El Paso Community College
Syllabus
Part II
Official Course Description

SUBJECT AREA	**Medical Laboratory Technology**
COURSE RUBRIC AND NUMBER	**MLAB 2331**
COURSE TITLE	**Immunohematology**
COURSE CREDIT HOURS	**3 2 : 3** **Credits Lec Lab**

I. Catalog Description

Studies blood antigens and antibodies. Presents quality control, basic laboratory technique and lab safety. Includes the principles, procedures and clinical significance of test results in genetics, blood group systems, pre-transfusion testing, adverse effects of transfusions, donor selection and components, and hemolytic disease of the newborn. A grade of "C" or better is required in this course to take the next course. **Corequisite: MLAB 1261. (2:3). Lab fee.**

II. Course Objectives

A. Unit I. Laboratory Operations and Safety

Upon satisfactory completion of this unit, the student will be able to:

1. Adhere to HIPAA protocols when communicating via telephone, facsimile, E-mail, performing Delta Checks, order entry, or cancelling requisitions.
2. Demonstrate adherence to Standard Precautions and the organizations' SOP (Standard Operating Procedures).
3. Compliance with government, state, and organizational safety regulations involving Biological, Chemical, Radioactive, Fire, Physical, and Electrical hazards.
4. Explain the word "STAT" in relation to turnout time for sample collection, test performance, and test reporting.
5. Explain the importance of actively participating in Quality Assurance, Quality Control and Proficiency Testing protocols incorporating precision, accuracy, Levi Jennings Charts and Westgard Rules.
6. Locate and make use of MSDS (Material Safety Data Sheets).
7. Demonstrate knowledge, skills, and ability to perform basic venous and dermal blood collection procedures for a donor center.
8. Explain the need to perform therapeutic phlebotomies.
9. Discuss nosocomial infections and identify the basic programs for infection control.
10. Identify the potential routes of infection and methods for preventing transmission of microorganisms through these routes.
11. Explain the proper techniques for hand washing, gowning, gloving, and masking.
12. Compare and contrast the different blood collection biohazard containers used to dispose of contaminated materials.

B. Unit II. Basic Genetics

At the end of this unit the student will be able to:

1. List the number of pairs of chromosomes, autosomes, and sex chromosomes found in the human body.

2. Define mitosis, meiosis, haploid, and diploid.
3. Compare the number of X chromosomes and Y chromosomes found in an ova and a spermatozoa.
4. Define locus, alleles, homozygous, heterozygous.
5. Compare and contrast the terms genotype and phenotype.

6. Differentiate dominance, recessive, codominance, amorph.
7. Discuss the genotypes and phenotypes of Blood Group A, B, AB, and O.

C. Unit III. Blood Groups

At the end of this unit the student will be able to:

1. Compare and contrast the structure and function of IgA, IgD, IgE, IgG, IgM.
2. Discuss agglutination as a two-step reaction.
3. Discuss the zeta potential with respect to:
   a. the physical phenomenon
   b. its affect with agglutination results
4. Discuss the role of sialic acid on the surface charge of red blood cells.
5. Discuss the effect of saline on the surface charge of red blood cells.
6. Indicate the percent solution of sodium chloride used to make isotonic saline.
7. Compare and contrast the role of the zeta potential on agglutination of IgM and IgG.
8. Compare and contrast the properties of agglutination of IgG and IgM with:
   a. the presence of substances needed to lower the zeta potential
   b. optimum temperature required
   c. causing hemolytic transfusion reactions
   d. the need for centrifugation
9. List two synonyms each for complete and incomplete-reacting antibodies.
10. Identify three commonly used substances that lower zeta potential.
11. Discuss the use of low ionic strength (LISS), PEG, and albumin in immunohematology procedures.
12. Discuss the microscopic and macroscopic appearance of the following types of agglutination:
    a. negative
    b. mixed field
    c. 1+
    d. 2+
    e. 3+
    f. 4+
    g. hemolysis
13. Discuss the importance of using fresh serum in compatibility testing.

D. Unit IV. The ABO System in Immunhematology

At the end of this unit the student will be able to:

1. Indicate the percentage of the U.S. population that have the following blood types:
   a. O
   b. A
   c. B
   d. AB
2. Describe the process of performing a forward typing.
3. Describe the process for performing reverse grouping.
4. Discuss the phenomena which occurs in the following instances that will affect reverse grouping:
   a. hypogammaglobulinemia
   b. elderly patients
   c. leukemic patients
   d. patients undergoing radiation therapy
5. Discuss the expected results for a reverse grouping on a newborn infant.
6. Explain the possible origin of any antibodies found in the cord blood of a newborn infant.

