

**Curriculum of M. Phil Program**  
**in**  
**Haematology**



**2007**

**King Edward Medical University**  
**Lahore Pakistan**

# Prologue

by

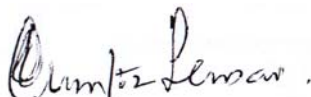
## **The Honorable Vice Chancellor KEMU**

The Program Faculty Committee Members of all M. Phil Programs are guided and assisted in order to enable them to meet the minimum requirements and Standards to be achieved. Only principle areas are addressed giving freedom for the students to raise questions and arguments and for the teachers to include most recent and best guidance literature curriculum contents. It is clear that beyond the main framework there are greater challenges in the areas of selecting modern knowledge, translating information into skills, selecting best pedagogy, teaching in the light of different knowledge levels as determined by Blooms Taxonomy, effective communication, making use of best teaching aids, evaluations, counseling and role modeling. Moreover teachers of Postgraduate M. Phil programs have additional responsibilities of keeping into view the community heeds in terms of health care problems in their respective fields. The students in this modern curriculum have more responsibilities to improve their knowledge beyond textbooks and visit libraries and World Wide Web as frequently as possible. Their logical arguments will serve as the backbone of learning process.

The whole curriculum is divided into semesters to facilitate, knowledge delivery and absorption, more effective. Each semester is further subdivided into modules. This will further make the education process smooth.

I remain confident that both faculty and students would enjoy during this program.

I congratulate Chairman Diploma Coordination Committee, Professor Dr. - ----- and his dedicated team members / Program Directors, who have put in lot of hard work to bring these framework guidelines in its present shape.



**Prof. Mumtaz Hassan (S.I.)**

MBBS (Pb.) B.Sc. (Pb.) MRCP (UK), DTM&H (Edin)  
FCPS (Pak.), FRCP (Lond.), FRCP (Edin), FRCP (Glasg.),  
FRCP (Ireland), DM (USA), FACP (USA), FACIP (USA),  
FCCP (USA), FAFCA (USA)

**Vice Chancellor**

King Edward Medical University,  
Lahore

# **Prologue**

**by**

**The Honorable Pro-Vice-Chancellor**

**KEMU**

M.Phil Programs in Basic Medical and Dental Sciences were introduced in Pakistan to create Scientist and Teachers. In absence of PhD programs these programs were equivalent to major qualifications of the Universities. These programs before 2001 were spread over four years, two (2) years of experience of teaching in same subject in recognized medical teaching institution, one (1) year of course work and one (1) year of lab work and research. In 2001 curriculum were revised and all four (4) years were included into the body of the program.

Now PhD programs are promoted, supported, encouraged and funded by Higher Education Commission, largely as M.Phil leading to PhD programs, the M.Phil programs are made equivalent to M.Phil in Engineering, Hard Sciences, Biological Sciences and Social Sciences.

The M.Phil programs based on this framework will have duration of two (2) years at postgraduate level (Level 7 according to the European Education Levels) and will be credit based, modularized, Semesterized during first year and research work during second year. The qualification of M.Phil will be "Medium Qualification" according to "PMDC Criteria" and "Masters (M) qualification according to QAA-UK criteria.



**Prof. Dr. Syed Muhammad Awais**

*(Sitara-e-Imtiaz)*

**M.B.B.S.(Pb), M.C.P.S.(Surg), M.Sc. Bio-eng. (Dun.), M.S. (Orth)**

**Pro-Vice Chancellor &**

**Prof. Orthopaedic Surgery**

**King Edward Medical University & Mayo Hospital & University,**

**Lahore.**

# **Prologue**

**by**

## **The Chairperson M. Phil Program Committee KEMU**

M.Phil programs at KEMU not only provide students with an outstanding education but also encourage them to self-directed, theoretical and practical learning. These above mentioned attributes are at the forefront of knowledge in every specialized field that provides a basis for originality in developing and/or applying ideas, often within a research context. The aim of this exercise is to develop conceptual understanding that enables the student; to evaluate critically current research and advanced scholarship in the discipline; and to evaluate methodologies and develop critiques of them and, where appropriate, and to propose new hypotheses.

M.Phil programs at KEMU also recognize and reinforce the ability of students to integrate knowledge and formulate judgments. Students are also directed to take account of social and ethical issues and responsibilities and also reflect experience of managing change in a complex environment. The learning process at this level is associated with independent working with other people at the same level or higher. All feasible efforts will be made by the departments to provide students an opportunity to develop the work or learning according to student's scholastic interest.

During the course of M.Phil training, students will be presented with unfamiliar learning situations and will be required to solve problems that involve many obscure and interacting factors. Many such factors are typically variable, making the learning context complex and unpredictable. The overall impact of these exercises is to; ensure a highly specialized education and its application in problem solving to ensure access to employment requiring decision-making in complex and unpredictable situations and Nurture independent learning ability required for continuing professional development Career progression within the respective field.

**Prof. Dr. Atiya Mubarik Khalid**

**M.B.B.S, M.Phil. (Anatomy)**

**Chairperson Department of Anatomy**

King Edward Medical University

Lahore.

## **FOREWORD**

Major advances have occurred in the field of hematology over the last decade and have been accompanied by an increased understanding of the biochemical, physiological and immunological processes involved in normal blood cell formation and function and the disturbances that occur in different diseases.

The hematological diagnosis is no longer based on morphological features alone, now a very important role is played by immunophenotypic cytogenetic and molecular genetic analysis. The great advances in molecular biology have had a major impact on the understanding of normal physiological processes and the basis of disease within the field of hematology.

With the continuing expansion of the practice of hematology, it has become a big challenge to develop a curriculum which is upto date and reflects the increasing understanding and advancing technology of this speciality. We have strived to achieve this goal.

