

Murray State University

Revised 7/28/15

DEPARTMENT: MATHEMATICS AND STATISTICS

COURSE PREFIX: MAT COURSE NUMBER: 309

CREDIT HOURS: 4

I. **TITLE:** Calculus and Analytic Geometry III

II. **COURSE DESCRIPTION AND PREREQUISITE(S):** Course develops main ideas of differentiation and integration of functions of several variables and introduces vector calculus. Topics include vectors, analytic geometry of 3-dimensional space, functions of several variables, partial derivatives, directional derivatives, integrals of functions of two and three variables, vector fields, line integrals, Green's theorem, and the divergence theorem.

Prerequisite(s): MAT 308.

III. **COURSE OBJECTIVES:**

The student will be able to

- A. graph spheres and cylindrical surfaces in 3-space;
- B. perform vector algebra, including dot product, projections, cross product, and triple scalar product;
- C. find vector, symmetric and parametric equations of a line in space;
- D. find vector equation, point-normal form, and general form of equation of plane;
- E. graph cylinders and quadric surfaces. Convert between rectangular, cylindrical and spherical coordinates;
- F. find limit of, differentiate, and integrate vector-valued functions;
- G. find arc length for vector-valued functions and determine motion-velocity, speed, and acceleration along a curve;
- H. find unit tangent and normal vectors to surfaces;
- I. calculate curvature;
- J. determine limit and continuity of functions of several variables;
- K. calculate partial derivatives of functions of several variables;
- L. demonstrate differentiability and chain rules for functions of two or more variables; calculate directional derivatives and gradients;
- M. generalize chain rule for functions of several variables;
- N. use second partial test to find maxima and/or minima and/or saddle points for functions of two variables;
- O. use Lagrange Multipliers to maximize/minimize subject to constraints, a function of two or more variables;
- P. use double integrals to find area over non-rectangular regions or in polar coordinates and surface area;
- Q. use triple integrals to find volume of solids, centroids, and centers of gravity and in spherical and cylindrical coordinates;
- R. calculate Jacobian for two and three-spaces;
- S. evaluate multiple integrals by change of variables;
- T. evaluate a line integral and relation to independence of path;

- U. evaluate surface integrals including vector-valued functions; and
- V. evaluate a line integral using Green's Theorem; Apply the Divergence Theorem, and Stokes' Theorem.

IV. CONTENT OUTLINE:

- A. Vector geometry
- B. The calculus of vector-valued functions
- C. Differentiation in several variables
- D. Multiple integration
- E. Line and surface integrals
- F. Vector analysis

V. INSTRUCTIONAL ACTIVITIES:

Lecture, daily assignments, group work, projects, reading assignments, oral presentations, and quizzes the material, as per instructor course design.

VI. FIELD, CLINICAL, AND/OR LABORATORY EXPERIENCES:

None

VII. TEXT(S) AND RESOURCES:

Calculus Early Transcendentals by Jon Rogawski

VIII. EVALUATION AND GRADING PROCEDURES:

- A. These are instructor specific, based on Exams, Homework, Quizzes, Projects, and the Final Exam. However the grading scale is standard.

Grading Scale:

90 - 100 %	A
80 - 89 %	B
70 - 79 %	C
60 - 69 %	D
Below 60%	E

- B. **Auditing:** If you seek to change your status to audit, you must continue to do all the graded assignments, to attend classes regularly after the audit is given, to miss no more than 5 class periods after the audit is given, and to maintain a grade of at least 70% of the grade they had upon taking the Audit. If these requirements are not followed, then an "E" will be earned for this course.

IX. ATTENDANCE POLICY:

Students are expected to adhere to the MSU Attendance Policy outlined in the current *MSU Bulletin*.

X. ACADEMIC HONESTY POLICY:

Murray State University takes seriously its moral and educational obligation to maintain high standards of academic honesty and ethical behavior. Instructors are expected to evaluate students' academic achievements accurately, as well as ascertain that work submitted by students is authentic and the result of their own efforts, and consistent with

established academic standards. Students are obligated to respect and abide by the basic standards of personal and professional integrity.

Violations of Academic Honesty include:

Cheating - Intentionally using or attempting to use unauthorized information such as books, notes, study aids, or other electronic, online, or digital devices in any academic exercise; as well as unauthorized communication of information by any means to or from others during any academic exercise.

Fabrication and Falsification - Intentional alteration or invention of any information or citation in an academic exercise. Falsification involves changing information whereas fabrication involves inventing or counterfeiting information.

Multiple Submission - The submission of substantial portions of the same academic work, including oral reports, for credit more than once without authorization from the instructor.

Plagiarism - Intentionally or knowingly representing the words, ideas, creative work, or data of someone else as one's own in any academic exercise, without due and proper acknowledgement.

Instructors should outline their expectations that may go beyond the scope of this policy at the beginning of each course and identify such expectations and restrictions in the course syllabus. When an instructor receives evidence, either directly or indirectly, of academic dishonesty, he or she should investigate the instance. The faculty member should then take appropriate disciplinary action.

Disciplinary action may include, but is not limited to the following:

- 1) Requiring the student(s) to repeat the exercise or do additional related exercise(s).
- 2) Lowering the grade or failing the student(s) on the particular exercise(s) involved.
- 3) Lowering the grade or failing the student(s) in the course.

If the disciplinary action results in the awarding of a grade of E in the course, the student(s) may not drop the course.

Faculty reserve the right to invalidate any exercise or other evaluative measures if substantial evidence exists that the integrity of the exercise has been compromised. Faculty also reserve the right to document in the course syllabi further academic honesty policy elements related to the individual disciplines.

A student may appeal the decision of the faculty member with the department chair in writing within five working days. Note: If, at any point in this process, the student alleges that actions have taken place that may be in violation of the Murray State University Non-Discrimination Statement, this process must be suspended and the matter be directed to the Office of Equal Opportunity. Any appeal will be forwarded to the appropriate university committee as determined by the Provost.

XI. NON-DISCRIMINATION POLICY AND STUDENTS WITH DISABILITIES:
Policy Statement

Murray State University endorses the intent of all federal and state laws created to prohibit discrimination. Murray State University does not discriminate on the basis of race, color, national origin, gender, sexual orientation, religion, age, veteran status, or disability in employment, admissions, or the provision of services and provides, upon request, reasonable accommodation including auxiliary aids and services necessary to afford individuals with disabilities equal access to participate in all programs and activities. For more information, contact the Executive Director of Institutional Diversity, Equity and Access, 103 Wells Hall, (270) 809-3155 (voice), (270) 809-3361 (TDD).

Students with Disabilities

Students requiring special assistance due to a disability should visit the Office of Student Disability Services immediately for assistance with accommodations. For more information, students should contact the Office of Student Disability Services, 423 Wells Hall, Murray, KY 42017. 270-809-2018 (voice) 270-809-5889 (TTD).