COURSE PLAN

FIRST: BASIC INFORMATION

College	
College	: Medicine
Department	: Basic Medical Sciences
Course	
Course Title	Blood and Lymphatic System (BLS).
Course Code	31500371
Credit Hours	: 4
Prerequisite	: None
Instructor	
Name	: Dr. Tariq N. Al-Shatanawi Course coordinator + other staff members as per subject.
Office No.	: 1
Tel (Ext)	:4609
E-mail	: talshatanawi@bau.edu.jo
Office Hours	: Sunday , Monday, Wednesday 10-12

Class Times

Building	Day	Start Time	End Time	Room No.
Lecture Hall Complex	Sunday, Monday, Tuesday Wednesday & Thursday	8:00	12:00	2

Text Books

ANATOMY:

1.Principles of Human Anatomy. By G.J. Tortora, Latest edition.
2.Clinical Anatomy for Medical Students. By R.S. Snell, Latest edition.
3.Basic Histology, by L. Carlos Junqueira. Latest edition.
4. Before we are born. By K.L. Moore and T.V.N. Persaud, Latest edition.

BIOCHEMISTRY:

1.Biochemistry by Campbell & Farrell ,latest edition
2.Lippincott's Illustrated Reviews "Biochemistry" , latest edition

PHYSIOLOGY:

1. Textbook of Medical Physiology, by Guyton and Hall, 10th edition, 2000.
2. Review of Medical Physiology, by William F. Ganong, 20th edition, 2001.

PATHOLOGY:
Basic Pathology, by Kumar, Cotran and Robbins, Latest edition.

PHARMACOLOGY:
Lipincott's Illustrated Reviews: Pharmacology, Latest edition.

COMMUNITY MEDICINE:
Supplementary Departmental handouts.

SECOND: PROFESSIONAL INFORMATION

COURSE DESCRIPTION

This course covers the cellular elements of lymph, blood and the histology of both central and peripheral lymphatic systems, including bone marrow, thymus, spleen and lymph nodes. It also covers the production of blood cells, the physiology of tissue fluids, lymph and plasma including the functions of these fluids and cells, bleeding, coagulation, chemistry of blood and lymph together with the structure of hemoglobin, its functions and hemoglobinopathies, plasma proteins, immunological properties of plasma globulins, complement, immunological mechanisms, the diseases that affect blood and the lymphatic system including disturbances of red blood cells, various types of anemia; disturbances of white blood cells including their numbers and functions; leukemia's and lymphomas; disturbances of bleeding and coagulation; diseases of the spleen and thymus; therapeutics of blood and lymphatic diseases. The course also covers the clinical aspects of hematologic and lymphoreticular diseases.

COURSE OBJECTIVES

After studying the material covered in lectures, practical sessions, clinical seminars and after using his/her private self learning time in a productive way, the student is expected to achieve the following specific objectives:

1. Describe the constituents of blood, their origin and function.
2. Discuss the structure and function of the lymphoreticular system.
3. Understand the basic classification systems of anemias, their laboratory and clinical features, public health aspects, and their management.
4. Understand the of types of Hemoglobinopathies
5. Understand the classification of neoplastic diseases of hematopoietic cells, methods for their diagnosis and their natural history and general guidelines for their management.
6. Describe the regulatory mechanisms of normal hemostasis, abnormalities that lead to bleeding disorders, pathologic aspects that cause thrombotic disorders and how are these conditions treated?
7. Describe blood borne pathogens with emphasis on morphological characterization and diagnosis.

COURSE LEARNING OUTCOMES

1) Knowledge and Understanding
   1. The structures of various blood and lymphatic system, their development, and their histology.
   2. The nature, functions, physiologic roles and mechanisms of action of blood components..
   3. Pathogenesis, morphological changes and complications of diseases affecting the blood and lymphatic system.
   4. The use of some tests and drugs in diagnosis and treatment of blood and lymphatic disorders
2) Professional Skills
   The student should be able to differentiate the different blood and lymphatic disorders.

3) Competences (Transferable skill and attributes)
   The student should be able to differentiate the different investigations required for each blood and lymphatic disorder.

