College of Dupage
Math 2232-002: Calculus and Analytic Geometry II

Contact Information:

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Course Objectives and Topic Outline:

Course description to appear in catalog: Applications of the definite integral, techniques of integration, indeterminate forms, improper integrals, sequences and series, Taylor and Maclaurin expansions, power series, conics, parametric equations, and polar coordinates.
Credit Hours: 5 Lecture Hours: 5 Lab Hours: 0
Prerequisite: MATH 2231 Calculus and Analytic Geometry I with a grade of "C" or better, or equivalent
A. General Course Objectives:
Upon successful completion of the course the student should be able to do the following:

1. Use definite integrals to determine the area enclosed by graphs
2. Use the disc, shell, and slicing methods to determine volumes of solids
3. Use definite integrals to determine arc length and the surface area of a solid of revolution
4. Use definite integrals to perform work and fluid force calculations
5. Evaluate integrals using the following methods: integration by parts, partial fractions, and trigonometric substitution
6. Determine integrals involving powers of trigonometric functions
7. Estimate a definite integral using the trapezoidal rule and Simpson's rule
8. Define hyperbolic functions
9. Graph hyperbolic functions
10. Verify identities involving hyperbolic functions
11. Differentiate functions involving hyperbolic functions
12. Integrate functions involving hyperbolic functions
13. Differentiate functions involving inverse hyperbolic functions
14. Determine the convergence or divergence of improper integrals and evaluate a convergent integral
15. Demonstrate the ability to write the terms of a sequence and an expression for the nth term of a sequence
16. Demonstrate the ability to determine if a given geometric or telescoping series converges or diverges, and find its sum if it converges
17. Demonstrate the ability to determine whether a given sequence is monotonic and/or bounded
18. List the terms of the sequence of partial sums of a series
19. Apply the nth term test for divergence of a series
20. Demonstrate the ability to determine whether a p-series converges or diverges
21. Estimate the sum of a series of positive constants and estimate the error bound

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22. Demonstrate the ability to determine the convergence or divergence of a series of constants using the following: integral test, comparison test, limit comparison test, alternating series test, ratio test, and root test
23. Demonstrate the ability to determine if a series of constants is absolutely convergent, conditionally convergent, or divergent
24. Estimate the sum of an alternating series and approximate the error bound
25. Develop a Taylor or Maclaurin polynomial of given degree for a given function
26. Use Taylor or Maclaurin polynomials to approximate a given function and estimate the error bound
27. Locate the interval of convergence of a power series and check for convergence at the endpoints of the interval
28. Differentiate and integrate a power series and find the intervals of convergence for the new power series obtained
29. Develop a power series to represent a function and determine its interval of convergence
30. Use a truncated power series to approximate functions and integrals
31. Demonstrate the ability to graph and analyze parabolas, ellipses, and hyperbolas
32. Demonstrate the ability to rotate the coordinate axes
33. Demonstrate the ability to sketch a curve represented by parametric equations and to write the corresponding rectangular equation
34. Demonstrate the ability to find a set of parametric equations given the rectangular equation
35. Demonstrate the ability to find dy/dx and d^2y/dx^2 given parametric equations
36. Demonstrate the ability to find the area of a surface generated by the rotation of a plane curve
37. Demonstrate the ability to find the area of a region enclosed by, and the arc length of, a plane curve given in parametric form
38. Demonstrate the ability to plot points in polar coordinates and convert between polar and rectangular coordinates
39. Convert rectangular equations to polar and vice-versa
40. Demonstrate the ability to graph polar equations and their tangents
41. Demonstrate the ability to find the area of a polar region and the arc length of a polar curve
42. Demonstrate the ability to find points of intersections of polar graphs
43. Demonstrate the ability to find the area of a surface of revolution of a polar curve
44. Demonstrate the ability to find polar equations of the conic sections

