School of Paramedical Sciences

Department of Medical Laboratory Technology

M Sc in Medical Laboratory Technology

Specialization in
(Clinical Biochemistry, and Hematology & Blood Transfusion)

FLEXILEARN

-Freedom to design your degree

STAREX UNIVERSITY
GURUGRAM
HARYANA
2021-2022

School of Paramedical Sciences

M Sc (Medical Laboratory Technology)
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STAREX UNIVERSITY
GURUGRAM
HARYANA
2021-2022

M Sc in Medical Laboratory Technology
(M Sc MLT
2 Years Course
(Four semesters)

Specialization in

1. **Clinical Biochemistry**
2. **Hematology and Blood Transfusion**

REGULATIONS OF M Sc MLT COURSE:

1. SHORT TITLE AND COMMENCEMENT

These regulations shall be called "THE REGULATIONS FOR THE MASTER OF SCIENCE IN MEDICAL LABORATORY TECHNOLOGY STAREX UNIVERSITY.

They shall come into force from the academic year 2021-22 Session.
The regulation and syllabus are subject to modifications by the standing Board of studies for paramedical courses from time to time.

II. REGULATIONS

1. ELIGIBILITY FOR ADMISSION

The candidate should have passed **B.Sc. (Allied Health Sciences/Medical Laboratory Technology (BMLT)/Biochemistry/Microbiology/Biotechnology/Genetics/Humanbiology/MBBS/BDS)** from any recognized university with a minimum of 50 % marks.

2. DURATION OF THE COURSE AND COURSE OF STUDY

The period of certified study and training of the M Sc MLT degree course shall be of two academic years.

3. MEDIUM OF INSTRUCTION

English shall be the medium of instruction for all the subjects of study and for examinations of

the course.

4. MINIMUM WORKING DAYS IN AN ACADEMIC YEAR

Each academic year shall consist of not less than 180 days with a minimum of 90 days working days per semester.

5. ATTENDANCE REQUIRED FOR APPEARING EXAMINATION

a) Examination will be conducted in both theory and practical as prescribed. Candidates will be permitted to appear for the Examinations in the subject, only if they secure not less than 60 % of attendance in each subject of the respective semester/year.

b) A student who does not meet the minimum attendance requirement in a semester or year must repeat the course work along with the next batch of students.

6. CONDONATION FOR LACK OF ATTENDANCE

Condonation of shortage of attendance in aggregate up to 10 % (between 60 % and 70 %) in each semester may be granted by the Institute's Academic Committee and as per the regulations of Starex University, under extraordinary circumstances on payment of extra one year tuition fee as penal fees.

7. INTERNAL ASSESSMENT (IA):

Internal assessment will be done in each subject of study and the marks will be awarded to the candidates as detailed in the scheme of examinations. The marks awarded will be done based on the candidate's performance in the assignments, class tests –written / practical, laboratory work, preparation and presentation of Project work/ seminars

or any other accepted tools of assessment, as assessed by the teachers. Candidate should have scored a minimum of 40% in Theory (IA) and 40% in Practical's (IA) separately to be allowed to appear for the Summative / Final Examination.

8. EXAMINATIONS:

a) The Summative/Final Examination will be conducted in the suggested pattern for all the two years (Four Semester).

b) The particulars of subjects for various examinations and distribution of marks are detailed in the Scheme of Examination.

9. ELIGIBILITY / MAXIMUM DURATION FOR THE AWARD OF THE DEGREE:

a) The candidates shall be eligible for the Degree of Master of Science in Medical Laboratory Technology when they have undergone the prescribed course of study for a period of not less than two years in Starex University and have passed the prescribed examinations in all subjects.

b) The maximum period to complete the course successfully should not exceed the period of 5 years.

10. MARKS QUALIFYING FOR A PASS

a) Candidate has to pass separately in Theory +Viva voce and Practical by getting a minimum of 50 % marks in the aggregate marks obtained in internal assessment and Summative/Final Examination. It is further subject to the condition that candidate should obtain minimum of 50% marks Summative/Final Examination and, 40% marks in Final Practical and 40 % marks in internal assessment.

b) If a candidate fails in either theory or practical, he / she has to reappear for both theory and practical.

11. DECLARATION OF CLASS

Letter Grade	Grade Point
O (Outstanding)	10
A+(Excellent)	9
A (Very Good)	8
B+(Good)	7
B (Above Average)	6
C (Pass)	5
F (Fail)	4
Ab (Absent)	0

Schedule of Examination-2021-22 (Total Credits-86)

SUMMARY OF PROGRAMME STRUCTURE				
Semesters	**Lecture(L) Hours Per Week**	**Tutorial (T) Hours Per Week**	**Practical (P) Hours Per Week**	**Total Credits**
First semester	12	4	8	20
Second semester	12	4	8	22
Third semester	12	4	8	22
Fourth semester	-	-	-	24
Total				86

I Semester

Sn	Nomenclature of paper/course	Paper Code	Course type	Scheme			Credits C(L-T-P)
				T	I	TM	
1	Physical and Analytical Biochemistry	1017101	Core	75	25	100	4(3-1-0)
2	Cellular pathology	1017102	Core	75	25	100	4(3-1-0)
3	General microbiology and Bacteriology	1017103	Core	75	25	100	4(3-1-0)
4	Human physiology	1017104	Core	75	25	100	4(3-1-0)
5	Practical- I	1017105	Core	75	25	100	4(0-0-8)

II Semester

Sn	Nomenclature of paper/course	Paper Code	Course type	Scheme			Credits C(L-T-P)
				T	I	TM	
1	Metabolism and Enzymology	1017201	Core	75	25	100	4(3-1-0)
2	Clinical Pathology	1017102	Core	75	25	100	4(3-1-0)
3	Immunology and Virology	1017103	Core	75	25	100	4(3-1-0)
4	Research Methodology, Biostatistics, and Hospital Management	1017104	Core	75	25	100	4(3-1-0)
5	Practical- II	1017105	Core	75	25	100	4(0-0-8)
6	Seminar	1017106	Core			50	2(0-2-0)

III Semester

Clinical Biochemistry

Sn	Nomenclature of paper/course	Paper Code	Course type	Scheme			Credits C(L-T-P)
				T	I	TM	
1	**Advances in Biochemical Sciences**	1017307	Core	75	25	100	4(3-1-0)
2	**Intermediary Metabolism and Metabolic Disorders**	1017308	Core	75	25	100	4(3-1-0)
3	**Diagnostic Enzymology**	1017309	Core	75	25	100	4(3-1-0)
4	**NTCC**	1017305	DECC			50	2(0-2-0)
5	**Practical- III (CB)**	1017310	Core	75	25	100	4(3-1-0)

