DELHI PHARMACEUTICAL SCIENCES & RESEARCH UNIVERSITY

(The First Pharmacy University in India)

School of Allied Health Sciences and Management

Programme Structure

Diploma in Medical Lab Technology (DMLT)

Program Overview

The aim of this Medical Laboratory Science program is to recruit, educate, and prepare highly competent paramedical scientists to serve their patients and the healthcare profession while demonstrating high ethical and moral standards and the utmost in technical competence.Through this course, students prepare for a career as a medical lab technician with requisite skills for diagnosing and treating illness through using lab instruments and performing diagnostic testsin hospitals, commercial laboratories, private clinics, nursing homes and other health centres, thus meeting the demand for quality healthcare management.

Program Outcomes: After completion of the program, the students would be able to:

PO1. Critical Thinking: Solve problems and take informed actions after identifying the assumptions that frame our thinking and actions and would enhance their administrative competence and decision making, when facing the challenges of the hospital and healthcare industry, as they must perform a multitude of tests and need to be able to assess if further tests are needed or, occasionally, if a test must be done over.

PO2.Effective Communication: Speak, read, write and listen in person and through electronic media to promote knowledge through applied and conceptual research relevant to hospital and healthcare management as they must communicate well with both patients and other departments and employees who are part of the health care team for the most effective patient care results.

PO3.Social Interaction: Act asa team player and part of a lab department as they must be in close contact with others, need to be able to facilitate good relations with them, need to smile, keep an orderly workspace, and attend staff meetings, conferences, employee activities, elicit views of others and mediate disagreements while applying skills in planning and managing hospitals and healthcare organizations to help reach conclusions in group settings.

PO4.Effective Citizenship: Demonstrate empathetic social concern towards national development, and the ability to act with an informed awareness of healthcare issues and hospital policies.

PO5. Ethics: Recognize ethical issues, ethical and social responsibility towards healthcare providers, patients and society, to justify the moral judgement concerning medical profession and inspire social values.

PO6.Environment and Sustainability: Get responsible towards the wellbeing of environment, the patients, healthcare professionals and the community by reducing toxicity of hospital waste, minimizing the use of hazardous chemicals, recycling and realising the importance of sustainable designs and building techniques to create true healing environment.

PO7.Self-directed and Life-long Learning: Engage in independent and life-long personal and professional learning and developing skills to cope with and socio-technological changes

Program Specific Outcomes: After completion of the program, graduates should be able to

PSO 1. Understand the latest concepts and techniques of medical lab technology and their applications in making the roles of the medical lab technologists effective and efficient.

PSO2. Perform medical tests with the help of medical instruments and the treatment of diseases, this program also equips candidates with the knowledge and skills required to handle the advanced lab equipment and perform accurate medical laboratory tests.

PSO3. Use appropriate strategies for effective planning, implementation and evaluation of institutional and community based health and family welfare program.

PSO4. Develop skills with the focus on strategic responsibility for training and development of human resource for health care delivery.

PSO5. Understand normal ranges/values for all common hematology/biochemical parameters and their clinical significance.

PSO6. Promote the efficient and equitable allocation of resources and development of strategies to promote cost-effective healthcare.

PSO7. Apply scientific approach to reduce cost of care through better material and money management.

PSO8. Appropriate and successful collection of blood specimens through venipuncture and capillary puncture.

PSO9. Describe the morphological variations of various blood cells and discuss their clinical importance.

PSO10. Learn various gram positive and gram negative bacteria, viruses and fungi causing diseases to human beings.

PSO11. Describe primary aspects of the blood bank including ABO-Rh and other common blood group systems, transfusion therapy, transfusion reactions, and hemolytic disease of the newborn.

PSO12. Explain principle, rationale uses and interpretation of routine biochemical tests for organism identification. Demonstrate proficient use of routine biochemical tests.

PSO13. Perform routine tissue processing and freeze drying technique in histopathology. Perform various staining techniques to identify premalignant or malignant condition.

PS014. Have the skills to analyse and solve operational problems in the delivery of hospital and healthcare services.

Semester - I

Semester	Paper Code:	Subject	Periods			Credit Units	Evaluation scheme		
			L	T	P		Internal*	External	Total
I	DML 101T	Anatomy and Physiology -I Theory	3	1	-	4	20	80	100
	DML102 T	General Biochemistry Theory	2	1	-	3	20	80	100
	DML103 T	General Microbiology Theory	2	1	-	3	20	80	100
	DML104 T	Fundamentals of Medical Lab Technology	2	1	-	3	20	80	100
	DML105 T	Computer Applications	2	-	-	2	50*	-	50*
	DML106	Communication Skills	2	-	-	2	50*	-	50*
	DML 101P	Anatomy and Physiology -I Practical	-	-	4	2	20	30	50
	DML 102P	General Biochemistry Practical	-	-	4	2	20	30	50
	DML 103P	General Microbiology Practical	-	-	4	2	20	30	50
	DML 105P	Computer Applications Practical	-	-	4	2	50	-	50*
Total			**13**	**4**	**16**	**25**	**290**	**410**	**700**

*Evaluation to be conducted by internal faculty/examiner.

Semester - II

	Paper Code:	Subject	Periods			Credit Units	Evaluation scheme		
			L	T	P		Internal*	External	Total
II	DML 201T	Anatomy and Physiology -II Theory	2	1	-	3	20	80	100
	DML 202T	Haematology –I Theory	2	1	-	3	20	80	100
	DML 203T	Pathology - Theory	2	1	-	3	20	80	100
	DML 204T	Clinical Biochemistry Theory	2	1	-	3	20	80	100
	DML 205T	Clinical Bacteriology Theory	2	1	-	3	20	80	100
	DML 201P	Anatomy and Physiology -II Practical	-	-	4	2	20	30	50
	DML 202P	Haematology- I Practical	-	-	4	2	20	30	50
	DML 203P	Pathology Practical	-	-	4	2	20	30	50
	DML 204P	Clinical Biochemistry Practical	-	-	4	2	20	30	50
	DML 205P	Clinical Bacteriology Practical	-	-	4	2	20	30	50
		Total	**10**	**5**	**20**	**25**	**200**	**550**	**750**

Semester - III

Semester	Paper Code:	Subject	Periods			Credit Units	Evaluation scheme		
			L	T	P		Internal*	External	Total
III	DML 301T	Hematology – II Theory	2	1	-	3	20	80	100
	DML 302T	Immunology, Parasitology and Serology-Theory	2	1	-	3	20	80	100
	DML 303T	Histopathology and Cytology-Theory	2	1	-	3	20	80	100
	DML 304T	Blood Banking Theory	2	1	-	3	20	80	100
	DML 301P	Hematology – II Practical	-	-	4	2	20	30	50
	DML 302P	Immunology, Parasitology and Serology-Practical	-	-	4	2	20	30	50
	DML 303P	Histopathology and Cytology-Practical	-	-	4	2	20	30	50
	DML 304P	Blood Banking Practical	-	-	4	2	20	30	50
Total			**8**	**4**	**16**	**20**	**160**	**440**	**600**

Semester - IV

Semester	Paper Code:	Subject	Periods			Credit Units	Evaluation scheme		
			L	T	P		Internal*	External	Total
IV	DML 401T	Diagnostic Biochemistry – Theory	2	1	-	3	20	80	100
	DML 402T	Clinical Virology and Mycology Theory	2	1	-	3	20	80	100
	DML 401P	Diagnostic Biochemistry Practical	-	-	4	2	10	40	50
	DML 402P	Clinical Virology and Mycology - Practical	-	-	4	2	10	40	50
	DML 403	Dissertation Project/ Internship *	-	-	-	4	-	100	100
		Internal Assessment				2	50*	-	50*
		Viva-Voce				2	-	50	50
Total			**4**	**2**	**8**	**18**	**110**	**390**	**500**

***Students will undergo an Internship of 12 weeks.**

Internship/Project duration: 12 weeks

S.No	Lab	Duration (weeks)
1	Biochemistry	3
2	Haematology	2
3	Pathology/Histopathology	2
4	Microbiology	3
5	Blood Bank/any specialized lab	2
	Total	**12**

SEMESTER-I

Anatomy and Physiology-I Theory

DML 101T

Contacts: 3L+1T **Credits: 04**

Course Overview

Human Anatomy and Physiology is a laboratory-based course that investigates the structure and function of the human body. It includes human anatomy, different tissues, human digestive system, skeletal, smooth and cardiac muscles, circulatory system, human bones and joints, blood pressure, pulse rate, heart rate and body temperature. This course is designed to develop the knowledge of Anatomy and Physiology in students.

Course Outcomes: After Completion of this course, students would be able to:

CO1: Describe the general structure and functions of the body as a whole.

CO2: Describe the general and microscopic structure and functions of each system of the body.

CO3: Explain the macroscopic and microscopic structure and functions of each organs of the body.

Course contents

Module 1: Introduction to human anatomy and physiology.

Parts of human body and Major body divisions.

Terminology: Anatomical landmarks, regions & directions, terms of positions and body movements.

Basic tissues of the body (Gross structure and functions): a) Epithelial tissue b) Connective tissue c) Muscular tissue d) Nervous tissue

Module 2: Musculo-skeleton system

Gross structure, function and classification of skeletal system

Bones of appendicular and axial skeleton (Names and brief description)

Joints & Articulations: Types of joints (Structural and functional classification).

Muscles: Classification, structure and functions of muscles.

Mechanism of Muscular contraction & fatigue

Module 3: Cardiovascular System

Composition and functions of blood, Basic structure of blood vessel, major arteries and veins of the body, Homeostasis.

Anatomy of heart: External & Internal features, Chambers and blood vessels attached to it.

Circulation of Blood, Cardiac cycle, Junctional tissues, Heart sounds, Cardiac output, Heart rate.

