MAC2233 - Survey of Calculus One

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Syllabus

Course Description

MAC 2233 is the first in the two semester sequence MAC 2233 and MAC 2234 surveying the important ideas of calculus but emphasizing its applications to business, economics, life and social sciences. The course covers important calculus topics such as: limits, differentiation, applications of the derivative, introduction to integration and its applications including area.

A minimum grade of C (not C–) in MAC 2233 satisfies three credits of the university General Education quantitative requirement.

Prerequisites

We assume a comprehensive background in precalculus for this course.

To enroll in MAC 2233, you must have earned a grade of C or better in MAC 1140, precalculus algebra, or MAC 1147, precalculus; earned calculus credit through an exam or earlier coursework; or have taken the ALEKS placement assessment and attained the required minimum score. You may take the ALEKS assessment through the ONE.UF homepage https://one.uf.edu; click on Placement under My Online Services. For more complete information, check the page https://student.ufl.edu/. Note the following paragraph:

"The Department of Mathematics encourages you to take the assessment even if you have met one of the prerequisites for MAC 2233. You may need to review your algebra skills and your placement assessment can provide information and specific areas for additional study."

You can check with either an advisor in your college, the MAC 2233 course coordinator, or an advisor in the math department (the main office is Little 358) to be sure that you are eligible for MAC 2233.

There is a needs assessment in the first weeks of the course to give students a good idea if they have adequate precalculus background for the course, or if they should consider dropping back to a precalculus course prior to taking this course.

Course Content and Materials

Course Materials

There are no required materials for this course; specifically there is no required textbook, clicker, or online homework code that you must purchase for this course.

In this course we will utilize a free online homework system known as Xronos. This work is supported by the Office of the Provost and the College of Liberal Arts and Sciences. The platform is accessible through the Canvas site via the "assignments" tab or through the provided configuration link on Canvas. More details are available on Canvas.

General Education Objective (Mathematics)

Courses in mathematics provide instruction in computational strategies in fundamental mathematics including at least one of the following: solving equations and inequalities, logic, statistics, algebra, trigonometry, inductive and deductive reasoning. These courses include reasoning in abstract mathematical systems, formulating mathematical models and arguments, using mathematical models to solve problems and applying mathematical concepts effectively to real-world situations.

This course in particular addresses some of the most fundamental tools for modeling and solving problems found in real world situations, as calculus is the mathematical underpinning for all of Newtonian physics, as well as most of economics. We also address techniques and methodologies in developing these models, and solving various types of equations using logical reasoning (primarily deductive) and core mathematical tools like various theorems, algebra, and inequalities. Finally, we attempt to demonstrate a large number of business specific applications and models that can be executed with the calculus content covered in this course.

Student Learning Outcomes (SLOs)

By the end of the course, students should be able to...

- Compute limits precisely.
- Compute derivatives precisely.
- Apply derivatives to common business and economic needs, such as optimization and linear approximation.
- Interpret monotonicity and curvature - obtained from derivatives - as real-world information based on the function's context.
- Locate and interpret absolute and local extrema - obtained from derivatives - as real-world information based on the function's context.
- Use derivatives to answer basic physical questions about position, speed, and acceleration.
- Use derivatives to sketch graphs of more complicated functions than had been encountered in previous courses, e.g. precalculus.
- Compute the basics of integration precisely.
- Use integration to answer abstract geometric problems, such as determining the area of a general shape.
- Distinguish between the definition and proper setting to use definite versus indefinite integrals.

Each of these SLOs are assessed via the Xronos practice content, Canvas Quizzes, and the Canvas Exams.

Lecture Videos

There are a number of things to keep in mind while progressing through the course, and especially with regards to the lecture videos.