**Prof. Samina Naeem**  
MBBS (Pb.) M. Phil. (Hematology)  
FCPS (Hematology)

**Professor of Pathology**  
King Edward Medical University,  
Lahore

## **INTRODUCTION**

King Edward Medical University (KEMU) is committed to excellence in promoting biomedical education at all levels and has robust programs at both undergraduate and postgraduate levels. KEMU has philosophy of not only enhancing the depth of knowledge of its students but also the breadth. Therefore during the first semester students will be required to take some multidisciplinary classes, which are compulsory for all M.Phil Students regardless of their area of specialization. Following is the content of the courses of the M.Phil program in Hematology, which is offered through Pathology department.

## **M.PHIL HEMATOLOGY PROGRAM FACULTY**

### **PROGRAM DIRECTOR**

Professor Dr. Samina Naeem

### **REGULAR FACULTY**

Professor Muhammad Munir  
Professor Faridoon Khan  
Dr. Nouman Aslam Malik  
Dr. Ahmed Hameed  
Dr. Faiza Bashir  
Dr. Humaira Rafique

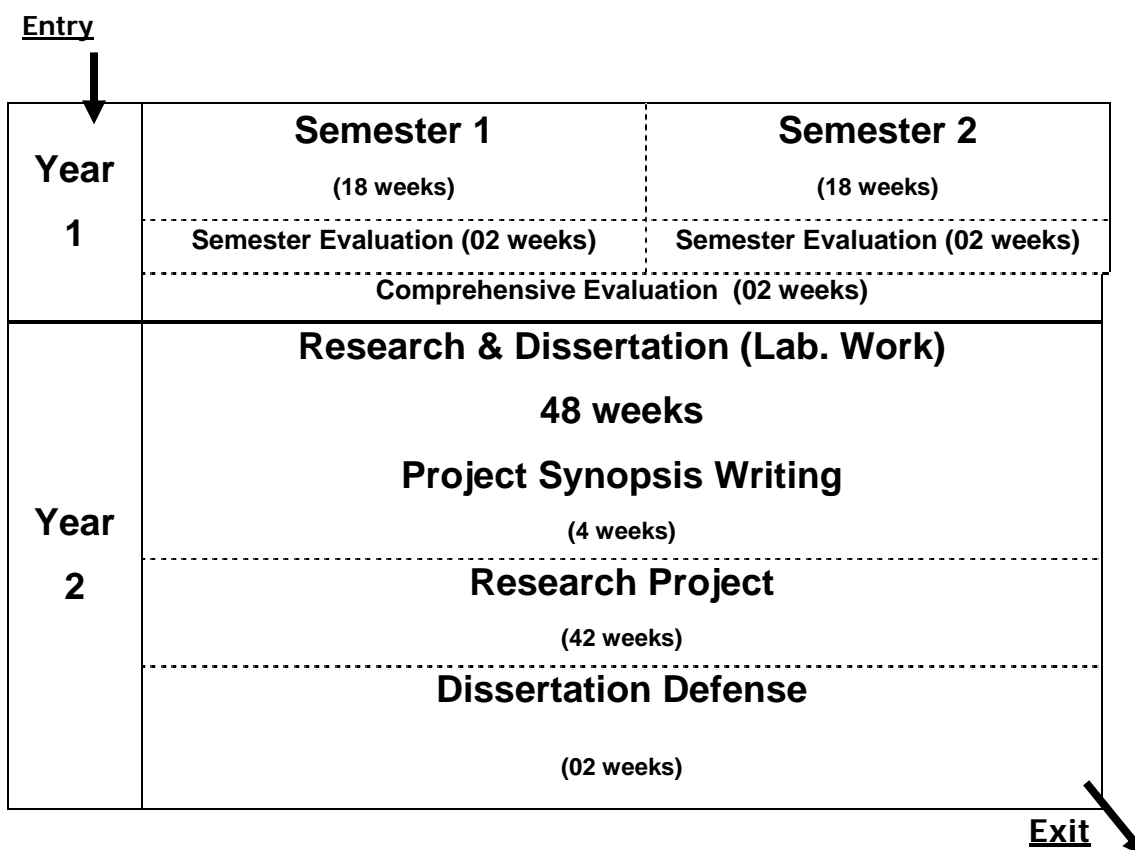
### **VISITING FACULTY**

Professor Yasmin Lodhi  
Brig. Sohaib Ahmed  
Dr. Tahir Shamsi  
Dr. Saba Jamal

# Program Outline

<b>Duration of the Program:</b>	02 Years (Full Time)
<b>Entry Qualifications:</b>	MBBS/BDS/BS.c Hons/MS.c (minimum 16 years of education).
<b>Entry Procedure;</b>	GRE Type Entry Test (MCQ Based) Written Test at Faculty of Basic Sciences Level Interview at Department of the Program Level

## Phase of Studies in Basic Curriculum:



Year 1 is semesterized into two Semesters of twenty (20) weeks each whereas year two (2) is annual of forty eight (48) weeks. Each module and the whole program is made credit based according to the following criteria.

### Credit Accumulation and Transfer System (CATS)

As defined by European Credits Transfer system, the CATS – KEMU is defined as follows

1. Contact Hours 1500 – 1800 hrs/year
2. 25 – 30 Contact Hours = 1 Credit Point
3. Number of Credit Point Required in a Year = 60
4. Number of Credit Point Required in a Semester = 30



## **First Year**

### First Semester (January 15<sup>th</sup> – May 28<sup>th</sup>):

Teaching	18 weeks
Review and Evaluation	02 weeks
Total	20 weeks

### Summer Recess (May 29<sup>th</sup> – July 30<sup>th</sup>)

### Second Semester (August 1<sup>st</sup> – December 20<sup>th</sup>):

Teaching	18 weeks
Review and Evaluation	02 weeks
Total	20 weeks

### Winter Recess (December 21<sup>st</sup> – January 14<sup>th</sup>)

## **Second Year**

### January 15<sup>th</sup> – December 20<sup>th</sup>

Project Synopsis Writing	04 weeks
Research Project	42 weeks
Dissertation Defense	02 weeks