Blood Pressure: Apparatus used and recording of blood pressure.

Lymph and lymphatic organs: Gross structure, function, clinical importance & applications.

Module 4: Respiratory System

Functional anatomy of the respiratory system, Mechanism of Respiration, Exchange of Respiratory gases and Control of respiration, Lung volumes and capacities, Artificial respirations

Respirometer: Procedure, clinical applications & Importance

Module 5: Digestive System

Organs associated with Gastro Intestinal System (Digestive system) with its functions:

Stomach, Pancreas, liver and Gall bladder, Spleen, Intestines

Process and phases of digestion

Text and References

1. Tortora, G. J., &Derrickson, B. H. (2008). Principles of anatomy and physiology. John Wiley & Sons.

2. Martini, F. (2006). Anatomy and Physiology Ed. Rex Bookstore, Inc..
3. Guyton, A. C. (1991). Basic neuroscience: anatomy and physiology. Philadelphia, PA: Saunders.
4. Shier, D., Butler, J., & Lewis, R. (2015). Hole's essentials of human anatomy & physiology. New York: McGraw-Hill Education.
5. Keller, M. (2015). The science of grapevines: anatomy and physiology. Academic Press.
6. Waugh, A., & Grant, A. (2014). Ross & Wilson Anatomy and physiology in health and illness E-book. Elsevier Health Sciences.
7. Coad, J., &Dunstall, M. (2011). Anatomy and Physiology for Midwives E-Book. Elsevier Health Sciences.
8. Kapit, W., Elson, L. M., & Elson, L. M. (1977). The anatomy coloring book. New York: Harper & Row.

General Biochemistry-Theory

DML 102T

Contacts: 2L+1T **Credits: 03**

Course Overview

This course will introduce and cover the basics of biochemistry. Students will learn about the general structure and function of lipids, carbohydrates, and nucleic acids, as well as the composition, structure, and function of proteins.

Course Outcomes: After Completion of this course, students would be able to:

CO1: Learn the different types of biomolecules, their classification, and functions in the body.

CO2: Gain knowledge and understanding of biochemistry, structure and function of biological molecules.

CO3: Prepare the solutions in different concentration as per the requirement in the biochemistry laboratory.

CO4: Describe the various instruments used in biochemistry lab.

Course contents

Module 1 : Introduction to Biochemistry, Glassware and micropipette

Importance of Biochemistry in MLT; Cleaning of glassware, use of cleaning agent, standardisation of volumetric glassware, use and handling of micropipette.

Module 2: Carbohydrates, Proteins and Lipids

Glucose and Glycogen metabolism; classification of proteins and functions; classification of Lipids and functions,Classification of lipids, chemistry and properties of fatty acids - saturated, &unsaturated fatty acids, triglycerides, phospholipids and steroids.

Module 3 : Vitamins and Minerals

Vitamins: Introduction, classification (fat soluble and water soluble), sources, recommended dietary allowance, deficiencies condition

Minerals: general functions, classification and functions, major characteristics of principal and trace elements, clinically important minerals.

Module 4: Hormones, Acids and bases

Hormones: Introduction, classification, mechanism of action, secondary messengers, role of various hormones, clinically important hormones

Acids and Bases: pH, Henderson-Hasselbalch equation, Buffers, Indicators, Normality, Morality and Molality.

Module 5: Basic Instruments / Equipment of Biochemistry

Principle of colorimetric analysis, selection of filters, Colorimetry, spectrophotometry, Flourimetry, Atomic Absorption Spectrophotometry, nephelometry, Flame photometry Principle, parts, working and care of colorimeter/ spectrophotometer, auto analyzer, semi analyzer.

Text and References

1. Moran, L. A., Horton, R. A., Scrimgeour, K. G., & Perry, M. D. (2014). Principles of biochemistry.
2. Gaw, A., Murphy, M., Srivastava, R., Cowan, R. A., & O'Reilly, D. S. J. (2013). Clinical Biochemistry E-Book: An Illustrated Colour Text. Elsevier Health Sciences.
3. Devlin, T. M. (Ed.). (2006). Textbook of biochemistry: with clinical correlations.
4. McKee, T., & McKee, J. R. (1999). Biochemistry: an introduction. WCB/McGraw-Hill.

5. Baynes, J. W., &Dominiczak, M. H. (2014). Medical Biochemistry E-Book. Elsevier Health Sciences.

General Microbiology-Theory

DML 103T

Contacts: 2L+1T **Credits: 03**

Course overview

General Microbiology course contains basic concept of Microbiology, Microscopy and Microbial Pathogenicity, Sterilization and Disinfection, Culture media and Inoculation. This course is designed to develop the knowledge of Microbiology in students.

Course Outcomes: After completion of this course, students would be able to:

CO1: Know and understand about microorganisms, their importance and history of microbiology.

CO2: Understand and apply various equipmentsand techniques used in microbiology.

CO3: Learn classification and basic morphological characteristics of microbes, their growthand interpretation.

Course contents

Module 1: Introduction to Microbiology

Introduction, importance and scope; safety measures in microbiology; Classification and taxonomy of Micro-organisms; Classification and morphological characteristics of bacteria, viruses, fungi, protozoa and helminthes.

Module 2: Common Lab Equipments

Incubator, Water bath, Centrifuge, Microscope, Fundamentals of Microscopy, working, care and handling of autoclave, hot air oven and laminar air flow

Module 3: Sterilization and Disinfection

Antibacterial, bactericidal, bacteriostatic and germicide agents; Classification and Methods of Sterilization, Sterilization indicators and calibration of equipments; disinfectants and antiseptics – types, mode of action, properties and uses.

Module 4: Growth and Cultivation of Microorganisms

Nutritional requirement of microorganisms, Types of media – liquid, solid , synthetic and routine laboratory media like basal, enriched, selective, enrichment, indicator, transport and storage.Inoculation of culture media, aerobic and anaerobic culture, isolation of pure cultures and disposal of culture. Microbial growth and growth curve.

Module 5: Staining Techniques

Method of smear preparation, Simple staining, gram staining, AFB, staining, Staining of spores, capsule; Principal & Techniques of biochemical test – Carbohydrate utilization test,Catalase, Oxidase, coagulase, Urease test and IMViC test

Text and References

1. Greenwood, D., Slack, R. C., Barer, M. R., & Irving, W. L. (2012). Medical Microbiology E-Book: A Guide to Microbial Infections: Pathogenesis, Immunity, Laboratory Diagnosis and Control. With STUDENT CONSULT Online Access. Elsevier Health Sciences.
2. Ryan, K. J., & Ray, C. G. (2004). Medical microbiology. McGraw Hill, 4, 370.
3. Isenberg, H. D. (1998). Essential procedures for clinical microbiology (pp. 3-36). Washington, DC: ASM press.
4. Levinson, W., &Jawetz, E. (1996). Medical microbiology and immunology: examination and board review. Appleton & Lange.
5. Talaro, K. P., & Chess, B. (2018). Foundations in microbiology. McGraw-Hill.
6. Hart, C. A., & Shears, P. (1996). Color atlas of medical microbiology (No. C QR46 H37 2004). Mosby-Wolfe.
7. Goldman, E., & Green, L. H. (Eds.). (2008). Practical handbook of microbiology. CRC

press.

8. Cappuccino, J. G., & Sherman, N. (2005). Microbiology: a laboratory manual (p. 507). San Francisco: Pearson/Benjamin Cummings.
9. Text Book of Microbiology-Ananthanarayanan& Jayaram Panikker
10. Mackie & McCartney practical medical Microbiology - Colle. Fraser, Marmion, Simmons

Fundamentals of Medical Lab Technology

DML 104T

Contacts : 2L+1T **Credits : 03**

Course Overview

The course would introduce the students to the laboratory rules, ethics, professional code of conduct and polices. It would equip the students with the skills to identify and enumerate different kinds of medical Laboratories and to explain the role of medical laboratory services.

Course Outcomes: After completion of this course, students would be able to:

CO1: Know and understand about the various lab wares, instruments, their importance and applications in the laboratory.

CO2: Understand the classification, structure, and principles of medical laboratories.

CO3: Learn about the various laboratory hazards, biosafety levels, biomedical waste management.

CO4: Understandblood collection techniques, preservation of blood samples, sampling errors, its safe transportation.

CO5: Understand the social, ethical and professional duties of laboratory technician.

Course Contents

Module 1: Introduction to Clinical laboratory

Classification and structure of medical laboratories, Basic laboratory principles, Code of conduct of medical laboratory personnel, Organization of clinical laboratory and role of medical laboratory technician, Medical laboratory professional and professionalism in laboratory workers, Lab borne infection, Bio hazards, fire hazards, chemical hazards, Overview of Biomedical waste management, Bio safety levels

Module 2: Common LaboratoryEquipment

- Types, working principle and handling of micro pipettes
- Burettes, Beakers, Petri dishes, depression plates.
- Flasks - different types)Volumetric, round bottmed, Erlemeyer conical etc.,)
- Funnels – different types (Conical, Buchner etx.,)
- Bottles – Reagent bottles – graduated and common, Wash bottles – different type Specimen bottles etc.,
- Measuring cylinders, Porcelain dish Tubes – Test tubes, centrifuge tubes, test tube draining rack Tripod stand, Wire gauze, Bunsen burner.
- cuvette holders Racks – Bottle, Test tube, Pipette Dessicator, Stop watch, rimers, scissors Dispensers – reagent and sample

Incubator, Hot Air Oven, Water Bath , Anaerobic Jar, Centrifuge, Autoclave, Microscope, Light Microscopy, Fluorescent Microscope, Dark-field Microscope, Common laboratory wares – PVC, polycarbonate, plastic.

Module 3: Phlebotomy

Materials required for blood collection. Blood collection techniques, venous and capillary, preservations and sampling errors. Home collection of blood, its preservations and safe transportation of blood sample, transportation and preservation of biological fluids, Uses of anticoagulants, Process of analysing the specimens, laboratory report.

