MONTGOMERY COLLEGE

Course Syllabus
Mathematics, Statistics, and Data Science Department

I. Contact Information

Professor: Zhou Dong
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Phone: (240) 567-7810
Office: HT 134 Germantown campus

Office Hours:

Monday & Wednesday 10:30 am – 12:50 pm	Drop-in Office Hours in HT 134 & Online Appointments
Fridays 10:30 am – 1:00 pm	Appointments only Click here to book an appointment

II. General Course Information

Calculus II – MATH182 (Formerly MA182)

4 credits / 5 hours (For computation of tuition, this course is equivalent to five semester hours. Five hours each week.)

A continuation of MATH 181; intended primarily for students of the physical sciences, engineering, and mathematics. Further differentiation and integration of transcendental functions. Methods of integration with applications, indeterminate forms, improper integrals, Taylor's formula; infinite series; polar coordinates.

PREREQUISITE:
A grade of C or better in MATH 181 or equivalent, or consent of department.

Spring 2025

Section	CRN 32033
Class Meetings	MWF 9:00 am – 10:25 am
Classroom	HT 400

III. Common Course Student Learning Outcomes

Upon course completion, a student will be able to:

- Evaluate integrals by using the appropriate techniques.
- Approximate definite integrals by using appropriate numerical techniques.
- Find limits involving indeterminate forms.
- Evaluate improper integrals.
- Set up, evaluate, and interpret integrals that represent arc length, area, volume, and average value.

- Set up, evaluate, and interpret integrals that model applications in physics.
- Solve selected differential equations using graphical, numerical, and analytic methods.
- Model applications such as population growth with differential equations.
- Determine the convergence or divergence of sequences and series.
- Represent functions with power series and approximate functions with Taylor polynomials.
- Graph polar equations.
- Use integration to find the area of a polar region.
- Use technology as an appropriate tool.

IV. Textbooks, Workbooks, and Supplies

Required materials for the course:

- *Single Variable Calculus: Concepts and Contexts* (5th edition), by James Stewart and Kokoska, Cengage Learning, 2023. (The ebook is available with WebAssign).
- *WebAssign Access Code* – for access to online homework and the ebook
  WebAssign Class Key: **montgomerycollege 9267 7647**
  Link: https://www.getenrolled.com/?courseKey=montgomerycollege92677647
- *Graphing calculator* - A TI-83 or TI-83 Plus is recommended.
- *Microsoft Teams* – for course announcements and communication. MC students can download Teams for free from their Microsoft 365 account accessed through MyMC. Join code: l7pv95t

Optional materials for the course**:**

- Desmos Calculator: Online at https://www.desmos.com/ or download the Desmos app on App Store or Google Play Store
- TI-calculator emulators - http://wabbitemu.org/
- Montgomery College has access to Wolfram's Mathematica, Mathematica Online, and Wolfram|Alpha Pro. To gain access, first create a Wolfram ID using your @montgomerycollege.edu email at https://account.wolfram.com/login/create if you do not already have one. Next, enter your @montgomerycollege.edu into the Site Info Page (https://www.wolfram.com/siteinfo/). Here, you will be able to gain access to the school's licenses.

V. Course Design

This course is designed to give the student a high degree of autonomy and students are expected to self-direct their learning. While many resources are provided for the student to aid in their learning, the final course grade is based solely on the student's mastery of the course standards as determined through assessments. This means it is up to the student to determine which resources to use (e.g. class meetings, textbook, lecture videos, online practice problems, etc.) in order to gain mastery of the course standards. Feedback on online assignments is provided for learning purposes only and will not affect the student's final course grade.

A. Bloom's Taxonomy

This class has been designed based on Bloom's Taxonomy. A basic understanding of Bloom's Taxonomy will help the student understand the course design as well as make better choices about how best to gain mastery of the material and be successful in this class.

