisms associated with human infections.
- Apply appropriate microbiology laboratory techniques, methodologies, instruments and equipment in accordance with current laboratory safety protocol.

List of Practical

- Aseptic practice in laboratory and safety precautions Care and maintenance of laboratory equipments like water bath, Centrifuges, oven, refrigerator, incubator etc
- Preparation of axenic cultures Preparation and pouring of Media-Nutrient agar, Blood agar, Mac-conkey agar, sugars, serum sugar kligler iron agar, Robertson cooked meat lowen stainjensons agar, sabourads dextrose agar.
- Operation of autoclave, hot air oven, distillation plant, filter like Seitze and membrane and sterility test Preparation of reagents (oxidase, Kovac etc).
- Disposal of contaminated materials like cultures etc
- Testing of disinfectants- Phenol coefficient and “In use tests “ Quality control of media, reagents etc
- Preparation of antibiotic discs, performance of antimicrobial susceptibility test Processing and identification of pure bacterial cultures
- Collection of specimens for microbiological investigations such as blood, urine, throat swab, rectal swab, stool pus swab, C.S.F. and other body fluids and O.T. specimens etc
- Processing of water, milk, food, and air samples for bacteriological examinations
- Identification of bacterial of medical importance up to species level.
- Plating of clinical specimen of media for isolation purification, identification, and quantitations purposes. Skin test like montoux, lepramin etc
- Antimicrobial susceptibility test for microbacteria To prepare different culture media used in mycology Staining technique a) KOH preparation b) LCB and c) India ink preparation To observe characteristics of common laboratory contaminants (fungal)
- Collection and processing of samples for diagnosis of fungal infections-Skin, nail, hair, body fluids, and secretions etc
- Staining techniques Haemagglutation test, Commercial kits based diagnosis, Antibiotic sensitivity (bacterial), Electron microscopic (demo), Bacterial culture Agar gel diffusion, ELISA

Suggested Readings:

- Ananthnarayanan. R & C. K. Jeyaram Panicker, Textbook of Microbiology,;Orient Longman. Ed.8; 2006.
- David Greenwood, Richard B. Slack John F. Peutherer Medical Microbiology, Churchill Livingstone, London. 16th Edn., 2002.
- J.G. Colle, A.Simmons, A.G. Fraser, B.P. Marmion, Mackie & McCartney Practical Medical Microbiology, Elsevier.Ed.14; 2006.
- Topley & Wilson, Topley & Wilson's Principles of Bacteriology, Virology & Immunity, Vol III; Bacterial Diseases, Edward Arolla, London. Ed.8; 1990.
- Jagadish Chandar, 1996; A Textbook of Medical Mycology; Interprint, New Delhi.
- Alexopoulos C.J, Introductory Mycology; John Wiley & Sons Inc, N.Y. 1992.
- H.C. Dube , Introduction to Fungi, Vikas Publishing House. Ed.3; 2005.
- D.R. Arora & B.R. Arora Medical Parasitology, CBS Publishers & Distributors, New Delhi. 1st Edn., 2002.

CLINICAL HAEMATOLOGY &BLOOD BANKING TECHNOLOGY

Subject Code: MMLTS3-105 **L T P C** **(Duration: 60 hrs)**
3 1 0 4

Course Objective:

- To educate and train a person to a skilled level of expertise in the domain area of the growing Health Sector.
- To enable the students to acquire knowledge of Pathological laboratory and operation of ground based growing Health Industry needs.

Course Outcome:

- This course provides analytical skills in different areas of clinical laboratory, clinical research and quality standards.
- In the rapidly growing area of scientific knowledge and skills, laboratory science is an important area of study for medical laboratory technicians.

UNIT 1 (15Hrs)

Introduction, History and Discovery to blood group system - Human blood group antigen, their inheritance, antibodies, and secreators. - ABO Blood Group System,: Sub-groups; Source of antigen, types of antibodies; Rhesus (RH) Blood Group System- Nomenclature and types of antigens ; mode of inheritance ; types of antibodies , techniques of grouping and cross matching - Coomb's test –direct and indirect test; titration of antibody - Compability test in blood transfusion, complication and hazards of blood transfusion

UNIT 2 (15Hrs)

Laboratory investigation of transfusion reactions and miss matched transfusion - Preparation of packed red cells and various fractions of blood for transfusion purposes - Blood collection-selection and screening of donor, collection of blood, various anticoagulants, and storage of blood - Organization, operation and administrations of blood bank - Structure, collection and significance of bone marrow composition and functions - Staining of bone marrow smears and preparation of histological sections - Hemoglobin, its synthesis, functions and degradation - Haemoglobin pigments and their measurement - Abnormal haemoglobin and their means of identification and estimation

UNIT 3 (15Hrs)

LE cell phenomenon and various methods of its demonstration, clinical importance - Haemostatic mechanisms and theories of blood coagulation - Physiochemical properties of coagulation factors - Screening coagulation procedures - Quantative essay of coagulation factors. Anatomy and physiology of Hamopoiesis , Anaemias , and other disorders of Erythropoiesis, Disorder of Leucopoisis, Physiology of Haemostasis and disorder of blood coagulation and fibrinolysis, immunogenetics , Routine Haematological techniques. Use of different anticoagulants , Haemoglobin estimation and standarization , red cells indices , total leucocyte counts , platelets count , blood and bone marrow preparation , staining with leishman stains , MGG and Perl's stain , reticulocyte count , investigation of haemolytic anaemia , screening coagulation test , preparation of brain thromboplastin , Euglobulin clot lysis , Fibrinogen level, FDPS , Blood grouping and matching , Coomb's test, Agglutination techniques, Serum Fe , Iron binding capacity , Investigation of nutritional anemia's

UNIT 4(15Hrs)

Artificial blood Iron metabolism and its disorder Antigens to blood groups, Components of Blood and its preservation Mechanism of Haemostatics Blood components separator Essentials of Blood Banks Role of Blood as a parameter of diagnostic industry Basic principles and clinical aspects of cell counter Electrode analyzer Artial blood gas analyzer.

Suggested Readings:

- Clinical Pathology, Hematology & Blood Banking *by Nanda Maheshwari*
- Concise Text in Clinical Pathology, Hematology & Blood Banking Author :SURABHI BANSAL

SECOND SEMESTER

DIAGNOSTIC BIOCHEMISTRY & ORGAN FUNCTION TEST

Subject Code: MMLTS3-201 **L T P C** **(Duration: 60 hrs)**
3 1 0 4

Course Objectives:

- Through this course the students are exposed to importance of biological macromolecules
- They acquire knowledge in the quantitative and qualitative estimation of biomolecules
- They study the influence and role of structure in reactivity of biomolecules

Course Outcomes:

At the end of the course, the students have a thorough understanding on the role of biomolecules and their functions.

