Course Change Request

New Course Proposal

Date Submitted: 01/26/26 10:37 am

Viewing: **MATH 515 : Advanced Calculus I**

Last edit: 02/04/26 2:33 pm

Changes proposed by: esander

Programs referencing this course

SC-MS-MATH: Mathematics, MS

In Workflow

1. **MATH Chair**
2. **SC Curriculum Committee**
3. SC Assistant Dean
4. Assoc Provost-Graduate
5. Registrar-Courses
6. Banner

Approval Path

1. 01/28/26 10:55 pm Maria Emelianenko (memelian): Approved for MATH Chair

Are you completing this form on someone else's behalf?

No

Effective Term: Fall 2026

Subject Code: MATH - Mathematics

Course Number: 515

Bundled Courses:

Is this course replacing another course? No

Equivalent Courses:

Catalog Title: Advanced Calculus I

Banner Title: Advanced Calculus I

Will section titles vary by semester? No

Credits: 3

Schedule Type: Lecture

Hours of Lecture or Seminar per week: 3

Repeatable:

May only be taken once for credit (NR)
GRADUATE ONLY

Default Grade Mode: Graduate Regular

Recommended Prerequisite(s):
Math 213 or MATH 215, and MATH 300 or equivalents

Recommended Corequisite(s):

Required Prerequisite(s) / Corequisite(s) (Updates only):
Graduate-level student

Registrar's Office Use Only - Required Prerequisite(s)/Corequisite(s):

And/Or	(	Course/Test Code	Min Grade/Score	Academic Level	)	Concurrency?

Registration Restrictions (Updates only):

Registrar's Office Use Only - Registration Restrictions:

Field(s) of Study:

Class(es):

Level(s):

Degree(s):

School(s):

Catalog Description:
The goal of this course is to introduce the student to the arguments and techniques that are used in modern analysis, and in particular it will help the student develop a facility with the limiting processes that occur regularly throughout mathematics. In addition the course reinforces the theory of differentiation and integration learned previously and places it on a more mathematically rigorous foundation. Finally, the course provides a mathematically rigorous foundation for solving problems in more advanced applied mathematics including numerical analysis, differential equations, and functional analysis. Topics studied

include: number systems, functions, sequences, limits, continuity, differentiation, integration, transcendental functions, and infinite series.

Justification:

What: Creating a new course.

Why: The goal of this course is for students to develop a rigorous foundation for calculus, hone skills of writing analytical proofs, develop examples and counter examples, give precise statements of definitions and theorems and apply these ideas in various contexts.

Does this course cover material which crosses into another department? No

Learning Outcomes:

Will this course be scheduled as a cross-level cross listed section? Yes

Please use the Additional Attachments button to attach two syllabi for review, one undergraduate and one graduate, preferably as separate documents. These should be provided in order to demonstrate the difference in expectations and assessments for undergraduates and graduates taking the course.

Attach Syllabus

Math515Syllabus.pdf

Additional Attachments

315f25sb.pdf

Staffing:

David Walnut, Flavia Colonna, Matt Holzer, Yiannis Loizides, Anton Lukyanenko, Carlos Rautenberg, Nathan Wagner, Thomas Wanner, Mahamadi Warma, Evelyn Sander

Relationship to Existing Programs:

This course is cross listed with Math 315. The goal is to have an opportunity for graduate students to learn the material at a higher level than they would learn when taking it as an undergraduate student. This course is part of a proposed change to our MS program.

Relationship to Existing Courses:

This course is cross listed with Math 315. The goal is to have an opportunity for graduate students to learn the material at a higher level than they would learn when taking it as an undergraduate student.

Have you reached out to the Libraries to determine whether there are adequate resources to support your course? If not, please email Meg Meiman, Associate University Librarian for Learning, Research, and Engagement at mmeiman2@gmu.edu.

No

Additional Comments:

This course is part of a proposed change to our MS program.

Reviewer Comments

Key: 19171

Math 515: Advanced Calculus, Advanced knowledge level

Course Modality: In person
Course Website: Canvas
Credits: 3
Prerequisite: C or better in Math 213 and Math 300 (or equivalent)
Restrictions on registration: Undergraduates cannot enroll in this class

Course Description

Number system, functions, sequences, limits, continuity, differentiation, integration, transcendental functions, and infinite series.