Hematology and Blood Transfusion

Sn	**Nomenclature of paper/course**	Paper Code	Course type	Scheme			Credits C(L-T-P)
				T	I	TM	
1	**Clinical Hematology (non-Neoplastic)**	1017311	Core	75	25	100	4(3-1-0)
2	**Clinical Hematology (Neoplastic)**	1017312	Core	75	25	100	4(3-1-0)
3	**Immunopathology and Advance Hematology Technique**	1017313	Core	75	25	100	4(3-1-0)
5	**NTCC**	1017305	DECC			50	2(0-2-0)
5	**Practical- III (HBT)**	1017314	Core	75	25	100	4(3-1-0)

IV Semester

Sn	Nomenclature of paper/course	Paper Code	Course type	Scheme			Credits C(L-T-P)
				T	I	TM	
1	Dissertation/Project	1017401	Core	-	-	600	24

CC	Core Course
DCEC	Discipline Centric Elective Courses
GEC	Generic Elective Courses
SEEC	Skill Enhancement Elective Courses

Examination Scheme:
For theory paper

Components	Midterm (S/O/A)	End Term
Marks	25	70

For practical

Components	Midterm(S/O/A)	End Term
Marks	20	30

(S-Subjective, O-Objective, A- Assignment)

SEMESTER I
PAPER - 1
PHYSICAL AND ANALYTICAL BIOCHEMISTRY
(1017101)

UNIT 1:

General introduction to laboratory equipment and instruments. Glassware's, balances, centrifuges, incubator, hot air oven, water bath. Brief description of Colorimetry and photometry and its laboratory tests – end point reaction and rate of reaction methods. Fluorometry. Flame photometry, electrophoresis, densitometer, blotting techniques. Chromatography – types. Polymerase chain reaction. Flow cytometry.

UNIT 2:

Automation, advantages of auto analyzers, continuous flow analyzers, discrete auto analyzer – types (semi-automated and fully automated).

UNIT 3:

Electrolytes: Definition, ionization of weak acids, weak bases pH, Henderson Hasselbach equation. Buffer systems – definition, titration curve of weak acids, buffering capacity, physiological buffers, respiratory and metabolic acidosis and alkalosis.

UNIT 4:

Organization and quality control in the laboratory, cleaning of glassware, biomedical waste management

PRACTICALS

1. Preparation of various solutions and buffers
2. Acid base titration
3. Color reactions of proteins, carbohydrates and lipids
4. Validation of Lambert's and Beer's law and derivation of standard curve in colorimetry.
5. Separation of plasma from anti coagulated blood and separation of serum from clotted blood.
6. Standardization of colorimeter, photometer, and spectrophotometer.
7. Determination of unknown concentration of colored solutions by photometric method.
8. Introduction to working of a semi-auto analyzer and fully automated chemistry analyzers.
9. Thin layer chromatography
10. HPLC
11. Serum proteinelectrophoresis
12. R_f value of aminoacids

Reference books/ Textbooks

1. U Satyanarayan and U Chakrapani. Text book of Biochemistry, 4th Edition 2013, Elsevier.
2. M N Chatterjea and Rana Shinde. Text book of Medical Biochemistry , 8th Edition 2012, Jaypee Brothers Medical Publishers (P) Ltd
3. D M Vasudevan, Sreekumari S, Kannan Vidhyanathan,Textbook of Biochemistry for Medical students, 8thEdition 2016, Jaypee & Brothers Medical Publishers (P) Ltd.
4. Albert L Lehninger, Michel M Cox, David L Nension, Lehninger Principle of Biochemistry, 6th Edition 2013, W H Freeman & Co.
5. Robert Kincaid Murray, David Bender, Kathleen M. Botham, Peter J. Kennelly, Harpers Illustrated Biochemistry, 30th Edition 2015, McGraw Hill Professional.
6. Michael Lieberman, Allan D. Marks, Colleen M. Smith, Dawn B. Marks, Marks' Essential Medical Biochemistry, 2nd Edition 2007, Lippincott Williams & Wilkins.
7. Donald Voet, Judith G. Voet, Charlotte W. Pratt. Fundamentals of Biochemistry: Life at the Molecular Level: Life at the Molecular Level. Fifth Edition 2016, Wiley

SEMESTER I

PAPER 2

PAPE

CELLULAR PATHOLOGY
(1017102)

Unit 1-

Cell Structure and functions: various cell organelles with functions. Basic structure of Blood cells. Development and classification of blood cells. The extra cellular matrix, collagen, elastin, fibrillin, fibronectin, laminin etc. Cellular adaptation**:** Overview of cell injury, mechanism of cellular injury, necrosis and apoptosis, pathological classification, cellular regeneration and repair, control of cell growth and wound healing.

Unit 2 - Neoplasia: Types of cancer, differentiation and anaplasia, cancer epidemiology , molecular basis of cancer, basis of multistep carcinogenesis, etiology of cancer, carcinogens – classification and mode of action, laboratory diagnosis of cancer, molecular profiling of cancer. Genetic disorders: mutations, types of mutations, disease due to defective repair mechanism, Mendelian disorders, sex chromosomes related disorders, diseases caused by change in structural proteins- Marfan syndrome, Ehler's syndrome, Danlos syndrome. Diseases caused by mutations in receptors proteins: Familial hypercholesterolemia, diabetes, protein energy malnutrition. Cytogenetics disorders: Down syndrome, Klinefelter syndrome, Turner syndrome, Fragile X syndrome. Pediatric disease, congenital anomalies, respiratory distress syndrome of newborn, Necrotizing enterocolitis, sudden death syndrome, cystic fibrosis. Fluorescent in-situ hybridization for identification of chromosomal abnormalities.

Unit 3 - Hemodynamic disorders: Hyperemia and congestion, hemorrhage, hemostasis, thrombosis, coagulation cascades, DIC, embolism, pulmonary thromboembolism, systemic thromboembolism, fat embolism, infarction. Environmental pollution : Air pollution, water pollution, and soil pollution, injury by chemical agents, injury by therapeutic and nontherapeutic agents : lead, carbon monoxide, alcohol and drug abuse, injury by physical agents. Exogenous estrogen and oral contraceptive pills side effects.

