

AMS161-91 Applied Calculus II Fall 2023

Instructor: Young-Seon Lee, PhD

Class Hour: Tu/Th 3:30 PM ~ 4:50 PM

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Office Hours: 1:00 PM ~ 3:00 PM, and 5:00 PM ~ 6:00 PM (Tuesday and Thursday),
B609 or virtual (Zoom), particular times are possible by arrangement.

TA and office hours:

- Nayeon Kwon, nayeon.kwon@stonybrook.edu Wed 10 AM – 12 PM
- Tak Won, tak.won@stonybrook.edu Tu/Thur 10:40 AM – 11:40 PM
- Yoonji Choi, yoongi.choi@stonybrook.edu Wed 1:30 PM – 3:30 PM

Course Description, and Textbooks

Course Title: Applied Calculus II

Course Description: Analytic and numerical methods of integration; interpretations and applications of integration; differential equations models and elementary solution techniques; Taylor series. Intended for CEAS majors. Not for credit in addition to MAT 127 or 132 or 142 or 171

Topics

1. Concepts on Integration and Methods of Integration: substitution, integration by parts, volume problems, approximating integrals with Riemann sums, improper integrals
2. Applications of the Integral: volume and other geometric applications, parametric curves, arc lengths; probability; economic interpretations
3. Elements of Differential Equations: slope fields, Euler's method, applications and modeling
4. Systems of first-order differential equations and second-order differential equations, including solutions involving complex numbers
5. Approximations and series: Taylor series, Fourier polynomials
6. Review and Tests

Learning Outcomes for AMS 161, Applied Calculus II

- 1.) Demonstrate a conceptual understanding of the Fundamental Theorem of Calculus and its technical application to evaluate definite and indefinite integrals.
 - * Solve problems graphically and analytically that illustrate how integration and differentiation are inverse operations;
 - * Use the Fundamental Theorem of Calculus to evaluate definite integrals whose limits are functions of x .
- 2.) Demonstrate skill in integrating basic mathematical functions, such as:
 - * polynomials,
 - * exponential functions
 - * sine and cosine functions.
- 3.) Develop facility with important integration tools such as:
 - * reverse chain rule;
 - * substitution methods;

- * integration by parts;
- * tables of integrals.
- 4.) Solve problems involving geometric applications of integration:
 - * area problems;
 - * volume problems;
 - * arc-length problems
- 5.) Develop basic skills in using numerical methods to evaluate integrals
 - * right-hand, left-hand, and trapezoidal rules;
 - * Simpson's rule.
- 6.) Solve problems involving applications of integration to in physics and economics.
 - * center of mass problems;
 - * force problems;
 - * work problems;
 - * present value of multi-year investments.
- 7.) Solve problems with sequences and series, including:
 - * find limits of sequences;
 - * test series for convergence;
 - * sum series.
- 8.) Demonstrate facility with constructing and using Taylor and Fourier series.
 - * Taylor series for simple functions
 - * Taylor series for composite functions and products of functions;
 - * Taylor series to integration problems;
 - * simple Fourier series.
- 9.) Model problems with simple types of differential equations and solve these problems:
 - * Model problems by solving first-order linear differential equations and solve them;
 - * use separation of variables to solve rate problems such as Newton's law of cooling and logistic equations;
 - * solve second-order linear differential equations.

Prerequisite: AMS 151_or MAT 131 or MAT 126.

Textbook:

- (1) "Calculus Early Transcendentals" by James Stewart, 8th or 9th Edition
- or
- (2) "Calculus (Single Variable)", by Hughes-Hallett, Gleason, McCallum, et.al., 6th Edition

Supplementary Textbooks:

"Calculus Volume 2" by Gilbert Strang and Edwin "Jed" Herman, Free download at
<https://openstax.org/details/books/calculus-volume-2>

Course Structure

This course consists of two lectures each week lasting 75 min each.

Methods for Assessment of Learning Outcomes

The expected learning outcomes for the course will be assessed through grading activities that include homework, attendance, exams, and quizzes.

Homework policy:

1. Homework will be assigned once a week on the Brightspace.
2. The lowest homework grades will be dropped before the final grading.
3. Late homework will **NOT** be graded for credit!
4. Collaboration with other classmates is encouraged in this course. Also, you may ask homework questions during office hours with TAs, or with me. But write-ups must be done independently.

5. Show all your work by writing all the steps to arrive at the solutions. A correct answer without the steps will receive minimal credit. This is good practice for what will be expected on exams.

Exams: There are two midterms and one final exam. Calculators are **NOT** allowed in the exams. Every exam is a closed book.

- Midterm 1: TBA
- Midterm 2: TBA
- Final Exam: December 11 (Monday), 6:30 pm – 8:30 pm

Quizzes: There will be a short in-class quiz, usually 5-10 minutes, once a week. No make-up quizzes will be allowed. The lowest quiz score will be dropped before the final grading.

Make-up Exams/Quizzes policy:

Make-up exams (quizzes) will only be given in case of an emergency or unavoidable circumstances, such as an illness requiring hospitalization, extreme emergencies (e.g. death in the family), severe medical reasons with a doctor's note (not a slight illness), military service obligations, or very important events (e.g. national conference, official school event). You must let me know about the problem as soon as possible. You must provide proper written documentation that you were physically unable to take the exam.

