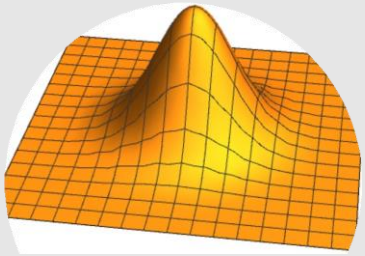

Bridgewater State University

Multivariable Calculus

MATH 261-Dec28- Jan22

Instructor Info

Vignon Oussa

TBA

Virtual Office

https://vignonoussa.wordpress.com

voussa@bridgew.edu

Course Info

Pre-req: Calc II with a minimum grade of "C-"

TTh

TBA

On Blackboard Collaborate

Office Hours

TBA

or by appointment

Help

Math Services

Monday 8:00 - 5:00 Tuesday 8:00 - 8:00 Wednesday 8:00 - 8:00 Thursday 8:00 - 5:00 Friday 8:00 - 3:00

Academic Achievement Center Maxwell Library

Overview

This course is a continuation of Calculus I and II. Topics will include parametric, polar equations, derivatives and integrals of multivariable functions, and vector analysis.

You are assumed to be fluent in standard Calc I and II topics. For instance, you should have a firm understanding of single-variable limit, differentiation, and integration. It is also crucial that you have a good grasp of basic trigonometry. If you have some gaps and holes in your knowledge, I ask that you refresh your under- standing of Trigonometry, Calculus I and II by reviewing materials posted here

https://vignonoussa.wordpress.com/video-lectures/

Material

Required texts

Calculus: Early Transcendentals, by James Stewart, 8th edition (chapters 12, 13, 14, 15, and 16)

Other Recommended texts

https://ximera.osu.edu/mooculus/calculus3
http://tutorial.math.lamar.edu/Classes/CalcIII/CalcIII.aspx
https://www.math.utah.edu/lectures/math2210.html

Other

For any other reading material, I will provide you with the relevant documents.

Grading scheme

30%	Midterm
30%	Homework (Blackboard)
5%	Participation
35%	Final exam

Grades will follow the standard scale: A=95-100, A-=90-94, B+=87-89, B=83-86, B-80-82, C+=77-79, C=73-76, C-=70-72, D=65-69, F=0-64

Curving is at the discretion of the professor.

Lectures and participation

The format of this course requires full participation. You are expected to arrive at each lecture prepared to engage in all in-class activities. If you miss class, it is your responsibility to find out what you missed. You are responsible for all announcements and material covered in class. The list of topics that we will cover in this course is quite extensive. Moreover, the series of concepts covered in the course are related to each other in the order in which they have been introduced. As such, our class time will primarily be devoted to lectures. Missing a single topic may seriously hinder your ability to grasp subsequent ones. This is an essential aspect of the course, and it will be challenging for you to acquire the missed content on your own. If you opt to disregard my recommendations, be also prepared to take full responsibility for the inevitable decrease in your performance. Most students are dedicated and responsible students. However, a small percentage of students tend to become discouraged as the term progresses; and cease regular attendance. As a warning, I would like to highlight that statistics show a strong correlation between low attendance and course failure. In preparing for lectures, you are expected to read the content of the materials beforehand. This will allow you to make better use of our meetings.

Blackboard homework

I will assign weekly homework on Blackboard. The assigned task will have strict deadlines. Thus, you must organize yourself to complete the work before the due date. I will not reopen any missed homework (deadlines are firm). It is your responsibility to manage your time successfully. When you solve math problems, it is crucial to find a quiet time to think on your own. Please, understand that it is from working your way through problems on papers that you learn mathematics. It is not enough to come to class and watch the instructor discuss a topic and solve problems. Mathematics is learned actively through repetition, and the process of acquiring new mathematical concepts is often challenging. However, it is quite beneficial to spend an appropriate amount of time unpacking materials on your own and at your own pace. You should maintain a notebook containing assigned problems that you have fully worked out on your own. I also encourage you to visit me during office hours to dis- cuss your attempts on assigned problems. Important ideas often come from discussions, and you gain additional insights by sharing and listening to different perspectives and approaches.

Classroom policies

1. Be respectful to your classmates and the instructor. The classroom is a professional environment and should be treated as such.
2. Questions are essential, encouraged, and always welcome. However, in order to maintain a respectful atmosphere conducive to learning, I ask that you raise your hands whenever you intend to ask a question or clarify a statement.
3. BSU students are prohibited from engaging in behavior or activity that causes the disruption of teaching, learning, research or other academic activities necessary for the fulfillment of the university mission. If disruptive behavior occurs, whether in the classroom or another academic environment, a faculty member has the right to remove the student from the classroom setting.