COURSE SYLLABUS

No	Title of Lectures 1st.Week	Learning Objectives
	Introduction to Hematopoietic system (Course coordinator)	Understand the general outline of the module. Be familiar with the modalities of teaching throughout the course.
1	**Lymph circulation and drainage** **(Anatomy 1)**	Understand the origin and composition of lymph. Explain the circulation of lymph in the body.
2	**Lymphoid Organs and tissue** **(Anatomy 2)**	Describe the gross anatomy and histology of the following lymphoid organs: Spleen, tonsils, thymus, lymph nodes and mucosa associated
3	**RBCs: Characteristics & functions** **(Physiology 2)**	Describe RBCs structure & its structure-function relationship. Understand the different functions of RBCs. Understand structure-function relationship of RBCs cell Identify the physiological factors that affect RBCs count. Understand the life span of RBCs & its relationship to blood donation

4	**Blood: composition, function, blood volume & viscosity (Physiology 1)**	Describe the composition of blood. Understand the functions of blood. Understand factors affecting viscosity of blood. Understand the principle of linear blood flow.
5	**Formed blood elements Peripheral blood Formed blood elements Bone Marrow I (Anatomy 4)**	List blood components. Classify formed elements of blood. Discuss the scientific basis of the above classification. Describe the basic structure of erythrocytes and criteria of their identification. List the components of cellular granulocytes. Name organs responsible for hematopoiesis in the fetus. List the developmental stages of hematopoiesis both prenatally and postnatally.
6	**Bone Marrow II (Erythropoiesis, Myelopoiesis&Thrombo poiesis) (Anatomy 5)**	Outline the major steps of post-natal development of blood formed elements (erythropoiesis, granulopoiesis, monocytopoiesis and megakaryopoiesis. Identify characteristic features of these cells.
	2nd .Week	
7	**WBCs (Physiology3)**	Recognize the different structural types of WBCs & their physiological functions. Define the life span & the physiological implication of WBC Differentiate between marginating& circulating pools of WBCs Understand the principle behind the total, relative & absolute WBCs count. Understand how to apply this knowledge in clinical practice.
8	**Heme Metabolism Metabolism of Porphyrins and Heme in hemoglobin (Biochemistry1)**	Understand the importance of iron and its forms in heme. Describe mechanism and sites of heme destruction. List substances produced by heme destruction and their fate in the body. Understand the basic abnormalities that may result in heme catabolism. Describe synthesis of porphyrins and regulation Describe heme synthesis and regulation Know types and causes of erythropioticporphyrias Describe Degradation of heme and jaundice formation
9	**Blood groups (Physiology 4)**	Understand the principles of ABO blood group system. Understand the principles of Rh blood group system. Understand the principles of the HLA system.

10	**Anemias: classification and strategies for diagnosis** **(Physiology 5)**	Name and describe the maturational sequence of erythroid cells in the bone marrow using the terms: proerythroblast, erythroblast, normoblast and reticulocyte. Discuss aplastic anemia with emphasis on its etiology, diagnostic criteria, clinical features and management. Discuss the role of erythropoietin in hematopoiesis with emphasis on its site of production and target cells. Classify anemias according to mean corpuscular volume (MCV) and give three examples of each type.
11	**Hemolytic anemia's I** **(Pathology 1)**	Describe parameters used to detect hemolysis. Classify hemolytic anemias. Describe immune processes leading to hemolysis with reference to diseases associated with hemolysis. Discuss the most frequent enzyme defects leading to hemolysis with emphasis on their clinical and laboratory findings. Identify: spherocyte, schistocyte, nucleated RBCs, Heinz bodies, elliptocyte and Howell-Jolly bodies.
12	**Hemolytic anemia's II And Hemoglobinopathies** **(Pathology 2)**	List the types of hemoglobin present in normal blood and what's the percentage of each type? For thalassemia syndromes describe the following: Basic genetic defect Red cell morphology Clinical manifestations and complications Diagnostic procedures
13	**Nutritional Anemia's (Megaloblastic and iron deficiency)** **(Biochemistry 2)**	For each of Iron, vitamin B12 and folic acid, describe: 1. Dietary sources 2. Absorption 3. Body stores 4. Transport mechanisms and metabolic sequences of deficiency 5. Clinical and laboratory findings 6. Describe the normal mechanism of regulation of iron in the body.
14	**Drugs used in anemia's** **(Pharmacology 1)**	List the major forms of iron used in the therapy of anemias. List the anemias for which iron supplementation is indicated and those for which it is contraindicated. Describe the acute and chronic toxicity of iron describes the major hazards involved in the use of folic acid as sole therapy for megaloblastic anemia.

