

**CATALOG YEAR 2006-2007**  
**(Please use separate form for each add/change)**

COLLEGE/SCHOOL : Arts and Sciences  
Current Catalog Page(s) Affected \_\_\_\_\_ 260 \_\_\_\_\_

**Course:** **BIOL 4425** Add:   X   Delete: \_\_\_\_\_  
(check all that apply) Change: Number \_\_\_\_\_ Title \_\_\_\_\_ SCH \_\_\_\_\_  
Description \_\_\_\_\_ Prerequisite \_\_\_\_\_

If new, provide Course Prefix, Number, Title, SCH Value, Description, prerequisite, and lecture/lab hours if applicable. If in current catalog, copy and paste the text from the and indicate changes in red.

**Biol 4425 Immunology. Four semester hours.**  
**A detailed study of the immune response and related events. Emphasis is placed on cellular and humoral branches of immunity, including the study of blood (serology) as a diagnostic tool.**  
**Prerequisite: BIOL 2421 or permission of instructor. Laboratory fee: \$30.00. (Cross-listed with BIOL 5425)**

Justification: The course has been previously taught as a special topics undergraduate course and is now being added to the catalog. Additional undergraduate courses are needed to meet demands of an increasing number of majors in biology.

Approvals:	Signature	Date
Chair Department Curriculum Committee	_____	_____
Chair Department	_____	_____
Chair College Curriculum Committee	_____	_____
Dean	_____	_____

## **Introduction to Immunology**

Course Title: Immunology  
Course Number: BIOL 4425  
Term/Year: Spring 2005  
Instructor: David L. Beck, BS, AM  
Office Hours: Tues 2-4 pm, Wed 9-11 am, Thurs 2-4 pm  
Office: Canseco Hall 302G  
Office Phone: 956-326-2587  
E-mail: [dbeck@tamiu.edu](mailto:dbeck@tamiu.edu)  
Home Phone: 956-722-0594 - (leave a message if I am not home)  
Do not call after 9 pm.

WebCT Website: <http://www.tamiu.edu/login.html>

Required Texts: Immunobiology, Janeway, 6th Edition  
Case Studies in Immunology, Rosen and Geha, 4th Edition  
Cards

Lecture: Tuesday and Thursday - 9:00 - 12:00  
Lecture Location: Canseco Hall - Room 216

### **Immunology Learning Outcome:**

1. Students will be able to distinguish and describe the components of the nonspecific immune response.
2. Students will be able to discuss the importance of the immune system in protection from infection.
3. Students will be able to describe and explain the purpose of the common features of the immune cells.
4. Students will demonstrate a knowledge of inflammation and compare the many nonspecific and specific responses that humans have to invading microbes.
5. Students will be able to discuss the basic principles of the adaptive immune response.
6. Students will be able to write about and apply basic immunologic concepts to everyday life and current scientific issues.

### **Course Content:**

The course will serve as an introduction to the field of Immunology. The course will introduce the immune system, and how it works in great detail. The course will also present comparative immunology, immunodeficiencies, autoimmune diseases, allergy, and immunological research techniques.

### **My Objective:**

My objective is to introduce the student to the immune system. This includes an understanding of the types of immune cells, how they coordinate the immune response, and how that immune response is both good, and sometimes bad. There will be an emphasis on human case studies,

and in the lab there will be an emphasis on antibody research methods, and in protein chromatography.

### **Course Requirements:**

1. Each student must attend each class. Attendance is expected.
2. Participation in weekly class discussions
3. You are required to take all four lecture exams
4. You are required to attend and participate in all lab assignments

### **Criteria for Grading and Evaluation**

The lecture portion of the course will account for two-thirds of your final grade, and the laboratory section will count for one third of your grade.

Exam 1	100 points
Exam 2	100 points
Exam 3	100 points
Final Exam	200 points
Reports/Quizzes	450 points
Essays	50 points

### **Weekly Assignments:**

1. Online course notes: Online notes are provided as lecture material. Each online note section includes notes and exam review. The exam review section tells you how heavily weighted that section of the notes is on the exam. More than one set of notes may be used per week. log in to WebCT each week and complete the weekly quiz (optional). Computers are available in the library and student computing center.
2. Textbook reading. The exams will be on the lecture notes, textbook, and handouts.
3. Weekly worksheet/ lab report: There are worksheet/lab reports due each week that will help you prepare for the exams.
4. Weekly Quiz: Each Tuesday there will be a 10-20 point quiz.

