

**ORDINANCES FOR B.Sc. MEDICAL LABORATORY TECHNOLOGY (B.Sc.MLT)**

1. The university shall undertake the instructions for Bachelor's Degree in Medical Laboratory Technology (B.Sc.MLT). The duration of the course shall be three academic years. Each year shall be divided in two semester. The duration of the each semester will be 20 weeks (90 working days)
2. The admission to this course will be based on merit in the qualifying examination or in an entrance test to be conducted by Punjab Technical University, provided the candidate is otherwise eligible for admission.
3. The eligibility for admission to B.Sc.MLT course shall be as follows:

(a)	Medical Stream	50% marks in the subjects of Physics, Chemistry and Biology in the 10+2 examinations and 33% for SC & ST category candidates.
(b)	Non-Medical Stream	50% marks in the subjects of Physics, Chemistry and mathematics in the 10+2 examinations and 33% for SC & ST category candidates.
(c)	Diploma MLT Stream	50% marks in aggregate and 33% for SC & ST category candidates.

Admission shall be purely on merit through counselling in these three streams. The seats will be equally divided in the three streams.

4. There shall be university Examination at the end of each semester. The examination for first, third & fifth semester shall ordinarily be held in the month of December and for the second, fourth & sixth semester in the month of May or such dates as may be fixed by the University.
5. Every candidate shall be examined in the subjects according to the syllabi and course outlines prescribed from time to time.
6. The first semester examination shall be open to a regular student who:-
  - i) has been on the rolls of the College during the first semester, and
  - ii) has attended not less than 75% of the lectures and practicals.
  - iii) Bears a good moral character.
7. The second, third, fourth, fifth & sixth semester examinations shall be open to a regular student who:
  - i) has been on the rolls of the college during these semesters as the case may be .

- ii) has attended not less than 75% of lectures and practicals.
  - iii) Has passed the previous semester examination respectively or is covered under re-appear regulations.
8. Attendance shall be counted upto seven days prior to the date of commencement of the University examination.
  9. The head of the institutions shall have the power to condone shortage in lectures and practicals in each paper to the extent of 10% of a total lectures delivered and practicals held in each paper. Condonation beyond 10% will be within the power of Vice – Chancellor.
  10. The medium of instruction shall be English.
  11. The minimum marks to pass the examination in each semester shall be 50% in each paper.
  12. A candidate shall not be eligible for a prize or medal, if
    - a) he/she does not pass the B.Sc.MLT examination in three years, and
    - b) has passed one or more subjects in a supplementary examinations.
  13. The internal assessment awards of a candidate who fails in the external examination shall be carried forward to the next examination.
  14. In the detailed marks card, the marks secured by the candidate in the internal assessment and external examination will be shown separately.
  15. The successful candidates shall be classified on the basis of aggregate marks in first, second, third, fourth, fifth & sixth semesters into following divisions.
    - a) Those who obtain 70% or more of the total aggregate marks – First division with Honors.
    - b) Those who obtain 60% or more but less than 70% of the total aggregate marks– First Division.
    - c) Those who obtain 50% or more but less than 60% of the total aggregate marks – Second Division.
  16. As soon as possible after the completion of examination, the university shall publish a list of successful candidates.
  17. A candidate is required to pass in all the courses prescribed in a semester in University Examination by securing minimum prescribed marks in a course as prescribed in the regulations. However, if a candidate fails to secure required marks in a course. he/she shall be allowed to reappear according to the following regulations.
    - a) A candidate detained from appearing in a semester examination of a subject(s) due to shortage of attendance will retake the course of study when the subject(s) are offered as a regular course in the subsequent semesters.
    - b) Those candidate who obtain less than 50% marks in University examination in any of the course shall be placed under reappear. They may appear in the University examination in the reappear course in the subsequent semester when the examination of this course is held.

- c) A candidate who has been placed in reappear because of University examination shall be allowed to study for next semester examination & shall be permitted to appear in the failed papers of the previous examinations in the subsequent examinations which shall be held along with the papers of the higher examination. Subject to the conditions. That for promotion in the third semester atleast 50% courses of first & second semester should be clear & similarly for promotion to the fifth semester, atleast 50% of the first, second, third and fourth semester together should be cleared.
  - d) A maximum of three chances.(including the regular chance) shall be given for clearing a course of any semester.
  - e) Those candidates who have been placed in reappear in a subject(s) and have less than 50% marks in the sessional examination of that subject(s) may be allowed to improve the sessional by taking one chance provided that this improvement can only be upto 50% marks in that subject(s)
18. An internship of six months after completion of the course is compulsory for a candidate to obtain bachelor's degree in MLT.
- 19 . LATERAL ENTRY TO BSc. MLT IIND YEAR will be opened to a student who has cleared diploma in MLT with 60% marks.

Semester : First

Name of the course : B.Sc.MLT

Sr. No.	SUBJECTS	STUDY SCHEME			Marks in Evaluation Scheme					Total Marks	
		Hrs/Week			INTERNAL ASSESSMENT			External Assessment		Int+ Ext (Theory)	Int+ Ext (Practical)
		T h	Pr	To t	Th	Pr	Tot	Th	Pr		
MT-101	Microbiology	4	6	10	50	50	100	75	75	125	125
MT-103	Anatomy & Histotechnology	4	6	10	50	50	100	75	75	125	125
MT-105	Haematology & Clinical Pathology	4	3	7	50	50	100	75	75	125	125
MT-107	Biochemistry	4	3	7	50	50	100	75	75	125	125
	Total	16	18	34	200	200	400	300	300	500	500

Total Marks for Semester = 1000

Semester : Second

Name of the course : B.Sc.MLT

Sr. No.	SUBJECTS	STUDY SCHEME			Marks in Evaluation Scheme						Total Marks	
					INTERNAL ASSESSMENT			External Assessment				
		Hrs/Week			Th	Pr	Tot	Th	Pr	Int+ Ext (Theory)	Int+ Ext (Practical)	
MT-102	Microbiology	4	6	10	50	50	100	75	75	125	125	
MT-104	Anatomy & Histotechnology	4	6	10	50	50	100	75	75	125	125	
MT-106	Haematology & Clinical Pathology	4	3	7	50	50	100	75	75	125	125	
MT-108	Biochemistry	4	3	7	50	50	100	75	75	125	125	
	Total	16	18	34	200	200	400	300	300	500	500	

Total Marks for Semester = 1000

Semester : Third

Name of the course : B.Sc.MLT

Sr. No.	SUBJECTS	STUDY SCHEME			Marks in Evaluation Scheme						Total Marks	
		Hrs/Week			INTERNAL ASSESSMENT			External Assessment			Int+ Ext (Theory)	Int+ Ext (Practical)
		T h	Pr	To t	Th	Pr	Tot	Th	Pr			
MT-201	Microbiology	4	6	10	50	50	100	75	75	125	125	
MT-203	Basic Cellular Pathology & Allied Techniques	4	6	10	50	50	100	75	75	125	125	
MT-205	Haematology	4	3	7	50	50	100	75	75	125	125	
MT-207	Biochemistry	4	3	7	50	50	100	75	75	125	125	
	Total	16	18	34	200	200	400	300	300	500	500	

