CASPER COLLEGE COURSE SYLLABUS
MLTK 2700 H1 Immunology

Semester/Year: Fall 2015

Lecture Hours: 3	Lab Hours: 3	Credit Hours: 4
Class Time:	Days:	Room:
Lecture Online Delivery		
Lab Section H1 5-8 pm	Thursdays 9/10 9/24 10/22 11/12 12/10	Aley 106
Section H2 6-9pm	Fridays 9/11 9/25 10/23 11/13 12/11	
Instructor's Name: Bernardino Madsen		

Instructor's Contact Information:	Office Phone: 268-2522	Email: dmadsen@caspercollege.edu

Office Hours: Monday 8-10, Tuesday 4-6, Wednesday 9-10, Thursday 10-11 Aley 212

Course Description:
Advanced biology course of immune systems: cellular and molecular mechanisms; host resistance to infectious agents; as well, as hypersensitivities, autoimmunity, tumor and tissue rejection. Includes laboratory for molecular and immunological techniques.

Statement of Prerequisites:
MOLB 2220 or consent of instructor
Health Requirements You will need to obtain proof of the following health requirements to be in student laboratory.

- Health Insurance (Private or available through Casper College)
- Hepatitis B vaccination (at least the first in the series of three)

Goal:
Students will gain experience and proficiency in advanced principles of immunology, serology, molecular, and cellular culture techniques used in immunological procedures.

Outcomes:

1. Describe components of the immune system, their functional interactions and physiology as it relates to immunity, disease states and disorders.
2. Perform immunology, serology and molecular assays using a variety of techniques, evaluate clinical data, interpret results, and correlate abnormal results with disease states.
3. Monitor and evaluate quality assurance data, identify errors and formulate plan for corrective action.
4. Evaluate patient specimen acceptability for serological analysis.
5. Operate clinical instruments, evaluate results, identify errors and resolve malfunctions.

6. Critique patient results and select appropriate follow-up tests.
7. Compare and contrast clinical laboratory procedures, interpret data and predict diagnosis.
8. Compare and contrast immunoassays, including dual-platform instrumentation for chemical and immuno- based assays.
9. Explain the use of the Southern transfer and hybridization techniques in the application of DNA fingerprinting and human genomic identity testing.
10. Analyze and interpret restriction fragment polymorphism patterns and relate these to paternity and crime scene investigations.
11. Describe and evaluate types of target sequences (DNA, mRNA, tRNA, rRNA).
12. Describe the amplification process of PCR including:
    a. Basic steps of an amplification process
    b. Principles of the methodology
    c. List and describe the function PCR components in the reaction mix
13. Explain the application of PCR to STR testing.
14. Solve problems using critical thinking and creativity (Casper College General Education Outcome #3)

Methodology:
Online delivery of power points and student discussion will be incorporated into a mostly laboratory setting for student instruction. Laboratory activities will be independent and will be assisted by one-on-one instruction.

Evaluation Criteria: ***REQUIRED STUDENT TASK/ASSIGNMENTS***

The required tasks and assignments are used to evaluate the student's acquisition and comprehension of the learning objectives. Assignments are designed to allow students to put the information learned in class and in readings into practice making judgments based on the data presented.

<u>Lecture Exams/Final</u>
Midterm exams will cover materials listed in the learning objectives for defined segments or units outlined on the lecture schedule. Most material will be covered specifically in the power points and activities but exam questions may cover materials presented in the assigned reading. There will be three lecture exams and a comprehensive final. Exams can only be made up if the student provides prior notification of absence.

<u>Laboratory reports</u>
Each student will complete specified laboratory exercises. In each lab, the students will use the basic molecular and immuno- techniques found in clinical laboratories to detect disease states, infectious organisms or patient immune status. The student will complete lab assignments or write a 1-2 page lab report describing the theory and test methodology, strategy for differential diagnosis and prognosis.

<u>Advanced Laboratory Techniques</u>
Based upon class discussions, lessons and laboratory experiences in this class, students will design an assay system to detect target molecules found in an infectious or disease state. The student will describe sample choice, collection, processing, methodology and the overall procedure for the detection of the target molecule from the complex mixture of a human sample (vaginal, throat, sputum swabs). The description will include identification of the target molecule, assay methodology, procedure, detection system, quality control, interpretation of results and correlation to disease state. You may want to visit a

clinical laboratory to see if automation is an option for your test method.

Molecular Testing

Using molecular manipulatives and genetic databases, the student will explore the practices of clinical molecular based testing.

