

DEPARTMENT OF ADVANCED  
ZOOLOGY AND BIOTECHNOLOGY

M. Sc MEDICAL LABORATORY  
TECHNOLOGY (Self Supporting)

## PG SYLLABUS

Effective from the Academic Year 2006 - 07



## LOYOLA COLLEGE

Autonomous

College Conferred with Potential for Excellence by UGC

Accredited at A+ by NAAC

Chennai - 600 034

Sem	Cat	Code	Title	Cre	Hrs
I	MC	ML 1808	CLINICAL BIOCHEMISTRY	4	5
I	MC	ML 1809	MOLECULAR BIOLOGY	4	6
I	MC	ML 1803	HAEMATOLOGY	3	5
I	MC	ML 1804	HAEMATOLOGY LAB COURSE	3	5
I	MC	ML 1802	BIOCHEMISTRY LAB COURSE	3	5
I	SE	ML 1952	MEDICAL TRANSCRIPTION	3	4
I	SE	ML 1951	HOSPITAL MANAGEMENT	3	5
II	MC	ML 2801	HUMAN PATHOGENS	3	4
II	MC	ML 2807	SEROLOGY AND BLOOD BANK LAB COURSE	3	6
II	MC	ML 2808	MICROBIOLOGY LAB COURSE	3	6
II	MC	ML 2809	IMMUNOLOGY	3	4
II	SE	ML 2951	METHODOLOGY OF MEDICAL LABORATORY RESEARCH	3	4
II	SE	ML 2952	ADVANCED MEDICAL LABORATORY TECHNIQUES	3	4
III	MC	ML 3800	BODY FLUID ANALYSIS	3	4
III	MC	ML 3801	HUMAN PHYSIOLOGY	3	4
III	MC	ML 3806	URINE ANALYSIS AND STOOL EXAMINATION - LAB COURSE	3	6
III	MC	ML 3805	SEMINAL AND SPUTUM ANALYSIS - LAB COURSE	3	6
III	SU	ST 3901	STATISTICAL APPLICATIONS IN BIOLOGICAL SCIENCES	3	4
III	ID	ML 3875	PHARMACEUTICAL CHEMISTRY AND TOXICOLOGY	3	4
III	GE	ML 3925	HUMAN REPRODUCTIVE PHYSIOLOGY & PATHOLOGY	3	5
IV	MC	ML 4801	NON INVASIVE TECHNIQUES	3	4
IV	MC	ML 4807	HISTOPATHOLOGY AND ESSENTIALS OF LAB	3	6
IV	SU	ML 3902	PATHOGENS OF HUMAN IMPORTANCE	3	4
II	SU	ML 2901	HUMAN ANATOMY AND PHYSIOLOGY	3	4
II	MC	BT 2900	SEPARATION TECHNIQUES (offered by biotechnology department)	3	4

## ML 1808 CLINICAL BIOCHEMISTRY

SEMESTER : I CREDITS : 04  
CATEGORY : MC NO OF HOURS PER WEEK : 05

**Objectives:** *To impart knowledge on the importance of principles of clinical biochemistry to the students.*

### Unit I. Basic principles and practices of clinical chemistry

Patient management, prognosis and diagnosis. Laboratory safety – toxic chemicals and biohazards – computers in the clinical chemistry lab for a reliable report.

### Unit II : Basic physiology, analytical procedures and clinical correlations

Amino acids and proteins, Enzymes- cardiac markers (LDH, SGOT, SGPT, alkaline phosphatase etc.), Blood Gases, pH (acid base balance) and Buffer systems, Electrolytes, Carbohydrate metabolism.

### Unit III. Endocrinology

Thyroid function, Tumor Markers, Chemical Assessment of Hemostasis, Therapeutic drug monitoring, Toxicology.

### Unit IV. Biochemical procedures

Lipids and lipoproteins, Vitamins (fat soluble and water soluble and their deficiency disorders), Porphyrins, Haemoglobin and Myoglobin, Non-protein Nitrogen, Renal function, Liver function, Pancreatic (exocrine and endocrine) functions, gastrointestinal function.

### Unit v. Paediatric clinical chemistry

Diseases of the newborn and their complications, Gastric clinical chemistry, Future directions in clinical chemistry.

#### REFERENCES:

1. Zubay, G.L. Biochemistry, W.M.C.. Brown Publishers, New York 1998.
2. Deb, A.C., Fundamentals of biochemistry, Books and allied(P)Ltd, 2002.
3. Satyanarayanan, U. Essentials of biochemistry, Books and allied(P) Ltd. 2002.
4. Campbell, P.N and A.D .Smith, Biochemistry Illustrated, 4<sup>th</sup> ed, Churchill Livingstone.

## ML 1809 MOLECULAR BIOLOGY

SEMESTER : I CREDITS : 04  
CATEGORY : MC NO. OF HOURS PER WEEK : 06

**Objectives :** *To provide a good foundation in molecular biology where importance is laid on the master molecule which is an emerging discipline with a broad conceptual approach that transcends all sections of anatomic and clinical pathology.*

### Unit I : Basic principles in molecular diagnostics

Organizations of molecular diagnostic laboratory-Bio-membranes and the sub-cellular organization of eukaryotic cells.

**Unit II :** Nucleic acid organelle - DNA-the genetic code and the synthesis of macromolecules-structure of nucleic acids –synthesis of biopolymers- nucleic acid synthesis-the role of RNA in protein synthesis-stepwise formation of proteins on ribosome.

**Unit III :** Molecular structure of genes and chromosomes –organization of cellular DNA into chromosomes –morphology and functional elements of eukaryotic chromosomes –chromosomal organization of genes and non-coding DNA.