B. Topical Outline:

1) Applications of the definite integral
   a) Areas between curves
   b) Volumes
      i) Disc method
      ii) Shell method
      iii) Slicing
   c) Work done by a moving force
   d) Fluid pressure on a vertical submerged surface
   e) Arc length
   f) Surface area of revolution

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g) Simpson's rule and the trapezoid rule
h) Moments and centers of mass (optional)

2) Integration techniques
   a) Integration by parts
   b) Trigonometric integrals
   c) Trigonometric substitution
   d) Partial fractions
   e) Rational functions of sines and cosines
   f) Tables (optional, but note cards, textbooks, tables of formulas and integrals, etc. will not be permitted on tests given in the classroom for Mathematics 2232)
3) Improper integrals
4) Sequences and series
   a) Sequences
   b) Taylor polynomials
   c) Series of positive terms
      i) Direct comparison test
      ii) Limit comparison test
      iii) Integral test
   d) Alternating series test
   e) Ratio test
   f) Root test
   g) Power series
      i) Maclaurin and Taylor series
      ii) Binomial series
      iii) Geometric series
      iv) Series created by substitution
      v) Differentiation and integration of power series
5) Conic sections
   a) Parabolas, ellipses, and hyperbolas
   b) Rotation of axes
   c) Tangent and normal lines
6) Polar coordinates and parametric equations
   a) Parametric equations
      i) Smooth curves
      ii) Derivatives
      iii) Arc lengths
      iv) Areas
      v) Graphs
      vi) Parametrization from graphs
   b) Polar equations
      i) Graphs
      ii) Equations from graphs
      iii) Conics
      iv) Slope of tangent lines
      v) The angle psi
      vi) Area and arc length

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7) Hyperbolic functions
   a) Definitions and graphs
   b) Derivatives and integrals
   c) Inverse hyperbolic functions and their functions

Course Materials:

- *Thomas' Calculus: Early Transcendentals*, 14th Ed. by Hass, Heil, Weir (ISBN 9780134768496)
  This textbook may come bundled with a MyMathLab access code. This code is *not* required (see next item).

Classtime:

Students are expected to attend class and PARTICIPATE. Students are responsible for all material covered in each class, even if they missed that day. Quizzes and exams will be held during class time.

While in class, students should be respectful of other students as well as the instructor. All students are welcome to share their thoughts and the classroom will be an inclusive space.

Students should not distract others with their computers or cell phones. Any distractible cell phone use should be done outside the classroom. All communication between instructor and students will be conducted either through Blackboard or via a COD email account. Make sure you check your COD email regularly.

Homework:

Homework will be assigned for every lecture from the textbook. Students need to spend time and attempt every assigned homework problem to master the material and be prepared for quizzes and exams.

Solution guides and online step-by-step solutions should not be overused when doing homework. Students who rely on these resources are not self-sufficient and will underperform on exams. When stuck on a problem, take the time to read class notes and the textbook for related examples. Set aside time for contacting the instructor or the Math Assistance Area for help.

On the last day of the semester, every student should bring in all their completed homework. The instructor will choose *one* section of homework that each student will turn in. Evidence of completion of this homework (with work shown) will earn the student homework credit for the semester.

Quizzes:

Quizzes will be taken during class time according to the course calendar.

Formula sheets are not allowed on any quiz. Quizzes will usually cover a few sections in-depth. The material covered on a quiz will be announced beforehand.

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Work must be shown for credit to be awarded for quiz questions. Questions must be answered according to the quiz or question instructions to receive full credit.

Every student may have one 24-hour extension on a quiz. The quiz will then be placed in the COD Testing Center and the student must complete the quiz there (on their own time).

The lowest quiz grade will be dropped before calculation of the final grade.

Exams:

There will be three (3) unit exams. Every exam will be comprehensive and questions might cover any material from earlier in the semester. See the calendar at the end of the syllabus for the weeks that the exams and quizzes will be given.

