



BROWARD COMMUNITY COLLEGE COURSE OUTLINE

LAST REVIEW: 2008-2009

(i.e. 2003-2004)

NEXT REVIEW: 2013-2014

(i.e. 2008-2009)

STATUS: A

(A, I, D)

COURSE TITLE: Calculus and Analytical Geometry III

COMMON COURSE NUMBER: MAC 2313

CREDIT HOURS: 5

CONTACT HOUR BREAKDOWN

(per 16 week term)

CLOCK HOURS:

(Voc. Course ONLY)

Lecture: **80**

Lab:

Clinic:

Other:

PREREQUISITE(S): MAC 2312

COREQUISITE(S): None

PRE/COREQUISITE(S): None

COURSE DESCRIPTION *(750 characters, maximum):*

This is the third of a three course sequence in calculus. Topics include vectors in 3-space, 3-dimensional surfaces, multivariate functions, cylindrical and spherical coordinates, multiple integrals, partial derivatives, vector fields, Green's Theorem, and Stokes' Theorem. A graphing calculator may be required in certain sections of this course. Recommendation of the Mathematics Department or at least a grade of "C" in the prerequisite course 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. Vectors in Three Space and Solid Analytic Geometry**
- 2. Differential Calculus of Multivariate Functions**
- 3. Directional Derivatives, Gradients and Applications**
- 4. Multiple Integrals**
- 5. Calculus of Vector Fields**

EVALUATION:



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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 – 1.5 3.1 – 3.6 5.1 – 5.6 2.1 – 2.8 4.1 – 4.7
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 – 1.5 4.1 – 4.7 2.1 – 2.8 5.1 – 5.6 3.1 – 3.6
6. Apply problem solving techniques to real-world experiences	1.1 2.1 – 2.4 3.1 – 3.6 5.1 – 5.6 1.3 2.8 4.2 – 4.5 1.4
7. Apply methods of scientific inquiry	1.1 – 1.4 3.1 – 3.6 5.1 – 5.6 2.8 4.1, 4.5
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*



BROWARD COMMUNITY COLLEGE COURSE OUTLINE

Common Course Number: MAC 2313

I. COURSE OVERVIEW:

Upon successful completion of this course, the students should be able to utilize the calculus techniques to analyze functions of more than one variable; find directional derivatives and gradients, apply partial derivatives; execute and apply multiple integration techniques; and explore the calculus of vector fields including Green's, Gauss's and Stokes' Theorems.

II. UNITS

Unit 1 Vectors in Three Space and Solid Analytic Geometry

General Outcome:

1.0 The student shall be able to compute and construct the Algebra of 3-Tuples, and the dot and cross products of vectors; and graph curves, and surfaces in \mathbf{R}^3 .

Specific Measurable Learning Outcomes:

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

1.1 Carry out the operations in a 3-dimensional vector space, graph lines, quadric surfaces, planes, and curves in \mathbf{R}^3 .

1.2 Find dot and cross products in \mathbf{R}^3 and apply them to the geometric constructs.

1.3 Find the equation of a plane and the equations of a line in \mathbf{R}^3 , and graph them.

1.4 Graph cylinders, surfaces of revolution, quadric surfaces, and curves in \mathbf{R}^3 .

1.5 Convert between rectangular, cylindrical and spherical coordinates.



Common Course Number: MAC 2313

Unit 2 Differential Calculus of Multivariate Functions

General Outcome:

- 2.0 The student shall be able to extend the concepts of domain, range, continuity, limits, derivative and differential from functions of one variable to functions of two or more variables.

Specific Measurable Learning Outcomes:

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

- 2.1 Demonstrate knowledge of the definition of a function of two or more variables by finding its domain and range.
- 2.2 Graph the domain and specified level curves of a function of two variables.
- 2.3 Find the partial derivatives for functions of two or three variables including using the chain rule and finding higher order partial derivatives.
- 2.4 Apply knowledge of the geometric interpretation of partial derivatives.
- 2.5 Find points of continuity of functions of two variables.
- 2.6 Demonstrate knowledge of the definition of limit of a function of two or more variables.
- 2.7 Determine whether or not the limit exists at a specified point for a function of two variables.
- 2.8 Find differentials for functions of two variables.



Common Course Number: MAC 2313

Unit 3 Directional Derivatives, Gradients, and Applications

General Outcome:

- 3.0 The student shall be able to find directional derivatives, gradients, and apply partial derivatives to find extrema of functions of two variables.

Specific Measurable Learning Outcomes:

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

- 3.1 Find the directional derivative of a function in the direction $v(t)$.
- 3.2 Find the gradient of a function, ∇f , and use it to find a directional derivative.
- 3.3 Find the equation of the tangent plane to a surface at a point.
- 3.4 Determine if a function has a relative maximum or minimum at a point.
- 3.5 Find the critical points of a function of two variables.
- 3.6 Use the method of Lagrange Multipliers to find the extrema in a constrained extrema problem.



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Unit 4 Multiple Integrals

General Outcome:

- 4.0 The student shall be able to extend the concept of integration to double and triple integrals with application.

Specific Measurable Learning Outcomes:

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

- 4.1 Evaluate double integrals by using iterated integrals.
- 4.2 Find volumes, plane areas, and the areas of surfaces using double integrals.
- 4.3 Evaluate double integrals in polar coordinates and use these integrals to find areas in polar coordinates.
- 4.4 Evaluate triple integrals by using iterated integrals.
- 4.5 Use triple integrals to find the volume of a three dimensional region.
- 4.6 Change coordinates of points and the equations of surfaces from Cartesian to cylindrical coordinates and vice versa.
- 4.7 Change the coordinates of points and the equations of surfaces from Cartesian to spherical coordinates and vice versa.



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Unit 5 Calculus of Vector Fields

General Outcome:

- 5.0 The student shall be able to apply the ideas and theorems of the calculus to vector fields, divergence and curl of a vector field, and use line integrals to find the work done by a force field in moving a particle along a curve.

Specific Measurable Learning Outcomes:

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

- 5.1 Prove that a selected vector field \mathbf{F} is conservative and find a potential function for \mathbf{F} .
- 5.2 Find the curl and divergence of a vector field.
- 5.3 Find the total work done if the motion is caused by a force field.
- 5.4 Evaluate the line integral over a smooth curve \mathbf{C} .
- 5.5 Show that a particular line integral is independent of the path, and evaluate the integral if \mathbf{C} is any piecewise smooth curve from (x_1, y_1, z_1) to (x_2, y_2, z_2) .
- 5.6 Apply Green's, Gauss's and Stokes's Theorems to evaluate line integrals and surface integrals.