**Unit IV :** DNA replication –repair-recombination –mutation - Regulation of the eukaryotic cell cycle-gene control in development-Cellular energetics-Types of syndromes - Cystic fibrosis.

**Unit V :** Molecular oncology including DNA assay for T and B-cell rearrangement- analysis for translocation, oncogene analysis - translocation gene mutation in various cancer, In situ hybridization- Blood group, molecular histocompatibility testing, forensic identity testing by DNA analysis.

#### REFERENCE BOOKS:

1. Albert B. Bray D and Lewis J Molecular biology of the cells, 2<sup>nd</sup> edition New York Garland Publications 1989.
2. Kirby L.T DNA fingerprinting; An introduction, New York, W.H. Freeman and Co.1992.
3. De Robertis, E.D.P., and De Robertis, E.M.F. Cell and Molecular Biology (6 Ed), W. B. Saunders College, Philadelphia. 1990.

## ML 1803 - HAEMATOLOGY

SEMESTER : I CREDITS : 03  
CATEGORY : MC NO. OF HOURS PER WEEK : 05

**Objective:** To understand the mechanism of blood formation and their abnormalities in various types of disorders.

### Unit I. Composition of Blood :

Components of the blood (Plasma and Cellular elements) and their functions – Haemopoietic system of the body (Leucopoiesis, erythrocytosis and thrombopoiesis).

**Unit II.** Haemostasis – disorders and regulation – Types of Anaemia ( deficiency of iron, B12 and folic acid, hemolytic, aplastic and genetic disorders), Bleeding disorders of man.

### Unit III. Coagulation of blood :

Coagulation system- recalcification time, activated partial thromboplastin time and thrombin time, Clotting time, Bleeding time, Prothrombin time, Partial Prothrombin time, Mechanism of coagulation of blood.

### Unit IV. Haemogram

Haemogram - Haemoglobin, PCV, ESR, RBC count, WBC count, Platelet count, Calculations of Anaemia using MCH, MCV & MCHC, Reticulocyte count, Absolute Eosinophil count, Differential count.

### Unit V. Special Haematological tests :

Osmotic fragility – Heinz body preparation, Blood parasites – Lupus Erythematosus (LE) Cell preparation – Cytochemical tests, Quality control and quality assessment.

#### RECOMMENDED BOOKS :

1. Kanai L. Mukherjee, Medical Laboratory Technology Vol. I. Tata McGraw Hill 1996, New Delhi.
2. Gradwohl, Clinical Laboratory-methods and diagnosis, Vol-I
3. Sabitri Sanyal, Clinical pathology, B.I.Churchill Livingstone(P)Ltd, New Delhi.2000.
4. Judith Ann Lewis, Illustrated guide to diagnostic tests-students version, Springhouse Corporation, Pennsylvania, 1994.

## ML 1804 - HAEMATOLOGY LAB COURSE

SEMESTER : I CREDITS : 3  
CATEGORY : MC NO. OF HOURS / WEEK : 5

**Haemogram:** Blood Pressure, Pulse rate, Clotting time, Bleeding time, Haemoglobin estimation, Erythrocyte Sedimentation Rate, Packed cell volume.

**Complete Blood count:** Prothrombin time, Differential count, Total Red Blood cell count, Total White blood cell count, Platelet count, Eosinophilic count, Reticulocyte count.

**Special Investigations:** Osmotic fragility, Heinz body preparation, Sickle cell preparation, Lupus erythematosus(LE) cell preparation and cytochemical tests.

#### RECOMMENDED BOOKS :

1. Kanai L. Mukherjee, Medical Laboratory Technology Vol. I. Tata McGraw Hill 1996, New Delhi.
2. Gradwohl, Clinical Laboratory-methods and diagnosis, Vol-I

## ML 1802 - BIOCHEMISTRY LAB COURSE

SEMESTER : I CREDITS : 3  
CATEGORY : MC NO. OF HOURS / WEEK : 5

#### GENERAL PROFILE:

Blood sugar, Urea, Uric acid, Creatinine, Cholesterol, triglyceride, High Density Lipoproteins, Low Density Lipoproteins, Very Low Density Lipoproteins.

#### CARDIAC PROFILE:

- Creatine Kinase (Myocardium), Lactate Dehydrogenase, Serum Glutamic Oxalacetic transaminase, serum glutamic Pyruvic transaminase.

#### ELECTROLYTES:

- Sodium, Potassium, Calcium, chloride, bicarbonate, phosphorus and magnesium.

## LIVER FUNCTION TEST:

Serum bilirubin, Total protein, AG Ratio, Gamma GT, Electrophoretic separation of protein, alkaline phosphatase, acid phosphatase and amylase.

## ML 1952 - MEDICAL TRANSCRIPTION

SEMESTER : I CREDITS : 3  
CATEGORY : SE NO. OF HOURS / WEEK : 4

**Objective :** To understand the essential aspects of medical terminology and transcriptional guidelines.

### Unit I : Introduction and Medical Terminology:

IT enabled services, Need of medical transcription, Equipments used. Medical terminology-Word root, combining form, Suffixes-prefixes, Formation and defining medical words.

### Unit II : Organ systems:

Orthopedics, Neurology, Ophthalmology, Endocrinology, Otorhinolaryngology, Pulmonology, Dermatology, Gastroenterology, Cardiology, Urology, Gynecology and obstetrics

(Anatomy and physiology, Pathology, Lab procedures, Drug used Vocabulary, Abbreviation)

### Unit III : Blood system

Immune system, Lymphatic system, Hematology. Psychiatry-Representative diseases, Diagnostic procedures, treatments. Pharmacology.