Total Marks for Semester = 1000

Semester : Fourth

Name of the course : B.Sc.MLT

Sr. No.	SUBJECTS	STUDY SCHEME			Marks in Evaluation Scheme						Total Marks	
					INTERNAL ASSESSMENT			External Assessment				
		Hrs/Week	Th	Pr	Tot	Th	Pr	Tot	Int+ Ext (Theory)	Int+ Ext (Practical)		
MT-202	Microbiology	4	6	10	50	50	100	75	75	125	125	
MT-204	Basic Cellular Pathology & Allied Techniques	4	6	10	50	50	100	75	75	125	125	
MT-206	Haematology	4	3	7	50	50	100	75	75	125	125	
MT-208	Biochemistry	4	3	7	50	50	100	75	75	125	125	
	Total	16	18	34	200	200	400	300	300	500	500	

Total Marks for Semester = 1000

Semester : Fifth

Name of the course : B.Sc.MLT

Sr. No.	SUBJECTS	STUDY SCHEME			Marks in Evaluation						Total Marks	
					Scheme			INTERNAL ASSESSMEN T				
		Hrs/Week	T h	Pr	To t	Th	Pr	Tot	Th	Pr	Int+ Ext (Theor y)	Int+ Ext (Practic al)
MT-301	Microbiology	2	--	2	25	--	25	75	--	100	--	
MT-303	Histopathology	2	--	2	25	--	25	75	--	100	--	
MT-305	Haematology	2	--	2	25	--	25	75	--	100	--	
MT-307	Biochemistry	2	--	2	25	--	25	75	--	100	--	
MT-309	Fundamentals of Computer	2	3	5	15	10	25	50	25	65	35	
MT-311	Training	--	2 3	23	--	25 0	250	--	25 0	--	500	
	Total	1 0	2 6	36	12 5	25 0	375	350	27 5	465	535	

Total Marks for Semester = 1000

Semester : Sixth

Name of the course : B.Sc.MLT

Sr. No.	SUBJECTS	STUDY SCHEME			Marks in Evaluation Scheme					Total Marks	
		Hrs/Week			INTERNAL ASSESSMEN T			External Assessme nt		Int+ Ext (Theor y)	Int+ Ext (Practic al)
		T h	Pr	To t	Th	Pr	Tot	Th	Pr		
MT- 302	Microbiology	2	--	2	25	--	25	75	--	100	--
MT- 304	Histopathology	2	--	2	25	--	25	75	--	100	--
MT- 306	Haematology	2	--	2	25	--	25	75	--	100	--
MT- 308	Biochemistry	2	--	2	25	--	25	75	--	100	--
CE- 216	Environmental Sciences	4	--	4	25	--	25	75	--	100	--
*	Training	--	2 0	24	--	25 0	250	--	250	--	500
	Total	1 2	2 0	36	12 5	25 0	375	37 5	250	500	500

Total Marks for Semester = 1000

PROPOSED Instructions For Conduction of Examination

1. Examination of all subject will be conducted at the end of each semester.
2. Centre for examination will be allotted by the university.
3. Papers setting and paper checking of theory examination will be external.
4. The time limit of the theory paper will be three hours.
5. Theory paper will consist of two sections Section A and Section B.
6. Section A will be compulsory and will carry 15 marks. It will consist of short questions, fill in the blanks , true or false and match the following.
7. Section B will carry 60 marks. The candidate will have to attempt 6 questions out of 7. Each question will carry 10 marks.
8. External examiner for practical examination will be appointed by the university.
9. Gap of minimum two days should be given between regular examination.
10. One question paper comprising of both theory and practical will be set for Fundamental of Computer(305) maximum marks of this paper will be 75 in which 50 marks should be of theory and 25 of practical. Internal checking should be conducted for this subject.

## FIRST SEMESTER

**MICROBIOLOGY (MT-101)**

## THEORY

GENERAL MICROBIOLOGY

1. Introduction and Brief History of microbiology : Definition , History and relationship of micro-org. to man  
Safety measures in microbiology
2. Care and maintenance of laboratory equipment
3. Culture media : (a) Preparation of various media (b) Standardization and use
4. Sterilization : (a) Definition  
(b) Different methods and principles - Moist heat , dry heat , Radiation & filtration  
(C) Autoclave - its structure ,functioning ,control & indicators
5. Antiseptics and disinfectants ; Definition , types ,mode of action & properties  
Uses of disinfectant & antiseptics ,testing efficiency
6. Glassware : Description of glass ware ,its use ,handling and care  
Decontamination and disposal of contaminated material
7. General characteristics and classification of important bacteria and fungi

VIROLOGY

1. Introduction to virology
2. Physiochemical characteristics of viruses
3. Diseases caused by different viruses and mode of infection

PARASITOLOGY

1. Introduction to medical parasitology and safety measures
2. General characters and classification of protozoa of Medical Importance
3. Morphology, Life cycle and laboratory diagnosis of Intestinal Protozoa- Amoebae and Giardia

## PRACTICAL :

1. To demonstrate safe code of practice for a microbiology laboratory
2. To prepare cleaning agents and to study the technique of cleaning of glassware
3. To study the working and handling of compound microscope
4. To study the method of sterilization by Autoclave
5. To study the method of sterilization by Hot Air Oven
6. To study the method of sterilization of media/solutions by filtration
7. To prepare Nutrient Agar in laboratory
8. To prepare Blood Agar in Laboratory
9. To prepare culture plates and agar slants
10. To perform inoculation of culture media (plates, slants and culture media)
11. To test the antimicrobial susceptibility of given bacterial culture on nutrient agar plates by Disc Diffusion Method
12. To study the morphology of giardia lamblia from permanent slides
13. To study the morphology of Entamoeba histolytica from permanent slides

**ANATOMY AND HISTOTECHNOLOGY (MT-103)**

## THEORY

1. Introduction to Histopathology and laboratory organization
2. Laboratory equipment ,its uses and maintenance

3. Laboratory hazards and safety precautions
4. Anatomy and physiology of human body: General organization , synopsis of all systems
5. Cell organization and function : Structure & function of all cell organelles
6. Skeletal system : Structure and function of all individual bones and joints ,movement of joints ,Skeletal muscles , Cardiac muscles ,smooth muscles , muscles of upper arm & anterior compartment of thigh (their name, attachments , functions and nerve supply)
7. Blood : Functions of blood , composition of blood ,plasma & its functions ; Blood clotting (mechanism ,clotting factors ) ; Morphology of red blood cells , their function and development ,Haemoglobin ,anaemia ; WBC :classification development & functions ; platelets : morphology &functions ; Blood groups , blood transfusion and transfusion reactions
8. Respiratory system : Structure of respiratory pathway ,function of respiratory tract ,cough reflex ,intrapleural pressure, mechanism of breathing and respiration , muscles of respiration ,vital capacity , tidal volume ,inspiration ,reserve volume and residual volume l.
9. Reception, recording and labeling of histology specimens
10. Fixation and various fixatives
11. Processing of histological tissues for paraffin embedding
12. Embedding and embedding media
13. Decalcification -various methods
14. Introduction to exfoliative cytology with special emphasis on female genital tract(PAP smear, cone biopsy)
15. Solvents, mordents, accelerators and accentuators

#### PRACTICAL

##### ANATOMY

1. To study laboratory equipment and its uses
2. Laboratory hazards and safety precautions
3. To study various bones of body (models)
4. To determine the joints of skeleton models
5. To prepare blood smear for identification of blood components
6. To study the various blood groups
7. To study various parts of respiratory system (chart)

##### HISTOLOGY

1. Reception and labeling of histology specimen
2. Preparation of various fixatives – Helly’s fluid, Zenker’s fluid, Bouin’s fluid, Carnoy’s fluid
3. To study the process of embedding
4. To study the process of decalcification
5. To prepare 70% alcohol from absolute alcohol

#### HAEMATOLOGY AND CLINICAL PATHOLOGY(MT-105)

##### THEORY

1. Introduction to hematology : Definition , importance , important equipment and chemicals, various tests performed, laboratory organization
2. Composition and function of blood : Definition of blood , composition of blood (cells, plasma /serum )
3. Formation of blood : Erythropoiesis ,Leucopoiesis ,Thrombopoiesis
4. Anticoagulants :Definition , uses, different types , mode of action, their merits and demerits
5. Morphology of normal blood cells : Normal morphology , morphology in diseases
6. Collection and preservation of blood :Different methods of collection , preservation ,changes in stored blood
7. Enumeration of blood cells : RBC count, WBC count, Platelet count – clinical significance, normal values, procedure, precautions and means to minimize errors.

