

**Prerequisites:** MATH 152 Calculus II with a C or above, or the equivalent.

**Instructor:** George Voutsadakis  
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**Office Hours:**

| Monday    | Tuesday   | Wednesday | Thursday  | Friday    |
|-----------|-----------|-----------|-----------|-----------|
| 2:00-2:50 | 2:00-2:50 | 2:00-2:50 | 2:00-2:50 | 2:00-2:50 |

**Required Texts:** Calculus: Early Transcendentals, by Jon Rogawski, Freeman, 2<sup>nd</sup> Edition, ISBN: 9781429282574, 2011.

**Recommended:** Student Solution Manual to Accompany Jon Rogawski's Calculus Multivariable, 2<sup>nd</sup> Edition, by Dresden, Bowen, and Paul, ISBN 978-1429255080, 2012.

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

**Course Objectives:** Upon completion of MATH 251, students will be able to:

1. Recognize standard equations of three dimensional surfaces in rectangular, cylindrical, and spherical coordinates; describe and sketch their graphs and traces; and find 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 determine 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.

**General Education Objectives:**

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.* All of the above **Course Objectives** will be used to satisfy the Mathematics General Education Outcome.

**Grading Scale and Policies:**

**Point Values:**

|            |                                |
|------------|--------------------------------|
| Exams      | 200 points                     |
| Final exam | 100 points                     |
| Quizzes    | 100 points                     |
|            | <b><u>Total 400 points</u></b> |

**Grading Scale%:**

|        |    |       |    |
|--------|----|-------|----|
| 94-100 | A  | 70-74 | C  |
| 90-93  | A- | 65-69 | C- |
| 87-89  | B+ | 60-64 | D+ |
| 84-86  | B  | 55-59 | D  |
| 80-83  | B- | 50-54 | D- |
| 75-79  | C+ | 0-49  | F  |

**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.

The homework exercises for each section covered are on the last pages of this handout. You should spend a lot of your math study time doing homework. If you are struggling with your homework seek help from your instructor or the tutors in the Learning Center.

The course outline on the next-to-last page is a projection of the general structure and content of the course. It is tentative and will be loosely followed.

**Ground Rules:**

- 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. All other electronic devices, including computers, PDAs and cell phones, must be turned off for all class lecture sessions.
- 2. Purpose of 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. Any form of cheating or plagiarism will be handled in accordance with the Academic Integrity Procedures. Violations of the University Academic Integrity Policy may result in an F course grade.
- 6. Testing:** Use of head phones, cell phones and hats during exams is prohibited.

**University Policies**

**Online and Blended Course Attendance Policy**

Students in online or blended classes are required to log in to the Course Management System (Blackboard, Wimba, TaskStream, etc.) and complete at least one “Academic Related Activity” within the Add/Drop period.

**The Americans with Disabilities Act & Accommodations**

In compliance with Lake Superior State University policies and equal access laws, disability-related accommodations or services are available to students with documented disabilities.

If you are a student with a disability and you think you may require accommodations you must register with Accessibility Services (AS), which is located in the KJS Library, Room 233, (906) 635-2355 or x2355 on campus. AS will provide you with a letter of confirmation of your verified disability and authorize recommended accommodations. This authorization must be presented to your instructor before any accommodations can be made.

Students who desire such services should meet with instructors in a timely manner, preferably during the first week of class, to discuss individual disability related needs. Any student who feels that an accommodation is needed – based on the impact of a disability – should meet with instructors privately to discuss specific needs.

**IPASS (Individual Plan for Academic Student Success)**

If at mid-term your grades reflect that you are at risk for failing some or all of your classes, you will be contacted by a representative of IPASS. The IPASS program is designed to help you gain control over your learning through proactive communication and goal-setting, the development of intentional learning skills and study habits, and personal accountability. You may contact Academic Services or email [ipass@lssu.edu](mailto:ipass@lssu.edu) if you would like to sign up early in the semester or if you have any questions or concerns.

**Tentative Course Outline:**

| Week | Dates | Monday | Tuesday | Thursday | Friday |
|------|-------|--------|---------|----------|--------|
| 1    | 08/27 | 11.3   | 11.4    | 11.5     | 11.5   |
| 2    | 09/03 | BREAK  | 12.1    | 12.2     | 12.2   |
| 3    | 09/10 | 12.3   | 12.4    | 12.4     | 12.5   |
| 4    | 09/17 | 12.6   | 12.7    | 12.7     | Exam 1 |
| 5    | 09/24 | 13.1   | 13.1    | 13.2     | 13.2   |
| 6    | 10/01 | 13.3   | 13.4    | 13.4     | 13.5   |
| 7    | 10/08 | 13.5   | BREAK   | Review   | Exam 2 |
| 8    | 10/15 | 13.6   | 13.6    | 14.1     | 14.2   |
| 9    | 10/22 | 14.2   | 14.3    | 14.3     | 14.4   |
| 10   | 10/29 | 14.4   | 14.5    | 14.5     | 14.6   |
| 11   | 11/05 | 14.6   | 14.7    | Review   | Exam 3 |
| 12   | 11/12 | 14.8.  | 14.8    | 15.1     | 15.1   |
| 13   | 11/19 | 15.2   | 15.2    | BREAK    | BREAK  |
| 14   | 11/26 | 15.3   | 15.3    | Review   | Exam 4 |
| 15   | 12/03 | 15.4   | 15.5    | 15.5     | 15.6   |