### Unit IV : Marketing of medical transcription :

Market research and analysis, Target marketing. Editing and phonetic problem solving-Types of errors, Editing, Proofreading.

### Unit V :Tools for medical transcription

Transcription Guidelines, Formatting of reports, English Grammar-Parts of Speech, Subject verb agreement, Tense, Punctuation.

## REFERENCE BOOKS:

1. The language of medicine, Fifth edition, WB Saunders Company, Devi-Ellen Chabner, BA, MAT.
2. Medical Terminology a text workbook, Alice V. Prendergast, Frances C. Fulton, 4<sup>th</sup> Edition, Addison Wesley, 1997.
3. Guyton and Hall, A text book of medical physiology, W.B Saunders, 1996.
4. Textbook of Human Physiology, Sarada Subramanyam, K.Madhavan Kutty, H.D.Singh.
5. Medical Transcription made easy, Alok jha, Prinyanka arora, Macmillan India Ltd.
6. Manual of Medical Transcription, Sheila B.Sloane, Marlyn Takahashi Fordney, W.B Saunders Company, 1994.

## ML 1951 - HOSPITAL MANAGEMENT

SEMESTER : I CREDITS : 3  
CATEGORY : SE NO. OF HOURS / WEEK : 5

**Objective:** To impart knowledge about the functioning and maintenance of various departments in the hospital.

### Unit I : Principles of Hospital Management

Role of Administrator - Hospital planning - Organization of O.P & I.P., Ancillary services, Emergency services, Operation theaters. Management of nursing services, Paramedical Staff, Hospital statistics, Evaluation of patient care, Resource mobilization, Public Relations in Hospital.

### Unit II : Human Resource Management

Manpower planning - Recruitment procedures - Training and Development, Educational institutions and consultants - Principles and methods of executive development programmes - Performance appraisals, Job satisfaction.

### Unit III : Inventory management

Need for adopting materials management concept, Norms for inventory, Inventory carrying cost, Understocking, Overstocking - ABC analysis - Inventory reports - Materials handling, Store keeping and warehousing management.

#### Unit IV : Book Keeping

Meaning and Objectives – Double entry system, Trial balance, Profit and loss account, Preparation of balance sheet, Medical records Maintenance.

#### Unit V : Limitations

Hospital hazards and infections - Nosocomial infections - Safety measures to be carried out in Hospital environment, Hospital waste management.

#### REFERENCE BOOKS:

1. Gupta, Hospital & Health care Administration, 2000, Jaypee Brothers Medical Publishers, New Delhi
2. Jha, S.M., Hospital Management, 2003, Himalaya publishing house, New Delhi.
3. Mohd.Faisal Khan, Hospital Waste Management, 2004, Kanishka publishers, New Delhi.
4. Shakti Gupta & Sunil Gupta, Hospital Stores Management – An Integrated Approach, 2000, Jaypee Brothers Medical Publishers, New Delhi.

### ML 2801 - HUMAN PATHOGENS

SEMESTER : II                              CREDITS                              : 3  
 CATEGORY : MC                            NO. OF HOURS / WEEK        : 4

**Objective :** To impart knowledge on identification, life cycle, host-pathogen relationships, pathogenicity and laboratory diagnosis of pathogens of man.

#### Unit I : Bacteriology

Classification – Diseases caused by *Staphylococcus*, *Streptococcus*, *Pneumococcus*, *Neisseria*, *Corynebacterium*, *Mycobacterium*, *Clostridium*, *Bacillus*, *Enterobacteria*, *Spirochaeta*, *Rickettsia*, *Chlamydeae*.

#### Unit II : Virology

Classification, Human viruses, Bacteriophage.

#### Unit III : Mycology

Dimorphic fungi causing Systemic Mycoses, Diamataceous Fungi, agents of Zygomycosis, Fungi causing *Eumycotic mycetoma*.

#### Unit IV : Protozoology

Entamoeba, Toxoplasma, Plasmodium, Leishmania, Trypanosoma, Giardia, Trichomonas, Balantidium.

#### Unit V : Helminthology

Cestodes –*Taenia*; *Trematodes* - *Schistosoma*; Nematodes: *Ascaris*, *Ancylostoma*, *Wuchereria*, *Trichuris*, *Enterobius*, *Loa*, *Strongyloides* - General features of vector of clinical importance and their role in transmission of diseases.

#### REFERENCE BOOKS

1. Richard, D.G., C.B., Slack, J. F. Peuthere, 1996. Medical Microbiology. Churchill Livingstone, US..A.
2. Chatterjee, 1986. Medical Parasitology. Tata Mc Graw Hill, India.
3. Collee, J.C., Duguid, J.P., Fracer, A.C., Marion .B.P, Mackie and McCartney, 1996. Practical Medical Microbiology, Churchill Livingstone, U.S.A.
4. Pelczar, M.J., E.C.S. Chan., Krieg, N.R, 1996. Microbiology, Tata McGraw Hill, India.

### ML 2807 - SEROLOGY AND BLOOD BANK LAB COURSE

SEMESTER : II                              CREDITS                              : 3  
 CATEGORY : MC                            NO. OF HOURS / WEEK        : 6

**Objective :** To impart hands - on training on the methodologies for identification of infectious human diseases.

#### Unit I : Widal for Typhoid and RPR (Rapid Plasma Reagin)

#### Unit II : Inflammatory Disorders

General inflammatory marks and specific therapeutic bioindicators. CRP (C reactive protein), RA ( Rheumatoid Arthritis), ASO(Anti Streptolysin O)

#### Unit III : Immunological Methods

Immunological test for pregnancy, Haemagglutination, Compliment fixation, Precipitation and Immunodiffusion

#### Unit IV : Blood Bank

Basic principle involved in Immunohaematology as prior to blood transfusion, Blood collection procedure, Blood grouping (Slide

method, tube method), Rh typing, Forward and Reverse grouping techniques, Cross matching (Major and Minor types), Separation of Blood components, Coombs test

#### Unit V : Screening Test

HbsAg, HCV, HIV (ELISA, Western Blot tests), TPHA (*Treponema pallidum* haemagglutination), Malarial parasites.