Module 4: Preparation of Reagents &Characteristics of laboratory Substances

Buffer and pH- Preparation of reagents: Normal, per cent and Molar solution, normal saline, Methods of measuring liquids. The chemical composition, structure, and properties of substances, chemical processes, the use of chemicals and their interactions, danger signs, preparation techniques, and safe disposal methods, Cleaning and care of general laboratory glassware and equipment, Preparation and storage of distilled water, analytical balance

Module 5: Medical Records & Medical Ethics

Definition, Medical Record Forms and their Content, Incomplete Record Control, Utility & functions of Medical Records in Laboratories, Reports & returns in Medical Record System. Medical ethics- Definition, Goal, Scope; Introduction to Code of conduct, Basic principles of medical ethics – Confidentiality, Malpractice and negligence - Rational and irrational drug therapy, Autonomy and informed consent - Right of patients**,** Medical ethics and its principles, Informed consent.

Text and References

1. Textbook of MedicalLabTechnology,Sood, JaypeeBrothers Publications
2. Fundamentals of urine and body fluid analysis (3rd ed.) - Brunzel, N. A
3. Textbook of Medical Laboratory Technology- Darshan P. Godkar, Praful B. Godkar

Computer Applications

DML 105T

Contacts: 2L **Credits:02**

Course Overview

This subject deals with the introduction Database, Database Management system, computer application in clinical studies and use of databases.

Course Outcomes: After completion of this course, students would be able to:

CO1: Understand the number system.

CO2: Learn HTML, XML,CSS and programming languages.

CO3: Understand the application of IT in various functions of labs.

CO4: Learn softwaresused commonly in medical lab technologies.

Course Contents

Module 1: Number System

Binary number system, Decimal number system, Octal number system, Hexadecimal number systems, conversion decimal to binary, binary to decimal, octal to binary etc, binary addition, binary subtraction – One's complement ,Two's complement method, binary multiplication, binary division

Module 2: Concept of Information Systems and Software

Information gathering, requirement and feasibility analysis, data flow diagrams, process specifications, input/output design, process life cycle, planning and managing the project

Module 3: Web technologies

Introduction to HTML, XML,CSS and Programming languages, introduction to web servers and Server Products Introduction to databases, MYSQL, MS ACCESS, Pharmacy Drug database

Module 4: IT in Labs

Awareness on the application of IT in Various functions of labs; Working knowledge of commonly used software in medical lab technologies.

Communication Skills
DML 106

Contacts: 2L **Credits: 02**

Course Overview

This course is designed to facilitate the students to communicate effectively by emphasizing on practical communication through refurbishing their existing language skills and also to bring one and all to a common take-of level

Course Outcomes: After completion of this course, students would be able to:

CO1: Understand the process, types and channelsof communication.

CO2: Learnthe body language and develop listening skills.

CO3: Learn presentation skills, email writing, resume writing,business correspondence, circulars & advertisements.

CO4: Learn stress management, time management, conflict management, diversity Management.

Course Contents

Module 1: Introduction to communication

Meaning, Process of Communication, Types of Communication, verbal and non-verbal, advantages and disadvantages.

Body Language, Channels of Communication, Formal and Informal, Directions of Communication within organisation, Barriers to communication-Listening Skills.

Module 2: Presentation Skills and confidence building

Presentation skills, Email writing, Resume writing,business correspondence, circulars & advertisements. Telephone etiquettes, Group Discussion, Networking skills, Facing Interviews – Mock Interview.

Module 3: Management skills

Stress management, Time Management, Conflict Management, Diversity Management. Managing meeting and Prsonal attitudes.

Module 4: Team Building

Leadership and team building; Corporate etiquettes, Human behavior and communication, its role in public healthproblems and solutions.

Text and References

1. Sharan J.Gerson and Steven M.Gerson – "Technical Writing – Process and Product" – Pearson Education – 2000.
2. Raymond V.Lesikar, John D. Pettit and Mary E.Flatley – Lesikass Basic Communication Tata McGraw Will 8th Edition – 1999.
3. Stevel. E. Pauley, Daniel G.Riordan – Technical Report Writing Today – AITBS Publishing & Distributors, India 5th edition – 2000.
4. Robert L.Shurter, Effective letters in business Third Ed. 1983.
5. Communication Skills by Vasantha Patri
6. McGraith – Basic Managerial Skills for all Prentice Hall of India – 6th Edition 2002.
7. Halliday, M.A. K R .Hasan, Cohesion in English, Longman, London 1976.

Anatomy and Physiology-I Practical

DML 101P

Contacts: 4P **Credits: 02**

Course Overview

Practical anatomy and physiology is complimentary to the theoretical discussions in anatomy and physiology. Practicals allow the verification of anatomical and physiological processes discussed in theory classes through experiments on living tissue, intact animals or normal human beings. Helps the students to understand the alterations in physiology in diseases and more emphasis shall be given to those relevant for medical laboratory technology students.

Course Outcomes: After completion of this course, students would be able to:

CO1: Demonstrate the different parts of the body.

CO2: Explain and demonstrate the structural differences between different types of muscles.

CO3: Analyze the difference in the tissues of the body.

CO4: Learn and explain the various parts of bones.

CO5: Demonstratethe different parts of gastro-intestinal, respiratory system and the heart.

LIST OF PRACTICALS

(Note: Demonstration may be performed from models and charts wherever applicable)

1. Demonstration of different parts of body

- Cranial cavity (Brain)
- Thoracic cavity (Heart and lungs)
- Abdominal cavity (Stomach, intestines, Liver, Gallbladder, spleen, pancreas, kidney,)
- Pelvic cavity (Reproductive organs)

2. Demonstration of basic tissues of the body (from prepared slides)

Epithelial tissue, Connective tissue, Muscular tissue, Nervous tissue

3. Demonstration of various parts of bones

- Bones of upper limb: Humerus, radius, ulna, fibula and articulated hand, Scapula and clavicle
- Bones of lower limb: Pelvic/hip bone, femur, tibia, fibula and articulated foot.
- Bones of Skull and mandible: Sternum and ribs, Bones of vertebral column

4. Demonstration of structural differences between: (from prepared slides)

Skeletal muscle, Smooth muscle and Cardiac muscle

5. Demonstration of heart:

- External features, internal features, valve areas, blood vessels attached to chambers, Coronary arteries
- Demonstration of Apex beat and Median Cubital vein (Ante cubital vein)

6. Demonstration of Radial pulse examination.

7. Demonstration of Blood pressure Estimation or recording

8. Demonstration of parts of respiratory system:

- Nose, pharynx and larynx, Trachea, bronchus and lungs.
- Demonstration of techniques of respirometer.

9. Demonstration of various parts of Gastro Intestinal system:

Mouth, esophagus, stomach, intestines, Liver & Gall bladder, Pancreas, Kidney

General Biochemistry- Practical

DML 102P

Contacts: 4P **Credits: 02**

Course Outcomes: After completion of this course, students would be able to:

CO1: Preparedifferent types of solutions and reagents.

CO2: Use and maintain the different types of equipment used in biochemistry lab.

CO3: Detect the presence of different bio-molecules in the sample.

CO4: Perform quantitative and qualitative analysis of different biomolecules in the samples.

List of Practicals

1. Use and proper maintenance of -Analytical balance, Electronic balance, Centrifuge, Colorimeter, spectrophotometer, pH meter, Homogenizer, Desiccators
2. Uses of Analytical balance, preparation of standard solutions, % solutions (V/V. W/V normal and molar solutions and preparation of reagents.
3. General reactions and identification of carbohydrates glucose, fructose, maltose, lactose sucrose, dextrin, starch and glycogen.
4. General reaction of proteins, colourreaction and precipitation of proteins- albumin, casein, gelatin, peptone.
5. Acidimetry and alkalimetry
6. pH determinationusingcolorimetricmethods and using pH meter.
7. Qualitative analysis of carbohydrates (Glucose, Fructose, Lactose, Maltose, Sucrose, , dextrin, starch and glycogen.)

8. Quantitative analysis of reducing sugars (DNSA method) and Proteins (Biuret method)
9. Reactions of Amino acids, colour reactions of albumin, globulin, casein, gelatin and peptone.
10. Benedict’s Test and Heat Coagulation Tests

General Microbiology-Practical

DML 103P

Contacts: 4P **Credits: 02**

Course Outcomes: After completion of this course, students would be able to:

CO1: Learn the laboratory safety rules and regulation in microbiology laboratory.

CO2: Explain the usage and proper maintenance of various laboratory instruments.

CO3: Demonstratethe different types of physical methods of sterilization.

CO4: Learn the different methods of disinfection.

CO5: Prepare the media and reagents for different biochemical tests.

CO6: Perform and report the results of various biochemical tests.

List of Practicals

1. Study of laboratory safety rules and regulation in microbiology laboratory.
2. Introduction and demonstration of Laboratory Equipment used in Microbiology
3. Demonstration of different types of physical methods of sterilization. Sterilization of heat labile fluids, glass wares, liquids, plastic and other laboratory and hospital wares
4. Demonstration of different methods of disinfection
5. Preparation of cotton plugs.
6. Pouring of the culture media.
7. Preparation of Slants.
8. Preparation of various culture media (solid and liquid).
9. Aerobic & anaerobic culture method
10. Study of colony character , Detection of motility - Hanging drop examinations with motile bacteria
11. To Perform simple staining, Gram staining, AFB staining and Capsule staining

12. Preparation of media and reagents for different biochemical tests. Performing and reporting of biochemical tests: IMViC, Catalase,Coagulase,Oxidase, Urease and carbohydrate utilization test

Computer Applications-Practical

DML 105P

Contacts: 4P **Credits: 02**

Course Outcomes: After completion of this course, students would be able to:

CO1: Design a questionnaire using a word processing package.

