COURSE DESCRIPTION - This course studies the theoretical aspects of the immune response and its relationship to the diagnosis of disease and immunohematology. Lecture and laboratory stress the detection, identification and characterization of antibodies, blood grouping and typing, compatibility testing, blood component therapy and diagnosis of pathological conditions.

LEARNING OUTCOMES
The students will be able to:
1. describe the techniques, principles and instruments us in the clinical laboratory for in immunohematology and serology.
2. describe serological procedures used in diagnosis of disease and immunohematology.
3. explain internal and external regulation of the laboratory.
4. explain the current theory of the immune response and immunological procedures.
5. evaluate laboratory and clinical results to determine normal and abnormal results.

The specific lecture and laboratory learning outcomes are contained in the lab manual. All examination questions are keyed to those outcomes.

GRADES: The final grade will be based on the points scored on a comprehensive final examination, three term examinations, attendance and graded laboratory and class evaluations.

<table>
<thead>
<tr>
<th>ACTIVITY</th>
<th>PERCENT OF GRADE</th>
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<tr>
<td>TEST 1</td>
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<tr>
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<td>LAB/CLASS EVALUATIONS</td>
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<tr>
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<td>30%</td>
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Laboratory and class evaluations should be turned into the instructor at the beginning of class or lab the week following the assignment. Work will not be accepted late and a zero will be given for the assignment. Unscheduled quizzes will be given during lecture and laboratory sessions and a zero will be given for a missed quiz.

All tests will be multiple choice with some short answer. The final may require a scantron card for an answer sheet. All examination questions are keyed to the lecture and laboratory learning outcomes. Careful study of those outcomes are required for each examination. Examinations may be taken only during the scheduled time.

The following scale will be used to report grades:
A - 90 - 100
B - 80 - 89
C - 70 - 79
D - 60 - 69
F - below 60
In order to enroll in BIMS 4332 you must have a grade of 70 or better in this class.

ACADEMIC HONESTY: The college catalog contains the university statement on academic integrity/academic honesty. It is essential that anyone considering a health career demonstrate honesty and integrity in their academic and professional life. Therefore, cheating will not be tolerated and will result in a failing grade in the course and possible further disciplinary action by the university.

ATTENDANCE: Attendance is required and is 10% of your final grade. If you miss a scheduled laboratory, and samples or reagents are not available, a zero will be given for that portion of the grade in the assignment. Other parts of that assignment must be turned in on time for a partial grade. Examinations may only be taken during the scheduled time.

DISABILITY AND VETERANS’ SERVICES: Texas A&M University-Corpus Christi is committed to providing persons with disabilities an equal opportunity to access campus facilities, resources and programs. The Americans with Disabilities Act (ADA) is a federal anti-discrimination statute that provides comprehensive civil rights protection for persons with disabilities. Among other things, this legislation requires that all students with disabilities be guaranteed a learning environment that provides for reasonable accommodation of their disabilities. Support and accommodations are also available for returning veterans who experience cognitive and/or physical access issues in the classroom or on campus. Our Office of Disability Services arranges such support and academic accommodations. To make a request, or for more information, call (361) 825-5816 or visit Driftwood 101. It is important to contact the Office of Disability Services in a timely fashion as it will take time for them to review requests and prepare accommodations and accommodation letters.

GRADE APPEALS: As stated in the Texas A&M University-Corpus Christi University Rules and Procedures (Section B [Academic Program], Part 13 [Students]: 13.02.99.C2 [Student Grade Appeals] and 13.02.99.C2.01 [Student Grade Appeal Procedures]), a student who believes that he or she has not been held to appropriate academic standards as outlined in the class syllabus, equitable evaluation procedures, or appropriate grading, may appeal the final grade given in the course. The burden of proof is on the student to demonstrate the appropriateness of the appeal. A student with a complaint about a grade is encouraged to first discuss the matter with the instructor. For complete details, including the responsibilities of the parties involved in the process and the number of days allowed for completing the steps in the process, consult the University Rules and Procedures specified above (accessible through the University Rules and Procedures website at http://www.tamucc.edu/provost/university_rules/index.html). For assistance and/or guidance in the grade appeal process, students may contact the Office of Student Affairs.