15	**Epidemiology, risk factors and prevention of Anemia (Community Medicine)**	Understand Mortality and morbidity distribution of anemia (globally and locally). Identify non-modifiable and modifiable anemia risk factors. Describe the major nutritional risk factors in the determination of anemia. Describe the different approaches in Anemia prevention.
16	**Acute Leukemia's** **(Pathology 3)**	Understand the classification of acute leukemia's with emphasis on the French American British (FAB) system. Define the term "blast". Describe the normal phenotypic changes seen in differentiating B and T lymphocytes with reference to similar changes seen in acute lymphoblastic leukemia. Describe the clinical presentations, complications. Explain how the following tests are used in diagnosing acute leukemia's: i. Myeloperoxidase ii. Non specific esterase iii. TDT List six chromosomal abnormalities associated with acute leukemia's.
17	**Salmonella typhi, enteric fever and Brucella** **(Microbiology 1)**	For each organism: 1. Describe the morphology and the structure. 2. Describe growth and toxins 3. Explain pathogenesis and clinical disease 4. Explain mode of transmissions. 5. Explain the clinical manifestations. 6. Be familiar with the laboratory diagnosis. 7. Be familiar with treatment and prevention.
18	**Chronic Myeloproliferative and myelodisplastic syndromes (Pathology 4)**	Understand the clinical manifestations, laboratory findings and complications of Chronic Myeloproliferative and myelodisplastic syndromes Describe the morphologic characteristics of Chronic Myeloproliferative and myelodisplastic syndromes
19	**Plasma proteins** **MOLECULAR BASIS OF HEMOGLOBIN DISORDERS** **(Biochemistry 3)**	Explain albumin role as a carrier of bile acids and in transport of bilirubin, steroids and fatty acids. Describe the electrophoresis pattern for plasma proteins and its value as a diagnostic tool. Know what is Hb S and its clinical correlation Know what is Hb C and its clinical correlation Know molecular basis of beta thalassemia & types including Hb E

		Know molecular basis of Thalassemia Intermedia Know molecular basis of alpha thalassemia & types Know what is hemoglobin Lepore and its clinical correlation Know the molecular basis of delta-beta thalassemia Know the molecular basis of High Persistance of Fetal Hemoglobin
	3rd.Week	
20	**Yersinia pestis and plague** **(Microbiology 2)**	Describe the general microbiological properties and differences from other yersinia. Understand cultural techniques, epidemiology and pathophysiology. Describe the clinical presentation, specimen collection for culture, treatment and prevention.
21	**Lymph Node Enlargement: Non-Hodgkin Lymphomas and Hodgkin Disease** **(Pathology 5)**	Understand the general characteristics of NHL, with reference to pathogenesis, classification and procedures used to diagnose them. Describe the grading systems of NHL. Compare the histopathologic, immunologic and clinical features of NHL. List three chromosomal translocations associated with NHL; describe the oncogenes associated with them. Describe the appearance of Reed-Sternberg cells and identify the significance of their presence. Define the meaning of "background" appearance of Hodgkin's disease and how it is used in diagnosis and classification of this disease. Describe the staging system of Hodgkin disease. List the four types Hodgkin's disease; describe their clinical presentations, general guidelines for patient evaluation and management
22	**Plasmodium and Babesiosis** **(Microbiology 3)**	Describe the following: 1. Microbiological properties, classification and diseases. 2. Microscopic differences between species, life cycle epidemiology, and pathophysiology. 3. Clinical presentation, specimen collection, diagnosis, treatment, and prevention.
23	**Anti-neoplastic drugs** **(Pharmacology 2)**	Recognize the general principles of cancer therapy. Understand the three main lines of cancer therapy. Understand methods of administration of cytotoxic drugs and the rules for combination therapy. Understand the terms: adjuvant therapy, growth fraction and cell cycle. Understand the mode of drug action either phase-specific or non-