#### REFERENCE BOOKS

1. Henry, Bernard, J., Sanford, T and Davidson, 2002. Clinical diagnosis and Management by laboratory methods. W.B. Saunders, New York.
2. Gradwohl, 2000. Clinical Laboratory Methods and Diagnosis. (ed) Ales C. Sonnenwirth and Leonard Jarret, M.D. B.I. Publications, New Delhi.
3. Richard, R, 1989. Clinical Laboratory Medicine, Medical Publi, Chicago.
4. Williams and J. William, 1990. Haematology. Mc Graw Hill, New York.

### ML 2808 - MICROBIOLOGY LAB COURSE

SEMESTER : II                                      CREDITS                                      : 3  
CATEGORY : MC                                      NO. OF HOURS / WEEK                      : 6

**Objective :** To impart the skill in essential microbiological techniques related to human samples.

**Unit I :** Sterilization of glassware & culture media; preparing & dispensing culture media-establishing pure cultures.

**Unit II :** Preparation of wet mount, mobility test –Simple stain-Gram’s stain-Acid Fast stain-Capsule stain.

**Unit III :** Physiological reaction of bacteria –Catalase test –Coagulates test –Oxidase Test- Nitrate test –Carbohydrate Fermentation test –IMVIC test –TSI test.

**Unit IV :** Identification of *Staphylococcus aureus*, *Streptococcus pneumoniae*; lactose&non lactose fermentation; members of *Enterobacteriaceae-Pseudomonas aeruginosa*

**Unit V :** Antibiotic sensitivity test-Qualitative: Kirby Bauer’s methods, Quantitative, MIC

**Unit VI :** Gram’s stain of yeast like fungal cells-India ink preparation-study of Lactophenol cotton blue mount –Potassium hydroxide mount.

#### REFERENCE BOOKS

1. Monica Cheesebrough, 1987. Medical Laboratory Manual for Tropical Countries, Vol 1 & 2. Butterworth.
2. Collect, J.C., Duguids, J.P., Fracer, A.C., Marimon, B.P., Mackie and Mc Cartney, 1996. Practical Medical Microbiology, Churchill Livingstone, U.S.A.
3. Gunesekaran, P, 1996. Laboratory Manual in Microbiology, New Age international, India.
4. Fischbach, F.T., Dunning, M.B, 2002. A Manual of Laboratory and Diagnostic Tests. Lippincott Williams and Wilkins, Baltimore.

### ML 2809 - IMMUNOLOGY

SEMESTER : I                                      CREDITS                                      : 3  
CATEGORY : MC                                      NO. OF HOURS / WEEK                      : 4

**Objective :** To understand the immune components, their organization and measures to gain immunity against infections.

#### Unit I: Immune components and their functions

Cellular components (B & T lymphocytes, macrophages/ monocytes, neutrophils, eosinophils, killer and natural killer cells); Humoral components (antibodies, complement system, cytokines, interferons and interleukins)

#### Unit II: Organisation of internal immune system

Lymphoid organs- Primary and secondary lymphoid organs (anatomical locations, structure and role) – bone marrow- thymus, bursa of fabricius-lymph node- spleen Payer’s patches and Kupffer cells – differentiation of cells into immunological component cells- basic structure and their role in immunity.

#### Unit III: Immunity against infections

Immunity against viral, bacterial and parasitic infections-immunological basis of hypersensitivity and graft rejections; Major Histocompatibility Complex (MHC)

#### Unit IV : Clinical immunology

Vaccines, types and their uses – immunization schedule for children – prevention of new born diseases like tetanus, diphtheria, whooping cough, typhoid, cholera, yellow fever and measles – time schedule.

## Unit V : Serological investigation

To differentiate various diseases in man caused by different pathogens (bacterial and viral infections)

### REFERENCE BOOKS

1. Ivon M. Roitt, 1998. Essentials of Immunology, Blackwell Scientific publications, Oxford.
2. Peckman, M and D. Vergain, 1997. Basic and Clinical Immunology Churchill Livingstone. N.Y.
3. Playfair, J.H.L, 2001. Immunology at a glance 7<sup>th</sup> ed. Blackwell Scientific Publications, Oxford.
4. Stewart, S, 2001. Immunology, Immunopathology and Immunity, 6<sup>th</sup> ed. ASM Press Washington D.C.

## ML 2951 - METHODOLOGY OF MEDICAL LABORATORY RESEARCH

SEMESTER : II CREDITS : 3  
CATEGORY : SE NO. OF HOURS / WEEK : 4

**Objective :** To create an awareness regarding the important of scientific approach in understanding Laboratory Techniques in medical through systematic and experimental approaches.

**Unit I :** Identification of areas of research field- problems and needs for experimental approach, Good laboratory practices.

**Unit II :** Review of Literature - biological and medical abstracts, current contents, CD Rom, Internet, Website, Citation Index- Peer- reviewed publications.

**Unit III :** Selection of suitable methodology and statistical techniques for controlled and unbiased experimentation – designing of experiments.

**Unit IV :** Guidelines for analysis and discussions – preparation of the manuscript for scientific publications, ethics in research.

**Unit V :** Preparation of project proposal-Thrust areas-Funding agencies (National and International) – Kinds of research program in India and abroad; Career development in laboratory research.- Impact factors, principle and method of patenting.