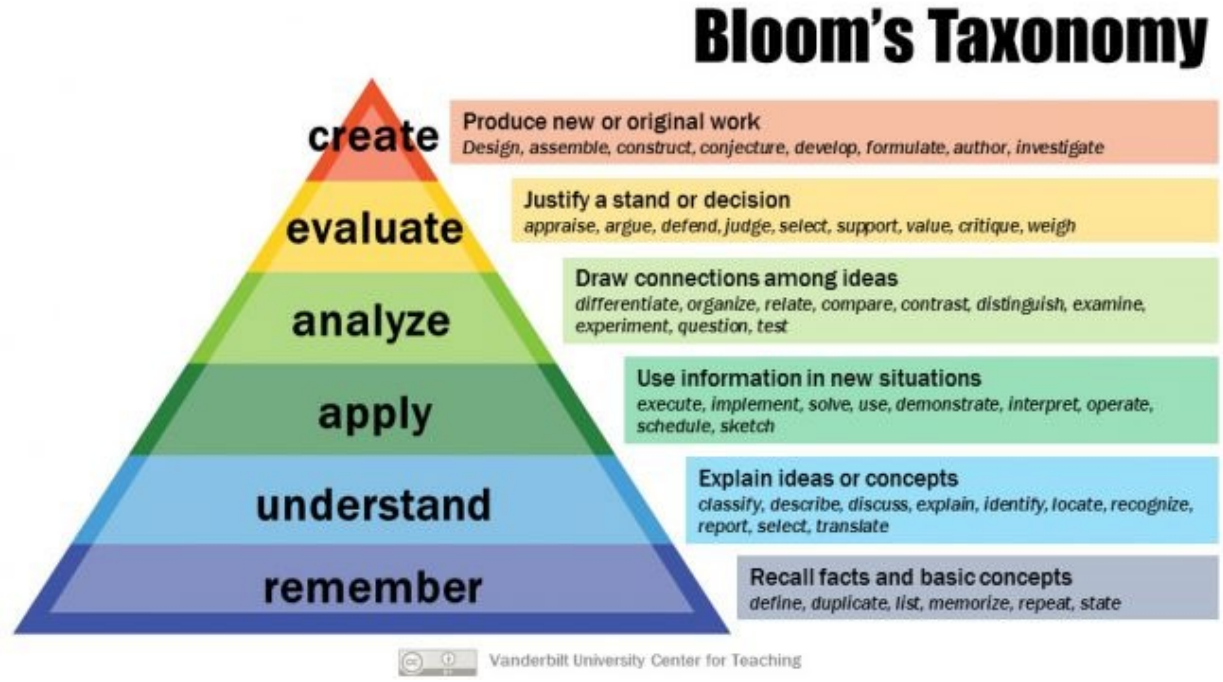

Figure 1 - Bloom's Taxonomy, from https://cft.vanderbilt.edu/guides-sub-pages/blooms-taxonomy/

B. Flipped Classroom Instruction

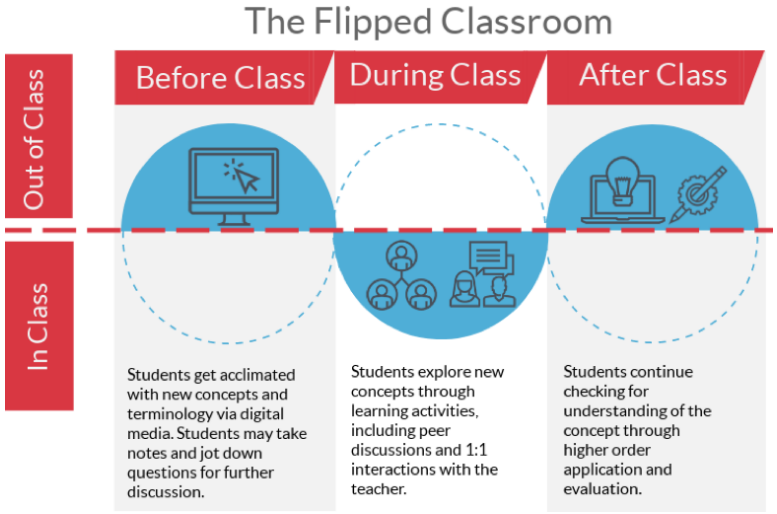

Figure 2 - The Flipped Classroom, from https://www.odysseyware.com/blog/using-classpace-flipped-classroom

