COURSE OF STUDIES

for

Doctor of Philosophy

in

<Haematology>

UNIVERSITY OF HEALTH SCIENCES, LAHORE PAKISTAN

Program Rationale:

- The PhD scholar will be equipped with in-depth and up-to-date knowledge of their subject which will increase their understanding of the subject and their teaching skills. High quality researchers/professionals will be produced.
- The PhD scholar will be able to understand the new knowledge and apply that in their projects with reliable research findings

Mission Statement:

- To produce skilled manpower at PhD level in the subject of Haematology which will subsequently serve the society by diagnosing the hematological disorders as well as they will be excellent teachers and dedicated researchers.
- They should be able to set new standard in high quality teaching and research in the area of Haematology and they should be able to inculcate world class research culture amongst students and faculty members

Program Educational Objectives:

The main objective of the PhD Program in Haematology department is to produce a high-quality professional with following objectives:

1. To increase the basic understandings of the subject concepts through quality education so that they can successfully apply it and can further use the knowledge in their career ahead as a teacher/researcher.
2. As post-graduate in Haematology, the PhD scholar should have the advanced understanding of the subject so that they can diagnose Hematological disorders.
3. The PhD scholar should also be able to read and interpret primary research papers in the area of study by presenting at journal clubs.

Program Learning Outcomes:

Outcomes:

1. The PhD scholar will be equipped with in-depth and up-to-date knowledge of their subject which will increase their understanding of the subject and their teaching skills.
2. High quality researchers/professionals will be produced.
3. The PhD scholar will be able to understand the new knowledge and apply that in their projects with reliable research findings.

SCHEME OF STUDIES (3-Year)

PhD Haematology

Semester #	Course code	Course title	Credit hours		
			Theory	Practical	Total
1	RM-801	Research Methodology	2	0	02
	AB-802	Advance Biostatistics	2	0	02
	RBCD-8036	Red blood cell disorders	2	1	05
	PCD-8038	Platelet and coagulation disorders	1	1	
2	ALT-803	Advanced Laboratory Techniques	1	1	02
	WBCD-8037	White blood cell disorders	1.5	1.5	07
	BBTM-8039	Blood banking and Transfusion medicine	1	1	
	QM-8040	Quality Management	1	1	
3,4,5,6	Research (thesis)		30		30
					(Total: 48)

Course Title

Red blood cell disorders

Contact Hours:		Credit Hours:
Theory =	36	Theory = 2
Practical =	54	Practical = 1
Total =	90	Total =3

Course code

RBCD-8036

Course Objective:

KNOWLEDGE

At the end of the course, the student will be able to

- Demonstrate the basic knowledge of hematopoiesis
- Illustrate the etiology, pathophysiology, clinical features, and laboratory investigations of Iron Deficiency Anaemia and Megaloblastic anemia
- Demonstrate the etiology, pathophysiology, clinical features and laboratory investigations of iron metabolism disorder.
- Demonstrate the etiology, pathophysiology, clinical features and laboratory investigations of quantitative and qualitative hemoglobin disorder.

ASSESSMENT TOOL

MCQs/SEQs

CLINICAL SKILLS:

Students will

- Differentiate and analyze the test result of Microcytic anemias
- Identify and explain the test result of macrocytic anemia
- Describe and analyze different methods for assessing iron status
- Demonstrate Schilling test
- Identify and explain Perls stain

- Identify abnormalities of Red Cell, White Cell and Platelet in morphology, CBC analyzer report

ASSESSMENT TOOL

OSPE/DOPS/TOACS/CBD

Learning Outcome:

By the end of this course, students will be able to:

1. **Comprehend Hematopoiesis**: Understand the process of hematopoiesis, including the cellular and molecular mechanisms involved in the production and regulation of blood cells.
2. **Analyze Anemia Types**: Analyze and differentiate between iron deficiency anemia and megaloblastic anemia, elucidating their respective etiologies, pathophysiologies, clinical presentations, and diagnostic criteria.
3. **Evaluate Iron Metabolism Disorders**: Evaluate disorders affecting iron metabolism, including iron overload conditions and iron-refractory anemia, by discerning their underlying mechanisms, clinical manifestations, and diagnostic modalities.
4. **Assess Hemoglobin Disorders**: Assess both quantitative and qualitative hemoglobin disorders, encompassing conditions such as thalassemia, sickle cell anemia, and hemoglobinopathies. This includes understanding their genetic basis, clinical phenotypes, and diagnostic approaches, including hemoglobin electrophoresis.
5. **Comprehensively Understand Inherited Bone Marrow Failure Syndromes:**Gain in-depth knowledge of inherited BMF syndromes, encompassing both pancytopenia and single cytopenia presentations.
6. **Apply Knowledge to Laboratory Investigations**: Apply acquired knowledge to interpret laboratory investigations related to hematological disorders, including complete

blood count (CBC), peripheral blood smear analysis, and specialized tests such as hemoglobin electrophoresis, to aid in diagnosis and management.

