SYLLABUS FOR FIRST SEMESTER

MEDICAL LAB TECHNOLOGY

Core Course 1
MLT101: Human Anatomy
Credits: 4
LTP: 310

THEORY

Course Description: The course aims study of human anatomy which develops a basic understanding of the structure and function of body organs and systems and their interactions. The course includes nutrition, metabolism, and growth and development.

Course Outcomes (CLO):

Upon successful completion of the course, the students should be able to learn about:
CO1: Illustrate the structure and function of various human organs and systems.
CO2: Explain how human organs and systems interact.
CO3: Describe the relationship between and processes related to nutrition and metabolism.
CO4: Recognize the stages of growth and development.

Course Content

Unit I

Structure & function ofhumanbody and Locomotion& support
Definitions, Subdivisions of Anatomy, Terms of location and position, Fundamental Planes, organizationofhumanbody.Cell(structure&function).Tissues(Epithelium,Connective,Muscular, Nervous).
Skeletal system: Types of bones, Bones and their parts, Divisions ofskeleton.
Joints: classification, types of movements withexamples.

Unit II

Sensory, Nervousand Circulatory system
Anatomical introduction to skin & Sense organs: Eye, Ear,Nose
Central nervous system: Spinal Cord (anatomy, functions), reflex- arc, meninges. Brain: Hind Brain, Midbrain, Forebrain.
Heart: size, location, coverings, chambers, blood supply, the blood vessels. General plan of circulation, pulmonary circulation. Names of arteries and veins and their positions.

Unit III

Respiratory and Digestive system
Organs of Respiratory System. Brief knowledge of parts and position.
Conducting portion: Nose, nasal cavity, Para nasal air sinuses, Larynx, trachea, bronchial tree.Respiratory portion: Pleura and lungs.
Components of Digestive system, Anatomy of organs of digestive system, mouth, tongue, teeth,salivary glands, liver, biliary apparatus, pancreas.

Unit IV

Excretory, Reproductive and Endocrine system

Kidneys: location, gross structure, excretory ducts, ureters, Urinary bladder, Urethra.
Male Reproductive System: Testis, Duct system.Female Reproductive System: Ovaries, Duct system
Endocrine glands: Positions, Hormones secreted and their functions- Pituitary, Thyroid parathyroid, Adrenal glands, Gonads & Islets of pancreas

Recommended Books / Suggested Readings:

1. Principles of Anatomy & Physiology – Tortora Gerard J
2. Chaursia's, A Text Book of Anatomy
3. Ranganathan, T.S., A Text Book of Human Anatomy.
4. Fattana, Human Anatomy, (Description and Applied), Saunder's& C P Prism Publishers, Bangalore.
5. Ester. M. Grishcimer, Physiology & Anatomy with Practical Considerations, J.P. LippinCott. Philadelphia.

Core Course 2
MLT121: Human Anatomy LAB
Credits: 2
LTP: 004

PRACTICAL LIST

1. Identification and description of all Anatomicalstructures.
2. Knowledge of Anatomy is by demonstration through slides, models, chartsetc.
3. Demonstration of parts (upper extremity, lower extremity, thoracic & abdominal viscera, face andbrain).
4. Demonstration of skeleton - articulated anddisarticulated.
5. Demo of all bones showing its parts, radiographs of normal bones and joints. Demonstration of all muscles of thebody.
6. Demonstration of heart and vessels in thebody.
7. Demonstration of parts of respiratory system, Normal radiographs ofchest.
8. Demonstration of all plexuses and nerves in thebody.
9. Demonstration of all part ofbrain.

Recommended Books / Suggested Readings:

1. Principles of Anatomy & Physiology – Tortora Gerard J
2. Chaursia's, A Text Book of Anatomy
3. Ranganathan, T.S., A Text Book of Human Anatomy.
4. Fattana, Human Anatomy, (Description and Applied), Saunder's& C P Prism Publishers, Bangalore.
5. Ester. M. Grishcimer, Physiology & Anatomy with Practical Considerations, J.P. LippinCott. Philadelphia.

Core Course 3
MLT102: Human Physiology
Credits: 4
LTP: 310

THEORY

Course Description: Physiology is the study of biological function. The course aims study of human function at the level of whole organisms, tissues, cells and molecules.

Course Outcomes (CLO):

Upon successful completion of the course, the students should be able to learn about:
CO1: Explain mechanical, physical, and biochemical function of humans.
CO2: Human Physiologyserves as the foundation of modern medicine
CO3: Understanding how the human body adapts to stresses, physical activity, and disease.

Course Content

Unit I

General Cell physiology
Cell and cell division- Structure, Function and classification of cell. Cellular Movements- Endocytosis and Exocytosis, Molecules ofcell. Transport across the cell membrane, Homeostasis. Diffusion, Osmosis, Bonding, Filtration, Dialysis, Surface Tension, Adsorption,Colloid.
Introduction of blood, Composition and function of blood, Blood cells morphology and development.

Unit II

Blood
Blood cells types and function, Composition and function of blood plasma and Blood clotting factor, Haemoglobin-structure, normal content, function, types. Erythropoiesis.
Erythrocyte sedimentation rate (ESR) and its significance, Hematocrit, PCV, MCV, MCH, MCHC, Blood volume, Prothrombin time, Clotting time, Bleeding time, Blood Group, ABO and Rh factor, Cross matching, Coagulation andAnticoagulants.

Unit III

Respiration and Cardiovascular system
Respiratory System Introduction, Structure, Function and Mechanics ofBreathing. Respiration measures (Vital capacity, Total Volume, Reserve volume, Total lung capacity), Mechanism ofrespirationRegulation of respiration, pulmonary function test, physiological changes in altitude & acclimatization, hypoxia.
Basic Physiology of Heart, Blood circulation, Arteries and veins, properties and structure of heartmuscle. Cardiac Cycle and heartsounds. Conductive system of heart, Blood Pressure definition, Regulation factor affecting blood Pressure.

Unit IV

Digestivesystem

Digestive system introduction, structure andfunction

Basic physiology of organs of digestive systems (Salivary glands, Gastric glands, Pancreas, Liver, Gallbladder). Composition and function of all digestive juices, Digestion and Absorption of carbohydrate, fat andproteins.

Recommended Books / Suggested Readings:

1. Textbook of Physiology:Guyton
2. Textbook of Physiology :Ganong
3. Human Physiology: A.K. Jain
4. Essentials of Medical Physiology: K.Semubulingam, Jaypee Publishers

Weblinks:

https://epgp.inflibnet.ac.in/view_f.php?category=1850

Core Course 4
MLT122: Human Physiology LAB
Credits: 2
LTP: 004

PRACTICAL LIST

1. Measurement of Pulse rate, Heart rate and Blood Pressure.
2. Auscultation for Heart Sounds and Normal Respiratory sounds.
3. Introduction of Microscope, identification of blood cells by study of peripheral blood smears.
4. DLC Differential Leucocytes count.
5. TLC Total Leukocytes Count.
6. RBC Count.
7. Estimation of Haemoglobin.
8. Estimation of bleeding time & clotting time.
9. Blood Group, ABO and Rh factor.

Recommended Books / Suggested Readings:

1. Textbook of Physiology:Guyton
2. Textbook of Physiology :Ganong
3. Human Physiology: A.K. Jain
4. Essentials of Medical Physiology: K.Semubulingam, Jaypee Publishers

Weblinks:

https://epgp.inflibnet.ac.in/view_f.php?category=1850

Core Course 5
MLT103: General Microbiology
Credits: 4
LTP: 310

THEORY

Course Description: The course aims study of human anatomy which develops a basic understanding of the structure and function of body organs and systems and their interactions. The course includes nutrition, metabolism, and growth and development.

Course Outcomes (CLO):

Upon successful completion of the course, the students should be able to learn about:
CO1: Illustrate the structure and function of various human organs and systems.
CO2: Explain how human organs and systems interact.
CO3: Describe the relationship between and processes related to nutrition and metabolism.
CO4: Recognize the stages of growth and development.

Course Content

Unit I

Origin and Evolution of Microbiology
Introduction, History & scope of Microbiology
General characteristics and classification of Microorganisms: Bacteria, fungi and viruses.

Unit II

Study of Common Lab Instruments
Microscope- types, principles and uses, Autoclave, Hot air oven, Incubator, Laminar air flow, Colony counter Principles and uses.
Safety measures in microbiology.Care and maintenance of laboratory equipments.
Laboratory organization, management, recording of results and quality control in microbiology.
Principles and methods ofsterilization.

Unit III

Morphology of Bacteria and Viruses
Bacterial anatomy: Cell wall, Cell membrane, Capsule, Flagella, Nucleoid, Bacterial Spore.
Structure of viruses, Concepts of replication and cultivation
Study of bacteria: Preparation of Stains, various Staining techniques (Simple staining, Gram staining, Acid-fast staining, Negative staining and Albert staining).

Unit IV

Microbial culturing techniques

Antibiotic resistance, various types of Culture media and Culture methods*viz.*(1) Basal media, (2) Enriched media, (3) Selective media, (4) Indicator media, (5) Transport media, and (6) Storage media

Bacterial Growth: Growth Curve, Generation Time, Environmental factors affecting growth.

Recommended Books / Suggested Readings:

1. Prescott's Microbiology (9th Edition)
2. Bailey & Scott's Diagnostic Microbiology (13th Edition)
3. Microbiology: An Introduction (12th Edition)
4. JawetzMelnick&Adelbergs Medical Microbiology (26th Edition)
5. Sherris Medical Microbiology (6th Edition)
6. Medical Microbiology (7th Edition)
7. Review of Medical Microbiology and Immunology (13th Edition)
8. Microbiology: Laboratory Theory and Application (3rd Edition)
9. Microbiology: An Application-Based Approach
10. BRS Microbiology and Immunology (6th Edition)
11. Microbiology: A Systems Approach (4th Edition)
12. Nester's Microbiology: A Human Perspective (8th Edition)
13. Brock Biology of Microorganisms (14th Edition)
14. Clinical Microbiology Made Ridiculously Simple (6th Edition)
15. Greenwood Medical Microbiology (18th Edition)
16. Pelczar, M. J., Chan, E. C. S., & Krieg, N. R. (1993). Microbiology: Concepts and applications. New York: McGraw-Hill.

Weblinks:

1. http://textbookofbacteriology.net/themicrobialworld/control.html
2. www.microbiologyplace.com
3. http://vedyadhara.ignou.ac.in/wiki/images/d/d0/MVPI-001-Practical.pdf
4. http://www.cdc.gov/meningitis/lab-manual/chpt11-antimicrobial-suscept-testing.html
5. http://www.biotopics.co.uk/microbes/tech2.html
6. http://biosci.usc.edu/courses/2002-fall/documents/bisc300-lab_isolation.pdf

Core Course 6
MLT123: General Microbiology LAB
Credits: 2
LTP: 004

PRACTICAL LIST

1. Detail study of Equipments used in microbiological laboratory.
2. Microbiology Lab Practices and Safety Rules
3. Microscopic Techniques
4. Simple Staining
5. Differential staining: Gram Staining, Acid Fast Staining etc.
6. Structural staining: Endospores, capsule staining etc.
7. Preparations of Microbiological Culture Media
8. Growth of bacteria: Streaking, Spread plating etc.
9. Sterilization techniques: Autoclave, hot air oven etc.
10. Evaluation and use of various disinfectants.

