

Prerequisites: Grade of C or better in MATH 152 (Calculus II)

Instructor(s): George Voutsadakis
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Office Hours:

Monday	Tuesday	Wednesday	Thursday	Friday
1:00-1:50	1:00-1:50	8:00-8:50	1:00-1:50	1:00-1:50

Required Text(s): Calculus Volume 3 (Freely available [here](#))

Course Description: Three-dimensional space, vectors, vector-valued functions, partial differentiation, multiple integration, and topics in vector calculus.

Course Learning Outcomes: At the conclusion of MATH 251, a student will be able to:

1. Characterize standard equations of three dimensional surfaces in rectangular, cylindrical, and spherical coordinates; describe and produce their graphs and traces; and calculate the equations of spheres, lines and planes.
2. Apply 2- and 3-dimensional vector arithmetic including dot and cross products and projections; compute vector length; analyze vector-valued functions to find tangents, normals, and binormals; and calculate arc length and curvature.
3. Compute partial derivatives of functions of two or more variables; and apply partial derivatives to gradients, directional derivatives, and approximation and optimization problems.
4. Compute double and triple integrals in rectangular, cylindrical, and polar coordinates; identify when to use each coordinate system; and translate from one system to the other.
5. Create and solve mathematical models involving area, volume, mass, moments, work, and optimal design, using dimensional analysis, vectors, partial derivatives or multiple integrals.
6. Carry out calculations using Green's theorem, Stokes' theorem, and the divergence theorem.

General Education Objective:

This course is designed to meet the Mathematics General Education Outcome. Students will be able to analyze situations symbolically and quantitatively in order to make decisions and solve problems.

This course contributes to LSSU's Institutional Learning Outcomes by addressing:

2. **Use of Evidence:** Students will identify the need for, gather, and accurately process the appropriate type, quality, and quantity of evidence to answer a complex question or solve a complex problem.



- 3. Analysis and Synthesis:** Students will organize and synthesize evidence, ideas, or works of imagination to answer an open-ended question, draw a conclusion, achieve a goal, or create a substantial work of art.

Grading Scale and Policies:

Sample Point Values:

Exams	(4x50)	200 points
Final Exam		100 points
Quizzes		100 points
		<u>Total 400 points</u>

Sample Grading Scale:

98%-100%	A+	70%-77%	C
92%-97%	A	68%-69%	C-
90%-91%	A-	66%-67%	D+
88%-89%	B+	62%-65%	D
82%-87%	B	60%-61%	D-
80%-81%	B-	0%-59%	F
78%-79%	C+		

Grading Policies:

You will be graded on correct methodology, i.e., if you provide an answer but show no work or your work is incorrect, you will receive no credit. Your solutions must be written in a connected, step-by-step logical fashion and all variables should be clearly defined. If your solution is not written clearly, you will not receive full credit. In many cases, setting up the correct mathematical model and using this model to solve a problem will be just as important as computing a numerical answer.

Course Policies:

- 1. Calculator:** The TI-83/84 Plus is the recommended calculator for this course. Your instructor reserves the right to ask you to solve problems in class, during quizzes and during exams without the use of a calculator.
- 2. Purpose of the Lecture:** Lectures are an opportunity for students to ask questions and seek clarification on material. This implies student preparation has been accomplished prior to class. Lecture is also the opportunity for the instructor to coordinate coverage of the material and present material that is historically or potentially difficult. It does not negate student preparation or study.



3. **Attendance Policy:** Attendance is strongly encouraged. If you miss a class, or are late, you are still responsible for class notes and assignments. Moreover, **you will be assigned a 0 score should a quiz take place during that missed lecture.**
4. **Make-Up Policy:** Each exam should be taken at the designated time. An exam may be taken prior to or after the scheduled date, by agreement with the instructor, provided that the student provides a request with a **documented valid excuse well in advance of the scheduled date. If an absence is unexcused, no make-up will be provided, either for exams or for quizzes.**
5. **Academic Integrity:** Students are expected to perform all assigned work themselves unless otherwise noted. Any form of cheating or plagiarism, including unauthorized use of AI, will be handled in accordance with the University policy on Academic Integrity:
<https://www.lssu.edu/provost/faculty-resources/>
6. **Testing:** Use of head phones, cell phones and hats during exams is prohibited.
7. **AI Policy:** The **use of artificial intelligence (AI) tools is not permitted in this course.** All assignments, projects, examinations, discussions, and written work must be completed solely through the student's own efforts. The use of AI-generated content, including text, images, code, problem solutions, summaries, translations, or other materials, constitutes unauthorized assistance. Students who use AI tools in violation of this policy will be subject to academic integrity procedures and disciplinary action in accordance with University policies.
8. **Snow Day / University Closure Policy:** In the event that the University closes due to inclement weather or an emergency, students are expected to check their university email and/or the course Moodle site for instructions regarding course activities. Students are responsible for monitoring course communications and completing any assigned work by the deadlines provided. If weather related circumstances, such as limited or unavailable internet access, may prevent a student from participating, they should communicate this to the instructor at the beginning of the semester.