7. **Integrate Clinical Features**: Integrate knowledge of the etiology, pathophysiology, and clinical features of hematological disorders to formulate comprehensive patient assessments and develop appropriate management strategies.
8. **Communicate Findings Effectively**: Communicate findings related to hematological disorders effectively, both orally and in writing, to healthcare professionals and patients, utilizing appropriate terminology and concepts.

Course Outline:

Diagnostic approach
- Macrocytic anemia
- Hypochromic microcytic anemia
- Normochromic normocytic anemia

Iron deficiency anemia
- Stages of development of iron deficiency
- Etiology and pathogenesis
- Clinical manifestations
- Laboratory findings

Megaloblastic and other Macrocytic anemias
- Vitamin B12 and Folate deficiency (Causes, clinical findings, pathogenesis and laboratory diagnosis)
- Pernicious anemia (Prevalence, Etiology and pathogenesis, Clinical manifestations & Laboratory findings)

Anemia in pregnancy

Anemia unique to infancy and childhood

Sideroblastic Anemias
- Heme synthesis in red cells
- Etiology
- Laboratory findings

Methemoglobinemia

Iron overload
- Hemochromatosis

Porphyrias
- Classification
- Causes
- Pathogenesis
- Diagnosis

Hemolytic Anemias : General Consideration

- Definition
- Classification
- Clinical manifestations
- Laboratory diagnosis

Hereditary Spherocytosis And Other Membrane Disorders

- Genetics
- Pathogenesis
- Clinical features
- Laboratory diagnosis
    - Hereditary elliptocytosis
    - Hereditary stomatocytosis

Hereditary Hemolytic Anemias associated with abnormalities of erythrocyte glycolysis and nucleotide metabolism

G-6 PD deficiency

- Genetics and distribution
- The enzyme and its variants
- Pathophysiology
- Clinical features
- Diagnosis

Related disorders of hexose monophosphate shunt and glutathione metabolism

Pyruvate kinase deficiency

- Geographic distribution
- Genetics
- Pathophysiology
- Clinical features
- Diagnosis

Abnormalities of purine and pyrimidine nucleotide metabolism

Immune Hemolytic Anemias

Mechanisms of immune destruction of RBC

- Complement system
- Destruction of IgM and IgG antibodies
- Demonstration of anti-red cell antibodies

Allo-immune hemolytic disease of fetus and newborn.

- Pathogenesis of maternal Rh allo-immunization
- Pathogenesis of Rh hemolytic disease and other fetal hemolytic disease
- Severity of Rh hemolytic disease
- Antibody detection and measurement

- Other hemolytic disorders
- Prevention

Auto-immune hemolytic anemia

- Classification
- Etiology
- Clinical features
- Laboratory Diagnosis

Acquired Hemolytic Anemias

- Infectious agents
    - Malaria
    - Other infections
- Chemical agents,drugs & venoms
- Physical agents
- Red cell fragmentation syndromes
    - Large vessel abnormalities
    - Small vessel disease
    - Thrombotic microangiopathy
    - Malignant hypertension
- March hemoglobinuria

Paroxysmal Nocturnal Hemoglobinuria

- Etiology and pathogenesis
- Clinical manifestations
- Laboratory findings
- Differential diagnosis

Acute Post Hemorrhagic Anemia

- Clinical description
- Pathophysiology
- Hematological finding
- Diagnosis

Hemoglobinopathies

The Abnormal Hemoglobins - General Principles

- Classification
- Genetic mechanism and molecular pathology
- Pathophysiology
- Hemoglobin C disorders
- Hemoglobin D disorders
- Hemoglobin E disorders

Sickle Cell Anemia

- Hemoglobin S- prevalence and distribution
- Pathophysiology

- Clinical features
- Laboratory diagnosis
- Sickle cell trait
- Other sickling syndromes
- Prevention