Recommended Books / Suggested Readings:

1. Benson HJ. 2002. Microbiological applications: a laboratory manual in general microbiology: McGraw-Hill New York, NY.
2. Brown AE. 2009. Benson's Microbiological Applications: Laboratory Manual in General Microbiology, Short Version: McGraw Hill.
3. Freshney RI. 2010. Culture of animal cells: a manual of basic technique and specialized applications: Wiley-Blackwell.
4. Harley JP. 2004. Laboratory exercises in microbiology: McGraw-Hill Science/Engineering/Math.
5. Kayser FH. 2005. Medical microbiology: Georg ThiemeVerlag.
6. Lacey LA. 1997. Manual of Techniques in Insect Pathology: Elsevier Science.
7. Madigan MT, Martinko JM, Dunlap PV, Clark DP. 2012. Brock biology of microorganisms: Pearson/Benjamin Cummings.
8. Pollack RA. 2004. Laboratory exercises in microbiology, 3e. Recherche 67: 02.
9. Roberts D, Greenwood M, Service PHL, Agency HP. 2003. Practical food microbiology: Wiley Online Library.
10. Steubing PM. 1993. Isolation of an Unknown Bacterium from Soil.
11. Tiwari R. 2009. Laboratory Techniques in Microbiology & Biotechnology: Abhishek Publications.
12. Vandepitte J, Verhaegen J, Engbaek K, Rohner P, Piot P, Heuck C. 2003. Basic laboratory procedures in clinical bacteriology: World Health Organization.

Elective Course 1
COM101: English Communication
Credits: 4
LTP: 400

Course Description: To make studentscapable of using English language in context.To enhance effective reading and writing skills.

Course Outcomes (CLO):

Upon successful completion of the course, the students should be able to:
CLO1: The students will develop a minute practical knowledge about English grammar and its usage
CLO2: The students will develop an understanding of the importance of free expression

Course Content:

Unit I

Reading Skills: Comprehension of Unseen Passage [Reading articles](Intermediate)Summary Paraphrasing, Translation and Precis Writing

Unit II

English Grammar and Usage: Parts of speech, common errors in writing (based on Parts of Speech) Tenses, Change of Voice, and Transformation of Sentences

Unit III

Basic Writing Skills and Writing Practices: Paragraph/essay writing, short life story writing, Notice (General like trip, change of name, function) making notes and Letter writing

Unit IV

Vocabulary Enhancement: Synonym, Antonym, Idioms and Phrasal verbs

Recommended Books / Suggested Readings:

1. Practical English Usage. Michael Swan OUP. 1995
2. On Writing Well. William Zinsser. Harper Resource Book. 2001
3. Communication Skills.Sanjay Kumar and PushpLata.Oxford University Press. 2006
4. Exercises in Spoken English. CIEFL, Hyderabad. Oxford University Press

Ability Enhanced Compulsory Course 1
ENS001: Environmental Studies
LTP
200
Credit: 2

Course Description: The course aims to equip the students with causes and consequences of different kinds of global environmental problems and develop the thinking about the remedial measures of these problems.

The course includes the scope of environmental studies, ecosystem, natural resources, biodiversity and its conservation, various types of environmental pollutions, policies & practices.

Course Outcomes (CLO):

Upon successful completion of the course, the students should be able to:

CO1: To understand the multidisciplinary nature of environment and ecosystem.
CO2: To provide an introduction to renewable and non-renewable resources of energy.
CO3: To become familiar with biodiversity and its conservation.
CO4: To analyze the various environmental practices, policies and pollutions.

Course Content

Unit 1: Introduction to environmental studies

- Multidisciplinary nature of environmental studies; components of environment –atmosphere, hydrosphere, lithosphere and biosphere.
- Scope and importance; Concept of sustainability and sustainable development.

Unit 2: Ecosystems

- What is an ecosystem? Structure and function of ecosystem; Energy flow in an ecosystem: food chain, food web and ecological succession. Case studies of the following ecosystems:
  a)Forest ecosystem
  b)Grassland ecosystem
  c)Desert ecosystem
  d)Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

Unit 3: Natural Resources: Renewable and Non-renewable Resources

- Land Resources and land use change; Land degradation, soil erosion and desertification.
- Deforestation: Causes and impacts due to mining, dam building on environment, forests, biodiversity and tribal populations.
- Water: Use and over-exploitation of surface and ground water, floods, droughts, conflicts over water (international & inter-state).
- Heating of earth and circulation of air; air mass formation and precipitation.
- Energy resources: Renewable and non-renewable energy sources, use of alternate energy sources, growing energy needs, case studies.

Unit 4: Biodiversity and Conservation

- Levels of biological diversity :genetic, species and ecosystem diversity; Biogeography zones of India; Biodiversity patterns and global biodiversity hot spots
- India as a mega-biodiversity nation; Endangered and endemic species of India
- Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts, biological invasions; Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.
- Ecosystem and biodiversity services: Ecological, economic, social, ethical, aesthetic and Informational value.

Unit 5: Environmental Pollution

- Environmental pollution : types, causes, effects and controls; Air, water, soil, chemical and noise pollution
- Nuclear hazards and human health risks
- Solid waste management: Control measures of urban and industrial waste.
- Pollution case studies.

Unit 6: Environmental Policies & Practices

- Climate change, global warming, ozone layer depletion, acid rain and impacts on human communities and agriculture.
- Environment Laws : Environment Protection Act; Air (Prevention & Control of Pollution) Act; Water (Prevention and control of Pollution) Act; Wildlife Protection Act; Forest Conservation Act; International agreements; Montreal and Kyoto protocols and conservation on Biological Diversity (CBD). The Chemical Weapons Convention (CWC).
- Nature reserves, tribal population and rights, and human, wildlife conflicts in Indian context

Unit 7: Human Communities and the Environment

- Human population and growth: Impacts on environment, human health and welfares.
- Carbon foot-print.
- Resettlement and rehabilitation of project affected persons; case studies.
- Disaster management: floods, earthquakes, cyclones and landslides.
- Environmental movements: Chipko, Silent valley, Bishnios of Rajasthan.
- Environmental ethics: Role of Indian and other religions and cultures in environmental conservation.
- Environmental communication and public awareness, case studies (e.g., CNG vehicles in Delhi).

Unit 8: Field work

- Visit to an area to document environmental assets; river/forest/flora/fauna, etc.
- Visit to a local polluted site – Urban/Rural/Industrial/Agricultural.
- Study of common plants, insects, birds and basic principles of identification.
- Study of simple ecosystems-pond, river, Delhi Ridge, etc.

Suggested Readings:

1.Carson, R. 2002. Silent Spring.Houghton Mifflin Harcourt.
2.Gadgil, M., &Guha, R.1993. This Fissured Land: An Ecological History of India. Univ. of California Press.
3.Gleeson,B. and Low, N. (eds.) 1999. Global Ethics and Environment, London, Routledge.
4.Gleick, P.H. 1993. Water in Crisis.Pacific Institute for Studies in Dev., Environment &Security.StockholmEnv.Institute, Oxford Univ. Press.
5.Groom, Martha J. Gary K. Meffe, and Carl Ronald carroll. Principles of Conservation Biology.Sunderland: Sinauer Associates, 2006.
6.Grumbine, R. Edward, and Pandit, M.K. 2013. Threats from India's Himalaya dams. Science, 339: 36-37.
7.McCully, P.1996. Rivers no more: the environmental effects of dams(pp. 29-64). Zed Books.
8.McNeil, John R. 2000. Something New Under the Sun: An Environmental History of the Twentieth Century.

9.Odum, E.P., Odum, h.T. & Andrews, J.1971. Fundamentals of Ecology. Philadelphia: Saunders.
10.Pepper, I.L., Gerba, C.P. &Brusseau, M.L. 2011. Environmental and Pollution Science.Academic Press.
11.Rao, M.N. &Datta, A.K. 1987. Waste Water Treatement.Oxford and IBH Publishing Co. Pvt. Ltd.
12.Raven, P.H., Hassenzahl, D.M. & Berg, L.R. 2012. Environment.8th edition.John Wiley & Sons.
13.Rosencranz, A., Divan, S., & Noble, M.L. 2001. Environmental law and policy in India.Tripathi 1992.
14.Sengupta, R. 2003.Ecology and economics: An approach to sustainable development. OUP.
15.Singh, J.S., Singh, S.P. and Gupta, S.R. 2014. Ecology, Environmental Science and Conservation. S. Chand Publishing, New Delhi.
16.Sodhi, N.S., Gibson, L. & Raven, P.H. (eds). 2013. Conservation Biology: Voices from the Tropics. John Wiley & Sons.
17.Thapar, V. 1998. Land of the Tiger: A Natural History of the Indian Subcontinent.
18.Warren, C.E. 1971. Biology and Water Pollution Control. WB Saunders.
19.Wilson, E.O. 2006. The Creation: An appeal to save life on earth. New York: Norton.
20.World Commission on environment and Development. 1987. Our Common Future. Oxford University Press.
21.www.nacwc.nic.in
22.www.opcw.org

SYLLABUS FOR SECOND SEMESTER

MEDICAL LAB TECHNOLOGY

Core Course 7
MLT201: Pathology
Credits: 4
LTP: 310

THEORY

Course Description: The course aims study of branch in the field of medical science, which is concerned about the diagnosis of ailments and disease with the assistance of clinical tests on bodily liquid like urine, blood, excretion etc.

Course Outcomes (CLO):

Upon successful completion of the course, the students should be able to learn about:
CO1: Describe cellular adaptations and alterations/changes in the cells.
CO2: Explain modifications in the tissues and occurring diseases.
CO3: Describe about cancer, genes and their stages.
CO4: Illustrate various infections and diseases due to protein malnutrition.

Course Content

Unit I

Introduction& History of Pathology and Cell Injury and Cellular Adaptations
Introduction & History of pathology, Basic definitions and familiarization with the common terms used in pathology, different branches.
Normal cell. Cell Injury- types of cell injury, etiology of cell injury, morphology of cell injury, cellular swelling. Cell Death- types- Autolysis, Necrosis, Apoptosis and Gangrene. Cellular Adaptations- Atrophy, Hypertrophy, Hyperplasia & Dysplasia.

Unit II

Inflammation, Hemodynamic Disorders
Acute inflammation - vascular event, cellular event, inflammatory cells.
Chronic Inflammation - general features, granulomatous inflammation, tuberculoma.
Tissue Renewal and Repair, healing and fibrosis, cirrhosis, introduction of oedema, hyperaemia, congestion, haemorrhage, haemostasis, thrombosis, embolism, infarction, shock and hypertension.

Unit III

Cancer and Healing
Cancer: Definitions, nomenclature, characteristics of benign and malignant neoplasm, metastasis, Carcinogens and cancer, concept of oncogenes, tumour suppressor genes, DNA repair genes and cancers stem cells.
Definition, different phases of healing, factors influencing wound healing.

