

Math 122 Calculus for the Life Sciences II
San Diego State University
Spring 20XX, Section XX: Class Meeting Time and Location

Instructor: TBD	Email: TBD
Office Location: TBD	Office Hours: TBD
Office Phone: TBD	Course Website: TBD
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Text: Calculus for Biology II, by Mahaffy & Chavez-Ross, SDSU Lecture Notes

Prerequisite: MATH 121.

Course Catalog Description: A continuation of MATH 121 with topics from integral calculus and an introduction to elementary differential equations. Not open to students with credit in MATH 150.

Learning Outcomes

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

1. Explain logistic growth model and dynamical systems,
2. Develop procedures for finding extreme values,
3. Explain, graph and differentiate trigonometric functions,
4. Solve linear differential equations analytically,
5. Use numerical methods to solve differential equations,
6. Explain the concept of integration and perform simple integrations,
7. Use basic methods of integration to evaluate integrals,
8. Use mathematics software, such as MAPLE or EXCEL, to solve mathematical problems in life sciences.

Course Objectives and Expectations on Students

This is a second and advanced 3-unit calculus course designed for students who are majoring in life sciences, particularly in biology. It is also for students wishing to satisfy SDSU's mathematics requirement for General Education.

The biological science is rapidly expanding with an increased need for more quantitative analysis of the data. Mathematics and computers are becoming more important to the life science work force. The main objective of this course is to provide student basic calculus skills to develop mathematical models for biological sciences, to help analyze data from life sciences, and to use mathematics software for solving life science problems. The students are expected to appreciate the usefulness of differentiation calculus and to relate the calculus to life science problems in their real life.

Scope and Purpose of the Course

This course, a second calculus course following Math 121, provides further knowledge and methods of differential and integral calculus for life sciences. It will introduce students to the more advanced concepts and methods of differential and integral calculus and applications to life sciences. The central themes of the course will be functions as mathematical models for life science problems, and determination and analysis of these functions by using differentiation and integration tools and computer software. For example, the monthly mean of surface air temperature at Chicago has an annual cycle, which may be modeled by trigonometric functions. The course material can aid to explain why a cat falling from a significant height

can always land on its feet. Quantitative description and analysis of these life science examples by using calculus will be taught in the course.

The course is intended to help students develop basic calculus thinking and problem-solving strategies that can be applied to life science problems. By emphasizing mathematical methods of applications, this course will engage students in logical thinking, problem solving and basic skills of data analysis and modeling in life sciences.

We will normally cover the following topics: logistic growth model, dynamical systems and applications, trigonometric functions, Newton's method for finding roots, differential equation, numerical methods for differential equations, definite integral, and usage of computer software. Although you will be challenged, the overriding theme of the course is to gain the basic calculus skills that are essential to today's life science workforce and researchers.

This Course Addresses GE (General Education) Requirement

This is a GE course. It addresses the GE requirement from three perspectives: (1) construct mathematical models for life sciences, analyze biological data, and communicate mathematical arguments, (2) apply differential and integral calculus skills to the real world problems, and (3) illustrate relevance of mathematical concepts across boundaries of various disciplines.

Assessment and Grading Method and Policy

Lab exam	30%
Homework	15%
Three Tests	35%
Final Exam	20%

The class consists of two lectures and one computer lab (2 hours) each week. The computer labs and the Lab Exams will provide practical applications of calculus to biology and will constitute 30% of your grade.

Mandatory class and lab attendance: Attendance to all lectures and labs is mandatory. We will often expand upon the ideas discussed in the book and some of the ideas and problems from the lectures may appear on the Exams. Attendance is extremely important.

No make-up exams: There are no make-up exams. If you miss an exam do to an emergency or illness, and you present verifiable documentation explaining the absence (i.e., letter from your doctor with addresses and phone numbers), then the other two exams will count as 45% of your grade. If you miss two exams, then you will need to take the course again.

Learning Resources for This Course

<http://www-rohan.sdsu.edu/~jmahaffy/courses/f08/math122/index.html> (Handouts, Announcements, Assignments, Exam scores)

www.math.sdsu.edu You can find Tutoring information by clicking on Dept Resources at top.

Tentative Schedule

WEEKS	TOPICS COVERED
1-3	Logistic Growth and Dynamical Systems
4-5	Trigonometric functions and their derivatives

6-8 Newton's method and optimization
9-11 Linear differential equations
12-13 Methods for solving differential equations
14-15 Definite integrals

FINAL EXAM THURSDAY, MM/DD/YYYY, 10AM-12PM

Religious Holidays: Please notify the instructor if a religious holiday conflicts with scheduled class or class work as soon as possible.