Unit 1 (15 Hrs)

Quality control, GMP and GLP, records Biochemical disorders Immune disorders Genetic disorders, chromosomal disorders, single cell disorders and complex traits**.** Chromosomal disorders: autosomal; sex chromosomal; karyotype analysis. G-banding, in situ hybridization (FISH and on –FISH), and comparative genomic hybridization (CGH).

Unit 2 (15 Hrs)

Cancer cytogenetics; special karyotyping. DNA diagnostics: PCR based diagnostics, ligation chain reaction, southern blot diagnostics, array-based diagnostics, DNA sequencing, genetic profiling, single nucleotide polymorphism. Haemoglobinopathies Neuro developmental disorders, Neuro degenerative disorders. Dynamic mutations.

Unit 3 (15 Hrs)

Biochemical diagnostics: inborn errors of metabolism, haemoglobinopathies, mucopolysaccharidoses, lipidoses, and glycogen storage disorders. Immunodiagnostics: diagnosis of infectious disease and mycobacterium diseases. Phage display, Immunoarrays, FACs

Unit 4 (15 Hrs)

Organ function tests- biochemical diagnosis and assessment of diseases of liver, kidney, pancreas, thyroid, muscle and CNS, and adrenals. Malabsorption syndromes and their biochemical evaluation. Blood and disorders- biochemical derangement in anemia. Enzymes and iosenzymes and their application in various disorders. Disturbances in acid-base balance. Lipoproteins and its disorders. Diabetes and atherosclerosis.

Suggested Readings

- Ananthnarayanan. R & C. K. Jeyaram Panicker, Textbook of Microbiology,; Orient Longman. Ed.8; 2006.
- David Greenwood, Richard B. Slack John F. Peutherer Medical Microbiology, Churchill Livingstone, London. 16th Edn., 2002.
- J.G. Colle, A.Simmons, A.G. Fraser, B.P. Marmion, Mackie & McCartney Practical Medical Microbiology, Elsevier.Ed.14; 2006.
- Topley & Wilson, Topley & Wilson's Principles of Bacteriology, Virology & Immunity, Vol III; Bacterial Diseases, Edward Arolla, London. Ed.8; 1990.

HISTOPATHOLOGY AND MORBID ANATOMY TECHNIQUES

Subject Code: MMLTS3-202 **L T P C** **(Duration: 60 hrs)**
3 1 0 4

Course Objectives:

- Through this course the students are exposed to importance of biological macromolecules
- They acquire knowledge in the quantitative and qualitative estimation of biomolecules
- They study the influence and role of structure in reactivity of biomolecules.

Course Outcomes:

- Students will be taught Mendelian genetics, their principles and gene interaction.
- They learn about chromosomal aberrations and structure of chromosomes.

Unit 1 (15 Hrs)

Theory lectures / Seminars / Group Discussions: General Pathology and Cytology of tumors: Pathology and Cytology of female genital tract. (8 sections) i. Anatomy, embryology, histology and physiology of female genital tract. ii. Cytology of female genital tract and normal vaginal flora. iii. Inflammatory lesions of vagina and cervix. iv. Cytology of begin disorders of epithelia of uterine cervix and vagina. v. Precancerous of cancerous lesions of cervix vi. Effect of therapeutic procedure such as radiotherapy and drugs on epithalia of female genital tract. vii. Significance of cervical cancer screening. viii. Hormonal cytology in various age groups.

Unit 2 (15 Hrs)

Histology and Cytology of normal respiratory tract. ii. Cellular abnormalities due to benign disorders of respiratory tract. iii. Etiopathogenesis of lung cancer and method of cytodiagnosis of lung cancer. iv. Cytological morphological characteristics of primary versus secondary lung carcinoma. v. Importance of lung cancer screening and accuracy of pulmonary cytology. vi. Role of cytologic techniques in diagnosis of cancer.

Unit 3 (15 Hrs)

Urinary tract ii. Anatomy, histology and cytology (normal urine) iii. Etiopathogenesis of bladder cancer and role of urinary cytology in diagnosis of bladder cancer and cancer of other sites. iv. Cytology of urothelial cancer. v. Gastrointestinal tract. vi. Anatomy, histology and normal cytology. vii. Cytology of malignant tumors. Effusions, Anatomy, Histology and cytology of pleural peritoneal and pericardial cavities. Bening and malignant cell population in effusions. Cytology of cerebrospinal fluid and miscellaneous fluids. Aspiration biopsy cytology-general principles of technique and cytogisgnosis. Breast and Nipple secretions vi. Anatomy and histology of breast. Cytology of nipple secretions and creast aspirates

Unit 4 (15 Hrs)

Automation in cytology laboratory ii. Application of flow cytometery iii. Etiology of cancer and methods of tumor induction iv. Sex chromatin and chromosomal abnormalities in cancer

Suggested Readings

- Practical Pathology Including Morbid Anatomy and Post-Mortem Technique By James Miller.
- Practical Pathology including morbid anatomy and post-mortem technique (Ex Lib Sydney Dernley) Miiller, James, and James Davidson

CYTOLOGY & CYTOGENETIC

Subject Code: MMLTS3-203 **L T P C** **(Duration: 60 hrs)**
3 1 0 4

Course Objectives:

- Demonstrate proficiency in maintaining a safe work place, including observation of lab safety procedures, use of personal protective equipment, identification hazards and proper disposal of commonly used chemicals and biohazardous materials.
- Demonstrate improvement in communication skills, including maintenance of laboratory notebooks, oral presentations and written report

Course Outcomes:

- Follow a protocol independently, including locating materials and equipment, practicing good lab procedures and accurately performing all experimental procedures.
- Analyze experimental results, differentiating between expected and unexpected results, trouble shooting, interpreting results and making conclusions.

UNIT 1 (15 Hrs)

Cytologic Techniques In addition to the rotational posting to look after the routine laboratory procedures, (Hospital Service Part), the candidate shall take learn the following special laboratory procedures: Methods of preparation of fluids for microscopic examination: a) Preparation of direct or sediment smears b) Cytocentrifuge preparation c) Preparation with membrane filters d) Preparation cell blocks e) Processing of haemorrhagic fluids f) Methods of preparation of cell suspensions

UNIT 2 (15 Hrs)

Technique of processing of cytologic samples for electron microscopic examination - Different staining techniques for sex chromatin - Direct technique of chromosomal analysis in tumors and karyotyping - Special staining techniques (including background of staining reaction of each); Mucus, Glycogen, Lipids, Pigments. - Enzyme cytochemistry; Acid and alkaline phosphatase and peroxidase. - Methods of monoclonal antibody staining in smears

UNIT 3 (15 Hrs)

Correction of technical errors in preparation and staining of cytological smears. Methods of disinfection, cleaning of glassware / laboratory equipments used in collection and processing of specimens, sterilization of equipments / instruments / syringes and needles / solutions for special laboratory use. Preparation of distilled water, saline and buffers commonly used for special cytological techniques**.** Light microscope, working and its applications Phase contrast microscope working and its application Electron microscope: working and application Fluorescent microscope: working and application Methods of examination under polarizing light and dark ground illumination

UNIT 4 (15 Hrs)

Methods of specimen collection Cervical smear for malignant cytology Vaginal smear or hormonal cytology Methods of pleural and pericardial tapping Methods of sputum induction in cases with non-productive cough To see the endoscopic procedures for collection of Brush cytology specimens from trachebronchial tree, Oesophageal and gastric lesions Principles of techniques of fine needle aspiration biopsy.