University Policies and Statements:

Online and Blended Course Attendance Policy

Students in online or blended classes are required to log in to the Course Management System (Moodle) and complete at least one "Academic Related Activity" within the Add/Drop period.

The Americans with Disabilities Act & Accommodations

Lake Superior State University is committed to following the requirements of the Americans with Disabilities Act Amendments Act and Section 504 of the Rehabilitation Act. This university is also dedicated to providing equal opportunity for participation in all programs, services and activities. If you are a student with a disability or think you may have a disability, please contact Accessibility Services, Library #233, (906) 635-2355, accessibility@lssu.edu to discuss your request further. Once you have registered with Accessibility Services, students should contact their instructor as early as possible for assistance with classroom accommodations.



Medically Excused Absence Approval

In the event that a student is absent due to serious illness, injury, or medical procedures, the student may be asked to provide a Medically Excused Absence Approval memorandum from the Provost's Office. This memorandum will specify the duration and conditions of the student's absence from classes, while keeping their personal information confidential. For more information, please refer to the Medically Approved Absences section of the [Excused and Required Absence Policy & Procedure](#).

Academic Success Center

To support you on your academic path, the Academic Success Center (ASC) provides free tutoring for all students and is located on the main floor of the library. The ASC offers walk in sessions for the math center, consultations with the writing center, and tutoring sessions by appointment. In addition, some classes offer supplemental instruction, which are group sessions tailored to your course content. Contact the ASC at academicsuccess@lssu.edu or 906-635-2849 to set up an appointment or ask questions.

Laker Success

The Laker Success program is designed to ensure your continued progress, inside and outside the classroom. Our committed staff offer individualized attention and group programs that empower you to identify your goals and determine ways to achieve them. Laker Success can also help you overcome obstacles by fine-tuning your learning skills, study habits, sharing proven procrastination-busters, and encouraging your personal power. Contact Laker Success by emailing lakersuccess@lssu.edu or by visiting the Student Engagement Center in Cisler Center, Room 100. Laker Success staff may contact you if an instructor, advisor, or peer asks them to check-in with you, follow up on a recent grade, or to invite you to an event. Take every opportunity to benefit from the many Laker Success services and resources, and remember: Success is personal, not perfect.

Add/Drop Policy

Courses can be added or dropped through Anchor Access until the sixth day of the semester (fourth day for the Summer semester). After this date, students need the instructor's permission to add a course. For additional details about add/drop or withdrawal, go to:

<https://www.lssu.edu/registrar/scheduling/adddrop-courses-withdrawal-information/>

Related dates for this semester can be viewed at: <https://www.lssu.edu/registrar/important-dates/>