No cell phones or computers will be allowed at all at a student's desk during the exam. Calculators will NOT be allowed. If a student cannot complete the problems asked without a calculator or referring to the textbook, then they should do the best they can while maintaining their academic honesty. Decimal approximations of numerical solutions on exams are not expected and will be penalized.

Exams will be graded not only on the correct answer, but correct work. Correct final answers without the appropriate work that leads to that answer will receive little or no credit. If a prompt asks for a problem to be completed using a certain method or formula, then using a different method of formula will not receive full credit.

Any submitted work that is not clearly visible or legible will be graded as if it was not completed.

Attendance Policy:

There is a constant stream of new material, homework, and other assessments in this course. Students should be working every day to master the material and complete the assigned work. Taking an occasional day off each week is recommended to not become over-stressed, but doing no work for more than a day will usually cause students to fall behind and never catch up.

Exams CANNOT be made up after their due date under any circumstances except as an accommodation required by the Center for Access and Accommodations. Quizzes cannot be made up after their due date unless an extension request is made in a timely manner.

Grade Calculation:

Graded Assessment	Percentage of Final Grade
Homework (1 section, turned in on the last day)	2%
Quizzes (lowest quiz is dropped)	23%
Three Unit Exams	25% Each

Letter Grade	A	B	C	D	F
Percentage	90% and Up	80% - 89%	70% - 79%	60% - 69%	Below 60%

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Written Style:

Student should practice and use good style when answering problems to receive any partial credit. If a student writes down a correct answer without sufficient work, they will receive no credit and may have to defend the academic integrity of their submission.

Any answer which requires an explanation should be written in complete sentences, all mathematical notation should be consistent and make sense, and anybody reading the solutions for the first time (namely, the grader) should have no confusion as to both the final answer and the work involved to get there. For example, "1 + 1 =2" is a complete sentence. It has a subject (1+1), a verb (=) and an object (2). Sloppy writing gets no credit. Professors are not mind-readers; Only the written work matters.

Academic Integrity:

Students should be aware of the Code of Academic Conduct and know the consequences should the code be violated. The document can be found at

Code of Academic Conduct

If a student is caught violating the Code they will receive grade penalty and will be reported through COD's academic integrity reporting system.

Student academic dishonesty includes but is not limited to**:**

- Dishonest use of course materials, such as student papers, examinations, reports and material posted on the Internet.

- Knowingly posting course materials of any kind on Internet sites such as (but not limited to) Course Hero and Chegg without the consent of the instructor.

- Knowingly assisting others in the dishonest use of course materials such as student papers, examinations and reports.

- Knowingly providing course materials such as papers, lab data, reports and/or electronic files to be used by another student as that student's own work.

- Plagiarizing, i.e., using language or ideas from materials without acknowledgement and/or copying work from other sources and submitting it as one's own.

- Examples of plagiarism include but are not limited to:

  § Copying a phrase, a sentence, or a longer passage from a source (including an Internet source) and submitting it as one's own.

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§ Summarizing or paraphrasing someone else's ideas without acknowledging the source.

§ Submitting group assignments individually as one's own independent work.

§ Copying or taking pictures of course materials such as videos, exams, quizzes or assignments and posting the copied items and/or pictures on the Internet **or** sharing these copied items and/or pictures with other students who have not yet completed the assignments.

§ Taking pictures or copying course materials that are considered confidential by the instructor such as exams or quizzes.

If an exam is being proctored, students should comply with the proctor's instructions. If a proctor accuses a student of violating the Code of Academic Conduct or not conforming to the assessment's instructions, and the student does not agree with the accusation, the student should provide countervailing written or video evidence to support their case.