		specific. Classify cytotoxic drugs and explain their mechanism of action. Recognize the major adverse effects of cytotoxic drugs. List the common drugs, which have an immunosuppressive effect.
24	**General overview of hemostatic process** **(Physiology 6)** **Physiology of blood coagulation** **(Physiology 7)**	Understand the process and stages (cascade) of blood coagulation and its significance. List and understand the role of factors involved in blood coagulation. Understand the role of serine proteases in the cascade of blood coagulation. Understand the intrinsic and extrinsic Pathways of blood clot Understand the cause of excessive bleeding Understand bleeding time, clotting time and prothrombine time
25	**Epstein Barr Virus (EBV) and Parvovirus B 19** **(Microbiology 4)**	Describe the following: 1. Microbiological properties and diseases. 2. Multiplication strategies, epidemiology, and patho-physiology. 3. Clinical presentation, specimen collection, laboratory diagnosis, treatment, and prevention.
26	**Congenital Bleeding disorders** **(Pathology 7)**	For each of von Willebrand disease, hemophilia A & B describe: heritance, etiology, clinical presentations & laboratory findings.
27	**Inherited disorders of platelets function** **(Pathology 8)**	List the surface glycoproteins of platelets and define their roles. Describe the pathogenesis and laboratory findings of Bernard-Solier disease and thrombasthenia.
	4th.Week	
28	**Q-Fever and other rickettsia** **(Microbiology 5)**	Describe the following: 1. Microbiological properties, classification and diseases. 2. Microscopic differences between species, multiplication cycle, epidemiology, and pathophysiology. 3. Clinical presentation, specimen collection, diagnosis, treatment, and prevention.
29	**A. molecular diagnostics of hemoglobin disorders** **B. Examples on molecular basis of**	For part A, the student should be able to: Be able to identify different hemoglobin types by hemoglobin electrophoresis Interpret hemoglobin electrogram to diagnose of hemoglobin disorders

	Hemophilia and Thrombophilia (Biochemistry 4)	Understand some examples on Molecular diagnosis of hemoglobin disorders; RFLP, PCR----- For part B , the student should be able to: Understand how mutation of factor IX gene causes two different types of hemophilia Understand how mutation in the 3' UTR of thrombin gene causes Hereditary thrombophilia Correlate Pulmonary embolism of maternal death during pregnancy or in the period following delivery and thrombophilia
30	**Idiopathic thrombocytopenic purpura (ITP) and thrombotic thrombocytopenic purpura (TTP)and DIC** **(Pathology 9)**	Describe the etiology, pathogenesis, clinical findings, laboratory results and patient management of adult and pediatric ITP. Identify the mechanism of neonatal and post transfusion thrombocytopenia. Describe the clinical findings and laboratory results of TTP. Understand the correct usage & significance of abnormalities of coagulation parameters.For disseminated intravascular coagulation (DIC) describe etiology , clinical presentations and laboratory findings
31	**Drugs used in coagulation disorders** **(Pharmacology 3)**	Compare the antiplatelet drugs. List three different drugs used to treat disorders of excessive bleeding. Compare the oral anticoagulants with heparin in terms of their pharmacokinetics, mechanisms, and toxicities. Compare the thrombolytic preparations
32	**Plasma cell tumors and monoclonal gammopathies** **(Pathology 10)**	Understand the clinical manifestations, laboratory findings and complications of plasma cell tumors. Define: 1. Bence Jones proteins 2. Monoclonal spike 3. M proteins 4. Heavy chain disease. 5. Waldenstrom'smacroglobulinemia.
33	**Trypanosomiasis, visceral leishmaniasis and Filariasis I** **(Microbiology 6)**	For each of Trypanosomiasis, leishmaniasis and filariasis, Describe the following: 1. Microbiological properties. 2. Classification and diseases. 3. Microscopic differences between species. 4. Life cycle epidemiology and specimen collection. 5. Pathophysiology and clinical presentation. 6. Diagnosis, treatment, and prevention.