Unit IV

Protein energy malnutrition and Diseases

Protein energy malnutrition, deficiency diseases of vitamins and minerals, nutritional excess and imbalances. Role and effect of metals (Zinc, Iron and Calcium) and their deficiency diseases, Aetiology and pathophysiology of diabetes, arteriosclerosis, myocardial infarction, respiratory diseases (COPD), Parkinson disease Infectious Diseases: pathogenesis & overview of modes of infections, prevention and control with suitable examples like Typhoid, Dengue

Recommended Books / Suggested Readings:

1. Harshmohan (2017), Textbook of Pathology,7th edition, Jaypee Publications
2. Robbins,(2012), Text book of Pathology, 3rd edition, Elsevier Publications
3. Text book of Histology,2ndedition,palGP,Paras medical publisher.
4. Histology for Pathologists by Stacey E Mills MD
5. Sternberg's Diagnostic Surgical Pathology [2 - Volume Set] by Stacey E Mills MD
6. Anatomic Pathology Board Review, 2e by Jay H. Lefkowitch MD
7. Clinical Pathology Board Review, 1e 1 Har/PscEditionby Steven L. Spitalnik MD (Author), Suzanne Arinsburg DO (Author), Jeffrey Jhang MD (Author)
8. Medical Laboratory Science-Theory and Practice: J Ochei and A. Kolhatkar
9. A Hand Book Of Medical Laboratory Technology By V.H.Talib
10. Inderbir Singh's Textbook of Human Histology with Colour Atlas and Practical Guide by Vasudeva Neelam
11. Medical Laboratory Technology: Methods and Interpretations Vol - 1 6th Edition by RAMNIK SOOD
12. Medical Laboratory Science by Ichei and Kolhatjar
13. Harsh Mohan pathology 8th edition.
14. Tejinder Singh Textbook of pathology
15. Hematology by RamnikSood
16. Medical Laboratory technology by RamnikSood

Core Course 8
MLT221: Pathology LAB
Credits: 2
LTP: 004

PRACTICAL LIST

1. Detail study of Microbiological Equipments
2. Urine-collection, processing, physical, chemical and microscopic examination
3. Collection, preservation and examination of stool
4. Sputum collection and microscopy, exminaton of sputum for AFB.
5. Analysis and examination of semen-physical examination, sperm motility, morphological study of sperms, fructose determination in semen.
6. Analysis of CSF, microscopical and chemical examination of CSF.
7. Macroscopic and microscopic examination of Ascitc fluid, Pleural fluid, pericardial fluid and synovial fluid.

Recommended Books / Suggested Readings:

1. Harshmohan (2017), Textbook of Pathology,7th edition, Jaypee Publications
2. Robbins,(2012), Text book of Pathology, 3rd edition, Elsevier Publications
3. Text book of Histology,2ndedition,palGP,Paras medical publisher.
4. Histology for Pathologists by Stacey E Mills MD
5. Sternberg's Diagnostic Surgical Pathology [2 - Volume Set] by Stacey E Mills MD
6. Anatomic Pathology Board Review, 2e by Jay H. Lefkowitch MD
7. Clinical Pathology Board Review, 1e 1 Har/PscEditionby Steven L. Spitalnik MD (Author), Suzanne Arinsburg DO (Author), Jeffrey Jhang MD (Author)
8. Medical Laboratory Science-Theory and Practice: J Ochei and A. Kolhatkar
9. A Hand Book Of Medical Laboratory Technology By V.H.Talib
10. Inderbir Singh's Textbook of Human Histology with Colour Atlas and Practical Guide by Vasudeva Neelam
11. Medical Laboratory Technology: Methods and Interpretations Vol - 1 6th Edition by RAMNIK SOOD
12. Medical Laboratory Science by Ichei and Kolhatjar
13. Harsh Mohan pathology 8th edition.
14. Tejinder Singh Textbook of pathology
15. Hematology by RamnikSood
16. Medical Laboratory technology by RamnikSood

Core Course 9
MLT202: General Biochemistry
Credits: 4
LTP: 310

THEORY

Course Description: The course aims study of branch of science that explores the chemical processes within and related to living organisms. It is a laboratory based science that brings together biology and chemistry. By using chemical knowledge and techniques, by understanding for solving biological problems.

Course Outcomes (CLO):

Upon successful completion of the course, the students should be able to learn about:
CO1: Describe function and importance of carbohydrates and proteins
CO2: Explain structural features and biological functions of amino acids
CO3: Describe about enzymes, their actions and factors affecting their activity
CO4: Explain nucleic acids and vitamins and their role in the body

Course Content

Unit I

Carbohydrates
Classification, function, importance, structure, digestion & absorption. Proteins: Classification, function, importance, structure, digestion & absorption.

Unit II

Amino acids
Classification, Structure, Properties and Biological functions. Lipids: Classification of lipids, Classification of fatty acids, Saturated & Unsaturated fatty acids, their biological functions, digestion and absorption, introduction of lipoproteins

Unit III

Enzymes
Definition, Classification of enzyme, Cofactor & Coenzymes, Concept of active sites and general mode of action of enzymes, units for measuring enzyme activity, factor affecting enzyme activity, factor responsible for abnormal enzyme secretion

Unit IV

Nucleic acids and Vitamins
Structure, Function and types of DNA and RNA, Nucleotides, Nucleosides, Nitrogen bases, purines and pyrimidines and role of Nucleic acid.
classification, function and disease associated with vitamins. Minerals and ions: Requirement, function and biological importance of Calcium, Iron, Iodine, Zinc, Phosphorus, Copper, Sodium and Potassium

Recommended Books / Suggested Readings:

1. D M Vasudevan, (2011),Text book of Medical Biochemistry,6th edition Jaypee Publishers
2. M N Chatterjea& Rana Shinde,(2012),Text book of Medical Page 15 of 38 B. Sc. in Medical Laboratory Technology Biochemistry,8th edition,Jayppe Publications
3. Singh &Sahni,(2008),Introductory Practical Biochemistry,2nd edition, Alpha science
4. Lehninger,(2013),Principles of Biochemistry,6th edition, W H Freeman
5. U Satyanarayan,(2008), Essentials of Biochemistry,2nd edition, Standard Publishers

Core Course 10
MLT222: General Biochemistry LAB
Credits: 2
LTP: 004

PRACTICAL LIST

1. Preparation of laboratory reagents and standard solutions, storage of chemicals.
2. Units of measurements. S.I. Units, measurement of volume, volumetric apparatus (pipettes, flasks, Cylinders)
3. Preparation, standardization and calibration of volumetric solutions
4. Preparation of buffer solution and measurement of their pH
5. To prepare the different concentration of solutions
6. To find out the normality of given solution
7. To identify carbohydrates in given solution by various methods.
8. To determine protein by Biuret method.
9. To perform protein test by various methods.
10. Physical examination of urine, sugar determination by Benedict's method.
11. Bile salt, Bile pigments and Urobilinogen determination
12. Determination of various parameters of urine by uristik method.

Recommended Books / Suggested Readings:

1. Enzymes: Biochemistry, Biotechnology & Clinical chemistry, (2001) Palmer Trevor, Publisher: Horwood Pub. Co., England.
2. Outlines of Biochemistry: 5th Edition, Erice Conn & Paul Stumpf ; John Wiley and Sons, USA
3. Fundamentals of Biochemistry. 3rd Edition (2008), Donald Voet& Judith Voet , John Wiley and Sons, Inc. USA
4. Lehninger, Principles of Biochemistry. 5th Edition (2008), David Nelson & Michael Cox, W.H. Freeman and company, NY.
5. Biochemistry: 7th Edition, (2012), Jeremy Berg, LubertStryer, W.H.Freeman and company, NY
6. Biochemical Methods for Agricultural Sciences – Sadasivam and Manikam. Wiley Eastern Limited, 1992..
7. Practical Clinical Biochemistry Harold Varley, CBS; 6 edition (1 December 2006)
8. An Introduction to Practical Biochemistry (3rd Edition) – David T Plummer. Tata McGraw-Hill Publishing Company Limited, 1992.

Core Course 11
MLT203: Immunology
Credits: 4
LTP: 310

THEORY

Course Description: This course has been formulated to impart basic aspects of immunity, antigens, antibodies, various serological reactions, techniques and their utility in laboratory diagnosis of human diseases.

Course Outcomes (CLO):

Upon successful completion of the course, the students should be able to learn about:
CO1: Describe the concept of immune system
CO2: Explain antigen and antibody interaction and functions
CO3: Describe about organization of MHC
CO4: Explain scientific approaches/techniques that are used to investigate various diseases.

Course Content

Unit I

Historical background and Cells
Historical background, general concepts of the immune system, innate and adaptive immunity; active and passive immunity; primary and secondary immune response. Cell and organs of immune system, Phagocytosis

Unit II

Antigens and haptens
Properties,foreignness, molecular size, heterogeneity, B and T cell epitopes; T dependent and T independent, Antigens. And Antibodies: Historical perspective of antibody structure; structure, function and properties of the antibodies; different classes, subclasses and biological activities of antibodies; concepts of antibody diversity, isotype, allotype, Introduction of hybridoma technology, monoclonal antibodies, polyclonal antibody

Unit III

Major Histocompatibility Complex
Mechanism of humoral and cell mediated immune response. Introduction of Major Histocompatibility Complex, organization of MHC and inheritance in humans; Antigen presenting cells, antigen processing and presentation Complement system and complement fixation test.

Unit IV

Laboratory tests and Diseases
Laboratory testsfor demonstration of antigen – antibody reaction such as agglutination, precipitation, ELISA, RIA, Immunofluorescence,
Rheumatological diseases, etiology and pathogenesis and lab investigations

Recommended Books / Suggested Readings:

1. Abbas AK, Lichtman AH, Pillai S. (2007). Cellular and Molecular Immunology. 6th edition Saunders Publication, Philadelphia.
2. Delves P, Martin S, Burton D, Roitt IM. (2006). Roitt's Essential Immunology.11th edition Wiley-Blackwell Scientific Publication, Oxford.
3. Goldsby RA, Kindt TJ, Osborne BA. (2007). Kuby's Immunology. 6th edition W.H. Freeman and Company, New York.
4. Murphy K, Travers P, Walport M. (2008). Janeway'sImmunobiology. 7th edition Garland Science Publishers, New York.
5. Peakman M, and Vergani D. (2009). Basic and Clinical Immunology. 2nd edition Churchill Livingstone Publishers, Edinberg.
6. Richard C and Geiffrey S. (2009). Immunology. 6th edition. Wiley Blackwell Publication

Core Course 12
MLT223: Immunology LAB
Credits: 2
LTP: 004

PRACTICAL LIST

1. To demonstrate agglutination reaction
2. Demonstration of Blood grouping
3. To perform RA test
4. To perform WIDAL test
5. To perform RPR test
6. To perform CRP test

Recommended Books / Suggested Readings:

1.Immunology 5th ed Janis Kuby, W.H.Freeman& Co Ltd; 5th Revised edition.
2.Fundamental Immunology 5th edition (August 2003): by William E., Md. Paul (Editor) By Lippincott Williams & Wilkins Publishers
3.Essential Immunology, Ivan M. Roit (1994)- Blackwell Scientific Pub, Oxford.
4.Cellular and Molecular Immunology, 3rd ed, Abbas, Saunders; 7 edition (11 June 2011)
5.Practical immunology, Frank Hay, 4th Edition , Blackwell Science
6.Introduction to Practical Biochemistry, D.T. Plummer, Tata MacGraw Hill

Elective Course 2
BCA101: Computer Fundamentals & IT
Credits: 4
LTP 400

Course Description: The course aims to equip the students with various Office Automation Tools like Word processor, Spreadsheet program & Presentation program.

The course includes Crafting professional word documents; excel spread sheets, power point presentations using the Microsoft suite of office tools.