Under the flipped classroom model, students begin learning the course material at home before class, while class time is focused on solidifying understanding through active discussion and problems solving:

Before class:

- Read textbook or lecture slides, or watch lecture videos
- Assess basic understanding using Pre-class Assessment on WebAssign
- Preview Classwork and bring questions for class discussion

During class:

- Participate in class discussion facilitated by the instructor
- Work in groups or individually on in-class assignments, with instructor support
- Receive individual and/or small group instruction as needed
- Take initial assessments and reassessments as needed

After class:

- Prepare for assessments and reassessments
  - Complete Practice Problem Assignments on WebAssign
  - Take practice quizzes in the Personal Study Plan on WebAssign
  - Attend instructor office hours
  - Utilize MAPEL Center tutoring

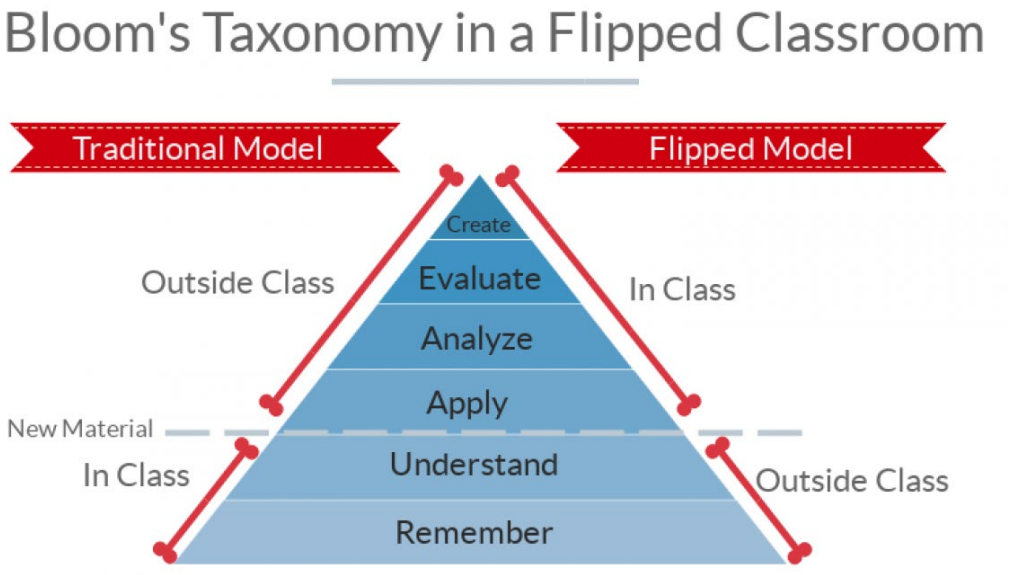

Figure 3- Bloom's Taxonomy in a Flipped Classroom, from https://www.odysseyware.com/blog/using-classpace-flipped-classroom

While preparing for class, students have their initial exposure to the new material through reading the textbook and lecture slides and watching lecture videos. The focus at this time is on the *Remember* and *Understand* levels of Bloom's Taxonomy:

- Memorize definitions and theorems
- Paraphrase definitions and theorems
- Understand worked examples

During class, students work with each other and the instructor to develop the *Apply*, *Analyze*, and *Evaluate* levels of Bloom's Taxonomy. Occasionally, students are expected to reach the *Create* level of Bloom's Taxonomy. After class, students should focus on consolidating their learning through additional practice and self-assessment in order to demonstrate mastery of course standards.

It is essential that students put in the time and effort necessary in and out of class. It is generally recommended that for each hour of in-class time, the student spends 2-3 hours out of class studying. This class meets for 5 hours each week; therefore, ***students should expect to spend 10 – 15 hours outside class time studying for this class.***

VI. Course Requirements

A. Course Standards

This course has 58 standards on which the students will be assessed. Of the 58 standards, 29 are core standards and 29 are elective standards. The core standards are essential material and mostly at the Apply and Analyze levels of Bloom's Taxonomy. The elective standards are either optional topics or a more advanced question for a core standard topic.

