

CMB580A2: Microbiology Basics for Computer Scientists and Engineers

Time: Tuesday-Friday (1:00p - 1:50p), Fall Semester (October 6th-30th, 2015) (1 Credit)

Location: Yates (Room 308)

Instructors: Principal Instructor

Dr. Brian Geiss

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Course Overview: Microorganisms such as bacteria and viruses cause diseases in plants, animals, and humans. One of the challenges of modern medicine is being able to rapidly diagnose infections so that appropriate care can be given to ameliorate disease. Emerging data and engineering intense technologies, such as biosensors and next generation sequencing, have brought scientists together from very different backgrounds to solve the problem of how to effectively detect pathogens in patient samples. The goal of this course is to provide scientists with backgrounds in computer science and engineering with a background in microbiology to help them better interface with biological scientists they may interact with on interdisciplinary projects. This course will provide students with an overview of the basic physiology of eukaryotic cells, bacteria, and viruses as well as provide an understanding of current diagnostic and therapeutic methods.

Course Learning Objectives:

At the end of this course, students will be able to:

- 1) Explain the differences between eukaryotic cells / bacteria / viruses
- 2) Discuss the functions of different organelles in cells
- 3) Describe how bacteria replicate
- 4) Explain how viruses infect and replicate within cells
- 5) Discuss how antimicrobial therapeutics function and are used
- 6) Explain how bacterial and viral pathogens are detected in clinical settings.

Course Requirements: Students are required to attend classes and participate in class discussions. I reserve the right to modify this syllabus and schedule as needed. I will announce changes in class, e-mail, or via Canvas. This course will require two hours of outside work for each class hour through readings.

Grading: Students enrolled in this graduate level course will be graded on scores from 2 non-comprehensive exams (50% each). No extra credit will be offered during this course.

Grading will be traditional:

- A (90-100)
- B (80-89)
- C (70-79)
- D (60-69)
- F (below 60)

Examinations will focus on demonstrating that students understand a clearly explain concepts discussed in class. Exams will be in mixed format (short answer, multiple choice).

Attendance. Students will be excused for up to two classes. Students should notify the instructor prior to their absence if possible.

Special Needs: Students with disabilities are encouraged to contact the Resources for Disabled Students' office to arrange for accommodation and support services. The RDS office is located at room 100 General Services Building, (970) 491-6385, <http://rds.colostate.edu/>.

Conduct: Student and faculty member conduct in this class shall conform with and be guided by the policy on academic integrity (<http://www.conflictresolution.colostate.edu/academic-integrity>) and shall also conform to the expectations of the student conduct code (<http://www.conflictresolution.colostate.edu/conduct-code>) for Colorado State. Specific examples of expected conduct relative to homework assignments and examinations will be discussed in class. You may be dismissed from a class period for unprofessional or inappropriate conduct or may be dismissed from the course if similar conduct would recur.

Course Materials

The content for this course has been developed in part from the textbooks "Microbial Biotechnology: Fundamentals of Applied Microbiology" (Glazer and Nikaido, Second Edition), "Diagnostic Microbiology" (Bailey and Scott, Eleventh Edition), and primary literature articles. The above textbooks are not required for this course. References to further information will be provided where necessary.

Office Hours: Class announcements will be made through Blackboard. I will be available from 1pm to 2 pm on Wednesdays and Fridays for Office Hours (Microbiology room B409). If you have questions that are of interest to the entire class, please post them on Blackboard and I will address them there.

Daily Course Topics

Section 1: Basic Cell Biology

Week 1

- October 6 – Course Introduction / Basic characteristics of eukaryotic cells
- October 7 – Replication of eukaryotic cells
- October 8 – Organization and function of cellular structures

Section 2: Bacteria

- October 9 – Basic characteristics of bacteria

Week 2

- October 13 – Bacterial replication mechanisms
- October 14 – Antibiotics and antibiotic resistance
- October 15 – Human and veterinary bacterial diseases
- October 16 – Exam #1

Section 3: Viruses

Week 3

- October 20 – Basic characteristics of viruses
- October 21 – Viral replication mechanisms
- October 22 – Antiviral therapeutics and rational drug design
- October 23 – Human and veterinary viral diseases

Section 4: Diagnostic technologies for pathogen detection

Week 4

- October 27 – Nucleic acid techniques (PCR/qPCR/NGS)
- October 28 – Protein based techniques (Western blot / ELISA / Mass spectrometry)
- October 29 – Biosensors
- October 30 – Exam #2