Tentative Course Outline

Date of Monday	Monday	Tuesday	Thursday	Friday
24-Aug	Vectors in Plane (2.1)	Vectors in Space (2.2)	Vectors in Space (2.2)	The Dot Product (2.3)
31-Aug	The Dot Product (2.3)	The Cross Product (2.4)	The Cross Product (2.4)	Lines and Planes in Space (2.5)
7-Sep	Labor Day	Quadric Surfaces (2.6)	Cylindrical & Spherical (2.7)	EXAM 1
14-Sep	Cylindrical & Spherical (2.7)	Vector-Valued Functions (3.1)	Calculus of Vector-Valued (3.2)	Calculus of Vector-Valued (3.2)
21-Sep	Arc Length & Curvature (3.3)	Arc Length & Curvature (3.3)	Functions of Several Vars (4.1)	Limits & Continuity (4.2)
28-Sep	Limits & Continuity (4.2)	Partial Derivatives (4.3)	Partial Derivatives (4.3)	Tangent Planes and Lin. Approx. (4.4)
5-Oct	The Chain Rule (4.5)	The Chain Rule (4.5)	Extra Room	EXAM 2
12-Oct	Indigenous People's Day	Directional Derivatives (4.6)	Directional Derivatives (4.6)	Maxima/Minima (4.7)
19-Oct	Lagrange Multipliers (4.8)	Lagrange Multipliers (4.8)	Double Integrals Rectangular (5.1)	Double Integrals General (5.2)
26-Oct	Double Integrals General (5.2)	Double Integrals Polar (5.3)	Double Integrals Polar (5.3)	EXAM 3
2-Nov	Triple Integrals (5.4)	Triple Integrals (5.4)	Triple Integrals Cylindrical and Spherical (5.5)	Triple Integrals Cylindrical and Spherical (5.5)
9-Nov	Vector Fields (6.1)	Vector Fields (6.1)	Line Integrals (6.2)	Line Integrals (6.2)
16-Nov	Conservative Vector Fields (6.3)	Green's Theorem (6.4)	Green's Theorem (6.4)	Divergence & Curl (6.5)
23-Nov	Extra Room	EXAM 4	Thanksgiving	
30-Nov	Surface Integrals (6.6)	Stokes' Theorem (6.7)	Stokes' Theorem (6.7)	Divergence Theorem (6.8)
7-Dec	<i>Final Exam Week</i>			



Suggested Practice Problems

STUDY 1-2 HOURS EVERY DAY! DO NOT LET UNDONE HOMEWORK ACCUMULATE!
IF YOU HAVE ANY QUESTIONS, BRING THEM IN TO CLASS OR VISIT ME AT THE OFFICE!!

Section	Problems
2.1	1, 3, 5, 7, 9, 11, 17, 19, 25, 29, 31, 35
2.2	61, 63, 65, 67, 69, 71, 75, 77, 79, 83, 85, 87, 89, 91, 93, 99, 103
2.3	123, 125, 127, 129, 131, 133, 135, 143, 145, 149, 153, 167, 171
2.4	183, 185, 187, 189, 191, 193, 197, 201, 209, 211, 215
2.5	243, 247, 249, 251, 255, 259, 267, 271, 275, 277, 281, 285, 289
2.6	303, 307, 319, 325, 331, 333, 339, 341
2.7	363, 365, 367, 371, 373, 375, 379, 381, 385, 386, 387, 389, 390, 399, 405, 407
3.1	1, 5, 7, 9, 11, 15, 16, 20, 21, 23, 25
3.2	41, 43, 47, 51, 53, 57, 59, 61, 63, 69, 71, 75, 77, 99, 101
3.3	103, 107, 111, 115, 117, 123, 125, 135, 137
4.1	6, 7, 10, 15, 17, 25, 27, 31, 33, 43, 49, 53, 55
4.2	61, 63, 65, 69, 71, 75, 81, 83, 87, 89
4.3	119, 121, 123, 129, 131, 135, 137, 143, 145, 147
4.4	165, 167, 173, 175, 183, 185, 186, 192, 194
4.5	217, 219, 221, 223, 225, 231, 233, 237, 239, 247
4.6	263, 265, 267, 269, 271, 275, 277, 279, 281, 283, 291, 293, 295, 301, 303, 305
4.7	311, 313, 319, 323, 327, 333, 345, 349, 351, 353
4.8	359, 361, 363, 371, 375, 381, 383, 385
5.1	13, 15, 17, 19, 21, 23, 25, 29, 33, 35
5.2	60, 61, 62, 67, 75, 77, 81, 83, 85, 87, 89, 97, 99
5.3	123, 125, 127, 129, 131, 133, 135, 137, 139, 145, 147, 149, 151, 159, 161
5.4	181, 183, 185, 187, 191, 193, 195, 197, 199, 203, 207, 217
5.5	241, 243, 245, 249, 251, 255, 257, 259, 267, 269, 277, 279, 281, 285
6.1	15, 17, 19, 22, 23, 31, 32-34
6.2	49, 51, 53, 55, 57, 67, 6, 73, 75, 85, 91
6.3	101, 103, 107, 109, 111, 113, 117, 119, 121, 129
6.4	147, 149, 155, 165, 167, 171, 173, 179, 181, 185, 189, 191, 197, 199, 201
6.5	213, 215, 217, 223, 225, 227, 233, 235, 247, 249, 251, 255
6.6	269, 273, 277, 281, 283, 285, 291, 295, 303, 307, 309, 311, 313
6.7	329, 331, 333, 335, 339, 343, 345, 351, 353, 357
6.8	385, 387, 393, 403, 409, 413, 415, 421, 423