## Year 1 Semester 1

### Class Schedule

	<b>701</b>	<b>702</b>	<b>703</b>	<b>704</b>	<b>705</b>	<b>706</b>
<b>Duration</b>	2 weeks	2 weeks	2 weeks	2 weeks	5 weeks	5 weeks
<b>Title of Module</b>	Introduction to Hematology	Research Methods & Biostatistics	Molecular Biology & Genetics	Basic Science	General Pathology	Hemopoiesis and Hemostasis
<b>Module Coordinator</b>	Prof. Samina Naeem	Prof. Syed Muhammad Awais	Prof. Fridoon		Prof. Muhammad Munir	Prof. Samina Naeem
<b>Place of Learning</b>	Department Lecture Room	Patiala Block	Patiala Block	Department Lecture Room	Department Lecture Room	Department Lecture Room

# Year 1 Semester 1

## Weekly Schedule

Days	8am-9am	9am-10am	10am-11am	11am-Noon	Noon-1pm	1pm-4pm
Monday					LUNCH	
Tuesday						
Wednesday						
Thursday						
Friday						
Saturday				Self Directed Learning/ Guided Library Hours	LUNCH	

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**Total No of hours in semester** **720**

Theory Lectures hours/weeks  18

Laboratory hours/weeks 12

Seminars and Assignments/weeks 06

Self learning hours/weeks 04

**Total hours/Week** **40**

Theory 70%

Practical 30%

# **Semester I**

## **Module 701 Introduction to Hematology (3 Credit Points)**

### **Course Description and Learning Objectives**

- This is the first course of the M.Phil Hematology program. It is designed to introduce the classical and contemporary topics in hematology.
- After taking this course the students will be expected to grasp the essential features of modern clinical and laboratory hematology and achieve an understanding of how many of the manifestations of blood diseases can be explained with this new knowledge of the disease processes.

### **Course Contents**

- Hemopoieses
- Anemias
  - Microcytic Hypochromic
  - Megaloblastic
  - Hemolytic
- Benign Leukocyte disorders.
- Hematological Malignancies
- Disorders of Hemostasis
  - Coagulation Disorders
  - Platelet abnormalities
- Quality control in laboratory hematology

### **Lab Work**

- Specimen collection and anticoagulants used.
- Reference ranges and normal values
- Laboratory organization and management
- Quality assurance
- Basic haematological investigations / techniques
  - Full blood count
  - Preparation of peripheral smears and staining methods
  - Reticulocyte count
- Automation in haematology

### **Seminars**

- Quality assurance in Hematology Lab
- Updates in classifications of leukemias and lymphomas

## **Self Learning**

- Review of literature
- Group discussion
- Computer review

Students will consult the relevant sections of the following books

## **Books Recommended**

1. Essential Hematology. A. V. Hoffbrand & J. E. Pettit
2. Practical Hematology. Sir J. V. Dacie & S. M. Lewis

**Module 702    **Research Methods & Biostatistics****  
**(2 Weeks/3 Credit Hours)**

**Course Description and Learning Objectives:**

- To help participants to formulate ideas that can be tested in a scientific manner
- To give participants a basic understanding of epidemiological methods and biostatistics.
- To develop the critical faculties of participants for evaluation of their own and other people's work.
- To give practical experience of development of study protocols and applications for research funding.
- To give practical experience of use of computers for word processing, database manipulation, use of spreadsheets, statistical analysis, preparation of slides and overheads, internet communication and video conferencing and report writing.

**Course Contents:**

1. Research Methods
  - Philosophy, language, types and structure of Research
  - Conceptualizing research, problem formulation, research objectives
  - Review of literature, sources of knowledge
  - The Planning-Evaluation Cycle
  - Sampling terminology, Probability sampling, Non-probability sampling, Bias and Error
  - Time in Research, Types of Relationships
  - Variables, Hypotheses, Types of Data
  - Introduction to Design, Types of Designs
  - Experimental Design
  - Survey Research, Types of Surveys
  - Qualitative research, Qualitative Data
  - Introduction to Design, Types of Designs, Experimental Design
  - Questionnaires
2. Biostatistics
  - Data display and summary, mean and standard deviation
  - Populations and samples
  - Statements of probability and confidence intervals
  - Differences between means: type I and type II errors and power
  - Differences between percentages and paired alternatives
  - The t tests and the chi-squared tests
  - Correlation and regression
  - Study design and choosing a statistical test

3. Epidemiology
  - What is epidemiology?
  - Quantifying disease in populations
  - Comparing disease rates
  - Measurement error and bias
  - Planning and conducting a survey
  - Ecological studies, Longitudinal studies, Case-control, cross sectional studies and experimental studies
4. Technical Writing
  - Synopsis writing
  - Grant proposal writing
  - Research paper writing
  - Thesis outline
  - Thesis writing

**Module 703****Molecular Cell Biology  
(3 Credit Points)****Course Description and Learning Objectives:**

- This course is the second in the series of two courses designed to introduce both classical and contemporary topics in biology to the students.
- This course is structured to entertain students irrespective of their major.
- After taking this course students will be expected to have a basic understanding of the following fundamental concepts
  1. The role of cellular and molecular biology in medicine.
  2. Immunology.
  3. Molecular and cellular developmental biology (“miracle of life” formation of a complex organism from a single cell).
  4. Evolution with a molecular perspective (natural force and their effect in transformation of life).