### REFERENCE BOOKS

1. Kothari C.R 1985. Research Methodology(Methods &Techniques)Wiley Eastern Ltd, N.Y.
2. Gopal Lal Jain , 2003 – Research Methodology (Methods , Tools and Techniques) Managaldeep publications, India.
3. Mc Burney,D.H 2002 Research methods Thomson Wadsivath, New York
4. Mason,E.J,. and Bramble,W.J.1978- Understanding and conducting research, Mc Graw Hill, New Delhi.
5. Palanichamy,S,and M.Manoharan 1991 , statistical methods for Biologists. Palani Paramount Publication, Palani, India.

## ML 2952 - ADVANCED MEDICAL LABORATORY TECHNIQUES

SEMESTER : II CREDITS : 3  
CATEGORY : SE NO. OF HOURS / WEEK : 4

**Objective :** To understand the current trends in advanced medical technology for a better insight into the pathogenesis of diseases at molecular level.

### Unit I : Introduction to Molecular Pathology

Laboratory application of nucleic acid technologies to elucidate, diagnose, monitor disease state and to evaluate non-disease status-techniques for the detection of DNA,and RNA structures at the molecular level..

### Unit II : Molecular Diagnostics

Basic principles and techniques-nucleic acid biochemistry-Relation to laboratory evaluation of disease and establishing a molecular diagnostic laboratory facilities, equipment, personnel. Clinical testing process, quality assurance, clinical validation and accreditation.

### Unit III : Molecular Genetics

Molecular genetics of hematopoietic neoplasm-lineage probes in the evaluation of hematopoietic neoplasma- Molecular analysis of chromosomal aberrations in leukemias and lymphomas, Molecular diagnosis of genetic diseases. Choice of techniques, choice of applications, special concept unique to molecular genetic disorders, specific disease examples. Application of molecular methods in clinical microbiology.

#### Unit IV : Hybridization

Tissue *in situ* hybridization; relationship of *in situ* hybridization to other molecular methods of immunohistochemistry, technical consideration and methodology; HLA DNA polymorphism, and parentage testing.

#### Unit V : Forensic Identity Testing

DNA analysis; historical aspects advantage of DNA over traditional serology; impact of DNA specimen collection, DNA degradation and environmental damage, quality assurance, standard, databank, legal challenge.

#### REFERENCE BOOKS

1. Henry, John Bernard, Todd Sanford and Davidson, 2002. Clinical diagnosis and management by laboratory methods. W.B. Saunders & Co.
2. Fischbach Francis A, 2003. Manual of laboratory and diagnostic tests. Philadelphia, J.B. Lippincott & Co, N.Y.
3. Gradwohls, 2000. Clinical laboratory methods and diagnosis ed. Alex.C. Sonnenwirth & Leonard Jarret. M.D.B.I. Publications, New Delhi,
4. Sood, R, 2005, Medical Laboratory methods and interpretation, Jaypee brothers medical publications, New Delhi.

### ML 3800 - BODY FLUID ANALYSIS

SEMESTER : III CREDITS : 3  
CATEGORY : MC NO. OF HOURS / WEEK : 4

**Objective:** To impart knowledge about the production, composition, normal & abnormal characteristics and lab evaluation techniques of body fluids.

#### Unit I : Physical properties of body fluids

Body fluid compartments, Solutes in body fluid, Clinical abnormalities of fluid volume regulation, Measurements of body fluid compartments, Movement of body fluids.

#### Unit II : Amniotic fluid

Formation and function of amniotic fluid, Chemical composition, Collection, Testing – Alpha fetoprotein, Acetyl cholinesterase, Neural tube defects, Chromosomal abnormalities, Haemolytic disease of newborn, Gestation age, Fetal maturation.

#### Unit III : Cerebrospinal fluid

Formation, Specimen collection, Causes of CSF pressure changes, Gross examination, Chemical analysis, Microbiologic examination, Immunologic tests, Cytological examination and clinical correlation.

#### Unit IV : Synovial fluid

Classification of joint disorders, Non-inflammatory joint diseases – Osteoarthritis, Traumatic arthritis, Neurogenic joint disease. Inflammatory joint disease – Rheumatoid arthritis, Lupus arthritis, Cell count, Chemical and serological examinations, Clinical correlations.

#### Unit V : Serous fluid & other body fluids

Formation, Collection, Classes of effusions, Cell types and clinical correlations. Lymph, Gastric fluid, Urine, Faeces, Seminal fluid, Sputum and sweat, Biomarker evaluation in body fluids for specific therapeutic prognostic and /or diagnostic potential.

#### REFERENCES:

1. Tortora, G.S., Grabowski, S.R., Principles of Anatomy & Physiology, 1996, 8th edition, Harper Collins, NY.
2. Guyton & Hall., Textbook of Medical Physiology, 2000, 10th edition, Elsevier, New Delhi.
3. June H. Cella, Juanita Watson, Manual of Laboratory Tests, 2004, Aitbs Publishers, New Delhi.
4. Elkinton & Danowski, The Body Fluids, 2002, Williams & Wilkins, Baltimore

### ML 3801 - HUMAN PHYSIOLOGY

SEMESTER : III CREDITS : 3  
CATEGORY : MC NO. OF HOURS / WEEK : 4

**Objectives :** To understand the anatomical organization of organs, its coordination and integrated physiological functions and disorders in human body.

**Unit I: Integumentary system:** Basic structure and functions of glands, layers and hair follicles. Gastrointestinal system: Dentition –types, Gastro-intestinal enzymes, Structure, absorption



**Unit II: Respiratory system:** Structure and function of respiratory organs, Gas exchange, Respiratory volume and capacities, Cardiovascular system: Structure and function of circulatory system: Human heart, blood vessels, lymphatics, Control of heart beat, Cardiac cycle.