8. Blood film : Different types , Methods of preparation ,Staining
9. Romanowsky stains : Principle of staining , Different stains ,their composition and preparation , method of staining

## PRACTICAL :

1. Cleaning of Glassware by general method and by chromic acid
2. Collection of blood by venous method
3. Collection of blood by capillary method
4. Preparation of anticoagulants
5. Enumeration of RBC in blood sample
6. WBC count in blood sample
7. Platelet count in blood sample
8. Preparation of thick and thin blood smear
9. Preparation of different staining solutions
10. staining of blood smear and observation of normal morphology of blood cells
11. Differential leucocyte count
12. Study of abnormal RBC from permanent slides
13. Study of abnormal WBC and Platelets from abnormal slides

## BIOCHEMISTRY(MT-107)

## THEORY

1. Introduction to medical lab technology : General introduction Role of medical lab technologists, ethics, responsibility, safety measures and first aid.
2. Cleaning and care of general laboratory glassware and equipment.
3. Distilled water :Types of distilled water plants , preparation & storage
4. Analytical balance: Principal ,Working & maintenance ; Preparation of reagents : Formulation and preparation ; Standard solutions : Various std. solutions used , their preparation ; storage of chemicals
5. Units of measurements ; S.I units: Definitions,conversions; Measurement of volume : Strength , Normality , Molarity, Molality; volumetric apparatus, calibration of volumetric apparatus
6. Definitions : Mole, molar and normal solutions (preparation , Standardization ) ; pH ( Definition ,Pka value, Example , Derivation of Henderson-Hasselbalch equation) ; Buffer solutions( Definition , preparation of important solutions) , pH indicators ( pH papers , universal & other indicators ) ;pH measurement :different methods (pH paper , pH meter , priciple of pH meter , structure ,working and maintenance.

## PRACTICAL :

1. To prepare a 0.1N Sod. Hydroxide solution
2. To prepare a 0.2N HCL solution
3. To prepare a 0.1 molar H<sub>2</sub>SO<sub>4</sub> (Sulfuric Acid)
4. To prepare a 0.2M Sodium Carbonate solution
5. Preparation of Distilled Water
6. Principle, working & maintenance of pH meter
7. Principle, working & maintenance of analytical balance
8. Preparation of Distilled Water by automated water still

## SECOND SEMESTER

**MICROBIOLOGY(MT-102)**

## THEORY

## I GENERAL MICROBIOLOGY

1. Principle of staining methods and preparation of reagents : Simple , Negative , Differential ( Gram , AFB ) ,Cytological (Capsule ,Endospore ,Flagella , Cell wall stains ) staining .
2. Aerobic and anaerobic culture methods : Pour plating , streaking , spreading ,stab culturing , swabing ,Anaerobic jar ,roll tube method ,anaerobic chamber )
3. General characters and nature of antigen and antibody
4. Principle of antigen antibody reaction
5. Collection, transportation and processing of clinical samples for microbiological investigations: Stool ,urine , Blood , CSF , Anal swabs , Nasopharyngeal samples ,Enteric samples .
6. Principle and mode of action of antibiotics and chemotherapeutic agents for bacteria and fungi
7. Care and handling of laboratory animals
8. Laboratory organisation, management, recording of results and quality control in microbiology

## II VIROLOGY

1. Isolation of viruses in laboratory by tissue culture, Embryonated eggs ,animal inoculation , cell and tissue culture technology, Animal cell lines
2. Principles of different serological tests used in Virology : Agglutination , Precipitation , Immunoelectrophoresis , RIA , ELISA , Immunofluorescence

## III Parasitology

1. Morphology and diagnosis of Oral vaginal flagellates Trichomonas, E. Gingivalis
2. Morphology and life cycle of Haemoprotozoa Malarial parasite including falciparum
3. Laboratory diagnosis of Malarial infection
4. General characters and classification of Medical Helminthology
5. Morphology and life cycle of Nematodes(Intestinal) Ascaris, Enterobius, Ancylostoma, Trichuris, Strongyloides
6. Laboratory diagnosis of intestinal nematode infection

## PRACTICAL :

1. To prepare the reagents for gram staining
2. To identify the bacteria in the given culture by gram staining
3. To prepare the reagents for Ziehl Neelson (AFB staining)
4. To identify Mycobacterium tuberculosis in the given sputum sample by AFB staining (Hot staining)
5. To prepare the reagents required for capsule staining (Hiss's Method)
6. To identify bacterial capsule in the given sample by Hiss staining
7. To prepare the reagents for Albert staining
8. To identify corynebacterium diptheriae in the given culture by Albert staining
9. To identify bacterial capsule in the given sample by Negative staining
10. To identify bacterial spores in the given sample by schuffer and Futton's Method
11. To perform Widal (slide Method ) Test
12. To study the different stages of life cycle of malarial parasite from permanent slides
13. To study the morphology of Ascaris lumbricoides
14. To study the morphology of Enterobius vermicularis
15. To study the morphology of Taenia saginata/Taenia solium from permanent slides
16. To study the morphology of Ancylostoma duodenale form permanent slides

**ANATOMY AND HISTOTECHNOLOGY (MT-104 )****THEORY**

1. Microscope : Structure ,Compound microscope ,types, parts and maintenance
2. Body fluids and their significance : Important terms , types of body fluid , total body water , avenues by which water leaves and enters body , general principles for fluid balance , cardinal principle , How body fluids maintain Homeostasis , Electrolytes & ions , Function of electrolytes , How electrolyte imbalance leads to fluid imbalance
3. Cardiovascular system : Defination , structure of heart , Working , arterial & venous system , function of heart
4. Digestive system : Organisation ; accessory organs ; structure & function ( Mouth , Tounge , Teeth , Oesophagus , Pharynx, Stomach , Intestine , Rectum , Anus ) ; Digestive glands ; physiology of digestion of carbohydrates ,lipids & protiens
5. Liver: structure and function
6. Urinary system : Main parts , Structure & function of kidney , structure of nephron , physiology of excretion & urine formation , urine , additional excretory organs
7. Genital system : Structure of male and female reproductive system , Gametogenesis in male & female , menstrual cycle .
8. Nervous system : Parts, function & structure ; brain , spinal cord , spinal &cranial nerves ; All & none principal , role of neurotransmitters in transmission of nerve impulse
9. Spleen, Thymus : Structure & function of spleen & Thymus gland ; Tonsils - Structure & function ; general information about lymphatic system
10. Endocrine system : Endocrine & exocrine glands , their location , structure & functions
11. Microtomes : various types, their working principle and maintenance
12. Microtomes Knives and Knife sharpening : General information
13. Practical section cutting, cutting faults and remedies
14. Routine staining procedures : Dye chemistry theory & practice of staining
15. Use of controls in various staining procedures
16. Collection, processing and staining of cytological specimen

