

**SOUTHEAST COMMUNITY COLLEGE
DIVISION OF ARTS AND SCIENCES**

Mathematics

Revision Date: 2015-03-31

Term: 2015 Spring
Course: MATH-2080-ES31 (Calculus 3)
Class Time: MTWT 09:30–10:55 CDT
Class Room: ESQ 109C

Instructor: Toby Bartels, PhD
Email: Tbartels@Southeast.edu
Voice mail: 402-323-3452
Text: 402-805-3021
Office Hours: MW 11:30–13:00 CDT, TT 14:30–15:30 CDT
Office: ESQ 112

Course policies are available at <http://TobyBartels.name/MATH-2080/2015w/>.

I. CATALOG DESCRIPTION

Course Number: MATH-2080
Course Title: Calculus & Analytical Geometry III
Prerequisite(s): MATH-1700
Catalog Description: Study of calculus and analytic geometry for functions of two or more variables. Coordinates, three-dimensional vectors, three-dimensional analytic geometry, differentiation and integration of functions of many variables and integration in vector fields.
Credit Hours: 6.0
Class Hours: 58 $\frac{1}{12}$
Lab Hours: 0
Total Contact Hours: 58 $\frac{1}{12}$

II. COURSE OBJECTIVES: *Course will:*

- A. Investigate vectors, vector operations, and applications of vectors to curves and surfaces in space.
- B. Investigate functions of two or more variables using geometric, numerical, and algebraic techniques.
- C. Investigate applications of differential and integral calculus to functions of two or more variables.
- D. Introduce and develop concepts for calculus of vector fields.

III. STUDENT LEARNING OUTCOMES AND GENERAL EDUCATION LEARNING OUTCOMES

- A. Student Learning Outcomes: *Student will be able to:*
 - 1. Identify basic surfaces from equations and write equations for basic curves and surfaces in three dimensions. *(review)*
 - 2. Perform basic vector operations (sum, difference, scalar multiplication, dot product, cross product, and box product) algebraically and interpret the operations graphically. *(review)*
 - 3. Write equations for lines and planes in space. *(review)*
 - 4. Compute and interpret derivatives and integrals of vector-valued functions.
 - 5. Compute limits and derivatives of functions of two or more variables.
 - 6. Use limits and derivatives to analyze a function of two or more variables.
 - 7. Use various tools to find extrema of a function on the interior of its domain and on the boundary of its domain.
 - 8. Write, evaluate, and interpret iterated integrals (double and triple integrals).

9. Use triple integrals to determine the mass, moments, and center of mass of solids in space.
 10. Use iterated integrals in cylindrical and spherical coordinates.
 11. Evaluate line integrals.
 12. Use line integrals of a vector field to compute flow, work, circulation, and flux.
 13. Use Green's Theorem to evaluate line integrals to compute flux, and circulation of a vector field.
 14. Evaluate surface integrals.
 15. Use surface integrals to compute surface area and the flux of a vector field through a surface.
 16. Compute the curl and divergence of a vector field.
 17. Use Stokes's Theorem, and the Divergence Theorem to evaluate surface integrals in a vector field.
- B. General Education Learning Outcomes**
1. **Thinking Critically:** The ability to examine data, ideas, issues and arguments; understand and evaluate assumptions and evidence; and reach logically valid conclusions. *(GELO 2)*
 2. **Problem Solving:** The ability to define a problem, propose hypotheses and strategies for testing solutions, implement outcomes that address all factors of the problem, evaluate results, and define any need for further work. *(GELO 3)*
 3. **Information Literacy:** The ability to identify the need for information; identify and assess sources; and interpret, synthesize, organize and use information within legal and ethical guidelines. *(GELO 5)*
 4. **Quantitative Reasoning:** The ability to reason and solve quantitative problems in a variety of contexts utilizing mathematical manipulations such as words, data sets, graphs, tables, etc. *(GELO 6)*