Suggested Readings

- Alberts, B. Bray, D. Lewis, J. Raff, M. Roberts, K. and Watson, J. D. I989. Molecular Biology (Ed.) Garland Publishing Inc. New York.
- Atherly, A. G., Girton, J. R. and McDonald, J. F. 1999. The Science of Genetics. Saunders College USA.
- Burnham, C. R. 1962. Discussions in Cytogenetics, Burgess Publishing Co., Minnesota.
- Busch. H. and Rothblum, L. 1982 Volume X. The cell nucleus: DNA part A, Academic Press.
- Hartl, D. L. and Jones E. W. 1998. Genetics: Principles and Analysis (4ih Ed.) Jones and Barew Publishers, Massachusetts, USA.

HUMAN GENETICS & HUMAN GENOME

Subject Code: MMLTS3-204 **L T P C** **(Duration: 60 hrs)**
3 1 0 4

Course Objectives:

- The instructional goal is to develop a thorough knowledge and understanding of human chromosomes, mitosis and meiosis in humans. Instructional Goal:
- The goal is to develop and understanding and skill in the mechanics of inheritance, patterns of inheritance, and Mendelian inheritance in humans.

Course Outcomes:

Knowledge: Human s Genetics offers knowledge and about the various aspects and concepts of Human genome and related genetic disorders.

UNIT 1 (15 Hrs)

History and development of human genetics; organization of the human genome Genes and chromosome structure, function and inheritance. Repetitive DNA in human genome Alu and SINE repeats. Functional organization of centromeres and telomerase and centrosomes.

UNIT 2 (15 Hrs)

Methods for genetic study in man-pedigree analysis, chromosomal analysis, biochemical analysis. Somatic cell genetics (somatic cell hybrids, monochomosome, hybrid panels, gene mapping, hybridoma technology, polyclonal and monoclonal antibody), molecular genetics analysis. Tissue culture techniques, long-term and short term cultures, lymphoblastoid cell lines; congenital abnormalities; clinical aspects of autosomal and sex chromosomal disorder; inborn errors of metabolism, haemoglobinopathies.

UNIT 3 (15 Hrs)

Human genome mapping – genetic mapping, physical mapping-restriction fragment length, polymorphism, pulse field gel electrophoresis, yeast artificial chromosome, bacterial artificial chromosomes, PI derived artificial chromosomes, expressed sequence tags, sequence-tagged sites. Micro satellites and single nucleotide polymorphism. Inherited human disease-single gene diseases, complete traits. Identification and isolation of disease genes- positional cloning, functional cloning, DNA and cDNA microarrays. Yeast two-hybrid system. Statistical methods for genetic analysis of complex traits, cancer genetics.

UNIT 4 (15 Hrs)

Immunogenetics; pre-natal diagnosis – chorionic villus sampling, amniocentesis. Pre-implantation diagnosis. Genetic diagnosis. Genetic counseling. Gene therapy-concept, vectors, gene targeting and tissue specific expression. Ethics and human genetics. Introduction to pharmacogenomics and toxicogenomics.

Suggested Readings

1. Pravash Sen. Gupta, Clinical Immunology; Oxford University Press. 2003.
2. Noel R. Rose, Herman Friedman, John L. Fahey, Manual of Clinical Laboratory Immunology. ASM. III edition; 1986.
3. Leslie Hudson and Frank C. Hay, Practical Immunology, Blackwell Scientific Publication. Ed.3; 1989.
4. Goding J.W., Monoclonal Antibodies: Principle and Practice; Academic Press. 2001.
5. Carl A. K. Borrebacck, Antibody Engineering, Oxford University Press. Ed.2; 1995.

DIAGNOSTIC BIOCHEMISTRY & ORGAN FUNCTION TEST-LAB

Subject Code: MMLTS3-205 **L T P C** **(Duration: 60 hrs)**
0 0 4 2

Course Objectives:

- Through this course the students are exposed to importance of biological macromolecules
- They acquire knowledge in the quantitative and qualitative estimation of biomolecules
- They study the influence and role of structure in reactivity of biomolecules

Course Outcomes:

At the end of the course, the students have a thorough understanding on the role of biomolecules and their functions.

Practical:

1. G-banded chromosomal preparation for detection of autosomes of autosomal/sec.
2. Chromosomal disorders (translocation, deletion, Down's syndrome, Klumefelter syndrome, Turner's syndrome, etc).
3. FISH for detection of : translocations, inversions (using appropriate probes) (eg, chro 9-22 translocation; X-Y translocation).
4. PCR base diagnosis (e.g. fragile-X syndrome; SRY in sex chromosomal anomalies).
5. Native PAGE analysis of enzyme.
6. Isozyme analysis of enzyme variants.
7. Hormonal detection by ELISA Kits. a) T3 b) T4 e) TSH f) LSH c) Free T3 d) Free T4 g) FSH h) Prolact.

Suggested Readings

- Ananthnarayanan. R & C. K. Jeyaram Panicker, Textbook of Microbiology,;Orient Longman. Ed.8; 2006.
- David Greenwood, Richard B. Slack John F. Peutherer Medical Microbiology, Churchill Livingstone, London. 16th Edn., 2002.
- Baron EJ, Fine Gold S.M; Diagnostic Microbiology. Blackwell Scientific Systems. 1995. 44 | P a g e VELS INSTITUTE OF SCIENCE, TECHNOLOGY AND ADVANCED STUDIES DOCUMENT ON LOCF IMMUNOLOGY & MICROBIOLOGY
- J.G. Colle, A.Simmons, A.G. Fraser, B.P. Marmion, Mackie & McCartney Practical Medical Microbiology, Elsevier.Ed.14; 2006.
- Topley & Wilson, Topley & Wilson's Principles of Bacteriology, Virology & Immunity, Vol III; Bacterial Diseases, Edward Arolla, London. Ed.8; 1990.

HISTOPATHOLOGY AND MORBID ANATOMY TECHNIQUES-LAB

Subject Code: MMLTS3-206 **L T P C** **(Duration: 60 hrs)**
0 0 4 2

Course Objectives:

- Through this course the students are exposed to importance of biological macromolecules
- They acquire knowledge in the quantitative and qualitative estimation of biomolecules
- They study the influence and role of structure in reactivity of biomolecules.

