



# BROWARD COMMUNITY COLLEGE COURSE OUTLINE

**LAST REVIEW: 2002-2003**  
*(i.e. 2003-2004)*

**NEXT REVIEW: 2007-2008**  
*(i.e. 2008-2009)*

**STATUS: A**  
*(A, I, D)*

**COURSE TITLE: Calculus and Analytical Geometry II**

**COMMON COURSE NUMBER: MAC 2312**

**CREDIT HOURS: 5**

**CONTACT HOUR BREAKDOWN**  
*(per 16 week term)*

**CLOCK HOURS:**  
*(Voc. Course ONLY)*

Lecture: **80**      Lab:  
Clinic:              Other:

**PREREQUISITE(S): MAC 2311**

**COREQUISITE(S): None**

**PRE/COREQUISITE(S): None**

**COURSE DESCRIPTION** *(750 characters, maximum):*

This is the second of a three-course sequence in calculus. Topics include techniques of integration, conics, polar coordinates, indeterminate forms, L'Hopital's Rule, proper integrals, infinite series, parametric equations, improper integrals and vectors; volume, arc length, surface area, work, and other applications of integration. A graphing calculator may be required in certain sections of this course. Meets Area 5A of the general education requirements for the A.A. degree. Meets Areas 4 or 5 of the general education requirements for the A.S. degree. Recommendation of the Mathematics Department or at least a grade of "C" in the prerequisite is required.

General Education Requirements – Associate of Arts Degree (AA), meets Area(s):      Area  
General Education Requirements – Associate in Science Degree (AS), meets Area(s):      Area  
General Education Requirements – Associate in Applied Science Degree (AAS), meets Area(s):      Area

## UNIT TITLES

1. Techniques of Integration
2. Polar Coordinates and Conics
3. Indeterminate Forms and Improper Integrals
4. Sequences and Infinite Series
5. Vectors
6. Parametric Equations
7. Applications of the Definite Integral



# BROWARD COMMUNITY COLLEGE COURSE OUTLINE

## EVALUATION:

Please provide a brief description (250 characters maximum) that details how students will be assessed on the course outcomes.

Students will be assessed on the course outcomes of this course in a variety of ways. They will be assessed with chapter tests, quizzes on one or more sections, midterm exams and final exams.

*\*\*\* Complete the following only if course is seeking general education status \*\*\**

## GENERAL EDUCATION Competencies and Skills \*:

Please highlight in green font all Competencies/Skills from the list below that apply to this course. In the box to the right of the Competency/Skill, enter all specific learning outcome numbers (i.e. 1.1, 2.7, 5.12) that apply.

1. Read with critical comprehension	
2. Speak and listen effectively	
3. Write clearly and coherently	
4. Think creatively, logically, critically, and reflectively (analyze, synthesize, apply, and evaluate)	1.1 – 1.7   3.1 – 3.6   5.1 – 5.4   7.1 – 7.8
5. Demonstrate and apply literacy in its various forms: (highlight in green ALL that apply) (1. technological, 2. informational, 3. mathematical, 4. scientific, 5. cultural, 6. historical, 7. aesthetic and/or 8. environmental )	1.1 – 1.7   4.1 – 4.8   7.1 – 7.8 2.1 – 2.7   5.1 – 5.4 3.1 – 3.6   6.1 – 6.9
6. Apply problem solving techniques to real-world experiences	7.1 – 7.8   6.7 – 6.9
7. Apply methods of scientific inquiry	
8. Demonstrate an understanding of the physical and biological environment and how it is impacted by human beings	
9. Demonstrate an understanding of and appreciation for human diversities and commonalities	
10. Collaborate with others to achieve common goals.	
11. Research, synthesize and produce original work	
12. Practice ethical behavior	
13. Demonstrate self-direction and self motivation	
14. Assume responsibility for and understand the impact of personal behaviors on self and society	
15. Contribute to the welfare of the community	

\* General Education Competencies and Skills endorsed by '05-'06 General Education Task Force



**Common Course Number: MAC 2312**

**UNITS**

**Unit 1      Techniques of Integration**

General Outcome:

- 1.0      The student shall be able to apply systematic procedures for estimating and evaluating elementary integrals.

Specific Measurable Learning Outcomes:

Upon successful completion of this unit, the student shall be able to:

- 1.1      Integrate by using basic integration formulas.
- 1.2      Integrate by using algebraic, trigonometric and other substitution methods.
- 1.3      Integrate by parts
- 1.4      Integrate certain trigonometric integrals involving powers of trigonometric functions.
- 1.5      Integrate by trigonometric substitution when integrands contain expressions of the forms:  $a^2 - u^2$ ,  $u^2 - a^2$ ,  $a^2 + u^2$  or  $ax^2 + bx + c$
- 1.6      Evaluate integrals with rational integrands by the use of partial fractions.
- 1.7      Evaluate integrals using a table of integrals.



**Common Course Number: MAC 2312**

**Unit 2      Polar Coordinates and Conics**

General Outcome:

- 2.0      The student shall be able to explain the relationship between Cartesian and polar coordinates and be able to convert relations in the plane based on one system to the other. In addition, the students should be able to apply the concepts of calculus to these relations and their graphical representations.

