國立清華大學
微積分一 Calculus (I)

Math 1010-05 Fall 2007
Textbook: *Calculus* by Salas, Hille, Etgen (10th edition)
Instructor: Kuo-Chang Chen

Chapter 1. Limits and Continuity (2 weeks)
1.1. Idea and definition of limit
1.2. Some limit theorems
1.3. Continuity
1.4. The pinching theorem
1.5. Two basic theorems

Chapter 2. Differentiation (2.5 weeks)
2.1. Idea and definition of derivative
2.2. Some differentiation formulas
2.3. Higher order derivatives
2.4. The chain rule
2.5. Differentiating trigonometric functions
2.6. Implicit differentiation

Chapter 3. Applications of the First and Second Derivatives (2.5 weeks)
3.1. The mean-value theorem
3.2. Increasing and decreasing functions
3.3. Local extreme values
3.4. Absolute extreme values
3.5. Concavity and points of inflection
3.6. Asymptotes
3.7. Differentials

Chapter 4. Integration (3 weeks)
4.1. Idea and definition of integral
4.2. Some properties of the definite integral
4.3. The antiderivative
4.4. The fundamental theorem of calculus
4.5. Some area problems
4.6. Indefinite integrals
4.7. Substitution and change of variables
4.8. Mean-value theorems for integrals

Chapter 5. Some Applications of the Integral (1 week)
5.1. Volume by parallel cross sections
5.2. Volume by shell method
5.3. The centroid of a region
5.4. The notion of work

Chapter 6. Some Transcendental Functions (1.5 week)

6.1. The logarithm function
6.2. The exponential function
6.3. Exponential growth and decay
6.4. Inverse trigonometric functions
6.5. Hyperbolic functions

Chapter 7. Techniques of Integration (1.5 weeks)

7.1. Integration by parts
7.2. Trigonometric polynomials
7.3. Trigonometric substitutions
7.4. Rational functions

Chapter 8. Polar Coordinates and Parametric Curves (1 week)

8.1. Polar coordinates
8.2. Area in polar coordinates
8.3. Parametric curves.
8.4. Tangents to parametric curves
8.5. Arc length and speed
8.6. Surfaces of revolution

Midterm Exam 1 (Thursday, Oct 25): Chapter 1, Chapter 2, Sections $3.1-3.4$
Midterm Exam 2 (Tuesday, Dec 18): Sections $3.5-3.7$, Chapter 4, Chapter 5
Final Exam (Tuesday, Jan 8): Chapter 1 ~ Chapter 8