IV. CONTENT/TOPICAL OUTLINE

- A. Three-Dimensional Coordinate Systems (review)
- B. Vectors (review)
- C. The Dot Product (review)
- D. The Cross Product (review)
- E. Lines and Planes in Space (review)
- F. Cylinders and Quadratic Surfaces
- G. Vector Functions and Their Derivatives
- H. Integrals of Vector Functions
- I. Functions of Several Variables
- J. Limits and Continuity in Higher Dimensions
- K. Partial Derivatives
- L. The Multivariable Chain Rule
- M. Directional Derivatives and Gradient Vectors
- N. Tangent Planes and Differentials
- O. Extreme Values and Saddle Points
- P. Lagrange Multipliers
- Q. Taylor's Formula for Two Variables
- R. Double and Iterated Integrals
- S. Double Integrals over General Regions
- T. Area by Double Integration
- U. Double Integrals in Polar Form
- V. Triple Integrals in Rectangular Coordinates
- W. Moments and Center of Mass
- X. Triple Integrals in Cylindrical and Spherical Coordinates
- Y. Line Integrals

- Z. Vector Fields, Work, Circulation, and Flux
- AA. Path Independence, Potential Functions, and Conservative Fields
- BB. Green's Theorem in the Plane
- CC. Surface Integrals and Flux
- DD. Stokes's Theorem
- EE. The Divergence Theorem
- FF. The Unified Theory

V. INSTRUCTIONAL MATERIALS

- A. Required text: Hass et al, *University Calculus, Early Transcendentals*, 2nd Edition, Pearson (Addison Wesley), 2012: hardback, looseleaf, or through MyMathLab.
- B. Additional resources:
 1. A graphing calculator is suggested.
 2. A MyMathLab access code is recommended.

VI. METHODS OF PRESENTATION/INSTRUCTION

- A. Lecture
- B. Class discussions
- C. Small group activities
- D. MyMathLab (optional)

VII. METHODS OF EVALUATION

- A. Homework in small groups
- B. Individual extra-credit and make-up homework
- C. Comprehensive final exam
- D. SCC grading scale:

A+	95%+	C+	75%+	F	59.99%–
A	90%+	C	70%+		
B+	85%+	D+	65%+		
B	80%+	D	60%+		

VIII. SPECIFIC COURSE REQUIREMENTS

None

SYLLABUS STATEMENTS

Statement of Equal Opportunity and Nondiscrimination

It is the policy of Southeast Community College to provide equal opportunity and non-discrimination in admission, attendance and employment matters for all qualified persons, attending or seeking admission to the College, without regard to race, color, ethnicity, religion, sex, age, marital status, national origin, veteran status, sexual orientation, disability, or other factors prohibited by law. Inquiries concerning the application of Southeast Community College's policies on equal opportunity and non-discrimination should be directed to the Vice President for Access, Equity and Diversity, SCC Area Office, 301 S 68th Street Pl, Lincoln NE 68510-2449; Phone 402-323-3412; Fax 402-323-3420; Email JSoto@Southeast.edu.

Americans with Disabilities Act – Reasonable Accommodations

If you have a disabling condition that may substantially limit your ability to participate in this class, it is your responsibility to contact the Disability Services provider on campus. For additional information and assistance contact:

Lincoln	Room J2	402-437-2620
Milford	Assessment Office	402-761-8202
Beatrice	Jackson Hall – Room J406	402-228-8242

Academic Integrity

Academic Integrity is one of the basic principles of a college community. SCC encourages and expects the highest standards of academic honesty from all students. Please note that cheating, plagiarism, or other forms of academic dishonesty are monitored and subject to disciplinary action.

Electronic Devices

Personal use of any electronic device not authorized by the instructor is prohibited. **Violations may lead to formal disciplinary action.** Instructors, for instructional purposes, may allow in the classroom the use of cell phones and personal electronic devices.

Firearms/Weapons Strictly Prohibited

SCC policy prohibits the possession of firearms, weapons, or fireworks on College property or at any College-sponsored event. Effective January 1, 2007, Nebraska State Statute 69-2441 makes it unlawful to carry a concealed handgun into a meeting of the governing body of a political subdivision, collegiate athletic event, school, school grounds, school-owned vehicle, or school-sponsored activity or athletic event. These prohibitions apply to EVERYONE (employees, students, invitees, and visitors) and are enforceable EVERYWHERE (all College property and all College-related events). Violations of these prohibitions will result in disciplinary and/or law enforcement action.