**Course Contents:**

1. Recombinant DNA and Biotechnology
2. Molecular Biology and Medicine
3. Natural Defenses against Disease
4. Differential Gene Expression in Development
5. Animal Development: From Genes to Organism
6. Development and Evolutionary Change
7. The History of Life on Earth
8. The Mechanisms of Evolution
9. Species and Their Formation
10. Reconstructing and Using Phylogenies
11. Molecular and Genomic Evolution

**Book Recommended:**

1. Life, ‘The Science of Biology’ by Craig Heller



**Module 704****Basic Science  
(2 Weeks/3 Credit Hours)****Course Description and Learning Objectives:**

- This is a multidisciplinary course that in two weeks gives students basic knowledge of the five pillars of basic medical sciences i.e. Anatomy Physiology Pathology Biochemistry And Course Pharmacology.
- Student taking this course will be able to understand

**Course Contents:****Anatomy**

1. Embryology
  - Fertilization, Zygote, Morula, Blastula, Gastrula, Embryonic period Derivatives of germ layers
  - Brief account of Amnion, Chorion, Placenta
  - Out line of development of Heart and its Anomalies
  - Brief account of development of Urogenital, Digestive systems
2. Histology
  - Cell,
  - Tissue (Epithelial tissue, Muscular tissue, Connective tissue and Nervous tissue)
  - General plan of microscopic structure of CVS
  - Systems (Respiratory, Urogenital, Digestive systems)
3. General Anatomy
  - Classification of bones, their blood supply and ossification
  - Classification of Joints Nerve Supply and Blood supply
  - Types and Nerve supply of Muscles
  - Definition of Neuron and Peripheral and Central nervous system
  - Surface marking of Heart, Lungs, Abdominal viscera
4. Thorax
  - Thoracic cage movements
  - Heart and its External and Internal features and Blood supply
  - Lungs, Pleura, Mediastinum (Name of contents)
5. Abdomen
  - Disposition of Abdominal and Pelvic viscera
  - Outline of Blood supply
  - Nerve supply and Lymphatic drainage and Peritoneal relation of viscera
6. Head & Neck
  - Bones, Foramina of skull
  - Names of Cranial nerves, Brief outline of 5<sup>th</sup> & 7<sup>th</sup> Cranial nerves
  - Dural venous sinuses, Blood supply and Nerve supply (brief account)

- Nose, Pharynx and Larynx. (Blood supply and Nerve supply)

### **Physiology**

1. Functional organization of the human body and control of the internal environment
2. Extra cellular fluid
3. Homeostasis
4. Dehydration and Rehydration and K<sup>+</sup> Homeostasis
5. Anemia, Polycythemia
6. Resistance of body to infection-the leukocytes, tissue macrophage system and inflammation
7. Immunity and allergy
8. Hemostasis and blood coagulation
9. Cardiovascular system properties of cardiac output CCF test cardiac function & Hypertension Normal ECG Acid Base Balance urine formation
10. Respiration Spirometry Regulation Real Electrocardiogram.
11. Body fluids & kidneys; regulation of acid-base balance
12. Pulmonary blood flow
13. The nervous system and special senses
14. The gastrointestinal tract
15. Metabolism and temperature regulation
16. Endocrinology and reproduction
17. Sports Physiology
18. Ovarian and testicular function tests
19. Thyroid Parathyroid Adrenal pancreas endocrine hypothalamus

### **Pathology**

1. Structure and functions of normal human cell inflammatory reaction, chemical mediators primary and secondary wound healing. Factors affecting the process of healing. Healing in fractured long bone.
2. Gram + Ve organisms and lesions produced by them. Gram- Ve organisms and lesions produced by them. Mycobacterial infections, lesions and laboratory diagnosis. Viral infections like Hepatitis, AIDS, Polio, Measles etc. Fungal infections-superficial deep seated and opportunistic. Parasites of medical importance and their lab. Diagnosis such as protozoa, tape worms and round worms
3. Etiology and pathogenesis of thrombosis, complications and diagnosis thrombosis, type, mechanisms of change of various emboli, infarction and its diagnosis.
4. Nomenclature etiology of tumors, benign and malignant tumour, route of spread of malignant Tumour, effects of tumors, oncogens, Tumour suppress genes, tumour markers, and their diagnostic significance, some prototype specific Tumour.
5. Pathologic calcifications. Its types and lesions, various exogenous and endogenous pigments and lesions. Deficiency diseases and lesions.
6. Physical irritants and lesions produced by them. Ionizing Radiations and lesions produced by them. Chemical agents as a cause of tissue injury.

7. Rheumatic, ischemic and congenital Heart disease, Endocarditis. Antheroma-its etiology, lesions and complications.
8. Glomerulonephritis, pyelonephritis, stones renal tumours diabetic Nephropathy.
9. Bronchiectasis, emphysema, pneumonias, tumours, tuberculosis pneumoconiosis.
10. Oesophageal lesions, peptic ulcer, gastritis, tumours of stomach, inflammatory bowel diseases, tuberculosis of intestine, tumours of intestine.
11. Tumours of bones, inflammation of bones and joints, muscle dystrophy important skin lesions and their diagnosis, inflammations and tumours in oral cavity including teeth and jaws.
12. Tumours of C.N.S inflammations of meninges and their lab diagnosis demyelinating diseases.
13. Tumours of lymph nodes and leukemias, multiple myeloma- lesions and lab diagnosis.