Course Outcomes (CLO):

Upon successful completion of the course, the students should be able to:

CO1: Use various Office Automation Tools like Word processor, Spreadsheet software & Presentation software.
CO2: Learn the fundamental of processing unit and operating system.
CO3: Understand various peripheral devices like Input and Output devices of Computer systems, online storage devices.
CO4: Perform documentation, accounting operations, presentation skills.
CO5: Study to use the Internet safely, legally, and responsibly

Course Content

UNIT I

Introduction to Computers: Introduction, Characteristics of Computers, Block diagram of computer. Types of computers and features, Mini Computers, Micro Computers, Mainframe Computers, Super Computers. Types of Programming Languages (Machine Languages, Assembly Languages, High Level Languages).Data Organization, Drives, Files, Directories. Secondary Storage Devices (FD, CD, HD, Pen drive) I/O Devices (Scanners, Plotters, LCD, Plasma Display) ,Data Representation: Bit, Byte, Binary, Decimal, Hexadecimal, and Octal Systems, Conversions and Binary Arithmetic (Addition/ Subtraction/ Multiplication): Introduction to Binary, Octal, Hexadecimal system Conversion, Simple Addition, Subtraction, Multiplication.

Functional Units of Computer System: CPU, registers, system bus, main memory unit Types of Memory (Primary and Secondary) RAM, ROM, PROM, EPROM,, cache memory, Inside a computer, SMPS, Motherboard, Ports and Interfaces, expansion cards, ribbon cables, memory chips, processors.

UNIT II

Devices: Input and output devices (with connections and practical demo), keyboard, mouse, joystick, scanner, OCR, OMR, bar code reader, web camera, monitor, printer, plotter. Memory: Primary, secondary, auxiliary memory, RAM, ROM, cache memory, hard disks, optical disks.

Algorithm: Definition, Characteristics, Advantages and disadvantages, Examples. Flowchart: Definition, Define symbols of flowchart, Advantages and disadvantages, Examples. Operating System and Services in O.S., Types of O.S.DOS: History, Files and Directories, Internal and External Commands, Batch Files.

UNIT III

Word Processing: Typing, Editing, Proofing & Reviewing, Formatting Text & Paragraphs, Automatic Formatting and Styles, Working with Tables, Graphics and Frames, Mail Merge, Automating Your Work & printing Documents.
Excel Spreadsheet: Working & Editing in Workbooks, Creating Formats & Links, formatting a Worksheet& creating graphic objects, Creating Charts (Graphs), formatting and analyzing data, Organizing Data in a List (Data Management), Sharing & Importing Data, Printing.

UNIT IV

PowerPoint Presentations: Getting started in PowerPoint, creating a presentation, Creating & editing slides, previewing a slide show, Adding picture & graph, adding sound & video, adding auto shape, Animating objects.

Electronic Payment System: Secure Electronic Transaction, Types of Payment System: Digital Cash, Electronic Cheque, Smart Card, Credit/Debit Card E-Money, Bit Coins and Crypto currency, Electronic Fund Transfer (EFT), Unified Payment Interface (UPI), Immediate Payment System (IMPS), Digital Signature and Certification Authority.

Recommended Books / Suggested Readings:

1. "Computers Today", D. H. Sanders, Fourth Edition, McGraw Hill, 1988.
2. Fundamental of Computers – By V. Rajaraman B.P.B. Publications.
3. "Fundamental of Computers – By P.K. Sinha.
4. MS-Office 2000(For Windows) – By Steve Sagman.
5. "Information Technology Inside and Outside", David Cyganski, John A. Orr, Paperback Edition, Pearson Education 2002.
6. IT Tools, R.K. Jain, Khanna Publishing House

SYLLABUS FOR THIRD SEMESTER

MEDICAL LAB TECHNOLOGY

Core Course 13
MLT301: Clinical Microbiology
Credits: 4
LTP: 310

THEORY

Course Description: This course is a comprehensive course which will cover major diseases caused microorganisms.

Course Outcomes (CLO):

Upon successful completion of the course, the students should be able to learn about:
CO1: Describe diseases caused by gram positive bacteria
CO2: Students will learn diseases caused by gram negative bacteria
CO3: Students will learn diseases caused by fungi and parasites
CO4: Students will learn diseases caused by virus

Course Content

Unit I

Diseases caused by Gram positive bacteria
List of diseases of various organ systems and their causative agents. The following diseases in detail with symptoms, mode of transmission, prophylaxis and control
Staphylococcal aureus infections
Streptococcal infections
Diphtheria
Enterococcal infections
Pneumococcal infections
Tuberculosis

Unit II

Diseases caused by Gram negative bacteria
List of diseases of various organ systems and their causative agents. The following diseases in detail with symptoms, mode of transmission, prophylaxis and control
Escherichia coli (*E. coli*) infections
Klebsiella infections etc.
Salmonella
Shigella
Niesseria
Cholera
Typhoid fever

Unit III

Diseases caused by Fungi and Parasites

List of diseases of various organ systems and their causative agents. The following diseases in detail with Symptoms, mode of transmission, prophylaxis and control

Aspergillosis
Candidiasis
Giardiasis
Malaria
Leishmaniasis
Amebiasis
Taeniasoliumand tinea genitalis

Unit IV

Diseases caused by Virus

List of diseases of various organ systems and their causative agents. The following diseases in detail with Symptoms, mode of transmission, prophylaxis and control

Polio, Herpes, Hepatitis, Rabies, Dengue, AIDS, Influenza with brief description of swine flu, Ebola, Chikungunya, Japanese Encephalitis

Recommended Books / Suggested Readings:

1. Mims' Medical Microbiology Richard Goering , Hazel Dockrell , Mark Zuckerman , Ivan M. Roitt , Professor Peter L. Chiodini Publisher Elsevier Health Sciences
2. Roitt's Essential immunology Delves, Peter J.,Martin, seamusJ.Burton,DennisR.Roitt, Ivan M Ananthanarayan and Paniker'sTextbookof microbiology Kapil , artied
3. Microbiology: an Introduction,12th edition Gerard J. TortoraBerdell R. Funke and Christine L. Case
4. Parasitology Chatterjee K.d.
5. Microbiology Pelczar, Michal J and Others
6. Medical microbiology Greenwood David and Other
7. Ananthanarayan and Panikar's text book of Microbiology Artikapil
8. Immunology Male David and Other
9. Mackie and Mc Cartney practical Medical Microbiology Collee J.G and Other
10. Bailey and Scott's Diagnostic Microbiology,13th edition Patricia Tille
11. Sherris Medical Micrbiology , 6th edition Pottinger, L. Barth Reller and Charles R. Sterling

Core Course 14
MLT321: Clinical Microbiology LAB
Credits: 2
LTP: 004

PRACTICAL LIST

1. Sterilization of microbiological labotarory.
2. Preparation of selective culture media for various pathogenic microorganisms.
3. Isolation of microorganisms from pus, sputum etc.
4. Blood culturing.
5. Analysis of stool samples.
6. Antiobiotic sensistivity test.
7. Study of motility of bacteria.
8. WIDAL test.
9. Analysis of Urine sample.
10. Microscopic study of fungi in clinical samples.

Recommended Books / Suggested Readings:

1. Mims' Medical Microbiology Richard Goering , Hazel Dockrell , Mark Zuckerman , Ivan M. Roitt , Professor Peter L. Chiodini Publisher Elsevier Health Sciences
2. Roitt's Essential immunology Delves, Peter J.,Martin, seamusJ.Burton,DennisR.Roitt, Ivan M Ananthanarayan and Paniker'sTextbookof microbiology Kapil , artied
3. Microbiology: an Introduction,12th edition Gerard J. TortoraBerdell R. Funke and Christine L. Case
4. Parasitology Chatterjee K.d.
5. Microbiology Pelczar, Michal J and Others
6. Medical microbiology Greenwood David and Other
7. Ananthanarayan and Panikar's text book of Microbiology Artikapil
8. Immunology Male David and Other
9. Mackie and Mc Cartney practical Medical Microbiology Collee J.G and Other
10. Bailey and Scott's Diagnostic Microbiology,13th edition Patricia Tille
11. Sherris Medical Micrbiology , 6th edition Pottinger, L. Barth Reller and Charles R. Sterling

Core Course 15
MLT302: Haematology I
Credits: 4
LTP: 310

THEORY

Course Description: This course has been designed to understand the blood disorders, its lab diagnosis and various type of laboratory test. It includes study of blood, blood-forming organs and blood diseases. Hematology includes the treatment of blood disorders and malignancies, including types of hemophilia, leukemia, lymphoma and sickle-cell anemia.

Course Outcomes (CLO):

Upon successful completion of the course, the students should be able to learn about:
CO1: Emphasizes cell identification, cell differentiation and cell morphology evaluation procedures.
CO2: Students will allows for practice of hematology analytical skills and correlation.
CO3: Describe laboratory findings with patient symptoms and clinical history.
CO4: Students will learn laboratory techniques used for diagnosing hematological diseases

Course Content

Unit I

Introduction to hematology and Blood
Introduction to hematology and laboratory organization Composition and functions of blood. and lymph.Detailed study of Haemoglobin and its functions of hemoglobin. Blood groups including Rh. Factor. Detailed study of Reticulocytes. Formation of blood. Morphology of normal blood cells and their identifications.

Unit II

Anticoagulants and hemostasis
Various anticoagulants, their uses, mode of action and their merits and demerits. Normal and absolute in haematology. Quality assurance in hematology
Overview of hemostasis and coagulation, Stages of platelets development, Primary and Secondary hemostasis, Role of platelets, Role of coagulation factors, Coagulation inhibitory system, Fibrinolysis

Unit III

Descriptive study of RBC and Hematological Diseases
Descriptive study of RBC abnormalities, Disorders related to RBC Normal white cell count & physiological variation Normal white cell count & physiological variation Hematological Diseases: Anemia and various types of anemia, Thalassemia, Polycythemia, hemolytic disease of new born, multiple myeloma, parasitic infections of blood Leukemia: definition and classification (General &FAB)

Unit IV

Laboratory studies

Laboratory Investigation & Bleeding Disorders Laboratory preparation for coagulation tests Routine coagulation tests, prothrombin time , plasma recalcification time ,partial thromboplastin time , activated partial thromboplastin time, thrombin time, Laboratory diagnosis of bleeding disorders .

Recommended Books / Suggested Readings:

1. Mukherjee .L.K(2017), Medical Laboratory Technology,Vol.1-3,3rd edition, Tata Mcgraw Hill
2. SoodRamnik,(2015), Text book of Medical Laboratory Technology,2nd edition, Jaypee Publications
3. Wintrobe's Clinical Haematology,(2014),13th edition, Lippincott Williams & Wilkins
4. De Gruchy's Clinical Haematology in Medical Practice,(2012),Sixth edition, Wiley Publications
5. Dacie& Lewis Practical Haematology, (2011),11th edition, Elsevier Publications

Core Course 16
MLT322: Haematology - I LAB
Credits: 2
LTP: 004

PRACTICAL LIST

1. Cleaning of Laboratory glassware in hematology
2. Clinical significance ,specimen collection, laboratory investigation & preservation of blood for various hematological investigations .
3. Preparation of blood smear.
4. Haemocytometery, procedures for cell counts-visual as well as electronic
5. Total leukocyte count and Differential leukocyte count.
6. Determination of total erythrocyte (RBC) count and platelet counts. Errors involved and mean to minimize such errors. .
7. Haemoglobinometery, various methods of estimation of Hb, errors involved and standardization of instrument for adaptation for Hb estimation.
8. Romanowskydyes , preparation and staining procedures of blood smears.
9. Laboratory tests for assessing bleeding disorders

Recommended Books / Suggested Readings:

1. Atlas of haematology (5/e) G.A. McDonald
2. Clinical Haematology Christopher A. Ludlam
3. Practical Haematology J.B. Dacie
4. Practical Haematology (8/e) S ir John
5. Haematology (International edition) Emmanuel C.Besa
6. Haematology (Pathophysiological basis for clinical practice (3/e) Stephen M. Robinson
7. Haematology for students Practitioners RamnikSood
8. Hand book of Medical Laboratory Technology (2/e) V.H. Talib

Core Course 17
MLT303: Histopathology and Cytology Techniques
Credits: 4
LTP: 310

THEORY

Course Description: This course has been designed to understand the diagnosis and study of diseases of the tissues, and involves examining tissues and/or cells under a microscope. This course also includes principles of modern cytology, including protocols for cytological examination.