CO2: Learn the various tools and techniques for efficient working in medical laboratory.

CO3: Export tables, queries, forms and reports to web pages and XML pages.

CO4. Gain the working knowledge of commonly used software in medical lab technologies.

List of Practicals

1. Design a questionnaire using a word processing package to gather information about a particular disease.
2. Create a HTML web page to show personal information.
3. Retrieve the information of a drug and its adverse effects using online tools
4. Creating mailing labels Using Label Wizard , generating label in MS WORD
5. Create a database in MS Access to store the patient information with the required fields Using access
6. Using Excel in minor Statistics
7. Design a form in MS Access to view, add, delete and modify the patient record in the database Generating report and printing the report from patient database
8. Creating invoice table using – MS Access
9. Drug information storage and retrieval using MS Access
10. Creating and working with queries in MS Access
11. Exporting Tables, Queries, Forms and Reports to web pages
12. Exporting Tables, Queries, Forms and Reports to XML pages

13. Awareness on the application of IT in Various functions of labs;Working knowledge of commonly used software in medical lab technologies like Laboratory Information Management Software (LIMS), Apex LIS, eLAB

SEMESTER II

Anatomy and Physiology – II Theory

DML 201T

Contacts: 2L+1T **Credits: 3L**

Course Overview

Human Anatomy and Physiology is a laboratory-based course that investigates the structure and function of the human body. It includes urinary system, endocrine system, nervous system, reproductive system, and respiratory system. This course is designed to develop the knowledge of anatomy and physiology in students which will further help them in their respective programs.

Course Outcomes: After completion of this course, students would be able to:

CO1: Understandthe structure and function of the various sense organs.

CO2: Explain different components with their functions with relation to the urinary and reproductive system.

CO3: Learn the structure and functions of nervous system.

CO4: Understand the different glands of the body and their functions.

Course contents

Module 1: SENSE ORGANS

Elementary knowledge of structures and functions of Eyeball, Ear, Nose, tongue and Skin

Module 2: URINARY SYSTEM

Structures and functions of various organs of Urinary system: Kidney, ureter, Urinary bladder, Urethra

Structure and functions of nephron, Physiology of urine formation, Composition of urine, Pathophysiology of renal disease and edema, Glomerular Filtration Rate.

Module 3: REPRODUCTIVE SYSTEM

Structures and functions of Female reproductive organs: Uterus, Ovary, Uterine tubes, vagina
Ovarian cycle, ovulation and fertilization
Structures and functions of Male reproductive organs: Testis, spermatic cord, epididymis, vas deferens, seminal vesicles, ejaculatory ducts, prostate.
Spermatogenesis

Module 4: NERVOUS SYSTEM

Central Nervous system: Structure and functions Brain and spinal cord
Peripheral Nervous system: Structures and functions of Cranial nerves and spinal nerves
Autonomic Nervous system: Structures and functions Parasympathetic and Sympathetic nerves.
Structure and functions of Neurons; and Transmission of nerve impulse

Module 5: ENDOCRINE GLANDS

Structures and functions of Endocrine glands: Pituitary gland, Thyroid gland, Parathyroid gland, Suprarenal glands, Thymus gland.

Text and References

1. Tortora, G. J., &Derrickson, B. H. (2008). Principles of anatomy and physiology. John Wiley & Sons.
2. Martini, F. (2006). Anatomy and Physiology'2007 Ed. Rex Bookstore, Inc..
3. Guyton, A. C. (1991). Basic neuroscience: anatomy and physiology. Philadelphia, PA: Saunders.
4. Shier, D., Butler, J., & Lewis, R. (2015). Hole's essentials of human anatomy & physiology. New York: McGraw-Hill Education.
5. Keller, M. (2015). The science of grapevines: anatomy and physiology. Academic Press.

6. Waugh, A., & Grant, A. (2014). Ross & Wilson Anatomy and physiology in health and illness E-book. Elsevier Health Sciences.

7. Coad, J., &Dunstall, M. (2011). Anatomy and Physiology for Midwives E-Book. Elsevier Health Sciences.Kapit, W., Elson, L. M., & Elson, L. M. (1977). The anatomy coloring book. New York: Harper & Row.

Haematology – I Theory
DML202T

Contacts: 2L+1T **Credits: 03**

Course Overview

Hematology course includes basic concept of Hematology, Instruments and apparatus used in hematology laboratory, Blood cells count, Hemocytometer and Automated cell counter. This course is designed to develop the knowledge about blood its various components, identification &analysis (Hematology) in students.

Course Outcomes: After completion of this course, students would be able to:

CO1: Understandthe basic components and concepts of Hematology.

CO2: Explain the different types of instruments or devices with their functions commonly used in medical laboratory.

CO3: Understand the responsibilities of a lab technologist

CO4: Describe basic theories of homeostasis.

CO5: Gain knowledge and understanding about the basic haematological diagnosis.

Course Contents

Module 1:Introduction to Hematology and its Equipments

Components of blood, functions of blood; Shape, size, structure and functions of blood cells.

Haemopoiesis: Erythropoiesis, leucopoiesis and thrombopoiesis.

Introduction to a microscope, Parts of a microscope, Centrifuge, Automated Cell Counter, Urine Analyser, Coagulometer Responsibilities of a lab technologist

Module 2: Coagulation Studies

Hemostasis - Basic concept and principle, Basic steps involved in Hemastosis. Basic Physiology of Coagulation, Coagulation factors., Mechanism of blood coagulation,Role of coagulation factors, Coagulation inhibitory system, Extrinsic Pathway, Intrinsic Pathway, Regulators of blood coagulation.

Module 3: Basic Haematological diagnosis

Preparation of Blood Smears, Specimen, EDTA blood, Blood Smear Method, Cover slip method, Spreader slide method, Wedge method, Types of Smear, Staining Of the Blood Films, Preparation of Stains, Total Cell Count, RBC, WBC, Platelets, Absolute Eosinophil Count, Estimation of Hemoglobin, PCV & Erythrocyte Indices, E.S.R, Importance of ESR Reticulocyte Count , Differential Count , Bleeding time, clotting time, prothrombin time.

Text and References

1. Godkar, P. B., &Godkar, P. D. (2005). Text Book of Medical Laboratory Technology: Basic Histopathologic Techniques and the Laboratory Requirements.
2. Rodak, B. F., Keohane, E. M., &Fritsma, G. A. (2013). Hematology-E-Book: Clinical Principles and Applications. Elsevier Health Sciences.
3. Sacher, R. A. (1987). Clinical hematology and fundamentals of haemostasis. Davis.
4. Diem, H., Haferlach, T., &Theml, H. (2004). Color Atlas of Hematology: Practical Microscopic and Clinical Diagnosis. Thieme.
5. Orkin, S. H., Nathan, D. G., Ginsburg, D., Look, A. T., Fisher, D. E., & Lux, S. (2014). Nathan and Oski'sHematology and Oncology of Infancy and Childhood E-Book. Elsevier Health Sciences.
6. Rodak, B. F., &Carr, J. H. (2015). Clinical Hematology Atlas-E-Book. Elsevier Health Sciences.
7. Mazza, J. J. (Ed.). (2002). Manual of clinical hematology. Lippincott Williams & Wilkins.
8. Keohane, E. M., Otto, C. N., &Walenga, J. M. (2019). Rodak'sHematology-E-Book: Clinical Principles and Applications. Elsevier Health Sciences.

Pathology -Theory
DML203T

Contacts: 2L+1T **Credits: 03**

Course Overview

Pathology Course is designed to provide students with essential medical knowledge and a broad understanding of human disease. The Course emphasizes "the language of disease" as a necessary foundation for self-education and lifelong learning. glossary or important diseases discussed in lecture.

Course Outcomes: After completion of this course, students would be able to:

CO1: Understandthe pathology of various diseases.

CO2: Explain the role of microbes responsible for pathogenesis of tumors and their oncogenesis.

CO3: Describe the science behind the process of healing.

CO4: Learn the definition, types and determinations of innate immunity and its mechanism.

Course Contents

Module 1: Basic Terminolgies

Inflammation , Acute inflammation - vascular event, cellular event, inflammatory cells. Chronic Inflammation - general features, granulomatous inflammation, tuberculoma.Pathology of localized and systematic infections. Healing: Definition, different phases of healing, factors influencing wound healing. Cell death and necrosis. Thrombosis,Embolism, Ischaemia and Infarction.

Module 2: Pathology of specific chronic infective disorders

Pathology of Tuberculosis, Leprosy and Syphilis Immunity: Definition, types and

determinations of innate immunity and its mechanism.

Module 3:

Phagocytosis, Compliment systems, Formation of antibody-hybridoma technology. Study of microbes responsible for pathogenesis of tumors and their oncogenesis.

Module 4

Derangement of body fluids, Disorders of circulation, AIDA and Hepatitis, Adaptive Disorders of Growth.

Text and References

1. J Ochei and A Kolhatkar (2000). Medical Laboratory Science- Theory and Practice, 1st Edition , Tata Mcgraw Hill Publishing Co Ltd.
2. Godkar, P. B., &Godkar, P. D. (2005). Text Book of Medical Laboratory Technology: Basic Histopathologic Techniques and the Laboratory Requirements
3. C F A Culling (1974). Handbook of Histopathological and Histochemical Techniques, 3rd Edition, Butterworth-Heinemann.
4. Bancroft J. D and Gamble M (2008). Theory & Practice of Histological Techniques, 6thEdition, Churchill livingstone.
5. Haven, M. C., Tetrault, G. A., &Schenken, J. R. (Eds.). (1994). Laboratory instrumentation. John Wiley & Sons.
6. Saliterman, S. S. (2006). Fundamentals of BioMEMS and medical microdevices. Bellingham, WA: Wiley-Interscience.
7. Baker, F. J., & Silverton, R. E. (2014). Introduction to medical laboratory technology. Butterworth-Heinemann.

