

**Virginia Western Community College**  
**MDL 125**  
**Course Title**

**Prerequisites**

Successful completion of BIO 141 prior to enrollment in course

**Course Description**

Introduces the basic principles of clinical hematology, including identification of normal and abnormal blood cells, blood cell formation, and blood cell dyscrasias, especially the anemias. Introduces students to routine hematological laboratory techniques such as cell counting and staining, and blood cell identification.

**Semester Credits: 4 Lecture Hours: 2 Lab/Clinical/Internship Hours: 3**

**Required Materials****Textbook:**

1.Clinical Hematology and Fundamentals of Hemostasis 5th Edition by D. Harmening ISBN: 978-08036173222. 2. Delmar's Clinical Laboratory Manual Series: Hematology 1st Edition by Allan Russell ISBN: 978-0827363731

**Other Required Materials:****Course Outcomes**

**At the completion of this course, the student should be able to:**

- Identify normal red and white blood cells and platelets
- Describe the process of hematopoiesis during different stages of human development
- Identify abnormal red and white blood cells in a peripheral blood smear
- Describe and differentiate the various types of anemia: Iron and folic acid deficiency, hemolytic anemia, anemia associated with disease and anemia caused by inherited genetic conditions
- Correlate the different types of anemia with red blood cell morphology in a peripheral blood smear
- Differentiate the various types of thalassemia and understand the underlying gene/protein abnormality unique to each type of thalassemia
- Differentiate the various types of hemolytic anemia based on the etiology of the hemolytic events
- Recognize red and white blood cell inclusions such as Howell-Jolly bodies, iron deposits and basophilic stippling
- Recognize how pre-analytical, analytical, and post analytical errors can adversely affect results

## **Topical Description**

### **I. Introduction to Clinical Hematology**

- A. Morphology of Cells on the Normal Blood Smear
- B. Erythropoiesis
- C. Myelopoiesis
- D. Monopoiesis
- E. Lymphopoiesis
- F. Megakaryocytopoiesis
- G. Bone Derived Cells
- H. Molecular Hematology and Advanced Concepts

### **II. Bone Marrow**

- A. Bone Marrow Structure
- B. Bone Marrow Function
- C. Indications for Bone Marrow Studies
- D. Obtaining and Preparing Bone Marrow for Hematologic Studies
- E. Bone Marrow Examination
- F. Bone Marrow Report

### **III. The Red Blood Cell**

- A. The Red Blood Cell Membrane
- B. Hemoglobin Structure and Function
- C. Active Red Blood Cell Metabolic Pathways
- D. Erythrocyte Senescence and Hemolysis

### **IV. Anemia**

- A. Causes of Anemia
- B. Significance of Anemia and Compensatory Mechanisms
- C. Clinical Diagnosis of Anemia
- D. Classification of Anemia
- E. Treatment of Anemias
- F. Tests in the Diagnosis of Anemia
- G. Patient Studies of Anemia

### **V. Evaluation of Cell Morphology: Platelet and White Blood Cell Morphology**

- A. Examination of the Peripheral Blood Smear
- B. The Normal Red Blood Cell Count
- C. Variations in Red Cell Distribution
- D. Variations in Size
- E. Hemoglobin Content/Color Variations
- F. Variations in Shape
- G. Red Cell Inclusions
- H. Examination of Platelet Morphology

I. White Blood Cell Morphology

**VI. Iron Metabolism and Hypochromic Anemias**

- A. Normal Iron Metabolism
- B. Iron Deficiency Anemia
- C. Anemia of Chronic Disease
- D. Sideroblastic Anemia
- E. Iron Overload and Hemochromatosis

**VII. Megaloblastic Anemias**

- A. Biochemical Aspects
- B. Clinical Manifestations of Megaloblastic Anemia
- C. Hematologic Features
- D. Etiology of Megaloblastic Anemia
- E. Laboratory Diagnosis of Megaloblastic Anemia

**VIII. Aplastic Anemia**

- A. Pathogenesis
- B. Etiology
- C. Acquired Aplastic Anemia
- D. Congenital Aplastic Anemia
- E. Clinical Manifestations of Aplastic Anemia
- F. Laboratory Evaluation
- G. Treatment, Clinical Course and Prognosis
- H. Related Disorders

**IX. Introduction to Hemolytic Anemias**

- A. Classification of Hemolytic Anemias
- B. Approach to Diagnosis of a Hemolytic State
- C. Hereditary Defects in the Red Cell Membrane
- D. Disorders of Membrane Cation Permeability

**X. Hemolytic Anemias: Hereditary Enzyme Deficiencies**

- A. Enzyme Deficiencies: Hexose Monophosphate Pathway
- B. Enzyme Deficiencies: Glycolytic Pathway
- C. Enzyme Deficiencies: Methemoglobin Reductase Pathway

**XI. Hemolytic Anemias: The Hemoglobinopathies**

- A. Classification
- B. Hemoglobinopathies
- C. Methemoglobinemia
- D. General Summary of Laboratory Diagnosis

**XII. Hemolytic Anemias: Thalassemia**

- A. Genetics of Hemoglobin Synthesis
- B. Pathophysiology of Thalassemias
- C. Thalassemia Syndromes
- D. Laboratory Diagnosis of Thalassemia
- E. Treatment of Thalassemia

**XIII. Hemolytic Anemias: Extracorpuscular Defects**

- A. Immune Hemolytic Anemia
- B. Nonimmune Hemolytic Anemia

**XIV. Hypoproliferative Anemia**

- A. Anemia of Chronic Diseases
- B. Anemia associated with Renal Disease and Renal Failure
- C. Anemia Associated with Endocrine disease/Disorders
- D. Anemia Associated with Malignancy
- E. Anemia Associated with Human Immunodeficiency Virus Infection and the Acquired Immunodeficiency Syndrome
- F. Anemia of Infancy
- G. Anemia Associated with Prematurity
- H. Preanalytical Anemia

**MDL 125 Hematology I Lab Syllabus**

Lab 1: Introduction to the Hematology Laboratory; Measurement in the Hematology Laboratory; Hematocrit Measurement

Lab 2: Making Blood smears/Buffy Coat Smears; Leukocyte Differential Count-Comparison of Normal Leukocytes

Lab 3: Platelet, WBC, RBC Count-Unopette and Automated Methods, Hemoglobin Measurement

Lab 4: Ident. Of Anemias: Iron Deficiency, Pernicious, Sickle, and Thalassemia

Lab 5: Identification of Abnormal RBCs and RBC Inclusions/Malarial Smears

Lab 6: Erythrocyte Sedimentation Rate-Wintrobe Method; Reticulocyte Count

Lab 7: Screening Test for G6PD Deficiency

Lab 8: Myeloperoxidase Staining of Leukocytes

Lab 9: Osmotic Fragility Test (Dacie Method)

Lab 10: Screening Hgb for SS-Sickle Cell Gene Detection-Edvotek

Lab 11: Hgb S and Infectious Mono Screening: Sickle-check and Monospot Tests

Lab 12: Phlebotomy Techniques

**Notes to Instructors**

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