Learning Outcomes

The goal of this course is to introduce the student to the arguments and techniques that are used in modern analysis, and in particular will help the student develop a facility with the limiting processes that occur regularly throughout mathematics. In addition the course reinforces the theory of differentiation and integration learned previously and places it on a more mathematically rigorous foundation. Finally the course provides a mathematically rigorous foundation for solving problems in more advanced applied mathematics including numerical analysis, differential equations, and functional analysis.

Prerequisite knowledge: Prior to the course, the student is expected to be familiar with the basic rules of logic and of mathematical proof including universal and existential quantifiers, negation, and mathematical induction. The student is also expected to be familiar with the notion of function and equivalence relation, and with the basic properties of sets.

You are required to familiarize yourself with some flavor of the mathematical typesetting software TeX, such as LaTeX. You are not expected to come in with this familiarity, but it is required that you typeset solutions to the homework sets using TeX. More details on this will be available on the Canvas page for this course.

Course Topics

The course will cover the following topics

- Week 1-2: Ch. 1 Tools for Analysis
- Week 3-4: Ch. 2 Convergent Sequences
- Week 5-6: Ch. 3 Continuous Functions
- Week 7-9: Ch. 4 Differentiation
- Week 10-11: Ch. 6 Integration: Two Fundamental Theorems
- Week 12-14: Ch. 9 Sequences and Series of Functions
- Week 14-15: Ch. 10 The Euclidean Space R^n

Course Textbook

Textbook: Patrick M. Fitzpatrick, Advanced Calculus (Second Edition)}, ISBN 0-534-37603-7. The course will cover portions of Chapters 1-4, 6, 9, and 10 of the text. Other topics will be covered if time permits.

Course Policies

Uncollected homework exercises: There is a posted list of homework exercises for the course taken from the exercises at the end of each section of the book. Students are expected to complete these homework problems in a timely fashion as the corresponding sections are covered in class. These exercises will not be collected. Collaboration is encouraged on these assignments.

Graded homework assignments: There will be short writing assignments given approximately weekly throughout the semester. The assignments will involve writing mathematically and grammatically correct solutions to problems, usually involving proofs. Your grade for these assignments will be based on the correctness of your proofs and clarity and correctness of your writing. Precise assignments and due dates will given on Canvas.

From time to time there will be class time set aside for work on particular homework assignments preferably in small groups. Students will be asked to write up the solutions to these problems and submit them individually. These submissions will be subject to the same requirements as ordinary homework assignments and will be graded in the same way.

Homework policies: The student should be aware of the following requirements for all homework sets:

- No late assignments will be accepted under any circumstances.
- All assignments are to be typed up using some flavor of TeX, such as LaTeX.
- Submissions are done electronically through Gradescope as a pdf file (no other file format is acceptable).

- Collaboration is permitted on the writing assignments, but the final write up must be done independently with no help from other sources.
- Students must demonstrate in written proofs that they substantially understand the problem and what they are writing.
- Copying someone else's work or copying a solution from the internet, AI assistant, or other source is a violation of the honor code and will be treated as such. If stuck on a problem or need a hint, contact the instructor either in person or by email.
- If any one of these rules is violated, the assignment will not be accepted.
- The average of your written homework assignment scores will count for 60\% of the final grade.

Midterm: A midterm exam will be given at a time announced on Canvas, taking the full class period. This exam will count for 20% of the final grade. A makeup exam will be given only in cases of extreme hardship and then only when the student has contacted the instructor in advance. Without advanced contact, no makeup will be given.

Final: There will be a cumulative final exam during the class's final exam spot. It will count for 20% of the final grade.

AI Tools: The use of Artificial Intelligence tools for the solution of any graded assignment is not allowed. All submitted solutions should be solely the work of the student.

Canvas: A Canvas page will be set up for this course. This page will contain announcements, handouts, solutions to exams, class notes, and other important information.
You should check Canvas regularly to avail yourself of these helpful resources.
https://its.gmu.edu/knowledge-base/honorlock-for-students/

Advanced knowledge level: This course is at a more advanced level than the undergraduate version of the material. This means that more will be expected of you as follows:

1. Problem sets will have some different problems that are at a more advanced level and with higher degree of mathematical sophistication than the ones assigned to undergraduates.
2. The exams will be different, covering more advanced material and/or to have an advanced knowledge level component.

