MATH 251 Multivariable Calculus, Section 011
MWF 1:50-3:00pm at 125 Brooks Hall

Instructor   Tony Se
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Office Hours   MWF 3:30-4:30pm at Collaborate Ultra, or by appointment

General Course Information
Method of Instruction: Lecture
Students can also attend lectures online. The links will be posted on eCampus.
Credit Hours: 4
Course Prerequisites: MATH 156 with a grade of C- or better

Where to Find Help
If you need help with the material in this course, you can:
- come to my office hours, or
- ask a Learning Assistant in the Math Learning Center 6-9pm Sunday to Thursday, or
- make an appointment with a Graduate Teaching Assistant.

Please make good use of these free services. More details will be posted on eCampus. You can also ask me questions through email.

Course Materials
Textbook
Calculus: Early Transcendentals, 8th Edition, by James Stewart

This is the same textbook that is currently used in Math 153, 154, 155, and 156. Instead of obtaining a hard copy, you may read the e-book once you have purchased access to WebAssign (see below).

WebAssign
You are required to purchase access to WebAssign for this class. Everyone has free access for two weeks, but fees must be paid by the end of the second week of classes. If you purchased multi-semester access in 155, 156, or a previous attempt at 251, you should be able to continue using it. If you have trouble, let me know.

To log into WebAssign, go to eCampus and select this course. Click the link in the left toolbar. If you have a WebAssign account from a previous class and purchased multi-semester access, but did NOT log into WebAssign using eCampus, you will need to link the two accounts. You should have an option to do this in WebAssign or you can contact WebAssign tech support.

If you miss any WebAssign deadline, or want to improve your WebAssign score, you may request automatic extensions on WebAssign within **14 days** from the deadline.

Calculators
No calculators are allowed on any quiz or exam.

eCampus
Information about this course will be posted on eCampus. Please check eCampus regularly for announcements, lecture recordings, homework and quiz solutions, your grade, etc. Any updates to this syllabus will also be posted on eCampus.

Technology Requirements
Internet Connection
You must have a computer with reliable and continuous Internet access, and a webcam if you choose to take a quiz remotely.

Online Proctoring
Quizzes and the Final Exam will be given in person and/or via Zoom. More details will be given during the semester.

Attendance Policy
You may attend the lectures either in person or online. If you attend class online, you will need reliable Internet connection whenever you take a quiz. There are no points for attendance, but you must submit class notes regularly. See Appendix B(ii).

Mastery Grading
This course will use Mastery Grading. In Mastery Grading, students earn their course grade by demonstrating competence in a list of **course objectives**, instead of by accumulating points on an exam. The standards for meeting course objectives are high. See Appendix (A) to (C). However, students will have multiple chances to meet each objective during the semester.

Quizzes and Final Exam
Achievement of course objectives is assessed in quizzes and the Final Exam. Quizzes will be given every week. You will have at least two times during the semester to demonstrate competence in each objective. Questions on quizzes and the Final Exam are graded on a refined pass/fail scale. See Appendix B(i). Your achievement of each objective is given by the objective grade on your latest attempt.

Extra Attempts on Course Objectives
If you are unsatisfied with your current objective grade and would like to reattempt the objective, you can wait for the objective to appear on the next quiz. If the objective has already appeared twice, you may reattempt the objective during office hours, or by appointment. Please try to notify me **24 hours** in advance if you would like to reattempt an objective during office hours or by appointment. You can just walk in to an office hour without notifying me, but then you will need to wait for me to prepare a question for the objective.
You may reattempt the objectives in **one** office hour visit per week. You may reattempt multiple objectives per visit.

Homework and Class Notes
You will need to submit online homework, written homework, and class notes regularly. These are graded on a pass/fail scale. See Appendix B(ii).