Course goals

By the end of this course you should be able to

- Handle vectors fluently in solving problems involving the geometry of lines curves, planes, and surfaces in space
- Visualize and draw graphs of surfaces in space
- Differentiate and integrate into multivariable settings
- Handle optimization problems

List of topics

We will cover roughly ten topics every week.

- 3D systems of coordinates, distance formula
- Vectors, operations, algebraic representation
- Standard basis vectors, unit vectors, the dot product, geometric interpretation, direction angles.
- Projections, perpendicular component, the cross product, geometric properties.
- Length of the cross product, area of a parallelogram, the triple product.
- Lines (parametric and symmetric equations), parametrization of a line segment, planes.
- Planes, examples, distance between a point and a plane, skew lines, cylinders.
- Introduction to vector functions.
- Domains of vector functions, limits, example, derivatives, tangent vectors, and lines to curves.
- Differentiation rules, integrals, length of a curve, arclength parametrization.
- Curvature of a curve, formulas, curvature of the graph of a function.
- Unit normal and binormal, normal plane, osculating plane, osculating circle, applications to mechanics
- Functions of several variables, domains, graphs, level curves, and level surfaces.
- Limits, properties, examples, use of polar coordinates, continuity.
- Partial derivatives, examples, geometric interpretation of partial derivatives.
- Higher derivatives, Clairaut's theorem, PDEs, tangent planes, linear approximations, differentials.
- The chain rule, for compound functions of one or more variables.
- Implicit differentiation for level curves and surfaces.
- Directional derivatives and the gradient vector.
- Orthogonality between the gradient and level curves, tangent lines to level curves, extensions to functions of 3 variables.
- Maximum and minimum values, the gradient test, the second derivative test.
- Closed sets, bounded sets, compact sets, extreme value theorem, Lagrange multipliers.
- Introduction to multiple integrals, geometric interpretation, averaging.
- Iterated integrals, Fubini's theorem, geometric interpretation, integration over Type I regions.
- Integration over Type II regions, regions that are of neither type, review of polar coordinates.
- Integration over polar rectangles and regions enclosed by two polar curves.
- Triple integrals over type 1, type 2 and type 3 solid regions.
- Integration in cylindrical coordinates.

- **Integration in spherical coordinates.**
- **Introduction to vector fields.**
- **Line integrals of scalar functions.**
- **Line integrals of vector fields.**
- **The fundamental theorem of line integrals.**
- **Computing the potential of a conservative vector field, Green's theorem.**
- **Extension of Green's theorem; curl and divergence.**
- **Parametric surfaces.**
- **Tangent plane to a parametric surface, surface area.**
- **Surface integrals of scalar functions, oriented surfaces, surface integrals of vector fields.**
- **Stokes' theorem.**
- **More on Stokes' theorem, and the divergence theorem.**

Note: The instructor reserves the right to change the dates and topics to be covered at any time.

Make-up policy

There will be three exams given throughout the semester. There will be no make-up exams unless you miss a class because of unwanted reasons such as a documented illness or the death of a family member. In such a situation, your final exam grade will be used to replace the missing test. Furthermore, I will, under no circumstance, accept late submissions. Under exceptional and unpreventable situations (which I reserve the right to evaluate), I may choose to make a one-time exception to a late submission.

Diversity and inclusivity statement

I consider this classroom to be a place where you will be treated with respect, and I welcome individuals of all ages, backgrounds, beliefs, ethnicities, genders, gender identities, gender expressions, national origins, religious affiliations, sexual orientations, ability - and other visible and non-visible differences. All members of this class are expected to contribute to a respectful, welcoming and inclusive environment for every other member of the class.

Accommodations for students with disabilities

If you are a student with learning needs that require special accommodation, contact the Office of Disability Services located on the ground floor of the Maxwell Library within the Academic Achievement Center (Tel: 508.531.2194, disability_resources@bridgew.edu**), as soon as possible, to make an appointment to discuss your special needs and to obtain an accommodations letter. In compliance with Bridgewater State University and equal access legislation, I am available to discuss appropriate accommodations that you may have as a student with a disability.**

Academic integrity

The University Code of Academic Integrity is central to the ideals of this course. Students are expected to be independently familiar with the Code and to recognize that their work in the course is to be their own original work that truthfully represents the time and effort applied. Violations of the Code are most serious and will be handled in a manner that fully represents the extent of the Code and that befits the seriousness of its violation.