### **Biochemistry**

1. Fluid & Electrolyte & Acid Base Balance in Human Body with select Clinical Scenarios.
  - Constitution of Extra & Intracellular Fluids.
  - Extracellular Fluid Compartments; Select Dehydration & Oedema Development & Management.
  - Intracellular Fluid Compartments; Select Dehydration & Oedema Development & Management.
2. Metabolic Cross Talk in Glycomics. Health & Disease Scenarios.
  - Site, Pathway Dynamics, Key & Regulatory Enzymes, Nutritional & Endocrine Command, Outcome & Clinical Complications in Glycolysis, Hexose Shunt Pathway, Glycogenesis & Glycogenolysis, Krebs's Pathway & Glucuronic Acid Pathway.
3. Metabolic Cross Talk in Lipomics. Health & Disease Scenarios.
  - Site, pathway Dynamics, Key & Regulatory Enzymes, Nutritional & Endocrine Command, Outcome & clinical Complications in Fatty Acid Oxidation & Biosynthesis, Ketosis, Cholesterologenesis & Lipoproteins.
4. Metabolic Cross Talk in Proteomics. Health & Disease Scenarios.
  - Site, pathway Dynamics, Key & Regulatory Enzymes, Nutritional & Endocrine Command, Outcome & clinical Complications in Urea Cycle, Protein Biosynthesis & Select Amino acid Metabolism with Genetic Disorders.
5. The Liver & Biliary System.
  - Liver Functions & Liver Function Tests, Biliary Stasis, Cholecystitis & Pancreatitis, Jaundice.
6. Nutrition & Endocrines Modalities.
  - Basic Nutritional Principles & Calorific Requirements. Diet in health & Disease.
  - Biosynthesis, Storage, Mechanism of Release, Transport, Binding to Receptor, Mode of Activity, Biochemical Functions & Abnormalities in Vitamin A, D, K, C & B Complex.
  - Biosynthesis, Storage, Mechanism of Release, Transport, Binding to Receptor, Mode of Activity, Biochemical Functions & Abnormalities in Insulin, Glucagon, Thyroid Hormones, Para thyroid Hormones, Calcitonin, Growth Hormone, Aldosterone, Cortisol & Catecholamines.

**Course Pharmacology**

1. Basic principles: Drug receptors and pharmacodynamics, pharmacokinetics, drug biotransformation
2. Autonomic drugs
3. Cardiovascular drugs
4. Renal drugs
5. Drugs with action on smooth muscles
6. Drugs that act in the central nervous system
7. Drugs used to treat diseases of blood, inflammation and gout
8. Endocrine drugs
9. Chemotherapeutic drugs
10. Special aspects of perinatal, pediatric and geriatric pharmacology
11. Drugs used in gastrointestinal diseases
12. Therapeutic and toxic potential of over the counter drugs. Local acting Drugs.

**Module 705****General Pathology  
(5 Weeks/9 Credit Hours)****Course Description and Learning Objectives:**

- Describe the responses to different types of injury at the cellular and sub-cellular level
- Enlist the differences between necrosis and apoptosis
- Describe different morphological patterns of tissue necrosis
- Describe the different types of responses of the cells to stress
- Describe the different types of exogenous and endogenous pigmentations
- Describe the sequence of vascular changes in acute inflammation (vasodilation, increased permeability) and their purpose
- Define the terms edema, transudate, and exudate
- Describe the steps involved in phagocytosis and the role of IgG and C3b as opsonins and receptors
- Compare and contrast acute vs chronic inflammation with respect to causes, nature of the inflammatory response, and tissue changes. Describe the differences between the various cell types (i.e. labile, stable, and permanent cells) in terms of their regeneration potential. List examples of each cell type
- Distinguish between fibrinous, purulent, and serous inflammation. Define an abscess
- Describe the systemic manifestations of inflammation and their general physiology, including fever, leukocyte left shift, and acute phase reactants
- Define and understand the process of excessive growth of different types of cell
- Differentiate the non-neoplastic excessive and neoplastic growths
- Understand the differences between benign and malignant tumors
- Understand the classification of different tumors
- Understand the TNM classification of malignant tumors
- Define and describe hyperemia and congestion, edema, hemorrhage, thrombosis, infarction and embolism
- Describe shock, its different types and understand mechanisms leading to shock.
- Describe the organization of nuclear material, its replication and division
- Understand different modes of inheritance
- Describe the different types of genetic aberrations
- Understand the basis of molecular diagnosis of genetic disorders
- Define the components of the immune system
- Understand the innate and adaptive immunity, the classes of immunoglobulins
- Define humoral and cellular immunity
- Define the differences between immunity and hypersensitivity
- Describe the autoimmune diseases and their diagnosis
- Understand the immune deficiency states

**Course Contents:**

1. Cellular Basis of disease (Cellular responses to stress ; Adaptations of growth and differentiation, Cell injury and cell death)
  - Hyperplasia
  - Hypertrophy
  - Atrophy
  - Metaplasia
  - Causes of Cell injury
  - Mechanisms of cell injury
  - Reversible and irreversible cell injury
  - Morphology of cell injury and necrosis
  - Apoptosis
  - Sub cellular responses to injury
  - Intracellular accumulations
  - Pathological calcification
2. Inflammation and healing
  - Acute Inflammation
  - Chemical mediators of inflammation
  - Outcomes of acute inflammation
  - Morphologic patterns of acute inflammation
  - Systemic effects of inflammation
  - Mechanisms of tissue regeneration
  - Repair by healing ,scar formation and fibrosis
3. Hemodynamic disturbances,
  - Edema
  - Hyperemia and congestion
  - Hemorrhage
  - Hemostasis and thrombosis
  - Embolism
  - Infarction
  - Shock
4. Neoplasia
  - Biology of tumor growth
  - Benign and Malignant Neoplasms
  - Molecular basis of cancer
  - Host defenses against tumors
  - Clinical features of tumors
5. Genetic Disorders
  - Mutations
  - Mendelian disorders
  - Disorders with multifactorial inheritance
  - Cytogenetic disorders
  - Single Gene disorders
  - Molecular diagnosis
  - Diagnosis of Genetic diseases
6. Diseases of immunity
  - General features of immune system
  - Cells and tissues of the immune system

- Innate and adaptive immunity
- Disorders of the immune system
- Autoimmune diseases
- Immunological deficiency syndromes

**Book Recommended:**

1. **Robbins Basic Pathology Updated Edition: With STUDENT CONSULT Online Access** by Vinay Kumar, Ramzi S. Cotran, and Stanley L. Robbins

**Module 706****Hemopoiesis and Hemostasis  
(7.5 Credit Hours)****Course Description and Learning Objectives:**

- This course encompasses the physiology of the entire hemopoietic system.
- After taking this course the students will be expected to have a basic understanding of the origin, development, morphology and functions of the normal hemopoietic cells and mechanism of hemostasis.