Calendar
01/19	Tuesday	First day of classes
01/25	Monday	Last day to add a class
03/03	Wednesday	No class
04/02	Friday	No class
04/16	Friday	Withdrawal deadline
04/30	Friday	Last day of classes
05/04	Tuesday	**Final Exam, 11:00am-1:00pm**

Mental Health Statement

Mental health concerns or stressful events can adversely affect your academic performance and social relationships. WVU offers services to assist you with addressing these and other concerns that you may be experiencing. You can learn more about the broad range of confidential mental health services available on campus at the Carruth Center for Psychological and Psychiatric Services (CCPPS) website: https://carruth.wvu.edu/

- If you are in need of crisis services, call the CCPPS main number 24/7: (304) 293-4431.

Crisis services are also available through text: Text WVU to 741741 for support 24/7 from a trained Crisis Counselor.

Academic Integrity

The integrity of the classes offered by any academic institution solidifies the foundation of its mission and cannot be sacrificed to expediency, ignorance, or blatant fraud. Therefore, instructors will enforce rigorous standards of academic integrity in all aspects and assignments of their courses. For the detailed policy of West Virginia University regarding the definitions of acts considered to fall under academic dishonesty and possible ensuing sanctions, please see the West Virginia University Academic Standards Policy (http://catalog.wvu.edu/undergraduate/coursecreditstermsclassification/). Should you have any questions about possibly improper research citations or references, or any other activity that may be interpreted as an attempt at academic dishonesty, please see your instructor before the assignment is due to discuss the matter.

Notice of Class Recording Policy

Meetings of a course at West Virginia University (WVU), whether online or in-person, may be recorded. Recordings are not guaranteed, and are intended to supplement the planned class session. Recordings will be made available to class participants, which may include students, assistants, guest lecturers, and co-facilitators. Recordings may be shared by the instructor or institution in accordance with WVU Rules and policies. The Recordings are owned by and contain intellectual property of WVU. The Recordings may not be shared, copied, reproduced, redistributed, transferred, or disseminated in any form or by any means without the prior written consent of authorized officials of WVU.

Inclusivity Statement

The West Virginia University community is committed to creating and fostering a positive learning and working environment based on open communication, mutual respect, and inclusion.
If you are a person with a disability and anticipate needing any type of accommodation in order to participate in your classes, please advise your instructors and make appropriate arrangements with the Office of Accessibility Services. (https://accessibilityservices.wvu.edu/) More information is available at the Division of Diversity, Equity, and Inclusion (https://diversity.wvu.edu/) as well.

Sale of Course Material Statement

All course materials, including lectures, class notes, quizzes, exams, handouts, presentations, and other course materials provided to students for their courses are protected intellectual property. As such, the unauthorized purchase or sale of these materials may result in disciplinary sanctions under the Student Conduct Code.
(https://studentconduct.wvu.edu/campus-student-code)

Sexual Misconduct Statement

West Virginia University does not tolerate sexual misconduct, including harassment, stalking, sexual assault, sexual exploitation, or relationship violence [BOG Rule 1.6 (https://policies.wvu.edu/finalized-bog-rules/bog-governance-rule-1-6-rule)]. It is important for you to know that there are resources available if you or someone you know needs assistance. You may speak to a member of university administration, faculty, or staff; keep in mind that they have an obligation to report the incident to the Title IX Coordinator (http://titleix.wvu.edu/what-is-title-ix/who-is-the-title-ix-coordinator).

If you want to speak to someone who is permitted to keep your disclosure confidential, please seek assistance from the Carruth Center (http://carruth.wvu.edu/), 304-293-9355 or 304-293-4431 (24-hour hotline), and locally within the community at the Rape and Domestic Violence Information Center (RDVIC, http://www.rdvic.org/), 304- 292-5100 or 304-292-4431 (24-hour hotline).

For more information, please consult WVU's Title IX Office (https://titleix.wvu.edu/resources-offices).

Student Evaluation of Instruction Statement

Effective teaching is a primary mission of West Virginia University. Student evaluation of instruction provides the university and the instructor with feedback about your experiences in the course for review and course improvement. Your participation in the evaluation of course instruction is both strongly encouraged and highly valued. Results are strictly confidential, anonymous, and not available to the instructor until after final grades are released by Admissions and Records. Information about how you can complete this evaluation will provided by your instructor.