**Homework Practice:**

**Section 11.1:** 1, 3, 5, 7, 11, 15, 19, 23, 25, 31, 33, 39, 49, 51, 53, 55

**Section 11.2:** 1, 3, 5, 7, 15, 17

**Section 11.3:** 1, 3, 5, 11, 15, 24, 27, 50, 51

**Section 11.4:** 1, 3, 5, 7

**Section 11.5:** 1, 3, 5, 11, 13, 15, 17, 21, 25, 33, 37

**Section 12.1:** 1, 3, 5, 9, 11, 13, 15, 17, 19, 21, 23, 25, 29, 31, 33, 35, 37, 39, 41, 43, 45, 47, 48, 49, 51, 55, 57, 59. Do more of each type, if you need the practice.

**Section 12.2:** 1, 3, 7, 11, 13, 17, 19, 25, 29, 33, 37, 41, 51, 55. Do more of each type, if you need the practice.

**Section 12.3:** 1, 9, 13, 15, 19, 23, 29, 35, 37, 39, 41, 49, 51, 53, 59, 65, 77. Do more of each type, if you need the practice.

**Section 12.4:** 1, 5, 9, 11, 13, 15, 19, 21, 24, 33, 41, 43, 50, 59. Do more of each type, if you need the practice.

**Section 12.5:** 1, 3, 5, 7, 9, 11, 13, 15, 17, 21, 23, 25, 27, 31, 33, 35, 37, 49, 51, 57. Do more of each type, if you need the practice.

**Section 12.6:** 1, 4, 5, 7, 8, 9, 11, 13, 15, 17, 19, 21, 25, 27. Do more of each type, if you need the practice.

**Section 12.7:** 1, 7, 11, 13, 15, 17, 19, 21, 23, 25, 27, 29, 31, 33, 37, 41, 43, 45, 47, 49, 51, 53, 55, 57, 59, 61, 63. Do more of each type, if you need the practice.

**Section 13.1:** 1, 3, 5, 7, 9, 11, 13, 15, 19, 21, 25, 28, 29. Do more of each type, if you need the practice.

**Section 13.2:** 1, 3, 5, 7, 9, 13, 17, 19, 23, 25, 29, 39, 41, 43, 45, 47, 49, 57. Do more of each type, if you need the practice.

**Section 13.3:** 1, 3, 5, 7, 9, 11, 13, 17, 23. Do more of each type, if you need the practice.

**Section 13.4:** 1, 3, 5, 7, 9, 11, 13, 15, 17, 29, 31, 37, 39, 43, 45, 57. Do more of each type, if you need the practice.

**Section 13.5:** 3, 5, 9, 11, 13, 15, 17, 19, 23, 29, 33, 35, 39. Do more of each type, if you need the practice.

**Section 13.6:** 1, 3, 5, 7, 11.

**Section 14.1:** 1, 3, 5, 9, 11, 17, 19, 20, 21, 23, 29, 31, 38. Do more of each type, if you need the practice.

**Section 14.2:** 1, 3, 5, 9, 11, 13, 19, 21, 23, 25, 29, 31. Do more of each type, if you need the practice.

**Section 14.3:** 9, 10, 11, 12, 13, 15, 17, 19, 21, 23, 25, 27, 29, 31, 33, 37, 39, 41, 43, 47, 49, 55, 47, 49, 61, 63, 65, 67, 71, 73. Do more of each type, if you need the practice.

**Section 14.4:** 3, 5, 7, 9, 11, 13, 17, 21, 23, 25, 27, 29, 31, 37, 39. Do more of each type, if you need the practice.

**Section 14.5:** 1, 3, 5, 9, 11, 17, 19, 20, 21, 23, 29, 31, 38, 43, 45. Do more of each type, if you need the practice.

**Section 14.6:** 1, 3, 5, 7, 9, 11, 13, 25, 27, 29. Do more of each type, if you need the practice.

**Section 14.7:** 3, 7, 11, 13, 25, 29, 37, 41. Do more of each type, if you need the practice.

**Section 14.8:** 5, 7, 13, 16, 28, 37, 41. Do more of each type, if you need the practice.

**Section 15.1:** 15, 17, 19, 21, 23, 25, 27, 29, 31, 33, 35, 37, 39, 41. Do more of each type, if you need the practice.

**Section 15.2:** 3, 5, 9, 11, 15, 17, 19, 21, 23, 25, 27, 29, 31, 33, 35, 39, 41, 45, 47, 49. Do more of each type, if you need the practice.

**Section 15.3:** 1, 3, 5, 9, 11, 13, 15, 17, 19, 21, 23, 25, 31. Do more of each type, if you need the practice.

**Section 15.4:** 1, 3, 5, 7, 11, 15, 19, 21, 23, 25, 27, 31, 33, 37, 41, 43, 45, 47, 49. Do more of each type, if you need the practice.

**Section 15.5:** 1, 3, 7, 11, 13, 17, 23. Do more of each type, if you need the practice.

**Section 15.6:** 1, 3, 5, 13, 15, 17, 21. Do more of each type, if you need the practice.