Course Outcomes:

- Students will be taught Mendelian genetics, their principles and gene interaction.
- They learn about chromosomal aberrations and structure of chromosomes.

Practical:

1. Method of Disinfection - Preparation of Distill Water
2. Fixilation and various fixatives
3. Decalcification
4. Processing
5. Sections and types of Microtomes
6. Staining – Methods and preparation of Staining H & E Staining.
7. Methods of staining preparation – Routine Staining..H & E Stain..,PAP mStain, Geimsa, Pas Stain, Vinkossa Staining
8. AFB Staining
9. Pars – Persion blue for RH

Suggested Readings

- Practical Pathology Including Morbid Anatomy and Post-Mortem Technique By James Miller.
- Practical Pathology including morbid anatomy and post-mortem technique (Ex Lib Sydney Dernley) Miiller, James, and James Davidson

CYTOLOGY & CYTOGENETICS -LAB

Subject Code: MMLTS3-207 **L T P C** **(Duration: 60 hrs)**
0 0 4 2

Course Objectives:

- Demonstrate proficiency in maintaining a safe work place, including observation of lab safety procedures, use of personal protective equipment, identification hazards and proper disposal of commonly used chemicals and biohazardous materials.
- Demonstrate improvement in communication skills, including maintenance of laboratory notebooks, oral presentations and written report

Course Outcomes:

- Follow a protocol independently, including locating materials and equipment, practicing good lab procedures and accurately performing all experimental procedures.
- Analyze experimental results, differentiating between expected and unexpected results, trouble shooting, interpreting results and making conclusions.

Practical Diagnostic Experience:

1. Cervical Cancer Screening
2. Identification of normal, inflammatory, metablastic dysblastic and maligent cells
3. Identification of specific infections, Trichomonas vaginalis, candidasis, Actinomycetas, Herpes, genetails condylamatous lesions'
4. Identification of cells foreign to cervix
5. Hormonal cytology : Calculation of hormonal indices and its interpretation Identification of benign and malignant cells in the following types of Specimens: i) Sputum and bronchial brush cytology ii) Esophageal and Gastric brush cytology iii) Oral Scraping iv) Effusions v) C.S.F and other body fluids vi) Urine vii) Breast aspiration smears and nipple discharge.

Suggested Readings

- Alberts, B. Bray, D. Lewis, J. Raff, M. Roberts, K. and Watson, J. D. I989. Molecular Biology (Ed.) Garland Publishing Inc. New York.
- Atherly, A. G., Girton, J. R. and McDonald, J. F. 1999. The Science of Genetics. Saunders College USA.
- Burnham, C. R. 1962. Discussions in Cytogenetics, Burgess Publishing Co., Minnesota.
- Busch. H. and Rothblum, L. 1982 Volume X. The cell nucleus: DNA part A, Academic Press.
- Hartl, D. L. and Jones E. W. 1998. Genetics: Principles and Analysis (4ih Ed.) Jones and Barew Publishers, Massachusetts, USA.
- Khush, G. S. 1973. Cytogenetics of Aneuploids, Academic Press, New York, London.
- Karp, G. 1999. Cell and Molecular Biology; Concepts and Experiments, John Wiley and Sons Inc. USA

DIAGNOSTIC MICROBIOLOGY & IMMUNO HAEMATOLOGY -LAB

Subject Code: MMLTS3-208 **L T P C** **(Duration: 60 hrs)**
0 0 4 2

Course Objectives:

- Apply systematized problem solving techniques to identify and correct procedural errors, identify instrument malfunctions and seek proper supervisory assistance, and verify the accuracy of laboratory results obtained.
- Operate and maintain laboratory equipment, utilizing appropriate quality control and safety procedures.

Course Outcomes:

- Perform routine clinical laboratory procedures within acceptable quality control parameters in Hematology, Chemistry, Immunohematology, and Microbiology under the general supervision of a Clinical Laboratory Scientist or Pathologist.
- Demonstrate technical skills, social behavior, and professional awareness incumbent upon a laboratory technician.

Practicals:

1. Typing of erythrocytes, Antigen and Antibodies (ABO and Rh)
2. Direct Coomb's Test
3. Indirect Coomb's Test
4. Major and Minor errors matching
5. HBSAg testing
6. Malaria , Syphilis
7. Handling of various laboratory instrument, cleaning, reagent preparation and drawing of the graph.
8. Principles application and maintenance of following laboratory equipments Immunoelectro Microscope
9. pH meter, Spectrophotometer including ELISA
10. Anti-D titration
11. Preparation of Antigen and Standardizing them.

Suggested Readings

- Fundamental Immunology (Hardcover) By William E. Paul. Publisher: Lippincott Williams and Wilkins.
- Immunology: International Edition (Paperback) By Janis Kuby, Thomas J. Kindt, Barbara A. Osborne and Richard A. Goldsby. WH Freeman and Co. Ltd.
- Immunology (Paperback) By Richard A. Goldsby, Thomas J. Kindt, Barbara A. Osborne and Janis Kuby. WH Freeman and Co. Ltd.
- Immunology (Paperback) By Ivan M. Roitt, Jonathan Brostoff and David Male. Publisher: Mosby.
- Introduction to Medical Immunology By Gabriel Virella, Marcel Dekker Inc.

HUMAN GENETICS & HUMAN GENOME -LAB

Subject Code: MMLTS3-209 **L T P C** **(Duration: 60 hrs)**
0 0 4 2

Course Objectives:

- The instructional goal is to develop a thorough knowledge and understanding of human chromosomes, mitosis and meiosis in humans. Instructional Goal:
- The goal is to develop and understanding and skill in the mechanics of inheritance, patterns of inheritance, and Mendelian inheritance in humans.

Course Outcomes:

Knowledge: Human s Genetics offers knowledge and about the various aspects and concepts of Human genome and related genetic disorders.

Practical of Human genetics

i. Pedigree analysis
ii. Chromosome preparation PHA- stimulated short term blood cultures, air dried chromosome preparation.
iii. G-banding of chromosome.
iv. Karyotype prepation. v. In situ hybridization-FISH (example with centromeric and telomeric probes).
v. Polyacrylamide gel electrophoresis- detection of enzyme.(for example G6PD, and X-linked enzyme)

Suggested Readings

1. Pravash Sen. Gupta, Clinical Immunology; Oxford University Press. 2003.
2. Noel R. Rose, Herman Friedman, John L. Fahey, Manual of Clinical Laboratory Immunology. ASM. III edition; 1986.
3. Leslie Hudson and Frank C. Hay, Practical Immunology, Blackwell Scientific Publication. Ed.3; 1989.
4. Goding J.W., Monoclonal Antibodies: Principle and Practice; Academic Press. 2001.
5. Carl A. K. Borrebacck, Antibody Engineering, Oxford University Press. Ed.2; 1995.

