



Course Syllabus of Diagnostic Hematology

Faculty : Medicine and Health sciences

Department: Health Sciences

Program : Bachelor in Medical laboratory

I. General information about the course instructor :

Name	Dr .Abdulrazzaq Othman Alagbare	Office Hours(3 Hours Weekly)					
Location & phone number	Sana'a 777182124	Sat	Sun	Mon	Tue	Wed	Thu
Email	alagbariz@yahoo.com	1		1		1	

II. General information about the course :

1.	Course Title:	Diagnostic Hematology				
2.	Course Code and Number :	BML471				
3.	Credit Hours	Lecture	Credit Hours	Lecture	Credit Hours	Lecture
		1		1		1
4.	Study Level and Semester:	4 th year/ 1 st semester				
5.	Pre-requisites :	BML242, BML353				
6.	Co-requisites :					
7.	Program in which the course is offered	Bachelor in Medical laboratory				
8.	Teaching Language:	English				
9.	Study System :	Semester based				
10.	Prepared by :	Dr. Abdulrazzaq Othman Alagbare				

III. Course Description :

This course concerned with the fundamental knowledge about the diagnostic hematology, the steps which must be followed during investigation of hematological disorders and the suitable interpretation of each case. In addition it concern with the understanding the principles of and interpretation of tests performed and with test selection in relation to clinical problems. Also one of the its principles is the understanding the instrumentation in hematology diagnostic procedure and how make it to help in diagnosis to meet the patient's needs for good and professional diagnosis. The teaching will include lecture, collaborative learning, self-learning, dialogue, brain storming discussion and assignment. The students will be evaluated through report, written exam and practical exam. Hematology I, and hematology II courses are pre-requests for this course.

عميد الكلية:
د. عبد الله المخلافي

رئيس القسم:
د. عبد الحبيب الرومان

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APPROVED
مستعمل
إدارة ضمان الجودة والاعتماد
بمكتب العلوم والتكنولوجيا

IV. Course aims: This course is aimed to:

1. Provide the student the knowledge and the role of the anticoagulant materials in the laboratory and Lab tests priorities .
2. Enable the students with the workup for diagnosis of blood disorders.
3. Allow the students to do Bone marrow examination and understand its importance in diagnosis of blood disorders.
4. Performing the Chemistry tests for anemia diagnosis .
5. Execute the automation in hematology and its benefits in blood diseases approach.
6. Apply the correct way how reported the cases.
7. Make the students able to use the hematological terminology to describe and interpret peripheral blood and bone marrow aspirate smears stained with Romanowsky stain.

V. Course Intended Learning Outcomes (CILOs) :

After completion of this course student should be able to:

1. **Define** the tests priorities system in the lab., the TAT of the tests, the critical values of the different blood tests which effect the patient life and how manage this situation
2. **Outline** anticoagulant materials and the most important reagents for hematological uses; specimen transporting, handling, storage, holding etc.
3. **Discuss and select** the different blood tests for investigating anemia, leukemia and bleeding disorders.
4. **Solve** and check the tests results errors for identifying possible sources of pre-analytical and analytical error; determining possible inconsistent results; recognizing health and disease states and differentiating specific hematologic disease .
5. **Report** the result with simple and meaningful way give a chance to understanding the patient case by his doctor.
6. **Perform** the routine tests for anemia, coagulopathy, and WBC disorders benign and malignant by classical methods investigation, CBC, blood film, Cytochemical stains,
7. **Practice and select** methods such as bone marrow study, immunophenotyping, cytochemistry, molecular and genetic analysis, etc. as diagnostic tools to perform correct diagnosis
8. **Perform** the special stains in diagnosis of leukemia and RBC disorders as iron staining of bone marrow specimen.
9. **Work** in the automated area under appropriate scientific supervision.
10. Cooperate with supervisors and colleagues in hematology lab and show the appropriate responsibility, self-confidence and behaviors.

