**Roanoke Valley Governor’s School for Science and Technology  
Multivariable Calculus**

**Syllabus 2023-2024  
Mrs. Melissa Fisher**

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1. **Course Information**
   1. **Course Description**

Multivariable Calculus builds on the concepts learned in Accelerated Calculus (AP Calculus AB and AP Calculus BC) and is the equivalent of a third semester college calculus course. Students investigate the geometry of three-dimensional curves and surfaces and extend their knowledge of single-variable derivatives and integrals to three and more dimensions. The major topics include: vector valued functions, partial derivatives, multiple integrals, vector fields, line integrals, and Green’s Theorem.

(Dual enrollment course with Virginia Western Community College)

Students have the option of dual enrolling through Virginia Western Community College. They may earn a total of 4 credits by successfully completing both semesters of this course. The content of this course corresponds with Virginia Western’s MTH 265 Vector Calculus course.

**Gifted education strategies**

* 1. **Understand the connections** between various mathematical representations: graphical, numerical, analytical, and verbal
  2. **Communicate** mathematics both orally and in well-written sentences, including being able to explain one’s solutions to problems
  3. **Model** a written description of a physical situation with a function, a differential equation, or an integral (problem-solving)
  4. Use **technology** to help solve problems, experiment, interpret results, and verify conjectures
  5. Determine the **reasonableness** of solutions, including sign, size, relative accuracy, and units of measurement
  6. Develop an **appreciation** of calculus as a coherent body of knowledge and as a human accomplishment
  7. **Text, Printed Resources, and Media Resources**

1. Hass, J., Weir, M. D., & Thomas Jr., G. B. (2016). *University Calculus: Early Transcendentals.* New York: Pearson.

2. Microsoft Office, Python 3, Geogebra, TI-84 Calculator

* 1. **Learning Objectives and Course Outcomes**
* Calculate the dot and cross products.
* Graph quadric surfaces and conic sections.
* Use the rectangular, polar, cylindrical, and spherical coordinate systems.
* Analyze and apply vector-valued and parametrized functions, employing their related theorems to describe motion in space, based upon tangent and normal vectors and the principles of curvature.
* Find and interpret the rate of change of a function of several variables.
* Find and interpret gradients and directional derivatives of functions of several variables.
* Express and evaluate area using double integrals in either rectangular or polar coordinate systems.
* Express and evaluate the volume, mass, etc. of a surface using triple integrals.
* Convert and integrate in either the rectangular, spherical, or the cylindrical systems.
* Compute line integrals for both scalar and vector valued functions.
* Apply Green’s Theorem and Stoke’s Theorem
* Evaluate Surface Integrals and interpret flux of a vector field.
* Find and interpret the divergence and curl of a vector-valued function.

1. **Grading Policy**
   1. **Grading Scale**

100-90% **A**

89-80% **B**

79-70% **C**

69-60% **D**

59-0% **F**

* 1. **Types of Evaluations**
     1. **Semester Exams:** At the end of each semester, a comprehensive exam will be given on scheduled Exam Days. These exams will cover **all** material covered during the semester.
     2. **Tests:** Tests will be administered after several integrated competencies have been mastered. These tests are designed to help the students learn to think about the broad connections between topics.
     3. **Quizzes:** Quizzes will be given to assess for connections between objectives. You will find a list of competencies and enabling objectives on-line that you are expected to master in this course.
     4. **Labs/Projects:** A lab is a problem or set of exercises designed to make use of current technology and/or ideologies requiring the use of higher order thinking skills. Labs are designed to be completed independently or in groups based upon instructions. These labs may involve mathematical modeling, data collecting, and the use of computer software and/or graphing calculators. Often, projects assigned will enhance your understanding of the integration of mathematics into other disciplines.
        1. Since many lab and project assignments will require you to work in a cooperative learning environment, your participation or lack thereof directly affects your learning experience as well as the other members of your group.
        2. Labs/projects will be accepted late with a penalty of 10% off per day it is late for a maximum of 5 days. No assignments will be accepted after 5 days.
     5. **Homework:** Homework is an integral part of this course and it is extremely important that it be completed on time. You are expected to check answers in the back of the book before coming to class and make note of specific questions/problems you would like to review. Homework will be checked, but not graded on a regular basis by various methods, including, but not limited to, asking you to exhibit proof that you worked on the assignment, asking you to write down your solution and work on an assigned problem and turning it in, or asking you to self-evaluate, etc. Students may collaborate on any homework or class work assignment unless otherwise specified.
  2. **Semester Grade Determination**

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| **Category** | **Weight** |
| Semester Exam | 15% |
| Tests | 35% |
| Quizzes | 35% |
| Labs/Projects | 15% |

* 1. **Final Grade Determination**

The final grade is the average of the 2 semester grades. Students who fail to maintain a B average or above will be subject to the RVGS probationary policy.