Grades: Grades in the course will be based on your INDIVIDUAL effort on all graded assignments. Discussion of course topics with others is helpful and encouraged; however, all work toward the solution of homework and exams submitted for credit, including written summaries, must be done SOLELY by you. Do not attempt to use ChatGPT or its cousins; it is instantly recognizable to your instructor.

Grading scale:
A, A- : 90 - 100
B-, B, B+ : 80 - 89
C-, C, C+ : 70 - 79
D : 60 – 69

Course Logistics

Content distribution: The course uses Canvas for distributing lecture materials and links to the homework assignments. The latter will be submitted and graded via Gradescope. Canvas can be accessed by visiting https://canvas.gmu.edu/ and logging in with your Mason ID and password, and there is a link to Gradescope from within the course site.

Communication: This course uses Canvas for announcements to distribute class updates, and Mason e-mail to communicate with students. If you wish, please share your name and gender pronouns with me and how best to address you in class and via email. The instructor's pronouns are given in Canvas, and you may address the instructor by title in email and verbally. Communication over email is largely preferred, and I will respond to student emails promptly within 24 hours.

Course Technology Requirements

Technical Help: If you have difficulty with accessing Canvas, please contact the ITS Support Center at (703) 993–8870 or support@gmu.edu. If you have trouble with using the features in Canvas, email courses@gmu.edu.

Other Details

Disability Statement
If you are a student with a disability and you need academic accommodations, please see me and contact the Office of Disability Resources at 703.993.2474. All academic accommodations must be arranged through that office.

Honor Code
The University Honor Code is to be followed at all times. Sharing information of any kind about exams or quizzes is prohibited. Any violations will be sent to the Honor Committee and will result in a grade of zero. See the University Honor Code.

AI Honor Code Violations: Do not use AIs such as ChatGPT, Gemini, Claude, Grok, etc. It is an honor code violation to have an AI do any part of your homework, exams,

or other graded work, even if you ask it to "explain" what it does before you copy in the answer.

AI Use Policy
Using AI to "help" with homework, exams, or other graded work is a violation of the Honor Code.

Getting Help
Come to Office Hours!

Student Responsibilities

1. Students must use their Mason email account to receive important University information, including communications related to this class. Per University policy, I will not respond to messages sent from or send messages to a non-Mason email address.
2. It is expected that each student will conduct himself or herself within the guidelines of the Honor Code. All academic work should be done with the level of honesty and integrity that this University demands.
3. You are responsible for the accuracy of your own schedule. Check Patriot Web regularly to verify that you are registered for the classes that you think you are. A student who is not registered may not continue to attend class. Faculty are not permitted to grade work of students who do not appear on the official class roster. You are responsible for knowing the last days to drop and add this class.
4. Once the add and drop deadlines have passed, instructors do not have the authority to approve any requests from students to add or drop/withdraw late. It is NOT permissible to drop the class and leave it at that. It needs approval. Late adds (up until the last day of classes) must be reviewed and approved by the department chair of the course being offered. They will be approved only in the case of a documented university error (such as a problem with Financial Aid being processed). All student requests for withdrawals and retroactive adds (after the last day of classes) must be reviewed by the student's academic dean.
5. Once final grades have been recorded, instructors cannot accept any work to change that course grade. Grade changes can only be approved when they are due to a calculation or recording error on the part of the instructor.
6. An IN (incomplete) grade is a very special grade that can only be applied for in writing. It can only be given in cases in which a student is passing a course and has a very limited amount of work left to complete the course.
7. Federal law (a law known as FERPA) requires the protection of privacy of student information. Therefore, no instructor on campus can speak about a student's record with anyone other than the student. The record includes how a student is doing in a course, whether a student has attended class, information about grades, whether a paper has been turned in. Anything. This prohibition includes parents, siblings, and spouses, anyone. This course adheres to the common course policies set by George

Mason University, which includes polices about Academic Standards, Accommodations for Students with Disabilities, FERPA, and Title IX. These policies are described in more detail at the following link: https://stearnscenter.gmu.edu/home/gmu-common-course-policies/ .