**Unit III : Endocrine system:** Glands and types of hormone, Functions and metabolic disorder.

**Unit IV : Neuromuscular system:** Basic structure and function of Central Nervous System (CNS), Autonomic Nervous System (ANS) and Peripheral Nervous System (PNS)-Sense organs, Reflexes, Transmission of nerve impulse. Musculoskeletal system –types of muscles, movement and muscle contraction - contractile mechanisms, Neuro-muscular disorders.

**Unit IV : Urino-genital system:** Structure and function of kidney: Mechanism of urine formation, micturition, male and female reproduction systems-Menstrual cycle, infertility and menopause, Control of growth and reproduction.

#### REFERENCE BOOKS:

1. Guyton A.C and J E Hall, A text book of Medical Physiology, W.B Saunders, 1996.
2. Talwar, G.P and C.M. Srivastava, A text book of Biochemistry and Human Biology. Prentice Hall of India Ltd., 2003
3. Human physiology from cells to systems, 5<sup>th</sup> edition 2004, Lauralee Sherwood, Thomson. Asia Pvt.Ltd. Singapore.
4. Physiology, Robert M. Beenu, Mathew N Levy, Bruce M. Koeppe, A. Stanton, 5<sup>th</sup> edition Mosby 2004.
5. Elaine N, Benzamin, Human anatomy and physiology, 3<sup>rd</sup> edition, Cammings publishing company, 1995.

### ML 3806 - URINE ANALYSIS AND STOOL EXAMINATION - LAB COURSE

SEMESTER : III CREDITS : 3  
CATEGORY : MC NO. OF HOURS / WEEK : 6

**Objectives:** To impart knowledge about the laboratory techniques to diagnose the abnormal characteristics of urine and stool and its clinical correlation.

**Unit I : Collection and physical examination:** Collection of urine, Types of preservative, physical examination; Volume, colour, odour, appearance, specific gravity and pH.

**Unit II : Chemical examination:** Reducing sugar-Benedict test, protein: -Heat and acetic acid test, and sulfosalicylic acid method, Ketone bodies-Roth era's test, Bile pigment (Fouchet method), bile salt (Hay's test), Urobilinogen-Ehrlich aldehyde test and Bence Jones protein test, Renal clearance test-urea, creatine, Test for mucin.

**Unit III : Microscopical Examination:** Microscopic examination; Identification of casts and crystals and blood cells-RBC, WBC, SE epithelial cells, smear for gram staining and urine culture.

**Unit IV : STOOL EXAMINATION:** Collection of fecal specimen, preservation, physical examination; volume, colour, odour and appearance. Chemical examination; reducing sugar, occult blood test Demonstration of fat in stool, detection of steatorrhoea.

**Unit V : Microscopic Examination of Feces:** Concentration method, direct centrifuge floatation method and ether extraction method for ova and cysts. Identification of crystals, meat fibers, fat globules and blood cells. Culture especially for enriched group of organisms.

#### REFERENCE:

1. Sabitri sanyal-(1991):Text book of pathology, first edition,
2. June H.cella- (1994): manual of laboratory test , AITBS publishers.

### ML 3805 - SEMINAL AND SPUTUM ANALYSIS - LAB COURSE

SEMESTER : III CREDITS : 3  
CATEGORY : MC NO. OF HOURS / WEEK : 6

**Objective:** To impart hands-on lab course on the techniques for analysis of sputum and seminal fluids.

#### SEMINAL FLUID EXAMINATION

**Unit I: Macroscopic examination:** Sample handling and collection techniques. Physical examination-Volume, Appearance, color, odor, pH, viscosity. Fructose estimation test.



testing of drugs: testing drugs in-vitro enzyme inhibition, receptor studies, safety and efficacy, microbiological testing, screening and testing by NMR , testing drugs in vivo: test systems drug potency, therapeutic ratio. Use of cell lines and animal models. Placebo-controlled studies. Safety evaluations, followed by efficacy studies.

### Unit III : Analytical techniques

Radio pharmacy: Labelling studies, isotopes, synthesis- incorporation of D or T or C isotopes, Radio active isotopes, units of radioactivity, measurements- Gieger Muller counter, scintillation counters, radio immunoassay. Cancer chemotherapy-radioactive isotopes. X ray crystallography, comparison of physiochemical data with bioactivity. Standard operating procedures while handling radioactive materials.

### Unit IV: General and Systemic Toxicology

General toxicology: Mechanism of toxic effect, toxicokinetics - chemical carcinogens and teratogens, treatment of intoxication. Response of respiratory system, reproductive system, liver, kidney to toxic agents. Toxic effects of metals, solvents, environmental pollutants.

### Unit V: Pharmacokinetic analysis

Bioavailability of drugs-role of bioenhancers. Entry routes for drugs, factors that affect drug distribution, drug metabolism, renal excretion of drug. Drug clearance: renal clearance, plasma clearance. Drug absorption and elimination.

#### REFERENCE BOOKS:

1. Jayashree Ghosh, A textbook of pharmaceutical chemistry, New Delhi: S. Chand & Company, 1999.
2. S.N.Pandeya and J.R.Dimmock, An introduction to drug design, New Delhi: New age international. 1997.
3. P.Parimoo, A Textbook of medical chemistry, New Delhi: CBS publishers. 1995.
4. G.Patrick, medical chemistry, New Delhi: Viva Books, 2002.
5. S.Ramakrishnan, K.G.Prasannan and R.Rajan, Textbook of medical biochemistry, Hyderabad: Orient Longman. 3<sup>rd</sup> Edition, 2001.
6. G.M.Brenner, Pharmacology, W.B. Saunders. Co 2000.
7. F.S.K.Barar, Essential of pharmacotherapeutics, New Delhi: S. Chand and Company 2000.
8. N.J.Ellenorn, Medical Toxicology, Williams and Wilkins 1997.