Unit 4- Hematopoiesis: origin, development and fate of blood cells. Erythropoiesis origin, development of RBC, biosynthesis of Hb, control of Erythropoiesis. Leucopoiesis – Granulocytes and agranulocytes and platelets. Mechanism of normal hemostasis. Mechanism and stages of coagulation, factors. Instruments in hematology and hematological stains. Acute inflammation: Vascular and cellular events, chemical mediators, inflammatory cells, systemic effects of inflammation, general inflammatory markers, CRP, ASO.

PRACTICAL

1. Advance microscopy
2. Hb estimation – Sahil's method
3. Peripheral Blood film (PBF)- Preparation, staining with Leishman's stain and examination/identification of the RBC, WBC (Differential) and Platelets
4. Cell counts by Neubauer chamber (RBC, WBC and platelet)
5. ESR and PCV Estimation
6. BT/CT determination
7. ABO/Rh blood grouping – slide method, forward and reverse grouping
8. Urine examination – physical, chemical examination for glucose, proteins, bile salts, bile pigments (bilirubin and urobilinogen), ketone bodies and occult blood.
9. Semen analysis, physical and counting in Neubauer's chamber.
10. Automation in hematology.

Text books:

1. J Ochei and A Kolhatkar, Medical Laboratory Science- Theory and Practice, 1st Edition 2000, Tata Mcgraw Hill Publishing Co Ltd.
2. Praful B. Godkar, Darshan P. Godkar, Text book of Medical Laboratory Technology, 3rd Edition 2014, Bhalani Publishing House.
3. R N Makroo, Principle &Practice of transfussion medicine, 1st Edition 2014, Jain Books.
4. Christopher D Hillyer, Beth, James, Transfusion Medicine & hemostasis: Clinical & Laboratory aspect, 2ndEdition 2013, Elsevier Healths.
5. Richard A. McPherson, Henry's Clinical Diagnosis and Management by Laboratory Methods, 22nd Edition 2014, Elsevier.

SEMESTER I

PAPER 3

GENERAL MICROBIOLOGY AND BACTERIOLOGY (1017103)

General Microbiology:

Unit 1:

- History and Pioneers in Microbiology: Contributions of Antony Van Leeuwenhoek, Louis Pasteur, Joseph Lister, Robert Koch (Koch's Postulates),
- Bacterial Taxonomy: Nomenclature and classification of microbes (in brief)

Unit 2:

- Microscopy, Stained preparation, Size & Shape and arrangement
- Morphology of bacteria: Structures of a bacterial cell and their functions
- Physiology of Bacteria: Nutrition, Gaseous requirement, temperature requirement and other growth requirements
- Sterilization and Disinfection
- Culture media and Culture methods
- Identification of Bacteria and their Antibiotic sensitivity testing
- Antimicrobial agents: Mechanism of Actions
- Bacterial metabolism: Oxidation, Fermentation

Unit 3:

- Morphology, Cultural Characteristics, Pathogenesis (in brief) Laboratory Diagnosis of following bacteria:
  - *Staphylococcus, Streptococcus including Pneumococcus, Neisseria, Micrococcus, Bacillus, Corynebacterium, Clostridium.*
  - *Enterobacteriaceae, Vibrios, Pseudomonas, Brucella, Haemophilus, Bordetella*
  - *Spirochaetes,*
  - *Chlamydiae, Rickettsiae.*
  - *Mycobacteria*
  - *Lactobacillus, , Bacteroides, Fusobacterium and Leptotrichia, Actinobacillus, Pasteurella, Francisella, Ureaplasma, Actinomycets, Nocardia,Listeria,*

Unit 4:

- Etiology and Laboratory diagnosis of Respiratory infections, Urinary tract infections, Pyrexia of unknown origin, Meningitis, Sepsis, Septicemia, Diarrheal diseases & food poisoning.
- Prevention and Control of Hospital acquired infections.
- Monoprophylaxis: Types of vaccines and schedule of vaccination.
- Principal and Practice of Hospital waste disposal
- Recent advances in diagnostic microbiology: Automation, Nucleic acid-based detection methods.

- Epidemiology of common infectious diseases and newer vaccines
- Bioterrorism

PRACTICALS

- Aseptic practices in laboratory and safety precautions
- Preparation of stains viz. Gram, Alberts, Ziehl-Neelsen (ZN) etc. and performing of staining.
- Preparation and pouring of media – Nutrient agar, Blood agar, Mac Conkey agar, Sugars, Serum sugars, TSI, Robertson's cooked meat, Lowenstein Jensen's, Sabouraud dextrose Agar.
- Quality control of media, reagents.
- Operation and quality control of Autoclave, hot air oven dispensator.
- Washing and sterilization of glassware (Plugging and packing)
- Disposal of contaminated materials like cultures.
- Care and maintenance of common laboratory equipment like water bath, centrifuge, refrigerators, incubators.
- Identification of Bacteria of Medical Importance upto species level
- Care and operation of Microscopes viz. Light and Fluorescent microscopes.
- Methods for the preservation of bacteria, Maintenance of stock cultures.
- Tests for motility: hanging drop preparation.

SEMESTER I

PAPER 4

HUMAN PHYSIOLOGY
(1017104)

UNIT 1

Blood - Composition and functions of blood, plasma proteins and their functions, erythropoiesis, leukopoiesis, thrombopoiesis, Structure and synthesis of haemoglobin. Properties and function of haemoglobin. Hemoglobin derivatives. Blood coagulation mechanism.

UNIT 2

Introduction to Digestive system – physiology and function of Salivary secretions, stomach, pancreas, liver and gall bladder, small intestine, large intestine, digestion and absorption of carbohydrates, fats and proteins in GI tract. Introduction to Cardiovascular system – physiology and anatomy of heart, cardiac cycle, arterial blood pressure.

UNIT 3

Physiology and anatomy of Respiratory system – mechanism of respiration,
General introduction to endocrine system – function of pituitary gland, thyroid gland, parathyroid gland, adrenal cortex, adrenal medulla, pancreas, thymus and pineal gland.
Organization of Nervous system – synapses, central nervous system and autonomic nervous system.

UNIT 4

Physiology and anatomy of Reproductive system, Excretory system- Structure of nephron, formation of urine (glomerular filtration, tubular reabsorption of glucose, water and electrolytes), tubular secretion, role of kidneys regulation of blood pressure, Regulation of body temperature – normal range and factors affecting body temperature.