### **Lecture Exams**

There are four lecture exams: three section exams and one comprehensive exam. Model exams are online. Exams will cover the lecture/discussion/lab portions of the course.

### **Attendance Policy**

Class policy is that any student missing greater than 20% of the course shall be given a grade of "F". Attendance is expected.

Lab attendance is MANDATORY. **This will be strictly enforced.**

### **Missed assignments:**

You are responsible for completing assignments on time. If you miss an assignment due to an excused absence you may submit that assignment at the next lecture/lab period. Assignments submitted late will be accepted for partial credit only. NO assignments will be accepted after **May 10, 2005** for any reason.

### **Missed Quizzes Policy**

If you miss a quiz for an unexcused absence it may not be made up.

### **Missed exams:**

If you miss an exam due to an unexcused absence you will receive a zero.

If you miss an exam due to an excused absence **you must take the exam within 7 days of missing the exam.** If there is an unusual reason that you can not complete the exam within 7 days you must notify the instructor within the 7 days of the exam date. Any extension beyond this seven day period is solely at the discretion of the instructor.

**ANY student missing two or more lecture/lab exams will receive an “F” for the course.**

### **Cell Phones:**

Turn them OFF before class or lab!

### **Online Materials:**

The following materials are online:

1. Announcements
2. Course information:
3. Lecture assignments, notes and quizzes
4. Discussion boards
5. External links

# **College of Arts and Sciences Policies**

## **Classroom Behavior**

The College of Arts and Sciences encourages classroom discussion and academic debate as an essential intellectual activity. It is essential that students learn to express and defend their beliefs, but it is also essential that they learn to listen and respond respectfully to others whose beliefs they may not share. The College will always tolerate diverse, unorthodox, and unpopular points of view, but it will not tolerate condescending or insulting remarks. When students verbally abuse or ridicule and intimidate others whose views they do not agree with, they subvert the free exchange of ideas that should characterize a university classroom. If their actions are deemed by the professor to be disruptive, they will be subject to appropriate disciplinary action, which may include being involuntarily withdrawn from the class.

## **Copyright Restrictions**

The Copyright Act of 1976 grants to copyright owners the exclusive right to reproduce their works and distribute copies of their work. Works that receive copyright protection include published works such as a textbook. Copying a textbook without permission from the owner of

the copyright may constitute copyright infringement. Civil and criminal penalties may be assessed for copyright infringement. Civil penalties include damages up to \$100,000; criminal penalties include a fine up to \$250,000 and imprisonment.

*Copyright laws do allow students and professors to make photocopies of copyrighted materials under strict conditions. You may not copy most, much less all, of a work, but you may copy a limited portion of a work, such as an article from a journal or a chapter from a book. These copies must be for your own personal academic use or, in the case of a professor, for personal, limited classroom use. In general, the extent of your copying should not suggest that the purpose or the effect of your copying is to avoid paying for the materials. And, of course, you may not sell these copies for a profit. Thus, students who copy textbooks to avoid buying them or professors who provide photocopies of textbooks to enable students to save money are both violating the law.*

### **Plagiarism and Cheating**

Plagiarism is the presentation of someone else's work as one's own. Recently, the Internet has complicated the picture. Getting something from the Internet and presenting it as one's own is still plagiarism. Copying another student's paper or a portion of the paper - is usually called "copying". Neither plagiarism nor copying will be tolerated. Should a faculty member discover that a student has committed plagiarism, the students will receive a grade of 'F' in that course and the matter will be referred to the Executive Director of Student Life for possible disciplinary action.

### **Students with Disabilities**

Texas A&M International University seeks to provide reasonable accommodations for all qualified persons with disabilities. This University will adhere to all applicable federal, state, and local laws, regulations and guidelines with respect to providing reasonable accommodations as required to afford equal education opportunity. It is the student's responsibility to register with the Director of Student Counseling and to contact the faculty member in a timely fashion to arrange for suitable accommodations.

### **Incompletes**

Incompletes are discouraged and are assigned only under extenuating circumstances. In fairness to those students who complete the course as scheduled, under no circumstances will an Incomplete ("I") be changed to an "A" unless the student has experienced a death in the immediate family or has a written medical excuse from a physician.

### **Independent Study Courses**

Independent Study (IS) courses are offered only under exceptional circumstances. Required courses intended to build academic skills may not be taken as IS (e.g., clinical supervision and internships). No student will take more than one IS course per semester. Moreover, IS courses are limited to seniors and graduate students. Summer IS course must continue through both summer sessions.