TEXT
Required:

Modern Blood Banking and Transfusion Practices by Harmening
Immunology and Serology in Laboratory Medicine by Turgeon
Laboratory Notebook and Lecture Notes
<table>
<thead>
<tr>
<th>Date</th>
<th>Event</th>
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<tr>
<td>August 26</td>
<td>Lecture - Immunology I (immuno1 – Turgeon part 1 &amp;2; Harmening 1-4)</td>
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<td>August 31</td>
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<td>September 1</td>
<td>Lab – Laboratory Safety/Quality Control I (bbqc1)</td>
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<tr>
<td>September 2</td>
<td>Lecture - ABO - H (ABHSe – Harmening 6 &amp;8)</td>
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<td>September 8</td>
<td>Lab - ABO Typing</td>
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<td>September 9</td>
<td>Lecture - Lewis - Secretor</td>
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<td>September 14</td>
<td>Lecture - ABO Problems (ABOprob – Harmening 6)</td>
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<td>September 15</td>
<td>Lab - ABO Problems</td>
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<td>September 16</td>
<td>Lecture - Review</td>
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<td>September 22</td>
<td>Lab - Rh System</td>
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<td>Lecture - Rh System (rhsys – Harmening 7)</td>
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<td>September 28</td>
<td>Lecture - Antiglobulin Test (ictdat – Harmening 5)</td>
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<td>September 29</td>
<td>Lab - Direct and Indirect Antiglobulin Tests</td>
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<td>Lecture - Other Blood Group Systems (blgrpsys- Harmening 9 &amp; 10)</td>
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<td>Lab - Antibody Detection (absid - Harmening 12)</td>
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<td>Lecture - Donors (donors – Harmening 11)</td>
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<td>October 26</td>
<td>Lecture - Compatibility Testing (compat – Harmening 13)</td>
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<td>October 28</td>
<td>Lecture - Complications</td>
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<td>November 2</td>
<td>Lecture – Positive DAT (hemdis – Harmening 18, 20, 21)</td>
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<td>November 3</td>
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<td>November 18</td>
<td>Lecture - Autoimmunity</td>
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<td>November 23</td>
<td>Lecture - Disease Identification (disea – Turgeon 13,16, 19, 20, 22)</td>
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<td>Lecture - Disease Identification</td>
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<td>Lecture - Syphilis/Pregnancy (syph – Turgeon -15)</td>
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<td>Lecture - Review</td>
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<td>Review</td>
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December 10 - **FINAL - 1:45 - 4:15**
BIMS 4331: CLINICAL IMMUNOLOGY I  
LECTURE OBJECTIVES AND READING ASSIGNMENTS

LECTURE 1 and 2  
IMMUNOLOGY 1
At the conclusion of this lecture and the reading assignments, the student should be able to:

DEF  a. define the following terms:
   antibody, antigen, immunity, active immunity, passive immunity,
   adaptive immunity, humoral immunity, cellular immunity, avidity, affinity

IG  b. name five classes of immunoglobulins and describe the physical and chemical properties
   including the ability to attach complement and number of subclasses

ABR  c. graft and compare a primary and secondary antibody response to antigenic stimulus

MET  d. describe the principles for the following serological methods or reactions:
   agglutination, precipitation, fluorescent antibody (direct and indirect),
   passive agglutination, agglutination inhibition (neutralization),
   immunoelectrophoresis, agar gel diffusion, radioimmunoassay, ELISA

TER  e. discuss or explain the following terms and their relationship to serological testing:
   prozone, inhibition (neutralization), titer, cross reaction,
   anamnestic response

PAT  f. define complement and describe completely the classical pathway and the alternate pathway
   of complement fixation including the initiators and complement associated activities

LECTURE 3  
QUALITY CONTROL 1
At the conclusion of this lecture and the reading assignment, the students
shall be able to:

EQ  a. describe the routine quality control on the following blood bank equipment:
   serofuge, heat blocks, waterbaths, refrigerators

ANT  b. state the NIH minimum standards for avidity and titer for the following antisera:
   anti-A, anti-B, anti-Rh(D)

ORG  c. describe at least seven organizational procedures that could minimize errors in the
   areas of personnel in the blood bank

SYM  d. interpret the symbols used for writing blood bank results:
   4+, 3+, 2+, 1+. M+, W+, =, neg

LECTURE 3  
ABH SECRETOR
At the conclusion of this lecture and the reading assignments, the student
will be able to:

IN  a. describe the mode of inheritance for the ABO, H and Secretor systems and the red
   cell phenotype frequencies for the white and black populations

AB  b. discuss the development and reaction characteristics of agglutinins in the ABO system
   including anti-A, anti-A1, anti-B, anti-A, B

H  c. discuss the H antigen, anti-H, the relationship to ABO system, “Bombay” blood type
   and describe the special problems found with this blood type.

