Analytic Geometry and Calculus 3
MATH 0240
Fall 2023 - 24

Sichuan University - Pittsburgh Institute

Instructor

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Classroom: **3 – 103 SCUPI Building**
Lectures: Section 1 - Monday 16:45 – 18:25
Wednesday 16:45 –18:25
Office Hours: Friday 2 – 4 AM

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Tutorials: TBA

Course Description

MATM 0240 is the third part of our standard calculus sequence. The distinct feature of this part of the course is its focus on multi-dimensional analysis, as opposed to the one-dimensional analysis learned in MATH 0220 & 0235 (Analytic Geometry and Calculus 1 & 2). This semester, you will learn such important concepts as the function of several variables, partial derivatives line-integrals, multivariable integrals, and vector calculus (with an emphasis on Green's and Stokes' theorems) and their applications. You will see that these concepts are a natural generalization of what you already know from Cal 1 and 2. This is how the tree of mathematics is built - going from simple to more complicated. Applications connect analytical skills to modelling real-world problems that demonstrate the power and utility of Calculus 3. The ideas of the Calculus 3 apply to numerous areas of engineering, physics, pure mathematics, biology, and many others. Some of them we will see in the course, some will surface later in your future special courses, yet some may wait until you become an engineer.

Like in MATH 0220 & 0235, your success in MATH 0204 would require much hard work, hours of study and problem-solving, and your active involvement in learning, both in and outside the classroom. Our course is designed to help you stay constantly connected with the course and the material and within easy reach of some of your best resources: your instructor, teaching assistants, and colleagues! It is important to realize that the material in each topic builds on material introduced earlier in the course and often generalizes concepts from Calculus I and II.

Prerequisites

MATH 0220 & 0230 - Analytic Geometry and Calculus 1 & 2

Course Learning Objectives (CLOs)

After completing this course, students should have developed a clear understanding of the fundamental concepts of multivariable Calculus and a range of skills that include:

1. Knowledge

1.1 An understanding of a parametric curve as a trajectory described by a position vector; the ability to find parametric equations of a curve and to compute its velocity and acceleration vectors.

1.2 A comprehensive understanding of the gradient, including its relationship to level curves (or surfaces), directional derivatives, and linear approximation.

1.3 An understanding of line integrals for work and flux, surface integrals for flux, general surface integrals and volume integrals. Also, an understanding of the physical interpretation of these integrals.

1.4 An understanding of the major theorems (Green's, Stokes', Gauss') of the course and of some physical applications of these theorems.

2. Skills

2.1 The ability to compute derivatives using the chain rule or total differentials.

2.2 The ability to set up and solve optimization problems involving several variables, with or without constraints.

2.3 The ability to set up and compute multiple integrals in rectangular, polar, cylindrical, and spherical coordinates.

2.4 The ability to change variables in multiple integrals.

3. Competences

3.1 Apply the computational and conceptual principles of calculus to the solutions of various scientific applications.

3.2 Use the most important theorems of vector calculus, such as the Fundamental Theorem of Line Integrals, Green's Theorem, the Divergence Theorem, and Stokes' Theorem, to simplify integration problems.

3.3 Analyse real-world scenarios using vector calculus, formulate problems about the scenarios, creatively model these scenarios (using technology, if appropriate) to solve the problems using multiple approaches, analyse if the results are reasonable, and then interpret and communicate the results.

3.4 Develop mathematical maturity to undertake tasks in engineering and related fields to apply the concepts of differentiable, integral, and multivariable calculus to open-ended problems.

Resources

Textbook:
Essential Calculus, 2nd Edition, International Metric Edition, James Stewart, Cengage Learning, 2010

Supplementary:
Calculus for Scientists and Engineers - ***Early Transcendentals***, William Brigg, Lyle Cochran, Bernard Gillett and Eric Schulz, 3rd edition, Pearson Education 2011

Technological Resources
Students may find virtual simulations an effective tool for real-world processes or systems operations.
https://ocw.mit.edu/courses/simulations-applets-and-visualizations/#mathematics

Blackboard
Please regularly log on and check https://pibb.scu.edu.cn/. Lecture notes, online quizzes, assignments, projects, announcements, and your grades will be uploaded on the MATH 0240 page of the Blackboard.

Course Content
We will cover most of the material from Chapters 11-13 in the textbook.

Class Structure
Lectures.

Tutorials
Tutorials run by our TAs will start in Week 02.

Course Assessment
The final grade will be computed based on the score of weekly assignments, quizzes, midterm, and final exams.

Exams
Two midterm exams and a final exam will be given in the semester. All exams are closed-book, and cheating is not tolerated. No electronic devices will be permitted during exams. Note that the final exam is comprehensive.

Exam Schedule

Midterm Exam 1:	Week 8,	2 hours duration - TBD
Midterm Exam 2:	Week 14,	2 hours duration - TBD
Final Exam:	Final Week,	2 hours Comprehensive

Final Grade

The final grade will be computed according to the following scheme:

Homework/Attendance:	10%
Quizzes:	10%
Midterm 1:	25%
Midterm 2:	25%
Final Exam:	30%

Cutoffs

A [90, 100], A- [85, 90), B+ [80, 85), B [76, 80), B- [73, 76), C+ [70, 73), C [66, 70), C- [63, 66), D+ [61, 63), D [60, 61), F (60, 0).