Last updated: February 01, 2021

Appendix

(A) Course Objectives

L. Linear Algebra
L.1 I can use Gaussian Elimination to solve a system of linear equations.
L.2 I can perform basic arithmetic operations on matrices.
12. Vectors and the Geometry of Space
12.1A I can locate and find the distance between points in three dimensional space.
12.1B I understand the relationship between simple equations or inequalities in three variables and surfaces or regions in three dimensional space.
12.2 I can perform basic arithmetic operations on vectors and understand their geometric meaning.
12.3 I can calculate and understand the properties of the dot product of two vectors.
12.4 I can calculate and understand the properties of the cross product of two vectors.
12.5A I can find equations of a straight line and of a plane and understand their geometric meaning.
12.5B I can determine where straight lines and/or planes intersect.
12.6 I can sketch and identify cylinders and basic quadric surfaces.
13. Vector Functions
13.1 I can find the domain and limits of vector functions.
13.2 I can sketch the graph, position vectors and tangent vectors of a vector function.
13.3A I can find the length of a space curve.
13.3B I can find and understand the meaning of curvature, unit normal and/or unit binormal vectors.
13.4 I understand the relationship between position, velocity, speed and acceleration functions.
14. Partial Derivatives
14.1 I can find and/or sketch the domain, the range and the graph of a multivariate function.
14.2* I can find limits of a multivariate function.
14.3 (14.5B) I can calculate partial derivatives of a multivariate function.
14.4B* I can estimate the value of a multivariate function using linear approximation and differentials.
14.5A I can use the multivariate Chain Rule.
14.6A* I can find and understand information given by gradient vectors.
14.6B (14.4A)* I can find equations of tangent planes/lines and normal lines to a surface/curve.
14.7 I can use the Second Derivatives Test to classify critical points of a function of two variables.
15. Multiple Integrals
15.1 I can approximate and find the exact value of a double integral over a rectangular region.
15.2 I can calculate double integrals using Cartesian coordinates.
15.3 I can calculate double integrals using polar coordinates.
15.4 I can calculate the mass of an object given its density function.
15.6 I can calculate triple integrals using Cartesian coordinates.
15.7 I can use cylindrical coordinates to describe solids and calculate triple integrals.
15.8 I can use spherical coordinates to describe solids and calculate triple integrals.
16. Vector Calculus
16.1 I can sketch vector fields.
16.2 I can calculate line integrals of scalar and vector functions.
16.3A (16.5A) I can determine whether a vector field is conservative, and if so, find a potential function.
16.3B (16.5B)* I understand and can apply the Fundamental Theorem for Line Integrals.
16.4* I understand and can apply Green's Theorem.

Note: This list of objectives is subject to change.

(B) Grade Rubrics
(i) The are four possible grades for questions on the quizzes and the Final Exam.

Score	Meaning
3 (E)	Excellent • The student follows the instructions in the question and uses the methods learned *in this course*, and • the student shows all required work, and • the student presents the solution very clearly, and • the student gives a correct or nearly correct final answer, and • the student makes no conceptual errors and no logical errors, and • the student makes at most 1 or 2 minor mistakes in all of <u>mat</u>hematics (MAT), <u>not</u>ation (NTN), and <u>ari</u>thmetic (ARI) combined, depending on the length of the problem.
2 (P)	Passing • The student follows the instructions in the question and uses the methods learned *in this course*, and • (MST) at most 1 or 2 <u>min</u>or <u>st</u>eps are missing or incorrect in the student's work, depending on the length of the problem, and • (RCL) the student presents the solution <u>r</u>ather <u>cl</u>early, and • the student gives a correct or nearly correct final answer, and • the student makes no conceptual errors and no logical errors, and • (MMI) the student makes at most 2, 3 or 4 <u>min</u>or <u>mi</u>stakes in all of <u>mat</u>hematics (MAT), <u>not</u>ation (NTN), and <u>ari</u>thmetic (ARI) combined, depending on the length of the problem.
1 (I)	Improving • The student shows some understanding of the problem and uses the methods learned *in this course*. However, • (INS) the student fails to follow some <u>ins</u>tructions in the question, or • (STP) at least 1 important <u>st</u>ep, or at least 2 or 3 minor steps are missing or incorrect in the student's work, depending on the length of the problem, or • (PRS) the <u>pres</u>entation of the solution requires the reader to guess the student's intent, or • (FIN) the student gives an incorrect <u>fin</u>al answer which is not a minor mistake, or • (UNF) the student's answer is <u>unf</u>inished or incomplete, or • (CON) the student makes a <u>con</u>ceptual error, or • (LOG) the student makes a <u>log</u>ical error, or • (IRR) the student gives an <u>irr</u>elevant or nonsensical argument, or • (REQ) the student makes an error in pre<u>req</u>uisite material either from previous courses or from previous objectives in the current course, or • (MIS) the student makes at least 3, 4 or 5 minor <u>mis</u>takes in all of <u>mat</u>hematics (MAT), <u>not</u>ation (NTN), and <u>ari</u>thmetic (ARI) combined, depending on the length of the problem.
0 (N)	Not gradable • The student does not meet the requirements of an I grade.

