“Diploma in Blood Bank Technology” will be one Year post graduate Course. The students will study four papers I, II, III and IV and practicals based on these papers. The teaching per week will be 16 hours for four papers and 16 hours practicals. The total marks of all papers will be 280 for the University Examination, distributed as 70 for each Paper of three hours duration. The internal evaluation marks will be 120 will be 30 marks of each paper. The total marks of Practicals will be 240 distributed as 60 marks for each practical paper, I to IV. The internal practical evaluation will be of 60 marks, distributed as 15 marks for each practical paper. The University Examination for practicals will be of total 24 hours.

Eligibility Criteria: B. Sc with Microbiology, Medical Technology, Biotecnology or Bio-science degree from Veer Narmad South Gujarat University or any other equivalent recognized university.

Paper I

Section One: Immunohaematology

1. Basic Principles of immunohaematology, Application of Blood groups: Population Genetics, Forensic medicine, Transfusion medicine
2. ABO Blood of Group Systems: History, Genetics, ABH antigens, Biochemical Synthesis of blood group antigens, Antigenic sites, weaker variants, Bombay Phenotype, ABO antibodies,
3. RH Blood Group System: History, Genetics, Molecular Genetics, Nature of Rh Antigens, Partial D, Week D, other variants of Rh, Rh Null, Rh antibodies, factors influencing Rh immunization, Functional role of Rh antigens
5. Antenatal Serology, Hemolytic disease of the newborn due to ABO Incompatibility, Rh Incompatibility and other allo-antibodies
6. Red cell serology techniques, their advantages and disadvantages, Cell and serum grouping, detection of weak A and B antigens and weak D/Partial D cases, Trouble shooting in red cell serology
7. Pre transfusion testing, Different methods of cross matching, cross matching in special circumstances, emergency cross matching, electronic cross matching
8. Principles of Direct and indirect antiglobulin test, enzyme technique, albumins technique, Detection of blood group antibodies, identification of their Specificity, clinical significance of antibody detection, differentiation between auto and allo-antibodies
9. Gel Technology, Microplate technique

Section Two: Hematology

1. Collection of blood samples, types of anticoagulants
2. Complete hemogram, Different methods of hemoglobin screening/estimation: Copper sulphate, hematology analyzers, Sahli’s, Cyanmethhemoglobin and Hemo-Q methods, Red cell indices
3. Normal erythropoiesis, Leucopoiesis, Formation and function of platelets
4. Classification of anemia, their laboratory diagnosis, Hemoglobinopathy: Beta Thalassemia and Sickle cell disease, G6PD deficiency, polycytemia
5. Autoimmune hemolytic anemia, classification, diagnosis, specificity of autoantibodies
6. Coagulation Mechanism, Hemostasis, laboratory tests for coa, Hemophilia A & B, Platelet disorders,
7. Hematological malignancies
8. Bone marrow transplantation, peripheral stem cells, cord blood stem cells, cord blood banking

**Reference Books**


**Practicals based on Paper I**

1. ABO cell and serum grouping by tube method
2. Rh typing by saline, enzyme and albumin methods.
3. Preparation LISS.
4. Preparation of Papain cystein.
5. Routine major and minor cross-matching.
6. Direct and Indirect antiglobulin method.
7. Rh typing by indirect antiglobulin method.
9. Gel technology (Demonstration).
10. Investigations of haemolytic transfusion reaction.
12. Identification of blood group antibodies
13. Hemoglobin estimation by Cyanmethhemoglobin method
14. Preparation of Copper Sulphate solution.
15. Hb estimation on Hematology Analyser.
16. Total RBC and WBC count.
17. WBC differential count and examination of blood smear for red cell abnormalities.
18. Platelet count.
20. Hb electrophoresis.
21. Sickling and solubility tests.
Paper II

Section One: General Immunology
1. Introduction to Immunology, History, Immunity
2. Antigens: Immunogen, allo-antigen, soluble antigen, Red cell antigen, Epitopes
3. Antibodies: Polyclonal antibodies, development of antibodies, structure of immunoglobulins, characteristics of immunoglobulins
4. Monoclonal antibodies: Hybridoma technology, Human monoclonal antibodies, Applications of MAb
5. Antigen antibody reaction: Antigen concentration, antibody concentration, enhancing media, other factors influencing antigen antibody reaction, Immunoassays: ELISA, IRMA, RIA
6. Cells of immune system: Phagocytic cells, Antigen presenting cells, T cells, T cell subsets, B cells, CD Markers, Flowcytometry for counting T & B cells
7. Autoimmune disorders, Their mechanisms,
8. Complement System
9. HLA antigens, HLA antibodies, HLA Serology, Histocompatibility matching: Molecular methods

Paper II

Section Two: Microbiology & Biochemistry
1. Introduction to Microbiology, Fundamentals of microscopy, sterilization and disinfection
2. Groups of Micro organisms, Micro organisms staining techniques
3. Bacteriological media, Pure cultures and cultural characteristics, Bacteria of medical importance,
4. Transfusion transmitted infections, HIV (1+2), HCV, HBV, malaria, syphilis
5. ELISA, rapid and other tests for diagnosis of transfusion transmitted infections
6. Biosafety, Management of Biomedical waste
7. Introduction to Biochemistry, Acid and Base, Buffers and Buffer action, pH, The Beer Law & its application
8. Carbohydrates, proteins, Lipids and Lipoproteins, Red cell membrane integral proteins and lipids, Biochemical estimation of Blood sugar, proteins, Lipid profile and kidney function tests
9. Instrumentation principles: pH meter, colorimeter, Spectrophotometer, Electrophoresis equipment

Reference Books
Practicals based on Paper II

**Immunology**
1. ELISA for HBsAg detection.
2. Rapid tests for HBsAg detection.
3. HCV antibody detection by ELISA.
4. HCV antibody detection by Rapid tests.
5. HIV (1+2) antibody detection by ELISA.
6. HIV (1+2) antibody detection by Rapid Tests.
7. VDRL test for Syphilis.
8. RPR test for Syphilis.
12. The Gram Stain.
13. The Acid fast Stain.
14. Staining for cell structure of organism.
15. Preparation of culture media.
18. Blood Cholesterol (Free and total) estimation.
20. Serum Iron and TIBC estimation.