Specific Measurable Learning Outcomes:

Upon successful completion of this unit, the student shall be able to:

- 2.1      Apply knowledge of polar coordinate system to change points and/or equations from the Cartesian coordinate system to the polar coordinate system and vice versa.
- 2.2      Graph polar equations including some polar equations of conics.
- 2.3      Find the points of intersection of curves whose equations are in polar form.
- 2.4      Find plane areas when the equations of curves are given in polar form.
- 2.5      Define the conics geometrically, graphically and algebraically.
- 2.6      Identify the standard equations, parameters and the relationship among the parameters for the parabola, the ellipse, and the hyperbola; and graph these curves.
- 2.7      Transform equations by translating and/or rotating the coordinate axes.



**Common Course Number: MAC 2312**

**Unit 3 Indeterminate Forms and Improper Integrals**

General Outcome:

- 3.0 The student shall be able to evaluate limits that are in indeterminate form and to either evaluate convergent improper integrals or show divergence.

Specific Measurable Learning Outcomes:

Upon successful completion of this unit, the student shall be able to:

- 3.1 Recognize limits in indeterminate form.
- 3.2 Apply L'Hopital's Rules to evaluate limits involving indeterminate forms.
- 3.3 Evaluate or show divergence of improper integrals that involve infinite limits of integration.
- 3.4 Apply the Comparison Test to show convergence or divergence of an improper integral.
- 3.5 Apply the concepts to evaluate or show divergence of improper integrals in which the integrand has an infinite discontinuity.
- 3.6 Estimate the value of a convergent improper integral.



**Common Course Number: MAC 2312**

**Unit 4 Sequences and Infinite Series**

General Outcome:

- 4.0 The student shall be able to determine the convergence or divergence of infinite sequences and infinite series; to evaluate certain infinite series; and to determine the set of numbers over which a power series converges.

Specific Measurable Learning Outcomes:

Upon successful completion of this unit, the student shall be able to:

- 4.1 Define infinite sequences, infinite series (including geometric, harmonic and p series), convergence and divergence of sequences and series, and identify the properties of monotonic sequences.
- 4.2 Determine if an infinite sequence diverges or converges and, if the latter, find its limit.
- 4.3 Apply the tests of convergence of a series including the n-th term, geometric series, p-series, alternating series, integral, ratio, root comparison and limit comparison tests.
- 4.4 Determine whether an alternating series converges absolutely, converges conditionally, or diverges.
- 4.5 Determine the radius and interval of convergence of a power series.
- 4.6 Find the power series expansion of certain functions by the processes of algebraic division differentiation and/or integration of a power series.
- 4.7 Find Taylor's expansion with remainder for differentiable functions.
- 4.8 Estimate the error in approximating a convergent series by a partial sum.



**Common Course Number: MAC 2312**

**Unit 5      Vectors**

General Outcome:

- 5.0      The student shall be able to define vectors in the x-y plane; identifying their properties under vector addition and multiplication by a scalar; and apply the dot product and cross product operations as they relate to angles between vectors and projection.

Specific Measurable Learning Outcomes:

Upon successful completion of this unit, the student shall be able to:

- 5.1      Define a vector in algebraic terms.
- 5.2      Define and find the magnitude of a vector.
- 5.3      Identify the properties of vectors under addition and multiplication by a scalar.
- 5.4      Apply the dot product to find projections and angles between vectors.



**Common Course Number: MAC 2312**

**Unit 6 Parametric Equations**

General Outcome:

6.0 The student shall be able to graph curves from their parametric equations and to apply the concepts of calculus to such curves.

Specific Measurable Learning Outcomes:

Upon successful completion of this unit, the student shall be able to:

- 6.1 Sketch the curve from a parametric representation.
- 6.2 Determine which of these terms apply to the curve: simple, smooth, closed.
- 6.3 Obtain a Cartesian equation of the curve in parametric form.
- 6.4 Find  $dy/dx$  without eliminating the parameter.
- 6.5 Find the equations of the tangent line and the normal line to the curve at a given point.
- 6.6 Integrate functions of  $x$  and  $y$  by using the parametric representations
- 6.7 Find the area bounded by a parametrically defined curve.
- 6.8 Find the length of a specified arc of the curve.
- 6.9 Apply the concept of arc length to determine the length of an arc of a specified curve in polar coordinates. Find the length of a specified arc of the curve.



**Common Course Number: MAC 2312**

**Unit 7      Applications of the Definite Integral**

General Outcome:

7.0      The student shall be able to find the area of plane regions, volumes of solids, length of arc of the graph of a function, and the work done by a force using the definite integral.

Specific Measurable Learning Outcomes:

Upon successful completion of this unit, the student shall be able to:

- 7.1      Calculate the area of a region between two curves.
- 7.2      Calculate the volume of a solid of revolution using the Disc Method.
- 7.3      Calculate the volume of a solid of revolution using the Shell Method.
- 7.4      Calculate the volume of a solid of known cross sections.
- 7.5      Calculate the length of an arc of the graph of a function over a finite interval.
- 7.6\*     Calculate the work done by a variable force acting along a line.
- 7.7\*     Calculate centroids of plane regions.
- 7.8\*     Calculate fluid pressure on a surface.

\*Recommended Option