Assignments

Homework will be assigned on Friday every week and due by the following week on Friday at the beginning of the class. No late homework is accepted, and plagiarism is not tolerated. The lowest grade of the assignment will be dropped when computing the final grade. Discussions of the assignment problems are encouraged, but each student must submit his/her assignment. Each homework must include a Name, Student ID, and Assignment Title. Homework must be done in a structured, logical, and orderly manner, enabling the grader to verify steps, equations, and methods used readily. For collaborative assignments, grading rubrics are used for objective and consistent assessment of various performances, assignments, and activities. The rubrics for the collaborative projects/assignments will be uploaded to the Blackboard.

Quizzes: In-class/online quizzes will be given on some lecture days and every tutorial session.

Schedule and weekly learning goals

The schedule is tentative and subject to change. The listed objects below should be viewed as the key concepts you should grasp after each week and also as a study guide before each exam and at the end of the semester. Each test will be based on material taught up until the second last week before the test; namely, Test 1 covers Weeks 02-08, and Test 2 is based on Weeks 09-13. The final exam will cover all topics taught in this semester.

Week	Dates	Chapter/Section	Topics
1	26/02 – 01/03	11.1 – 11.2	• Functions of several variables • Limits and continuities Sections
2	04/03 – 08/03	11.3 – 11.4	• Partial derivatives • The tangent plane and linear approximation
3	11/03 – 15/03	11.5	• Chain rule and it's Applications
4	18/03 – 22/03	11.6	• Directional derivatives and the gradient vector
5	18/03 – 22/03	11.7	• Maximum and minimum values
6	25/03 – 29/03	11.8	• Lagrange multipliers
7	01/04 – 05/04	12.1 – 12.2	• Double integrals over rectangular regions
8	08/04 – 12/04	12.3 – 12.4	• Double integrals over general regions
9	15/04 – 19/04	12.5	• Double integrals in polar coordinates

10	15/04 – 19/04	12.6	• Triple integrals
11	22/04 – 26/04	12.7 – 12.8	• Triple integrals in cylindrical coordinates Triple integrals in spherical coordinates
11	22/04 – 26/04	13.1 – 13.2	• Vector fields
12	29/04 – 03/05	13.2 – 13.3	• Line integrals
11	06/05 – 10/05	13.4	• The fundamental theorem for line integrals
12	13/05 – 17/05	13.5	• Green's Theorem
13	20/05 – 24/05	13.6 – 13.9	• Curl and divergence
14	27/05 – 31/05	13.7	• Parametric surfaces and their area
15	03/06 – 07/06	13.8-I	• Surface integrals
16	10/06 – 14/06	13.8-II	• Stoke's theorem
17	17/06 – 21/06	13.9	• Divergence theorem
18	24/06 – 28/06		**Final Exam Week**

Course Policies

During Class

Computers may be allowed in class for the electronic recording of notes. But please refrain from using computers for any activities unrelated to the course. Phones are prohibited as they are rarely helpful for anything in the course. Eating and drinking are allowed in class, but please keep from it affecting the course.

Attendance Policy

Attendance is expected in all lectures. Valid excuses for absence will be accepted before class. In extenuating circumstances, valid excuses with proof will be accepted after class.

Policies on Late Assignments and Exams

Students should start their homework assignments immediately after the assignments are given, and DO NOT wait until the last minute to meet the deadlines. Late assignments will be NOT accepted except for emergencies and health issues. Any other late assignments handed in will be marked but will be given a zero mark. At most, two extensions for assignments will be given in this course. All assignments will be counted in your total grade. Late submission for previous assignments during the final exam period will NOT be accepted in any form for any excuses.
All tests and the final exam are mandatory. There will be no makeup exam for each test. If you miss the final, a makeup exam may be given for the final exam if the student has approval from the instructor or emergencies and health issues with valid proof. I will not accept the student deceleration for absence form for the final exam.

Academic Assistance

If you have questions regarding class materials, homework problems, grading issues, etc., you are encouraged to attend office hours. Unless you cannot make it, you may email the TA or

the instructor. Please allow 24 to 48 hours for any response to emails. The subject of each email must include "[MA0240]". For example, if you have a question regarding a homework problem, the email's subject could be [MA0240] Question about Problem X of Assignment X. Please make sure that you sign off with your official name (the one that appears in Blackboard). You are encouraged to use academic language in your posts.

Academic Integrity

At Sichuan University, we are guided in all of our work by the values of academic integrity: honesty, trust, fairness, responsibility, and respect (The Centre for Academic Integrity, Duke University, 1999). As a student, you are required to demonstrate these values in all your work. Everyone at SCUPI is expected to treat others with dignity and respect. The Code of Student Conduct allows Sichuan University to take disciplinary action if students do not follow this community expectation.