**Paper III**

**Section One: Blood Banking: Blood Donation**
1. Donor Motivation, Motivational Techniques, Social Marketing, Preparation of IEC Materials
2. Donor recruitment & Retention: Types of blood donors, Donor selection, medical interview and medical examination, screening for hemoglobin estimation, Managing rejected blood donors, technique for conversion of first time donor into regular voluntary donor, donor felicitation
3. Tapping room equipment, their principles, and use, emergency medicines, Pre donation counseling, Bleeding of the donor, post donation care, post donation counseling,
4. Screening of blood units for mandatory tests, Discarding infected units,
5. Blood Donation drive: Awareness programs prior to Donation drive, Camp site, staff requirement, management of camp, transportation of blood units from camp site to blood bank
6. Preservation of donated blood, blood preservation solutions, Additive solutions
7. Apheresis procedures, Apheresis products, preparation of multiple products on cell separators, Maintenance of cell separator equipment
8. Autologous blood donation, techniques of donor blood collection

Section Two: Blood Banking: Blood Components

1. Selection of blood bags for component preparation, preparation of red cell concentrate, Fresh Frozen plasma, platelet concentrate, cryoprecipitate, washed red cells, Frozen red cells
2. Plasma Fractionation: Principles, manufacturing of different plasma derivatives
3. Component Testing, Labeling,
4. Transportation and storage of blood components.
5. Preparation of leukoreduced blood products, Leukocyte filters, component extractors.
6. Metabolic changes in blood components during storage, release of cytokine during storage.
7. Inventory management and maintenance of blood stock.
8. Irradiated blood components
9. Blood substitutes

Reference Books


Practicals based on Paper III

2. Bleeding of the blood donor.
3. Operation of blood collection monitor, tube sealer and needle burner.
4. Platelet pheresis on cell separator (Baxter).
5. Platelet pheresis on cell separator (Gambro or Hemonetics).
6. Preparation of red cell concentrate and fresh frozen plasma.
7. Preparation of washed red blood cells.
8. Preparation of platelet concentrates by PRP method.
11. Preparation of leukoreduced platelets using leukocyte filter.
13. Measurement of factor VIII level in FFP  
14. Measurement of fibrinogen level in FFP  
15. Sterility test on platelet concentrates.  
16. Sterility test on Whole blood  
17. Measurement of pH and other platelet parameters.

**Paper IV**

**Section One: Transfusion Therapy**

2. Blood administration, transfusion filters, post transfusion care, Therapeutic plasma exchange  
3. Judicious use of blood; management of different types of anemia, management of bleeding patient, Neonatal transfusion, Transfusion practices in surgery, Transfusion therapy for oncology and trans plantation patents.  
4. Hemolytic transfusion reaction immediate and delayed; immune and non immune reaction path physiology; Clinical signs and symptoms Laboratory invigilation for HTR Tests to defect bacterial Contamination in blood,  
5. Non hemolytic transfusion reactions Immediate and delayed, febrile reaction, allergic reaction, clinical signs and symptoms.  
7. Strategies to prevent transfusion reactions  
8. Autologous blood transfusion, Hemodilution technique, Red cell harvesting for autologous blood transfusion  
9. Hospital transfusion committee, transfusion audit.

**Paper IV**

**Section two: Quality Control Documentation and legal Aspects of blood Banking**

1. Quality control of blood grouping regents, QC of anti-human globulin reagent, bovine albumin, Normal saline  
2. Quality control of blood bank raw materials and kits.  
3. Quality control of different blood bank Components, sterility test on component.  
4. Automation in blood bank  
5. Calibration, validation and maintenance of blood bank equipment, QC of blood bank techniques, internal and external QC.  
6. Organization of blood bank services, Blood Bank premises and infrastructure, Regional blood transfusion centre and blood storage centres, Blood bank management system  
7. Regulations for blood bank operation: Drugs and cosmetics Law, National blood policy, standards in Blood Banking, licensing procedures.  
8. Recruitment and training of blood bank personnel, Proficiency test.  
Reference Books

Practicals based on Paper IV
1. Titre of anti-A/anti-B reagents.
2. Rh Genotype determination
3. Titre of anti-D reagents with Homozygous and Heterozygous Rh positive cells
5. Specificity of Anti-A, Anti-B and Anti-AB reagents
6. Specificity of Anti-D reagents
7. Anti-IgG and anti C3d titre of antihuman globulin reagents.
8. Quality control of 22% bovine albumin
10. Quality control of Copper sulphate solution
11. Quality control of LISS
12. Determination of red cell contamination in platelet product.
13. Determination of WBC contamination in platelet product.
14. Demonstration of fully automatic blood grouping system.
15. Sterility test on whole blood.
16. Writing standard operating procedures.
17. Validation of refrigerators, cold room, incubator etc.
18. Validation of Laminar air flow cabinet.