**PRACTICAL :**

1. To study parts of compound microscope
2. To study circulatory system (charts)
3. To study digestive system (charts)
4. Study of Urinary system (charts)
5. Study of Genital system (male & female)
6. To study various parts and types of microtome
7. To study the sharpning of microtome knife (honing and stropping technique)
8. To study section cutting
9. To stain given specimen with haematoxyline & eosin stain

**HAEMATOLOGY AND CLINICAL PATHOLOGY (MT-106)****THEORY**

1. Quality assurance in hematology
2. Hb : Definition , types , synthesis and breakdown of H b
3. Haemoglobinometry- various methods of estimation of Hb, errors involved and means to minimize such errors
4. Erythrocyte sedimentation rate : Defination , methods of estimation , normal value , factors influencing ESR and Clinical significance , Errors involved and means to minimize such errors
5. Haemocrit value : Estimation by macro and micro methods , their merits and demerits , factors influencing PCV and Clinical significance , Errors involved and means to minimize such errors

6. Red cell indices : Definitions , procedure & general formulas for calculating indices , clinical significance , normal values , numerical problems related to calculation of red cell indices
7. Reticulocyte count – clinical significance, normal value, method for Reticulocyte count & precautions
8. Absolute eosinophil count – clinical significance, normal value, method for Absolute eosinophil count & precautions
9. Routine examination of urine : Composition of urine ; Types of sample ; collection of sample ; Physical , Chemical & microscopic examination .
10. Examination of CSF & semen .
11. Physiological variation in Hb , PCV , TLC , platelets

## PRACTICAL :

1. Estimation of Haemoglobin by Sahli's method
2. Hb estimation by Drabkin's method
3. Hb estimation by Oxyhaemoglobin method
4. Determination of ESR by Westergren method
5. Determination of ESR by Wintrobe's method
6. Determination of PCV by microhaematocrit method
7. Determination of PCV by Macrohaematocrit method
8. Calculation of Red cell Indices
9. Physical Examination of Urine
10. Chemical Examination of Urine
11. Microscopic Examination of Urine
12. Reticulocyte count
13. Absolute Eosinophil count
14. Examination of CSF
15. Examination of semen sample

BIOCHEMISTRY (MT-108)  
THEORY**1. Biomolecules**

- a. Major intracellular organs and their functions definitions : Nucleus, Mitochondria, Ribosomes, Endoplasmic Reticulum, Lysosome, Plasma membranes , Peroxisome, Cytosol
- b. Major methods used to separate and purified biomolecules

**2. Carbohydrate Metabolism**

- a. Introduction
- b. Importance
- c. Classification
- d. Digestion and absorption of Carbohydrates
- e. Metabolism of carbohydrates: Glycolysis, TCA Cycle, Glycogenesis, Glycogenolysis, Gluconeogenesis (cori cycle)

**3. Protein:**

- a. Introduction
- b. Importance
- c. Structure of Protein
- d. Classification of Protein
- e. Important properties of Protein & Amino acid : Denaturation, Color Reaction, Chromatography, Electrophoresis
- f. Protein Synthesis

- g. Mechanism of Protein synthesis
- h. Digestion and absorption of Protein
- i. Amino Acid metabolism
- j. Formulation of Urea
- k. Mechanism of urea formulation
- l. Urea cycle

#### **4. Lipids**

- a. Introduction
- b. Classification
- c. Important Chemical reaction & properties of fat
- d. Digestion & absorption of fat
- e. Break down of fatty acids(B-oxidation)
- f. Fatty acid synthesis

#### **5. Nucleic Acid**

- a. Introduction
- b. Functions of Nucleic Acid
- c. Function of energy carrier

#### **6. Enzymes**

- a. Introduction
- b. Importance
- c. Classification
- d. Factor effecting enzyme actionably
- e. Enzyme Inhabitation
- f. Clinical Enzymology

#### **PRACTICAL**

1. To determine the presence of carbohydrates by molish test
2. To determine the presence of reducing sugar by Fehling solution
3. To determine the presence of reducing sugar by Benedict's method
4. To determine starch by Iodine test
5. Qualitative determination of glucose in serum, plasma, whale blood, spinal fluid (by kit method)
6. Estimation of blood glucose by Folin wu method
7. Quantitative determination of urea in plasma, serum or urine
8. Quantitative determination of serum albumin
9. Determination of creatin in serum or plasma by alkaline picrate method
10. Quantitative determination by cholesterol in serum or plasma by Wy-bengs method

## THIRD SEMESTER

**MICROBIOLOGY(MT-201)**

## THEORY

1. Morphology, Cultural characteristics, lab Diagnosis, Biochemical Properties of :  
Staphylococci, Pneumococci, Corynebacteria, Escherichia coli, Klebsiella, Enterobacteria, Proteus, Salmonella, Shigella, Arizona, Citrobacter, Yersinia, Pseudomonas, Vibrio, Haemophilus, Mycobacteria, Brucella, Bordetella, Bacillus, Clostridia, Nisseria, Treponema, Borrelia, Leptospira, Mycoplasma, Rickettsia, Chlamydia, Tric Agents
2. Introduction to Mycology and Morphology, Cultural Characteristics and lab diagnosis of :  
Candida, Dermatophytes, Cryptococci, Blastomyces, Coccidioides, Paracoccidioides, Dermatococcus, Mycetozoa, actinomycetes, Nocardia
3. Biochemical Tests used for Identification of Bacteria and Fungi :  
Catalase test, Coagulase test, Citrate utilization test, Indole test, Voges Proskauer test, Carbohydrate Utilization test, Methyl Red Test, Urease Test, Oxidase test, Nitrate Reduction, H<sub>2</sub>S Production, Methylene Blue Reduction, Ammonia Production, Sugar Fermentation.
4. Staining Techniques used in virology : Negative Contrast, Thin Sections, shadowing
5. Use of Embryonated Eggs in Virology
6. Morphology, life cycle, lab diagnosis of : Leishmania, Trypanosoma
7. Morphology, life cycle, lab diagnosis of tissue : Filaria, Trichinella, Dracunculus
8. Morphology, life cycle, lab diagnosis of interdigital cestodes : Taenia, Echinococcus, H. nana, T. Latum
9. Culture Techniques for Protozoa, amoeba, Leishmania
10. Culture methods for Helminths, Hookworm, Roundworm

**PRACTICAL:**

1. To identify the bacteria in the given culture by catalase test
2. To identify the bacteria in the given culture by coagulase test
3. To identify the bacteria in the given culture by citrate Utilization Test
4. To identify the bacteria in the given culture by Carbohydrate Utilization Test
5. To identify the bacteria in given culture by Methyl Red test
6. To identify the bacteria in the given culture by Voges Proskauer (VP) test
7. To identify the bacteria in the given culture by indole Test
8. To identify the bacteria in the given culture by Urease test
9. To identify the bacteria in the given culture by Oxidase test
10. To isolate bacteria from the soil sample
11. To process and identify the culture of Streptococcus in the laboratory
12. To process and identify the culture of staphylococcus in the laboratory
13. To process and identify the culture of Escherichia coli in the laboratory
14. To process and identify the culture of pseudomonas in the laboratory
15. To cultivate fungi on Sabouraud's Dextrose Agar (SDA media)
16. To culture fungi on corn meal Agar (CMA media)
17. To culture fungi on Rice starch Agar (RSA media)
18. To isolate fungi from soil sample
19. To isolate fungi from Hair sample

BASIC CELLULAR PATHOLOGY AND ALLIED TECHNIQUES (MT-203)  
THEORY

I. Study of Body Tissues

- a** Epithelial Tissue : Simple epithelium, Compound epithelium,
- b** Connective Tissue: Connective tissue Proper, Skeletal tissue , Vascular tissue
- c** Muscular Tissue : Striated Muscles, Unstriated Muscles, Cardiac Muscles

