MATH 231-01 and 231L-01, Calculus III and Calculus III Lab, Fall 2021
MWF 8:00-8:50am, Tu/Th 8:00-9:20am, AC 345

Instructor: Dr. Amy DeCelles

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Course Description: A multivariable calculus course. Topics include: vectors and their properties in two and three dimensions; multivariable functions, including recognition of surfaces, limits and continuity, partial differentiation, optimization, multiple integrals, polar, cylindrical and spherical coordinates, vector fields, line and surface integrals, Green's, Stokes' and the Divergence Theorems. Three hours of lecture and three hours of recitation per week.

Prerequisite: Successful completion (C- or better) of MATH 132 (Calculus II), or its equivalent.

Credits and Workload Expectations: 4 credits, 6 hours per week outside the classroom.

Course Materials and Resources:

- Textbook: *Calculus, Early Transcendentals*, 9th Edition, by Stewart, Clegg, and Watson

- Calculator: Not required, but you may find a graphing calculator to be helpful. Calculators will not be permitted during exams.

- Canvas. Notes and other information will be posted there. Students are expected to check Canvas (and Bethel email) regularly.

- WebAssign: online practice problems, etc.

- *Mathematica* Software: Available on the computers in lab S030.

- Learning Commons: lower level of the Miller/Moore Academic Center (AC)

Course Objectives: Upon successful completion of this course, students will be able to:

- demonstrate understanding of the concepts of vectors, vector functions, partial derivatives, multiple integration and vector calculus and use these tools to solve real world problems (M1, ME1, E1, EM1, M5, ME5, E2, EM2);

- visualize, utilize, and draw 3-dimensional representations of vectors and graphs (M1, M4, ME1, ME4, E4, EM4);

- utilize appropriate technology to aid in representing 3- (and 4-) dimensional graphs (M3, ME3, E3, EM3); and

- relate themes in "Flatland" to the mathematics in this course, the evolution of cultural norms, and ultimately their own faith/spiritual walk with Christ (M6, ME6).

Course Structure: This course is designed to help you progress from a basic to a mastery level of understanding and competency. Typically new material will be introduced via lecture in the MWF classes, and in the Tu/Th classes students will work in small groups, solving problems and explaining key concepts to one another and to the class.

Collaboration and Consultation: I encourage you, when working on homework, to collaborate with fellow students, to reread the textbook, and to ask the professor or the Learning Commons tutors for help. You are also free to consult other textbooks or online resources for general information on the topic. However, *you may not at any point consult any worked solution to an assigned homework problem.* This includes but is not limited to: the student solution manual, the instructor solution manual, other students' written homework, and any online solution. If in doubt about the acceptability of a certain kind of collaboration or consultation, ask the professor. Please see the university policy on academic dishonesty, below.

Attendance: Attendance in class (both lecture and lab) is expected, and a portion of the final grade comes from preparation for and participation in class. Absences for official university functions will be excused, provided that the instructor is notified in advance. Absences due to qualifying family or medical emergencies will also be excused, though the instructor reserves the right to ask for verification. In the case of an excused absence, it is the student's responsibility to contact the instructor in a timely fashion and, if desired, make arrangements for an assignment to compensate for the missed class work.

Late Work: Written work is due at the beginning of class on the date it is due; WebAssign assignments are due 15 minutes before the start of class. Late work is typically not accepted. The lowest two discussion prep scores and the lowest single mastery checkpoint score will be dropped at the end of the semester. Moreover, each student may have one "no questions asked" 24-hour extension on a problem set; the request must be received within 2 hours of the original deadline. Extensions on other assignments will be considered if requested before the due date, and work may certainly be submitted before the due date, if arrangements have been made with the professor in advance. If there is a serious, unforeseeable reason for missing more than one week of class, it is the student's responsibility to contact the professor as soon as possible and to make an appointment with the professor upon returning to classes to make a plan, e.g. whether to continue with the course, take an incomplete, or withdraw; and if continuing, how to make up missed work.

Missed Exams: Make-up midterm exams may be given to students with legitimate excuses such as serious illness, university sponsored events, etc., as long as the make-up exam can be taken within a reasonable time frame. If it is not possible to schedule a make-up exam within a reasonable time frame, the grade for the midterm may be prorated from the final exam. Written documentation may be required. Rescheduling the final is not possible except under very extreme circumstances.

Incompletes: Grades of I are normally not given in this course. However, they may be granted due to extenuating circumstances if (i) at least 60% of the course work has been completed at a level of C or better and (ii) the student demonstrates the ability to complete the remaining coursework outside of the classroom. In such cases, a well-documented petition should be submitted to the professor well before grades are due to the Registrar. Please see the university policies on incomplete grades and withdrawing from a class.