Textbooks:

1. **1** B. D. Chaurasia, BD Chaurasia's Human Anatomy Regional and Applied Dissection and Clinical: Lower Limb Abdomen and Pelvis, Vol I, II and III, 7th Edition 2016, CBS Publishers & Distributors.
2. K Simbulingam & P Simbulingam, Essential Medical Physiology, 6th Edition 2012, Jaypee Brothers Medical publishers (P) LTD.
3. N Murgesh, Basic Anatomy and Physiology, 6th Edition 2011, Satya Publishers.
4. Anne Waugh, Kathleen and J W Wilson, Ross and Wilson Anatomy and Physiology, 12th Edition 2014, Churchill Living Stone.
5. Gerard J. Tortora, Bryan H. Derrickson, Principle of anatomy and physiology, 14th Edition2014, Wiley Publication.

SEMESTER I

PAPER 5

PRACTICAL
(1017105)

Practicals are based on theory papers

SEMESTER II

PAPER 1

METABOLISM AND ENZYMOLOGY (1017201)

UNIT 1:

Enzymes: definition and classification, enzyme as catalysts, enzyme specificity, factors affecting enzyme activity, Enzyme kinetics, Enzyme inhibitors, co enzymes, isoenzymes, Determination of enzymes – comparison of endpoint reaction and rate of reaction methods.

UNIT 2

Carbohydrates - Definition, function, classification. Properties and digestion of carbohydrates. Metabolism – Glycolysis, glycolgenesis, glycogenolysis, Citric acid cycle, Hexose monphosphate shunt (HMP), Gluconeogenesis. Electron transport system, Regulation of blood glucose, diabetes, Diabetic profile test, lab test for blood (plasma) glucose determination, glucose tolerancetest.

UNIT 3:

Proteins – structure and classification, functions of protein, Types of proteins, Amino acid metabolism, urea cycle and its associated defects. Proteinuria and its causes, Lab determination of protein in body fluids. Aminoaciduria. Biochemistry of lipids, digestion and absorption of lipids. Lipid metabolism, lipo-protein, dyslipidemia, lipid profile.

UNIT 4:

Non protein nitrogenous molecules, Metabolism of nucleotides - nucleosides and nucleotides, Purine and pyrimidine. Heme metabolism and associated disorders.

PRACTICALS

1. Kinetic properties of enzymes
2. Quantitative analysis of various parameters (protein, glucose, AL, ALT, cholesterol, creatinine, urea).
3. Calculation of clearance (urea and creatinine)
4. Glucose tolerance test.
5. Biochemistry of various body fluids (pleural, pericardial, CSF)
6. Diabetic profile including glycatedhaemoglobin.
7. Organ function tests: LFT, KFT, lipidprofile.
8. Analysis of abnormal urine and its applications

Textbooks:

8. U Satyanarayan and U Chakrapani. Text book of Biochemistry, 4th Edition 2013, Elsevier.
9. M N Chatterjea and Rana Shinde. Text book of Medical Biochemistry , 8th Edition 2012, Jaypee Brothers Medical Publishers (P) Ltd
10. D M Vasudevan, Sreekumari S, Kannan Vidhyanathan,Textbook of Biochemistry for Medical students, 8thEdition 2016, Jaypee & Brothers Medical Publishers (P) Ltd.
11. Albert L Lehninger, Michel M Cox, David L Nension, Lehninger Principle of Biochemistry, 6th Edition 2013, W H Freeman & Co.
12. Robert Kincaid Murray, David Bender, Kathleen M. Botham, Peter J. Kennelly, Harpers Illustrated Biochemistry, 30th Edition 2015, McGraw Hill Professional.
13. Michael Lieberman, Allan D. Marks, Colleen M. Smith, Dawn B. Marks, Marks' Essential Medical Biochemistry, 2nd Edition 2007, Lippincott Williams & Wilkins.
14. Donald Voet, Judith G. Voet, Charlotte W. Pratt. Fundamentals of Biochemistry: Life at the Molecular Level: Life at the Molecular Level. Fifth Edition 2016, Wiley

SEMESTER II

PAPER 2

CLINICAL PATHOLOGY
(1017202)

Unit I

Fetal and neonatal physiology and pediatric diseases: Growth and functional development of the fetus, adjustment of the infant to extrauterine life, special functional problem in the neonate, problems of prematurity, congenital anomalies, perinatal infections, syndromes of the newborn, immune hydrops, tumors and tumor like lesions of infancy and childhood.
Cervical cancer, uterine and ovarian cancers, gestational trophoblastic neoplasia. Sexually transmitted diseases – syphilis, gonorrhoea, trichomoniasis, human papilloma virus infection. Diseases during pregnancy – placental inflammations and infections, ectopic pregnancies, gestational trophoblastic diseases and eclampsia.

Unit II

Red blood cells disorders: basic aspects of anemia - definition, pathophysiology, classification and clinical features. Investigation of anemia in general.

Microcytic hypochromic anemias: Iron deficiency anemia – iron metabolism, causes of iron deficiency, clinical features and laboratory investigation.

Macrocytic anemia: Megaloblastic anaemia - etiology, clinical features, lab investigations. Non - megaloblastic anaemia. Pernicious anemia.

Normocytic normochromic anemia: anemia in systemic disorders, (acute blood loss, renal failure, liver disorders).

Disorders of haemoglobin : structure of haemoglobin and synthesis, normal and abnormal hemoglobin, haemoglobinopathies (thalassemia and sickle cell anemia).

Hemolytic anemias: definition, pathogenesis, classification, clinical features, lab investigation.

Aplastic anemia: pancytopenia.

Polycythemia – classification, clinical features and lab investigation.

Unit III

WBC disorders: Leukemoid reaction, myelodysplastic syndrome (MDS) – definition, clinical features, peripheral smear and bone marrow findings.

Leukemias: definition, classification – FAB and WHO of acute leukemias, diagnostic criteria, cytochemical staining and immunophenotyping.

Chronic leukemia: classification, diagnostic criteria, clinical feature and lab investigation.

Myeloproliferative disorders: classification, clinical features, lab investigations, chronic myeloid leukemia in detail.

Lymphoproliferative disorders: chronic lymphocytic leukemia in detail.

Plasma cell disorders: classification. Plasma cell myeloma – definition, clinical features, lab investigations.

Unit IV

Hemorrhagic disorders: definition, pathogenesis, clinical features and classification of vascular, platelet disorders, coagulation disorders and fibrinolysis.

Platelet disorders: quantitative- thrombocytopenia, ITP – classification, clinical features and bone marrow findings in ITP.

Qualitative platelet disorders - thrombocytosis- definition, etiology and lab investigations.