Thalassemias and Related Disorders

- Prevalence and geographic distribution
- Genetic mechanisms and molecular pathology
- Pathophysiology
- Clinical and laboratory features of
    - Alpha thalassemia
    - Beta thalassemia
    - Hereditary persistence of fetal hemoglobin
    - Hb Lepore syndromes
- Diagnosis and differential diagnosis
- Prevention

The inherited BMF syndromes

Pancytopenia (usually associated with a global haemopoietic defect)

- Fanconi anaemia
    - Clinical features
    - Cell and molecular biology
    - Treatment
- Dyskeratosis congenita
    - Clinical features
    - Cell and molecular biology
    - Treatment
- Shwachman–Diamond syndrome
    - Clinical features
    - Cell and molecular biology
    - Treatment
- Reticular dysgenesis
    - Clinical features
    - Cell and molecular biology
    - Treatment
- Pearson syndrome
    - Clinical features
    - Cell and molecular biology
    - Treatment
- Familial aplastic anaemia (autosomal and X-linked forms)
- Myelodysplasia
- Non-haematological syndromes (Down, Dubowitz syndromes)

Single cytopenia (usually)

Anaemia

- Diamond–Blackfan anaemia

    - Clinical features
    - Cell and molecular biology
    - Treatment
- Congenital dyserythropoietic anaemia
    - CDA type I
    - CDA type II
    - CDA type III
    - Treatment

Practicals:

- Hb estimation
- Red cell count (automated & Manual)
- White cell count (automated & Manual)
- Platelet count (automated & Manual)
- Iron studies
- CBC analyzer
- Retic count
- RBC count
- Ramnowsky stains
- Iron stain
- Hemoglobin Electrophoresis & HPLC
- Sickle Cell Solubility Test
- Osmotic Fragility Test

Recommended Books:

1. Dacie and Lewis Practical Haematology, 12th Edition by Barbara J. Bain & Imelda Bates & Mike A Laffan
2. Postgraduate Haematology, 8th Edition by A. Victor Hoffbrand, Douglas R. Higgs, David M. Keeling, Atul B. Mehta by A. Victor Hoffbrand, Douglas R. Higgs, David M. Keeling, Atul B. Mehta
3. Hoffbrand's Essential Haematology 8th Edition by A. Victor Hoffbrand, David P. Steensma
4. Haemoglobinopathy Diagnosis, 3rd Edition by Barbara J. Bain
5. Robbins & Cotran Pathologic Basis of Disease 10th Edition by Vinay Kumar, Abul Abbas, Jon Aster10th Edition by Vinay Kumar, Abul Abbas, Jon Aster
6. Blood Cells A Practical Guide 3rd Edition by Barbara J. Bain
7. de Gruchy's Clinical Haematology in Medical Practice, 5th Edition by Frank Firkin, C. Chesterman, D. Penington, B. Rush

8. Manual of Laboratory Medicine Armed Forces Institute of Pathology Rwp
9. Tietz Applied Laboratory Medicine 2nd Edition by Mitchell G Scott
10. Henry's Clinical Diagnosis and Management by Laboratory Methods 24th by Richard A Mcpherson

Course Title Platelet and Coagulation disorders

Contact Hours:		**Credit Hours:**
Theory =	18	Theory = 1
Practical =	54	Practical = 1
Total =	72	Total =2

Course code

PCD-8038

Course Objective:

KNOWLEDGE

At the end of the course, the student will be able to

1. Demonstrate the basic knowledge of Megakaryopoiesis
2. Demonstrate knowledge about the aetiology, pathophysiology, clinical features and laboratory investigations of:
    a. Heriditory Coagulation disorders
    b. Platelet disorders
    c. von Willebrand Disease
    d. Fibrinolytic Disorders
    e. Clotting Factors disorders and their Inhibitors
    f. Acquired Coagulation Disorders
    g. Coagulation defects in Liver and kidney disease
    h. Vitamin K deficiency
3. Illustrate the etiology, pathophysiology, diagnosis and management of arterial and venus Thrombosis (thrombophilia), Heparin-Induced Thrombocytopenia, Lupus Anticoagulants, Antiphospholipid Antibodies, and Antiphospholipid Syndrome