The following table lists the 58 standards. The first column indicates whether the standards is a core or elective standard. The second column shows a code by which the standard will be referred to as. The code consists of the corresponding section number in the textbook the standard is from, followed by two letters. The third column is a description of the standard.

MATH182 Calculus II Course Standards

	Code	Description
C	**5.5SR**	**Evaluate indefinite and definite integrals via a single application of the substitution rule.**
E	5.5SA	Evaluate indefinite and definite integrals via application of the substitution rule requiring algebraic or trigonometric manipulation of the integrand.
C	**5.6BP**	**Evaluate indefinite and definite integrals via a single application of integration by parts.**
E	5.6PS	Evaluate indefinite and definite integrals via multiple applications of integration by parts or integration by parts and the substitution rule.
C	**5.7TI**	**Evaluate indefinite and definite integrals involving trigonometric functions by making appropriate use of the Substitution Rule and relevant trigonometric identities.**
E	5.7TS	Evaluate indefinite and definite integrals by making a trigonometric substitution.
E	5.7PF	Evaluate indefinite and definite integrals by a partial fraction decomposition of the integrand.
C	**5.8CA**	**Use CAS (computer algebra systems) to solve integrals and interpret the results appropriately.**

C	**5.9AI**	**Compute and analyze left endpoint, right endpoint, midpoint rule, trapezoidal rule, and Simpson's rule approximations of definite integrals.**
E	5.9AE	Compute error bounds and number of intervals needed for error bound with midpoint, trapezoidal, and Simpson's rule approximations.
C	**5.10RI**	**Recognize improper integrals and rewrite them as limits of integrals that are not improper.**
E	5.10CI	Determine whether an improper integral converges or diverges by computing the associated limit(s).
C	**6.1AF**	**Use integrals to compute areas bounded by functions, both with respect to x and with respect to y. (Evaluation of the integral may be done using technology)**
E	6.1AP	Use integrals to compute areas bounded by parametric curves. (Evaluation of the integral may be done using technology)
C	**6.2VR**	**Use integrals to compute volumes of solids of revolution by the washer or disk method. (Evaluation of the integral may be done using technology)**
E	6.2VS	Use integrals to compute volumes by the general slicing method. (Evaluation of the integral may be done using technology)
E	6.3CS	Use integral to compute volumes of solids of revolution by the cylindrical shell method. (Evaluation of the integral may be done using technology)
C	**6.4AC**	**Use integrals to compute arc length of functions with respect to x and with respect to y. (Evaluation of the integral may be done using technology)**
E	6.4LP	Use integrals to compute arc length of parametric curves. (Evaluation of the integral may be done using technology)
C	**6.5AV**	**Use integrals to compute average value of functions. (Evaluation of the integral may be done using technology)**
E	6.5MV	Apply the Mean Value Theorem of Integrals appropriately.
C	**6.6SP**	**Use integrals to compute work done by a spring. (Evaluation of the integral may be done using technology)**
E	6.6WK	Use integrals to compute work done in lifting objects against gravity. (Evaluation of the integral may be done using technology)
E	6.6CM	Compute the center of mass for regions in the xy-plane (using integrals when necessary).
E	6.7CS	Compute the consumer surplus (using integrals when necessary).
E	6.8PB	Compute the probability of various outcomes given a probability density function (using integrals when necessary).
E	6.8MM	Compute the mean and median for a probability density function (using integrals when necessary).
C	**H.PG**	**Graph and analyze polar equations.**
C	**H.AR**	**Use integrals to compute areas of polar regions. (Evaluation of the integral may be done using technology)**

