DUBLIN, VIRGINIA
COURSE PLAN

Course Number and Title: MTH 265 Calculus III

Prepared by: NRCC Math Faculty — Fall 2025 (Date)

Approved by: S. Tolbert-Hungoz (Dean) — Fall 2025 (Date)

Course Description

Focuses on extending the concepts of function, limit, continuity, derivative, integral and vector from the plane to the three dimensional space. Covers topics including vector functions, multivariate functions, partial derivatives, multiple integrals and an introduction to vector calculus. Features instruction for mathematical, physical and engineering science programs.
Lecture 4 hours. Total 4 hours per week.
Prerequisite: Completion of MTH 264: Calculus II or equivalent with a grade of C or better
4 credits

Introduction

The course satisfies a mathematics requirement for the for mathematical, physical, and engineering science programs. This course includes techniques and applications of differential and integral calculus of several variables as wells as sequences and series.

Student Learning Outcomes

Upon successful completion of this course, the student will be able to:

A. Vectors and the Geometry of Space
   a. Identify and apply the parts of the three-dimensional coordinate system, distance formula and the equation of the sphere
   b. Compute the magnitude, scalar multiple of a vector, and find a unit vector in the direction of a given vector
   c. Calculate the sum, difference, and linear combination of vectors
   d. Calculate the dot product and cross product of vectors, use the products to calculate the angle between two vectors, and to determine whether vectors are perpendicular or parallel
   e. Determine the scalar and vector projections
   f. Write the equations of lines and planes in space

g. Draw various quadric surfaces and cylinders using the concepts of trace and cross-section

B. Vectors and the Geometry of Space
   a. Sketch vector valued functions
   b. Determine the relation between these functions and the parametric representations of space curves
   c. Compute the limit, derivative, and integral of a vector valued function
   d. Calculate the arc length of a curve and its curvature; identify the unit tangent, unit normal and binormal vectors
   e. Calculate the tangential and normal components of a vector
   f. Describe motion in space

C. Partial Derivatives
   a. Define functions of several variables and know the concepts of dependent variable, independent variables, domain and range.
   b. Calculate limits of functions in two variables or prove that a limit does not exist;
   c. Test the continuity of functions of several variables;
   d. Calculate partial derivatives and interpret them geometrically, calculate higher partial derivatives
   e. Determine the equation of a tangent plane to a surface; calculate the change in a function by linearization and by differentials,
   f. Determine total and partial derivatives using chain rules,
   g. Calculate directional derivatives and interpret the results
   h. Identify the gradient, interpret the gradient, and use it to find directional derivative
   i. Apply intuitive knowledge of concepts of extrema for functions of several variables, and apply them to mathematical and applied problems. Lagrange multipliers.

D. Multiple Integrals
   a. Define double integral, evaluate a double integral by the definition and the midpoint rule and describe the simplest properties of them.
   b. Calculate iterated integrals by Fubini'sTheorem
   c. Calculate double integrals over general regions and use geometric interpretation of double integral as a volume to calculate such volumes. Some applications of double integrals may include computing mass, electric charge, center of mass and moment of inertia
   d. Evaluate double integrals in polar coordinates to calculate polar areas, evaluate Cartesian double integrals of a particular form by transforming to polar double integrals
   e. Define triple integrals, evaluate triple integrals, and know the simplest properties of them. Calculate volumes by triple integrals
   f. Transform between Cartesian, cylindrical, and spherical coordinate systems; evaluate triple integrals in all three coordinate systems; make a change of variables using the Jacobian

E. Vector Calculus
   a. Describe vector fields in two and three dimensions graphically; determine if vector fields are conservative, directly and using theorems
   b. Identify the meaning and set-up of line integrals and evaluate line integrals
   c. Apply the connection between the concepts of conservative force field, independence of path, the existence of potentials, and the fundamental

theorem for line integrals. Calculate the work done by a force as a line integral

d. Apply Green's theorem to evaluate line integrals as double integrals and conversely
e. Calculate and interpret the curl, gradient, and the divergence of a vector field
f. Evaluate a surface integral. Understand the concept of flux of a vector field
g. State and use Stokes Theorem
h. State and use the Divergence Theorem

General Education Student Learning Outcomes Included in Course

General education at NRCC provides the educational foundation necessary to promote intellectual and personal development. Upon completing the associate degree, graduates will demonstrate competency in student learning outcomes in 1) civic engagement, 2) critical thinking, 3) professional readiness, 4) quantitative literacy, 5) scientific literacy, and
6) written communication.