### **Student Attendance / Drop Responsibility**

The College of Arts & Sciences adheres to the Attendance Policy in the current University catalog.

"It is the responsibility of the STUDENT to drop the course before the drop date. Faculty are not responsible for dropping students who suspend class attendance".

**Final Examination**

Final Examinations must be comprehensive and must be given on the day specified.

**Student E-mail Address**

All students must obtain a TAMIU e-mail address

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## **Biol 4471 - Spring 05 - Syllabus**

Dates of specific lecture materials are approximate. Be prepared to proceed to the next days materials.

Immunology, David L. Beck, TR 9:00-11:50

Jan 11 Introduction to Immunology

Jan 13 Innate Immune System

Cases: 1. Congenital Asplenia

Lab 1: Anatomy and Physiology of the Immune System

Jan 18 Innate Immune System

Jan 20 Adaptive Immune System: Immunogen

Cases: 13. Factor I Deficiency

Cases: 14. Deficiency of the C8 Complement Component

Cases: 21. Chronic Granulomatous Disease

Lab 2: Cells of the Immune System

Jan 25 Major Histocompatibility Complex

Jan 27 Major Histocompatibility Complex

Cases: 6. X-linked Sever Combined Immunodeficiency

Cases: 7. Adenosine Deaminase Deficiency

Cases: 5. MHC Class I Deficiency

Cases: 9. Toxic Shock Syndrome

Lab 3: Solutions, Dilutions, and Plant Saponins

Feb 1 Immunoglobulin Structure

Feb 3 Immunoglobulin Gene Rearrangement

Cases: 2. X-linked Agammaglobulinemia

Cases: 11. Omenn Syndrome

Lab 4: Somatic Mutations

Feb 8 Exam I

Feb 10 T-Cell Receptor

Cases: 17. Acute Infectious Mononucleosis

Cases: 30. A Kidney Graft for Complications of Autoimmune Insulin-Dependent Diabetes Mellitus

Lab 5: Complement in the blood

Feb 15 Negative Selection

Feb 17 Negative Selection

Cases: 15. Graft-versus-Host Disease

Cases: 22. Autoimmune Polyglandular Syndrome

Cases: 39. T-Cell Lymphoma

Lab 6: Blood Typing - Agglutination Reactions



Feb 22 Positive Selection

Feb 24 Tolerance

Cases: 25. MHC Class II Deficiency

Cases: 33. Systemic Lupus Erythematosus

Lab 7: ELISA

Mar 1 Lymph Node: Antigen Presentation

Mar 3 Lymph Node: Affinity Maturation

Cases: 3. Hyper IgM Immunodeficiency

Cases: 4. Activation-induced Cytidine Deaminase Deficiency

Cases: 19. Wiskott-Aldrich Syndrome

Cases: 41. Lepromatous Leprosy

Lab 8: Antibody Diffusion Assays

Mar 8 Adaptive Immune Summary

Mar 10 Adaptive Immune Summary

- Summary:
1. Invasion and Inflammation
  2. Antigen Presentation and T-cell mediated immunity
  3. B-cell and antibody generation
  4. Responses to antibody coated cells
  5. Shutting down the immune response
  6. Reactivation of the immune response

Cases: 20. X-linked Lymphoproliferative Syndrome

Cases: 31. Autoimmune Lymphoproliferative Syndrome

Lab 9. Antigen Presentation

Mar 15 Exam II

Mar 17 Immunodeficiency

Cases: 16. Acquired Immune Deficiency Syndrome

Cases: 40. Interferon-gamma receptor Deficiency

Lab 10. Solutions, Ammonium sulfate precipitation

Mar 22 Spring Break

Mar 24 Spring Break

Mar 29 Allergy

Mar 31 Allergy

Cases: 10. Contact Sensitivity to Poison Ivy

Cases: 23. Allergic Asthma

Cases: 36. Acute Systemic Anaphylaxis

Cases: 42. Atopic Dermatitis

Lab 11. Construction of columns

Apr 5 Autoimmunity

Apr 7 Autoimmunity

Cases. 26. Hemolytic Disease of the Newborn

Cases. 28. Multiple Sclerosis

Cases. 29. Autoimmune Hemolytic Anemia

Cases. 34. Rheumatoid Arthritis

Cases 35. Rheumatic Fever

Lab 12. Desalting Column and DEAE Ion Exchange Chromatography

Apr 12 Vaccination

Apr 14 Vaccination

Lab 13. SDS-PAGE

Apr 19 Exam III

Apr 21 Comparative Immunology

Lab 14. To Be Announced

Apr 26 Immunology from Birth to Death

Apr 28 Review

Lab 15. To Be Announced

May 4 Review

**May 10 FINAL EXAM - 8 am**

Detailed Reading List - as of Dec 22, 2004  
Additional reading may be assigned.