E	H.AL	Use integrals to compute arc length of polar curves. (Evaluation of the integral may be done using technology)
C	**8.1SQ**	**Determine whether a sequence converges and find the limit of the sequence if possible.**
E	8.1RS	Compute the limit of a recursive sequence.
C	**8.2TD**	**Apply the Test for Divergence appropriately.**
C	**8.2GS**	**Analyze geometric series for convergence or divergence.**
E	8.2GA	Solve application problems using geometric series.
E	8.2TS	Analyze a telescoping series.
C	**8.3IT**	**Apply the Integral Test appropriately.**
C	**8.3CT**	**Apply the Comparison and Limit Comparison Tests appropriately.**
E	8.3RE	Use the Remainder Estimate for the Integral Test for error bounding in approximating series by partial sums.
C	**8.4AS**	**Apply the Alternating Series Test appropriately.**
C	**8.4RT**	**Apply the Ratio Test appropriately.**
E	8.4AE	Use the Alternating Series Estimation Theorem for error bounding in approximating series by partial sums.
C	**8.5RI**	**Determine the radius and interval of convergence of power series.**
C	**8.6PS**	**Generate power series for new functions from power series of known functions by algebraic means.**
E	8.6DI	Generate power series for new functions from power series of known functions by differentiation or integration
C	**8.7MS**	**Memorize the Maclaurin series for important functions.**
E	8.7TS	Generate Taylor series for functions from the definition.
C	**8.8TP**	**Generate Taylor polynomials from the definition.**
E	8.8TA	Solve application problems using Taylor polynomials, including bounding errors.
C	**7.1DE**	**Test possible solutions to differential equations analytically and graphically.**
C	**7.2DF**	**Relate differential equations to direction fields, and sketch solutions curves in direction fields.**
C	**7.2EM**	**Apply Euler's Method to find approximate solutions of Initial Value Problems.**
C	**7.3SE**	**Solve separable differential equations.**
E	7.3OT	Find the orthogonal trajectories of families of curves.
E	7.3MP	Solve a mixing problem.
E	7.4CH	Solve a Newton's law of cooling or heating problem.
C	**7.4EX**	**Generate exponential growth and decay models and analyze their solution curves.**
E	7.5LG	Generate logistic growth models and analyze their solution curves.

B. Course Grade

This course uses Standards Based Grading (SBG). Your course grade will be based solely on mastery of the course standards. Assessments of standards will be graded as follows:

Score	Mastery Level	Student work
4	Perfect Mastery	Demonstrates complete understanding of the underlying concept and provides correct solution with appropriate notation and use of language
3	Imperfect Mastery	Demonstrates complete understanding of the underlying concept but has minor errors in calculation and/or problems with notation and use of language
2	Developing	Demonstrates developing but incomplete understanding of the concept as indicated by major errors in the computation and/or large gaps of logic in the presentation of the solution
1	Novice	Demonstrates little to no understanding of the concept with some relevant computations
0	No evidence	Demonstrates no evidence of understanding or not attempted

Both Perfect Mastery (score = 4) and Imperfect Mastery (score = 3) are considered mastery. A student is only required to demonstrate mastery on a standard once. There will be three opportunities for demonstrating mastery on each standard:

1. Initial assessments (weekly)
2. Reassessment the week following the initial assessments
3. Final assessment during final exam week