1. RFLP MAPPING:

In this lab, each student will evaluate a set of genomic DNA ladders and standard obtained from suspects or crime scene in the case histories you are provided. Students generate restriction fragment length polymorphism (RFLP) patterns for each individual in the case, analyze and interpret the RFLP patterns to answer case history questions.

2. PCR:

Using the manipulatives provided, students will characterize the PCR amplification process, determine the mathematical expression for the PCR amplification. Given DNA sequences, identify a target sequence, design a forward and reverse primer that bind specifically to amplify a portion of the target DNA sequence. Students are expected to calculate the primer annealing temperature based upon the melting requirements. Additionally, the reaction conditions for the hybridization reaction must be specified. Students must design and explain how the amplicons will be detected and concentration determined

3. PCR Application: VNTR and STR analysis

PCR has been applied to DNA sequencing, detection of nucleic acids from pathogens, genetic disease, paternity testing and forensic investigations. One application is the use of PCR to characterize variable numbers of tandem repeats (VNTRs) and short tandem repeats (STRs). Compare VNTR and STR genotypes in forensic and paternity case histories.

Immunology Study Cards :

Based upon ASCP content guidelines, you will make a study card for each topic that includes: topic, abnormal physiology, significant analyte, testing methodology, result interpretation and correlation to disease. Cards will be due at lab session dated November 19. Card Content list available through ascp.org, medical lab technician content outline under certification link http://www.ascp.org/pdf/BOR-PDFs/Guidelines/ExaminationContentGuidelineMLT.aspx . Please do all of the immunology content listed.

GRADING:

A = 92-100%	Final grades:	Lecture Exams/Final
B = 82-91%		Lab Reports
C = 70-81%		Adv. Lab Techniques
D = 60-69%		Molecular Testing
F = <60%		Study Cards

Required Text

Contemporary Clinical Immunology and Serology. Kate Rittenhouse-Olson and Ernesto De Nardin ISBN978-0-13-510424-8

Required Personal Protective Equipment (PPE)

Gloves PLEASE BRING 2 BOXES
Scrubs (any color)
Safety goggles

Class Policies: Last Date to Change to Audit Status or to Withdraw with a W Grade is the Casper College deadlines.

Exams must be completed without the use of textbooks, notes or assistance from classmates. Attendance is required for lecture and student labs. No make-up labs will be available.

Student Rights and Responsibilities: Please refer to the Casper College Student Conduct and Judicial Code for information concerning your rights and responsibilities as a Casper College Student.

Chain of Command: If you have any problems with this class, you should first contact the instructor in order to solve the problem. If you are not satisfied with the solution offered by the instructor, you should then take your problem through the appropriate chain of command starting with the Department Head/Program Director, the Dean, and lastly the Vice President for Academic Affairs.

Student complaints should be addressed through the following chain of command:

1) The instructor of your course: Bernardino D. MAdsen
2) MLTK Program Director: Dr. Audrey Hentzen
3) Dean, School of Health Science (Dr. Tammy Frankland 268-2495)
4) The Interim Vice President for Academic Affairs (Dr. Shawn Powell).

Academic Dishonesty **:** (Cheating & Plagiarism) Casper College demands intellectual honesty. Proven plagiarism or any form of dishonesty associated with the academic process can result in the offender failing the course in which the offense was committed or expulsion from school. See the Casper College Student Code of Conduct for more information on this topic.

Official Means of Communication: Casper College faculty and staff will employ the student's assigned Casper College email account as a primary method of communication. Students are responsible to check their account regularly.

ADA Accommodations Policy: If you need academic accommodations because of a disability, please inform me as soon as possible. See me privately after class, or during my office hours. To request academic accommodations, students must first consult with the college's Disability Services Counselor located in the Gateway Building, Room 344, (307) 268-2557, bheuer@caspercollege.edu. The Disability Services Counselor is responsible for reviewing documentation provided by students requesting accommodations, determining eligibility for accommodations, and helping students request and use appropriate accommodations.

Course calendar or schedule is available on the moodle webpage.