**Overview:**

1. What do you know?
2. Plagiarism.
3. Learning vocabulary.
4. Abbreviations
5. What is immunology? Page 1-2
6. Review of Biology
7. Review of Cell Biology Handout
8. Review of Organ Systems Handout
9. Lymphatic System
10. Anatomy of the Lymphatic System Page 6-12 (1-2 to 1-4)
11. Immune cells involved Page 2-6 (1-1)
12. What is the big picture? How do they work together?
  - A. Infection
  - B. Inflammation Page 12-13 (1-5)
  - C. Antigen Presentation Page 13-16 (1-6 to 1-9)
  - D. Adaptive Immune Response Page 17-31 (1-10 to 1-18)
    1. T-cell mediated immunity
    2. Antibody Production
    3. Antibody mediated responses
  - E. Shutting down the response
  - F. Surveillance and Reactivation
  - G. Deficiency, Allergy, Autoimmune Disease, Vaccines 31-35 (1-19 to 1-21)

**Innate Immunity**

1. What happens when a pathogen enters the body? Page 37-40 (2-1)
2. Normal flora - competition.
3. Physical Barriers Page 40-42 (2-2)
4. Chemical Barriers
5. Cellular Barriers - Phagocytosis and cytotoxic cells. Page 42-45 (2-3)
6. Mucosal Membrane
7. Inflammation Page 45-48 (2-4)
8. Pattern Recognition Page 48-54 (2-5 to 2-9)
9. Complement Page 55-75 (2-10 to 2-19)
10. Cytokines - molecular cell phones Page 75-80 (2-20 to 2-21)
11. Phagocytic Cells Page 82-84 (2-23)
12. Cytotoxic Cells Page 89-92 (2-27 to 2-28)
13. How the innate immune response leads to adaptive

**Immunogen**

1. What is an immunogen? Handout page 27-31
2. What does the immune system recognize? Handout page 31-37
  - What can it present?

What is the response?	
MHC Class I versus MHC Class II Presentation	Page 120-128 (3-13 to 3-17)
Antigen Pocket	
Haptens	
Linear versus Conformation Epitope	
MHC of $\gamma\delta$ T cells	

### **Antigen Presentation and Recognition**

1. Antigen Presentation	Page 169-182 (5-1 to 5-8)
Antigen is brought in	
Antigen from within	
Display of antigen	
2. MHC Diversity and Function	Page 183-198 (5-9 to 5-18)
A. MHC diversity and gene organization	
B. HLA Typing	
C. Alternate antigen presentation	
D. Superantigens and MHC	
3. Bound by Immunoglobulins and T-cell Receptor	
A. What is antibody	
B. What is the T-cell Receptor	
4. T-cell Receptor and MHC Interaction	Page 115-120 (3-10 to 3-12)

### **Immunoglobulin**

1. What is antibody	Page 103-107 (3-1 to 3-3)
2. antibody Structure	Page 108-110 (3-4 to 3-5)
3. Antibody diversity/hypervariable regions	Page 110-115 (3-6 to 3-9)
4. Antibody classes	Page 154-158 (4-15 to 4-17)
	Page 160-165 (4-19 to 4-21)
5. Class Switching	Page 158-160 (4-18)
6. Light chain rearrangement	Page 135-140 (4-1 to 4-3)
7. Heavy chain rearrangement	Page 140-146 (4-4 to 4-8)
8. Somatic Mutation	Page 146-149 (4-9 to 4-10)

### **T-cell Gene Rearrangement**

Page 149-154 (4-11 to 4-14)

### **B-cell and T-cell Development**

1. Bone Marrow (B/T/NK cell switch)	Page 241-246 (7-1)
2. B-cell Development	Page 310 Figure 7.46
Page 247-250 (7-2 to 7-3), Page 258-267 (7-8 to 7-11), Page 275-280 (7-17)	
A. Gene Rearrangement	
B. Selection of B cells expressing antibody	
C. Negative selection of B-cells (rearrangement or death)	
D. Migration to the lymph nodes	
3. T-cell Development	Page 311 Figure 7.47
Page 251-258 (7-4 to 7-7), Page 267-275 (7-11 to 7-16), Page 280-293 (7-18 to 7-25)	
A. Migration from bone marrow to thymus	