7. Discuss Anti-A and Anti-B results in group O individuals, indicating the effect this will have in reverse grouping.
8. Discuss the possibilities of resulting blood types from the mating of homozygous and heterozygous parents of the following blood types:
   a. O
   b. A
   c. B
   d. AB
9. Identify the naturally occurring antibodies for in the following blood types:
   a. O
   b. A
   c. A
   d. AB
10. Indicate the percentage of group A individuals who are:
    a. A_1
    b. A_2 and weaker sub-groups
11. Discuss Dolichus Biflorus in the production of anti-A_1 and anti-A_1 lectin.
12. Discuss the reactions of anti-A_1 with the following:
    a. A_1 and A_1B
    b. A_2 and A_2B
13. Discuss the importance of using anti A, B in detecting sub groups of A.
14. Indicate the percentage of the following blood groups that produce anti A_1:
    a. A_2
    b. A_2B
15. Explain the forward and reverse grouping of the above blood groups which have produced anti A_1.
16. Discuss the outcome of a crossmatch of a patient with an anti A_1 with the following:
    a. A_1 donor
    b. A_2 donor
17. Discuss the importance of using A_1 cells in reverse grouping.

E. Unit V. The H Gene and the Secreter Genes and their significance

At the end of this unit the student will be able to:

1. Indicate the frequency of the H. gene.
2. Discuss the importance of the H substance regarding the ABO system.
3. Discuss the frequency of the Bombay phenotype.
4. Identify the H genes present in the Bombay phenotype.
5. Discuss the importance of anti-H in finding compatible blood for the recipient.
6. Discus the blood type needed to donate a Bombay phenotype patient.
7. Discuss the designation Oh.
8. Indicate he percentage of the U.S. population that secrete ABH antigens in their saliva.
9. Identify the genes that make up the secretor system.
10. Discuss which combinations of secretor genes will combine to produce:
    a. Secretors
    b. Non-secretors

F. Unit VI. Blood Group Systems

At the end of this unit the student will be able to:

1. Discuss the incidence of antigens in adult caucasians, African-Americans, and newborns.
2. Discuss the difficulty in finding compatible units of blood.
3. Describe the types of transfusion reactions and their typical work-ups.
4. Discuss the ability of the some antibodies to cross the placenta causing hemolytic disease of the newborn, and include the use of RhoGAM.
5. Discuss the immune or natural occurrence of the antibody for the following blood group systems:
   a. Lewis

b. Kell
c. Kidd
d. Duffy
e. Lutheran
f. U
g. P
h. Ii
i. Xg
j. Diego

6. Discuss the Lewis system including the following:
   a. the method of absorption of Lewis antigens from the plasma onto the red blood cells
   b. the appearance of Lewis antigens on red blood cells
   c. the age of which Lewis antigens begin to appear on the red cells of an infant in the same frequency as adults
   d. the racial difference in Lewis antigen frequencies
   e. the involvement of the ABO, H, Sese Lele in the Lewis system
   f. the importance of hemolysis as an end point for Lewis antibodies
7. Discuss the Kell system including the following:
   a. the presence of Kell and Cellano antigens
   b. the racial difference in frequency in Kell antigens
   c. the antigenicity of the Kell antigen
   d. the reaction of Kell antibodies in enzyme systems
8 Discuss the Duffy system including the following:
   a. the frequency of Fy (a-b-) in the caucasian population
   b. their reaction with enzyme systems
9. Discuss the Kidd system including the following:
   a. the detection of Kidd antibodies with enzymes
   b. the need for complement in the serum
   c. the possibility of an undetectable antibody after its initial appearance
   d. its cause in delayed transfusion reactions
10. Discuss the MNSs system including its use in paternity suits.
11. Discuss the Ii system including:
   a. the presence of the Ii antigen on newborn red blood cells
   b. the time of production and frequency of anti I
   c. the importance of anti I as a cold agglutinin
   d. the presence of anti I as it may affect a cross-match procedure
   e. the importance of the use of cord cells in antibody identification
   f. the importance of performing a cold absorption
   g. the importance of performing a prewarmed cross-match
12. Define antigenicity-immunogenicity.
13. Discuss the biologic function of red blood cell antigens.
14. Compare and contrast the following types of antigen distribution:
   a. high incidence (public)
   b. low incidence (private)
15. Compare and contrast the likelihood of antibody production upon receiving a unit of blood with high incidence antigens and low incidence antigens.
16. Discuss the difficulty in obtaining compatible blood to antibodies that have been formed against high and low incidence antigens.