4. Able to interpret thrombophilia results in pregnancy, on the oral contraceptive pill, hormone replacement therapy and in patients on anticoagulant therapy
5. Apply important clinical concepts and principles to draw conclusions about Anticoagulant, Antiplatelet, and Thrombolytic Drugs

ASSESSMENT TOOL

MCQs/SEQs

CLINICAL SKILLS:

Students will

1. Identify and explain the following laboratory tests
    a. Bleeding time
    b. Prothrombin time
    c. Activated Partial Thromboplastin Time
    d. Thrombin Time
    e. Fibrinogen level
    f. D dimers and Fibrinogen Degradation Products
    g. Mixing studies
    h. Factor assays
    i. Platelet function studies
    j. Urea lysis test
    k. Thrombophilia screening
    l. Lupus anticoagulant testing
    m. Factor V leiden assay
    n. Factor inhibitors
2. Use specified methods of enquiry and competence in taking sample collection and processing in Hemostasis
3. Demonstrate knowledge about the significance of taking history and an examination of a bleeding patient
4. Identify and explain the guidelines for Evaluation of Coagulation Analyzers and Coagulation Testing

5. Explain the Point-of-Care Testing in Hemostasis

ASSESSMENT TOOL

OSPE/DOPS/TOACS/CBD

Course contents

Platelets and Megakaryocytes

- Megakaryocytes
- Platelet formation and release
- Platelet structural and functional anatomy
- Platelet physiology
- Platelet function
  - Platelet adhesion
  - Platelet aggregation
  - Platelet release reaction
  - Pathologic role of platelets in hemostasis and thrombosis
- Platelet antigens

Blood Coagulation And Fibrinolysis

- Normal coagulation cascade
- Clotting factors
  - Structure and function of all factors
- Natural inhibitors of coagulation system
  - Protein C and protein S pathway
  - Anticoagulant proteins
  - Alpha2 macrogloblin, serine protease inhibitors, Anti thrombin III,
  - Protein C inhibitor
  - Heparin Co factor II
  - Tissue factor pathway inhibitor
  - Fibrinolytic system

- Inhibitors of fibrinolytic system
- Physiologic regulation of fibrinolysis

- Role of fibrinolytic process in preventing thrombosis

Endothelium and Regulation of Hemostasis

- Endothelial cell structure
- Anti-thrombotic properties of endothelium
- Pro-thrombotic properties of endothelium

Disorders of Hemostasis and coagulation

Diagnostic Approach to the Bleeding Disorders

- Clinical evaluation of the bleeding patient
- Laboratory methods for the study of hemostasis and blood coagulation.
- Bleeding and coagulation time
- PT and APTT
- Factor assays
- Tests for inhibitors of coagulation

Bleeding Disorders Caused By Vascular Abnormalities

- Classification
- Pathophysiology

Thrombocytopenia

- Classification
- Causes of thrombocytopenia
- Pathophysiology of immunological platelet destruction
- Thrombotic thrombocytopenic purpura
- Other forms of non-immunologic platelet destruction

Thrombocytosis

Qualitative Disorders Of Platelet Function

- Bernard Soulier syndrome

- Glanzmann's thrombasthenia
- Storage pool disease
- Abnormal platelet mechanism
- Acquired disorder of platelet function

Inherited Coagulation Disorders

- Hemophilia A
- Von Willebrand's disease
- Hemophilia B
- Factor XIII deficiency
- Prothrombin deficiency
- Factor V deficiency
- Factor VII deficiency
- Factor X deficiency
- Factor XI and XII deficiency
- Pre kallikarein deficiency

Acquired Coagulation Disorders

- Deficiency of vitamin k dependent factors
- Liver disease
- Disseminated intravascular coagulation
- Primary fibrinolysis
- Pathologic inhibitors of coagulation

Thrombosis and Anti Thrombotic Drugs

- Pathophysiology of thrombosis
- Inherited thrombotic disorders
- Anti-thrombotic drugs
- Laboratory evaluation & monitoring of anticoagulant therapy

Practicals:

- PFA 100

- Screening test Bleeding time, Prothrombin time, Activated Partial Thromboplastin Time
- Thrombin Time
- Fibrinogen level
- D dimers and Fibrinogen Degradation Products
- Mixing studies
- Factor assays
- Platelet function studies
- Urea lysis test
- Thrombophilia screening
- Lupus anticoagulant testing
- Factor V leiden assay
- Factor inhibitors