Course content outline:

I. Immunology
   a. Introduction to Immunology
   b. Cells/organs of the Immune System
   c. Cells/organs of the Immune System
   d. Antigens
   e. Immunoglobulins
   f. Immunoglobulin gene organization
   g. Major Histocompatibility Complex
   h. Antigen Processing and Presentation
   i. T-Cell Receptors
   j. T-Cell Maturation
   k. B-Cell Maturation
   l. Cytokines
   m. Complement
   n. Cell Mediated Immunity
   o. Leukocyte Migration and Inflammation
   p. Hypersensitivities

II. Immune Response to Infectious Diseases
   a. Vaccines
   b. AIDS
   c. Autoimmune Disease
   d. Transplantation
   e. Immunity and Cancer
   f. Tumor Markers

III. Sample Processing
   a. Evaluate samples
   b. Prepare for testing
   c. Storage conditions

IV. Agglutination Techniques
   a. MHA-TP
   b. RPR
   c. Monospot
   d. Rheumatoid Arthritis Latex test
   e. Anti-streptolysin titer
   f. CRP

V. Precipitation Techniques
   a. Latex
   b. Radial-immuno-diffusion
   c. Immunoelectrophoresis

VI. Instrument Techniques
   a. Principles
   b. RIA

- c. ELISA
- d. Enzyme inhibition
- e. Nephelometry
- f. Immunofluorescence
- g. Instrument maintenance

VII. Molecular Biology
- a. Target Molecules
- c. Types of Nucleic Acid
- d. Collection, handling and storage
- c. Nucleic Acid Synthesis
- d. Protein Synthesis

VIII. Immunoassays
- a. Monoclonal Antibodies
- b. Antigen-Antibody Reactions
- c. Competitive-Binding Reactions
- d. Radioactive Labels
    1. Radioimmunoassay
    2. Immunoradiometric Assay
- c. Enzyme Labels
- d. Enzyme-linked immunosorbent assay
- e. Immunoenzymetric
- f. Enzyme-multiplied immunoassay technique

IX. Fluorescent Labels
- a. Substrate-labeled fluorescent immunoassay
- b. Fluorescence polarization immunoassay
- c. Microparticle enzyme immunoassay
- e. Radioactive energy attenuation

X. Nucleic Acid Hybridization Reactions
- a. Probe design and synthesis
- b. Nucleic Acid Detection
    1. Radioactive labels
    2. Enzyme or Fluorescent labels

XI. Chemiluminescent labels
- a. Direct nucleic acid testing
    1. Southern and northern hybridization
    2. DNA fingerprinting
    3. Fluorescent *in situ* hybridization
    4. Semi-automated testing
    5. Hybridization protection assay
    6. Amplified detection system
- b. Amplified nucleic acid testing
    1. Polymerase chain reaction
    2. Ligase chain reaction
    3. Nucleic acid based amplification
    4. Transcription mediated amplification
    5. Strand displacement amplification

6. Emerging technologies

CALENDAR

Week	Date (WEEK OF)	Lab day	**Topic**	Reading
1	8/24		Overview	Chpt 1
2	8/31		Antibody	Chpt 2
3	9/7		Antigens, Epitopes and Immunogenicity	Chpt 3
LAB	9/10-11 Thur H1: 5-8 H2: Friday6-9 pm	Lab Night		
4	9/14		Cellular Immunity	Chapt 4
5	9/ 22		Complement	Chpt 5
6	9/21		EXAM 1	Ch 1-5
LAB	9/24-25 Thur H1: 5-8 H2: Friday6-9 pm	Lab Night		
7	9/28		Agglutination and Precipitation reactions	Chpt 6
8	10/5		Labeled Immunoassays	Chpt 7
9	10/12		Serology Math	Chpt 8
10	10/19		Hypersensitivity reactions	Chpt 9
	10/22-23 Thur H1: 5-8 H2: Friday6-9 pm	Lab Night		
11	10/26		Systemic Autoimmunity	Chpt 10
12	11/2		EXAM II	Ch 6-10

13	11/9		Immunoproliferative Diseases	Chpt 13
	11/14 6-9 pm	Lab Night		
14	11/16		Primary Immunodeficiency Diseases Acquired Immunodeficiency	Chpt 15
15	11/23		Thanksgiving	
16	11/30		Primary Immunodeficiency Diseases Acquired Immunodeficiency	Chpt 16
17	12/7		Molecular Biology Techniques **EXAM III**	Ch 23 Ch 13,15,16,23
	12/10-11 Thur H1: 5-8 H2: Friday6-9 pm	Lab Night		CARDS DUE
Finals	12-14			

Immunology Study Cards Initials: _____

Topic:

Relationship to metabolism, organ dysfunction or patho-physiology:

Gold Standard Test Methodology
Specimen:
Methodology:

Special notes:

Lab Test: Reference Range: Clinically Significant Results:

Immunology Study Cards Initials: _____

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