G. Unit VII. Enzymes and Blood Group Systems

At the end of this unit the student will be able to:

1. Discuss the effect of enzymes on the zeta potential.
2. Discuss the effect that enzymes have on the ability of red blood cells to take up antibodies.
3. Discuss the effect of false-positive reactions with the use of enzyme systems.
4. Compare and contrast the following methods of enzyme testing for antibodies:
   a. pre-treatment

b. one-stage testing
5. Identify the enzymes commonly used for each of the above methods.
6. Identify two enzyme systems that are sensitive for the Rh system.
7. Discuss the efficacy of enzyme systems used for the following antibodies:
   a. Anti-I, P_1, Lewis, A, B
   b. Antibodies in the Rh system
   c. Kell and Kidd
   d. Anti M, N, Duffy

H. Unit VIII. The use of Antiglobulin in Blood Banking

At the end of this unit the student will be able to:

1. Explain the use of the following synonyms for the antiglobulin test:
   a. Coombs
   b. AHG
2. Identify the immunoglobulin class that is detected with antiglobulin testing.
3. Discuss the method of production of Anti-human Globulin serum reagent including the following:
   a. animal used
   b. substance injected into animal
   c. type of antibody produced
   d. portion of the antibody produced that is used in blood bank

I. Unit IX. Direct Anti-globulin Test

At the end of this unit the student will be able to:

1. Discuss the use of the abbreviation DAT.
2. Identify the location of the original sensitization between the antibody and the red blood cell that results in a positive DAT.
3. Explain the difference in the terms sensitization and agglutination.
4. Discuss the procedure for the direct antiglobulin test including the following:
   a. the use of patients red blood cells
   b. the removal of plasma proteins by washing
   c. washing adult blood cells three times and cord blood six times
   d. the removal of Wharton's jelly
   e. the addition of AHG serum
   f. centrifugation
5 Explain the importance of a positive DAT in the following conditions:
   a. hemolytic disease in the newborn
   b. autoimmune hemolytic anemia
   c. drug-induced positives
   d. transfusion reaction with incompatible blood
6. Explain the importance of positive DAT and hemolytic disease of newborn including:
   a. the frequency of ABO and Rh incompatibilities
   b. the source of anti-D
   c. the Rh types of the newborn which will result in sensitization of red blood cells
   d. the immunoglobulin class of anti-D
7. Discuss the importance of the positive direct Coomb's reaction in acquired hemolytic anemia including the following:
   a. define autoimmune
   b. occurrence in collagen disease
   c. occurrence in Systemic Lupus Erythematosus
   d. occurrence in paroxysmal Cold hemoglobinuria 4.3
   e. occurrence in lymphomas and lymphocytic leukemias 4.3
8. Discuss the importance of the positive DAT in drug induced states including the following:
   a. the use of penicillin
   b. the use of methyldopa
   c. the use of cephalosporin

d. the use of cephalexin

9. Discuss the importance of the positive DAT in an incompatible transfusion reaction of an antibody present in the recipient with the antigen on the donor cells.
10. Explain the implications mixed-field agglutination in incompatible transfusions.
11. Discuss the importance of a false positive reaction using the blood of a patient with cold agglutinins.
12. Discuss the methods used to avoid false positive reactions in specimens from patients with cold agglutinins.

J. Unit X. Indirect Anti-globulin Test

At the end of this unit the student will be able to:

1. Identify the location of the RBC sensitization that will result in a positive indirect antiglobulin test.
2. Indicate the importance of the incubation time of the serum-RBC mixture on the resulting reaction.
3. Discuss the importance of running the following an indirect antiglobulin test both at room temperature and at 37°.
4. Identify the immunoglobulin class that is detected by each of these phases.
5. Discuss the procedure of an indirect antiglobulin test including:
   a. volume of serum used
   b. volume of red blood cells used
   c. percent solution of red blood cells used
   d. incubation time
   e. appropriate centrifugation points
   f. washing after incubation
   g. addition of AHG serum
   h. use of Coomb's control cells (check cells)
6. Discuss the process of immunization that results from a previous transfusion and pregnancy.
7. Indicate where antibodies produced by immunization can be found.
8. Compare and contrast the results of a indirect antiglobulin test and a direct antiglobulin test in:
   a. previous transfusion and pregnancy
   b. acquired hemolytic anemias
9. Explain the manner in which the following will yield false-negative results in antiglobulin testing:
   a. failure to add AHG serum
   b. exogenous gamma globulin and its inactivation of AHG serum
   c. outdated AHG serum
   d. the presence of a fibrin clot
   e. contaminated test tubes
10. Discuss the manner in which the following react to yield false positive antiglobulin test:
    a. colloidal silica
    b. over centrifugation
    c. bacterial contamination of cells serum, and reagents
    d. overzealous reading
    e. shaking the tubes to hard