Coagulation disorders inherited: Hemophilia A & B, Von – Willebrand's disease, acquired vitamin K deficiency, liver diseases, DIC.

Investigations of hemorrhagic disorders: tests of vascular and platelet function – bleeding time, clotting time, platelet count, platelet aggregation studies.

Antiphospholipid antibody syndrome- definition, clinical features, lab investigation. Bone marrow examination- aspiration and Trephine biopsy and staining Automation in hematology
Collection, transport, preservation and processing of various clinical specimens.

Urine examination – physical, chemical and microscopic urine analysis by Strip method

Body fluids: CSF – specimen collection, normal composition and clinical significance, routine examination (physical and cytological examination)

Other fluids: pleural, pericardial and peritoneal fluids, synovial and gastric fluids - Brief description with routine examination

Semen analysis and pregnancy test

Practical

1. Coomb's test (direct and indirect)
2. Urine : microscopic examination and automation in urine analysis
3. Reticulocyte count: preparation, staining examination and corrected retic count.
4. Semen analysis: microscopic examination and methylene blue staining for morphology
5. Pregnancy test
6. Body fluid analysis (CSF, pleural and peritoneal/ascetic fluid)- physical, chemical and microscopic examination

7. Sickling test for sickle cell anemia
8. Osmotic fragility test
9. LE cell preparation and examination
10. PT and APTT tests
11. BT/CT with clot lysis and clot retraction time
12. Automation in urine analysis

Textbooks:

6. J Ochei and A Kolhatkar, Medical Laboratory Science- Theory and Practice, 1st Edition 2000, Tata Mcgraw Hill Publishing Co Ltd.
7. Praful B. Godkar, Darshan P. Godkar, Text book of Medical Laboratory Technology, 3rd Edition 2014, Bhalani Publishing House.
8. R N Makroo, Principle &Practice of transfussion medicine, 1st Edition 2014, Jain Books.
9. Christopher D Hillyer, Beth, James, Transfusion Medicine & hemostasis: Clinical & Laboratory aspect, 2ndEdition 2013, Elsevier Healths.
10. Richard A. McPherson, Henry's Clinical Diagnosis and Management by Laboratory Methods, 22nd Edition 2014, Elsevier.

SEMESTER II

PAPER 3

IMMUNOLOGY AND VIROLOGY
(1017203)

Immunology:

Unit 1:

- Immunity (Innate and Acquired) Antigens
- Antigen
- Antibody

Unit 2: Antigen and antibody reactions

- General Features of antigen-antibody reaction Precipitation, Agglutination
- Complement Fixation
- Immunofluorescence, RIA, EIA Western Blot

Unit 3:

- Structure and function of Immune system: (In brief)
- Major Histocompatibility Complex
- Immune Response: Humoral Immune response, Primary & secondary immune response, Cellular Immune Response.
- Hypersensitivity
- Autoimmunity and Immunodeficiency Diseases
- Transplantation immunology: Classification of transplants, Allograft reaction,
- Factors favoring allograft survival, Graft-vs-host reaction

Virology

Unit 4:

- General Properties of viruses
- Nomenclature and Classification of viruses
- Morphology: virus structure and Virus replication
- Virus host interactions
- Bacteriophage,
- Morphology, life cycle, laboratory diagnosis of:
    - Herpes viruses, Mumps, measles, Rubella virus Influenza viruses, Paramyxoviridae
    - Polio, Hepatitis viruses, Rabies virus
    - Human immunodeficiency viruses, Oncogenic viruses
    - Epidemiology of viral infections Pox viruses, Echo and Coxsackie viruses, Enteric viruses other than Polio virus Rhinoviruses.
    - Adenoviruses and Coronaviruses.
    - Antiviral agents and viral vaccines

PRACTICALS

1. Serological tests – ELISA for HIV, HBsAg, HCV
2. Collection of blood by venipuncture, separation of serum and preservation of serum.
3. Performance of serological tests viz. Widal, VDRL/RPR.
4. Enzyme linked immunosorbent assay: HIV, HBsAg, HCV.
5. Latex agglutination tests: RA, CRP.
6. Rapid tests HIV.

Textbooks:

2. Dale Male, Jonathan Brostoff, David B Roth and Ivan RoittKuby Immunology, 7th Edition 2012, Mosby (Elsevier).
3. C P Baveja, Text book of Microbiology, 4th Edition 2010, Arya Publication.
4. Arti Kapil, Ananthanarayan and Paniker's Textbook of Microbiology, 9th Edition 2013, Orient BlackSwan.
5. D.R.Arora / BrijBala Arora, Textbook of Microbiology, 5th Edition 2016, CBS Publishers & Distributors Pvt. Ltd..
6. B S Nagoba and D V Bedpathsk, Immunology, 1st Edition 2008, BI Publications.
7. J Ochei and A Kolhatkar, Medical Laboratory Science- Theory and Practice, 1st Edition 2000, Tata Mcgraw Hill Publishing Co Ltd.
8. Praful B. Godkar, Darshan P. Godkar, Text book of Medical Laboratory Technology, 3rd Edition 2014, Bhalani Publishing House.
9. Peter Lydyard, Alex Whelan, Michael Fanger, Instant Notes in Immunology 3rd Edition 2011, BIOS Scientific Publisher.
10. William E. Paul, Fundamental Immunology 7th Edition 2013, WoultersKluwar / Lippincott Williams & Wilkins.
11. T Doan, R Mervold, S Visseli, C Waltenbough, Immunology 2nd Edition 2013, WoultersKluwar / Lippincott Williams & Wilkins.

SEMESTER II

PAPER 4

RESEARCH METHODOLOGY, BIO STATICS AND HOSPITAL

MANAGEMENT (1017204)

UNIT-I

Introduction and Some Basic Concepts:
Sample and population. Statistical definitions. Random sampling. Testing of hypothesis.
Statistical tools for collection, presentation and analysis of data relating to causes and incidence of diseases.
Measurement of central tendency.
Measures of variation. Frequency distribution.

UNIT-II

Concept of Probability:
Laws of Probability. Probability Distribution
Binomial, Normal and Chi-square distribution
Commonly used procedures and test of significance and estimation
Correlation and regression
Test of significance namely Z test, T test, Chi square test, F test
Analysis of variance.

UNIT-III

Research Statistics:
Research Statistics pertaining to medical laboratory technology
Testing the efficacy of manufacturing drugs.
Medicines and injections for curbing and controlling specific diseases.
Statistical analysis of instrumental data and comparison of various biological techniques used in hospitals.

