



**University of International Business and Economics
International Summer School**

MAT 120 Calculus II

Term: June 13th – July 14th, 2022

Instructor: Peng Gao

Home Institution: Beihang University

Email: penggao@buaa.edu.cn

Class Hours: Monday through Thursday, 120 minutes each day (2,400 minutes in total)

Office hours: TBD

Discussion sessions: 2 hours each week

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

**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

**Week 3
Assignment**

Midterm Tuesday, June 28.

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
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

**Week 4
Assignment**

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, 37, 43

The Integral Test

11.3: 3, 5, 7, 9, 11, 15, 17, 19, 21, 23, 25

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

**Week 5
Assignment**

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, July 14.