K. Unit XI. AABB Standards

At the end of this unit the student will be able to:

1. Identify the AABB organization.
2. Discuss AABB policies with respect to the following:
   a. recruiting and selecting donors
   b. collection, storage, processing, and distribution of blood
   c. need for consultation for special problems
   d. staffing
   e. working environment

f. procedure manuals
g. handling and discarding of blood and blood components
h. conditions for sterilization of materials
i. reagents and anticoagulants used
j. quality control program

3. Discuss AABB standards concerning blood donors with respect to the following:
   a. time of questions asked to donor regarding history of the donor
   b. acceptability of donors with a history of heart disease, kidney, liver, and lung disorders, cancer, abnormal bleeding, convulsions after infancy
   c. donor presently undergoing drug therapy
   d. donation interval as regards to donating:
      (1) whole blood
      (2) plasmapheresis
   e. age of blood donors
   f. exceptions regarding age
   g. minimum hemoglobin and hematocrit values for male and female
   h. pulse rate
   i. blood pressure range
   j. pregnancy
   k. donor weight as regards amount collected
   l. temperature
   m. immunization with respect to:
      (1) smallpox
      (2) measles (rubeola)
      (3) German measles (rubella)
      (4) Rabies (therapeutic)
   n. donor skin appearance
   o. dental surgery with respect to bacteremia and bacterial endocarditis
   p. donor as recipient
   q. infectious diseases, especially viral hepatitis, malaria, active tuberculosis
   r. alcohol or narcotic habituation
   s. information provided to donor with respect to clinically significant abnormalities
   t. blood collection technique

L. Unit XII. Blood Components in the Imunohematology (Blood Bank) Department

At the end of this unit the student will be able to:

1. Describe the procedure for the interviewing, collection, and processing of Donor blood components.
2. Discuss the centrifugation, separation and/or thawing of the following blood components:
   a. packed red blood cells
   b. leukocyte-poor rbc's
   c. fresh frozen plasma
   d. cryoprecipitate
   e. platelet concentrate
3. Compare and contrast the effects of the preparation of the above components on the end product.
4. Discuss storage and stability of each of the above blood components.
5. Discuss the effect of drugs on the above components.
6. Discuss the loss of important plasma contents in preparation of the above.
7. Discuss the testing of the donor units as regards the following:
   a. ABO typing
   b. Rh typing
   c. Du typing
   d. Antibody screening
   e. Serologic testing
   f. Testing for HBsAG

g. Confirmation of ABO and Rh typing during performance of cross match
h. Storage of pilot sample

8. Describe the labeling of donor unit with respect to:
   a. type of component and blood type and Rh factor of component
   b. quantity of component
   c. quantity of anticoagulant
   d. donor number
   e. storage temperature of component
   f. expiration date
   g. antibody test results
   h. hepatitis test results.
9. Discuss the following with respect to the final blood component:
   a. its storage
   b. temperature during transportation
   c. expiration dates for the whole blood platelets, RBC's in a closed system, RBC's in an open system, fresh frozen plasma, and cryoprecipitate.
10. Select the appropriate type of fresh frozen and RBCs to transfuse patients with various blood types.

M. Unit XIII. Miscellaneous Procedures for Immunohematology Department

At the end of this unit the student will be able to:

1. Explain the procedure for performing RhoGam Studies.
2. Explain the protocols required when performing a work-up on a patient that has had a transfusion reaction.
3. Discuss the reasons for the need to perform a therapeutic phlebotomy.
4. Explain the need for aliquoting.
5. Discuss the respond to a trauma Blood Bank STAT order.
6. Explain the actions that may be required in response to the need of a mass transfusion.
7. Perform Delta Checks when required.
8. Prepare and submit patient specimens for specialized testing as when appropriate.
9. Perform and interpret cord blood studies, fetal screens, and elutions.