**Course Contents:**♦ **Origin and development of blood cells**

- Haemopoietic organs
- Haemopoietic stem cells
- Haemopoietic growth factors
  - Functions
  - Mechanism of action
  - Receptors

♦ **Erythrocyte**

- Erythrocytosis
  - Erythroid progenitor & precursors
  - Stages of normoblastic differentiation
  - Control of erythrocytosis
  - Nutritional factors required for erythrocytosis
  - Biosynthesis of haemoglobin
    - Globin synthesis
    - Heam synthesis
- Mature Erythrocyte
  - Structure and Function of membrane
  - Structure of haemoglobin
  - Function of erythrocytes
  - Energy metabolism in erythrocytes
- Destruction of Erythrocytes
  - Mechanism of red cell destruction
  - Sites of destruction
    - Immune destruction



◆ **Leucocytes**

- Neutrophil Leucocytes
  - Development
  - Morphology
  - Functions
  - Normal values & variation in different conditions
- Eosinophil and Basophil
  - Development
  - Morphology
  - Functions
  - Normal values & variation in different conditions
- Monocytes
  - Development
  - Morphology
  - Functions
  - Normal values & variation in different conditions
- Lymphocytes
  - Development
  - Morphology
  - Functions
  - Normal values & variation in different conditions
    - The Immune Response
    - Complement System

◆ **Platelets and Megakaryocytes**

- Development
- Structure
- Functions

◆ **Blood Coagulation**

- Normal mechanism of coagulation
- Control of coagulation
- Fibrinolysis
- Endothelium and its role in Hemostasis

**Lab Work**

- Specimen collection and anticoagulants used.
- Reference ranges and normal values
- Laboratory organization and management
- Quality assurance
- Basic haematological investigations / techniques
  - Full blood count
  - Preparation of peripheral smears and staining methods
  - Reticulocyte count

- Automation in haematology
- Blood cell morphology in health
- Performance of bone marrow aspiration and trephine biopsy

### **Seminars**

- Molecular and genetic basis of thalasseмии
- Colony stimulating factors and their clinical applications
- Updates in coagulation mechanism
- Neutrophil kinetics in man

### **Self Learning**

- Review of literature
- Group discussion
- Computer review

Students will consult the relevant sections of the following books

### **Books Recommended:**

1. Wintrobe's Clinical Hematology G.R. Lee, T. C. Bithell, J Foerster, J. W. Athens, J. N. Lukens.
2. Post Graduate Haematology. A.V. Hoffbrand, D. Catovsky, E.G.D. Tuddenham.



## Year 1 Semester 2

### Weekly Schedule

Days	8am-9am	9am-10am	10am-11am	11am-Noon	Noon-1pm	1pm-4pm
Monday					LUNCH	
Tuesday						
Wednesday						
Thursday						
Friday						
Saturday				Self Directed Learning/ Guided Library Hours	LUNCH	

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**Total No of hours in semester**      **720**

Theory Lectures hours/weeks            18  
 Laboratory hours/weeks      12  
 Seminars and Assignments/weeks      06  
 Self learning hours/weeks      04

**Total hours/Week**      **40**

Theory      70%  
 Practical      30%

**Module 707****Erythrocyte Disorders  
(4.5 Credit Points)****Course Description and Learning Objectives:**

- This course marks the commencement of Hematological diseases and deals with Erythrocyte Disorders.
- On completion of this course the students are expected to acquire in depth knowledge of common disorders of red cells which include deficiency anemia, anemia of pregnancy, childhood and chronic diseases and acquire skills for their laboratory diagnosis.
- The students will also have an understanding of relatively rare disorders like sideroblastic anemia and porphyrias.

**Course Contents:****◆ Anemias**

- General features
- Diagnostic approach to Anemias

**◆ Iron Deficiency Anemias**

- Iron Metabolism
- Etiology and Pathogenesis
- Clinical Features
- Lab. Diagnosis

**◆ Megaloblastic Anemias**

- Vit. B12 and folic acid metabolism
- Etiology and pathogenesis
- Clinical features
- Lab Diagnosis
- Treatment

**◆ Anemias of Chronic Disorders**

- Chronic Infections
- Renal Disease
- Liver Disease
- Malignant Disease
- Endocrine Disease

◆ **Sideroblastic Anemias**

- Classification
- Pathogenesis
- Lab. Diagnosis

◆ **Haemochromatosis and Porphyrrias**

- Etiology, Clinical Features and Diagnosis

◆ **Anemia of Pregnancy**

◆ **Anemia of Infants and Children**

### **Lab Work**

- Red Blood cell morphology in
  - iron deficiency anemia
  - Megaloblastic anemia
  - Anemia of chronic disorders
  - Sideroblastic anemias
- Red cell cytochemistry
  - Perls stain
- Identification of malarial parasite and other hemoparasite

### **Seminars**

- Soluble transferrin receptor for the evaluation of erythropoiesis and iron status
- Iron Deficiency Anemia. Assessment, Prevention and Control. A guide for Program Managers
- Diagnosis of cobalamin deficiency: the old and the new
- Folate deficiency beyond megaloblastic anemia: hyperhomocysteinemia and other manifestations of dys-functional folate status.