Clinical Biochemistry Theory

DML 204T

Contacts: 2L+1T **Credits: 03**

Course overview

Clinical biochemistry combines analytical chemistry with aspects of physiology, physical chemistry, pathophysiology and diagnostic medicine. Clinical biochemistry uses biochemical knowledge and techniques to assist in the diagnosis of human disease, to follow its progress and to monitor the effect of treatment. Biochemistry, biochemical testing, and specialist biochemical practitioners have an important role in clinical practice in both diagnosis and management.

Course Outcomes: After completion of this course, students would be able to:

CO1: Learn about urine analysis and its clinical significance.
CO2: Understand the physical characteristics and composition of stool.
CO3: Explain the composition,functions and clinical significance of CSF.
CO4: Estimate various parameters in CSF and understand the normal and abnormal levels.
CO5: Describe the nomenclature, chemical nature and their relation in diseases.

Course contents

Module 1: Urine Analysis

Normal Composition of Urine and its Properties, Collection and preservation of Urine, Clinical Importance of Urine Analysis, Abnormal Constituents like Sugar, Proteins, Bile Salts, Bile Pigments, Blood, Ketone bodies, Urobilinogen in excess; Identification of Sugar, Glycosuria and Proteinuria.

Module 2: Stool Chemistry

Physical characteristics and Composition of Stool; Significance of Blood, Excess fats and Stercobilinogens in Stool, Detection of Occult blood. Theory of Fat and Stercobilinogen Estimation.

Module 3: Cerebrospinal Fluid

Composition and Functions of CSF. Clinical significance of CSF Analysis.Estimation of Sugar, Chloride, Proteins in CSF; Normal And Abnormal levels

Module 4: Biological Fluids

Formation and Composition of different Biological Fluids. Trunsudate and Exudates (Peritoneal/Pleural/Synovial/Ascitic/Gastric Juice etc); Principle of Protein Estimation in Different Biological Fluids; Free And Total Acidities in Gastric Juice

Module 5 : Enzymes

Definitions, nomenclature, chemical nature of enzymes, classification, factors affecting enzyme activity, Active sites, Co-enzyme, Enzyme inhibition, Units of Enzyme, Isoenzymes, Enzyme pattern in diseases.

Module 6: Chromatography

Theory of Chromatographic Separation, Different Chromatographic Methods like Paper and TLC, Separation of Amino Acid/Sugars etc

Text and References

1. Moran, L. A., Horton, R. A., Scrimgeour, K. G., & Perry, M. D. (2014). Principles of biochemistry.
2. Gaw, A., Murphy, M., Srivastava, R., Cowan, R. A., & O'Reilly, D. S. J. (2013). Clinical Biochemistry E-Book: An Illustrated Colour Text. Elsevier Health Sciences.
3. Devlin, T. M. (Ed.). (2006). Textbook of biochemistry: with clinical correlations.
4. McKee, T., & McKee, J. R. (1999). Biochemistry: an introduction. WCB/McGraw-Hill.
5. Baynes, J. W., &Dominiczak, M. H. (2014). Medical Biochemistry E-Book. Elsevier Health Sciences.
6. In, E. C. (1997). Textbook of biochemistry with clinical correlations.

7. Varley, H. (1954). Practical clinical biochemistry. Practical clinical biochemistry.

8. White, A., Handler, P., Smith, E., &StettenJr, D. (1959). Principles of biochemistry. Principles of Biochemistry., (Edn 2).

Clinical Bacteriology

DML 205T

Contacts: 2L+1T **Credits: 03**

Course Overview

The course will provide students with an introduction to the theory of clinical bacteriology. It will equip students with an appreciation of the role of the clinical Bacteriology for diagnosis and management of common diseases.

Course Outcomes: After completion of this course, students would be able to:

CO1: Learn the detailed systematic and diagnostic study of bacteria.

CO2: Understand the morphology, pathogenicity, lab diagnosis and prophylaxis of various types of bacteria.

CO3: Learn the processing of the various biological specimens.

CO4: Explain the common type of nosocomial infection.

CO5: Describe the bacteriological examination of water, milk and air.

Course Contents

Module 1: Bacteriology

Introduction, detailed systematic and diagnostic study of bacteria (medically important, pathogenic and related organism), bacterial reproduction, bacterial growth; Bacterial genetics- plasmid, mutation, transformation, transduction and conjugation.

Module 2: Types of Bacteria

Morphology, pathogenicity, lab diagnosis and prophylaxis of:

Gram negative bacteria:Neisseria gonorrhoeae, Neisseria meningitides, Escherichia coli, Shigella, Klebsiella, Proteus, Yersinia, Salmonella, Vibrio, Aeromonas, Pseudomonas,

Campylobacter, Bacteroides, Fusobacterium, Brucella, Haemophilus, Bordetella and Helicobacter pylori.

Gram positive bacteria: Staphylococci, Streptococci, Pneumococcus, Enterococcus, Bacillus, Corynebacterium, Clostridia, Mycobacterium, Actinomycetes and Listeria.

Miscellaneous bacteria:Spirochetes, Rickettsiae, Chlamydia and Mycoplasma.

Module 3: Nosocomial infections

Introduction, common type of nosocomial infection, surveillance (bacteriological) and control nosocomial infection.

Module 4: Processing of clinical samples

Processing of Blood, sputum, throat swab, nasopharyngeal swab, Pus & wound swab, urine, CSF and other body fluids, stool and rectal swab

Module 5: Special laboratory techniques

Antimicrobial susceptibility testing; Bacteriological examination of water, milk and air.

Text and References

1. Greenwood, D., Slack, R. C., Barer, M. R., & Irving, W. L. (2012). Medical Microbiology E-Book: A Guide to Microbial Infections: Pathogenesis, Immunity, Laboratory Diagnosis and Control. With STUDENT CONSULT Online Access. Elsevier Health Sciences.
2. Ryan, K. J., & Ray, C. G. (2004). Medical microbiology. McGraw Hill, 4, 370.
3. Isenberg, H. D. (1998). Essential procedures for clinical microbiology (pp. 3-36). Washington, DC: ASM press.
4. Levinson, W., &Jawetz, E. (1996). Medical microbiology and immunology: examination and board review. Appleton & Lange.
5. Talaro, K. P., & Chess, B. (2018). Foundations in microbiology. McGraw-Hill.
6. Hart, C. A., & Shears, P. (1996). Color atlas of medical microbiology (No. C QR46 H37 2004). Mosby-Wolfe.
7. Goldman, E., & Green, L. H. (Eds.). (2008). Practical handbook of microbiology. CRC press.

8. Cappuccino, J. G., & Sherman, N. (2005). Microbiology: a laboratory manual (p. 507). San Francisco: Pearson/Benjamin Cummings.
9. Mackie & Macartney practical medical Microbiology - Collee. Fraser, Mar mion, Simmons

Anatomy and Physiology-Practical
DML201P

Contacts: 4P **Credits: 02**

Practical anatomy and physiology is complimentary to the theoretical discussions in anatomy and physiology. Practicals allow the verification of physiological processes discussed in theory classes through experiments on living tissue, intact animals or normal human beings. This is helpful for developing an insight on the subject.

Course Outcomes: After completion of this course, students would be able to:

CO1: Demonstratethe various sense organs.
CO2: Demonstratethe various parts of the urinary system.

CO3: Demonstratethe various parts of the male and female reproductive system.

CO4: Demonstrate the various endocrine glands.

List of Practicals

(Note: Demonstration may be performed from models and charts wherever applicable)

1. **SENSE ORGANS:** Demonstration of various sense organs of Eyeball, Ear, Nose, tongue, skin

2. **URINARY SYSTEM**: Demonstration of various parts of Urinary system: Kidney, Ureter, Urinary bladder and Urethra

3. **REPRODUCTIVE SYSTEM**:

A) Demonstration of various parts of female reproductive organs. Ovary, Uterus, Uterine tubes, cervix and Vagina

B) Demonstration of various parts of Male reproductive organs: Testis, spermatic cord, epididymis, vas deferens, seminal vesicles, ejaculatory ducts, prostate

4. **NERVOUS SYSTEM**: Demonstration of Various parts of Brain: Cerebrum, Cerebellum, Pons and Medulla.

5. **ENDOCRINE GLANDS**: Demonstration of various Endocrine glands: Pituitary gland, Thyroid gland, Parathyroid glands, Suprarenal glands and Thymus glands

Haematology-I Practical
DML 202P

Contacts: 4P **Credits: 02**

Course Outcomes: After completion of this course, students would be able to:

CO1: Learn the working, use and maintenance of the various haematological instruments.

CO2: Explain the preparation of the various types of anticoagulants.

CO3: Understand the collection of venous and capillary blood.

CO4: Perform various haematological tests.

List of Practicals

Demonstrations

1. Instruments & appliances for use in Haematology- Working & maintenance
2. Preparation of various anticoagulants
3. Preparation, sterilization of buffers and solutions
4. Preparation of the stains and other reagents

Practicals

5. Collection of venous and capillary blood
6. Preparation of peripheral blood film
7. Estimation of hemoglobin by Sahli's method and CMG method.
8. To perform RBC Count, WBC Count, platelet Count, DLC
9. To perform blood grouping system.
10. To perform ABO and RH blood grouping by forward and reverse typing
11. Coagulation profile: bleeding time (BT) Clotting time (CT), and clot retraction test (CRT)

Pathology -Practical

DML 203P

Contacts: 4P **Credits: 02**

Course Outcomes: After completion of this course, students would be able to:

CO1: Understand the pathological conditions and their clinical importance.

CO2: Correlate normal and altered morphology of different organ systems in different diseases together with their clinical significance.