II. Study of Various Systems

- a** Alimentary system : Diseases of Mouth(Inflammatory & Infectious (conditions) , Diseases of Pharynx(Tonsillitis and diphtheria), diseases of Salivary Glands( Mumps, Calculus formation), Diseases of Oesophagus ( Oesophageal varies, Inflammatory & infections condition)
- b** Digestive System : Diseases of Stomach(Gastritis, Peptic Ulceration Tumours), Diseases of Intestine( Appendicitis, microbial diseases, typhoid, food poisoning, cholera & desentry), bowel disease Tumours, Hernias, Intestinal, Obstruction & Malabsorption
- c** Liver : Hepatitis, Inflammation & Liver failure
- d** Pancreas : Pancreatitis, Fibrosis & Tumour
- e** Gall Bladder : Gall Stones, Jaundice
- f** Circulatory System: Shock, Diseases of Blood Vessel(Atheroma, arteriosclerosis, aneurysms, thrombosis, varicose vein tumours), Thrombosis, embolism, Infarction, Oedema, Diseases of Heart ( Cardiac failure, disorders of heart valves, rheumatic heart disease, cardiac arrhythmias, heart block), Disorders of blood pressure(types & hypotension)
- g** Respiratory system : Disorders of upper Respiratory Tract( Infectious & inflammatory disorders common cold, sinusitis, tonsillitis, pharyngitis, laryngitis, Diphtheria, Hay fever) Diseases of Bronchi( Bronchitis, Asthma) Disorders of lungs(Pneumonia, Lung abscess, tuberculosis, Bronchial carcinoma, lung collapse)

III. Microscopy

- a** Darkground Microscope
- b** Polarizing microscope
- c** Phase contrast microscope
- d** Interference microscope
- e** U.V. Light microscope
- f** Micrometry

IV. Metachromasy and Metachromatic Dyes

V. Haematoxylin Stain : Importance

VI Stains :-MGG, Papantocolou

- a** Special Stains : PAS, Mucicarmine, Alcian Blue, Schmorl, Acid Phosphatase

PRACTICAL:

1. To study epithelial tissue (slides)
2. To study connective tissue (slides)
3. To study squamous cell from cheek cells
4. To study stained slide preparation of alimentary system
5. To study stained slide preparation of digestive system
6. Study of stains slides of liver, pancreas, gall bladder
7. Study of various types of microscope
8. Examination of diphtheriae bacilli in throat infection
9. To study stained slide preparation of circulatory system

10. To study stained slide preparation of respiratory system.

## **HAEMATOLOGY(MT-205)**

### THEORY

1. Basic Principles In Blood Banking and Immuno Haematology
  - a Genetics of Blood Grouping
  - b History of Blood Grouping System
  - c Antibodies and Antigens Involved
  - d ABO and Rh System
  - e Other Blood Group System
2. ABO System (Practical aspect) Direct and Indirect method for detecting blood groups (ABO and Rh)
3. Compatibility Testings : Principle, Procedures and precautions, Major and Minor cross match
4. Blood Transfusion and components : Introduction, blood for donation and laboratory tests, Anticoagulants used, Biochemical changes in stored blood, whole blood preservation, Separation of components of blood
5. Mismatched Transfusion : Complications of blood transfusion, their prevention and alternatives to transfusion of homologous blood
6. Bone Marrow : Structure of bone and bone marrow, sites of bone marrow functions clinical importance of bone marrow aspiration, equipment used , procedure of aspiration and biopsy, precautions, staining of bone marrow, Composition of bone marrow(Normal and average value)
7. Osmotic Fragility Test : Normal value, clinical significance, procedure & precautions

### PRACTICAL:

1. To prepare Acid Citrate Dextrose(ACD) and Citrate Phosphate Dextrose (CPD) solution
2. ABO ‘ Front grouping ‘ with Antisera by slide method
3. ABO ‘ Front Grouping ‘ with Antisera by tube method
4. Recognition of ‘ D ‘ ( Rh o) antigen on human Red cells (Tube method)
5. Recognition of ‘D’ antigen by slide method
6. To perform Direct Antiglobulin test ( Coomb’s TEST)
7. To perform Indirect Antiglobulin Test (Coomb’s TEST)
8. To perform cross Matching (Compatibility test)
9. To prepare various fractions of blood for transfusion
10. Bone marrow aspiration and staining of bone marrow smear
11. To perform osmotic fragility test of blood sample

**BIOCHEMISTRY(MT-207)**

## THEORY

1. Radio isotopes and their use in biochemistry: Basic structure of atom ; properties of alpha ,beta ,gamma radiations ; Clinical importance ; radioactivity decay ; measurement of radioactivity ( Scintillation Counting & by Geiger Muller Counting )
2. Osmosis : Defination , types , factors affecting osmotic pressure , Vant Hoff's Equation , Application of osmosis , numericals dialysis
3. Surface tension : Defination , factors effecting surface tension
4. Urine analysis(Qualitative)for sugar, proteins, bile pigments, Ketone bodies, porphobilinogen, faecal occult blood, bile salts , Microscopic examination , Spectroscopic method ( Direct vision spectroscope & Hartridge Reversion Spectroscope )
5. Collection and preservation of biological specimens : Introduction to blood, Collection and preservation of blood specimens , Anticoagulants ,preparation of anticoagulant bottles ; separation of serum plasma & preservation ;Stool - Microscopic examination , precautions for patient , guidelines for proper collection , preservation and disposal ; Sputum -- Collection and preservation ; CSF -- examination , biochemical changes , clinical significance , estimation of chlorides in CSF
6. Basic statistics : Definations , calculation of mean & SD; Probability - Defination, equally likely events , independent events, mutually exclusive event , compound event, random expermint ; Normal Distribution
7. Volumetric analysis: Types of volumetric reactions ,common terms ,apparatus , acid - alkali titration's , calculation of equivalent weight ; preparation of standard acid and base solutions (preparation of 1.0N HCl & 0.1 N Sodium hydroxide solution ); chloride estimation -- clinical significance , principle , method of estimation of chloride .

## PRACTICAL :

## Biochemistry

1. Demonstration of Osmosis
2. Demonstration of Dialysis
3. Qualitative analysis of sugar in urine Benedict method
4. Qualitative analysis of sugar in urine by Fehling's test
5. Qualitative analysis of Proteins in urine by Acetic acid test
6. Qualitative analysis of Proteins in urine by sulphosalicylic acid
7. Qualitative analysis of bile pigments in urine
8. Qualitative analysis of bile salts in urine
9. Estimation of Glucose in C.S.F.
10. Estimate the amount of chloride present in a given sample of water using standard silvernitrate solution

FOURTH SEMESTER**MICROBIOLOGY(MT-202)**

## THEORY

1. Antimicrobial sensitivity testing-.
  - a. Introduction- Direct and indirect method
  - b. Definition of antimicrobial agents, chemotherapeutic agents.
  - c. Method for antimicrobial testing ;
    - i. Diffusion method- Disc diffusion method ,Disc elution method, Stokes Disc diffusion test, Bauer kirby disc diffusion
    - ii. Dilution method –MIC, MBC, turbidity standards.
2. Antimicrobial susceptibility testing for mycobacteria
  - a. Introduction
  - b. Biochemical Testing
  - c. Proportional Susceptibility testing
  - d. Rapid methods of testing
  - e. BACTEC system
  - f. Disc diffusion method
  - g. Absolute Conc. Method
3. Preparation and standardization of Antigens and Antisera
  - a. Introduction to Antigens and Antibody
  - b. Characteristics of Antigens
  - c. Factors affecting immunogenicity of a molecule
  - d. Antigens containing preparations (Production and standardization)
  - e. Antibody preparations
  - f. Hybridoma technology for production of monoclonal antibodies
4. Egg counting techniques
  - a. Principle
  - b. Stoll's Egg counting technique
  - c. KATO's cellophane covered thick smear
  - d. Macmasters Egg counting chamber
  - e. General Lab procedure
5. Preparation of stains and staining procedures of malaria
6. Identification of different Plasmodium species
  - a. Introduction
  - b. Staining
  - c. Stages of development
  - d. Pigmentation
  - e. Infected Red cells
  - f. Parasites Density
  - g. Parasite Specie
7. Preparation of media and maintenance of cultures of E. histolytica, Giardia, Leishmania.
8. Preservation of Microbes
  - a. Need of preservation
  - b. Criteria of preservation
  - c. Various methods; (Soil preservation, agar slant culture, Storage under mineral oil, preservation in sterile

Distilled water, Preservation at low temperature, Drying under vacuum, cryopreservation, freeze drying.