Grading: Your course grade will be determined by the following items:

Attendance = 5%, Homework = 15%, Quiz = 15%, Midterm 1 = 20%, Midterm 2 = 20%,
Final Exam = 25%

The final letter grade will be determined by the following grading scale in percentage (%):

A: [93, 100], A-: [90, 93), B+: [87, 90), B: [83, 87), B-: [80, 83), C+: [77, 80),
C: [73, 77), C-: [70, 73), D+: [67, 70), D: [60, 67), F: [0, 60)

Attendance: You are required to attend every class regularly. The percentage of participation in each class should be more than 50% to be considered attending each class.

Attendance Policy

- (1) All students of SUNY Korea are required to attend every class.
- (2) Unexcused absences will affect seriously the students' final grades in the course.
- (3) If a student has over 20% unexcused absence, the student's final course grade will be an F.
- (4) Students should report the reason for absence to the instructor in advance, or immediately after the absence.
- (5) When a student excuses his/her absence, the student must provide documentation of the reason for the absence to the instructor.
- (6) The instructor of the course reserves the right to excuse absences.
- (7) The course instructor may excuse the absence if the submitted documentation fulfills the conditions below.
 - i) Extreme emergencies (e.g. death in the family)
 - ii) Severe medical reasons with a doctor's note (Not a slight illness)
 - iii) Very important events (e.g. national conference, official school event)
- (8) At the end of the semester, the course instructor should submit a copy of the attendance sheet to the Academic Affairs Office.

Absence due to officially approved trips: The person responsible for a student missing class due to a trip should notify the instructor of the departure and return schedule in advance of the trip. The student may not be penalized and is responsible for the material missed.

Concerns: If you have ANY problem related to the course, please feel free to discuss it with us. We truly want you to succeed in this course and will do whatever we can to help resolve the problem. You can talk to me before or after class, during office hours, or via email.

Students with Disabilities:

If you have a physical, psychological, medical, or learning disability that may impact your course work, please contact One-Stop Service Center, Academic Building A201, (82) 32-626-1117. They will determine with you what accommodations if any, are necessary and appropriate. All documentation regarding your personal information will be kept confidential.

Academic Integrity:

Each student must pursue his or her academic goals honestly and be personally accountable for all submitted work. Representing another person's work as your own is always wrong. Faculty are required to report any suspected instances of academic dishonesty to the Academic Judiciary. Faculty in the Health Sciences Center (School of Health Technology & Management, Nursing, Social Welfare, Dental Medicine) and School of Medicine are required to follow their school-specific procedures. For more comprehensive information on academic integrity, including categories of academic dishonesty, please refer to the academic judiciary website at <http://www.stonybrook.edu/uaa/academicjudiciary/>

Critical Incident Management:

Stony Brook University expects students to respect the rights, privileges, and property of other people. Faculty are required to report to the Office of Judicial Affairs any disruptive behavior that interrupts their ability to teach, compromises the safety of the learning environment, or inhibits students' ability to learn. Faculty in the HSC Schools and the School of Medicine are required to follow their school-specific procedures.

Conduct:

Stony Brook University expects students to maintain standards of personal integrity that are in harmony with the educational goals of the institution; to observe national, state, and local laws and University regulations; and to respect the rights, privileges, and property of other people. Faculty are **required** to report to the Office of Judicial Affairs any disruptive behavior that interrupts their ability to teach, compromises the safety of the learning environment, or inhibits students' ability to learn. Faculty in the HSC Schools and the School of Medicine are required to follow their school-specific procedures.

Course Evaluations

Stony Brook University values student feedback in maintaining the high-quality education it provides and is committed to the course evaluation process, which includes a mid-semester assessment as well as an end-of-the-semester assessment, giving students a chance to provide information and feedback to an instructor which allows for development and improvement of courses. Please click the following link to access the course evaluation system: <http://stonybrook.campuslabs.com/courseeval/>

Tentative Class schedule:**AMS161-91 Applied Calculus II****Fall 2023**

Week	Date	Topics	Hughes-Hallett et al.	Stewart, 8th ed
1	8-29	Intro, Antiderivatives	Sec. 6.1, 6.2	Sec. 4.9
	8-31	Areas and Distances	5.1	5.1
2	9-5	The Definite Integral	5.2	5.2
	9-7	The Fundamental Theorem of Calculus	5.3	5.3
3	9-12	Indefinite Integrals and the Net Change Theorem	6.2	5.4
	9-14	The Substitution Rule	7.1	5.5
4	9-19	Areas Between Curves	8.1	6.1
	9-21	Volumes, Volumes by Cylindrical Shells	8.1	6.2, 6.3
5	9-26	Work, Average Value of a Function	8.5	6.4, 6.5
6	10-5	<i>Exam 1 Review</i>		
7	10-10	Integration by Parts	7.2	7.1
	10-12	Trigonometric Integrals	7.4	7.2
8	10-17	Trigonometric Substitution	7.4	7.3
	10-19	Integration of Rational Functions by Partial Fractions		7.4
9	10-24	Approximate Integration	7.5	7.7
	10-26	Improper Integrals	7.6	7.8
10	10-31	<i>Exam 2 Review</i>		
	11-2	Arc Length	8.3	8.1
11	11-7	Density and Center of Mass	8.4	8.3
	11-9	Sequences, Series	9.1, 9.2	11.1, 11.2
12	11-14	The Integral Test and Estimates of Sums	9.3	11.3
	11-16	The Comparison Tests, Alternating Series	9.3	11.4, 11.5
13	11-21	Absolute Convergence and the Ratio and Root Tests	9.4	11.6
	11-23	Power Series	9.5	11.8
14	11-28	Representations of Functions as Power Series	10.1	11.9
	11-30	Taylor and Maclaurin Series	10.2	11.10
15	12-5	Separable Equations	11.4	9.3
	12-7	Final Exam Review		