University of International Business and Economics

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International Summer School

MAT 120 Calculus II

Term: June 26-July 23, 2021
Instructor: Sema Salur
Home Institution: University of Rochester
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Class Hours: Monday through Friday, 120 minutes each day (2,400 minutes in total)
Discussion sessions: TBD
Office hours: to be announced

Total Contact Hours: 64 contact hours (45 minutes each, 48 hours in total)
Credit: 4 units

Course Description:

In this course, the student will gain knowledge of the basic theory of integrals and proficiency with various standard techniques of integration: integration by parts, trigonometric substitution, partial fraction decomposition, etc. The student will also be exposed to certain traditional applications of those techniques: calculation of volumes (of solids of revolution, for example) and arc lengths, and the solution of some elementary differential equations. The student will be introduced to the theory of sequences and series, and the approximation of functions using series.

Course Goals:

A student who satisfactorily completes this course will:

- Have facility with the basic theory and techniques of integral calculus (the Fundamental Theorem of Calculus, integration by parts, etc.) and have an understanding of why the theory and techniques are valid.
- Have precise knowledge of the definitions and theorems from the basic theory of sequences and series: convergence of sequences, partial sums, series convergence, absolute convergence, conditional convergence, Integral Test, Comparison Test, etc.
- Have facility with basic calculational skills: evaluation of integrals using the basic techniques of integral calculus, calculation of volumes and arc length, solution of elementary differential equations, determination of convergence or divergence of sequences and series, calculation of radius of convergence of power series, determination of the power series representation of appropriate functions, etc.
- Have a rudimentary ability to explain mathematical theory (e.g., why integration by parts works, etc.) using rigorous mathematical reasoning.

Required Text:

Stewart, James. Single Variable Calculus: 8th edition with ISBN 978-1-285-74062-1

Prerequisites:

The course is based on Calculus I or its equivalent. Students are expected to know basic concepts of calculus for functions of a single real variable. They include: basic elementary functions and their properties, differentiation and geometrical significance of the derivative, definite and indefinite integrals, Fundamental Theorem of Calculus, indefinite integrals of basic elementary functions.

Attendance policy:

Summer school is very intense and to be successful, students need to attend every class. Occasionally, due to illness or other unavoidable circumstance, a student may need to miss a class. A medical certificate is required to be excused. Any absence may impact on the student's grade. Arriving late or leaving early will count as a partial absence. If a student is missing less than a point for a better grade, the better grade will be given, provided the student had no unexcused absences during the course.

Grading Policy:

There will be one midterm and a final exam in this class. All exams will be closed-book. No notes, calculators, or other electronic devices will be allowed.
The course grades will be calculated based on the following percentages:

- Homework: 30%
- Midterm: 30%
- Final Exam: 40%

The final exam will be cumulative. There will be no make-up exams.

Grading Scale:

Assignments and examinations will be graded according to the following grade scale:

A	90-100	**C+**	72-74
A-	85-89	**C**	68-71
B+	82-84	**C-**	64-67
B	78-81	**D**	60-63
B-	75-77	**F**	below 60

Class Rules:

All academic work should be done with the high level of honesty and integrity. Academic misconduct of any kind may result in a grade penalty or the assignment of a failing grade.

Course Schedule:

Week 1
Assignment

The Fundamental Theorem of Calculus
4.3: 3, 7, 9, 11, 13, 19, 25, 29, 39, 49
The Substitution Rule
4.5: 3, 5, 7, 11, 17, 25, 37, 39, 41, 47
Areas between Curves
5.1: 1, 3, 5, 7, 13, 17, 21, 27, 29, 31
Volumes
5.2: 1, 3, 5, 7, 9, 11, 13, 15, 17, 19, 21
Volumes by Cylindrical Shells
5.3: 3, 7, 9, 11, 13, 15, 17, 19, 21, 29
Applications to Physics, Work
5.4: 1, 3, 5, 7, 11, 13, 15, 17, 21, 25
Average Value of a Function
5.5: 1, 3, 5, 7, 9, 11, 13, 15, 17, 19
Discussion hours on Saturday