Final Course Grade: The overall score for this course will be computed as outlined below.

- Discussion Preparation (5%): drafting solutions to discussion problems before class

- Problem Sets (20%): about 14 problem sets, roughly weekly, each consisting of final solutions to discussion problems and full written solutions to WebAssign problems, whose answers are also submitted online; written (15%), online (5%)

- Mastery Checkpoints (15%): about 10 checkpoints (e.g. a quiz, group challenge problem, oral presentation, or other activity), typically given during lab

- Midterm Exams (30%): tentatively scheduled for Wed Sep 15, Mon Oct 18, Wed Nov 10

- Final Exam (20%): cumulative; Mon Dec 6, 8-10am

- Best Exam (5%): at the end of the semester the score for the best exam will contribute an extra 5% towards the overall score

- Flatland Reflection (5%): tentatively due Mon Oct 25

Final letter grades will be determined from the overall score as follows:

A	93-100	B+	87-89	B-	80-82	C	73-76	D+	67-69	D-	60-62
A-	90-92	B	83-86	C+	77-79	C-	70-72	D	63-66	F	0-59

Learning Commons: Located on the lower level of the Miller/Moore Academic Center (AC), the Learning Commons offers in-person and online tutoring services to all Bethel students, including help with any sort of writing projects, from conception to completion. Tutors are trained to give thoughtful feedback and advice on a variety of study skills, understanding concepts pertaining to relevant coursework, and overall writing concerns.

DEI: Bethel University respects the dignity of all God's image-bearers, and stands against racism, prejudice, and discrimination. Because Christ calls us to love our neighbor as ourselves, Christian discipleship includes pursuing the good of those who suffer injustice due to their color, race, or ethnicity. Therefore, we aim to continually transform our classrooms into safe and hospitable spaces where we listen to one another with mercy, learn from and value each other with tenacity, and commit to pursuing justice for the most vulnerable in our community.

Accessibility and Accommodations: Bethel University strives to make learning experiences accessible to all participants. If you anticipate or experience physical or academic barriers based on disability, please contact the Center for Academic Success to discuss options. To schedule an appointment, email `rachel.kennedy@betheluniversity.edu` or call 574-807-7460.

Academic Dishonesty: The student handbook (p. 156) states: "Any act of deceit, falsehood or stealing by unethically copying or using someone else's work in an academic situation is strictly prohibited.

1. A student found guilty of plagiarism or cheating will receive an "F" (zero) for that particular paper, assignment or exam. Should this occur, the professor will have an interview with the student and will submit a written report of the incident to the academic dean.

2. If a second offense should occur, the student will be asked to appear before the professor, the academic dean and the vice president for student development.

The student should realize that at this point continuation in a course and even his/her academic career may be in jeopardy. In the event of a recommendation for dismissal, the matter shall be referred to the Student Development Committee."

Cell Phones: Cell phones must be turned off and stowed in book bags during class. Any student using a cell phone for any reason (without permission) will be asked to leave the class and an unexcused absence will be recorded. Students using cell phones during exams or graded activities may be cited for cheating (at professor's discretion). In the case of expected emergencies, students may seek permission from the professor to leave their cell phones on during class, but the phone must remain in the book bag. Professors reserve the right to have operational cell phones in class.

Covid-19: Students are expected to follow current Bethel University policies (e.g. re: masking); students not in compliance may be asked to leave the classroom and be recorded as absent.

Disclaimer: This syllabus is not a legal contract, but serves as a general outline for the semester. The professor reserves the right to make adjustments to the course as the need arises.

Tentative Schedule: A tentative semester schedule is on the following page.