Course Outcomes (CLO):

Upon successful completion of the course, the students should be able to learn about:
CO1: Elementary knowledge of specimen collection, tissue fixatives and tissue processing
CO2: Students will learn logging of specimen, preparation of tissues, frozen section technique, handling and embedding of small tissue fragments.
CO3: Understanding about section cutting and staining, staining procedures
CO4: Students will learn laboratory techniques *viz.*Autoanalyzer, tissue processor, microtome.
CO5: Students will have elementary knowledge of decalcification

Course Content

Unit I

General outline of Procedures in the Examination of Tissues
Introduction to histopathology and laboratory organization, Elementary knowledge of sample collection, Reception, recording and labeling of histology specimens, FixedTissues, ParaffinSections, Cutting andStaining, Report andFiling

Unit II

Fixation& Decalcification and Processing
Fixation, SimpleFixatives, CompoundFixatives, Micro AnatomicalFixatives, Fixation ofSmears, Fixation of GrossSpecimen, SecondaryFixation, Decalcification
Dehydration, Clearing, Impregation and embedding, Embedding, Gelatin Embedding, Plastic Embedding, Trimming of Blocks

Unit III

SectionCutting
Microtome's: Microtome -Types, Uses, Parts, different types of microtome knives, care &maintenance. Sharpening of MicrotomeKnives, Stropping, Routine Paraffin SectionCutting, Floating out Bath, Difficulties encountered inParaffin, Section Cutting, FrozenSections, Fixing Tissue forCyrostat, Examination

Unit IV

StainingMethods and MuseumTechniques

Hematoxylin & Eosin stain- Method ofpreparation, Staining Reaction of Carbohydrates:PAS, Metachromatic StainingMethods, Staining of Lipids &Cholesterol, Staining ofPigments

The mounting of pathological specimens - Introduction, Preparation of specimen, Fixation of specimen-Kaiserling solution-1 &Kaiserling solution-2, Precaution taken for the Fixation of Specimens, Storage of Specimens, Mounting of Museum Specimens, Routine Mounting of Specimens, Filling and Scaling

Recommended Books / Suggested Readings:

1. Histopathology Guy Orchard , Edited by Brian Nation Publisher Oxford University Press
2. Text book of Histology,2ndedition,palGP,Paras medical publisher.
3. Histology for Pathologists by Stacey E Mills MD
4. Sternberg's Diagnostic Surgical Pathology [2 - Volume Set] by Stacey E Mills MD
5. Anatomic Pathology Board Review, 2e by Jay H. Lefkowitch MD
6. Clinical Pathology Board Review, 1e 1 Har/Psc Edition
7. by Steven L. Spitalnik MD (Author), Suzanne Arinsburg DO (Author), Jeffrey Jhang MD (Author)
8. Medical Laboratory Science-Theory and Practice: J Ochei and A. Kolhatkar
9. A Hand Book Of Medical Laboratory Technology By V.H.Talib
10. Inderbir Singh's Textbook of Human Histology with Colour Atlas and Practical Guide by Vasudeva Neelam
11. Medical Laboratory Technology : Methods and Interpretations Vol - 1 6th Edition by RAMNIK SOOD

Core Course 18
MLT323: Histopathology and Cytology Techniques LAB
Credits: 2
LTP: 004

PRACTICAL LIST

1. Tissue processing by using tissue processor
2. Sharpening of the microtomeknife
3. Gross examination and fixation of thespecimen
4. Decalcification of calcifiedtissue
5. Processing of the tissue by manualmethod
6. Section cutting of paraffin wax embeddedtissue
7. To fix the section on theslide
8. Staining of the tissue section by using hematoxylin and eosin stainingmethod
9. Cell BlockPreparation

Recommended Books / Suggested Readings:

1. Histopathology Guy Orchard , Edited by Brian Nation Publisher Oxford University Press
2. Text book of Histology,2ndedition,palGP,Paras medical publisher.
3. Histology for Pathologists by Stacey E Mills MD
4. Sternberg's Diagnostic Surgical Pathology [2 - Volume Set] by Stacey E Mills MD
5. Anatomic Pathology Board Review, 2e by Jay H. Lefkowitch MD
6. Clinical Pathology Board Review, 1e 1 Har/Psc Edition
7. by Steven L. Spitalnik MD (Author), Suzanne Arinsburg DO (Author), Jeffrey Jhang MD (Author)
8. Medical Laboratory Science-Theory and Practice: J Ochei and A. Kolhatkar
9. A Hand Book Of Medical Laboratory Technology By V.H.Talib
10. Inderbir Singh's Textbook of Human Histology with Colour Atlas and Practical Guide by Vasudeva Neelam
11. Medical Laboratory Technology : Methods and Interpretations Vol - 1 6th Edition by RAMNIK SOOD

Ability Enhanced Compulsory Course 2
AHS101: Entrepreneurship in Medical Laboratory Management
Credits: 2
LTP: 200

THEORY

Course Description: This course coversprinciples of management, management functions, lab planning and store management. This course also impart knowledge about lab staffing and selection procedure for new equipment and students will learn about the labeling and lab safety procedures

Course Outcomes (CLO):

Upon successful completion of the course, the students should be able to learn about:
CO1: Students will be able to identify different levels of management, leadership and administrative qualities
CO2: Students will learn disciples about different type of staff requirement in lab, their jobs and responsibilities, performance, validation of new equipments
CO3: Students upon learning the different laboratory hazards, students will be able to manage the laboratory safety accordingly

Course Content

Unit I

Principles of Management: Leadership, Management, Administration, Decision Making.
Management Function: Introduction, Planning, Organizing, Directing, Controlling
Lab Planning: Space Requirement, duties
Stores: Organisation,Function, types of stores, Stores Record, Goods Inward Note form Material Requisition Form, Bin Card

Unit II

Laboratory Staffing and Scheduling: Introduction, Lab Personnel, Current Dynamics affecting Staffing, Personnel Requirement, Laboratory staffing, Staffing scheduling
Selection and Implementation of New Equipment and Procedure: Introduction, defining laboratory requirement, Performance consideration, technology requirement, Human recourses, implementation, Verification and Validation

Unit III

Labeling Laboratory Safety: Safety Management plan and responsibilities, Standard precautions, Hazard prevention and containment, sterilization and Decontamination, Spill management, Fire safety, Waste management, Packaging and Shipping of Infectious substances, Personnel training

Unit IV

Managing Psychological self - Stress, Emotions, Anxiety
Leadership Concept, types, qualities of good leader
Medical Ethics and Code of Conduct: Ethics and code of conduct, legal aspects – confidentiality malpractice/ negligence; legal implications, law suits, consumer protection and insurance for professional health hazards

Reference

1. F.J. Baker et al, An introduction to medical laboratory technology, Butterworths and Co. London.
2. Lynch , Medical laboratory technology, W.B. saunders
3. Medical Laboratory Technology by Praful B Godkar; Bhalani Publishing House, Mumbai (India).
4. Text Book of Medical Laboratory Technology by FJ Baker; ButterworthsHeinmann Publishers, Oxford
5. Text Book of Medical Laboratory Technology by KL Mukherjee Vol I, II and III; Tata McGraw Hill Publishers, New Delhi
6. Medical Lab Technology by RamnikSood, Jay Pee Brothers, New Delhi
7. District Laboratory Practice in Tropical Countries by Monica Chesbrough, Churchill Livingstone.

SYLLABUS FOR FOURTH SEMESTER

MEDICAL LAB TECHNOLOGY

Core Course 19
MLT401: Clinical Biochemistry
Credits: 4
LTP: 310

THEORY

Course Description: This course has been designed to understand the diagnosis and study of diseases of the tissues, and involves examining tissues and/or cells under a microscope. This course also includes principles of modern cytology, including protocols for cytological examination.

Course Outcomes (CLO):

Upon successful completion of the course, the students should be able to learn about:
CO1: Familiarize students with the specific characteristics of a laboratory of clinical biochemistry
CO2: Students will learn Know the analytical methods commonly used in the clinical laboratory.
CO3: Understanding the pathophysiology and molecular basis of the most prevalent diseases
CO4: Students will learn laboratory techniques for testing in detail.
CO5: Students will have elementary knowledge of mechanisms of body parts and their functions, diseases etc.

Course Content

Unit I

ClinicalInstrumentation

Photometry: Definition, laws of photometry, absorbance, transmittance, absorption maxima, instruments, parts of photometer, types of photometry-colorimetry, spectrophotometry, flame photometry, fluorometry, choice of appropriate filter, measurements of solution, calculation of formula,applications. Immunodiffusion Techniques, Radioimmunoassay & ELISA -Principles &Applications. Electrophoresis-Principle, Types &Applications. Polymerase Chain Reaction -Principle &Applications. Autoanalysers-Principle &Applications

Unit II

Water & Mineral Metabolism and Liver Functions & their Assessment

Distribution of fluids in the body, ECF & ICF, water metabolism, dehydration, mineral metabolism, macronutrients (principal mineral elements) & trace elements.
Based on: Carbohydrate metabolism, Protein metabolism, Lipid metabolism, Measurements of serum enzyme levels, Bile pigment metabolism, Jaundice, its types and their biochemical findings.

Unit III

Renal Function Tests, Vitamins and Cardiac Profile

Renal Function Tests: Various Tests, GFR & Clearance
Vitamins: Fat & water soluble vitamins, sources, requirement, deficiency disorders & biochemical functions.

Cardiac Profile: In brief Hypertension, Angina, Myocardial Infarction, Pattern of Cardiac Enzymes in heart diseases

Unit IV

Different methods of Glucose and Cholesterol Estimation
Principle advantage and disadvantage of different methods of glucose and cholesterol estimation.
Mechanism and testing in detail
Bone marrow in detail, Detailed Examination of Stool, Semen, Sputum, CSF, and other body fluids like pleural fluid, pericardial, peritoneal, synovial, ascitic fluid.