Week 2
Assignment

Integration by Parts
7.1: 5, 7, 9, 11, 15, 17, 19, 21, 29, 37
Trigonometric Integrals
7.2: 3, 5, 11, 15, 19, 21, 23, 33, 45, 49
Trigonometric Substitution
7.3: 3, 5, 9, 11, 13, 19, 21, 23, 27, 29
Integration of Rational Functions by Partial Fractions
7.4: 5, 7, 9, 11, 15, 23, 27, 31, 39, 41
Strategy for Integration
7.5: 3, 11, 17, 23, 27, 35, 43, 49, 61, 63
Improper Integrals
7.8: 1, 5, 7, 9, 11, 13, 21, 25, 27, 37
Arc Length
8.1: 3, 9, 11, 13, 17, 19, 21
Discussion hours on Saturday

Week 3
Assignment

Midterm: Monday, July 12
Area of a Surface of Revolution
8.2: 3, 5, 7, 9, 11, 15
Curves Defined by Parametric Equations
10.1: 1, 5, 7, 9, 11, 15, 19

Calculus with Parametric Curves
10.2: 1, 3, 5, 7, 9, 11, 17
Polar Coordinates
10.3: 1, 3, 5, 7, 9, 11, 15, 17, 21, 29
Areas and Lengths in Polar Coordinates
10.4: 3, 7, 11, 13, 19, 23, 27, 29, 37, 39
Sequences
11.1: 3, 5, 7, 11, 15, 23, 25, 29, 31, 37
Series
11.2: 7, 15, 17, 19, 21, 25, 29, 22, 37, 43
The Integral Test
11.3: 3, 5, 7, 9, 11, 15, 17, 19, 21, 23, 25
Discussion hours on Saturday

Week 4
Assignment

The Comparison Tests
11.4: 3, 5, 7, 9, 11, 15, 17, 19, 21, 25, 29
Alternating Series
11.5: 3, 5, 9, 11, 19, 23, 25, 27, 29, 31, 33
Absolute Convergence, Ratio Test and Root Test
11.6: 3, 5, 7, 9, 11, 15, 17, 19, 21, 23, 25, 27, 29
Strategy for Testing Series
11.7: 1, 3, 5, 7, 9, 11, 13, 15, 17, 19, 21, 23, 25, 33, 37
Power Series
11.8: 3, 5, 7, 9, 11, 13, 15, 17, 19, 21, 23, 25
Representation of Functions as Power Series
11.9: 3, 5, 7, 9, 11, 15, 17, 19
Taylor and MacLaurin Series
11.10: 5, 11, 21, 35, 53, 61
Final Exam: Friday July 23.
Course Wrap up on Sat, July 24

General Comments:

1. In order to train your minds in mathematical thinking, much of lecture will consist of the "Socratic Method" of questioning. Even if silently, do try to puzzle out the answers. An analogy: the lecture should be a "mental exercise" class. Knowledge cannot be given: it must be stolen. Engage your mind.
2. Many problems will not be solvable at first (or second) viewing. Be patient: clarify any unknown concepts, try to reduce the problem, brainstorm to unearth possibly relevant concepts, and follow your intuition. It may help to, after a period of hard work, put the problem away. Do not worry if you cannot do every problem: what is important is that you try.

3. If you find yourself getting lost in the material, come to office hours immediately! It is much is easier to lead a student's mind individually rather than in a group.
4. Note that we may not dot every i or cross every t in class: you are responsible for reading the text. In particular, it is to your advantage to read the material before coming to class; in this way the student becomes an active participant rather than a passive recipient.
5. Basic etiquette should be maintained. For example: to give your classmates time to think, please do not blurt out answers unless called upon (or overcome with excitement); please do not walk out of class without prior explanation, etc.
6. Using a cell phone in class is not permitted; students using phones will be penalized 5 percentage points on the next exam.
7. Tests will check your understanding of the lectures as well as cover homework-type problems; it will benefit you to check after each lecture to see if you've understood the line of the arguments. Precise knowledge of the theory is vital!