Suggested readings

1. Dacie and Lewis Practical Haematology, 12th Edition by Barbara J. Bain & Imelda Bates & Mike A Laffan
2. Postgraduate Haematology, 8th Edition by A. Victor Hoffbrand, Douglas R. Higgs, David M. Keeling, Atul B. Mehta by A. Victor Hoffbrand, Douglas R. Higgs, David M. Keeling, Atul B. Mehta
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10. Tietz Applied Laboratory Medicine 2nd Edition by Mitchell G Scott

11. Henry's Clinical Diagnosis and Management by Laboratory Methods 24th by Richard A Mcpherson

Malignant & non Malignant White Blood cell disorders

Course title

Malignant White Blood cell disorders (Leukemias, Myelo & lymphoproliferative disorders, MDS, lymphomas {Hodgkin & non- Hodgkin) and Plasma cell dyscrasias) and Non Malignant White Blood cell disorders

Course code

WBCD-8037

Contact Hours:		Credit Hours:
Theory =	45	Theory = 1.5
Practical =	81	Practical = 1.5
Total =	126	Total =3

Contact hours(Theory and Practical)

Face to face teaching	45
Clinical lab work	81

Credit Hours(Theory and Practical)

(1.5+1.5)

Course Learning outcomes

KNOWLEDGE

By the end of this course, students will have developed:

1. **Comprehensive Knowledge of Molecular Basis and Cytogenetics**:
    - Understand the molecular basis and cytogenetic abnormalities associated with hematologic malignancies, including chromosomal translocations, gene mutations, and aberrant signaling pathways implicated in disease pathogenesis.

- Analyze the prognostic significance of cytogenetic and molecular markers in predicting disease outcomes and guiding treatment strategies.

2. **In-depth Understanding of Molecular Biology**:
    - Gain an in-depth understanding of the molecular biology underlying myeloproliferative neoplasms (MPNs) and myelodysplastic syndrome (MDS), including genetic mutations, clonal evolution, and mechanisms of disease progression.
    - Evaluate emerging therapeutic targets and personalized treatment approaches based on molecular profiling in MPNs and MDS.
3. **Expertise in Pathology of Acute Leukemias**:
    - Acquire expertise in the pathology of acute lymphoblastic leukemia (ALL) and acute myeloid leukemia (AML), including morphological features, immunophenotypic characteristics, and diagnostic criteria.
    - Interpret bone marrow aspirate and biopsy specimens to differentiate between different subtypes of acute leukemias based on cytomorphology, flow cytometry, and molecular testing.
4. **Understanding of Pharmacogenomics in Hematological Diseases**:
    - Understand the principles of pharmacogenomics and its relevance to the treatment of hematological diseases, including genetic variations influencing drug metabolism, efficacy, and toxicity.
    - Apply pharmacogenomic principles in clinical practice to optimize treatment selection, dosing, and monitoring in patients with hematologic malignancies.

ASSESSMENT TOOL

MCQs/SEQs

CLINICAL SKILLS:

1. **Critical Thinking and Problem-Solving Skills**:
    - Develop critical thinking skills to analyze complex molecular and cytogenetic data in the context of hematologic malignancies, integrating genetic findings with clinical presentation and disease management.

- Apply problem-solving skills to interpret diagnostic tests, identify actionable mutations, and formulate individualized treatment plans for patients with hematologic malignancies.

2. **Laboratory Techniques and Data Interpretation**:
    - Acquire proficiency in laboratory techniques used in molecular diagnostics, cytogenetics, and flow cytometry for the evaluation of hematologic malignancies.
    - Demonstrate competence in interpreting laboratory results, including molecular genetic assays, fluorescence in situ hybridization (FISH), and next-generation sequencing (NGS) data, to guide diagnosis and treatment decisions.
3. **Effective Communication and Collaboration**:
    - Develop effective communication skills to convey complex scientific concepts and diagnostic findings to patients, families, and multidisciplinary healthcare teams.
    - Foster collaboration with laboratory personnel, pathologists, oncologists, and other healthcare professionals to ensure coordinated patient care and optimize treatment outcomes.
4. **Evidence-Based Practice and Lifelong Learning**:
    - Embrace the principles of evidence-based practice to critically evaluate scientific literature, clinical guidelines, and emerging research findings in the field of hematologic malignancies.
    - Cultivate a commitment to lifelong learning and professional development, staying abreast of advancements in molecular diagnostics, targeted therapies, and precision medicine approaches for hematologic malignancies.