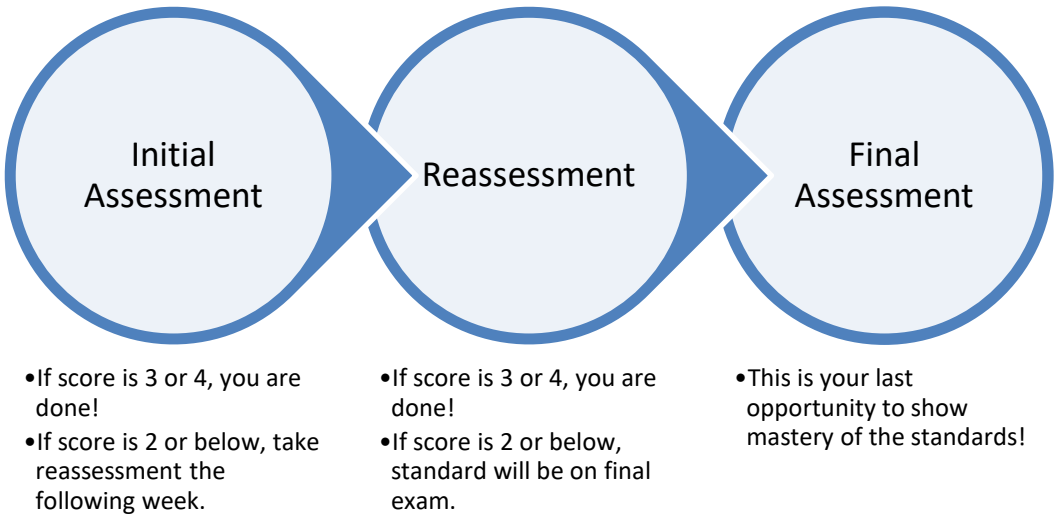

Figure 4 Assessment flow chart

C. Grading Standards

Final letter grades will be determined according to this rubric:

Grade	Core Standards	All standards (Core and Elective)
A	Mastery on all	Average score is 3.5 or above
B	Mastery on all	Average score is between 3 and 3.5
C	Mastery on all	Average score is below 3
D	Not all mastered	Average score is above 2
F	Not all mastered	Average score is below 2

Note:

- Mastery means a score of 3 or 4.
- For the grades of A, B, or C, you must demonstrate mastery on ALL Core Standards.
- Highest score for each standard across all assessment attempts is used (e.g. if you initial assessment score is a 3 and you reassess but earn a score of 2, the score of 3 is counted in your grade).

D. Assessments and Make-up Policy

Make-ups for missed assessments will not be available. However, the instructor will make every effort to arrange for alternate assessment times if student notifies the instructor of the need ahead of time or in cases of emergency on the same day as the scheduled assessment. All WebAssign assignments have been setup for unlimited automatic extensions when requested.

VII. Student Code of Conduct

A. Standards of College Behavior

Students are expected to adhere to the Montgomery College Student Code of Conduct (https://www.montgomerycollege.edu/_documents/policies-and-procedures/42001-student-code-of-conduct.pdf).

B. Academic Honesty

All assessments in this class are closed notes, closed book, and individual. The use of graphing calculators is permitted. Students should not be collaborating on any assessments and any attempts to submit work that is not the student's own, including AI assisted or AI generated work, constitutes breaches of academic honesty and will result in appropriate sanctions. Students should refer to Section VIII Academic Dishonesty of the Student Code of Conduct or the following excerpt for more details: https://www.montgomerycollege.edu/_documents/academics/support/learning-centers/writing-reading-learning-ctr-germantown/academic-dishonesty-and-how-it-is-handled.pdf

C. Artificial Intelligence Policy

Artificial Intelligence (AI) tools like ChatGPT, Claude, or similar technologies can be valuable resources for learning and practice in this course. You are encouraged to use AI for:

- Generating additional practice problems
- Checking your work on ungraded assignments
- Getting explanations of mathematical concepts
- Working through example problems

However, the use of AI is strictly prohibited on all graded assessments. Using AI on any graded work will be considered a violation of academic integrity and will result in appropriate disciplinary action.

Remember that while AI can be a helpful study tool, developing your own mathematical understanding and problem-solving abilities is essential for success in this course and future mathematics courses.

VIII. Collegewide Policies and Procedures

A. Attendance Policy

Students are expected to attend all class sessions. In cases involving excessive absences from class, the instructor may drop the student from the class. An excessive absence is defined as one more absence than the number of classes per week during a fall or spring semester; the number of absences is prorated for accelerated sessions.

B. Withdrawal and Refund Dates

It is the student's responsibility to drop a course. Non-attendance of classes or failure to pay does not constitute official withdrawal.

- Refund Drop Deadline – February 2, 2025
- No Grade Drop & Audit/Credit Deadline – February 16, 2025
- W Grade Drop Deadline – April 20, 2025

C. Audit Policy

All students registered for audit are required to consult with the instructor before or during the first class session in which they are in audit status, and students are required to participate in all course activities unless otherwise agreed upon by the student and instructor at the time of consultation. Failure to consult with the instructor or to so par-ticipate may result in the grade of "W" being awarded. This action may be taken by the in-structor by changing the "AU" to "W" before the drop with "W" date.