### **Self Learning**

- Review of literature
- Group discussion
- Computer review

Students will consult the relevant sections of the following books

**Books Recommended:**

1. Wintrobe's Clinical Hematology G.R. Lee, T. C. Bithell, J Foerster, J. W. Athens, J. N. Lukens.
2. Post Graduate Haematology. A.V. Hoffbrand, D. Catovsky, E.G.D. Tuddenham.
3. Practical Hematology. Sir J. V. Dacie & S. M. Lewis

**Module 708****Erythrocyte Disorders**  
**(4.5 Credit Points)****Course Description and Learning Objectives:**

- Erythrocyte Disorders are continued in this course and reach completion.
- After taking this course the students are expected to gain comprehensive knowledge of Hemolytic anemias, Hemoglobinopathies, Thalassemias and Bonemarrow Failure Syndromes and acquire skills for their diagnosis.

**Course Contents:**♦ **Hemolytic Anemias**

- Classification
- General features --- clinical  
--- laboratory
- Red Cell Membrane Defects (HS, HE)
- Enzymopathies (esp. G-6 PD, PK deficiency)
- Immune Hemolytic Anemias
  - Autoimmune Hemolytic Anemia
  - Isoimmune Hemolytic Anemia
- Paroxysmal Nocturnal haemoglobinuria
- Acquired Haemolytic Aneamias due to drugs, chemicals, physical agents,

♦ **The Abnormal Haemoglobins**

- Classification
- Prevalence
- Genetic Mechanism
- Pathophysiology of Hb S, C, D, E
- Diagnosis
- Unstable haemoglobins
- Methaemoglobinemias

♦ **Thalassemias**

- Genetic mechanism
- Prevalance
- Pathophysiology
- Diagnosis
- Treatment



### ◆ Aplastic Anemia / Bonemarrow Failure Syndromes

- Inherited
- Acquired

### Lab Work

- Laboratory methods for investigation for Hemolytic anemias
- Investigations for Hereditary Hemolytic anemias
  - Osmotic Fragility test
  - Detection of enzyme deficiencies in Hereditary Hemolytic anemias
- Investigations of abnormal hemoglobins and thalassaemias.
  - Hemoglobins electrophoresis
  - Sickling test
  - HBF estimation
- Investigation for PNH (Ham's Test)
- Coomb's Test direct and indirect
- Serologicla investigation of the auto-immune and drug-induced immune haemolytic anaemias
- Bone marrow morphology in aplastic anemia

### Seminars

- The Thalassaemia Syndromes
- Clinical expression and laboratory detection of red blood cell membrane protein mutations
- Hereditary red cell enzymopathies
- The Haemolytic Anemias
- Guidelines for the diagnosis and management of acquired aplastic anemia.

### Self Learning

- Review of literature
- Group discussion
- Computer review

Students will consult the relevant sections of the following books

### Books Recommended

1. Wintrobe's Clinical Hematology G.R. Lee, T. C. Bithell, J Foerster, J. W. Athens, J. N. Lukens.
2. Post Graduate Haematology. A.V. Hoffbrand, D. Catovsky, E.G.D. Tuddenham.
3. Practical Hematology. Sir J. V. Dacie & S. M. Lewis

**Module 709      **Leukocyte Disorders and Hemoncology**  
(4.5 Credit Points)**

**Course Description and Learning Objectives:**

- This course is designed to deal with the non neoplastic disorders of leukocytes as well as general and some specific aspects of Hemoncology.
- After the completion of this course the students will acquire knowledge of the non neoplastic white cells disorders including HIV disease.
- They will also be well versed in the molecular basis, cytogenetics and immuno diagnosis of leukemia and lymphoma.
- The students will be expected to have in depth knowledge of Acute leukemia and Myelodysplastic Syndromes and skills for their diagnosis.

**Course Contents:**

◆ **Non-malignant Disorders of Leucocytes**

- Variation of leucocytes in disease
- Neutropenia
- Qualitative disorder of leucocytes
- Lysosomal storage disease
- Langerhan's cell histiocytosis
- Haematological aspect of AIDS

◆ **Disorders of the Spleen**

- Anatomy
- Functions
- Splenomegaly --- Etiology
- Splenectomy
  - Indications
  - Complications

**HAEMATOLOGICAL MALIGNANCIES**

◆ **Molecular Basis of Leukemia and Lymphoma**

◆ **Cytogenetics of Leukemia and Lymphoma**

◆ **Immuno Diagnosis of Leukemia and Lymphoma**

◆ **Acute Leukemias**

- Classification and Diagnosis
- Acute Myeloid Leukemia
- Childhood Acute Lymphoblastic Leukemia
- Adult Acute Lymphoblastic Leukemia

◆ **Myelodysplastic Syndromes**

**Lab Work**

- Differential Leukocyte Count in various diseases
- Bone marrow morphology in Gaucher's disease
- Hematological features of hypersplenism
- Hematological findings in splenectomy
- Peripheral blood and bone marrow findings in
  - Myelodysplastic syndromes
  - Acute lymphoblastic leukemia
  - Myeloblastic leukemia
- Cytochemistry for above neoplasias
  - Myeloperoxidase
  - Sudan Black
  - Estrases specific and nonspecific
  - PAS
- Flowcytometry in above mentioned hematological malignancies

**Seminars**

- Neutrophil disorders and their management
- The hematological features of HIV infection
- The importance of diagnostic cytogenetics on outcome in AML
- Diagnostic cerebrospinal fluid (CSF) examination in children with acute lymphoblastic leukemia (ALL)
- WHO classification of myelodysplastic and myeloproliferative diseases

**Self Learning**

- Review of literature
- Group discussion
- Computer review

Students will consult the relevant sections of the following books

**Books Recommended**

1. Wintrobe's Clinical Hematology G.R. Lee, T. C. Bithell, J Foerster, J. W. Athens, J. N. Lukens.
2. Post Graduate Haematology. A.V. Hoffbrand, D. Catovsky, E.G.D. Tuddenham.
3. Practical Hematology. Sir J. V. Dacie & S. M. Lewis
4. Bone Marrow Pathology Barbra J. Bain.

