

# MTH 2554: Multivariable Calculus

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Office Hrs: MTW: 10:30 - 11:45 Fridays or by appointment



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**Webpage for the course:** Additional materials for this course are posted at <http://www.risat.org/calculus-iii>

**Catalog Description.** A study of vectors, polar coordinates, three-dimensional geometry, differential calculus of functions of several variables, multiple integrals, line and surface integrals, and vector fields including Green's theorem, Stoke's theorem, and Divergence theorem.

**Prerequisites:** MTH 1555 (Calculus II) with a grade C or better.

**Textbook:** Suggested textbook is **Calculus with Early Transcendentals**, by Stewart. Any edition is fine! Any used textbook including older editions are just fine.

**Course objectives:** A student who successfully completes this course will be able to:

- (1) To understand the foundations of the geometry in space: vectors, dot and cross product, equations of lines, planes, surfaces.
- (2) Have a deep understanding of vector functions and how they are used in physics, engineering, topography, climate change, etc.
- (3) Understand the theory of partial derivatives and their applications: tangent planes, maximums and minimums for functions of several variables.
- (4) Be able to compute multiple integrals, including integrals that require a change of coordinates (variables).
- (5) To have a solid understanding of vector calculus, line integrals, curl and divergence, Green, Stoke, and Divergence theorems.

**Delivery of lectures.** This is a face to face class. You are expected to attend lectures, which will be held on Room: ODH 202A (O'Dowd Hall) MTWR 9:45 - 11:20 a.m.

There will be one midterm which will be held during regular class time. Please block the date. No makeup exams will be given under any circumstances. I follow the class calendar (next page) very closely. Please use it as your guide throughout the semester.

**Materials needed.** For the course you will need some version of the book **Calculus** of Stewart.

**Grading:** The following chart will be used to determine your grade:

Homework: 20%  
Midterm I: 20%  
Midterm II: 20%  
Final: 40%

Grades will be determined with the following scale:

A	A-	B+	B	B-	C+	C	C-	D+	D	D-	F
94-100	90-93	87-89	84-86	80-83	77-79	73-76	70-72	67-69	63-66	60-62	0-59

**Course policies.** The course will be conducted in accordance to the Oakland University regulations and policies. Details can be found here: <https://oakland.edu/provost/policies-and-procedures/>

**Good study habits.**

- Take careful notes, make sure to go over them when you get home
- Solve all the problems at the end of each section. Even when you are not able to solve a problem you learn a lot from them if you attempt to do so.
- Create study groups and participate actively on them
- Come to my office hours and ask for help for things that you don't understand. Make sure you come prepared with well thought questions.

**Contents.** We will cover chapters 12-16 in Stewart's book (with some small deviations). The following list of topics will be followed very closely. Please pay attention and take careful notes as some of the problems or topics might not be in the book.

**Chapter 12:** Vectors and geometry of space

- 12.1 Three dimensional coordinate system
- 12.2 Vectors
- 12.3 The dot product
- 12.4 The cross product
- 12.5 Equations of lines and planes
- 12.6 Quadratic surfaces

**Chapter 13:** Vector functions

- 13.1 Vector functions and space curves
- 13.2 Derivatives and integrals of vector functions
- 13.3 Arc length and curvature
- 13.4 Motion in space: velocity and acceleration

**Chapter 14:** Functions of several variables, partial derivatives

- 14.1 Functions of several variables
- 14.2 Limits and continuity
- 14.3 Partial derivatives
- 14.4 Tangent planes and linear approximation
- 14.5 The chain rule
- 14.6 Directional derivatives and the gradient
- 14.7 Maximum and minimum values
- 14.8 Lagrange multipliers

**Chapter 15:** Multiple integrals

- 15.1 Double integrals over rectangles
- 15.2 Iterated integrals
- 15.3 Double integrals over general regions
- 15.4 Double integrals in polar coordinates
- 15.5 Applications of double integrals
- 15.6 Surface area
- 15.7 Triple integrals
- 15.8 Triple integrals in cylinder coordinates
- 15.9 Triple integrals in spherical coordinates
- 15.10 Change of variables in multiple integrals

**Chapter 16:** Vector Calculus

- 16.1 Vector fields
- 16.2 Line integrals
- 16.3 The fundamental theorem of line integrals
- 16.4 Green's theorem
- 16.5 Curl and divergence
- 16.6 Parametric surfaces and their areas
- 16.7 Surface integrals
- 16.8 Stoke's theorem
- 16.9 The divergence theorem

MONDAY		WEDNESDAY		FRIDAY	
Jan 5th		7th Section: 12.1-12.2	1	9th Section: 12.3	2
12th Section: 12.4	3	14th Section: 12.5	4	16th Section: 13.1	5
No Class 19th		21st Section: 13.2	6	23rd Section: 13.3	7
26th Section: 13.4	8	28th Section: 14.1	9	30th Section: 14.2	10
Feb 2nd Section: 14.3	11	4th Section: 14.4	12	6th Section: 14.5	13
9th Section: 14.6	14	11th Section: 14.7	15	13th Section: 14.8	16
16th <b>Midterm I:</b>	17	18th Section: 15.1	18	20th Section: 15.2	19
23rd Section: 15.3	20	25th Section: 15.4	21	27th Section 15.5	22
Winter Break Mar 2nd		Winter Break 4th		Winter Break 6th	
9th Section 15.6	23	11th Section 15.7	24	13th Section 15.8	25
16th Section 15.9	26	18th Section 15.10	27	20th Review	28
23rd Section 16.1	29	25th Section 16.2	30	27th Section 16.3	31
30th Section 16.4	32	Apr 1st Section 16.5	33	3rd Review	34
6th <b>Midterm II:</b>	35	8th Section 16.6	36	10th Section 16.7	37
13th Section 16.8	38	15th Section 16.9	39	17th Review	40
20th Review	41	22nd	42	24th	43
<b>Final Exam: 8:00-11:00 AM</b> 27th	44	29th	45	May 1st	46