UNIT-IV

Health care – an overview:
Functions of Hospital administration
Modern techniques in Hospital management
Challenges and strategies of Hospital management
Administrative Functions–
Planning, Organizing, Staffing, Leading and Controlling Organizational Structure,
Motivation and leadership.
Designing health care organization.

Hospital Management:
Medical record, House-keeping services.
Laboratory performance.

Management of biomedical waste.
Total patient care – indoor and outdoor.
Nursing and ambulance resources, Evaluation of hospital services. Quality assurance.

Textbooks:

1. R.A. Day. How to write a scientific paper. Cambridge University Press.
2. Cooray P.G. Guide to scientific and technical writing.
3. Carter V. Good and Douglas E seats Methods of Research.
4. Alley, Michael. The craft of scientific writing. Englewood Cliffs. N.N. Prentice 1987.
5. Sundar Rao, Jesudian Richard - An Introduction to Biostatistics. S.P. Gupta - Fundamentals of statistics, Sultan Chand.

SEMESTER III

PAPER 5

PRACTICALS

(1017205)

Practicals are based on theory paper

SEMESTER

III

Clinical

Biochemistry

PAPER 1

Advances in Biochemical Sciences (1017301)

UNIT I

Signal Transduction:

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

UNIT II

Metabolism of Xenobiotics:

Xenobiotics, Cytochrome P450, Phase I and Phase II reaction, affects of age and sex on activities of Xenobiotic metabolizing enzymes. Salicylates-Poisoning, Heavy Metals -Leads, Mercury, Zinc poisoning and preventive measures.

UNIT III

Biochemical and Genetic basis of diseases:

Biochemical basis of diseases, Molecular basis of disease, Major classes of genetic disease, Diagnosis and treatment, Molecular medicine

UNIT IV

Molecular Technique and Bioinformatics:

Polymerase Chain Reaction, Microarray, Blotting, Southern, Northern, and Western Blotting, Immunofluorescence, and Gel Documentation.

Gene annotation, DNA sequence data, Homology search of DNA and Amino acid, Blasta, Fasta, Human genome project, Application in Medical Science.

PRACTICALS

1. Principle, working, standardization and calibration of ELISA for hormone.
2. Standardization and calibration of various instruments such as semi-auto analyzer, fully automated analyzer, CLIA, analyzer.
3. Quality control in the laboratory- external and internal preparation of SOPs and application of west Gerald's rules.
4. Hormonal analysis including thyroid profile and infertility profile on ELISA and CLIA.
5. Arterial blood gas analysis and interpretation.
6. DNA extraction, PCR and RTPCR
7. Analytical electrophoresis
8. Quantification of tumor marker, bone markers and anemia profile.
9. Estimation of vitamin D and Vitamin$_{12}$, TSH, T3, T4

Textbook:

1. U Satyanarayan and U Chakrapani. Text book of Biochemistry, 4th Edition 2013, Elsevier.
2. M N Chatterjea and Rana Shinde. Text book of Medical Biochemistry , 8th Edition 2012, Jaypee Brothers Medical Publishers (P) Ltd
3. D M Vasudevan, Sreekumari S, Kannan Vidhyanathan,Textbook of Biochemistry for Medical students, 8thEdition 2016, Jaypee & Brothers Medical Publishers (P) Ltd.
4. Albert L Lehninger, Michel M Cox, David L Nension, Lehninger Principle of Biochemistry, 6th Edition 2013, W H Freeman & Co.
5. Robert Kincaid Murray, David Bender, Kathleen M. Botham, Peter J. Kennelly, Harpers Illustrated Biochemistry, 30th Edition 2015, McGraw Hill Professional.
6. Michael Lieberman, Allan D. Marks, Colleen M. Smith, Dawn B. Marks, Marks' Essential Medical Biochemistry, 2nd Edition 2007, Lippincott Williams & Wilkins.
7. Donald Voet, Judith G. Voet, Charlotte W. Pratt. Fundamentals of Biochemistry: Life at the Molecular Level: Life at the Molecular Level. Fifth Edition 2016, Wiley

SEMESTER

III PAPER 2

Intermediary Metabolism and Metabolic Disorders
(1017302)

Unit I

Biological Oxidation:

Oxidation and Reduction, Oxidases, Dehydrogenases, Hydroperoxidases, Oxygenase, and Mono oxygenase

UNIT-II

Carbohydrate Metabolism: Metabolism of Glycogen, Glycogenolysis, Glycogenolysis, Hormonal regulation, Regulation of glycogen Metabolism, Gluconeogenesis, Futile cycle, Blood glucose level regulation, Cori cycle, Glucose transport and Transporters. Clinical significance of gluconeogenesis, pentose phosphate pathway, Diabetes, Ketosis, Hypoglycemia, Glycogen storage disease.

Unit III

Lipid Metabolism:
Lipid transport and storage, Plasma Lipoproteins, Apolipoproteins, Lipoprotein metabolism, Clinical Significance of lipoprotein.
Cholesterol synthesis and regulation of hyperlipidemia, Atherosclerosis

Unit IV

Amino acid metabolism:

Amino acid, Biosynthesis and clinical significance of Polyamine, Nitric oxide, Histamine, Serotonin, Creatinine, Melamine, and GABA (Y-aminobutyrate). Phenyl ketonuria, Tyrosinemia, and other amino acid metabolism. Introduction to nucleic acid metabolism, denovo and salvage pathway and disorders and pyrimidine metabolism.

PRACTICAL

1. Estimation of total Cholesterol
2. Estimation of Tryglycerise
3. Estimation of HDL
4. Estimation of LDL
5. Estimation of VLDL
6. Estimation of total HBA1c
7. Estimation of total OGTT
8. Estimation of total Amino acids
9. Estimation of total creatinine
10.

