City College of San Francisco
Course Outline of Record

I. GENERAL DESCRIPTION
A. Approval Date
   April 2014
B. Department
   Mathematics
C. Course Number
   MATH 110B
D. Course Title
   Calculus II
E. Course Outline Preparer(s)
   Amy McLanahan, Alice Stevens, Gary Ling, Lily Lum, Ni Peterkovsky
F. Department Chair
   Dennis Piotrowski
G. Dean
   David Yee

II. COURSE SPECIFICS
A. Hours
   Lecture: 4 weekly (70 total)
   Conference: 1 weekly (17.5 total)
B. Units
   4
C. Prerequisites
   MATH 110A
   None
   None
D. Course Justification
   The calculus sequence, MATH 110A/B/C, is intended for students majoring in mathematics, computer science, engineering, or physical sciences.
E. Field Trips
   No
F. Method of Grading
   Letter
G. Repeatability
   0

III. CATALOG DESCRIPTION
A second course in single-variable calculus. Applications of integration, techniques of integration, numerical integration, indeterminate forms, improper integrals, parametrized curves, polar coordinates, infinite sequences and series, and power series.

IV. MAJOR LEARNING OUTCOMES
Upon completion of this course a student will be able to:
A. Evaluate definite, indefinite, and improper integrals by employing standard techniques of integration.
B. Estimate definite integrals using numerical techniques.
C. Apply integration to solve problems involving geometric calculations, applications to physics, and other problems involving total change of a function.
D. Describe, graph, compare, contrast, and apply polar and parametric representations of curves using the tools of calculus.
E. Evaluate limits involving indeterminate forms.
F. Determine the convergence or divergence of sequences, series, and improper integrals.
G. Apply convergence tests to infinite series.
H. Calculate and interpret the interval of convergence of power series.
I. Calculate, interpret, and apply power series representations of functions.

V. CONTENTS
A. Applications of integration
   1. Volumes by slicing, including disks and washers
   2. Volumes by cylindrical shells
   3. Centroids
   4. Work
   5. Average value of a function
   6. The Mean Value Theorem for integrals
   7. Arc length
   8. Area of a surface of revolution
   9. Separable differential equations
B. Techniques of integration
   1. Integration by parts
   2. Trigonometric integrals
   3. Trigonometric substitution
   4. Partial fractions
   5. Integration using tables
   6. Numerical integration
      a. Midpoint rule
      b. Trapezoidal rule
      c. Simpson's rule
C. Indeterminate forms and improper integrals
   1. Definitions
   2. L'Hopital's rule
   3. Computation of improper integrals
   4. Comparison tests for improper integrals
D. Parameterized curves
   1. Parameterizations
   2. Tangents
   3. Areas bounded by parametric curves
   4. Arc length
E. Polar coordinates
   1. Graphing in polar coordinates
   2. Tangents to polar curves
   3. Areas bounded by polar curves
   4. Arc length
F. Infinite sequences
   1. Definition and notation
   2. Definition of convergence
   3. Convergence theorems
G. Infinite series
   1. Definition and notation
   2. Definition of convergence
   3. Geometric series
4. Harmonic series
5. p-series
6. Sums, differences, and multiples of convergent series
7. Absolute and conditional convergence
8. Convergence tests
   a. Nth term test for divergence
   b. Integral test with bounds
   c. Direct comparison test
   d. Limit comparison test
   e. Alternating series test with remainder bound
   f. Ratio test
   g. Root test
H. Polynomial approximation and power series
1. Taylor polynomial approximations
2. Taylor's formula with remainder
3. Definition of power series
4. Radius and interval of convergence
5. Power series representations for some familiar functions
   a. Reciprocal function
   b. Natural exponential function
   c. Sine and cosine functions
   d. Binomial series
6. Constructions of new power series from known power series
7. Differentiation and integration of power series

VI. INSTRUCTIONAL METHODOLOGY
A. Assignments
1. In-class assignments: discussion, individualized work, or small group work appropriate to the day's lesson
2. Out-of-class assignments
   a. Regular reading assignments on material covered in class
   b. Regular homework that provides students with review and practice on the topics and procedures taught such as techniques of integration, applications of integration, infinite sequences and series, and power series
   c. Group work may be required at the discretion of the instructor
B. Evaluation
1. Assignments as described above
2. Periodic exams that assess each student's proficiency in topics such as evaluating integrals using trigonometric substitution and integration by parts, estimating definite integrals using numerical techniques such as the trapezoidal rule, and applying convergence tests to infinite series
3. A comprehensive final examination in key topics such as computing volumes of solids of revolution using washers, evaluating improper integrals, graphing in polar coordinates, and calculating power series representations of functions
C. Textbooks and other instructional materials
1. Textbook
Learning, Belmont, California, 2012.
b. The Mathematics Department's textbook list indicates the current textbook.
2. Other Instructional Materials
   a. Instructor developed notes or supplementary exercises may be required.
   b. A scientific calculator or graphing calculator may be required.
   c. Access to the Internet for online homework may be required.

VII. TITLE 5 CLASSIFICATION
CREDIT/DEGREE APPLICABLE (meets all standards of Title 5. Section 55002(a)).