CO3: Classify diseases of various body systems and how they manifest clinically and histopathologically.

List of Practicals

Demonstration

1. Identify and interpret gross and microscopic features of acute inflammations in organs such as appendix, lungs, meninges,
2. Cellular components of chronic and granulomatous inflammation
3. Granulation tissue, callous
4. Histopathological slides to demonstrate the various types of cell injury, calcification and extracellular accumulation
5. Demonstration of inflammatory changes morphologically by suitable histopathological slides.
6. Types of necrosis: caseous, coagulative, liquifactive
7. Identify and interpret gross and microscopic features of organs in commonly occurring neoplastic and non-neoplastic diseases

Clinical Biochemistry-Practical

DML 204P

Contacts: 4P **Credits: 02**

Course Outcomes: After completion of this course, students would be able to:

CO1: Preparethe vials for blood collection.

CO2: Prepareplasma /serum/PFF

CO3: Perform basic biochemistry laboratory testing and estimate the levels of the various parameters in biological samples.

List of Practicals

1. Preparation of vials for blood collection
2. Preparation of Plasma /Serum/PFF
3. Qualitative analysis of urine for abnormal constituents
4. Estimation of Blood/plasma/Serum Glucose
5. Estimation of Total Protein in sample
6. .Estimation of chloride in biological sample
7. Estimation of occult blood in stool sample.
8. Estimation of Serum ALP
9. Estimation of SGOT and SGPT

Clinical Bacteriology - Practical

DML 205P

Contacts: 4P **Credits: 02**

Course Outcomes: After completion of this course, students would be able to:

CO1: Perform streak plate and pour plate, spread plate method or carpet culture.

CO2: Identifythe medically important bacteria from pure culture.

CO3: Process the various biological samples for culture and identification of pathogens.

List of Practicals

1. To perform streak plate and pour plate, spread plate method or carpet culture
2. Identification of medically important bacteria from pure culture: Staphylococcus, Streptococcus, E.coli, Klebsiella.
3. Demonstration of anaerobic culture techniques
4. Preparation of different solid culture media and liquid culture media for the processing clinical samples
5. Processing of following clinical samples for culture and identification of pathogens: –
   i) Blood
   ii) Throat swab
   iii) Sputum
   iv) Pus
   v) Urine
   vi) Stool
6. Processing of water, milk, food and air samples for bacteriological examination

SEMESTER III

Haematology-II Theory

DML 301T

Contacts: 2L+1T **Credits: 03**

Course overview

To develop the knowledge about the pathophysiology and investigation of important morphological blood cell disorders such as anisocytosis, poikilocytosis, anemia and leukemia based on an up-to-date knowledge.

Course Outcomes: After completion of this course, students would be able to:

CO1: Explain the morphological disorders of blood cells, physiological variations of erythrocytes, leucocytes and thrombocytes.

CO2: Describe the various components of blood, their functions, and roles in various disease states.

CO3: Understand about anemia.

CO4: Describe the details of Leukemia and its classification.

CO5: Explains the pathogenesis and laboratory diagnosis of different types of anaemia andleukemia.

Course Contents

Module 1: Blood Cells Disorders

Morphological disorders of blood cells, physiological variations of erythrocytes, leucocytes and thrombocytes

Bone Marrow: Cell composition of normal adult Bone marrow, Aspiration, Preparation & Staining, Periodic Acid Schiff, Sudan Black, Myeloperoxidase

Module 2: Anemia

Classification of Anemia, Distribution of body Iron, Iron Absorption, Iron deficiency, lab findings, causes, sign and symptoms, and laboratory diagnosis of iron deficiency anemia, pernicious anemia, megaloblastic anemia, aplastic anemia, sideroblastic anemia; anemia due to chronic renal failure and liver disease.

HemolyticAnemia:Pathogenesis and laboratory diagnosis of hereditary spherocytosis, hereditary elliptocytosis, thalassemia and sickle cell anemia; other types of anemia- Glucose -6-phosphate dehydrogenase deficiency, pyruvate kinase deficiency, paroxysmal nocturnal haemoglobinuria, warm antibody type, cold antibody type, incompatible blood transfusion, hemolytic disease of newborn.

Module 3: Leukemia

Classification, Blood Picture, Differentiation of Blast cells, Introduction, causes, sign & symptoms, classification and laboratory diagnosis; Haemopoisis- cell maturation-myeloid and lymphoid leukemia

Text and References

1. Godkar, P. B., &Godkar, P. D. (2005). Text Book of Medical Laboratory Technology: Basic Histopathologic Techniques and the Laboratory Requirements.
2. Rodak, B. F., Keohane, E. M., &Fritsma, G. A. (2013). Hematology-E-Book: Clinical Principles and Applications. Elsevier Health Sciences.
3. Sacher, R. A. (1987). Clinical hematology and fundamentals of haemostasis. Davis.
4. Diem, H., Haferlach, T., &Theml, H. (2004). Color Atlas of Hematology: Practical Microscopic and Clinical Diagnosis. Thieme.
5. Orkin, S. H., Nathan, D. G., Ginsburg, D., Look, A. T., Fisher, D. E., & Lux, S. (2014). Nathan and Oski's Hematology and Oncology of Infancy and Childhood E-Book. Elsevier Health Sciences.

Immunology, Parasitology and Serology-Theory

DML 302T

Contacts: 2L+1T **Credits: 03**

Course Overview

The course will provide students with an introduction to the theory Immunology, Parasitology and Serology.

Course Outcomes: After completion of this course, students would be able to:

CO1: Understand the human immune system and their responses, detailed idea about the immunity of the body.

CO2: Describe the innate, acquired, local and herd immunity.

CO3: Learn about the concept of antibody, their structure, classes, properties and function.

CO4: Describe the parasite and hostrelationship.

CO5: Gainknowledge about the life cycle, transmission, pathogenicity, and control strategies of clinically important parasites.

CO6: Explain the pathogenesis and laboratory diagnosis of different diseases caused by various protozoans and helminths.

CO6: Apply knowledge of the various serological tests and advanced diagnostic techniques to diagnoseparasitic infection and also interpret the tests.

Course Contents

Module 1: Immunity, Antigen and Antibody

Definitions: Infection, Pathogenicity, Virulence, Primary infection, nosocomial infection

Immunity: Definition, types - Innate, acquired, local and herd immunity, opsonization and phagocytosis, vaccine and immunization.
Antigen: Antigen properties, structure and types; Adjuvant.
Antibody: Immunoglobulin – structure, classes, properties and function; Monoclonal and polyclonal antibody.
Antigen Antibody Reactions

Module 2: Immune System

Principles of Humoral and cellular immune response; Major histocompatibility complex; Cell and Organs of Immune System - Primary lymphoid organ, secondary lymphoid organ, T-lymphocytes, B-lymphocytes, cytokines, TNF, Interferon; General Properties and Pathways of Complement system

Module 3: Introduction of Parasitology

Introduction to clinical parasitology, general characteristics, morphology and classification of parasites, classification of hosts and vectors, relationship between parasites and host, mode of transmission of parasitic infections.

Module 4: Protozoologyand Helminthology

Morphology, life cycle, pathogenicity, prevention and lab diagnosis of Entamoeba, Dientamoeba, Iodamoeba, Trichomonas, Trypnosomes, Leishmania, Giardia, Plasmodium, Isopaora, Balantidium and Toxoplasma.

Morphology, life cycle, pathogenicity, prevention and lab diagnosis of Platyhelminthes and Nemathelminthes: (egRound worm, Hookworm, T.solium, T seginata)

Module 5

Antigen Antibody Reactions – Principle and application of agglutination, precipitation and flocculation reaction.

Module 6: Serological tests and Advanced Diagnostic Techniques

Principle, technique, interpretation of - WIDAL, RPR, ASO,CRP, TPHA test by agglutination technique
Advance diagnostic techniques like ELISA, Immunoelectrophorasis.

Text and References

1. Greenwood, D., Slack, R. C., Barer, M. R., & Irving, W. L. (2012). Medical Microbiology E-Book: A Guide to Microbial Infections: Pathogenesis, Immunity, Laboratory Diagnosis and Control. With STUDENT CONSULT Online Access. Elsevier Health Sciences.
2. Ryan, K. J., & Ray, C. G. (2004). Medical microbiology. McGraw Hill, 4, 370.
3. Isenberg, H. D. (1998). Essential procedures for clinical microbiology (pp. 3-36). Washington, DC: ASM press.
4. Levinson, W., &Jawetz, E. (1996). Medical microbiology and immunology: examination and board review. Appleton & Lange.
5. Talaro, K. P., & Chess, B. (2018). Foundations in microbiology. McGraw-Hill.
6. Hart, C. A., & Shears, P. (1996). Color atlas of medical microbiology (No. C QR46 H37 2004). Mosby-Wolfe.
7. Goldman, E., & Green, L. H. (Eds.). (2008). Practical handbook of microbiology. CRC press.
8. Cappuccino, J. G., & Sherman, N. (2005). Microbiology: a laboratory manual (p. 507). San Francisco: Pearson/Benjamin Cummings.

Histopathology and Cytology-Theory
DML 303T

Contacts: 2L+1T **Credits: 03**

Course Overview

The course introduces the students to the various types of tissue preparations and developing expertise in the students in Tissue processing, Embedding, Microtome and Mounting and Staining procedure in Histopathology. Cytology part exposes the students to the latest advancements in cytological investigations.

Course Outcomes: After completion of this course, students would be able to:

CO1: Understand theconcept of tissue processing and embedding.
CO2: Describe fixatives, their classification, properties, composition.
CO3: Learn about the concept of microtome and mounting.
CO4: Describe the principle and theory of hematoxylin and eosin staining.
CO5: Describe and recognize cells of specific histological tissues and organ systems.
CO6: Learn the collection of sample, preparation of smears and their staining for cytology.