Recommended Books / Suggested Readings:

1. D M Vasudevan, (2011),Text book of Medical Biochemistry,6th edition Jaypee Publishers
2. M N Chatterjea& Rana Shinde,(2012),Text book of Medical Page 15 of 38 B. Sc. in Medical Laboratory Technology Biochemistry,8th edition,Jayppe Publications
3. Singh &Sahni,(2008),Introductory Practical Biochemistry,2nd edition, Alpha science
4. Lehninger,(2013),Principles of Biochemistry,6th edition, W H Freeman
5. U Satyanarayan,(2008), Essentials of Biochemistry,2nd edition, Standard Publishers

Core Course 20
MLT421: Clinical Biochemistry LAB
Credits: 2
LTP: 004

PRACTICAL LIST

1. Blood ureaestimation.
2. Serum creatinine, uric acid, total protein, albumin, globulin and glucose estimation
3. Total cholesterolestimation, HDL cholesterol (direct)estimation, LDL cholesterol (direct)estimation
4. Triglycerideestimation,
5. Serum Bilirubin totalestimation and directestimation
6. Serum GOT (AST)estimation, GPT (ALT)estimation
7. Alkaline Phosphataseestimation
8. Serum sodiumestimation and potassiumestimation
9. Detailed Examination of Stool
10. Detailed Examination of Semen
11. Detailed Examination of Sputum

Recommended Books / Suggested Readings:

1. A guidebook to Biochemistry MichaelYudkin
2. A Manual of Laboratory & Diagnostic Tests (6/ e) FrancesFischbach
3. Biochemistry Voet andVoet
4. BiochemistryStryer
5. Biochemistry U. Satyanarayan. & U.Chakrapani
6. Clinical Biochemistry RichardLuxton
7. Clinical Diagnosis & Management by Laboratory method0 (20/e) John BernardHenary
8. Clinical Biochemistry G.Guru
9. Handbook of Biochemistry M.A.Siddique
10. Textbook of Medical Biochemistry S.Ramkrishnan
11. Biochemical Techniques K.Choudhary
12. Text book of Medical Biochemistry Chaterjee&Shinde
13. Principles of Biochemistry David L.Nelson
14. Principles of BiochemistryLehninger
15. Textbook of Biochemistry and Human Biology G.P.Talwar
16. Textbook of Medical Laboratory Technology Godkar andGodkar
17. Outline of Biochemistry ConnStumpf
18. Principles of Internal MedicineIsselbacher
19. Proteins and Proteomics : Laboratory Manual Richard J.Simpson
20. Purifying Proteins for Proteomics: Laboratory Manual Richard J.Simpson

Core Course 21
MLT402: Clinical Serology
Credits: 4
LTP: 310

THEORY

Course Description: This course has been designed to understand basic immunology, including the innate and acquired immunity. Presents serology principles and its application in the diagnosis of infectious diseases such as Lyme disease, syphilis, viral hepatitis, HIV infection, infectious mononucleosis, cytomegalovirus and other viral infections.

Course Outcomes (CLO):

Upon successful completion of the course, the students should be able to learn about:
CO1: Developing a working knowledge of the principles and procedures of serology
CO2: Producing accurate, skilled clinical laboratory workers with strong ethical and professional values
CO3: Understanding the infections caused by microorganisms and their tests
CO4: Students will learn serological techniques for testing in detail

Course Content

Unit I

Antigens, antibodies, structure and classes of antibodies, monoclonal antibodies and itsuses.Collection and preparation of specimen, Epidemiological markers of microorganismserotyping,Principles of immunologic reactions, serodiagnosis.Collection and preparation of specimen,Serological test for syphilis (STS), Agglutination tests, C-reactive protein test (CRP), Rheumatoid arthritis test (RA),Serodiagnosis of streptococcal infection,Serodiagnostic tests for miscellaneous disorders, Immunologic test for pregnancy RIA,ELISA

Unit II

Epidemiological markers of microorganism serotyping,Serological Tests-Widal, ASO, LFT, CRP, Rosewaller, brucella agglutination, cold agglutiration, VDRL, TPHA, PTA-ABSLab diagnosis of fungal infections Superficial dermatophyte fungal infections, Candidiases, creptococosis, Pulmonary infections, Mycetoma, other deep mycotic infections, subcutaneous fungal infections subcutaneous fungal infections spozotrichosis, chromoblastomycosis, Eye and Ear fungi infections

Unit III

Serological tests for fungal infections and skintests. Advanced techniques in microbiology ELISA, RIA, CCIEA, Co-agglutination GLC, HPLCetc.Rapid diagnostic methods and Automation inMicrobiology.Principles of Serological techniques used in virology- ELISA, RIA, IF, Immuno peroxidasetest.

Unit IV

Principles of serological techniques used in Virology-Part 1:HA, HAI, Had, SRH,RPHA, IHA, CFT,CIEP. PrinciplesofSerologicaltechniquesusedinVirology-Part-11Nt,ELISA,RIA,IF,Immuno-peroxidasetest

Recommended Books / Suggested Readings:

1. Clinical Immunology and Serology: A Laboratory Perspective (Clinical Immunology and Serology (Stevens)) Paperback – Import, 1 Dec 2009by Christine Dorresteyn Stevens
2. Immunology & Serology in Laboratory Medicine, 5th Edition By Mary Louise Turgeon, EdD, MLS(ASCP)CM
3. Kuby Immunology By Judy Owen , Jenni Punt , Sharon Stranford Publisher W.H.Freeman& Co Ltd

Core Course 22
MLT422: Clinical Serology LAB
Credits: 2
LTP: 004

PRACTICAL LIST

1. Serological tests Serological test for syphilis (STS),Agglutination- 4 tests ,C-reactive protein test (CRP) ,Rheumatoid arthritis test (RA), Serodignosis of streptococcal infection .HBs Ag, HIV-1(Rapid TriDot test) Widal test, Tuberculine test
2. SEROLOGICAL TESTS: Widal, ASO, LFT, CRP, Rosewaller, Brucella agglutination, cold agglutination, VDRL, TPHA, FTA-ABS.
3. Principles of Serological techniques used in virology- ELISA, RIA, IF, Immuno peroxidase test \
4. Serological tests for fungal infections and skin tests
5. Advanced techniques in microbiology ELISA, RIA, CCIEA, Co-agglutination GLC, HPLC etc.
6. Rapid diagnostic methods and Automation in Microbiology.

Recommended Books / Suggested Readings:

1. Clinical Immunology and Serology: A Laboratory Perspective (Clinical Immunology and Serology (Stevens)) Paperback – Import, 1 Dec 2009by Christine Dorresteyn Stevens
2. Immunology & Serology in Laboratory Medicine, 5th Edition By Mary Louise Turgeon, EdD, MLS(ASCP)CM
3. Kuby Immunology By Judy Owen , Jenni Punt , Sharon Stranford Publisher W.H. Freeman& Co Ltd

Core Course 23
MLT403: Clinical Parasitology and Virology
Credits: 4
LTP: 310

THEORY

Course Description: This course covers basic theory and clinical procedures used to isolate and identify intestinal, blood, and tissue parasites; dermatophytes, systemic and subcutaneous fungi, viruses, and mycobacteria.

Course Outcomes (CLO):

Upon successful completion of the course, the students should be able to learn about:
CO1: Explain different procedures used for the identification of intestinal and blood parasites.
CO2: Correlate microbiological 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.
CO3: Demonstrate accurate/effective skills in student lab and internship by utilizing the information from this course.
CO4: Students will learn viral diseases and techniques for testing in detail

Course Content

Unit I

Introduction of parasites, host, zoonosis, host parasits relationship, sources of infection, mode of infection, pathogenesis, immunity in parasitic infection, lab diagnosis Protozoalogy: Entamoeba histolytica, Malarial Parasites, Leishmania, Trypanosomes, their morphology, life cycle, pathogenesis, clinical features and lab diagnosis. Helminthology: Introduction and classification, Taeniasolium, TaeniaSaginata,Fasciola, Ascaris, Wuchereriabancrofti their morphology, life cycle, pathogenesis, clinical features and lab diagnosis. Hookworm, Trichuris. Dracunculus their morphology, life cycle, pathogenesis, clinical features and lab diagnosis.

Unit II

Nature and Properties of Viruses Introduction: Discovery of viruses, nature and definition of viruses, general properties, concept of viroids, virusoids, satellite viruses and Prions. Structure of Viruses:Capsid symmetry, enveloped and non-enveloped viruses Isolation, purification and cultivation of viruses Viral taxonomy: Classification and nomenclature of different groups of viruses, Modes of viral transmission: Persistent, non-persistent, vertical and horizontal Viral multiplication and replication strategies: Interaction of viruses with cellular receptors and entry of viruses. Assembly, maturation and release of virions

Unit III

Poxviruses, Herpesviruses, hepaptitis viruses, retroviruses-HIV, Picorna viruses, rhabdoviruses, orthomyxoviruses and paramyxo viruses, TORCH profile,Symptoms, mode of transmission, prophylaxis and control of Polio, Herpes, Hepatitis, Rabies, Dengue, HIV, Influenza with brief description of swine flu, Ebola, Chikungunya, Japanese Encephalitis. Diagnostic methods in Parasitology: Introduction, Examination of stool, urine, blood, Culture methods, Immunological diagnosis and serology

Unit IV

Introduction to oncogenic viruses, Types of oncogenic DNA and RNA viruses, concepts of oncogenes and proto-oncogenes, prevention & control of viral diseases, antiviral compounds and their mode of action, interferon and their mode of action, General principles of viral vaccination

Recommended Books / Suggested Readings:

1. Ananthanarayan R. and Paniker C.K.J. (2009) Textbook of Microbiology. 8th edition, University Press Publication
2. Brooks G.F., Carroll K.C., Butel J.S., Morse S.A. and Mietzner, T.A. (2013)
3. Adelberg's Medical Microbiology. 26th edition. McGraw Hill Publication
4. Goering R., Dockrell H., Zuckerman M. and Wakelin D. (2007) Mims' Medical Microbiology. 4 th edition. Elsevier
5. Willey JM, Sherwood LM, and Woolverton CJ. (2013) Prescott, Harley and Klein's Microbiology. 9th edition. McGraw Hill Higher Education
6. Ananthanarayan R. and Paniker C.K.J. (2009) Textbook of Microbiology. 8th edition, University Press Publication
7. Adelberg's Medical Microbiology. 26th edition. McGraw Hill Publication

Core Course 24
MLT423: Clinical Parasitology and Virology LAB
Credits: 2
LTP: 004

PRACTICAL LIST

1. Leishman staining for malarial parasites
2. Demonstration of permanent slide of Trichuris, Ascaris and Hookworm
3. Saline and iodine wet mount for observing ova and eggs of parasites.
4. Concentration of stool samples by floatation method and sedimentation method
5. Zinc sulphate conc. Method for stool sample
6. Demonstration of various parasites by permanent slides.
7. Aldehyde Chopra test for Kala Azar
8. To perform HBsAg/ Australia Ag by rapid method
9. To perform HBsAg by ELISA
10. Demonstration of PCR HBV

Recommended Books / Suggested Readings:

1. Ananthanarayan R. and Paniker C.K.J. (2009) Textbook of Microbiology. 8th edition, University Press Publication
2. Brooks G.F., Carroll K.C., Butel J.S., Morse S.A. and Mietzner, T.A. (2013)
3. Adelberg's Medical Microbiology. 26th edition. McGraw Hill Publication
4. Goering R., Dockrell H., Zuckerman M. and Wakelin D. (2007) Mims' Medical Microbiology. 4th edition. Elsevier
5. Willey JM, Sherwood LM, and Woolverton CJ. (2013) Prescott, Harley and Klein's Microbiology. 9th edition. McGraw Hill Higher Education
6. Ananthanarayan R. and Paniker C.K.J. (2009) Textbook of Microbiology. 8th edition, University Press Publication
7. Adelberg's Medical Microbiology. 26th edition. McGraw Hill Publication