**PRACTICAL:**

1. To prepare reagents of giemsa stain
2. To perform Giemsa stain for the identification of plasmodium in the given sample

3. To prepare leishman stain reagents
4. To perform leishman stain for the identification of plasmodium in the given sample
5. To prepare reagents for field stain
6. To perform field staining on the given sample for the diagnosis of Malaria
7. To prepare J.S.B. stain
8. To perform J.S.B staining on given culture for the identification of plasmodium
9. To check the susceptibility of E. Coli. against vancomycin by disc diffusion method
10. To check the susceptibility of Staphylococcus aureus against tetracycline by disc diffusion method
11. To compare the antimicrobial susceptibility of E.coli and staphylococcus aureus against tetracycline by stoke's Disc diffusion Method
12. To check the Antimicrobial susceptibility by Disc illusion Method culture

## **BASIC CELLULAR PATHOLOGY AND ALLIED TECHNIQUES (MT-204)**

### THEORY

1. Study of Body Tissues
  - A. Nervous Tissues
2. Study of Various Systems :
  - a. Urinary System : Diseases of Kidney ( Glomerulonephritis, Nephrotic, Syndrome, Pyelonephritis, Renal Failure, Renal Calculi, abnormality & tumours of kidney), Diseases of Renal Pelvis, Ureters, Bladder & Urethra (urinary Obstruction & urinary tract infection, Bladder Tumours)
  - b. Endocrine System: Disorders of Anterior Pituitary (Hyper & Hypo secretion), Disorders of Posterior Pituitary, Disorders of thyroid ((Hyper & Hypo secretion), Disorders of Parathyroid ((Hyper & Hypo secretion), Disorders of Adrenal Cortex & Adrenal Medulla ((Hypers & Hypo secretion of Gluco & mineralocorticoids), Disorders of Pancreatic Islets (types of diabetes mellitus & complication)
  - c. Reproductive System: Sexually Transmitted Diseases (Chlamydia, Gonorrhoea, Syphilis, candidiasis, AIDS & hepatitis B), Diseases of Female Reproductive System (Pelvic inflammatory disease disorders of cervix, uterine body, uterine tube & ovaries & breast), Diseases of Male Reproductive System (Infection of Penis, Urethra, epididymis, testes & prostate gland)
  - d. Nervous System : Disorder of Brain ( Head Injury, Circulatory Disturbance, Dementia, Parkinsons diseases, Infection of CNS (Pyogenic Infection, Viral Infection, Creutzfeldt – Jacob diseases, Phenyl Ketonuria, Diseases of Spinal cord ( Motor neuron , Sensory neuron, Mixed , Diseases of peripheral nerve,(Neuropathies , Neuritis)
  - e. Senses Organs : Diseases of Ear (Otitis otosclerosis, presbycusis, labyrinthitis, deafness), Diseases of the Eye (Infection , Glaucoma, Squint, Cataract, Retinal Disease, Refractive errors of eye)
3. Carbohydrates & Amyloid Stains : Periodic Acid Schiff (PAS) Stain, Benhold's Congo Red Stain, Toluidine Blue Stain, Crystal Violet stain
4. Connective Tissue Stains :
  - a. Muscles
  - b. Elastic Fibers : Verhoeff Stain, Eweight's Resorcin – fuchsian stain, Aniline Blue Stain, Pectin Fibres, Reticulin Stain
  - c. Collagen Fibers : Weigert-van Gieson Stain, Masson's Trichrome Stain, Phosphotungstic Acid haematoxylin Technique
5. Principles of Metal Impregnation – Silver impregnation method
6. Demonstration and Identification of Minerals and Pigments: Haemosiderin & Iron stain, Prussian Blue Stain, Vonkossa

## Silver Nitrate for Calcium

## 7. Cytological screening and quality control in cytology laboratory.

## PRACTICAL

1. To study stained slide preparation of nervous tissue and nervous system
2. Study of procedure for CSF examination
3. To study stained slides preparation of urinary system
4. To study urinary crystals found in pathological condition
5. Determination of glomerular filtration rate
6. Bacteriological examination of urine
7. To study stained slide preparation of endocrine system
8. To study stained slides preparation of reproductive systems
9. To study method for detection of fructose in seminal fluid
10. To study method for sperm motility and sperm count
11. Examination of throat swab

**HAEMATOLOGY(MT-206)**

## THEORY

1. Hemoglobin Pigments : Urobilinogen, Sterobilinogen, Bilirubin, Biliverdin-normal values, clinical importance, causes of abnormality and detection
2. Abnormal Haemoglobin : Composition and structure of normal Hb, Abnormal Hb's(eg-Hb Bart, HbC, HbS,HbD, HbE, Hb Groweer, Hb-H) composition, means of identification and estimation , Haemoglobinopathies – Thalassemia, Sickle cell Anemia, Haremolytic Anemia
3. Le Cell : linical importance , difference between LE and Tart Cell, different methods of estimation
4. Haemostasis : Mechnisim, various copuletion factors, theories of coaguletion, mechanism of blood coapulation , Fibuirinolysis
5. Coagulation Factors : Physiochemical Properties of coapulation factors and differentiation into Groups
6. Routine Coagulation Tests : BT by Dukes, Ivy's method, Clotting time by leetwhite, Capillary method, Prothromibin Time(PT), Partial Thromboplastin Time(PTT), PTTK, Clot retraction and lysis time, Plasma Recalcification Time, Thrombin Time, Protomine Sulphate test – Normal values Principle, clinical significance, special arrangements required, Procedure, Precautions,

**PRACTICAL:**

1. Estimation of Bleeding time lay Duke's method
2. Bleeding time determination by Ivy's method
3. Determination of clotting time by lee White method
4. Determination of clotting time by capillary method
5. To perform clot retraction and lysis time of blood sample
6. Determination of prothrombin time (PT)
7. Determination of plasma recalcification time(RT)
8. Determination of partial thromoboplastin time(PTT)
9. Determination of activated partial thromboplastin time(APTT)
10. Determination of thrombin test (TT)
11. Protamine sulphate test
12. Estimation of LE cell
13. Determination of fetal haemoglobin
14. Measurement of Haemoglobin pigments