Course contents

Module 1: Grossing, Fixation and Decalcification

Grossing and specimen's management; Fixatives - classification, properties, composition,; Post chroming.Decalcification - decalcifying agentandcomposition.

Module 2: Tissue processing and Embedding

Tissue processing, dehydrating agents and dehydration process, clearing, Impregnation, Paraffin Embedding.

Module 3: Microtome and Mounting

Microtome: Definition, types, care and use of microtome; Microtome knife, honing and stropping; Technique for sectioning, paraffin embedded tissue, frozen section; Errors in sectioning and remedies; Mounting solutions.

Module 4: Staining

Principle and theory of hematoxylin and eosin staining; Specific stain for collagen, reticulin, elastin, fat, amyloid, glycogen, mucin, iron and neuron.

Module 5

Solvents mordents accelerators and accenuators.Special staining procedure for connective tissues, Carbohydrates, Amyloids and Pigments.

Meta chromasia and Metachromatic dyes. Museum technique. Exfoliative cytology, FNAC and Cervical cytology, Techniques, Applications and interpretation of results.

Module 6: Cytology

A. Female Genital tract:

1. Anatomy, Histology, Physiology & normal cytology
2. Techniques of collection of specimen for cervical cytology study.
3. Cytology in Ovarian cancers

B. Respiratory tract, Gastrointestinal tract and Urinary tract:

1. Anatomy, Histology, Physiology
2. Collection of sample, preparation of smears and staining
3. Cytology of normal, non-malignant& malignant conditions

Text and References

1. J Ochei and A Kolhatkar (2000). Medical Laboratory Science- Theory and Practice, 1st Edition , Tata Mcgraw Hill Publishing Co Ltd.

2. Godkar, P. B., &Godkar, P. D. (2005). Text Book of Medical Laboratory Technology: Basic Histopathologic Techniques and the Laboratory Requirements
3. C F A Culling (1974). Handbook of Histopathological and Histochemical Techniques, 3rd Edition, Butterworth-Heinemann.
4. Bancroft J. D and Gamble M (2008). Theory & Practice of Histological Techniques, 6thEdition, Churchill livingstone.
5. Haven, M. C., Tetrault, G. A., &Schenken, J. R. (Eds.). (1994). Laboratory instrumentation. John Wiley & Sons.
6. Saliterman, S. S. (2006). Fundamentals of BioMEMS and medical microdevices. Bellingham, WA: Wiley-Interscience.
7. Baker, F. J., & Silverton, R. E. (2014). Introduction to medical laboratory technology. Butterworth-Heinemann.

Blood Banking

DML 304T

Contacts: 2L+1T **Credits: 03**

Course Overview

The students would be able to know the basic components of blood and their significance in normal health, by examination of blood and various types of diseases can be diagnosed.

Course Outcomes: After completion of this course, students would be able to:

CO1: Understand theprinciple of blood grouping.
CO2: Describe the blood collection procedure, storage of bloodand it's transfusion.
CO3: Learn the significance of cross matching and screening of blood.
CO4: Explain the preparation of various blood components and their storage.

Course Contents

Module 1: Introduction to Blood Grouping

ABO Grouping and its Subgroups, Rh Grouping and Erythroblastosis Foetalis, Antigens and Antibodies

Module 2: Collection and Storage of Blood

Screening and selection of donor, Collection and preservation of blood in blood bank, Anticoagulants used in Blood Banking, Cleaning and Care of Glassware in Blood Banking

Module 3: Cross Matching and Screening of Blood

Major and Minor Cross Matching, Preparation of Working Antiglobulin Serum, Principle and Importance of Cross Matching, Transfusion Reactions, Screening of blood for AIDS, Hepatitis and Syphilis.

Module 4: Testing

ABO testing slides and tube test, reverse grouping, discrepancies between cell and serum results, sources of error, rouleux formation and methods of checking it.

RH grouping test slide or rapid tube test false - positive and false - Negative results, Du system & its significance.

Coombs test- Directed and indirect, principle, explanation of procedure and sources of error control, interpretation and clinical application.

Preparation of various blood components, their storageand Uses of Cold Centrifuge

Text & References

1. Medical Laboratory manual for trophical countries Vol, l ≪ Monica Chesbrough, ELBS Edition

2. Medical Laboratory technology : A procedure manual for routine Diagnostic Tests Vol l, ll, lll; Kanai L. Mukharjee, Tata McGraw Hill Pub.

3. Dacie and lewis : Practical Hematology

4. De Gruchy's : Clinical Hematology in Medical practice; Frank Firlin, Colin cheterman David Peningtom and Bryan Rush

5, Manual of basic techniques for a Health Laboratory; WHO Publication, World health house, Indrapratha Estate, Ring Road, New Delhi-02.

Haematology-II-Practical

DML 301P

Contacts: 4P **Credits: 02**

Course Outcomes: After completion of this course, students would be able to:

CO1: Perform DLC and GBP.

CO2: Prepare thick blood smear.

CO3: Determine malarial Ag and Ab by rapid kit methods.

CO4: Demonstrate the abnormal blood cells and various types of anemia.

List of Practicals

1. To perform DLC
2. To perform GBP
3. Demonstration of AML slide
4. Demonstration of CML slide
5. Demonstration of CLL slide
6. Demonstration of CLL slide
7. Preparation of thick blood smear
8. Demonstration of malarial parasites
9. Determination of malarial Ag and Ab by rapid kit methods
10. To perform TLC
11. To perform tissue processing
12. Demonstration of abnormal blood cells.
13. Demonstration of microcytic and hypochromic anemia.
14. Demonstration of macrocytic and normochromic anemia.
15. Demonstration of hemolyticanemia.

16. Demonstration of hemorrhagicanemia.

Immunology, Parasitology and Serology-Practical

DML 302P

Contacts: 4P **Credits: 02**

Course Outcomes: After completion of this course, students would be able to:

CO1: Collect blood and prepare thin and thick smears.

CO2: Identify the parasites, arthropods of medical importance.

CO3: Examinethe blood smears for malaria and microfilaria together with their identification.

CO4: Perform Widal test, RPR test, ASO, CRP by agglutination method.

CO5: Perform routine stool examination for the detection of intestinal parasites.

List of practicals

1. Determination of IgG and IgM class antibodies to herpes simplex virus by ELISA
2. Identification of parasites of medical importance dealt in the theory
3. Collection of blood and preparation of thin and thick smears
4. Staining of blood smears for blood parasites
5. Examination of blood smears for malaria and microfilaria and their identification
6. Identification of arthropods of Medical importance dealt in the theory. Identification up to genera of common vectors of Malaria, Filariasis, Japanese. Encephalitis.
7. To perform Widal test (Slide & Tube), RPR test, ASO, CRP by agglutination method
8. Routine stool examination for the detection of intestinal parasites and performing of concentration methods:
    - Saline preparation, Iodine preparation
    - Flotation method : ZnSo4
    - Sedimentation method: Formal ether
9. **Demonstration of** Ouchterlony Double Immunodiffusion technique

Histopathology and Cytology-Practical
DML 303P

Contacts: 4P **Credits: 02**

Course Outcomes: After completion of this course, students would be able to:

CO1: Demonstrate the various histopathological instruments.

CO2: Preparethe various types of reagent used in Histopathology.

CO3: To perform Gram's, Acid fast, Geimsta and Hematoxylin eosin staining.

CO4: Demonstrate the normal cytology of respiratory tract, urinary tract, CSF.

List of Practicals

1. Demonstration of Histopathological Instruments: Laboratory Microscopes, Compound light microscope, Paraffin wax bath, slide warmer, Microtomes, Automatic Tissue Processor
2. Microtome knives, honing and stropping and its care and maintenance
3. Preparation of various types of reagent used in Histopathology
4. To perform Gram's staining
5. To perform Acid fast staining
6. To perform Geimsta staining
7. To perform Hematoxylin -eosin staining
8. Demonstration of AML, CML, CLL and CLL slides
9. Embedding ,trimming and cutting of cross-section
10. Tissue processing: Dehydration, Making solution of different reagents and fixatives
11. Demonstration of normal cytology of respiratory tract, urinary tract, CSF,

Blood Banking-Practical
DML304P

Contacts: 4P **Credits: 02**

Course Outcomes: After completion of this course, students would be able to:

CO1: Perform direct Coomb's test.

CO2: Preparethe 5% cell suspension.

CO3: Perform coagulation profile.

CO4: Perform forward typing of ABO and Rh and reverse typing of ABO blood group system.

CO4: Perform section cutting.

List of Practicals

1. To perform coagulation profile
2. Preparation of 5% cell suspension
3. Preparation of pooled cells
4. To perform direct Coomb's test
5. To perform blood grouping system.
6. To perform forward typing of ABO and Rh
7. To perform reverse typing of ABO blood group system
8. To perform section cutting
9. Blood Apheresis
10. To perform H&E staining
11. Demonstration of FNAC techniques, procedure and smear preparation for various superficial palpable FNAC sites

SEMESTER IV

Diagnostic Biochemistry-Theory

DML 401T

Contacts: 2L+1T **Credits: 03**

Course Overview

Diagnostic biochemistry combines analytical chemistry with aspects of physiology, physical chemistry, pathophysiology and diagnostic medicine. Diagnostic clinical biochemistry uses biochemical knowledge and techniques to assist in the diagnosis of human disease, to follow its progress and to monitor the effect of treatment. Biochemistry, biochemical testing, and specialist biochemical practitioners have an important role in clinical practice in both diagnosis and management.

Course Outcomes: After completion of this course, students would be able to:

CO1: Learn the concept of bilirubin formation, excretion, its normal and abnormal values and clinical significance.

CO2: Understand the normal ranges and clinical significance of various enzymes.

CO3: Explain the role of liver.

CO4: Estimate various liver function tests.

