CAL POLY

September 2008

Mathematics 162 Calculus for the Life Sciences II

1. Catalog Description

Math 161, 162 Calculus for the Life Sciences I, II (4) (4) GE B1

Review of exponential, logarithmic, and trigonometric functions. Differential and integral calculus with applications to the biological sciences. Introduction to differential equations and mathematical modeling. Examples, exercises and applications to emphasize problems in life sciences. Not open to students with credit in MATH 141, 142 respectively. 4 lectures. Prerequisite: Completion of ELM requirement, and passing score on appropriate Mathematics Placement Examination, or MATH 118 or equivalent.

2. Required Background or Experience

Math 161 or equivalent.

3. Learning Objectives

Upon completion of Math 162, the student should:

a) Understand the definition of the definite integral.
b) Understand the Fundamental Theorem of Calculus.
c) Be able to apply the integral in the analysis of selected biological phenomena.
d) Understand the integration techniques of substitution, integration by parts, and partial fractions.
e) Have a basic understanding of the approximation of functions by Taylor polynomials.
f) Understand how elementary pure time and autonomous differential equations can be used to model certain biological systems.
g) Understand the concepts of elementary matrix theory, including eigenvalues and eigenvectors.
h) Understand the definition of the partial derivative.
i) Be able to solve selected linear and nonlinear systems of differential equations, and understand how they may be applied to certain problems in biology.

4. Text and References

Neuhauser, Claudia, Calculus for Biology and Medicine, 2nd ed., Prentice-Hall, 2004.

5. Minimum Student Materials

Paper, pencils, calculator and notebook.

6. Minimum University Facilities

Classroom with ample chalkboard space for class use.

7. Content and Method

Content	No. of Lectures
6. Integration	6
6.1 The Definite Integral	
6.2 The Fundamental Theorem of Calculus	
6.3 Applications of Integration	
7. Integration Techniques and Computational Methods	7
7.1 The Substitution Rule	
7.2 Integration by Parts	
7.3 Practicing Integration and Partial Fractions	
7.7 The Taylor Approximation *(Optional)*	
8. Differential Equations	6
8.1 Solving Differential Equations	
8.2 Equilibria and Their Stability	
8.3 Systems of Autonomous Equations *(Optional)*	
9. Linear Algebra and Analytic Geometry	6
9.1 Linear Systems	
9.2 Matrices	
9.3 Linear Maps, Eigenvectors, and Eigenvalues	
10. Multivariable Calculus	2
10.1 Functions of Two or More Independent Variables	
10.2 Limits and Continuity	
10.3 Partial Derivatives	
11. Systems of Differential Equations	7
11.1 Linear Systems: Theory	
11.2 Linear Systems: Applications	
11.3 Nonlinear Autonomous Systems: Theory	
11.4 Nonlinear Systems: Applications	
Total	34

Method

Largely lecture with blackboard illustration of the discussion along with supervised work and individual conferences. Most examples, exercises and applications will be taken from the life sciences.

8. Methods of Assessment

The primary methods of assessment are, in decreasing order of importance: essay examinations, quizzes and homework. Typically, there will be two or three hour-long examinations during the quarter, and a comprehensive final examination. Students are required to show their work, and are graded not only on the correctness of their answers, but also on their understanding of the concepts and techniques. Quizzes are typically given once or twice a week to provide a spot check of student learning. Homework is required daily.

* Note to instructors: An errata sheet for the text is available from the course supervisor.