This course includes the following general education student learning outcomes:

- Identify the problem or complex issue and its various parts
- Explain numerical information presented in mathematical forms (e.g., equations, graphs, diagrams, tables, words).
- Convert relevant information into various mathematical forms (e.g., equations, graphs, diagrams, tables, words).
- Accurately solve mathematical problems.
- Make judgements and draw relevant conclusions from quantitative analysis of data and predict future trends when appropriate.
- Demonstrate appropriate workplace and classroom demeanor and behavior e.g., attendance (for online classes this means regular engagement), submissions of assignments by set deadlines and appropriate dress.

Instructional Methods

The instructional procedures may include lectures, discussions, in-class work, homework, and tests. Further information is available in the Course Syllabus.

Instructional Materials

Textbook: Calculus 3 OpenStax
Calculator: See instructor specific requirements. No symbolic/menu driven calculators.
Cell phones may not be used as calculators.
Software: MyOpenMath
Other: Pencils and paper. Ink is not to be used for any graded work

Course Content

- Vectors and the geometry of space
- Vector functions
- Partial derivatives
- Limits and continuity of multivariable functions
- Double and triple integrals and their applications
- Polar, rectangular, cylindrical, and spherical coordinate systems
- Vector calculus

Grading/Evaluation

Students are evaluated on the following and other work as considered appropriate by the instructor:

- *class attendance, participation, and discussion*
- *assignments*
- *quizzes*
- *tests*
- *final exam*

See the course syllabus for details on how grades for this course will be calculated using percentages or points.

Grading scale:

90 - 100 = A
80 - 89 = B
70 - 79 = C
60 - 69 = D
Below 60 = F

Attendance

Regular attendance at classes is required. When absence from a class becomes necessary, it is the responsibility of the student to inform the instructor prior to the absence whenever possible. The student is responsible for the completion of all study missed during an absence. Any instruction missed and not completed will affect the grade of the student regardless of the reason for the absence.

Cheating/Plagiarism Policy

Students are expected to complete their own work and maintain complete academic honesty. Honesty develops into integrity. All aspects of the course are covered by the Academic Honesty section in the New River Community College Student Handbook.

Any student found cheating or plagiarizing will receive a zero for that work and it could result in an “F” for the course. This includes plagiarism, which is

defined as “To present another's words or ideas as one's own or without attribution” (American Heritage Dictionary, 2019). Remember that plagiarism includes using words or ideas from Internet sites, as well as copying from print sources.

AI Usage

Different instructors will have different expectations around students’ usage of artificial intelligence (AI) tools depending upon the goals and learning outcomes of a course. Students should refer to the class syllabus/addendum for more specific guidelines. It is important to understand that using unauthorized AI tools to complete course work may result in an academic honesty violation. Students should always ask their instructor for guidance if they have any questions about the appropriateness of using a tool.

Withdrawal Policy

Student Initiated Withdrawal Policy

A student may drop or withdraw from a class without academic penalty during the first 60 percent of a session. For purposes of enrollment reporting, the following procedures apply:

If a student withdraws from a class prior to the termination of the add/drop period for the session, the student will be removed from the class roll and no grade will be awarded.

After the add/drop period, but prior to completion of 60 percent of a session, a student who withdraws from a class will be assigned a grade of “W.” A grade of “W” implies that the student was making satisfactory progress in the class at the time of withdrawal, that the withdrawal was officially made before the deadline published in the college calendar, or that the student was administratively transferred to a different program.
After that time, if a student withdraws from a class, a grade of “F” or “U” will be assigned. Exceptions to this policy may be made under documented mitigating circumstances if the student was passing the course at the last date of attendance.

A retroactive grade of “W” may be awarded only if the student would have been eligible under the previously stated policy to receive a “W” on the last date of class attendance. The last date of attendance for a distance education course will be the last date that work was submitted.

Students requesting a late withdrawal due to documented mitigating circumstances should contact the Coordinator of Admissions and Records.