- This course assumes familiarity with precalculus. Although there are lots of recorded example videos provided, the algebraic working out is often done more quickly than in a precalculus course to reflect that students should be comfortable with this kind of algebraic manipulation.
- Example videos emphasize the calculus work and will often include extra algebraic steps for pedagogical reasons, to make the process clearer and easier to understand. This does not mean you need to show the exact same work in your own worked out solutions. If you have any questions or concerns about what is expected for work, please ask your instructor or TA for clarification.
- In this course we also aim to instill the basics of mathematical reasoning. This means teaching how to problem solve when presented with content that is otherwise unfamiliar. Importantly this means that *you should expect to be confronted with problems that you have not seen before.* If you have always had problems that are variations of problems that have been demonstrated for you already, then your teachers have done you a grave disservice.
- **Expect to have to reason and think on the fly during exams, quizzes, and homework.** You will almost certainly see questions on your assessments that are unfamiliar. Remember that part of the content for this course is teaching you **how to recognize aspects of a problem to see what techniques to use**.
- Finally, remember that math, by it's nature, is cumulative. If an exam has listed content that will be tested, that means that the content is the *focus* of the exam, but *not the only skills necessary for the exam.* Clearly we will not list on every exam things like 'addition' or 'multiplication' as exam topics. Similarly, most of the content that we will cover in this class, by it's nature, will be used in future content of this same course. Thus you should consider all exams as "cumulative" with the listed content for the exam being the primary *focus* of the exam.

Online Resources

E-learning Canvas, a UF course management system, is located at https://elearning.ufl.edu. Use your Gatorlink username and password to login. All course information including your grade, course homepage, syllabus, lecture videos, office hours, test locations, mail tool, discussion forum, free help information, etc. can be accessed from this site. **You are responsible for verifying that your grades are accurate. There is no grade dispute at the end of the semester** (see below for the One Week Policy).

Calculators

A graphing calculator and Wolframalpha are useful as study and learning tools when used appropriately, **but they are not essential.** I also recommend the online graphing calculator Desmos (https://www.desmos.com), and the app GeoGebra (https://www.geogebra.org) to help you as you learn the material. Keep in mind however, mathematics is a collection of ideas that are not mastered through calculator skills. **No calculators are allowed on quizzes or exams.**

Grading

See the tables below to see what will contribute to your grade, and what is necessary to attain a specific grade.

Assignment	Point Value	Total Points
Xronos (Combined)	50	50
Quizzes (10 of 13)	10	100
Exams (4 total)	50	200
Final	100	100
Total Points		450

Grade	Point Range	Grade	Point Range
A	405-450	C*	315-329
A−	390-404	C−	300-314
B+	375-389	D+	285-299
B	360-374	D	270-284
B−	345-359	D−	255-269
C+	330-344	E	0-254

∗ Note that a minimum grade of C is required for General Education credit.

Online Coursework

In this course we will utilize an in-house interactive online homework system developed by the math department at UF. This platform, called Xronos, is free of charge. The lecture videos are embedded, along with supplementary videos and interactive content spread throughout for asyncronous learning in the course. There is a single Xronos 'assignment' in Canvas **for each module** which is an interactive set of course notes that presents the material. It has numerous interactive features as well as examples and problems scattered throughout. Each assignment is due the day before the relevant module exam, but it may be worked on (no longer for credit after the due date) for the entire semester, in the event a student wants to do work for review in preparation of taking an exam or the final. I recommend you do not try to complete the entire assignment at the end of the module. First, there is simply too much to do all at once, and second it is intended as one of the primary sources of learning for the exams and content. Your best bet is to be diligent and do them throughout the semester along the provided timeline located within each module to maximize learning and retention of the material.

There are some notes to keep in mind about how Xronos works:

- Canvas may (and almost certainly will, often) tell you that a grade has been submitted for the "Xronos assignment" when you first work on it (possibly whenever you work on it, depending on your Canvas settings). Rest assured that canvas really means that a grade **update** has been submitted, not a final grade. You can continue working on Xronos and accumulating points, right up until the Xronos assignment is due; there is no "final submission" of a grade prior to that, regardless of what canvas might try to tell you.
- In most of the tiles of the interactive texts are lecture videos. Completing watching these counts toward credit for completion for the tile, so you must watch the videos in order to get full credit for the tile (and thus the Xronos assignment).
- Throughout the text there are problems embedded in the text to monitor learning and give examples. These are counted as part of the grade, and you are required to complete these to get credit for the assignment. These are often static problems, ie each student will have the same problems with no randomization. You are free to work together on these problems, but keep in mind they are intended as practice, and as such **you are responsible for knowing the material covered in the homework**.
- There are special thin tiles that are practice tiles. These typically (but not always) include a video showing how to work through problems of this type. This video needs to be completed for full credit **but** you can skip to the end of the video to count it "completed" if you don't wish to watch the entire video. These practice tiles are almost always procedurally generated problems that allow you to "try another" via the green button in the top right corner. This will generate another problem for you to try, allowing for nearly unlimited practice problems. Note that you need to make sure you have 100% completion of the tile before hitting the "try

another" button to ensure you get full credit for the assignment, more on this can be found in the orientation video on Xronos.

