



## COURSE OUTLINE

<u>Course Number</u> MAT152	<u>Course Title</u> Calculus II	<u>Credits</u> 4
<u>Hours:</u> <u>Lecture/Lab/Other</u> 4 Lecture	<u>Co- or Pre-requisite</u> MAT151 with a minimum C grade or better, successful completion of an equivalent course, or approval of the department chair.	<u>Implementation</u> <u>sem/year</u> Fall 2003

### Catalog description (2009-2012 Catalog):

Continuation of MAT151. Topics include techniques of integration, areas, volumes, arc length, surface area, improper integrals, analysis of infinite sequences and series, Maclaurin and Taylor series, parametric equations and derivatives of parametric curves, polar coordinates in the plane and integrals using polar coordinates, and the analytic geometry of the conic sections.

Is the course New, Revised or Modified? No

### Required texts/other materials

1. Text: Calculus with Early Transcendentals, 6<sup>th</sup> Edition  
Author: Stewart  
Publisher: Thomson
2. A graphing calculator is required. Recommended models include the TI-83, TI-84, or TI-86. Calculators with symbolic manipulation are not permitted.

Revision date:  
Spring 2009

Course coordinator:  
Art Schwartz 609.570.3761

### Information resources:

- The college library has many books and CDs available for reference.
- WebAssign is an online companion to the text offering a lot of practice.
- The Learning Center has tutoring and help available to the students.

**Course Competencies/Goals:**

Upon successful completion of this course, students will be able to demonstrate the ability to:

1. Identify and use techniques necessary for integration.
2. Calculate areas, volumes, surface areas, and arc lengths using integration .
3. Develop power series representations of functions and use the appropriate convergence test to study the behavior of series.
4. Apply techniques of differential and integral calculus to parametric and polar equations.
5. Recognize and apply equations of conic sections.
6. Use calculus methods to model and solve applications problems, including selecting or developing appropriate procedures and verifying the validity and appropriateness of the solution.
7. Demonstrate specific skills, competencies, and thought processes sufficient to support further study or work in this field or related fields.

**Course-specific General Education Knowledge Goals and Core Skills:****General Education Knowledge Goals:**

**Goal 1. Communication.** Students will communicate effectively in both speech and writing.

**Goal 2. Mathematics.** Students will use appropriate mathematical and statistical concepts and operations to interpret data and to solve problems.

**Goal 4. Technology.** Students will use computer systems or other appropriate forms of technology to achieve educational and personal goals.

**MCCC Core Skills:**

**Goal A. Written and Oral Communication in English.** Students will communicate effectively in speech and writing, and demonstrate proficiency in reading.

**Goal B. Critical Thinking and Problem-solving.** Students will use critical thinking and problem solving skills in analyzing information.

In the following **Units of Study in Detail** Course Competencies/Goals will be denoted CG, **General Education Knowledge Goals** will be denoted GE and **MCCC Core Skills** will be denoted CS.

**Units of Study in Detail:****UNIT I Applications of the Definite Integral** (8 lecture hours)  
(Sections on work, fluid pressure, and force are optional.)

At the conclusion of this unit the student should be able to:

1. calculate the area bounded by several functions using  $x$  or  $y$  as the independent variable of integration. (CG 1,2,6,7; GE 1,2,4; CS A)
2. calculate the volume generated by revolving an area bounded by several functions about the  $x$  axis or  $y$  axis by using the disk-washer or cylindrical shells methods. (CG 1, 2, 6, 7; GE 1, 2, 4; CS A)
3. define and use integrals to find the length of a plane curve. (CG 1, 2, 6, 7; GE 1,2,4; CS A)
4. define and use integrals to find the surface of revolution. (CG 1, 2,6,7; GE 1,2,4; CS A)
5. define and use properly the vocabulary presented in this unit. (CG 1, 2, 6, 7; GE 1,2,4; CS A)

**UNIT II Principles of Integral Evaluation** (14 lecture hours)

At the conclusion of this unit the student should be able to:

1. apply the appropriate integration formulas previously presented in this course. (CG 1, 2, 6, 7; GE 1,2,4; CS A,B)
2. recognize when to use and perform integration by parts as many times as needed to evaluate an integral. (CG 1,2,6,7; GE 1,2,4; CS A,B)
3. apply trigonometric identities to integrate powers of trigonometric functions. (CG 1, 2, 6, 7; GE 1,2,4; CS A,B)
4. use trigonometric substitution where applicable to evaluate integrals. (CG 1,2,6,7; GE 1, 2, 4; CS A,B)
5. use partial fraction decomposition when needed to integrate rational functions. (CG 1, 2, 6, 7; GE 1, 2, 4; CS A,B)
6. use integral tables to evaluate integrals. (CG 1,2,6,7; GE 1,2,4; CS A,B)
7. explain and use the trapezoid rule or Simpson's rule to approximate definite integrals. (CG 1, 2, 6, 7; GE 1, 2, 4; CS A,B)
8. determine whether an integral is improper, and if so, determine if it converges or diverges and be able to find what it converges to if it converges. (CG 1,2,6,7; GE 1,2,4; CS A,B)
9. define and use properly the vocabulary presented in this unit. (CG 1,2,6,7; GE 1,2,4; CS A)

**UNIT III      Infinite Series**

(18 lecture hours)

Upon completion of this unit, a student should be able to:

1. define an infinite sequence, write several of its terms, write its general term and determine whether it converges to a limit or diverges. (CG 1,3,6,7; GE 1,2,4; CS A, B)
2. apply the methods of the difference, ratio or derivative methods to determine if a sequence is eventually monotonic or neither, if a sequence is bounded and, if it is bounded, its limit. (CG 1,3,6,7; GE 1,2,4; CS A,B)
3. for a given infinite series determine which convergence test (divergence test, p-series, integral test, comparison test, limit comparison test, ratio test, root test, geometric series, or alternating series test) to use to determine absolute convergence, conditional convergence or divergence, apply the test and if possible determine the limit. (CG 1, 3,6,7; GE 1,2,4; CS B)
4. write an  $n$ th degree Maclaurin or Taylor polynomial for a given function and determine the related Maclaurin or Taylor series. (CG 1,3,6,7; GE 1,2,4; CS B)
5. calculate the radius of convergence and interval of convergence for a given power series. (CG 1,3,6,7; GE 1,2,4; CS B)
6. state and apply the Remainder Estimation Theorem to estimate the error in using a polynomial of  $n$ th degree to approximate a function. (CG 1,3,6,7; GE 1,2,4; CS A, B)
7. perform algebraic and calculus manipulations of power series. (CG 1,3,6,7; GE 1,2,4; CS B)
8. define and use properly the vocabulary presented in this unit. (CG 1,2,3,6,7; GE 1,2,4; CS A)

**UNIT IV      Analytic Geometry in Calculus**

(8 lecture hours)

Upon completion of this unit, a student should be able to:

1. convert points in rectangular form to polar form and vice versa. (CG 1,4,6,7; GE 1,2,4; CS B)
2. graph equations and points using the polar coordinate system. (CG 1,4,6,7; GE 1,2,4; CS B)
3. determine the polar equation for a given graph. (CG 1,4,6,7; GE 1,2,4; CS B)
4. calculate slopes of tangent lines, equations of tangent lines and length of parametric and polar curves. (CG 1,4,6,7; GE 1,2,4; CS B)
5. calculate areas of regions that are bounded by polar curves. (CG 1,4,6,7; GE 1,2,4; CS B)
6. find vertices, foci, centers, asymptotes, directrix, where applicable of conic sections given in rectangular form and use this information to solve application problems. (CG 1,4,6,7; GE 1,2,4; CS B)

7. find the eccentricity, foci, the distance from the pole to the directrix or vertices of given polar equations of a conic section in order illustrate the graph. (CG 1,4,6,7; GE 1,2,4; CS B)
8. derive the polar equation of a conic section for given conditions. (CG 1,4,6,7; GE 1,2,4; CS B)
9. define and use properly the vocabulary presented in this unit. (CG 1,4,6,7; GE 1,2,4; CS A)

### **Evaluation of student learning:**

Tests, quizzes, homework assignments and projects may be used in evaluating the students' progress throughout the course depending on the individual instructor. It is suggested that four unit tests and a final exam be used in evaluating the students' progress. A suggested day-by-day schedule and suggested homework problems should be available to the students. A final exam must be given in the course.

A possible plan for determining the students' final grades is as follows:

Four Unit Tests	60%
Cumulative Final Exam	25%
Homework, Projects and Quizzes	15%

### **Statement of Academic Integrity**

Under no circumstance should students knowingly represent the work of another as one's own. Students may not use any unauthorized assistance to complete assignments or exams, including but not limited to cheat-sheets, cell phones, text messaging and copying from another student. Violations should be reported to the Academic Integrity Committee and will be penalized. Please refer to the Student Handbook for more details.