- B. T-cell Receptor rearrangement
  - C. Positive Selection - Proliferation and Differentiation (CD4/CD8)
  - D. Negative Selection
  - E. Migration to lymph nodes
4. Tolerance Page 566-577 (13-7 to 13-15)

**Lymph Node: Cells**

Page 293-303 (7-26 to 7-32)

- 1. Naive T-cells go to lymph node and circulate - long time
- 2. Naive B-cells go to lymph node and circulate - short time
- 3. Antigen Presenting Cells go to circulation, tissues, and lymph nodes
  - Antigen Presenting Cells that ingest antigen migrate to lymph nodes

(B-cell and T-cell Tumors)

Page 304-308 (7-33 to 7-35)

**Lymph node: Antigen Presentation**

- 1. Review of antigen presentation
- 2. Antigen Capture and Maintenance
  - Dendritic cells, Macrophages, and B-cells

Page 331-337 (8-6 to 8-8)

**Lymph Node: T-cell Activation and Response**

- 1. Interaction of the antigen presenting cell and the naive T-cell 319-331 (8-1 to 8-5)
- 2. Activation versus tolerance (Costimulation)
- 3. Activation Page 337-343 (8-9 to 8-14)
  - Permanent gene expression changes (effector T cells)
  - Clonal Expansion
  - T<sub>H</sub>1 versus T<sub>H</sub>2 response
- 4. Effector T cells ( $\alpha$ : $\beta$  versus  $\gamma$ : $\delta$ )
  - A. Overview Page 343-351 (8-15 to 8-20)
  - B. T-cell cytotoxicity Page 351-356 (8-21 to 8-25)
  - C. Macrophage activation Page 356-362 (8-26 to 8-29)
  - D. B-cell activation

**Lymph Node: B-cell Activation and Response**

- 1. Mechanisms of B-cell activation Pages 367-372, 383-387 (9-1 to 9-3, 9-10 to 9-11)
  - A. Activation by T-cells (Thymus Dependent)
    - Proliferation with memory
  - B. Other activation mechanisms (Thymus Independent)
    - Proliferation with no memory
- 2. Activated B-cell goes to the germinal center Pages 375-378, 373-375 (9-5 to 9-6, 9-4)
  - A. Antibody production is sustained by antigen presenting cell
  - B. B-cells that interact with T-cells can class-switch
  - C. Affinity maturation and selection by T-cells Pages 379-382 (9-7 to 9-8)
  - D. Memory cells Page 383 (9-9)
- 3. Antibody function Pages 387-397 (9-12 to 9-18)
  - A. Classes
  - B. Neutralization / inactivation

C. Complement activation	
D. Agglutination	
E. Opsonization	
4. Fc Receptor	Pages 398-905 (9-19 to 9-23)
A. Fc	
B. F <sub>C</sub> E (IgE)	
<b><u>Immune Response (putting it all together)</u></b>	Pages 409-432 (10-1 to 10-12)
1. Invasion and Inflammation	Pages 446-456 (10-22 to 10-26)
2. Antigen acquisition and presentation	
3. T-cell activation and effector T-cell function	
4. B-cell activation and affinity maturation	Pages 566-577 (13-7 to 13-15)
5. Immunoglobulin functions	Pages 461-470 (11-1 to 11-5)
A. Maintenance of the immune response	
6. Shutting down the immune response	
7. Reactivation of the immune response	
8. Escaping the immune response (Hepatitis C?)	
<b><u>Mucosal Immunity and Immune-Privileged Sites</u></b>	Pages 432-446 (10-13 to 10-21)
<b><u>Immunology from Conception to Death</u></b>	Handout
<b><u>Vaccination</u></b>	Pages 642-657, 683-687 (14-18 to 14-30, A-1 to A-4)
<b><u>Immunodeficiency</u></b>	Pages 470-508 (11-6 to 11-30)
1. Primary immunodeficiency	
2. Secondary immunodeficiency	
A. Immunodeficiencies (many by review)	
A.	
B.	
C.	
D. SLE	
E. Diabetes	
F. Hepatitis C	
G. AIDS	
<b><u>Allergy</u></b>	Pages 517-550 (12-1 to 12-18)
<b><u>Autoimmunity</u></b>	Pages 557-566, 578-608 (13-1 to 13-6, 13-16 to 13-39)
<b><u>Comparative immunology</u></b>	Pages 665-681 (15-1 to 15-11)