SYLLABUS FOR FIFTH SEMESTER

MEDICAL LAB TECHNOLOGY

Core Course 25
MLT501: Haematology - II
Credits: 4
LTP: 310

THEORY

Course Description: This course covers the diagnosis and management of blood cell disorders, anatomy and physiology of hematopoiesis, routine specialized hematology tests, analysis, classification, and monitoring of blood cell abnormalities

Course Outcomes (CLO):

Upon successful completion of the course, the students should be able to learn about:
CO1: Students integrate knowledge and making informed judgments about hematology test results in the clinical setting
CO2: Provide knowledge of complete blood and their examination
CO3: Demonstrate various mechanisms of blood related issues
CO4: Students will learn investigations in haematology

Course Content

Unit I

Introduction, Haemopoiesis
QualityAssurance, Blood collectionprocedures, Anticoagulants used in Hematology: Generalapplications, Anaemia: typescauses
Main CellLines, Erythropoiesis, Leucopoesis, Functions ofWBCs, Functions ofPlatelets

Unit II

Complete BloodCount(CBC)and Examination of PeripheralBloodSmear
Haemoglobinestimation, Haemocytometry (Counting of Cells inBlood), Packed cell volume(PCV), Manual CellCounts, Use of Counting Chamber (Haemacytometer) for cellcounting, Red Cell Count (ManualMethod), Red Blood CellIndices, WBC counts-Total anddifferential. Total Eosinophil count(TEC), Platelet count (ManualMethod), Erythrocyte sedimentationrate
Preparation of BloodSmear, Staining of BloodSmear, Microscopic Examination of the BloodFilm, The Differential Count ofLeucocytes, Interpretation of the variations/Abnormalities inLeucocytes, Morphological Variations/Abnormalities inErythrocytes

Unit III

Miscellaneous InvestigationsinHaematology
Osmotic fragility, Investigation of G-6 PDdeficiency, Examination of Bone Marrow Test for SickleCells, Estimation on of Hb-F (Foetal – Haemoglobin) by Akali DenaturationMethod, Plasma haemoglobin and Haptoglobin, demonstration of hacmosiderin inurine, AutohaemolysisTest, Spectroscopic Examination of Blood for the detection of abnormal Hbpigments, ReticulocyteCount, Staining of HeinzBodies, Staining

of Siderocytes (Demonstration of PappenheimerBodies), PeroxidaseStaining, PASReaction, Neutrophil (Leucocyte) AlkalinePhosphatase

Unit IV

HaemostasisandFibrinolysis

Haemostasis, Mechanism ofHaemostasis, Functions of Platelets in Haemostasis andCoagulation, Coagulation, Coagulationfactors, Pathways for the CoagulationProcess, Fibrinolysis, Disorders of Bloodcoagulation, Tests for CoagulationFunction, Clotting Time (Lee- WhiteMethod), ClotRetraction, Test to measure the ExtrinsicSystem: One –Stage ProthrombinTime(PT), Test for Prothrombin ConsumptionIndex(PCI), Test for IntrinsicSystem, Assays of CoagulationFactors

Recommended Books / Suggested Readings:

1. Clinical Haematology Christopher A.Ludlam
2. Practical Haematology J.B.Dacie
3. Practical Haematology (8/e) S irJohn
4. Haematology (International edition) EmmanuelC.Besa
5. Haematology (Pathophysiological basis for clinical practice (3/e) Stephen M.Robinson
6. Haematology for students Practitioners RamnikSood
7. Hand book of Medical Laboratory Technology (2/e) V.H.Talib
8. Atlas of haematology (5/e) G.A.McDonald

Core Course 26
MLT521: Haematology – II LAB
Credits: 2
LTP: 004

PRACTICAL LIST

1. Hb Estimation-Sahli's method &Cyanmeth haemoglobin method
2. RBC Count and Reticulocyte Count
3. Preparation of blood smears and staining with Leishman stain
4. WBC Count, WBC –Differential Count
5. Platelet Count
6. Absolute Eosinophil Count
7. ESR- Westergrens & Wintrobe's method,
8. Bone Marrow Smear preparation & staining procedure-Demonstration
9. Demonstration of Malarial Parasite.

Recommended Books / Suggested Readings:

1. Clinical Haematology Christopher A. Ludlam
2. Practical Haematology J.B. Dacie
3. Practical Haematology (8/e) S irJohn
4. Haematology (International edition) Emmanuel C. Besa
5. Haematology (Pathophysiological basis for clinical practice (3/e) Stephen M. Robinson
6. Haematology for students Practitioners Ramnik Sood
7. Hand book of Medical Laboratory Technology (2/e) V.H. Talib
8. Atlas of haematology (5/e) G.A.Mc Donald

Core Course 27
MLT502: Basic Pharmacology
Credits: 4
LTP: 310

THEORY

Course Description: This course aims to augment student's awareness toward their body system and diseases. The course also aims to enrich their knowledge about the full body system with respect to diseased and treatment.

Course Outcomes (CLO):

Upon successful completion of the course, the students should be able to learn about:
CO1: The student would be able to produce knowledge of body system and disease and various mechanisms involved in the particular part
CO2: Students would be able to produce treatment side effects and toxicity produced.
CO3: Students would be able to produce knowledge of products which produce toxicity to body system

Course Content

Unit I

General Pharmacology: Drug, Drug nomenclature, Route of administration, concept of Pharmacokinetics, Pharmaco-dynamics and Adverse during action.
Basic concept of Xenobiotic, Drug substance, ADMI, Plasma concentration time curve w.r.t. drug molecule, on set of action, Cmax, Tmax, therapeutic window ED50, LD50, MEC, MTC etc

Unit II

Drug concentration and effect (Dose response curve), doses of various drugs, potency, terategenicity, carcinogenicity, factor affecting drug action, dose decisions in infants. Routes of drug administration and various formulation

Unit III

Drug action on ANS, PNS.
Introduction to autonomic nervous systems, parasympethomimetics, parasympatholgtics, sympathomimetics, sympatholytics
Drug action on CNS

Unit IV

Drugs action on cardiovascular system, B- blockers, Ace inhibitors, AT-2 inhibitors, CNS acting, non selective etc.
Drug action on GIT, antiemetic, antiulcer, prokinetic only

General introduction to antibiotics and antimicrobial sped rum penicillin, tetracycline, aminoglycosides only

Recommended Books / Suggested Readings:

1. Lippincott's Illustrated Reviews: Pharmacologyby Richard A. Harvey
2. Basic & Clinical Pharmacology by Bertram G. Katzung
3. Rang & Dale's Pharmacologyby Humphrey P. Rang
4. Essentials of Medical Pharmacology Seventh Edition. KD Tripathi

Core Course 28
MLT522: Basic Pharmacology LAB
Credits: 4
LTP: 002

PRACTICAL LIST

1. General introduction of Pharmacology and experimental Pharmacology.
2. Introduction of animal used for experimental pharmacology.
3. Introduction to collection of blood sample from experimental animals.
4. Introduction of administration of drugs in experimental animals
5. To study the equipments used for isolated and perfused frog heart in experimental pharmacology.
6. Animal ethics and good laboratory practice

Recommended Books / Suggested Readings:

1. Lippincott's Illustrated Reviews: Pharmacology by Richard A. Harvey
2. Basic & Clinical Pharmacology by Bertram G. Katzung
3. Rang & Dale's Pharmacology by Humphrey P. Rang
4. Essentials of Medical Pharmacology Seventh Edition. KD Tripathi

Core Course 29
MLT503: Clinical Endocrinology and Toxicology
Credits: 4
LTP: 310

THEORY

Course Description: This course covers the basic knowledge of hormones & toxic substances with their determination techniques as well as related disorders.

Course Outcomes (CLO):

Upon successful completion of the course, the students should be able to learn about:
CO1: Students integrate full fledge knowledge about hormones
CO2: Provide knowledge of complete thyroid function test
CO3: Students will get knowledge about infertility profile
CO4: Students will learn growth hormones and toxicology

Course Content

Unit I

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

Unit II

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

Unit III

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

Unit IV

Growth hormone, ACTH, Aldosterone, Cortisol their estimation and clinical significance, reference range, hypo and hyper secretion.
Introduction of Toxicology, Alcohol poisoning, Lead poisoning, Zinc poisoning, Mercury poisoning drugs abuse, screening procedure for drug screening, Spot tests, hair and urine test, Immunoassay for drugs.

Recommended Books / Suggested Readings:

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

Core Course 30
MLT523: Clinical Endocrinology and Toxicology LAB
Credits: 4
LTP: 002

PRACTICAL LIST

1. To determine T3 conc. in serum sample.
2. To determine T4 conc. in serum sample.
3. To determine TSH conc. in serum sample.
4. To determine LH conc. in serum sample.
5. To determine FSH conc. in serum sample.
6. To determine Prolactin conc. in serum sample.
7. To perform TRIPLE test.
8. Demonstration of male and female infertility test.
9. Beta HCG

Recommended Books / Suggested Readings:

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

Skill Enhancement Course 1
AHS102: Medical Laboratory Management
Credits: 4
LTP: 400

THEORY

Course Description: This course covers the knowledge of quality practices and staff skills, patient selection and management, and better understanding of lab costing and investment decisions.

Course Outcomes (CLO):

Upon successful completion of the course, the students should be able to learn about:

CO1: Students will understand the importance and method of Observing and reporting while dealing with patients
CO2: Students will understand guidelines for collecting documentation
CO3: Students will learn to maintain restful environment

Course Content

Unit I

Organization of Laboratory

Functional components of clinical laboratories, (cleanliness, precautions to be taken WRT patients, reports, analysis, Communication between physician, patients, and the medical laboratory professional. Basic needs of clinical laboratory technician, awareness of soft skills, How to deal with various people.Principles and processes for providing customer and personal services including needs assessment techniques. Quality service standards, alternative delivery systems, and customer satisfaction evaluation techniques

Unit II

Observing and reporting

Management and maintenance of records. Understand the importance and method of Observing and reporting while dealing with patients during sample and report collection. The relevant legislation, standards, policies, and procedures followed in the Organization. Manage people/patient effectively as per the guidelines. The principles of leadership and guidance.Importance and method of Observing and reporting while assisting the pathologists and other members of the team. Importance of verbally informing the person in authority.

Unit III

Documentation

Guidelines for documentation, Guidelines for Collectingdocumentation, Varioustypesofrecordsinlaboratorysetup, Usesandimportanceofrecordsinlaboratorysetup, Essential requirement ofrecords, Understand abbreviations andsymbols. Enter, transcribe, record, store, or maintain information in written or electronic/magneticform. Usage of LMIS(Laboratory information managementsystem)

Unit IV

Professional Behavior in HealthcareSettings

How to maintain restful environment, Business, mission, and objectives of theorganization. General and Specific etiquettes to be observed onduty, Understand need for compliance of organizational hierarchy andreporting, legal and ethicalissues, Importance of conservation of resources inlaboratories. Effective working relationships with the people,The importance of planning, prioritizing and organizing work, Efficient use of time, Importance of keeping the work area clean andtidy

Recommended Books / Suggested Readings:

1. Clinical Laboratory Management by Lynne Shore
2. Medical Laboratory Management by Sangeeta Sharma et al
3. Information Technology for Management by Lucas, Henry C.
4. A Foundation Course in Value Education by R R Gaur, R Sangal, G P Bagaria, 2009 Fundamentals of Ethics for Scientists &Engineers by E G Seebauer& Robert L. Berry, 2000 Human Values, New Age International Publishers by A.N. Tripathy, 2003
5. Environment Biology by Agarwal, K. C. 2001
6. Environment Protection and Laws by Jadhav, H &Bhosale, V.M. 1995
7. Medical Laboratory Technology by Praful B Godkar; Bhalani Publishing House, Mumbai (India)
8. Text Book of Medical Laboratory Technology by FJ Baker; Butterworths Heinmann Publishers, Oxford
9. Text Book of Medical Laboratory Technology by KL Mukherjee Vol I, II and III; Tata McGraw Hill Publishers, New Delhi
10. Medical Lab Technology by RamnikSood, Jay Pee Brothers, New Delhi
11. District Laboratory Practice in Tropical Countries by Monica Chesbrough, Churchill Livingstone.