Textbooks:

1. U Satyanarayan and U Chakrapani. Text book of Biochemistry, 4th Edition 2013, Elsevier.
2. M N Chatterjea and Rana Shinde. Text book of Medical Biochemistry , 8th Edition 2012, Jaypee Brothers Medical Publishers (P) Ltd
3. D M Vasudevan, Sreekumari S, Kannan Vidhyanathan,Textbook of Biochemistry for Medical students, 8thEdition 2016, Jaypee & Brothers Medical Publishers (P) Ltd.
4. Albert L Lehninger, Michel M Cox, David L Nension, Lehninger Principle of Biochemistry, 6th Edition 2013, W H Freeman & Co.
5. Robert Kincaid Murray, David Bender, Kathleen M. Botham, Peter J. Kennelly, Harpers Illustrated Biochemistry, 30th Edition 2015, McGraw Hill Professional.
6. Michael Lieberman, Allan D. Marks, Colleen M. Smith, Dawn B. Marks, Marks' Essential Medical Biochemistry, 2nd Edition 2007, Lippincott Williams & Wilkins.
7. Donald Voet, Judith G. Voet, Charlotte W. Pratt. Fundamentals of Biochemistry: Life at the Molecular Level: Life at the Molecular Level. Fifth Edition 2016, Wiley

SEMESTER

III PAPER 3

Diagnostic Enzymology
(1017303)

Unit 1:

Historical prospective, General characteristics, nomenclature and IUB classification. Introduction to the following terms- Holoenzymes, apoenzymes, cofactors, co-enzymes, prosthetic group, metalloenzymes, measurement and expression of enzyme activity, Enzyme assay activity units (I U and Ketal). Enzyme specific types and theories (Luck and Key, Induced fit and three-point attachment), Ribozymes and Abymes. Isolation and purification of enzymes, criteria of homogeneity of enzymes

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Unit 2:

Enzyme Kinetics:

Factor affecting enzyme activity- substrate, pH and Temp etc. Derivatives of Michalis maintain equation of unisubstrate reaction KM and its significance. Kcat, /KM and its importance, measurement of Km and Vmax line linevavarburk and other linear transformation, Bisubstrate reaction. Enzyme inhibition, types of reversible inhibition, competitive, uncompetitive, derivative of equation for different types of inhibitors, Determination of Ki.

Unit 3:

Role of co-factor in enzyme catalysis NAD^+/FADP, FMN/FAD, coenzyme A, TPP, PLP, Lipic acid, Vitamin b_{12}, and tetrahydrofolic acid, factor contributing enzyme catalysis proximity and oriental, acid base catalysis, covalent catalysis, mechanism of action of chymotrypsin and lysozyme.

Control of enzyme activity feed back inhibition, allosteric control with special reference to aspartate transcarboxylase. Sigmoidal kinetics, concrted and sequential model for action of allosteric enzyme. Reversible and irreversible enzyme modification of enzyme.

Unit 4:

Protein ligand interaction. Binding of protein to ligand having single binding site and two binding site, cooperatively, phenomena and scatchered plot. Clinical significance of CPK, CK-MB, LDH SGOT, SGPT, cholinesterase, amylase, lipase, aldolase, alkaline and acid phosphatases. Centre of enzymatic activity feedback inhibition.

PRACTICALS

1. Estimation of SGPT
2. Estimation of SGOT
3. Estimation of Amylase
4. Estimation of lipase
5. Estimation of total CK
6. Estimation of CK-MB
7. Estimation of Cholinesterase
8. Estimation of ALP
9. Estimation of ACP
10. Estimation of LDH

Textbooks:

1. U Satyanarayan and U Chakrapani. Text book of Biochemistry, 4th Edition 2013, Elsevier.
2. M N Chatterjea and Rana Shinde. Text book of Medical Biochemistry , 8th Edition 2012, Jaypee Brothers Medical Publishers (P) Ltd
3. D M Vasudevan, Sreekumari S, Kannan Vidhyanathan,Textbook of Biochemistry for Medical students, 8thEdition 2016, Jaypee & Brothers Medical Publishers (P) Ltd.
4. Albert L Lehninger, Michel M Cox, David L Nension, Lehninger Principle of Biochemistry, 6th Edition 2013, W H Freeman & Co.
5. Robert Kincaid Murray, David Bender, Kathleen M. Botham, Peter J. Kennelly, Harpers Illustrated Biochemistry, 30th Edition 2015, McGraw Hill Professional.
6. Michael Lieberman, Allan D. Marks, Colleen M. Smith, Dawn B. Marks, Marks' Essential Medical Biochemistry, 2nd Edition 2007, Lippincott Williams & Wilkins.
7. Donald Voet, Judith G. Voet, Charlotte W. Pratt. Fundamentals of Biochemistry: Life at the Molecular Level: Life at the Molecular Level. Fifth Edition 2016, Wiley

SEMESTER

III PAPER 4

NTCC
(1017304)

PAPER 5

Practicals

(1017305)

Practicals are based on the subjective papers

SEMESTER

III

Hematology and Blood Transfusion

PAPER 1

Clinical Hematology (Non-Neoplastic)

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UNIT I

Hematopoiesis: Theories of hematopoiesis (origins and development of Blood Cells)

Normal erythropoiesis, Role of erythropoietin in erythropoiesis, destruction of erythrocytes

Leukopoiesis (Development and maturation of granulocytes and non-granulocytes), antigen independent and antigen dependent lymphocytosis.

Megakaryopoisis-stages of megakaryocyte development and release of platelets, micro-megakaryocytes.

UNIT II

Disorder of Red cell anemia: Definition, normal erythrocytes kinetics and pathophysiology, various classification of anemia, and adaptive mechanism in anemia, lab diagnosis of anemia.

Iron metabolism and heme synthesis, Iron deficiency in anemia of chronic disorders, sideroblastic anemia, hemochromatosis, porphyria

UNIT III

Biochemical and Genetic basis of diseases:

Biochemical basis of diseases, Molecular basis of disease, Major classes of genetic disease, Diagnosis and treatment, Molecular medicine

UNIT IV

Molecular Technique and Bioinformatics:

Polymerase Chain Reaction, Microarray, Blotting, Southern, Northern, and Western Blotting, Immunofluorescence, and Gel Documentation.

Gene annotation, DNA sequence data, Homology search of DNA and Amino acid, Blasta, Fasta, Human genome project, Application in Medical Science

Textbook:

1. J Ochei and A Kolhatkar, Medical Laboratory Science- Theory and Practice, 1st Edition 2000, Tata Mcgraw Hill Publishing Co Ltd.
2. Praful B. Godkar, Darshan P. Godkar, Text book of Medical Laboratory Technology, 3rd Edition 2014, Bhalani Publishing House.
3. R N Makroo, Principle &Practice of transfussion medicine, 1st Edition 2014, Jain Books.
4. Christopher D Hillyer, Beth, James, Transfusion Medicine & hemostasis: Clinical & Laboratory aspect, 2ndEdition 2013, Elsevier Healths.
5. Richard A. McPherson, Henry's Clinical Diagnosis and Management by Laboratory Methods, 22nd Edition 2014, Elsevier.
6. Vinay Kumar, Abul K. Abbas Jon C. Aster. Robbins Basic Pathology (Robbins Pathology), 10th edition, Elsevier india

SEMESTER

III PAPER 2

Clinical Hematology (Neoplastic)
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Unit I

Principle of diagnosis of hematopoic Lymphoid neoplasm
Classification of hematopoietic neoplasm
Classification of lymphoid neoplasm
Cancer Biology

UNIT-II

Molecular genetic of myeloid leukemia's CBS translocation, RAR translocation.
Molecular genetic of lymphoid leukemia's tel gene translocation, E_2A translocation
Molecular genetic of non-Hodgkin's lymphoma malignancies
Complication of hematopoietic neoplasm: host defense defect, hemorrhagic, neurologic, metabolic complication, organ infiltration, ocular, renal, anemia, abdominal, musculoskeletal complications.