THIRD SEMESTER

CLINICAL HEMATOLOGY (NON NEOPLASTIC)

Subject Code: MMLTS3-301 **L T P C** **(Duration: 60 hrs)**
3 1 0 4

Course Objective:

1. Distinguish normal and abnormal hematological laboratory findings to predict the diagnosis of hematological disorders and diseases.
2. Recognize laboratory results consistent with leukemia and other white blood cell disorders.

Course Outcome:

1. Correlate hematological findings with those generated in other areas of the clinical laboratory, patient symptoms and clinical history, to make appropriate and effective on-the-job professional decisions.
2. Perform basic hematological laboratory testing, assess laboratory data and report findings according to laboratory protocol

UNIT 1 (15 Hrs)

Hematopoiesis- Theories of Hematopoisis (origin and development of Blood cells) - Normal Erythropoiesis, Role of Erythropoietin in Erythropoiesis, destruction of Erythrocytes - Leucopoiesis (development and maturation of granulocytes and nongranulocytes), antigen independent and antigen dependent lymphopoiesis - Megakaryopoiesis-stages of megakaryocyte development and release of platelet, micromegakaryocytes.

UNIT 2 (15 Hrs)

Disorder of Red cell-Anemia-Definition, Normal Erythrocytes kinetics and pathophysiology, various classification of Anemia and adaptive mechanism in Anemia, Lab diagnosis of Anemia - Iron metabolism and Heme synthesis, Iron Deficiency in Anemia of chronic disorder, sideroblastic Anemia, hemochromatosis, porphyria - Hereditary disorders of Haemoglobin structures and synthesis. - Structural variants of haemoglobin, pathophysiology of structural haemoglobin variants, sickle cell Anemia with lab diagnosis - Thalassemia, definition, types of thalessemia including Alpha, Beta thalessemia, pathophysiology and lab diagnosis - Hemolytic Anemia-Classification, intrinsic and extrinsic, hemolytic Anemia, hereditary spherocytosis, hereditary elliptocytosis, PNH, G6PD and Pyruvate kinase deficiency, HUS, TTP, IDC - Immune hemolytic Anemia: classification ,pathophysiology and lab diagnosis - Megaloblastic Anemia, Pathophysiology and lab diagnosis

UNIT 3 (15 Hrs)

Disorder of White Blood Cells: Neutriophilia, Luekemoid reaction, neutropenia, morphologic abnormalities of neutrophils, functional abnormalities of neutrophils, reactive eosinophilic and hyper eosinophilic syndrome, lymphocytosis, infectious mono neucleosis, lymphocytopenia

UNIT 4 (15 Hrs)

Hemostatic mechanisms, Disorder and Lab Diagnosis: Role of platelet in hemostasis, lab investigation of primary hemostasis - Secondary hemostasis, coagulation factors, coagulation pathways-intrinsic and extrinsic, fibrinolytic system, screening test for coagulation and fibrinolysis. - Platelet disorders in primary hemostasis - Von-Wille Brand disorder, factor VIII & IX deficiency, fibrinogen deficiency, lupus like anticoagulant, thrombosis and conditions pre-disposing to thrombosis, heparin anticoagulants.

Suggested Readings:

1. Pravash Sen. Gupta, Clinical Immunology; Oxford University Press. 2003.
2. Noel R. Rose, Herman Friedman, John L. Fahey, Manual of Clinical Laboratory Immunology. ASM. III edition; 1986.
3. Leslie Hudson and Frank C. Hay, Practical Immunology, Blackwell Scientific Publication. Ed.3; 1989.
4. Goding J.W., Monoclonal Antibodies: Principle and Practice; Academic Press. 2001.
5. Carl A. K. Borrebacck, Antibody Engineering, Oxford University Press. Ed.2; 1995.

CLINICAL HEMATOLOGY (NEOPLASTIC)

Subject Code: MMLTS3-302 **L T P C** **(Duration: 60 hrs)**
3 1 0 4

Course Objective:

1. Understand both established information and recent clinical advances in coagulopathies, anticoagulant and thrombolytic therapies;
2. Understand blood and marrow morphology and hematopathology;

Course Outcome:

1. Able to successfully function within NHS organisational and management systems.
2. Communicates effectively and is able to share decision making, while maintaining appropriate situational awareness, professional behaviour and professional judgement.

UNIT 1 (15 Hrs)

Principles of diagnosis of hematopoietic-Lymphoid neoplasm - Classification of hematopoietic neoplasm - Classification of lymphoid neoplasm - Cancer biology

UNIT 2 (15 Hrs)

Molecular genetic of myeloid leukemia's, CBF translocation, RAR translocation - Molecular genetic of lymphoid leukemia's, tel gene translocation,E2A translocation - Molecular genetic of non-Hodgkin lymphomalignancies - Complication of hematopoietic neoplasm: host defense defect, haemorrhagic, neurologic, metabolic complication, organ infiltration, ocular, renal, anemia, abdominal, musculoskeletal complications.

UNIT 3 (15 Hrs)

Hematopoitic growth factor, their application in hematologic neoplastic conditions - Hematopoietic stem cell transplantation and its applications - Tumor antigens. - Cytokines, interferon, interleukins, their role in hematologic neoplastic conditions.

UNIT 4 (15 Hrs)

Classification of acute leukemia's - Acute lymphoblastic leukemia's, clinical features, diagnosis, classification and risk factor assessment - Acute myelogenous leukemia's, epidemiology, clinical features, immunophenotypes, classification, clinicopathologic syndromes and special types - Myelodysplastic syndromes: classification, diagnosis, clinical features, pathogenesis, biologic features and lab findings - Chronic myeloid leukemia's: history, incidence, clinical features, diagnosis, bone marrow findings, cytogenetic findings, immunophenotypes and molecular findings, cellular and molecular pathogenesis - Polycythemia vera: history, epidemiology, clinical feature, blood and lab findings, bone marrow study, cytogenetic and pathogenesis - Myelofibrosis: History and pathogenesis, clinical features, lab finding and diagnosis - Chronic lymphocytic leukemia: Aetiology, clinical findings ,lab findings and staging - Non Hodgkin's lymphomas: aetiology, clinical features, classification and lab findings - Hodgkin Disease: Aetiology, epidemiology, clinical feature and staging and lab diagnosis - Plasma cell dyscrasis: Aetiology , cytogenetic and molecular biology, protein abnormalities, clinical features and lab diagnosis.