SEC  d. discuss the relationship of the Secretor gene to the ABO and the H genes

ABO  e. describe the procedures used to obtain the front and reverse ABO typing and interpret
   the ABO type of blood specimen when given the cell typing and serum grouping

SUB  f. describe the reaction patterns found in subgroups of A and B and identify a subgroup
   of the ABO system when given the typical reactions
LECTURE 4
LEWIS SYSTEM
At the conclusion of this lecture and the reading assignments, the student will be able to:

GEN  a. describe the genetics for the Lewis system and the red cell phenotype frequencies for the white and black populations

INT  b. discuss the interrelationship of the ABO, H, Lewis, and Secretor genes

LAB c. describe the antibodies of the Lewis system

LECTURE 5
ABOPROB
ABO PROBLEMS
At the conclusion of this lecture and the reading assignments, the student will be able to:

DIS a. recognize an ABO grouping discrepancy

PRO b. explain four reasons for “missing antigens” in the cell typing, “additional antigens” in the cell typing, “additional antibodies” in the serum and “missing isoagglutinin” in the serum typing

MET c. describe the routine techniques that are useful in preventing ABO typing problems and special methods that may be helpful with problem resolution

EVA d. evaluate the ABO typing results and testing methods to determine possible explanations for ABO typing problems

LECTURE 6
RH SYS
Rh-Hr SYSTEM
At the conclusion of this lecture and the reading assignment, the student shall be able to:

AG  a. name the five most common antigens in the Rh-Hr system and name at least two other alleles for C and E besides c and e

GEN b. discuss briefly the inheritance theories of Fisher-Race and Wiener

Nom c. use the Wiener, Fisher-Race or the Rosenfield nomenclature to describe the RH-Hr antigens present on a given cell and recognize the percent of the white population positive for the five most common antigens

DU d. describe the forms of the “weakened D” phenotype and describe at least two other weakened antigens and two other gene position effects found in the Rh-Hr system

DEL e. describe the deletion cells found in the Rh-Hr system, explain what is meant by the term “Rh null syndrome” and the relationship of the LW antigen

ABS f. describe the serological characteristics of the antibodies of the Rh-Hr system and their importance in hemolytic disease of the newborn and transfusion complications including:

anti-D, anti-C, anti-E, anti-c, anti-e, anti-f, anti-C\(
anti-G, anti-V, anti-VS

COM g. name five combination antigens in the Rh-Hr system and describe the antibodies which react with those antigens

PRO h. describe the methods for obtaining the Rh type of a blood sample including the use of an appropriate Rh control

LECTURE 7
ICTDAT
ANTIGLOBULIN TEST
At the conclusion of this lecture and the reading assignment, the student shall be able to:

DEZ a. discuss the term “zeta potential” and describe at least three methods used to overcome the zeta potential and problems associated with it

DAT b. describe the procedure for the direct antiglobulin test and the indirect antiglobulin test and how they are used in the blood bank including:
   - cell typing, antibody screening, compatibility testing

EA d. describe the following reagents and their use in the blood bank:
   - enzymes, albumin, anti-human globulin, low ionic strength solution, chemically modified typing sera

FAS e. describe the cause of false negative and false positive results in the antiglobulin test and methods to prevent these problems

LECTURE 8 and 9
OTHER BLOOD GROUP SYSTEMS
At the conclusion of this lecture and the reading assignment, the student shall be able to:

SYS a. relate the antigens, phenotype frequencies, antibody characteristics, importance to the blood bank and special problems for the following blood group systems:
   - I, P, Duffy, Kell, Kidd, MNS, Lu, Diego, Cartwright, XG

LECTURE 10 and 11
IDENTIFICATION OF ANTIBODIES
At the conclusion of this lecture and the reading assignment, the student shall be able to:

AB a. recognize the presence of an unexpected blood group antibody

CHA b. recognize the characteristics of common antibodies, including the phase and temperature of reaction and the percentage of the population reacting with the antibody

EVA c. evaluate given and obtained panel results to identify single and simple multiple antibody problems

LECTURE 12 and 13
DONORS
BLOOD DONORS
At the conclusion of this lecture and the reading assignment, the student shall be able to:

AGE a. state the AABB donor requirements for age, hemoglobin or packed cell volume, pulse, blood pressure, temperature, weight and time interval for whole blood donations

DIS b. describe the AABB donor regulations regarding infectious diseases, surgery, skin diseases, immunizations and alcohol or narcotics use

PHL c. discuss phlebotomy site preparation and describe the proper care of the blood donor after donation, including the treatment of donation complications

LAB d. state the AABB requirements for laboratory processing of donor blood

ACC e. evaluate the acceptability of a blood donor using the AABB donor standards

LECTURE 13 and 14
COMPAT
COMPATIBILITY TESTING
At the conclusion of this lecture and the reading assignment, the student shall be able to:
AAB  a. state the AABB requirements for a compatibility requisition and the patient blood sample used for transfusion testing
PRO  b. describe the principle and the procedure for the major crossmatch and state if the crossmatch will be compatible or incompatible in a given situation
DIS  c. discuss the following transfusion complications including the symptoms and the methods to avoid the problems:
   - hemolytic transfusion complication, diseases, leukocyte antibody, allergic reaction, circulatory overload, septicemia, citrate toxicity, potassium toxicity
INV  d. describe the immediate steps required to investigate a possible hemolytic transfusion complication

LECTURE 15  HEMDIS
HEMOLYTIC DISEASE
At the conclusion of this lecture and the reading assignment, the student shall be able to:
DAT  a. state four causes of a positive direct Coombs in a patient
TRE  b. describe the test results including the approximate time interval for the significant results found in intravascular and extravascular hemolytic transfusion reaction for the following:
   - Bilirubin, plasma hemoglobin, urinalysis, direct Coombs, haptoglobin, methemoglobin, urobilinogen
AHD  c. discuss hemolytic disease of the newborn due to ABO incompatibility, including the cause, treatment, prenatal testing, postnatal testing and expected results
DHD  d. discuss hemolytic disease of the newborn due to anti-Rh\(_0\) (D) including prevention, cause, treatment, prenatal testing, postnatal testing, test results expected and at least 5 other antibodies that can cause hemolytic disease of the newborn

LECTURE 16 and 17  AUTOIM
AUTOIMMUNITY I
At the conclusion of this lecture and the reading assignment, the student shall be able to:
IMT  a. explain the term “immunological tolerance” and explain the possible relationship to autoimmune diseases and discuss at least three possible mechanisms which might cause an autoimmune disease
ODI  b. describe the symptoms, causes, treatment and laboratory tests used in the diagnosis of the following:
   - Autoimmune hemolytic anemia, cold agglutinin disease, paroxysmal nocturnal hemoglobinuria, paroxysmal cold hemoglobinuria, Hashimoto disease, Grave’s disease, Addison’s disease, pernicious anemia, ulcerative colitis
BST  c. discuss the relationship of Group A beta hemolytic Strep infection to glomerulonephritis and rheumatic fever and describe the antibody tests used in the diagnosis including the principles, differences, normals and the interpretation of abnormal results
COL  d. describe the test methods for cold agglutinin disease and the expected results

LECTURE 18 and 19  DISEA
DISEASE IDENTIFICATION
At the conclusion of this lecture and the reading assignment, the student shall be able to
FEB  a. define the term “febrile agglutination” and describe the principles and procedures
of the Weil-Felix reaction

b. discuss factors that need to be considered when interpreting results of a febrile screen and interpret results given

c. briefly discuss and compare the different types of viral hepatitis

d. describe the principle of the tests used for the diagnosis and stage of the following diseases:
   infectious mononucleosis, hepatitis, HIV, Lyme disease, Babesiosis, Erlichiosis,

LECTURE 21  SYPH
SYPHILIS SEROLOGY AND PREGNANCY TESTING
At the conclusion of this lecture and the reading assignment, the student shall be able to:

STA  a. describe the clinical manifestations and serological test results in each of the three stages of syphilis

PRI  b. explain the principles and the procedures of the RPR, VDRL, FTA, and the MHSTA test for syphilis screening and name the conditions in which non-treponemal tests for syphilis may be falsely positive

HCG  c. define the term human chorionic gonadotrophin (HCG) and explain its clinical significance

PRI  d. describe the principles of pregnancy tests and interpret the results of a pregnancy test including causes of false positives and false negatives

CRP  e. state the characteristics of CRP and discuss the association to various disease states and therapy