III. THECB Learning Outcomes (WECM)

1. Apply principles of safety, quality assurance and quality control in Immunohematology.
2. Evaluate specimen acceptability.
3. Describe blood group genetics, characteristics of the blood group systems, and the principles of immunology as they relate to immunohematology.
4. List the requirements for the donation of blood.
5. Describe the preparation, storage, and use of blood components.
6. Evaluate laboratory test results.
7. Select additional procedures to be performed.
8. Correlate test results with patient conditions.
9. Describe the principles of and perform routine blood bank tests.

IV. Evaluation

A. Preassessment

Students should have successfully completed the Specialized Admissions process to enter the Medical Laboratory Technology Program. Prerequisites and/or Corequisites may be required for MLAB courses.

B. Postassessment

1. Quizzes, lecture exams, and a final comprehensive written examination will be used to assess students' competency in didactic objectives.
2. Lab competency exams and lab practical exams are used to assess students' achievement of psychomotor objectives.
3. Lab practical exams require students to demonstrate a particular skill learned in the lab component of the class.
4. Written unit exams will consist of the following question types: multiple-choice, completion, essay, matching, spelling, analysis, and definition or any combination of these.

C. Final Examination

A comprehensive Final Exam is scheduled for this course.

D. Evaluation

To evaluate students' achievement of course objectives, student grades are tabulated using a final grade break down sheet. To successfully complete MLAB2331 Immunohematology, the student must achieve at least a 70% in course components. The students overall grade must be no less than "C". (Note: All health programs require a grade of no less than "C," therefore no "D's" will be awarded for this course)

E. Remediation

If a student scores less than 70% on any exam, the instructor will encourage the student to conference with the instructor or tutor, to review problem areas. Different learning and studying techniques will be discussed.

G. Grading

Grading Scale used in calculating students' final grade for MLAB2331 Immuohematology.

Evaluation Tools	% Value	Grading Scale
Quizzes	10%	A = 90-100%
Lecture Exam I	20%	B = 80 –89%
Lecture Exam II	20%	C = 70- 79%
Lecture Exam III	20%	D = 60 – 69%
Comprehensive Final	30%	F = 59% and below

(Immunohematology Lab is on a Pass/Fail bases. Laboratories will be graded on a Pass/Fail system based on the competency limits set by the program for each individual procedure. An average of 80% is required to pass the laboratory portion of MLAB 2331 Chemistry.)

Each grade will initially be determined in decimals to the tenths. The final grade however, will only be recorded as a whole number. The guide used will be to round 0.1 through 0.4 to the lower whole number, and 0.5 through 0.9 are raised to next whole number. Example: If at the end of the course a student earns 87.4, the grade will be reflected as 87%. If the student earns 87.6 the grade is rounded to 88%. No decimals will be shown on the final grade scanners.

V. Disability Statement (Americans with/Disabilities Act [ADA])

EPCC offers a variety of services to persons with documented sensory, mental, physical, or temporary disabling conditions to promote success in classes. If you have a disability and believe you may need services, you are encouraged to contact the Center for Students with Disabilities to discuss your needs with a counselor. All discussions and documentation are kept confidential.

Offices located: VV Rm C-112 (831-2426); TM Rm 1400 (831-5808); RG Rm B-201 (831-4198); NWC Rm M-54 (831-8815); and MDP Rm A-125 (831-7024).

VI. 6 Drop Rule

Students who began attending Texas public institutions of higher education for the first time during the Fall 2007 semester or later are subject to a 6-Drop limit for all undergraduate classes. Developmental, ESL, Dual Credit and Early College High School classes are exempt from this rule. All students should consult with their instructor before dropping a class. Academic assistance is available. Students are encouraged to see Counseling Services if dropping because exemptions may apply. Refer to the EPCC catalog and website for additional information.

VII. Title IX and Sex Discrimination

Title 9 (20 U.S.C. 1681 & 34 C.F.R. Part 106) states the following "No person in the United States shall, on the basis of sex, be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any educational program or activity receiving Federal financial assistance." The Violence Against Women Act (VAWA) prohibits stalking, date violence, sexual violence, and domestic violence for all students, employees and visitors (male and female). If you have any concerns related to discrimination, harassment, or assault (of any type) you can contact the Assistant to the Vice President for Student and Enrollment Services at 915-831-2655. Employees can call the Manager of Employee Relations at 915-831-6458. Reports of sexual assault/violence may also be reported to EPCC Police at 915-831-2200.