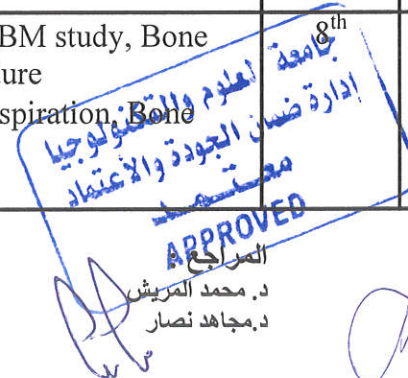


VI. Course topics and sub-topics (theoretical and practical) with contact hours and alignment to CILOs

Topics/Units of Course Contents

First: Theoretical Aspects

No.	Course Topics/Units	Sub-topics	No. of Weeks	Contact Hours
1	Lab tests priorities STAT, STAT, ASAP, Routine Tests, TIMED TESTS A.M, TAT,	<ul style="list-style-type: none"> Critical Values, Types of measurements in the lab 	1 st	1
2	Anticoagulant materials in the laboratory 1-Ethylenediamine tetraacetic acid- EDTA, 2-Sodium Citrate, 3-Heparin	<ul style="list-style-type: none"> Effects of storage on the blood count 	2 nd	1
3	Automation in hematology and Anemia approach Automated instruments advantages Automated techniques of blood counting types	<ul style="list-style-type: none"> Fully automated instruments, Semi-automated instruments Reliability of electronic counters, FBC or CBC, Various Parameters of CBC, Sources of CBC errors 	3 rd	1
4	Hemoglobin importance for anemia diagnosis Microcytic anemia, Macrocytic anemia, Normocytic anemia's Decreased RBC count due to increased destruction: (hemolytic disorders)	<ul style="list-style-type: none"> Membrane defect, 2-Enzyme deficiencies, 3-Hemoglobinopathies Causes of high red blood cell count, Red Blood Cells Counting 	4 th	1
5	The Reticulocytes count and importance for anemia investigation A-Automated method Retic. Count, B-Manual Reticulocyte Count RBC electronic parameters Importance	<ul style="list-style-type: none"> Erythrocyte indices MCV, MCH, MCHC, RDW RBC parameters evaluation, The RBC indices applications 	5 th	1
6	1-Erythrocyte inclusion bodies 2-Peripheral smear evaluation	<ul style="list-style-type: none"> Flagged specimens and The peripheral smear evaluation Variation in erythrocyte size (anisocytosis) and content 	6 th	1
7	Midterm exam		7 th	1
8	Bone marrow examination Cases needs bone marrow study Iron evaluation, Pancytopenia	<ul style="list-style-type: none"> Indications for BM study, Bone Marrow Procedure Bone marrow aspiration, Bone marrow biopsy Dry Tap (DTs) 	8 th	1



9	Anemia Diagnosis -Chemistry tests for	1-Iron study panel, 2-Megaloblastic anemia investigation	9 th	1
10	Chemistry tests for Hemolytic anemia	<ul style="list-style-type: none"> Plasma hemoglobin , Plasma Haptoglobin , Plasma Methemalbumin , Plasma unconjugated bilirubin 	10 th	1
11	Flowcytometry, immunophenotyping	<ul style="list-style-type: none"> The Malignant Hematological Disorders Introduction 	11 th	1
12	Automation in white blood cells diagnosis Manual versus automated cell counting	<ul style="list-style-type: none"> Advantages of the automated analyzers Automated instruments properties Disadvantages of the automated analyzers Designated categories of Automated instruments 	12 th	1
13	leucocytes benign disorders WBC counting, The CBC report Leucocytes in the P. blood, Relative values, Absolute value	<ul style="list-style-type: none"> Leukocyte indices, Immature granulocyte (ig) count WBC- Benign diagnostic evaluation The main tests for cells function studies 	13 th	1
14	Tumors of the hematopoietic and lymphoid tissues Workup Chromosomal analysis Cytochemical stains	<ul style="list-style-type: none"> Complete blood count.(CBC or FBC) Peripheral blood film inspection A bone marrow examination Flow cytometry or immunophenotyping studies 	14 th	1
	Final exam		1	1
	Total number of weeks and hours		15	15

Second: Practical/Tutorial/Clinical Aspects

No.	Practical/Tutorial/Clinical topics	No. of Weeks	Contact Hours
1	Types of measurements unites The metric measurement system and abbreviations, uses in practice anticoagulant materials, preparation, uses, importance, types, advantages, disadvantages, practical examples of each one	1 st	2
2	Automation in hematology CBC on automated analyzer, How its work?, how indicate the abnormal results? Blood cells analyzers and pathological cells What is your second step when its flagged?		2