CO5: Describethe coagulation of blood, significance of PT determination, and the principle of estimation.

CO6: Understand the clinical significance of pancreatic function test, Lipid Profile testand Diabetes, Kidney Function Test, Thyroid function test and Infertility profile.

Course contents

Module 1: Haem-catabolism and bilirubin metabolism

Bilirubin formation and excretion, Conjugated and un-conjugated bilirubin, Normal and abnormal values and clinical importance of serum bilirubin in relation to differential diagnosis.

Module 2: Liver function test

Introduction, normal ranges and clinical significance of albumin, aspartate transaminase, transaminases, alkaline phosphatase, lactate dehydrogenase, total bilirubin, direct bilirubin, gamma glutamyl transpeptidase, INR, 5' nucleotidase, coagulation test.

Liver and its functions, Estimation of bilirubin, A : G ratio, SGOT, SGPT, ALP, PT etc.

Module 3: Prothrombin Time

Coagulation of blood, significance of PT determination, Principle of estimation

Module 4: Lipid Profile test

Important biological fats, cholesterol, clinical significance of cholesterol estimation, lipid profile-LDL cholesterol, VLDL, HDL, TG, Principle and its estimation.

Module 5: Pancreatic function test and Diabetes

Amylase, lipase, insulin, glucagon, clinical conditions.

Diabetes: Types of diabetes, biochemical changes, role of insulin and glucagon, diabetes in relation to pregnancy and cardiovascular disease.Oral glucose tolerance test and HbA1c.

Module 6: Kidney Function Test

Function of kidney in respect of NPN, Difference between PN and NPN, Estimation of different NPN like urea, creatinine, uric acid in blood.

Module 7: Thyroid function test and Infertility profile

Thyroid function test: T3 and T4, TSH, TRH, free T3 and T4, rT3 and rT4, Calcitonin, anti TSH, Thyroglobin, Iodine

Infertility profile: Testosterone, Estrogen, Progesterone, Prolactin, Oxytocin, LH, FSH, clinical conditions

Text and References

1. Moran, L. A., Horton, R. A., Scrimgeour, K. G., & Perry, M. D. (2014). Principles of biochemistry.
2. Gaw, A., Murphy, M., Srivastava, R., Cowan, R. A., & O'Reilly, D. S. J. (2013). Clinical Biochemistry E-Book: An Illustrated Colour Text. Elsevier Health Sciences.
3. Devlin, T. M. (Ed.). (2006). Textbook of biochemistry: with clinical correlations.
4. McKee, T., & McKee, J. R. (1999). Biochemistry: an introduction. WCB/McGraw-Hill.
5. Baynes, J. W., &Dominiczak, M. H. (2014). Medical Biochemistry E-Book. Elsevier Health Sciences.
6. In, E. C. (1997). Textbook of biochemistry with clinical correlations.
7. Varley, H. (1954). Practical clinical biochemistry. Practical clinical biochemistry.
8. White, A., Handler, P., Smith, E., &StettenJr, D. (1959). Principles of biochemistry. Principles of Biochemistry., (Edn 2).

Clinical Virology and Mycology Theory
DML 402T

Contacts: 2L+1T **Credits: 03**

Course overview

This course contains virology, clinically importance virus, mycology and common fungal infections modules. This course is designed to develop the knowledge of virology and mycology in students.

Course Outcomes: After completion of this course, students would be able to:

CO1: Know about various medically important viruses, their pathogenesis and laboratory diagnosis.

CO2: Understand the strategies of prediction of HIVs and Hepatitis B.

CO3: Learn the basic morphology and cultural characteristics of fungi, their growth and their laboratory diagnosis.

CO4: Explain the common fungal infections.

CO5: Samples collection, processing and storage of clinical specimens for the diagnosis of fungi.

Course contents

Module 1: Virology

General properties of viruses; Collection, transportation and storage of clinical samples; Cultivation of viruses; Molecular methods for virus diagnosis, Strategies of Prediction of HIVs and Hepatitis B

Module 2: Clinically important virus

Human immunodeficiency viruses, viral hepatitis, rabies virus, herpes viruses, influenza viruses, rubella, mumps, measles, rota virus, poliomyelitis, japanese encephalitis, dengue, chikungunya, human onocogenic viruses and kyasanur forest disease.

Module 3: Mycology

General properties, morphology, classification and cultivation of fungi; Types of mycoses; Lab diagnosis of fungal infections.

Module 4: Common fungal infections

Dermatophytes, candidiasis, mycetoma, rhinosporidium, sporotrichosis, histoplasmosis, blastomycosis, coccidiodosis, paracoccidiodosis, cryptococcosis, aspergillosis, pencillosis, zygomycosis and pneumocystis.

Module 5

Samples collection, processing and storage of clinical specimens for the diagnosis of fungi.

Text Books

1. C P Baveja (2010). Text book of Microbiology, 4th Edition, Arya Publication.
2. Arti Kapil, Ananthanarayan and Paniker's (2013). Textbook of Microbiology, 9th Edition 2013, Orient Black Swan.
3. Greenwood, D., Slack, R. C., Barer, M. R., & Irving, W. L. (2012). Medical Microbiology E-Book: A Guide to Microbial Infections: Pathogenesis, Immunity, Laboratory Diagnosis and Control. With STUDENT CONSULT Online Access. Elsevier Health Sciences.
4. Ryan, K. J., & Ray, C. G. (2004). Medical microbiology. McGraw Hill, 4, 370.
5. Isenberg, H. D. (1998). Essential procedures for clinical microbiology (pp. 3-36). Washington, DC: ASM press.
6. Levinson, W., &Jawetz, E. (1996). Medical microbiology and immunology: examination and board review. Appleton & Lange.

7. Talaro, K. P., & Chess, B. (2018). Foundations in microbiology. McGraw-Hill.

8. Hart, C. A., & Shears, P. (1996). Color atlas of medical microbiology (No. C QR46 H37 2004). Mosby-Wolfe.

9. Goldman, E., & Green, L. H. (Eds.). (2008). Practical handbook of microbiology. CRC press.

10. Cappuccino, J. G., & Sherman, N. (2005). Microbiology: a laboratory manual (p. 507). San Francisco: Pearson/Benjamin Cummings.

Diagnostic Biochemistry-Practical

DML 401P

Contacts: 4P **Credits: 02**

Course Outcomes: After completion of this course, students would be able to:

CO1: Perform basic biochemistry laboratory testing for various parameters.

CO2: Determine prothrombin time.

CO3: PerformHbA1C.

List of Practicals

1. Estimation of cholesterol, Triglyceride, Phospholipid, Serum Total Cholesterol
2. Prothrombin time determination
3. Estimation of direct Bilirubin, Total Bilirubin, ALP
4. Estimation of serum albumin and A : G ratio
5. Estimation of Serum Amylase and serum lipase
6. Estimation of Glycosylated hemoglobin
7. Estimation of OGTT
8. Estimation of Urea, uric acid, Creatinine in blood sample
9. Estimation of T3 and T4 hormone in blood sample
10. To perform HbA1C

Clinical Virology and Mycology Practical
DML 402P

Contacts: 4P **Credits: 02**

Course Outcomes: After completion of this course, students would be able to:

CO1: Understand the various laboratory rules and regulation of virology laboratory

CO2: Determine Hepatitis virus of different antigens by ELISA.

CO3: Performvarious staining techniques.

CO4: Collect, and process the various biological samples for the diagnosis of fungal infections.

List of Practicals

1. Laboratory rules and regulation of virology laboratory.
2. Demonstration of cultivation of viruses
3. Determination of Hepatitis virus of different antigens by ELISA
4. Determination of HIV antibodies in human serum or plasma.
5. To perform rapid test for the diagnosis of different viral disease.
6. Preparation of different culture media like SDA, CMA,RSA & BHI medium and culture technique
7. Perform staining techniques like KOH mount, LCB Mount and Indiaink
8. Collection , processing of samples for the diagnosis of fungal infections
   - Skin, Nail, Hair & body fluids

DISSERTATION PROJECT / INTERNSHIP
DML 403

Credits: 08

The students have to complete compulsory 3 months (12 weeks) internship training during the 4th semester (Final semester), preferably in Government Hospitals of Delhi.

The details and duration of training:

1. Biochemistry 3 weeks
2. Hematology 2 weeks
3. Pathology/Histopathology 2 weeks
4. Microbiology 3 weeks
5. Blood Banking/Any specialized lab. 2 weeks

During internship training the student has to prepare a project file, one project file for each subject. This shall be based on the work done, or techniques performed that is followed by the industry, hospital or organizations where the student has undergone training. The project file has to be submitted or produced during internal or external exams conducted by the / University. Equal weightage of marks shall be allotted to all the five projects.

After completion of training, the concerned Hospital or industry etc, shall issue the training certificate to the concerned student indicating clearly the duration and the labs where the students had completed 3 months internship/training.

The certificate copy has to be submitted to the University. On the basis of certificate issued by the Hospital or industry, the students may be issued original DMLT Certificate by the University provided the students clear all the university exams for all the semester exams and viva voce. Without completing compulsory 3 months internship/ training, students shall not be awarded DMLT degree by the University.

It is desirable that, all the students have to undergo Training/ Internship preferably in Delhi Govt. Hospitals. But Internship training may also be permitted in Private Hospitals or Hospitals run by Autonomous body or organizations where all the required training facilities are available. However, it is with prior approval or permission of the Competent Authority.

Further, it may be possible that, due to unforeseen situations, incidents or due to someunavoidable reasons or circumstances the student may not be able to take the internship/training in Delhi. Hence, in such circumstances the student may be permitted to undergotraining in other states of Govt. Hospitals, Private Hospitals or Autonomous body that have all the facilities to undergo the Training. However, under such cases also, prior approval of the Competent Authority in writing has to be obtained by the concerned student.