Suggested Readings

1. Pravash Sen. Gupta, Clinical Immunology; Oxford University Press. 2003.
2. Noel R. Rose, Herman Friedman, John L. Fahey, Manual of Clinical Laboratory

Immunology. ASM. III edition; 1986.
3. Leslie Hudson and Frank C. Hay, Practical Immunology, Blackwell Scientific Publication. Ed.3; 1989.
4. Goding J.W., Monoclonal Antibodies: Principle and Practice; Academic Press. 2001.
5. Carl A. K. Borrebacck, Antibody Engineering, Oxford University Press. Ed.2; 1995.

IMMUNO PATHOLOGY & ADVANCED HEMATOLOGIC TECHNIQUES

Subject Code: MMLTS3-303 **L T P C** **(Duration: 60 hrs)**
3 1 0 4

Course Objective:

1. Distinguish normal and abnormal hematological laboratory findings to predict the diagnosis of hematological disorders and diseases.
2. Recognize laboratory results consistent with leukemia and other white blood cell disorders.

Course Outcome:

1. Correlate hematological findings with those generated in other areas of the clinical laboratory, patient symptoms and clinical history, to make appropriate and effective on-the-job professional decisions.
2. Perform basic hematological laboratory testing, assess laboratory data and report findings according to laboratory protocol.

UNIT 1 (15 Hrs)

Basic Immunohematology: Blood group antigens, red cells membrane structure. Blood group antibody and complements - Erythrocytes antigen and antibody, ABO and Rh system and other red blood cells and antigen and anti body - Immuno hematology test and procedures, factors affecting haemagglutination, compatibility testing, anti human globulin test - New techniques and automation.

UNIT 2 (15 Hrs)

Blood collection, donor registration, donor selection, medical history, phlebotomy and donor reactions - Blood processing test: guideline for blood transfusion and testing - Pre transfusion testing - Artificial blood and blood substitute.

UNIT 3 (15 Hrs)

Component preparation and uses - Organization, planning and management of blood bank - Licensing of blood bank - Quality control in blood banking - Special situations hemapheresis, plasmapheresis and leucopheresis.

UNIT 4 (15 Hrs)

Flow cytometry: principle, instrumentation and application of flow cytometry - Advance monoclonal antibody testing and procedures - Advance cytogenetic method and their hematologic application - Molecular genetic and its application in hematology, PCR, hybridization, stem cell therapy and gene therapy.

Suggested Readings

1. Pravash Sen. Gupta, Clinical Immunology; Oxford University Press. 2003.
2. Noel R. Rose, Herman Friedman, John L. Fahey, Manual of Clinical Laboratory Immunology. ASM. III edition; 1986.
3. Leslie Hudson and Frank C. Hay, Practical Immunology, Blackwell Scientific Publication. Ed.3; 1989.
4. Goding J.W., Monoclonal Antibodies: Principle and Practice; Academic Press. 2001.
5. Carl A. K. Borrebacck, Antibody Engineering, Oxford University Press. Ed.2; 1995.

IMMUNO HEMATOLOGY-LAB

Subject Code: MMLTS3-304 **L T P C**
0 0 4 2

Course Objective:

- Develop proficiency in performing and interpreting ABO and Rh blood typing using standard serological methods.
- Acquire skills to screen for and identify clinically significant antibodies, ensuring compatibility in blood transfusions.
- Learn to conduct cross matching procedures to ensure safe and effective blood transfusions, minimizing the risk of transfusion reactions.

Course Outcome:

- Demonstrate accurate blood typing and identification of ABO and Rh blood groups using serological techniques.
- Analyze and interpret serological test results, applying this knowledge to solve complex immune hematological problems.
- Understand and adhere to safety protocols and quality control measures in the immunohematology laboratory.

List of Practical's

1. Blood Grouping
2. Differential Leukocyte Count
3. Total Leukocyte Count
4. Widal Test
5. Rapid Plasma Reagin (RPR) Test
6. Single Radial Immuno diffusion (SRID)
7. Ouchterlony Double Diffusion
8. Rocket Immuno Electrophoresis
9. Counter Current Immuno electrophoresis
10. Enzyme Linked Immuno sorbent Assay (ELISA) – DOT
11. Enzyme Linked Immuno sorbent Assay (ELISA) – Plate
12. Immuno precipitation
13. Western Blotting

ADVANCES IN BIOCHEMICAL SCIENCES

Subject Code: MMLTS3-305 **L T P C** **(Duration: 60 hrs)**
3 1 0 4

Course Objective:

1. Distinguish normal and abnormal hematological laboratory findings to predict the diagnosis of hematological disorders and diseases.
2. Recognize laboratory results consistent with leukemia and other white blood cell disorders.

Course Outcome:

1. Correlate hematological findings with those generated in other areas of the clinical laboratory, patient symptoms and clinical history, to make appropriate and effective on-the-job professional decisions.
2. Perform basic hematological laboratory testing, assess laboratory data and report findings according to laboratory protocol.

UNIT 1 (15 Hrs)

Signal Transduction Hormone Receptors, Hormone Classification, Peptide, Steroid and tyrosine derivatives, Signal Transduction by different groups of hormones. Hormone action by Calcium and calmodulzin.

UNIT 2 (15 Hrs)

Metabolism of Xenobiotics Xenobiotics, Cytochrome P450, Phase I and Phase II reaction, affect of age and sex on activities of Xenobiotic metabolizing enzymes. Salicylate –Poisoning, Heavy Metals-Lead, Mercury, Zinc poisoning and preventive measures.

UNIT 3 (15 Hrs)

Biochemical and Genetical Basis of Disease Biochemical basis of disease, molecular basis of disease, Major classes of genetic disease, diagnosis and treatment, molecular medicine.

UNIT 4 (15 Hrs)

Molecular Techniques & Bioinformatics Polymerase Chain Reaction, Microarray, Blotting; Southern, Northern and Western Blotting, Immunofluorsence and Gel documentation. Gene annotation, DNA sequence data, Homology search of DNA and amino acids; Blasta, Fasta, Human Genome Project, Application in Medical Science.

Suggested Readings

1. Pravash Sen. Gupta, Clinical Immunology; Oxford University Press. 2003.
2. Noel R. Rose, Herman Friedman, John L. Fahey, Manual of Clinical Laboratory Immunology. ASM. III edition; 1986.
3. Leslie Hudson and Frank C. Hay, Practical Immunology, Blackwell Scientific Publication. Ed.3; 1989.
4. Goding J.W., Monoclonal Antibodies: Principle and Practice; Academic Press. 2001.
5. Carl A. K. Borrebacck, Antibody Engineering, Oxford University Press. Ed.2; 1995.

INTERMEDIARY METABOLISM & METABOLIC DISORDERS

Subject Code: MMLTS3-306 **L T P C** **(Duration: 60 hrs)**
3 1 0 4

Course Objective:

1. Distinguish normal and abnormal hematological laboratory findings to predict the diagnosis of hematological disorders and diseases.
2. Recognize laboratory results consistent with leukemia and other white blood cell disorders.

