

MATH 5198: Mathematics for Bioscientists

Prepared by Harvey J. Greenberg, CCB Director
and Professor of Mathematics

October 13, 2002

THIS COURSE DOES NOT APPLY TO ANY MATHEMATICS DEGREE AT CU DENVER.

Audience: People with B.S. in Biology or a related field.

Prerequisites: B.S. in approved major (not Mathematics)
Analytical Geometry and Calculus II (MATH 2411)

Overall description: This will cover mainstream topics that are in the following MATH courses:

3195 Linear Algebra and Differential Equations

4408 Applied Graph Theory

4791 Continuous Modeling

Many examples will be from biology, and the pace will be brisk (not intended for undergraduates). A student can expect to spend at least 10 hours per week outside of class.

Catalog description: Introduces linear algebra, discrete structures, graph theory, algorithms analysis, and differential equations, using applications to molecular biology. No credit for Mathematics majors.

Frequency: To be offered each fall semester

Grading: Problem sets to measure knowledge retention;
Exam or project to measure ability to synthesize concepts.

Outline

(Number of class sessions shown in parentheses, as ranges.)

1. Introduction & Overview (1–2)
 - 1.1 Conduct of course
 - 1.2 Review of fundamentals
 - Logic, sets and functions
 - Mathematical reasoning
 - 1.3 Mathematical biology: Historical perspectives
2. Linear algebra (8–9)
 - 2.1 Vectors and matrices
 - 2.2 Independence, singularity, bases, and rank
 - 2.3 Systems of equations & canonical forms
 - 2.4 Special matrices
 - 2.5 Markov chains
3. Graph Theory Models (6–8)
 - 3.1 Terms and concepts (incl., relations)
 - 3.2 Connectivity, paths, and cycles
 - 3.3 Matrix representations
 - 3.4 Trees and other special graphs
4. Algorithms (5–7)
 - 4.1 Shortest paths
 - 4.2 Spanning trees
 - 4.3 Some concepts
 - 4.4 Complexity
5. Differential equations (6–8)
 - 5.1 First order equation
 - 5.2 First order system
 - 5.3 Analytic vs. numerical solutions
 - 5.4 Bifurcations, stability, and chaos
6. Avenues for Further Study (1)