34	**Trypanosomiasis, visceral leishmaniasis and Filariasis II** **(Microbiology 7)**	For each of Trypanosomiasis, leishmaniasis and filariasis, describe the following: 1. Microbiological properties. 2. Classification and diseases. 3. Microscopic differences between species. 4. Life cycle epidemiology and specimen collection. 5. Pathophysiology and clinical presentation. 6. Diagnosis, treatment, and prevention.
	Final Exam (Theory + Practicals) = 65 %	
PRACTICAL LABORATORY SESSIONS		
No	**Title**	**Objectives**
1	**Anatomy and Histology of lymphoid organs and tissue** **Histology of blood elements** **(Anatomy)**	1. Identify the anatomical location and characteristics of the lymphoid organ and tissue 2. Identify the distribution of lymph ganglia (groups) 3. lymph vessels histology and distribution 4. Thoracic duct 5. Review criteria for identifying neutrophils. 6. Examine a blood smear under the light microscope applying the above criteria to decide which cell is a neutrophil. 7. Repeat the same process above in identifying other blood cells: basophils, acidophils, lymphocytes, platelets and RBCs. 8. Review criteria and distinguishing histological features for identifying a lymph node. 9. Examine a cross section of lymph node under the light microscope applying the above criteria. 10. Repeat the same process above in identifying and examining cross sections of the spleen, thymus, tonsils and Mucosa Associated Lymphoid Tissues (MALT).
2	**RBCs & WBCs count Hb, PCV, RBCs, WBCs, differential blood grouping , bleeding and**	**Introduce the student to the hematology lab.** 1. Learn the basic techniques used in counting & the clinical implication of this count. 2. Learn the basic techniques in doing RBCs & WBCs count Hb, PCV, RBCs, WBCs, differential blood grouping , bleeding and clotting time Understand how to calculate RBCs values & their clinical significance

	clotting time **(Physiology)**	3. Learn the basic techniques of WBCs and differential count. 4. Understand total leukocytic count, the differential leukocytic count & their clinical significance.
3	**Anemias and acute leukemia's** **(Pathology)**	Identify the morphologic abnormalities of peripheral blood and bone marrow in: 1. Iron deficiency anemia 2. Megaloblastic anemia 3. Thalassemias 4. Sickle cell anemia 5. Micoangiopathic hemolytic anemia 6. G6PD hemolytic anemia 7. Autoimmune hemolytic anemia 8. Hereditary spherocytosis 9. Lymphoblasts 10. Myeloblasts 11. Promyelocytes 12. Prolymphocytes 13. Auer rods 14. Identify the diagnostic microscopic changes of: 15. Acute myeloid leukemia 16. Acute lymphoblastic leukemia
4	**Blood culture techniques** **(Microbiology)**	1. Describe aseptic techniques used in blood culture. 2. Describe types of systems involved in the blood culture. 3. Describe different types and constitutes of blood culture bottles. 4. Describe cultural and incubational environments. 5. Isolation and identification of Salmonella typhi from blood sample 6. Widal Test

COURSE LEARNING RESOURCES

Lectures, Labs, clinical case discussion, video sessions and seminars.

ONLINE RESOURCES

This system is taught by more than one staff. Each staff is free to give online links to the students as learning resources.

ASSESSMANT TOOLS

(Write assessment tools that will be used to test students ability to understand the course material and gain the skills and competencies stated in learning outcomes

ASSESSMENT TOOLS	%
Mid Exam (Theory)	**35**
Final Exam (Theory + Practicals + Clinical Cases)	**65**
TOTAL MARKS	100

THIRD: COURSE RULES

ATTENDANCE RULES
GRADING SYSTEM
Example:

Attendance and participation are extremely important, in this aspect the university rules will be applied. Attendance will be recorded by the instructor for each class. Maximum allowed absence is 15% of the course. The result of absentees isthatthe student will not be permitted to attend the final examination and he/she will be granted zero mark in that exam.

A	**4**
A-	**3.75**
B+	**3.5**
B	**3**
B-	**2.75**
C+	**2.5**
C	**2**
C-	**1.75**
D+	**1.5**
D	**1**
D-	**0.75**
F	**0.5**

*Percentages are according to the number of students who passed the exam.

REMARKS

Use of Mobile Devices During Class is prohibited. Therefore students are required to turn off their mobile devices.

COURSE COORDINATOR

Course Coordinator: Dr. Tariq N. Al-Shatanawi - Department of Basic Sciences

Signature: **Signature:**

Date: **Date:**