	<p>What means hemogram? What means cytogram ? all in practice level</p> <p>What means Fully automated instruments?</p> <p>What means Semi-automated instruments?</p> <p>How many variables measured by automated instruments?</p>		
3	<p>RBC study</p> <ul style="list-style-type: none"> The importance of Red cells counting, for anemia, polycythemia etc. Significance of Results of the RBC counting with PCV What indicate the blood cells count study Laboratory evaluation for anemia, How we study any anemia? Types of Hb Which tested in the lab, application, result reading and interpretation Factors That Affect Result of Hb Heamatocrite (Hct) or Packing cells volume (PCV-Hct) Diagnostic uses of the buffy coat in practice <p>Hemoglobin Electrophoresis, principle, application, result reading and interpretation</p>	3 rd	2
4	<p>➤ Cases study of, Normocytic normochromic anemia,</p> <p>C. Microcytic anemia</p> <p>D. Macrocytic anemia</p>	4 th	2
5	<p>Reticulocytes COUNT importance for anemia investigation</p> <p>4. Methods, Reticulocyte count-Absolute Value</p> <p>5. Corrected retic , Reticulocyte production index, RPI evaluation</p> <p>6. RBC parameters, evaluation, how calculated? What indicate?</p> <p>Cases to study</p>	5 th	2
6	<p>1-Erythrocyte inclusion bodies</p> <p>Practical evaluation of each inclusion, preparation , reporting, such as</p> <ul style="list-style-type: none"> Heinz bodies, Hemoglobin C crystals, Howell-Jolly bodies , Pappenheimer bodies, Cabot rings ,Basophilic stippling, Reticulocytes, Normoblast (NRBC), Sederoblast, sederocyte <p>2-peripheral smear evaluation</p> <p>Blood smear evaluation -REFERENCE RANGES, Blood smear Critical Values</p> <p>Morphologic Evaluation of Red Blood Cells</p> <p>How reported.? What indicate? Such as sickle cells, blast cells, Malarial parasites etc</p>	6 th	2
7	<p>Variation of red cells shape (poikilocytosis) such as</p> <p>1-Spherocytosis, 2-Target Cells, 3-Ovalocytes, 4- Elliptocytosis</p> <p>5- Tear Drop Cells, 6- Blister cell, 7- Schistocytosis</p> <p>8- Stomatocytosis, 9- Burr (crenation) cell. 10- Keratocytes (horn cell),11- Acanthocytosis:, 12- Sickle Cells: ,13- Rouleaux Formation, 14- Red cell-agglutination</p> <p>How reported.? What indicate?</p>	7 th	2
8	<p>Automation in white blood cells diagnosis</p> <p>Advantages and Disadvantages of the automated analyzers in white blood cells diagnosis, counting.....</p> <p>Designated categories of Automated instruments in white blood cells measurements as follow. What measure? Which cells</p>		2

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	<p>included</p> <ul style="list-style-type: none"> ➤ a three-part differential count ➤ or five- part differential count ➤ A sixth - part differential count ➤ to seven-part differential count. <p>➤ Flagged result in cases such as Sickle cells resistant to lysis , What effect on the count of WBC? How to solve the problem? NRBC which counted as WBC? How corrected ?Practical steps, cases to study, to compare results</p>		
9	<p>WBC COUNTING</p> <ul style="list-style-type: none"> ➤ Relative values and Absolute value ➤ Importance, practice evaluation, case study ➤ immature granulocyte counting, importance, practice steps, reporting, cases study ➤ Blood film white blood cells study, Neutrophils, toxic granulation, immature granulocytes, vacuolization. PMN, How evaluated? Reported.. cases study, Cases of neutropenia ➤ Cases of atypical lymphocytosis, Normal lymphocytosis, comparing between cases, How reported? 	9 th	2
10	<p>leukemia Workup</p> <p>cases of acute and chronic leukemia study, steps of diagnosis (CBC, Blood film, cytochemistry staining, B.M evaluation. Immunophenotyping study of CD markers) How reported?, Stains uses for evaluation</p>	10 th	2
11	Bone marrow importance in the hematology diagnostic process	11 th	2
12	Final Lab exam	12 th	2
	Total number of weeks and hours	12	24