## ML 3925 - HUMAN REPRODUCTIVE PHYSIOLOGY & PATHOLOGY (to any PG student other than MLT)

SEMESTER : III	CREDITS	: 3
CATEGORY : GE	NO. OF HOURS / WEEK	: 5

**Objective:** To impart the basic knowledge and the functions of human reproductive system and their related disorders with the causal factors to non MLT students.

### Unit I: Male Reproductive System & Hormonal Function:

Physiologic anatomy, spermatogenesis, male sexual act, testosterone and other male sex hormones, Abnormalities of male sexual function, male infertility.

### Unit II: Female reproductive system and the hormonal functions:

Physiologic anatomy, female hormonal system, ovarian cycles, function of estradiol and progesterone, female sexual act, female infertility; Hormone replacement therapy (HRT), Menopause and post menopause.

**Unit III: Pregnancy:** Maturation and fertilization of the ovum, early nutrition of the embryo, function of the placenta, hormonal factors in pregnancy, response of the mothers body to pregnancy, parturition.

### Unit IV: Fetal and neonatal physiology and pediatric diseases:

Growth and functional development of the fetus, adjustment of the infant to extrauterine life, special functional problems in the neonate, problems of prematurity, congenital anomalies, perinatal infections, syndrome of the newborn, immune hydrops, tumors and tumor like lesions of infancy and childhood. The role of fetal factors in programming adult- onset diseases.

### Unit V: Pathology:

Gynaecological malignancies- ovarian cancer, uterine cancer, cervical cancer, gestational trophoblastic neoplasia. Sexually transmitted diseases- syphilis, gonorrhoea, trichomoniasis, human papilloma virus infection. Diseases during pregnancy-placental inflammations and infections, ectopic pregnancy, gestational trophoblastic diseases, eclampsia.

#### REFERENCES BOOKS:

1. Guyton A.C and J E Hall, A text book of medical physiology, W.Bsaunders, 1996.
2. Vijaykumar, Ramzi.S. Cotran, Stanley L. Robbins, Basic pathology, 7<sup>th</sup> edition, Saunders publications, 2003.

3. Braunwald, Fauci, kasper, hauser, Iorgo, Principles of internal medicine, Volume-1, 15<sup>th</sup> edition, McGraw Hill, 2001.

## ML 4801 - NON INVASIVE TECHNIQUES

SEMESTER : IV CREDITS : 3  
CATEGORY : MC NO. OF HOURS / WEEK : 4

**Objective:** To impart the knowledge on various Non Invasive Techniques used for the diagnosis of human diseases.

**Unit I : Imaging Techniques:** X-Ray -Fundamentals of X-ray, Generation and Detection of X-rays, X-ray Diagnostic Methods. Computerized Tomography: Basic principles, diagnostic methods, Positron Emission Tomography (PET).

**Unit II : Nuclear medical imaging:** Fundamentals of Radioactivity, Diagnostic Methods, EEG-Recording, ECG, EMG, Single Photon Emission Computed Tomography (SPECT),

**Unit III : Magnetic Resonance Imaging:** Fundamentals of Nuclear Magnetic Resonance, Imaging Methods, Ultrasound -Fundamentals of Acoustic Propagation, Ultrasonic Diagnostic Methods.

**Unit IV : Ophthalmological examination:** Visual acuity test, Fluorescein angiography; Ophthalmoscopy, Oculoplethysmography-Transcranial Doppler studies, Evoked potential studies.

**Unit V : Mammography:** Mammographic unit, breast dose, low-dose mammography. Electrocardiography, Electroencephalography.

### REFERENCE BOOKS:

1. Non Invasive Techniques in Ophthalmology, B.R.Masters. Blackwell Scientific,1988.
2. Sacher, R. and McPherson, R.Widemann's, Clinical interpretation of Lab Tests, F.A. Davis & Co.,1991.
3. Text book of Radiology and Imaging, Vol-1, David Sultan, 7<sup>th</sup> Edition. 2003.
4. Illustrated Guide to Diagnostic tests, Springhouse Corporation, Springhouse, Pennsylvania, 1993.
5. Resnick, Donald and Niwayama. General diagnosis, W.B.Saunders, 1988.

## ML 4807 - HISTOPATHOLOGY AND ESSENTIALS OF LAB

SEMESTER : IV CREDIT : 3  
CATEGORY : MC NO. OF HOURS / WEEK : 6

**Objectives:** To impart knowledge on processing the autopsy and biopsy samples to observe tissue abnormalities for the diagnosis of disease.

**Unit I : General introduction of histopathology,** Reception, recording, handling and labeling of histology specimens, fixation and various fixatives and their preparation.

**Unit II : Tissue processing-**processing of histological tissues, dehydration, clearing, wax preparation, paraffin embedding and embedding media, decalcification and block preparation.

**Unit III : Microtomes-** various types, their working principle and maintenance. Microtomes knives and knife sharpening procedure, practical section cutting, cutting fault and remedies

**Unit IV : Staining preparation-**preparation of slide, deparaffinization and routine staining procedures, Identification and Demonstration of different metabolic compounds, mounting and mounting media.

**Unit V : Essentials of lab-**The metric system, acid base equilibrium, pH, buffer, preparation of reagents and solutions. (Percentage, normal, molar).