SYLLABUS FOR SIXTH SEMESTER

MEDICAL LAB TECHNOLOGY

Core Course 31
MLT601: Application of Molecular Techniques in Medical Laboratory
Credits: 4
LTP: 310

THEORY

Course Description: This course covers the knowledge of molecular structure of biomolecules, advance and RAPID tests techniques.

Course Outcomes (CLO):

Upon successful completion of the course, the students should be able to learn about:
CO1: Students integrate full fledge knowledge of structure of biomolecules
CO2: Provide knowledge of advance instrumentation
CO3: Students will get knowledge about the RAPID tests methods.

Course Content

Unit I

Molecular structure of Biomolecules
Structure of DNA: Various types of nucleotides, Watson-Crick model of DNA, Introduction to Replication, transcription and translation.
Structure of Proteins: Various types of amino acids. Primary, Secondary and tertiary structure of proteins.
Basic structure of Lipids.

Unit II

Advance Instrumentation in Molecular Diagnosis
Molecular cloning
Polymerase chain reaction
Gel electrophoresis
Macromolecule blotting and probing
Microarrays

Unit III

Introduction and Use of Biosensors in molecular diagnostics
Application of PCR in molecular diagnostics
Application of RT-PCR in molecular diagnostics

Unit IV

RAPID test
Rapid antibody tests.
Rapid HIV test.
Rapid plasma reagin.

Rapid antigen tests.
Rapid influenza diagnostic test.
Malaria antigen detection tests.
Rapid strep test.
Rapid urease test.

Recommended Books / Suggested Readings:

1. Freifelder D (2012). Molecular Biology, 5th edition. Narosa Publishing House, India
2. Berg JM, Tymoczko JL, Gatto GJ and Stryer L (2015) Biochemistry, 8th Edition, WH Freeman & Co., New York.
3. Allison A. Lizabeth (2012) Fundamental Molecular Biology, 2nd Edition. J Willey and Sons, Hoboken,New Jersey.
4. Freifelder D and Malacinski GM (2005) Essentials of Molecular Biology, 4th Edition, John and Bartlett Publishing, UK
5. Krebs JE., Kilpatrick ST and Goldstein ES. (2013). Lewin' GENES XI, Jones & Bartlett Learning. Burlington, MA.

Core Course 32
MLT621: Application of Molecular Techniques in Medical Laboratory LAB
Credits: 4
LTP: 002

PRACTICAL LIST

1. Preparation of various reagents used in Molecular diagnosis.
2. Performance of DNA Gel Electrophoresis.
3. Performance of PCR.
4. Performance of RT-PCR
5. Demonstration of various Blotting techniques.

Recommended Books / Suggested Readings:

1. Freifelder D (2012). Molecular Biology, 5th edition. Narosa Publishing House, India
2. Berg JM, Tymoczko JL, Gatto GJ and Stryer L (2015) Biochemistry, 8th Edition, WH Freeman & Co., New York.
3. Allison A. Lizabeth (2012) Fundamental Molecular Biology, 2nd Edition. J Willey and Sons, Hoboken, New Jersey.
4. Freifelder D and Malacinski GM (2005) Essentials of Molecular Biology, 4th Edition, John and Bartlett Publishing, UK
5. Krebs JE., Kilpatrick ST and Goldstein ES. (2013). Lewin' GENES XI, Jones & Bartlett Learning. Burlington, MA.

Core Course 33
MLT602: Blood Banking
Credits: 4
LTP: 310

THEORY

Course Description: This course covers the knowledgeblood bank, blood storage and preserved for later use. The preserved blood is later used for blood transfusion. The main aim of this course is to train students about blood bank technology and turn them into skilled blood bank technicians.

Course Outcomes (CLO):

Upon successful completion of the course, the students should be able to learn about:
CO1: Students will understand blood transfusion reactions
CO2: Provide knowledge about Importance and methodology of cleanliness, and hygiene environment
CO3: Students will understand the practices to curb infection
CO4: Students will learn methodology to identify blood groups

Course Content

Unit I

Components of blood
Immuno- hematology in detail
ABO blood group system in detal
Rh blood group system in detail

Unit II

Methodology to identify bloodgroups
Different aspects of Blood transfusion techniques
Investigation of transfusionreaction.
Transfusion of various components of blood

Unit III

Serumimmunoglobulin
Different aspects of working inblood
Storage ofBlood
Infection control and prevention- Practices to curb infection, Hospital borne infections, Prevention and treatment of needle stick injury, Management of blood and body substance spills in the health caresetting

Unit IV

The path of disease transmission-
Paths of transmission including direct contact and penetrating injuries, risk of acquisition. Sources of

infecting microorganisms including persons who are carriers in- incubation phase of the disease or those who are acutely ill. Aspects of infectious diseases including- opportunistic organisms, pathogens

Recommended Books / Suggested Readings:

1. Atlas of haematology (5/e) G.A. McDonald
2. Clinical Haematology Christopher A. Ludlam
3. Practical Haematology J.B. Dacie
4. Practical Haematology (8/e) S ir John
5. Haematology (International edition) Emmanuel C.Besa
6. Haematology (Pathophysiological basis for clinical practice (3/e) Stephen M. Robinson
7. Haematology for students Practitioners RamnikSood
8. Hand book of Medical Laboratory Technology (2/e) V.H. Talib
9. Handbook of Blood Banking and Transfusion Medicineby Rao Gundu HR, JagannathanLatha, Eastlund Ted
10. Modern Blood Banking & Transfusion Practices Hardcover – 2012by Denise M Harmening
11. Textbook of Blood Banking and Transfusion Medicine - Elsevier eBook on VitalSource, 2nd Edition By Sally V. Rudmann, PhD, MT(ASCP)SBB, CLS
12. Textbook of Blood Banking and Transfusion Medicine by Sally V. Rudmann
13. Hospital Epidemiology and Infection Control by C. Glen Mayhall
14. Hospital Acquired Infections: Prevention and Control Paperback – Import, 2010 by PurvaMathur
15. Hospital Infection Control Guidelines: Principles and Practice by Singh Sanjeev, Gupta Shakti Kumar, Kant Sunil
16. Bennett & Brachman's Hospital Infections Sixth Edition by William R. Jarvis MD (Author)
17. Handbook of Hospital Infection Control, 2013 by Sanjay Singhal
18. Hospital Infection Prevention Principles & Practices Editors: Wattal, Chand, Khardori, Nancy

Core Course 34
MLT622: Blood Banking LAB
Credits: 2
LTP: 004

PRACTICAL LIST

1. Safety rules and Quality Control
2. Introduction to the blood Bank
3. Blood collection and components preparation
4. ABO typing and ABO discrepancies
5. Rh typing
6. Coomb's tests (Antiglobulin tests)
7. Cross matching Handout
8. Antibodies screening
9. Antibodies identification
10. Antibody titer determination

Recommended Books / Suggested Readings:

1. Practical Haematology J.B. Dacie
2. Practical Haematology (8/e) S ir John
3. Haematology (International edition) Emmanuel C.Besa
4. Haematology (Pathophysiological basis for clinical practice (3/e) Stephen M. Robinson
5. Haematology for students Practitioners RamnikSood
6. Hand book of Medical Laboratory Technology (2/e) V.H. Talib
7. Handbook of Blood Banking and Transfusion Medicineby Rao Gundu HR, JagannathanLatha, Eastlund Ted
8. Modern Blood Banking & Transfusion Practices Hardcover – 2012by Denise M Harmening
9. Textbook of Blood Banking and Transfusion Medicine - Elsevier eBook on VitalSource, 2nd Edition By Sally V. Rudmann, PhD, MT(ASCP)SBB, CLS
10. Textbook of Blood Banking and Transfusion Medicine by Sally V. Rudmann
11. Hospital Epidemiology and Infection Control by C. Glen Mayhall
12. Hospital Acquired Infections: Prevention and Control Paperback – Import, 2010 by PurvaMathur
13. Hospital Infection Control Guidelines: Principles and Practice by Singh Sanjeev, Gupta Shakti Kumar, Kant Sunil

Skill Enhancement Course 2
AHS103:Laboratory Law, Ethics and Medical Waste Management
Credits: 4
LTP: 400

THEORY

Course Description: This course is an introduction to the concepts of medical law and ethics for health care practitioners. It includes ethical concepts as they relate to the medical profession. Managed care, other health care legislative rulings are discussed. Medical waste management learners about health care waste and its impact on health and environment. Acquaint the learner group to existing legislation, knowledge and practices regarding health care waste Management.

Course Outcomes (CLO):

Upon successful completion of the course, the students should be able to learn about:
CO1: Students will understand the importance of laboratory laws and ethics
CO2: Students will understand how to keep medical records and their information.
CO3: Students will learn to maintain hazardous health care waste.
CO4: Students will learn about legislation and policies on Health care waste management

Course Content

Unit I

Laboratory law and ethics
Medical ethics, Definition, Goal,Scope.Introduction to Code ofconduct. Basic principles of medical ethics, ConfidentialityMalpractice and negligence, Rational and irrational drugtherapy.
Right of patients Care of the terminallyill.Euthanasia Organ transplantation, ethics andlaw

Unit II

Medico legal aspects of medical records, Medico legal case andtype.
Records and document related to MLC ownership of medicalrecords.
Confidentiality Privilege communication, Release of medicalinformation.
Unauthorized disclosure, retention of medical records, other variousaspects.

Unit III

Introduction, Definition of General and Hazardous health care waste, Infectious waste, Genotoxic waste, Waste Sharps, Biomedical waste – categories Categorization and composition of Biomedical waste. Specification of materials. Colour coding. Sources of Health care wastes, Hospitals & health care establishments & other sources.

Unit IV

Legislation and policies on Health care waste management. Biomedical waste Management and handling Rules, 1998 and its amendment there after. CPCB guidelines. (Central pollution control board) Some idea on Safe disposal of Radioactive waste Rules, 1995 guideline of BARC

Recommended Books / Suggested Readings:

1. The Book of Hospital Waste Management: Dr. D.B. Acharya & Dr. Meeta Singh (Minerva Press, New Delhi)
2. Hospital Waste Management & its Monitoring: Madhuri Sharma (Jaypee Brothers, Medical Publishers (P) Ltd. New Delhi)
3. M.N.Rao&A.K.Dutta, "Wastewater Treatment", Oxford - IBH Publication, 1995.
4. W .W. Eckenfelder Jr., "Industrial Water Pollution Control", McGraw-Hill Book Company, New Delhi, 2000.