

Southern Illinois University Carbondale
Applied Calculus for Technology
IT-307 Syllabus

Course Description: Applying mathematical techniques to technology problems, including analysis, formulation, and problem solutions. Techniques of differentiation, max-min problems, and elementary techniques of integration.

Course Objectives: Develop proficiency in applying the mathematical methods of calculus to the solution of industrial and business problems. This includes development of the ability to analyze a problem and to formulate it in mathematical terms appropriate to its solution through the use of calculus.

Textbook: Calculus for Business, Economics, and the Social and Life Sciences, 8th Edition, Laurence D. Hoffman and Gerald L. Bradley, McGraw-Hill Book Company, New York, 2004. ISBN: 0-07-242432-x..... OR...

Calculus for Business, Economics, and the Social and Life Sciences, 9th Edition, Laurence D. Hoffman and Gerald L. Bradley, McGraw-Hill Book Company, New York, 2007. ISBN: 0-07-305191-8

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Prerequisite: Mathematics 111 (Precalculus) or equivalent (College Algebra).

Equipment: A hand-held scientific calculator with graphing capabilities (of the student's choice) is recommended but not required. The Instructor will be referencing and using the TI-89 in class.

Notes and Class Aids: Students are encouraged to acquire a copy of the instructor's notes via email (from the instructor). These notes may be referenced during testing. In addition the student may find it beneficial to purchase the Student Solutions Manual for the 8th Edition (ISBN: 0-07-285583-5) not sure if it is available for the 9th Edition.

Assignments: If it has "been a while" since the student completed his last math class it is recommended that he conduct a self-analysis of his Algebra skills and purchase review materials as required. The Instructor **urges** the student to review the Quadratic Equation, Chapter 1, and Appendix A in the text **as a minimum** prior to the first class.

Grading: Letter grades will be based on the following:

90 – 100% = A
80 – 89% = B
70 – 79% = C
60 – 69% = D
Less than 60% = F

Evaluation: There will be four in-class tests and one take-home test each worth 100 points for a total of 500 points. In addition there are two graded homework assignments (each worth 100 points) that constitute the remaining 200 points. The student's grade is computed as a percentage of the 700 total points. All in-class tests are closed book unless noted. Calculators may be used for test purposes however it is not to be used solely to calculate "the answer." The student is required to show the steps and rules required in calculating the answer and it is at the **discretion** of the Instructor to determine if enough work is included.

NOTE: Take home assignments (tests and homework) will be collected at 8:00 AM on the due date. Assignments turned in late will be subject to the following grade penalty: 10 points if turned in after the assigned time on the due date, 20 points each calendar day thereafter. Exception to this policy is documented emergencies or excused absences.

Missed exams and quizzes: Make-up tests will be given for absences due to **documented** emergencies/excused absences due to circumstances beyond the control of the student. If a student misses class it is his responsibility to provide documentation and make up the missed work and tests.

Course Outline and Sequence:

Weekend 1	Chapter 1	Sections 1.1	There will be a not-for-grade pre-test on Saturday morning covering basic Algebra and Chapter 1 Sections 1, 2 & 3.
	Note: Lecture on this chapter is mostly review.	1.2	
		1.3	
		1.4	
		1.5	
	Chapter 2	Sections 2.1	
		2.2	
		2.3	
		2.4	
		2.5	
		2.6	
	Chapter 3	Sections 3.4	
		3.5	
	Chapter 4	Sections 4.1	
		4.2	

Take home test (#1) covering Chapters 2 & 3
 Graded Home-work assignment #1 covering Chapters 3 & 4

Weekend 2	Chapters 4, 5 & 6 on	Sections 4.3	Sat. 8:00 AM take home assignments due
	Introducing	4.4	
	exponential and	Sections 5.1	
	logarithmic	5.2	Saturday PM In-class Test (#2)
	functions	5.4	covering Chapters 3 & 4
		Section 6.1	
		6.2	Sunday PM In-class Test (#3)
			covering Chapters 3 & 4

Take home test (#3 optional) covering Chapters 3 & 4
 Graded Home-work assignment #2 covering Chapters 4, 5 & 6

Weekend 3	Chapters 4, 5 & 6	Sections 4.3	Sat. 8:00 AM take home assignments due
	Concentrating	4.4	
	exponential and	Sections 5.1	
	logarithmic	5.2	Saturday PM In-class Test (#4)
	functions	5.4	covering Chapters 4, 5 & 6
		Section 6.1	
		6.2	Sunday PM In-class Test (#5)
			covering Chapters 5 & 6

IT 307 Applied Calculus for Technology
Student Competencies

1. Algebra Review: Students will start with a general review of algebraic concepts that will be required for the satisfactory completion of this course. These requirements include those concepts found in the Appendices of the textbook and especially the following:

- a. Exponential Definitions and Laws
- b. Factoring Polynomials
- c. Solving Linear and Quadratic Equations
- d. Solving Linear and Non-Linear Inequalities
- e. Solving Systems of Equations

2. Functions: The study of functions is essential to the understanding of calculus. These will be accomplished both graphically and algebraically to enhance understanding of the material.

- a. Definition of a Function
- b. Domain of a Function
- c. Functional Notation
- d. Operations of Functions --basic operations and composition
- e. Special Functions
 - (1) Linear Functions
 - (2) Quadratic Functions
 - (3) Exponential and Logarithmic Functions
 - (4) Piece-wise Defined Functions
- f. Graphs of Functions
 - (1) Basic Principles
 - (2) Functional Models

3. Limits and Continuity of Function: The study of limits will be completed both graphically and algebraically with the student gaining an understanding of several types of functions and their geometric meaning.

- a. Limits
 - (1) Definition geometric notion
 - (2) Definition formal definition
 - (3) Finding limits of functions
 - (a) on a graph
 - (b) of an equation
- b. Continuity
 - (1) Definition geometric
 - (2) Definition formal definition

4. The Derivative: After studying the formal definition of the derivative and considering its graphic implications, the student will learn the techniques of differentiation and apply these techniques to solving problems.

a. Formal Definition

$$\lim_{\Delta x \rightarrow 0} \frac{f(x + \Delta x) - f(x)}{\Delta x}$$

b. Rules:

- (1) Power Rule
- (2) Sum Rule
- (3) Product Rule
- (4) Quotient Rule
- (5) Chain Rule
- (6) Implicit Differentiation
- (7) Higher Order Derivatives

c. Applications

- (1) Rate of change
- (2) Differentials used in Marginal Analysis
- (3) Absolute and Relative Extrema
- (4) Optimization
- (5) Exponential Models

5. Antiderivatives and the Integral: After studying the concept of antidifferentiation and integration, and once again considering the graphic implications, the student will learn elementary techniques and apply these techniques.

a. The Indefinite Integral

b. Rules

- (1) Power Rule
- (2) $\int \frac{1}{x} dx$
- (3) $\int e^x dx$
- (4) Sum Rule
- (5) Integration by Substitution
- (6) Integration by Parts
- (7) Use of Tables

c. Applications

- (1) The Definite Integral: $\int_a^b f(x) dx$
- (2) Area
- (3) Length
- (4) Business and Economic Problems