1. **Class Policies and Procedures**
   1. **Absences and tardies:** The policy in the RVGS student handbook will be followed.
   2. **Make-up Work:** Course activities, assignments, and the course calendar will be available on Moodle or through e-mail. Please check Moodle and your Governor’s School email account daily. If you are not in school, you should check the course calendar and Moodle first for information and assignments. You should make every attempt to complete these assignments and submit them upon your return.
   3. **Late-work policy:** Late assignments will lose 10% credit for each day late and no assignments will be accepted more than **four days** late, at which point you will receive a zero. Group assignments are to be submitted on the due date regardless of whether all group members are present on the due date. Each day you are at Governor’s School counts as one day, even if you do not have my class that day. In other words, if you wait until you are in my class again, you will lose credit for each school day that has passed since the assignment was due, not for each class meeting that has passed.
   4. **Cheating:** The policy in the RVGS student handbook student code of conduct will be followed.
   5. **Technology Policy:** The RCPS Acceptable Use Policy and the RVGS student handbook policy will be followed.
   6. **Cell phones:** The policy in the RVGS student handbook for cell phones and electronics will be followed. If parents need to contact a student during class, they should call the front office.
   7. **Extra help:** It is inevitable that there will be times when you may not grasp a concept the first time. Extra help is always available, but it is up to you to seek help as soon as possible. The following options are available to you, but you should be sure to make arrangements with your teacher to make sure that she is available at a given time:
2. Before School (8:00-8:25)
3. After School (including 11:00 – 11:30 am for AM session; 3:35 – 4:00 pm)
4. During Lunch (arrangements must be made in advance)
5. E-mail: Emails received before 3:30 pm Monday through Friday will be answered in a timely fashion; emails received outside these times will be answered at the teacher’s earliest convenience.

***Note: If you choose to dual enroll this course through Virginia Western Community College you have access to their campus resources which include but are not limited to the Brown Library and tutors. Please refer to the Virginia Western website for more information: www.virginiawestern.edu***

* 1. **Parent/Student Vue:** Grades are available through Parent/Student Vue. For assistance with accessing your grades, please contact the school’s guidance counselor. If you have questions regarding a particular grade entry, please let your teacher know as soon as possible.
  2. **Interim Reports:** A hard-copy of your current grade will be given to you to take home three times during each semester (see dates on the school calendar). The interim report is a snapshot of the current class average. Please feel free to discuss your report with the teacher at any time.
  3. **Student Performance Strategy:** Interventions will be implemented at the teacher’s discretion or in the event that the student's grade falls below an 80.
  4. **General classroom procedures**
     1. **Calculators:** Bring your calculator to class **every day** although we may not use it every day. Always keep your calculator in excellent working condition. Do not expect to be provided with a calculator if you do not bring yours or have not kept your batteries in good working order. Not having a calculator means that you are not prepared for class and consequences for unpreparedness will be at the discretion of the teacher.
     2. **Rounding Rules:** When a calculator is involved, students should store values until the final step of the solution and then round or truncate per AP guidelines which will be discussed in class.
  5. **SEC Notification:** Per Virginia Code (§ 22.1-16.8), parents must be aware of the use of any instructional materials with explicit content.  No explicit materials are used in this course.

**All students must fill out an online Virginia Western Application and MUST have an EMPL ID number to be enrolled in any dual class.**

***Virginia Western Community College Policies***

**Academic Dishonesty:**

Academic dishonesty is not tolerated at Virginia Western; violations of this policy can result in disciplinary actions, including suspension or expulsion from the college.  According to The Virginia Western Student Handbook, academic dishonesty includes, but is not limited to, the following:

\*  Cheating on a test by giving, receiving, offering, and/or soliciting information.

\*  Buying, selling, stealing, or soliciting any material purposed to be a part of an assignment.

\*  Plagiarism (taking and using the ideas of another as one’s own).

\*  Unauthorized use of materials, notes, or other aids during a test.

For more information, read the “Conduct” section of the VWCC Student Handbook

**ADA Statement:** Questions or concerns about the college’s and student’s rights and responsibilities regarding persons with disabilities may be directed to the 504/ADA Coordinator.  The Americans with Disabilities Act of 1990 (ADA) and section 504 of the Rehabilitation Act provides protection from illegal discrimination for qualified individuals with disabilities.

**Copyright Statement:** The materials for this course are only for the use of students enrolled in this course for purposes associated with the course, and may not be retained or further disseminated.

Here are some VWCC resources that may be useful to you!

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| Emergency Alert Information | <http://www.virginiawestern.edu/police/crisismanagement.php> |
| Campus Safety Video | <http://www.virginiawestern.edu/police/safety.php> |
| Student Consumer Information | <http://www.virginiawestern.edu/services/studentconsumerinfo.php> |
| VWCC Withdrawal Policy | <http://www.virginiawestern.edu/services/withdrawal.php> |
| VWCC Student Resources | <http://www.virginiawestern.edu/services/resources.php> |
| VWCC Student Rights and Responsibilities | <http://www.virginiawestern.edu/services/handbook/studentconduct.php> |
| VWCC Student Conduct Policy | <http://www.virginiawestern.edu/services/handbook/studentconduct.php> |
| VWCC Student Grievance Procedures | <http://www.virginiawestern.edu/services/handbook/grievance.php> |
| Title IX:   Policy on Sexual Violence, Domestic Violence, Dating Violence, and Stalking | <http://www.virginiawestern.edu/services/intervention/sexualharassment.php> |