Unit III

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

Unit IV

Classification of acute leukemia's
Acute lymphoblastic leukemia's clinical features, diagnosis, classification and risk factor asssment.
Acute myelogenous leukemia's epidemiology, clinical features, immunophenotypes, classification, clinicopathologic syndrome and special stain.
Myelodysplastic syndrome: classification, diagnosis, clinical features, pathogenesis, biologic features and lab findings.
Chronic myeloid leukemia, : history, incidence, clinical features, diagnosis, bone marrow findings, cytogenetic findings, immunophenotype, and molecular findings, cellular and molecular pathogenesis.
Polycythemia vera: history, epidemiology, clinical features, blood and lab findings, bone marrow study, cytogenetics and pathogenesis.
Myelofibrisis. History, and pathogenesis, clinical features, lab diagnosis.
Hodkins and non hodkins disease: Aetiology, clinical features, classification, stages and lab diagnosis.
Plasma cell dyscrasis: Etiology, cytogenetics and molecular biology, protein abnormalities, clinical features and lab diagnosis.

Textbooks:

1. J Ochei and A Kolhatkar, Medical Laboratory Science- Theory and Practice, 1st Edition 2000, Tata Mcgraw Hill Publishing Co Ltd.
2. Praful B. Godkar, Darshan P. Godkar, Text book of Medical Laboratory Technology, 3rd Edition 2014, Bhalani Publishing House.
3. R N Makroo, Principle &Practice of transfussion medicine, 1st Edition 2014, Jain Books.
4. Christopher D Hillyer, Beth, James, Transfusion Medicine & hemostasis: Clinical & Laboratory aspect, 2ndEdition 2013, Elsevier Healths.
5. Richard A. McPherson, Henry's Clinical Diagnosis and Management by Laboratory Methods, 22nd Edition 2014, Elsevier.

SEMESTER III PAPER 3

Immunopathology and Advance Hematology Technique

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Unit 1:

Basics of immunohematology: Blood group antigens, red cell membrane structure, blood group antibody and compliments.

Erythrocyte's antigen and antibody, ABO and Rh system and other red blood cell antigen and anti-body.

Immunohematology test and procedures factors affecting hemagglutination, compatibility testing, antihuman globulin test.

New techniques and automation.

Unit 2:

Blood collection, donor registration, selection, medical history, phlebotomy and donor reaction.

Blood processing test: guidelines for blood transfusion and testing.

Pretransfusion testing.

Artificial blood and blood substitute.

Unit 3:

Component preparation and uses.

Organization, planning and management of blood bank.

Licensing of Blood Bank

Quality control in blood banking

Special situations hemapheresis, plasmapheresis, and leukapheresis

Unit 4:

Flow cytometry: principle, instrumentation, and application

Advance monoclonal antibody testing and procedure

Advance cytogenetic method and their hematologic application

Molecular genetics and its application in hematology

Stem cell technology, therapy and

Gene therapy

PRACTICALS

Textbooks:

7. R N Makroo, Principle &Practice of transfussion medicine, 1st Edition 2014, Jain Books.
8. Christopher D Hillyer, Beth, James, Transfusion Medicine & hemostasis: Clinical & Laboratory aspect, 2ndEdition 2013, Elsevier Healths.
9. Blood transfusion in clinical medicine. Ed. Pl mollison, 8th edition, Blackwell Sci. Pub. Oxford.
10. Transfusion Medicine Ed. WH churchill, SR Kurtz, Blackwell Sci, Pub, Oxford, 1988
11. Clinical Practice of Transfusion Medicine Ed. L Petx, Swisher, 2nd edition, Curchill Livingstone, New York, 1989
12. Blood transfusion therapy: A problem oriented approach Ed. JAF napier, John Willey & sons, Chichester, 1987
13. Principles of transfusion medicine Ed. EC Rossi, TL simon, GS Moss, William & Wilkins, Tokyo 1991
14. Modern blood banking & transfusion practices. Ed. Denise M Harmonge, 4th edition, FA Davis, PA 1994
15. Transfusion Immunology & Medicine Ed. Carel J van Oss, Marcel Dekker, New York, 1990
16. Blood separation & plasma fractionation Ed. J Robinson, Harris, Willey Liss, New York, 1990
17. Ggroups in man Ed. RR Race, R Singer, Blackwell Scientific Pub, Oxford, 8th edition
18. Applied blood group serology Ed. PD Issit, Montogmerry Sci. Pub Florida, 1994

SEMESTER

III PAPER 4

NTCC
(1017304)

PAPER 5

Practicals

(1017305)

Practicals are based on the subjective papers

SEMESTER IV

DISSERTATION
(1017401)

The research project is to be carried out over a period of approximately 5 to 6 months. Each student will select research project in consultation with their respective supervisors. The projects will be selected such that a student can reasonably be expected to make an original contribution to the chosen area of research within the time allotted. The purpose of the project is to provide the student with training in academic research and acquisition of practical skills, including the design of a research project, planning of experiments, dealing with practical problems, recording, presenting and analyzing the data.

Unit I- Thesis Proposal Development

Through regular meetings, the student and advisor will discuss this literature in detail and the topic for research project will be finalized in the third semester.

Unit II- Thesis proposal

Each student must submit to the university with the signed approval of the advisor, a thesis proposal defining the thesis project, the methods and design of the experiments needed and plans for completion of the project in the third semester.

Unit III – Thesis preparation

This is involving preparation of the thesis. The thesis must include a cover page, table of contents, introduction, review of literature, materials and methods, observations, results and discussion and final conclusions section summarizing the outcome of the project. The master chart comprising the details of experiments performed will be attached. The student should submit a draft of the thesis to the advisor by the end of the fourth semester. Four copies of the completed thesis duly certified by the supervisor will be submitted to the controller of examination