Students will

ASSESSMENT TOOL

OSPE/DOPS/TOACS/CBD

Course contents

Hematologic Malignancies

- General aspects

- Molecular genetics
- Complications

Classification and Differentiation of Acute Leukemias

- Acute Lymphoblastic Leukemia
- Clinical features
- Laboratory diagnosis
- Differential diagnosis
- Acute Myelogenous Leukemia
- Clinical presentation
- Classification
- Lab diagnosis including cytogenetics
- Special issues

The Myelodysplastic Syndromes

- Classification
- Pathogenesis and genetic features
- Clinical findings
- Laboratory diagnosis

Myeloproliferative Disorders

a) Chronic Myeloid Leukemia

- Clinical presentation and course
- Cellular and molecular pathogenesis
- Laboratory diagnosis

b) Polycytehmia Vera

- Clinical features
- Cytogenesis
- Pathogenesis
- Laboratory diagnosis

c) Myelofibrosis

- Etiology and pathogenesis
- Laboratory diagnosis
- Differential diagnosis
- Treatment

d) Essential Thrombocythemia

- Etiology and pathogenesis
- Laboratory diagnosis
- Cytogenetics
- Differential diagnosis

Lymphoproliferative Disorders

a) Chronic Lymphocytic Leukemia

- Etiology
- Clinical and laboratory findings
- Laboratory diagnosis
- Staging

b) Hairy Cell Leukemia

c) Non – Hodgkin Lymphomas

- Etiology and cytogenetic studies
- Classification
- Morphology
- Clinical features
- Prognostic factors

d) Hodgkin Disease

- Etiology and pathogenesis
- Clinical features
- Classifications
- Staging

e) Cutaneous T cell Lymphoma; Mycosis Fungoides and Sezary Syndrome

Plasma Cell Dyscrasias

General Considerations

a) Multiple Myeloma

- Etiology , cytogenetics and pathogenesis
- Clinical manifestations
- Laboratory diagnosis

b) Waldenstrom Macroglobulinemia

c) Heavy Chain Disease

- Clinical features
- Lab diagnosis

d) Amyloidosis

- Physical and chemical nature of amyloid fibrils
- Pathogenesis
- Clinical findings
- Laboratory diagnosis

e) Cryoglobulin and cryoglobulinemia

- Classification
- Clinical findings
- Laboratory diagnosis

Practicals

- MPO
- SBB
- Periodic Acid-Schiff (PAS)
- Acid Phosphatase
- Leucocyte/Neutrophil Alkaline Phosphatase (LAP/NAP)

- Esterase and iron Staining test

Suggested readings

1. Dacie and Lewis Practical Haematology, 12th Edition by Barbara J. Bain & Imelda Bates & Mike A Laffan
2. Postgraduate Haematology, 8th Edition by A. Victor Hoffbrand, Douglas R. Higgs, David M. Keeling, Atul B. Mehta by A. Victor Hoffbrand, Douglas R. Higgs, David M. Keeling, Atul B. Mehta
3. Hoffbrand's Essential Haematology 8th Edition by A. Victor Hoffbrand, David P. Steensma
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5. Robbins & Cotran Pathologic Basis of Disease 10th Edition by Vinay Kumar, Abul Abbas, Jon Aster10th Edition by Vinay Kumar, Abul Abbas, Jon Aster
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7. Bone Marrow Pathology 5th Edition by Barbara J. Bain
8. de Gruchy's Clinical Haematology in Medical Practice, 5th Edition by Frank Firkin, C. Chesterman, D. Penington, B. Rush
9. Manual of Laboratory Medicine Armed Forces Institute of Pathology Rwp
10. Tietz Applied Laboratory Medicine 2nd Edition by Mitchell G Scott
11. Henry's Clinical Diagnosis and Management by Laboratory Methods 24th by Richard A Mcpherson

Blood Banking and Transfusion Medicine

Course title

Blood Banking and Transfusion Medicine

Course code

BBTM-8039

Contact Hours:		**Credit Hours:**
Theory =	18	Theory = 1
Practical =	54	Practical = 1
Total =	72	Total =2

Contact hours(Theory and Practical)

Face to face teaching	18
Clinical lab work	54

Credit Hours(Theory and Practical)

(1+1)