**Module 710****Hemoncology  
(4.5 Credit Points)****Course Description and Learning Objectives:**

- This course deal with specific Hematological Malignancies.
- After taking this course the students are expected to acquire updated knowledge of chronic leukemias, lymphomas, plasma cell dyscrasias and stem cell transplantation.
- The students will acquire skills for lab diagnosis of above disorders.

**Course Contents:****◆ Myeloproliferative Disorders**

- Chronic myeloid leukaemias
- Polycythaemia vera
- Myelofibrosis
- Essential thrombocythemia

**◆ Lymphoproliferative Disorders**

- Chronic lymphocytic leukaemia
- Non-Hodgkin's lymphoma
- Hodgkin's disease
- Hairy cell leukaemia

**◆ Plasma Cell Dyscrasias**

- General consideration
  - Etiology
  - Protein abnormalities
  - Properties of M-component
  - Diagnosis
- Multiple Myeloma
- Waldenstrom's Macroglobuliaemia
- Heavy Chain Disease
- Amyloidosis
- Cryoglobulinemia

## Lab Work

- Bone marrow and peripheral blood morphology in
  - Chronic Myeloid Leukemia
  - Chronic Lymphocytic Leukemia
  - Non Hodgkin's Lymphoma
  - Hodgkin's Lymphoma
  - Multiple Myeloma
- Cytochemistry for above neoplasias
  - Myeloperoxidase
  - Sudan Black
  - Estrases specific and nonspecific
  - PAS
- Flowcytometry in above mentioned hematological malignancies

## Seminars

- Juvenile myelomonocytic leukemia
- Monitoring minimal residual disease in BCR-ABL-positive chronic myeloid leukaemia
- Development of an International Prognostic Index (IPI) for myeloma
- Issues relating to individual entities in the WHO classification of lymphoma

## Self Learning

- Review of literature
- Group discussion
- Computer review

Students will consult the relevant sections of the following books

## Books Recommended

1. Wintrobe's Clinical Hematology G.R. Lee, T. C. Bithell, J Foerster, J. W. Athens, J. N. Lukens.
2. Post Graduate Haematology. A.V. Hoffbrand, D. Catovsky, E.G.D. Tuddenham.
3. Practical Hematology. Sir J. V. Dacie & S. M. Lewis
4. Bone Marrow Pathology Barbra J. Bain.

**Module 711****Disorders of Hemostasis  
(6 Credit Points)****Course Description and Learning Objectives:**

- This course deals with all the disorders of Hemostasis.
- After completing this course the students are expected to have knowledge of the disorders of platelets, blood vessels, inherited and acquired defects of coagulation as well as thrombophilia.
- The students are expected to be able to perform upto date investigation for these disorders.

**Course Contents:****◆ Thrombocytopenia**

- Classification
- Pathophysiology
- Diagnosis

**◆ Thrombocytosis****◆ Qualitative Abnormalities of Platelets****◆ Bleeding Disorders due to Vascular Defects****◆ Coagulation Disorders**

- Inherited coagulation disorder, esp. Haemophilia A, Haemophilia B, von Willibrand Disease
- Acquired Coagulation disorders
  - DIC and Fibrinolysis
  - Deficiency of Vit. K-dependent factors
  - Liver disease (affecting coagulation)
  - Pathologic inhibitors of coagulation
  - Other factors affecting coagulation

**◆ Thrombosis, Inherited Thrombophilia**

## Lab Work

- Platelet count,
- BT,
- CT,
- PT,
- APTT,
- INR,
- TT,
- FDPs,
- Fibrinogen level.
- Mixing experiments,
- Clotting factor level.

## Seminars

### Self Learning

- Review of literature
- Group discussion
- Computer review

Students will consult the relevant sections of the following books

## Books Recommended

1. Wintrobe's Clinical Hematology G.R. Lee, T. C. Bithell, J Foerster, J. W. Athens, J. N. Lukens.
2. Post Graduate Haematology. A.V. Hoffbrand, D. Catovsky, E.G.D. Tuddenham.
3. Practical Hematology. Sir J. V. Dacie & S. M. Lewis

**Module 712****Transfusion Medicine  
(3 Credit Points)****Course Description and Learning Objectives:**

- This course is designed to encompass the diagnostic and clinical aspects of blood transfusion.
- After the completion of this course are expected to have indepth knowledge of red cell antigens and anti-bodies.
- The students will gain knowledge of all aspects of clinical blood transfusion including blood component therapy and prevention of blood transfusion transmissible diseases.
- They will acquire upto date skills involved in laboratory blood transfusion.

**Course Contents:**

- ◆ **Red Cell Immunohematology**
- ◆ **Antigens In Human Blood**
- ◆ **Clinical Blood Transfusion**
  - Blood Donor
  - The recipient
  - Storage of blood
  - Blood Components
  - Appropriate use of blood and components
  - Complications of blood transfusion
- ◆ **Hemolytic Disease of New Born**

**Lab Work**

- ABO grouping
- Rh grouping
- Cross match test
- Anti body screening
- Special compatibility tests
- Tests for transfusion reactions
- Titration of anti bodies
- Tests for ABO Hemolytic disease of new born



## **Seminars**

- New technologies for red cell serology
- Structural and functional diversity of blood group antigens
- Guidelines on hospital blood bank documentation and procedures
- Guidelines for the clinical use of blood cell separators
- Guidelines of the administration of blood and blood components and the management of transfused patients

## **Self Learning**

- Review of literature
- Group discussion
- Computer review

Students will consult the relevant sections of the following books

## **Books Recommended**

1. Blood Transfusion in Clinical Medicine. P.L. Mollison, C.P. Engelfret, M. Contras.
2. Post Graduate Haematology. A.V. Hoffbrand, D. Catovsky, E.G.D. Tuddenham.
3. Practical Hematology. Sir J. V. Dacie & S. M. Lewis