During a reattempt during office hours, students will have opportunities to correct their mistakes following prompts by the instructor. The grade rubrics for reattempts are the same as the table above, with the following adjustments.

Score	Adjusted meaning for reattempts during office hours
3 (E)	The student makes only minor mistakes (MMI) or misses only minor steps (MST), and is able to correct the errors without any or with only slight instructor prompts.
2 (P)	The student makes only minor mistakes (MMI) or misses some steps (STP), and is able to correct the errors with detailed instructor prompts.
1 (I)	The student shows some understanding of the problem, but • the student has errors other than (MMI), (MST) and (STP), or • the student is not able to correct the errors (MMI), (MST) or (STP) even after detailed instructor prompts.
0 (N)	The student does not show any understanding of the problem.

(ii) There are two possible grades for online homework, written homework and class notes.

Score	Meaning
2 (P)	Passing The student shows some understanding of the material and made a serious attempt in the assignment. This corresponds to around 80% for online assignments.
1 (N)	Not passing The student did not make a serious attempt in the assignment, or the student's work is not gradable (similar to a 0 on a quiz).

(C) Course Grade
Initial student grades are calculated as follows. This is not yet the student's final letter grade.

Base grade	Meaning
A	• The student achieves an E in at least 50% of the objectives, and • the student achieves at least a P in at least 90% of the objectives, and • the student achieves at least a P in 5 objectives with an asterisk *, and • the student achieves at least one P in Chapter L, two Ps in Chapters 13 and 16, and three Ps in Chapters 12, 14 and 15.
B	• The student achieves an E in at least 35% of the objectives, and • the student achieves at least a P in at least 80% of the objectives, and • the student achieves at least a P in 4 objectives with an asterisk *, and • the student achieves at least one P in Chapter L, two Ps in Chapters 13 and 16, and three Ps in Chapters 12, 14 and 15.
C	• The student achieves an E in at least 20% of the objectives, and • the student achieves at least a P in at least 70% of the objectives, and • the student achieves at least a P in 3 objectives with an asterisk *, and • the student achieves at least one P in Chapter L, two Ps in Chapters 13 and 16, and three Ps in Chapters 12, 14 and 15.
D	• The student achieves an E in at least 10% of the objectives, and • the student achieves at least a P in at least 60% of the objectives, and • the student achieves at least a P in 2 objectives with an asterisk *, and • the student achieves at least one P in Chapter L, two Ps in Chapters 13 and 16, and three Ps in Chapters 12, 14 and 15.
F	The student does not meet the requirements of a D.

The student's **final** letter grade is determined by the following adjustments to the initial grade.
- Students may earn a + grade if they achieve many more E's than required. The meaning of "many more" will be determined at the end of the semester.
- Students will earn one letter grade lower if they achieve a P in less than 80% of the online homework, 80% of the written homework, or 80% of the class notes without a university-related excuse. Students may fail for excessive missed assignments.