1.1.1.1 Course Learning outcomes

KNOWLEDGE

At the end of the course, the student will be able to

1. Illustrate the structure of immunoglobulin, genetic basis for antibody diversity, red cell alloantibodies and autoantibodies, Factors influencing antigen antibody reactions, Natural and acquired antibodies, Mechanisms of red cell sensitization, complement activation, blood product anticoagulants and preservatives.
2. Describe and explain the biochemistry, genetic inheritance, immunogenicity and clinical significance of Carbohydrate (ABO, Lewis, P, I/i) and Protein (Kell, Kidd, Duffy, MNS and others) red cell antigens
3. Identify and summarized the significance of disease associations with the null phenotypes of ABO, Rh and Kell

4. Identify and explain the types of blood donors and strategies to recruit voluntary blood donors
5. Analyze and explain the preparation and quality control of blood components
6. Demonstrate the indication, preparation and contraindication of Plateletpheresis, Leucapheresis/Plasmapheresis
7. Illustrate the complications of blood transfusion
8. Identify and explain the Hemolytic disease of the newborn
9. Identify and explain the indication & contraindication of component therapy in different disorders and special transfusion Circumstances such as pregnancy, neonates, transplant patients
10. Illustrate the Leukoreduction (indications and methods) and Emergency transfusion protocols
11. Comprehensively Understand Stem Cell Transplantation (SCT):
12. Gain a thorough understanding of SCT, including its historical background, rationale, and principles underlying the procedure.
13. Recognize the importance of conditioning regimens in preparing recipients for successful engraftment and minimizing complications.
14. Evaluate SCT in Acquired Non-Malignant Diseases:
15. Evaluate the role of SCT in the management of acquired non-malignant diseases, such as aplastic anemia, paroxysmal nocturnal hemoglobinuria (PNH), AIDS-related hematological disorders, and Langerhans cell histiocytosis.
16. Analyze clinical indications, patient selection criteria, and outcomes associated with SCT in these conditions.
17. Assess SCT for Immune Deficiencies & Genetic Disorders:
18. Assess the utility of SCT in treating immune deficiencies and genetic disorders, including primary immunodeficiencies, metabolic disorders, and hemoglobinopathies.
19. Understand the mechanisms by which SCT can correct underlying genetic defects and restore immune function in affected individuals.

ASSESSMENT TOOLS

MCQs, SEQs

CLINICAL SKILLS:

Students will be able to

1. Identify serologic testing by different methods – Tube, gel, solid phase and microplates
2. Analyze the methods of Weak D testing, antibody screening and identification, cross matching, enhancement techniques, adsorption/elution techniques, Donath Landsteiner test and antibody titration tests
3. Identify and explain the investigation of blood transfusion reactions
4. Carry out the use of pediatric blood bags, sterile connecting devices, irradiation of red cell and platelet concentrates, leucodepleted blood products and leucocyte concentrate
5. Analyze the investigation of possible transfusion-transmitted infections
6. Monitor quality control of blood grouping, Coomb's antisera and blood products & Dispose of blood components
7. Use specified methods of Apheresis
8. Analyzing the serologic investigation of Immune hemolytic anemia

ASSESSMENT TOOL

OSPE/DOPS/CBD

1.1.1.2 Course contents

Transfusion of blood and blood components

- Donor selection
- Blood donation and collection
- Collection process
- Red cell preservation
- Anticoagulants
- Components and fractionation of blood
- Blood components
- Plasma fractionation products
- Frozen RBC

- Autologous blood transfusion
- Indications of blood transfusion
- Exchange transfusion

Platelet Transfusion

- Indications of platelet transfusion
- Selection of platelet donors
- Preparation of platelet concentrates
- Platelet storage
- Frozen platelet

Granulocyte Transfusion

- Indications
- Selection of donors
- Preparation of granulocytes for transfusion
- Storage
- Dosage
- Adverse effects

Transfusion of Plasma And Plasma Derivatives.

