CAL POLY

September 2009

MATH 141 Calculus I

1. Catalog Description

MATH 141, 142, 143 Calculus I, II, III (4) (4) (4) GE B1
(Also listed as HNRS 141, 142, 143)

Limits, continuity, differentiation, integration. Techniques of integration, applications to physics, transcendental functions. Infinite sequences and series, vector algebra, curves. 4 lectures. **MATH 141** prerequisite: Completion of ELM requirement and passing score on appropriate Mathematics Placement Examination, or MATH 118 and MATH 119 or equivalent. **MATH 142** prerequisite: MATH 141 with a grade of C- or better or consent of instructor. **MATH 143** prerequisite: MATH 142.

2. Required Background or Experience

Math 118 and Math 119 or equivalent.

3. Learning Objectives

The student should:
a. Understand the meanings of functions, and be able to represent them by means of graphs.
b. Understand fundamental concepts of limits and continuity.
c. Understand the meaning of a derivative and be able to compute derivatives of algebraic functions and trigonometric functions.
d. Be able to use derivatives to solve problems involving maxima, minima, and related rates.
e. Begin to understand integration.

4. Text and References

Stewart, James, Calculus, 6th edition, Thomson Brooks/Cole, 2008.

5. Minimum Student Materials

Paper, pencils and notebook.

6. Minimum University Facilities

Classroom with ample chalkboard space for class use.

7. Content and Method

Content	No. of Lectures
CHAPTER 1 – **FUNCTIONS AND MODELS**	1
CHAPTER 2 – **LIMITS AND RATES OF CHANGE**	5
2.1 The Tangent and Velocity Problems	
2.2 The Limit of a Function	
2.3 Calculating Limits using the Limit Laws	
2.5 Continuity	

CHAPTER 3 – **DERIVATIVES**		9
3.1	Derivatives and Rates of Change	
3.2	Derivative as a Function	
3.3	Differentiation Formulas	
3.4	Derivatives of Trigonometric Functions	
3.5	The Chain Rule	
3.6	Implicit Differentiation	
3.8	Related Rates	
3.9	Linear Approximations and Differentials	
CHAPTER 4 –**APPLICATIONS OF DIFFERENTIATION**		11
4.1	Maximum and Minimum Values	
4.2	The Mean Value Theorem	
4.3	How Derivatives Affect the Shape of the Graph	
4.4	Limits at Infinity; Horizontal Asymptotes	
4.5	A Summary of Curve Sketching	
4.7	Optimization Problems	
4.8	Newton's Method	
4.9	Antiderivatives	
CHAPTER 5 – **INTEGRALS**		6
5.1	Area and Distances	
5.2	The Definite Integral	
5.3	The Fundamental Theorem of Calculus	
5.4	Indefinite Integrals and the Total Change Theorem	
5.5	The Substitution Rule	
	Total	32

Note

The version of the text we use differs from the standard 6th edition of Stewart in one way. At the end of each chapter, there are supplementary problems whose answers don't appear in the solutions
manual. Instructors wishing to grade students on the correctness of homework solutions could consider assigning some of these.

The above course outline lists the sections which should be covered carefully and in their entirety. It is expected that in most cases, several more sections can be taught. Additional material should be chosen from the following sections: 2.4 The precise Definition of a Limit, 3.9 Linear Approximations and Differentials, and 4.8 Newton's Method. Instructors can choose the additional sections according to their own tastes and as time permits.

Method

Largely lecture with blackboard illustration of the discussion along with supervised work and individual conferences.

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. For instructors who so choose, quizzes can be given once or twice a week to provide a spot check of student learning. Homework is typically required daily.