D. Disability Support Services

Your success in this class is important to me. If there are aspects of this course that prevent you from learning or exclude you, please let me know as soon as possible. If you have a disability that may impact your access and learning in this course, please contact me to discuss your specific needs. An accommodation letter from Disability Support Services (DSS) (http://www.montgomerycollege.edu/dss) authorizing your accommodations will be needed. Please note that accommodations needed for an online course may be different from those needed in a traditional classroom setting, so it is

important to work with DSS to determine appropriate accommodations for this course as early as possible. Since accommodations are not retroactive, it is strongly recommended that you notify me as early as possible in the term.

E. Veteran's Services

If you are a veteran or on active or reserve status and you are interested in information regarding opportunities, programs and/or services, please visit the **Combat2College website** (http://www.montgomerycollege.edu/combat2college).

F. Delayed Opening or Closing of the College

Montgomery College will always operate on its regular schedule unless otherwise announced. Depending on the nature of the incident, notifications of emergencies and changes to the College's operational status will be communicated through one or more of the following means:

- College emergency responders: Security Officers, Campus Response and/or Support Teams
- Montgomery College ALERT (https://www.montgomerycollege.edu/life-at-mc/public-safety/mc-alert.html). Registered users receive text and e-mail messages
- Montgomery College Emergency Desktop Notification. Scrolling messages are broadcast on College computers
- Montgomery College website (http://www.montgomerycollege.edu/)
- MyMC website (http://mymc.montgomerycollege.edu/)
- Montgomery College student e-mail system (http://portal.office.com/)
- Montgomery College employee voice mail. From off-site, dial 240-567-1701
- Montgomery College employee e-mail (http://mail.montgomerycollege.edu/)
- Montgomery College main phone number at 240-567-5000
- Montgomery College cable channel 10 in Montgomery County
- Commercial radio and TV stations including:

Television	Radio
Channel 4 WRC	WTOP (103.5 FM)
Channel 5 WTTG	WFRE (99.5 FM) - Frederick
Channel 7 WJLA	WAMU (88.5 FM)
Channel 9 WUSA	WFMD (930 AM) - Frederick
News Channel 8	WMAL (630 AM)

All inquiries from the news media regarding an emergency event should be directed to the College's Office of Communications.

How Closing and Delays Impact Classes

If a class can meet for 50% or more of its regularly scheduled meeting time OR if the class can meet for 50 minutes or more, it will meet. Montgomery College will always operate on its regular schedule unless otherwise announced. Depending on the nature of the incident, notifications of emergencies and changes to the College's operational status will be communicated through one or more communication methods including the College's website (http://www.montgomerycollege.edu). For the most up-to-date information regarding College openings, closings, or emergencies, all students, faculty,

and staff are encouraged to sign up for email and text alerts via Montgomery College ALERT (https://www.montgomerycollege.edu/life-at-mc/public-safety/mc-alert.html). For registration information, please visit the **Montgomery College Public Safety website** (http://www.montgomerycollege.edu/emergency).

G. Communication

This course will use your official Montgomery College email address, Microsoft Teams, and Microsoft OneNote for communication. It is recommended that you check your MC email and Teams accounts routinely for official communication from the College and your instructor.

This course will NOT use Blackboard for communication.

H. Sexual Misconduct

Montgomery College's Sexual Misconduct **Policy & Procedure (31001-CP)** (https://www.montgomerycollege.edu/_documents/policies-and-procedures/31001-sexual-misconduct.pdf) and Federal Title IX law prohibit discrimination and harassment on the basis of sex in College programs and activities. Any student who is impacted by sexual harassment, sexual assault, dating and domestic violence, stalking, gender discrimination, pregnancy discrimination, gender-based harassment or retaliation should contact the College's Title IX Coordinator to make a report and or/access supportive measures and resources. For more detailed information about the College's response to sexual misconduct or to make a formal complaint visit the **College's Title IX webpage** (https://www.montgomerycollege.edu/policies-and-procedures/title-ix/).

