

DRAFT SYLLABUS
Integrated molecular and cellular biology for non-biologists I
MG 660 (5 cr)

Instructor: Erich Grotewold

Meeting times: M (2 hr), W (2 hr), F (1 hr).

Objectives: The main objective of this course is to provide an overview of molecular and cellular biology to non-biology graduate and advanced undergraduate students with a major in mathematics, physics, chemistry or related fields. This course is the first of a series of two, and focuses primarily on the molecular biology, biochemistry and genetics of single cells. The course is a required course of the Masters of Science program in Mathematical Biology (MSMB).

Learning goals:

Students can identify the scientific method, and describe how it is used to design and interpret biological experiments.

Students can identify and describe the major experimental methods used in biological research.

Students can conceptualize basic biological mechanisms.

Students can apply concepts discussed in class to new experimental and quantitative frameworks.

Required textbook: Selected chapters from B. Alberts, A. Johnson, J. Lewis, M. Raff, K. Roberts, P. Walter. *Molecular Biology of the Cell*, 2008, Fifth edition.
Other required course material will be available through Carmen.

Prerequisite: Introductory Biology, or admission to the MSMB program, or permission of instructor.

Course structure:

The course will consist of lecture/class discussion sections on M/W. Friday class will include discussion of homework assignments, laboratory visits, or midterm exams.

Learning and assessment activities:

Class assignments: The course will include three homework assignments. These will be based on exploratory topics relating concepts from class with quantitative issues and experimental design. All assignments are due at the beginning of class on the due date. 15% of grade (5% each).

Laboratory visits: Four visits to research laboratories relevant to the class will be included, allowing students to learn about current research and scientific methods.

Class participation: 10% of grade.

Exams: The course will include two midterms and one (cumulative) final exam. Each is open book, and open note.

Midterms: 50% of grade (25% each)

Final: 25% of grade

Outline of the course by week:

Week 1: The Cell - Prokaryote and eukaryote cells, cellular structure, organelles

Alberts section I (chapter 1)

Week 1 Friday: Assignment 1 distributed

Week 2: Organizing Principles - Molecular structures, bonds and interactions between molecules, protein structure

Alberts section I (chapter 2)

Week 2 Friday: Molecular Biology laboratory visit

Week 3-4: Biology of the Nucleus - DNA, principles of genetics, DNA replication, transcription, recombination

Alberts section II

Week 3 Friday: Assignment 1 due

Week 4 Friday: Midterm 1 & Assignment 2 distributed

Week 5-6: Metabolism - Enzymes, enzyme kinetics, law of mass action, general cellular cofactors with a focus on ATP and NADH/NADPH, electron transfer reactions

Alberts section I (chapter 3)

Week 5 Friday: Microscopy laboratory visit

Week 6 Friday: Assignment 2 due

Week 7: Translation & Protein Modifications - Protein synthesis, protein stability, protein modifications, transport of proteins within cells

Alberts section I (chapter 3)

Week 7 Friday: Midterm 2, Assignment 3 distributed

Week 8: Membrane Structure and Function - Structure of cellular membranes, transport mechanisms across membranes

Alberts section IV (chapter 10, 11+)

Week 8 Friday: Genomics facility visit

Week 9: Special Integration Case 1 - Cell division & cell death

Alberts section IV (chapter 16, 17)

Week 9 Friday: Assignment 3 due

Week 10: Special Integration Case 2 - Bacteriophage λ and the *lac* operon

Week 10 Friday: Interactive laboratory experience, λ infection of *E. coli*

Test week: Final exam

Statement on academic misconduct:

“It is the responsibility of the Committee on Academic Misconduct to investigate or establish procedures for the investigation of all reported cases of student academic misconduct. The term “academic misconduct” includes all forms of student academic misconduct wherever committed; illustrated by, but not limited to, cases of plagiarism and dishonest practices in

connection with examinations. Instructors shall report all instances of alleged academic misconduct to the committee (Faculty Rule 3335-5-487). For additional information, see the Code of Student Conduct (http://studentaffairs.osu.edu/info_for_students/csc.asp).

Statement of ADA compliance:

“Students with disabilities that have been certified by the Office for Disability Services will be appropriately accommodated, and should inform the instructor as soon as possible of their needs. The Office for Disability Services is located in 150 Pomerene Hall, 1760 Neil Avenue; telephone 292-3307, TDD 292-0901; <http://www.ods.ohio-state.edu/>.”