No-Show Policy

A student must either attend face-to-face courses or demonstrate participation in online courses by the last date to drop for a refund. A student who does not meet this deadline will be reported to the Admissions and Records Office and will be withdrawn as a no-show student. No refund will be applicable, and the student will not be allowed to attend/participate in the class or submit assignments. Failure to attend or participate in a course will adversely impact a student's financial aid award.

Instructor Initiated Withdrawal

A student who adds a class or registers after the first day of class is counted absent from all class meetings missed. Each instructor is responsible for keeping a record of student attendance (face-to-face classes) or performance/participation (online classes) in each class throughout the semester.

When a student's absences equal twice the number of weekly meetings of a class (equivalent amount of time for summer session), the student may be dropped for unsatisfactory attendance in the class by the instructor.

Since attendance is not a valid measurement for online courses, a student may be withdrawn due to non-performance. A student should refer to his/her online course plan for the instructor's policy.

In accordance with the No-Show Policy, a student who has not attended class or requested/accessed online learning materials by the last day to drop the class and receive a refund must be withdrawn by the instructor during the following week. No refund will be applicable.

When an instructor withdraws a student for unsatisfactory attendance (face-to-face class) or non-performance (online class), the last date of attendance/participation will be documented. Withdrawal must be completed within five days of a student's meeting the withdrawal criteria. A grade of "W" will be recorded during the first sixty percent (60%) period of a course. A student withdrawn after the sixty percent (60%) period will receive a grade of "F" or "U" except under documented mitigating circumstances when a letter of appeal has been submitted by the student. A copy of this documentation must be placed in the student's academic file.

The student will be notified of the withdrawal by the Admissions and Records Office. An appeal of reinstatement into the class may be approved only by the instructor.

Non-Discrimination Statement

This College promotes and maintains educational opportunities without regard to race, color, national origin, religion, disability, sex, sexual orientation, gender identity, ethnicity, marital status, pregnancy, childbirth or related medical conditions including lactation, age (except when age is a bona fide occupational qualification), veteran status, or other non-merit factors.

Disability Statement

If you are a student with a disability and in need of accommodations for this course, please contact the Center for Disability Services (CDS) for assistance. CDS is located within the Advising Center in Rooker Hall. For more information about disabilities services, see Center for Disability Services Policies and Procedures.

Academic Success Center (Tutoring Center)

Free tutoring is available to all NRCC students in any subject area. In-person, one-on- one, and group tutoring sessions are available both in Dublin (Godbey 131) and at the mall site (room 202). Online tutoring sessions are also available to accommodate students who are unable to attend an in-person tutoring session. In addition, the Academic Success Center offers several online tutorials which are posted in Canvas on the NRCC Tutoring Services tab. For more information about the Academic Success Center at NRCC, please visit https://www.nr.edu/asc/ or call 1-540-674-3664.

General Health Guidelines and Student Expectations

In guarding against the transmission of infectious illnesses, it is imperative that we follow specific health-related best practices.

As a condition for attending class or otherwise using NRCC facilities, I, as a student, agree to the following conditions:

I will follow all CDC, state, and local guidelines pertaining to diseases and health conditions. More information can be found at the links below.

a. CDC Diseases and Conditions: https://www.cdc.gov/nchs/fastats/diseases-and-conditions.htm
b. Virginia Department of Health: https://www.vdh.virginia.gov/
c. New River Health District: https://www.nrvroadtowellness.com/

In the event of health threats or changes in guidelines, I understand in-person classes may be moved online, fully or partially, and I will need to be prepared to access technology and the internet with as little as 24 hours' notice.

By continuing my enrollment in class(es), **I agree to meet each of the expectations outlined above.**

New River Community College encourages all students to fully vaccinate against transmissible illnesses. Information about vaccinations can be found on the Virginia Department of Health website at www.vdh.virginia.gov.

Required Safety Training

Virginia law, effective August 1, 2024, requires campus safety and emergency preparedness training for all students enrolled in on-campus classes at public colleges and universities. The training must focus on an active shooter event and be completed by the last day of their first term in college.

To comply with this legislation, students will view a college-provided awareness and training video during the first two weeks of class for this course.

Evacuation Procedure

Please note the evacuation route posted at the classroom doorway. **Two routes are marked in case one route might be blocked.**