15. Laboratory diagnosis of Haemolytic Anaemia
16. Laboratory diagnosis of Sick cell anemia

## BIOCHEMISTRY(MT-208)

### THEORY

- 1 Colorimetry & Spectrophotometry
  - a. Introduction
  - b. Theory of Spectrophotometry & Colorimetry (Lambert's Law & Beer's Law)
  - c. Instrumentation : Radiation Sources, Filters & Monochromators, Slits, Cells, Detection of Radiation, Power Supply, Visual Comparators, Photo-Electric Colorimeters ( Single and double beam Instrument), Manual (Non-recording) Spectrophotometers (Single and Double)
  - d. Applications of Colorimetry & Spectrophotometry
- 2 Flame Photometry
  - a. Introduction
  - b. Principle
  - c. Instrumentation
  - d. Two types of Flame Photometer: First Type, Second type
  - e. Applications of Flame photometry : Qualitative analyses, Quantitative analysis
  - f. Experimental procedure for Quantitative analysis : Standard addition method , Internal standard method
  - g. Interferences in Flame Photometry
  - h. Limitations of flame photometry.
3. Chromatography
  - a. Introduction
  - b. Classification of Chromatography
  - c. Types of Chromatography :
    - Paper Chromatography : Introduction, Principle, Types of Paper Chromatography, Experimental details for Qualitative Analysis, Application
    - Thin Layer Chromatography(TLC) : History & Origin, Superiority of TLC over other Chromatographic techniques, Experimental Techniques, Evaluation of the Chromatogram (Direct method, Indirect method), Application of TLC
    - Column Chromatography : Introduction, Principle, Experimental details, Factors effecting column efficiency, Application of Column Chromatography
    - Gas Chromatography : Introduction, Principle, Instrumentation, Application of Gas chromatography
4. Electrophoresis
  - a Introduction
  - b Principle
  - c Instrumentation
  - d Types of electrophoresis (I) Paper Electrophoresis (ii) Gel Electrophoreses
  - e Application
5. Atomic Absorption Spectroscopy
  - a Introduction
  - b Principle
  - c Differences between the Atomic Absorption Spectroscopy & Flame emulsion spectroscopy
  - d Advantages of Atomic Absorption spectroscopy over Emission Flame Spectroscopy
  - e Disadvantages of Atomic Absorption spectroscopy
  - f Instrumentation
  - g Types of Instruments
  - h Application
  - i Electometry Determination of Na<sup>+</sup> & K<sup>+</sup>
  - j RadioImmuno Assay {RIA & EIISA}

PRACTICAL

1. Principle, working & maintenance of Colorimeter
2. Principle, working & maintenance of Spectro Photometer
3. Principle, working & maintenance of Flame Photometer
4. Principle & procedure of Paper Chromatography
5. Principle & demonstration of TLC
6. Principle & procedure of Gas Chromatography
7. Principle & procedure of Column Chromatography
8. Principle & procedure of Electrophoresis
9. Demonstration of ELISA

**FIFTH SEMESTER**MICROBIOLOGY (MT-301)  
THEORY

1. Preservation of microbes and lyophilization methods
2. Total and viable counts of bacteria
3. Testing of disinfectants Rideal Walker Chick Martin and In use tests.
4. Preparation and standardization of vaccines and immunization
5. Bacteriological examination of water, milk, food and air.
6. Nosocomial infections and sterility testing of I/V fluids and processing of various samples for hospital infections
7. Toxin Antitoxin assays and pathogenicity tests
8. Principles of serological techniques used in virology-HA, HA, Had, SRH,RPHA, IHA, CFT,CIEP.
9. Mode of transmission of viral agents
10. Morphology and life cycle of free living Amoebae, Balantidium, Toxoplasma
11. Diagnosis of Morphology and life cycle of trematodes- Schistosomes, Intertinal flukes, blood flukes, wing flukes
12. Serological and immunological techniques used in diagnosis of parasitic infections-Gel diffusion, IHA, IFA, ELISA,

HISTOPATHOLOGY (MT-303 )  
THEORY

1. Handling of fresh histological specimen(tissues) cryo/frozen sections of fresh and fixed tissues, freeze drying.
2. Lipids, identification and demonstration
3. Micro-organisms in tissues- various staining technique for their demonstration and identification
4. Nucleic acids, DNA and RNA special stains and procedures
5. Cytoplasmic constituents and their demonstration
6. Cervical cytology-basis of detection of malignant and premalignant lesions
7. Hormonal assessment with cytologic techniques and sex chromatin and pregnancy tests.
8. Cells and organs of immune system
9. Immunoglobulins, antibodies and humoral immune response
10. Allergy
11. Rheumatological diseases and investigations.

HAEMATOLOGY (MT-305)  
THEORY

1. Definition and classifications of anaemia
2. Laboratory investigation for megaloblastic anaemia
3. Laboratory investigation for iron deficiency Anaemia
4. Laboratory investigation for haemolytic anaemia including classification and causes
5. Leukemia: definition and classification (General & FAB )
6. Cytachemical staining procedure in various haemopoietic disorders.
7. Blood parasites : Laboratory diagnosis and treatment of important parasites found in blood.

BIOCHEMISTRY(MT-307)  
THEORY

1. Principles of assay procedures for biological materials Total proteins, albumin, Glucose, Urea, Uric acid, Creatinine, Cholesterol, Bilirubin.
2. Sodium, Potassium, Chloride, Calcium and phosphorus.
3. PBI, 17- Ketosteroids, Barbiturates

**Fundamentals of Computer (MT-309)**

## THEORY

1. Introduction About Computer
  - Block diagram of computer
  - Generations of computers & Its classification
  - Computer Languages
  - Input,Output & Storage devices
  - Software & Hardware
2. Introduction of Operating System
  - MSDOS introduction & its various commands
  - System Files & Booting process
  - Formatting of Floppy & Harddisk
  - Windows introduction and its commonly used commands
3. Introduction of MS-WORD
  - MS-WORD tools
  - Creating,Opening,Saving,Closing,Printing and Deleting document.
  - Formatting Tools
  - Page & Paragraph alignment
  - Mail-Merge
  - Different ways of viewing a document
  - Spell Checker
  - Justification of a document
  - Creation & editing of Tables
4. Introduction about Excel
  - Spreadsheet & its Various tools
  - Creating & manipulating spreadsheet
  - Creating & Editing Charts
  - Database creation
5. Introduction about PowerPoint
  - Power Point Tools
  - Creating & manipulating Presentations
  - Editing ,Formating & aliging tools
  - Creation & Manipulation of charts
6. Internet & its Aplications
  - Introduction & its Aplications
  - WWW,HTTP,FTP
  - Creating EMAIL ID,Deleting & Changing passwords
  - Composing of messages,deletion,Replying,Forwarding Messages
  - Searching of information
  - Downloading information
  - Sending of attachment
7. Installation of different Software & introduction about different Software related to MLT.

**SIXTH SEMESTER**MICROBIOLOGY(MT-302)  
THEORY

1. Epidemiological markers of microorganism serotyping, Bacteriophage and Bacteriocine typing methods
2. Lab diagnosis of common Bacterial infections viz:- pyogenic infections, Respiratory tract infections, Meningifis, Diptheria, Whooping Cough, Gas gangrene, food poisoning, Enteric fever, Acute diarrhea diseases, cholera, Urinary tract infection, Tuberculosis, Leprosy, Plague, Anthrax, Typhus fever, syphilis, Gonorrhea and other STD's
3. Serological Tests-Widal, ASO, LFT, CRP, Rosewaller, brucella agglutination, cold agglutination, VDRL, TPHA, PTA-ABS
4. Lab 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
5. Serological tests for fungal infections and skin tests
6. Advanced techniques in microbiology ELISA, RIA, CCIEA, Co-agglutination GLC, HPLC etc.
7. Rapid diagnostic methods and Automation in Microbiology.
8. Principles of Serological techniques used in virology- ELISA, RIA, IF, Immuno peroxidase test
9. Prevention of viral disease
10. Immunity in viral infection
11. Introduction to Entomology Identipcation of Adultworms- mosquitoes, flies, ticks and fleas
12. Animal care, handling and uses in parasitology.
13. Preparation of parasitic antigens, antigens and antisera Handling and operating of sophisticated equipment.