Tentative Schedule, Calculus III, Fall 2021

Mon	Tues	Wed	Thurs	Fri
Aug 16, 2021	Aug 17, 2021	Aug 18, 2021	Aug 19, 2021	Aug 20, 2021
			Intro to Course	Parametric Curves (10.1)
Aug 23, 2021	Aug 24, 2021	Aug 25, 2021	Aug 26, 2021	Aug 27, 2021
Parametric Calculus (10.2)	D 10.1, 10.2	Polar Coordinates (10.3)	M 10.1-2 D 10.3	Polar Areas, Lengths (10.4)
Aug 30, 2021	Aug 31, 2021	Sep 1, 2021	Sep 2, 2021	Sep 3, 2021
Conic Sections (10.5) **Due: P1 (10.1-3)**	D 10.4, 10.5	3D Coordinates and Vectors (12.1, 12.2)	M 10.3-10.5 D 12.1, 12.2	Dot Product (12.3)
Sep 6, 2021	Sep 7, 2021	Sep 8, 2021	Sep 9, 2021	Sep 10, 2021
Labor Day	D 12.3 **Due: P2 (10.4-5, 12.1-2)**	Cross Product (12.4)	M 12.1-12.3 D 12.4	Equations of Lines and Planes (12.5)
Sep 13, 2021	Sep 14, 2021	Sep 15, 2021	Sep 16, 2021	Sep 17, 2021
Cylinders and Quadric Surfaces (12.6)	D 12.5; Rev	**Exam 1** (10.1-10.5, 12.1-12.5) **Due: P3 (12.3-5)**	D 12.6	Vector Functions and Space Curves (13.1)
Sep 20, 2021	Sep 21, 2021	Sep 22, 2021	Sep 23, 2021	Sep 24, 2021
Derivatives and Integrals of Vector Functions (13.2)	D 13.1, 13.2	Arc Length, Curvature (13.3) **Due: P4 (12.6, 13.1-2)**	M 12.6, 13.1-2 D 13.3	Functions of Several Variables (14.1)
Sep 27, 2021	Sep 28, 2021	Sep 29, 2021	Sep 30, 2021	Oct 1, 2021
Limits and Continuity (14.2)	Service Day	Partial Derivatives (14.3)	D 14.1, 14.2, 14.3	Tangent Planes, Linear Approximations (14.4)
Oct 4, 2021	Oct 5, 2021	Oct 6, 2021	Oct 7, 2021	Oct 8, 2021
The Chain Rule (14.5) **Due: P5 (13.3, 14.1-3)**	D 14.4, 14.5	Directional Derivs. and the Gradient (14.6)	Fall Break	Fall Break
Oct 11, 2021	Oct 12, 2021	Oct 13, 2021	Oct 14, 2021	Oct 15, 2021
Maxima and Minima (14.7) **Due: M 13.3, 14.1-3**	D 14.6, 14.7	Lagrange Multipliers (14.8) **Due: P6 (14.4-14.7)**	M 14.4-7 D 14.8	Double Integrals over Rectangles (15.1)
Oct 18, 2021	Oct 19, 2021	Oct 20, 2021	Oct 21, 2021	Oct 22, 2021
Exam 2 (12.6-14.8) **Due: P7 (14.8)**	D 15.1 Flatland	Double Ints. over General Regions (15.2)	D 15.2 Flatland	Double Ints. in Polar (15.3)
Oct 25, 2021	Oct 26, 2021	Oct 27, 2021	Oct 28, 2021	Oct 29, 2021
Applications (15.4) **Due: P8 (15.1-15.2), FL paper**	D 15.3, 15.4	Surface Area (15.5)	M 15.1-15.4 D 15.5	Triple Integrals (15.6)
Nov 1, 2021	Nov 2, 2021	Nov 3, 2021	Nov 4, 2021	Nov 5, 2021
Triple Ints., Cylindrical (15.7) **Due: P9 (15.3-15.5)**	D 15.6, 15.7	Triple Ints., Spherical (15.8)	M 15.6-15.7 D 15.8	Change of Variables (15.9)
Nov 8, 2021	Nov 9, 2021	Nov 10, 2021	Nov 11, 2021	Nov 12, 2021
Vector Fields (16.1) **Due: P10 (15.6-8)**	D 15.9, Rev.	**Exam 3** (15.1-15.9) **Due: P11 (15.9)**	D 16.1	Line Integrals (16.2)
Nov 15, 2021	Nov 16, 2021	Nov 17, 2021	Nov 18, 2021	Nov 19, 2021
Fund. Thm. of Line Ints. (16.3)	D 16.2, 16.3	Green's Thm. (16.4) **Due: P12 (16.1-3)**	M 16.1-3 D 16.4	Curl and Divergence (16.5)
Nov 22, 2021	Nov 23, 2021	Nov 24, 2021	Nov 25, 2021	Nov 26, 2021
Param. Surfaces (16.6)	D 16.5, 16.6	Thanksgiving Break	Thanksgiving Break	Thanksgiving Break
Nov 29, 2021	Nov 30, 2021	Dec 1, 2021	Dec 2, 2021	Dec 3, 2021
Surface Integrals (16.7) **Due: P13 (16.4-6)**	Stokes' Thm. (16.8) D 16.7 (30 min)	Divergence Thm. (16.9)	D 16.8-9	M 16.7-9 **Due: P14 (16.7-9)**