Course Outcome:

1. Correlate hematological findings with those generated in other areas of the clinical laboratory, patient symptoms and clinical history, to make appropriate and effective on-the-job professional decisions.
2. Perform basic hematological laboratory testing, assess laboratory data and report findings according to laboratory protocol.

UNIT 1 (15 Hrs)

Biological Oxidation: Oxidation and reduction, oxidases, Dehydrogenases, Hydroperoxidases, oxygenases and mono oxygenase.

UNIT 2 (15 Hrs)

Carbohydrate Metabolism : Metabolism of Glycogen, Glycogenesis, Glycogenolysis, Hormonal regulation, Regulation of Glycogen metabolism, Gluconeogenesis, futile cycles, blood glucose level regulation, cori cycle, Glucose transport and transporters. Clinical significant of gluconeogenesis, Pentose phosphate PATHWAY. Diabetes, Ketosis, Hypoglycemia, Glycogen-Storage diseases.

UNIT 3 (15 Hrs)

Lipid Metabolism: Lipid Transport and storage, Plasma Lipoproteins, Apolipoproteins, Lipoprotein metabolism, Clinical Significance of Lipoprotein. Cholesterol synthesis and regulation Hyperlipidimia, Atheroclerosis.

UNIT 4 (15 Hrs)

Amino Acid Metabolism: Amino acids, Biosynthesis and clinical significance of Polyamine, Nitric Oxide, Histamine, Serotonin, Melatonin, Creatinine, Melanin and GABA (γ - Amino by tyrate). Phenyl ketonurea, Tyrosinimia and other amino acid metabolic disorders. Introduction to nucleic acid metabolism, denovo and salvage pathway and disorders of purine and pyrimidine metabolism.

Suggested Readings

1. Pravash Sen. Gupta, Clinical Immunology; Oxford University Press. 2003.
2. Noel R. Rose, Herman Friedman, John L. Fahey, Manual of Clinical Laboratory Immunology. ASM. III edition; 1986.
3. Leslie Hudson and Frank C. Hay, Practical Immunology, Blackwell Scientific Publication. Ed.3; 1989.
4. Goding J.W., Monoclonal Antibodies: Principle and Practice; Academic Press. 2001.
5. Carl A. K. Borrebacck, Antibody Engineering, Oxford University Press. Ed.2; 1995.

DIAGNOSTIC ENZYMOLOGY

Subject Code: MMLTS3-307 **L T P C** **(Duration: 60 hrs)**
3 1 0 4

Course Objective:

1. Distinguish normal and abnormal hematological laboratory findings to predict the diagnosis of hematological disorders and diseases.
2. Recognize laboratory results consistent with leukemia and other white blood cell disorders.

Course Outcome:

1. Correlate hematological findings with those generated in other areas of the clinical laboratory, patient symptoms and clinical history, to make appropriate and effective on-the-job professional decisions.
2. Perform basic hematological laboratory testing, assess laboratory data and report findings according to laboratory protocol.

UNIT 1 (15 Hrs)

Historical perspectives, General Characteristics, nomenclature and IUB enzyme classification (rational, overview and specific examples) introduction to the following terms with examples - Holoenzyme, apoenzyme, cofactors, co enzyme, prostletic group, metalloenzyme measurement and expression of enzymatic activity, Enzyme assay activity units (I.U. and metal) Enzyme specificity types and theories (Lock and key, induced fix and three points attachment) Riboenzymes and Abzymes. Isolation and purification of enzyme, criteria of homogeneity of enzymes.

UNIT 2 (15 Hrs)

Enzyme Kinetics Factor affecting enzyme activity enzyme concentration, substrate concentration, pH and temp. Derivation of michoulis maintain equation of unisubstrate reaction km and its significance, Kcat / KM and its importance, measurement of Km and Vmax line linevavarburk and other linear transformation, Bisubstrate reaction. Enzyme inhibition, types of reversible inhibition competitive, uncompetitive, derivation of equation for different types of inhibitors, determination of Ki.

UNIT 3 (15 Hrs)

Role of cofactor in enzyme catalysis NAD+/HADP, FMH / FAD coenzyme A, TPP, PLP, Lipic acid, Vitamin B12 and tetrahydrofalic. Factors contibutic to enzymatic catalysis proximity and orientation, acid base catalysis, covalent catalysis mechanism of action of chymotrypsin and Lysozyme. Control of enzyme aciticvty feed back inhibition, allsotric control with special reference to asparate trans carbomylase. Sigmodial kinetics, concrted and sequential model for action of allostric enzyme. Reversible and irreversible modification of enzyme.

UNIT 4 (15 Hrs)

Protein legend interaction. Biding of protein to legend having single binding site and two binding site, cooperatively phenomena and Scatchared plot. Clinical significance of CPK, CK MB, LDH, SGOT, SGPT, Cholinestrase amylase, lipase aldolase alkaline and acid phosphate.Central of enzymatic activity feed beck inhibition.

Suggested Readings

1. Pravash Sen. Gupta, Clinical Immunology; Oxford University Press. 2003.
2. Noel R. Rose, Herman Friedman, John L. Fahey, Manual of Clinical Laboratory Immunology. ASM. III edition; 1986.
3. Leslie Hudson and Frank C. Hay, Practical Immunology, Blackwell Scientific Publication. Ed.3; 1989.
4. Goding J.W., Monoclonal Antibodies: Principle and Practice; Academic Press. 2001.
5. Carl A. K. Borrebacck, Antibody Engineering, Oxford University Press. Ed.2; 1995.

GENERAL ISSUES IN CLINICAL MICROBIOLOGY

Subject Code: MMLTS3-308 **L T P C** **(Duration: 60 hrs)**
3 1 0 4

Course Objective:

1. Distinguish normal and abnormal hematological laboratory findings to predict the diagnosis of hematological disorders and diseases.
2. Recognize laboratory results consistent with leukemia and other white blood cell disorders.

Course Outcome:

1. Correlate hematological findings with those generated in other areas of the clinical laboratory, patient symptoms and clinical history, to make appropriate and effective on-the-job professional decisions.
2. Perform basic hematological laboratory testing, assess laboratory data and report findings according to laboratory protocol.

UNIT 1 (15 Hrs)

Epidemiology of Infectious diseases, hospital acquired infection management of hospital waste, Investigation of an infection out break. Animal and human ethics involved in Microbiological work.

UNIT 2 (15 Hrs)

Selection of Diagnostic Tests:- Analysis of tests, Test – Verification and Validation, Bioassays of Vitamins and Antibiotics, Sterility test, Endotoxin test, Procedure and significances. Quality in the clinical Microbiology Lab – QC, QA program.