I. Pregnancy

Title IX prohibits discrimination on the basis of sex, including pregnancy and related conditions. The College must give all students who might be, are, or have been pregnant the same access to school programs and educational opportunities as other students. For guidance and obligations related to academic adjustments, accommodations, and support, please see the **College's Title IX webpage** (https://www.montgomerycollege.edu/policies-and-procedures/title-ix/).

IX. Schedule

A. Class Meeting Schedule

	MATH 182 Spring 2025 Class Meeting Schedule		
Week	**Date**	**Topic**	**Text**
1	Mon 1/27	Course Introduction	Syllabus
	Wed 1/29	The Substitution Rule	5.5
	Fri 1/31	Integration by Parts	5.6
2	Mon 2/03	Additional Techniques of Integration (Trig)	5.7
	Wed 2/05		
	Fri 2/07	Additional Techniques of Integration (Partial Fractions)	5.7
3	Mon 2/10	Integration Tables and CAS	5.8
	Wed 2/12	Approximate Integration	5.9

	Fri 2/14	Improper Integrals	5.10
4	Mon 2/17	Area	6.1
	Wed 2/19	Volumes	6.2
	Fri 2/21		
5	Mon 2/24	Volumes by Cylindrical Shells	6.3
	Wed 2/26	Arc Length	6.4
	Fri 2/28	Average Value	6.5
6	Mon 3/03	Applications to Physics and Engineering	6.6
	Wed 3/05		
	Fri 3/07	Applications to Economics and Biology, Probability	6.7, 6.8
7	Mon 3/10	Polar Coordinates	App H
	Wed 3/12		
	Fri 3/14	Sequences	8.1
8	*Spring Break*		
9	Mon 3/24	Series	8.2
	Wed 3/26		
	Fri 3/28	The Integral and Comparison Tests; Estimating Sums	8.3
10	Mon 3/31		
	Wed 4/02	Other Convergence Tests	8.4
	Fri 4/04		
11	Mon 4/07	Power Series	8.5
	Wed 4/09	Representation of Functions as Power Series	8.6
	Fri 4/11	Taylor and Maclaurin Series	8.7
12	Mon 4/14		
	Wed 4/16	Applications of Taylor Polynomials	8.8
	Fri 4/18	Modeling with Differential Equations	7.1
13	Mon 4/21		
	Wed 4/23	Direction Fields and Euler's Method	7.2
	Fri 4/25	Separable Equations	7.3
14	Mon 4/28		
	Wed 4/30	Exponential Growth and Decay	7.4
	Fri 5/02	The Logistic Equation	7.5
15	Mon 5/05	Predator-Prey Systems (optional)	7.6
	Wed 5/07	Final Exam Review	
	Fri 5/09	Final Exam Review	
	Wed 5/14	**Final Exam (8:00 am - 10:00 am)**	

B. Assessment Schedule

Assessment Schedule		
	Initial Assessment	**Reassessment**
Mon 2/03	5.5, 5.6	
Mon 2/10	5.7	5.5, 5.6

Mon 2/17	5.8, 5.9, 5.10	5.7
Mon 2/24	6.1, 6.2	5.8, 5.9, 5.10
Mon 3/03	6.3, 6.4, 6.5	6.1, 6.2
Mon 3/10	6.6, 6.7, 6.8	6.3, 6.4, 6.5
Spring Break		
Mon 3/24	App H, 8.1	6.6, 6.7, 6.8
Mon 3/31	8.2	App H, 8.1
Mon 4/07	8.3, 8.4	8.2
Mon 4/14	8.5, 8.6	8.3, 8.4
Mon 4/21	8.7, 8.8	8.5, 8.6
Mon 4/28	7.1, 7.2	8.7, 8.8
Mon 5/05	7.3, 7.4, 7.5	7.1, 7.2
Fri 5/09		7.3, 7.4, 7.5
Wed 5/14	**Final Assessment**	

The professor reserves the right to make changes to this syllabus.

Last Updated January 24, 2025