HISTOPATHOLOGY(MT-304)  
THEORY

1. Tissues requiring special treatment i.e eye ball, Bone marrow biopsy, undercalcified bones.
2. Neuropathologic techniques
3. Enzyme histochemistry demonstrations of phosphatases, dehydrogenases oxidases and peroxidases etc.
4. Electron microscope, working principle, components and allied techniques for electron microscopy, ultra-microtomy
5. Museum techniques
6. Aspiration cytology principles, indications and utility of the technique with special emphasis on role of cytotechnician in FNAC clinics
7. Infection and immune system
8. Cancer Immunology
9. Tissue typing for kidney transplant

HAEMOTOLOGY(MT-306)  
THEORY

1. Laboratory tests for assessing bleeding disorders
2. Laboratory investigation for disseminated intravascular coagulation(DIC)
3. Mechnaism of fibrinolysis test for fibrinolysis
4. Platelet function tests and their interpretation

5. Techniques available for cytogenetic studies
6. Use of Radioisotopes in hematology
7. Safety measures for handling Radioisotopes

BIOCHEMISTRY(MT-308)  
THEORY

1. Glucose tolerance test, insulin tolerance test, gastric analysis, xylose absorption test, clearance test for renal function-Enzymes Acid and alkaline phosphates, AST, ALT, Amylase and lactate dehydrogenase, CPK
2. Analysis of calculi and CSF
3. Quality control of clinical investigations, Automation in clinical biochemistry laboratory, laboratory organisation management and maintenance of records.

ENVIRONMENTAL SCIENCES (MT-310)  
THEORY

The Multidisciplinary nature of environmental studies:

Definition, scope and importance. Need for public awareness.

Natural Resources :

Renewable and non-renewable resources :

1. Natural resources and associated problems.
  - a Forest resources : Use and over-exploitation, deforestation, case studies, Timber extraction, mining, dams and their effects on forests and tribal people
  - b Water resources : Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems
  - c Mineral resources : Use and exploitation, environmental effects of extracting and using mineral resources, case studies
  - d Food resources : World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems. Water logging, salinity, case studies
  - e Energy resources : Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources Case studies
  - f Land resources : Land as a resource, land degradation, man induced landslides, soil erosion and desertification.
2. Role of an individual in conservation of natural resources.
3. Equitable use of resources for sustainable lifestyles.

Ecosystems

1. Concept of an ecosystem
2. Structure and function of an ecosystem
3. Producers, consumers and decomposers
4. Energy flow in the ecosystem
5. Ecological succession
6. Food chains, food webs and ecological pyramids
7. Introduction, types, characteristic features, structure and function of the following ecosystem :

- a. Forest ecosystem
- b. Grassland ecosystem
- c. Desert ecosystem
- d. Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

#### Biodiversity and its conservation

1. Introduction-Definition : genetic, species and ecosystem diversity
2. Biogeographical classification of India
3. Value of biodiversity : Consumptive use, productive use, social, ethical aesthetic and option values
4. Biodiversity at global, National and local levels
5. India as a mega-diversity nation
6. Hot-spots of biodiversity
7. Threats to biodiversity : Habitat loss, poaching of wildlife, man-wildlife conflicts
8. Endangered and endemic species of India
9. Conservation of biodiversity : In-situ and Ex-situ conservation of biodiversity.

#### Environmental Pollution

1. Definition, Causes, effects and control measures of :-
  - a. Air pollution
  - b. Water pollution
  - c. Soil pollution
  - d. Marine pollution
  - e. Noise pollution
  - f. Thermal pollution
  - g. Nuclear hazards
2. Solid waste Management : Causes, effects and control measures of urban and industrial wastes.
3. Role of an individual in prevention of pollution.
4. Pollution case studies.
5. Disaster management : floods, earthquake, cyclone and landslides

#### Social Issues and the Environment

1. From Unsustainable to sustainable development
2. Urban problems related to energy
3. Water conservation, rain water harvesting, watershed management
4. Resettlement and rehabilitation of people : its problems and concerns Case studies
5. Environmental ethics : Issues and possible solutions.
6. Climate change, global warming, acid rain, ozone layer depletion nuclear accidents and holocaust. Case studies.
7. Wasteland reclamation
8. Consumerism and waste products
9. Environment Protection Act
10. Air (Prevention and Control of Pollution) Act.
11. Water (Prevention and control of Pollution) Act
12. Wildlife Protection Act
13. Forest conservation Act
14. Issues involved in enforcement of environmental legislation
15. Public awareness.

Human Population and the Environment

1. Population growth, variation among nations
2. Population explosion- Family welfare Programme.
3. Environment and human health
4. Human Rights
5. Value Education
6. HIV/AIDS
7. Women and Child Welfare
8. Role of Information Technology in environment and human health
9. Case Studies

Field work

1. Visit to a local area to document environmental assets-river forest grassland/hill mountain
2. Visit to a local polluted site-Urban/Rural/Industrial/Agricultural
3. Study of common plants, insects, birds.
4. Study of simple ecosystems-pond, river, hill slopes, etc. (field work Equal to 5 lecture hours)

REFERENCE BOOKS FOR MICROBIOLOGY

Sr.	Title	Author/Publisher
1	Microbiology	Pelczar, Kahn and creig (Tata McGraw Hills)
2	Text book of Microbiology	R. Ananthanereyan and CKJ Panker (Orient Longman Ltd.)
3	Medical Micrology	Satish Gupte(Jaypee Brothers, Mecal Publishers)
4	Medical laboratory Technology. Vol.	Kanai. L.Mukheyee (Tata McGraw Hill)
5	Medical Laboretory manual for Trapical Countires Vol II Microbiology	Monia Cheesbrough (ELBS, Oxford)
6	Textbook of Parasitology	N.C. Dey
7	Resilocogy	Chettyyee ( Chettyyee Medical Publishers)
8	A handbook of Medical Laboratory Technology	V.H. Talib (CBS Publishers)
9	Textbook of Medical Oparestology	C.K. Jayaram Panuker (Jaypee Brother, Mediceal Publishers)
10	Immunology – Kuby	Richard. A. Goldsby, Thomas. J.Kindt, Barbara.A. Osborne, Jaypee Brothers

## REFERENCE FOR ANATOMY, HISTOTECHNOLOGY, CELLULAR PATHOLOGY &amp; HISTOPATHOLOGY

Sr.	Title	Author/Publisher
1	Anatomy and Physiology -Ross and Wilson	Anne Waugh and Allison Grant, Churchill Livingstone
2	Human Anatomy-Volume I,II,III	B.D.Chaurasia, CBS Publisher
3	A text book of Human Anatomy	T.S.Ranganathan,
4	Textbook of Human Histology	Inderbir singh, Jaypee Brothers
5	Di Fiore`s Atlas of Histology	Victor.P.Eroschenko, Lippincott William and Wilkins
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Volume 1 &amp; 2

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John Foerster  
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2	Computer Applications	Sawtantar Singh
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17	Environmental Chemistry	Sharma B.K., Goel Publ. House, Meerut
18	Survey of the Environment	The Hindu (Magazine)
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20	Handbook of Environmental Law, Rules, Guidelines, Compliance and standards Vol I & II	Trivedi R.K., Enviro Media (Reference)
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