UNIT 3 (15 Hrs)

Statistical Analysis Of Microbiological Data And Research: Introduction to Mean, Mode, Median, Mean deviation, standard deviation, coefficient of variation correlation and Regression analysis. Theorems: Probability and simple binomial distribution sampling – t, Z and F test of significance, small and large samples of medical significance Chi-square test.

UNIT 4 (15 Hrs)

Computer applications: Introduction to components of computers, Data storage devices, memory concepts, software and its types, Elementary idea to DOS- Applications of common packages – WINDOWS 3, 1, 95 and 98. Introduction to algorithms and flowcharts. Application in Medical Microbiology and information communications (data bases, emails, local networks).

Suggested Readings

1. Pravash Sen. Gupta, Clinical Immunology; Oxford University Press. 2003.
2. Noel R. Rose, Herman Friedman, John L. Fahey, Manual of Clinical Laboratory Immunology. ASM. III edition; 1986.
3. Leslie Hudson and Frank C. Hay, Practical Immunology, Blackwell Scientific Publication. Ed.3; 1989.
4. Goding J.W., Monoclonal Antibodies: Principle and Practice; Academic Press. 2001.
5. Carl A. K. Borrebacck, Antibody Engineering, Oxford University Press. Ed.2; 1995.

DIAGNOSTIC MICROBIOLOGY

Subject Code: MMLTS3-309 **L T P C** **(Duration: 60 hrs)**
3 1 0 4

Course Objective:

1. Distinguish normal and abnormal hematological laboratory findings to predict the diagnosis of hematological disorders and diseases.
2. Recognize laboratory results consistent with leukemia and other white blood cell disorders.

Course Outcome:

1. Correlate hematological findings with those generated in other areas of the clinical laboratory, patient symptoms and clinical history, to make appropriate and effective on-the-job professional decisions.
2. Perform basic hematological laboratory testing, assess laboratory data and report findings according to laboratory protocol.

UNIT 1 (15 Hrs)

Bacteriology:- Biochemical tests for identification of bacteria. Molecular Mechanism of drug resistance, detection of antibacterial resistance, antimicrobial susceptibility testing Cultivation of anaerobic bacteria of medical significance. Laboratory diagnosis of bacterial diseases – Diphtheria, Tuberculosis, Typhoid, Syphilis, Gonorrhea, Urinary Tract Infections, Food Poisoning.

UNIT 2 (15 Hrs)

Mycology:- classification of fungal diseases - Superficial, Cutaneous, Subcutaneous and Systemic Mycoces, Opportunistic infections. Transmission of fungal diseases, Immunity to fungal diseases – Laboratory diagnosis of fungal diseases In-vitro antifungal susceptibility testing, antifungal drug resistance.

UNIT 3 (15 Hrs)

Parasitology and virology - Processing of body fluids and stool specimen for identification of parasites culture techniques and animal inoculation methods for identification of parasites. Cultivation of animal viruses Viral serological and molecular techniques.

UNIT 4 (15 Hrs)

Immunology Immunty to infectious agents, Measurement of humoral response, cell mediated response, Phagocytic uptake and killing, Recombinant vaccines. Immunological techniques:- Immuno blotting, ELISPOT, Complement fixation, RIA and immuno fluorescence. Hypersensitivity reactions

Suggested Readings

1. Pravash Sen. Gupta, Clinical Immunology; Oxford University Press. 2003.
2. Noel R. Rose, Herman Friedman, John L. Fahey, Manual of Clinical Laboratory Immunology. ASM. III edition; 1986.
3. Leslie Hudson and Frank C. Hay, Practical Immunology, Blackwell Scientific Publication. Ed.3; 1989.
4. Goding J.W., Monoclonal Antibodies: Principle and Practice; Academic Press. 2001.
5. Carl A. K. Borrebacck, Antibody Engineering, Oxford University Press. Ed.2; 1995.

INSTRUMENTATION & TECHNIQUES IN MEDICAL MICROBIOLOGY

Subject Code: MMLTS3-310 **L T P C** **(Duration: 60 hrs)**
3 1 0 4

Course Objective:

1. Distinguish normal and abnormal hematological laboratory findings to predict the diagnosis of hematological disorders and diseases.
2. Recognize laboratory results consistent with leukemia and other white blood cell disorders.

Course Outcome:

1. Correlate hematological findings with those generated in other areas of the clinical laboratory, patient symptoms and clinical history, to make appropriate and effective on-the-job professional decisions.
2. Perform basic hematological laboratory testing, assess laboratory data and report findings according to laboratory protocol.

UNIT 1 (15 Hrs)

Role of the Microbiologist:- Responsibility to the patient and clinician. General Concept for specimen collection and handling. Lab physical Design and Organization – Lab Design with report to safely of air handing system, Mechanical system, walls, floors, ceilings and furniture, Institution. Organization of the Microbiology laboratory.

UNIT 2 (15 Hrs)

Microscopy –Principles, application of light microscopy dark field microscopy, fluorescence microscope, Electron microscopy TEM, SEM, Automation in microbiology. Prepation of stains – Gram, Alberts, Capsule, Spore, Ziehl, Neelsen, Lactophenol Cotton Blue, Preparation of regents used in biochemical analysis.

UNIT 3 (15 Hrs)

Instrumentation Techniques: Centrifugation Basic principles and common centrifuges used in Laboratory. (Clinical high speed & ultra, Electrophoresis General Principal, application of Gel electrophoresis, PAGE, Agarose Gel elcetrophoresis Spectroscopy UV – VIS absorption Spectroscopy, Flow Cytometry Principle and application.

UNIT 4 (15 Hrs)

Molecular and Techniques and Bioinformatics – Polymerase Chain Reaction, Micro array, Southern Blotting, Northen Blotting, Western blotting Immunofluorsence and gel documentation. Introduction to Bioinformatics Gene annotation, DNA sequence data, Homology search of DNA and amino acids, BLASTA, FASTA, Human Genome Project.

Suggested Readings

1. Pravash Sen. Gupta, Clinical Immunology; Oxford University Press. 2003.
2. Noel R. Rose, Herman Friedman, John L. Fahey, Manual of Clinical Laboratory Immunology. ASM. III edition; 1986.
3. Leslie Hudson and Frank C. Hay, Practical Immunology, Blackwell Scientific Publication. Ed.3; 1989.
4. Goding J.W., Monoclonal Antibodies: Principle and Practice; Academic Press. 2001.
5. Carl A. K. Borrebacck, Antibody Engineering, Oxford University Press. Ed.2; 1995.

FOURTH SEMESTER

PROJECT WORK

Project work which will carry 400 marks

The project will be based upon the research and actual bench work. It will begin form the 3rd semester and will continue through the 4th one. The project report will be submitted ant the end of the 4th semester and evaluated (50% evaluation by internal examiner and 50% evaluation by external examiner