Covid-19 Information and Exposure Reporting

Students should adhere to COD's Covid-19 safety protocols throughout the semester if visiting campus. All relevant policies regarding masking, vaccinations, reporting can be found on the COD website at

https://www.cod.edu/coronavirus/index.aspx

If you have been exposed to Covid-19 or have been diagnosed with Covid-19, please fill out the Student Self-Reporting form at

https://cm.maxient.com/reportingform.php?CollegeofDuPage&layout_id=9

Covid Vaccination or Testing Requirement

College of Dupage follows the statewide mandate for students, faculty, and staff to show a proof of vaccination or a weekly negative COVID test result.

If you are vaccinated, you must submit your vaccination card using the steps located here: https://cod.edu/coronavirus/vaccine-verification.aspx

If you are not vaccinated, you must follow the testing requirements located here: https://cod.edu/coronavirus/covid-testing.aspx

If you have followed the instructions above and receive an email from me and/or the college indicating that you are NOT CLEARED to attend class, please contact the Dean of Student Affairs deanofstudents@cod.edu immediately. If you are not cleared to come to class, the college may automatically drop you from the course.

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Center for Access and Accommodations:

The College of DuPage is committed to the equitable access of educational opportunities for students with disabilities in accordance with The Americans with Disabilities Act, As Amended and Section 504 of the Rehabilitation Act of 1973. Any student who feels they may need an accommodation on the basis of an illness, injury, medical condition, or disability should contact the Center for Access and Accommodations to determine eligibility for accommodations and to obtain an official Letter of Accommodation. The Center for Access and Accommodations can be reached via email at access@cod.edu. Students may also initiate a request for services by going to www.cod.edu/access and clicking on the green box labeled "complete form to request accommodations." If you are already registered with the Center for Access and Accommodations, please email me your Letter of Accommodation as soon as possible. Please DO NOT send any private health documentation or Doctor's notes to the course instructor.

Withdrawal Policy:

The final day for a student to withdraw from any course will be equal to 75% of the time for the respective academic session (see the Registration Calendar) through myACCESS https://myaccess.cod.edu or in person at the Registration office, Student Services Center (SSC), Room 2221.

After the deadline, students will be required to appeal for late withdrawal and provide appropriate documentation to the Student Registration Services Office for all requests. Students who are granted approval to withdraw by petition will not be eligible for refunds of tuition or fees and will receive a 'W' grade on their transcript. Appeals must be submitted prior to the designated final exam period for 16-week classes and before the last class meeting for all other session classes

Course Schedule:

Semester Week (Monday)	New Material Available	Assignments Due

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Week 1 (June 13, 2022)	Calculus I review, hyperbolic functions, area between curves, volume of solids of revolution, disc and washer method	Quiz 1 (Thursday): Calculus I Review, 7.3, 5.6
Week 2 (June 20)	Arc length, surface area of volumes of revolution, work and fluid pressure, basic integration rules	Quiz 2 (Thursday): 6.1-6.4
Week 3 (June 27)	Integration by parts, trigonometric integrals, trigonometric substitution	**Exam 1** (Wednesday): 5.6, 7.3, Chapter 6, 8.1
Week 4 (Tuesday, July 5) No classes on Monday, July 4	Partial fractions, numerical integration method, improper integral, sequences	Quiz 3 (Wednesday): 8.1-8.4
Week 5 (July 11)	Series, integral test, p-series, comparison tests, alternating series, ratio and root tests	Quiz 4 (Tuesday): 8.5, 8.7-8.8, 10.1
Week 6 (July 18) Last Day to Withdraw is Sunday, July 24	Power series, Taylor and Maclaurin series, convergence of power series, applications of Taylor series	**Exam 2** (Tuesday): Chapter 8, 10.1
Week 7 (July 25)	Parametric equations, calculus of parametric equations, polar coordinates, graphing with polar coordinates	Quiz 5 (Thursday): 10.2-10.6
Week 8 (August 1)	Polar area and arc length, polar conics, rotation of axes	**Exam 3** (Tuesday): Chapter 10 Quiz 6 (Thursday): 11.1-11.7, Rotation of Axes One homework section chosen at random (Thursday)

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