- Fresh frozen plasma
- Anti-hemophilic factor
- Factor concentrates
- Albumin
- Immunoglobulin preparation- indications and dosage

Adverse Effects Of Blood Transfusion

- Immunologic reactions
- Non immunologic reactions
- Infectious complications (diseases transmitted)
    - Hepatitis B,C,D,A,E
    - HIV, Cytomegalovirus, EB Virus

- Malaria and other parasitic infection

Therapeutic Aphaeresis

Hemopoietic Stem Cell Transplantation

- Hemopoietic stem cells
- Sources
- Indications
- Engraftment
- Complications
- Graft versus host disease
- Infectious diseases

Stem Cell Transplantation

- Overview, rationale, conditioning
- SCT in acquired non-malignant diseases (Aplastic Anemia, Paroxysmal Nocturnal Hemoglobinuria, AIDS, Langerhan cell histiocytosis)
- SCT for immune deficiencies & genetic disorders

Allogeneic & autologous SCT for hematological malignancies

Practicals:

Blood grouping

Cross match

Antibody screening and identification

Resolution of ABO Discripancies

Component preparation

QC of Components

Suggested readings

1. Dacie and Lewis Practical Haematology, 12th Edition by Barbara J. Bain & Imelda Bates & Mike A Laffan
2. Modern Blood Banking & Transfusion Practices, 7th by Denise M. Harmening
3. Postgraduate Haematology, 8th Edition by A. Victor Hoffbrand, Douglas R. Higgs, David M. Keeling, Atul B. Mehta
4. AABB Technical Manual of Blood Banking 20th Edition

5. Basic & Applied Concepts of Blood Banking and Transfusion Practices, 5th Edition by Paula R. Howard, MS, MPH, MT(ASCP)SBB
6. Hoffbrand's Essential Haematology 8th Edition by A. Victor Hoffbrand, David P. Steensma
7. Handbook of Haematology and Blood Transfusion Technique J.W. Delancy and G.Garralty
8. Manual of Laboratory Medicine Armed Forces Institute of Pathology Rwp

Course title

Quality Management

Course code

QM-8040

Contact Hours:		**Credit Hours:**
Theory =	18	Theory = 1
Practical =	54	Practical = 1
Total =	72	Total =2

Contact hours(Theory and Practical)

Face to face teaching	18
Clinical lab work	54

Credit Hours(Theory and Practical)

(1+1)

Course Learning outcomes

KNOWLEDGE

At the end of the course, the student will be able to

- Define and Explain Quality Assurance Quality Control
- Explain and identify Pre-analytical, analytical and post analytical variables
- Define proficiency testing
- Identify and explain external quality control
- Discuss the importance of quality standards, models and awards (ISO, TQM, Malcolm Baldrige, EFQM etc.)

ASSESSMENT TOOLS

Clinical Skills:

Students will be able to

- Analyse and identify inventory management
- Explain the communication skills with lab staff, patients, administration and vendors

- Discuss the implementation of policies and SOPs
- Analyze optical techniques, electrochemistry, electrophoresis and Lab Automation including centrifuge, water bath, analytical balance, automated Hematology analyzers, spectrophotometer

Assessment Tool

MCQs/SEQs

Corse content

Quality control in Haematology and blood bank

Internal quality control measures

- External quality assessment
- Quality Assurance

Pre-analytical, Analytical and Post-analytical Components

- Proficiency Testing
- Establishment of Quality Control Limits
- Interpretation of Quality Control Charts
- Bulls Testing Algorithm
- Monitoring QC with Patient Specimens
- Detection of abnormal Test Results And Delta Checks

Instrument validation

Quality standards, models and awards (ISO, TQM, Malcolm Baldrige, EFQM etc.)

Implementation of policies and SOPs

Suggested readings

1. Dacie and Lewis Practical Haematology, 12th Edition by Barbara J. Bain & Imelda Bates & Mike A Laffan
2. Quality Assurance in Haematology by S. M. Lewis (Author), R. L. Verwilghen (Editor)
3. Automation and Quality Assurance in Haematology Textbook Binding by R.M. Rowan (Author), J.M. England (Author
4. Handbook of Hematologic Pathology 1st Edition By Harold Schumacher, William Rock, Sanford Stass
5. Effective Processes for Quality Assurance 1st Edition By Boyd L. Summers

Compulsory Teaching Skills

For a thorough evaluation of students' understanding and critical thinking abilities, all PhD students in their respective disciplines will;

1. Design a comprehensive set of 50 Multiple Choice Questions (MCQs) and 25 Short Essay Questions (SEQs) for M. Phil students.
2. Plan 20 observed lectures focusing on key topics.

These assessments will provide Ph.D. students valuable experience in educational design and delivery. These will also enhance their interactive learning with the provision of real-time feedback.