## ML 3902 - PATHOGENS OF HUMAN IMPORTANCE

(for M.A.Med.Soci.)

SEMESTER : IV CREDITS : 3  
CATEGORY : SU NO. OF HOURS / WEEK : 4

**Objective:** To impart knowledge on host pathogen relationship and diagnosis and prevention.

### Unit I : Introduction

Sterilisation procedure – physical, chemical and gaseous, Disinfection, Antiseptics. infections, community acquired infections.

## Unit II : Air borne infections

Tuberculosis, Whooping cough, Influenza, Pneumonia, streptococcal infections, Diphtheria, Measles, Chicken pox , Mumps.

## Unit III : Food and water borne infections

Cholera, Typhoid, Shigellosis, Brucellosis, Gastroenteritis, Amoebiasis, Taeniasis Poliomyelitis,Jaundice.

## Unit IV : Sexually transmitted diseases

AIDS, Syphilis, Gonorrhoea, Lymphogranuloma venereum, Genital Herpes, Trichomoniasis.

## Unit V : Vector borne diseases

Plague, Rickettsia, Malaria, Filariasis, Rabies,Leptospirosis.

### TEXT BOOKS

1. Pelczar, M.J.,E.C.S. Chan, Krieg, N.R, Microbiology, Tata McGraw Hill, 1996.
2. Richard, D.G., C.B., Slack, J.F.Peuthere,Medical Microbiology, Churchill Livingstone,1996

### REFERENCE BOOKS

1. David Greenwood, Richard, Slack and Peuthere, Medical Microbiology, ELBS, 2000.
2. Collee, Duguid, Fraser, Marimon, Simmons – Mackie and McCartney’s Medical Microbiology, Churchill Livingstone, 2002.
3. Prescott, Harley, Klein, Microbiology, Wm. C. Brown Publishers,2000

## ML 2901 - HUMAN ANATOMY AND PHYSIOLOGY (offered to M.A. Medical Sociology)

SEMESTER : II	CREDITS	: 3
CATEGORY : SU	NO. OF HOURS / WEEK	: 4

**Objective:** To understand the essential aspects of organ systems in man, their functions and related disorders.

## Unit I : Integumentary system

Layers, hair follicles, glands, Digestive system- structure, dentition- types, gastrointestinal hormones-enzymes –absorption-liver and gastric function tests.

## Unit II : Respiratory system

Structure and function of respiratory organs, mechanism of respiration –transport of respiratory gases- lung functions tests. Human heart, blood vessels- Lymphatic systems- working of heart; Cardiac function tests.

## Unit III : Neuromuscular system

Structure of central autonomic and peripheral nervous systems- sense organs, reflexes, types of muscles-transmissions of nerve impulse; muscle function tests.

## Unit IV : Endocrine System

Types of glands and their secretions, functions and metabolic disorders

## Unit V : Genitourinary system

Structure and functions of kidney; mechanism of urine formation; renal functions tests; structure and function of male and female reproductive systems; menstrual cycle and related disorders; Types of family planning procedures.

## Unit VI : Pre and postnatal diagnosis

Amniocentesis; prenatal and postnatal disorders.

### REFERENCE BOOKS:

1. Guyton A.C and J E Hall, A text book of Medical Physiology, W.B Saunders, 1996.
2. Talwar,G.P.and C.M.Srivastava, A text book of Biochemistry and Human Biology, Prentice Hall of India Ltd. , 2003
3. Human physiology from cells to systems, 5<sup>th</sup> edition 2004, Lauralee Sherwood, Thomson. Asia Pvt. Ltd. Singapore.
4. Physiology, Robert M.Beenu, Mathew N Levy, Bruce M.Koeppem, A.Stanton, 5<sup>th</sup> edition Mosby 2004.

## BT 2900 - SEPARATION TECHNIQUES

(offered by biotechnology department)

SEMESTER : II	CREDITS	: 3
CATEGORY : MC	NO. OF HOURS / WEEK	: 4

**Objectives :** *The course provides to the MLT basic knowledge in separation principles and to keep in pace with the rapid progress in the developing techniques of separation , advancing in the field of biotechnology.*

### Unit I : Basic principles and concepts

Principles and fundamental Instrumentation in separation techniques, significance of various separation techniques and their applications.

### Unit II : Centrifugation techniques

Basic principles, procedure and working mechanism of centrifugation- different methods of centrifugation techniques(zonal, differential, density gradient and isopycnic centrifugation).

### Unit III :Chromatographic techniques

Principle, working methods and advantages of various chromatographic techniques (Adsorption and partition) -paper chromatography-column, ion exchange, Gas –liquid, affinity, molecular- exclusion, thin layer and HPLC.

### Unit IV : Electrophoretic techniques

Principles and procedures of electrophoresis, gel electrophoresis (vertical, horizontal)- polyacrylamide gel electrophoresis (PAGE)- SDS and isoelectric focussing.

### Unit V : Molecular techniques

Isolation of DNA, RNA, Plasmids and protoplast.Blotting techniques (Southern , Northern and western), PCR techniques and their applications.

### TEXT BOOKS :

1. Karoki Upadhyay and Nath(1993). Biophysical chemistry, revised edition, Himalaya House publications.
2. Old RN and SB Primrose(1994), Principles of gene manipulation-Blackwell scientific publications.

### REFERENCES :

1. PA sewell and B clarke(1991), Chromatographic separations, John Wiley & sons
2. Keith Wilson and KH goulding(1986). Biologist guide to principles and techniques of practical biochemistry Edward Arnold (Publications)Ltd.
3. J.E.Bailey and D Ollis.Biochemical engineering fundamentals(II edition Mac Graw Hill Book Company)