

BOROUGH OF MANHATTAN COMMUNITY COLLEGE
City University of New York

Department of Mathematics

Title of Course: ADVANCED CALCULUS I

Class hours: 3

Course: MAT 601

Lab hours (No Lab):

Semester:

Instructor:

Credits: 3

Tel#:

Office:

Email:

Course Description: This course is designed to extend the fundamental concepts of elementary differential calculus to higher mathematical analysis suitable to students either specializing in mathematics, or who need to use more advanced mathematics as an application to other fields.

Basic Skills: Students will be introduced to the nature of mathematical abstraction and formal proofs. The syllabus presents the standard content of similar courses and designed to be transferable to four-year institutions.

Prerequisites/Co-requisites: Calculus III (MAT303) or equivalent with departmental approval.

Student Learning Outcomes:

Course Student Learning Outcomes	Measurements
<p>1. Understand the concept of completeness of the system of real numbers: a least upper bound, a greatest lower bound. Understand the concept of topology of the reals: open sets, close sets, accumulation points, closure, open cover, compact sets.</p>	<p>1. Homework assignments and/or take home projects: Quizzes and/or Midterm Exams: Final Exam.</p>
<p>2. Understand the concept of convergence, and to use the notion of epsilon-delta correctly. Understand the concept of sequences and subsequences, monotone sequences and Cauchy sequences.</p>	<p>2. Homework assignments and/or take home projects: Quizzes and/or Midterm Exams: Final Exam.</p>
<p>3. Understand the concept of one-sided limits, continuity and uniformly continuity. Understand the concept of derivative, l'Hospital's rule, Taylor's formula. Understand the concept of upper sum, lower sum, Riemann integrability</p>	<p>3. Homework assignments and/or take home projects: Quizzes and/or Midterm Exams: Final Exam.</p>

<p>4. Prove main theorems of analysis of the real line: Heine-Borel theorem, Bolzano-Weierstrass theorem, Nested Interval theorem, Monotone Convergence theorem, Cauchy Convergence Criterion, Intermediate Value theorem, Chain Rule, Rolle's theorem, Mean Value Theorem for Derivatives, Cauchy Mean Value theorem, l'Hospital's rule, Taylor's theorem, Fundamental Theorems of Calculus.</p>	<p>4. Homework assignments and/or take home projects: Quizzes and/or Midterm Exams: Final Exam.</p>
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General Education Outcomes and Assessment:

General Education Learning Outcomes	Measurements
<p>Communication Skills- Students will be able to write, read, listen and speak critically and effectively.</p>	<p>Assignments and/or the home projects; exams and/or midterm exams; Final exam</p>
<p>Quantitative Reasoning- Students will be able to use quantitative skills and the concepts and methods of mathematics to solve problems.</p>	<p>Assignments and/or the home projects; exams and/or midterm exams; Final exam</p>
<p>Information & Technology Literacy- Students will be able to collect, evaluate and interpret information and effectively use information technologies.</p>	<p>Assignments and/or the home projects; exams and/or midterm exams; Final exam</p>

Required Text: Advanced Calculus (Third Edition), A.E. Taylor & W.R. Mann, John Wiley & Sons, Inc., New York; 1983.

Other Resources: Internet

Use of Technology (If Applicable):

Evaluation and Requirements of Students: At the beginning of the semester, the instructor will advise the students of the determination of the final grade which will be based on a weighted average of homework, quizzes, unit exams, projects, written assignments and the final examination. Students are expected to attend all scheduled classes.

Outline of Topics:

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1.11 Derivatives	12

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1.64	Limits of Sums, Products, and Quotients	67
<i>The Real Number System</i>		
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2.3	The Principle of Mathematical Induction	75
2.4	The Axiom of Continuity	77
2.5	Rational and Irrational Numbers	78
2.6	The Axis of Reals	79
2.7	Least Upper Bounds	80
2.8	Nested Intervals	82
<i>Continuous Functions</i>		
3	Continuity	85
3.1	Bounded Functions	86
3.2	The Attainment of Extreme Values	88
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<i>Functions of Several Variables</i>		
5	Functions and Their Regions of Definition	116
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5.4	Modes of Representing a Function	127
<i>The Elements of Partial Differentiation</i>		
6	Partial Derivatives	130
6.1	Implicit Functions	132
6.2	Geometrical Significance of Partial Derivatives	135
6.3	Maxima and Minima	138
6.4	Differentials	144
6.5	Composite Functions and The Chain Rule	154
6.52	Second Derivatives by The Chain Rule	164
6.6	Derivatives of Implicit Functions	172
6.7	Extremal Problems with Constraints	177
6.8	Legrange's Method	182
<i>Point-Set Theory</i>		

16	Preliminary Remarks	512
16.1	Finite and Infinite Sets	512
16.2	Point Sets on a Line	514
16.3	The Balzano-Weierstrass Theorem	517
16.31	Convergent Sequences on a Line	518
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<i>Fundamental Theorems on Continuous Functions</i>		
17	Purpose of the Chapter	527
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17.2	The Boundedness Theorem	529
17.3	The Extreme-Value Theorem	529
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17.5	Continuity of Sums, Products, and Quotients	532
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17.7	The Intermediate-Value Theorem	533

College Attendance Policy

At BMCC, the maximum number of absences is limited to one more hour than the number of hours a class meets in one week. For example, you may be enrolled in a three-hour class. In that class, you would be allowed 4 hours of absence (not 4 days). In the case of excessive absences, the instructor has the option to lower the grade or assign an F or WU grade.

Academic Adjustments for Students with Disabilities

Students with disabilities who require reasonable accommodations or academic adjustments for this course must contact the Office of Services for Students with Disabilities. BMCC is committed to providing equal access to all programs and curricula to all students.

BMCC Policy on Plagiarism and Academic Integrity Statement

Plagiarism is the presentation of someone else's ideas, words or artistic, scientific, or technical work as one's own creation. Using the idea or work of another is permissible only when the original author is identified. Paraphrasing and summarizing, as well as direct quotations require citations to the original source. Plagiarism may be intentional or unintentional. Lack of dishonest intent does not necessarily absolve a student of responsibility for plagiarism.

Students who are unsure how and when to provide documentation are advised to consult with their instructors. The library has guides designed to help students to appropriately identify a cited work. The full policy can be found on BMCC's web side, www.bmcc.cuny.edu. For further information on integrity and behavior, please consult the college bulletin (also available online).