Quizzes

Quizzes will be administered inside canvas. These will be twenty-five minute assessments to keep you up to date on the content as we progress through the course. There are thirteen quizzes offered, but we will count the top ten grades (meaning you get to drop three quizzes). Keep in mind, with the way the course is structured, assessments will get progressively harder as we go through the semester. This means if you skip a quiz early on and decide it will be a "drop" quiz, that you will be trading a much easier quiz for a much harder one later on.

Also keep in mind that quizzes are "due" right before the relevant exam, but there is a recommended timeframe to complete them up as we progress through the semester. Since the recommended timeframe would normally be when quizzes are due, and all the quizzes are due later, you are effectively getting free "extensions" on all the quizzes automatically. For this reason **no extensions will be granted to complete quizzes or makeup missed quizzes**.

Exams

Exams in this course will be proctored using a proctoring service called Honorlock. Information on how to sign up for Honorlock will be posted to canvas.

There are four exams during the semester, with a final at the end (for a total of five tests). The time and content for each exam are as follows:

Exam	Date	Content
Exam 1	See Canvas	Topics: Limits
Exam 2	See Canvas	Topics: Theory of Derivatives
Exam 3	See Canvas	Topics: Applications of Derivatives
Exam 4	See Canvas	Topics: Integration
Final	See Canvas or Registrar List	Cumulative: All Content

An Important Note About Exam Design

Another remark about the exams is necessary. Typically, for most math courses, the class mean average exam score is in the $63\% - 68\%$ range. This often comes as a (rather unpleasant) shock to students, especially those that are newer to UF and are use to getting consistently excellent grades. The instructor and TA(s) will provide all the help they can, and there is unlimited practice offered as well (see 'On-line homework' above), but ultimately you are on your own for exams, and they are exceptionally challenging. The exams are *not* written with the intention that the problems are ones that you have already seen with different numbers. One of the primary purposes of this course is to teach you how to use mathematical tools to solve mathematical problems, which requires knowledge, understanding, and creativity to figure out which tool to use, when to use it, and how to use it correctly. We aren't trying to teach you to (only) follow a preset list of instructions. We are trying to teach you to be a problem solver; one who can utilize their knowledge and skills to unravel a completely new problem when they are confronted with one.

Final

There will be a final exam on April 27th. Your final will be cumulative, thus any content covered this semester is "fair game" for the final (including any content covered after the fourth exam). The exact format of the final will be announced as we get closer to the date. Since the final is cumulative, I will replace your lowest exam score with half the points you earn on the final (only if it helps. Notice that the final is worth twice the points of a standard exam, thus half the points on the Final will be equivalent to the number of points on a single exam). This will be done automatically, **You do not need to request this**.

Course Attendance and Interaction

This course is provided online and asynchronously. This means that there are **no** regular meeting times of the entire class, or even smaller subsections (e.g. sections for discussion courses) as part of the base structure. This clearly means that attendance is not tracked or mandatory - since there is no regular meeting to attend. Moreover,

due to the course design, the makeup policy is intended to be more forgiving for those with complex schedules (see below). Nonetheless, keep in mind that the attendance policy adheres to UF's attendence and makeup policy.

This is intended to allow a more flexible scheduling of content, especially for those that have irregular schedules - like full time work or considerable travel or other responsibilities outside of coursework. The intent is that the content is broken up in such a way that you can do larger chunks in advance - to account for times when you might not be able to do regular course work throughout a week as is typical in a more standard course.

Unfortunately, this also means that it is very easy to lose track of content and fall behind and due to a lack of forced meeting times, it can also feel isolating. I encourage you to regularly post in the discussion board, email, and/or attend office hours to help keep a regular schedule - whatever that means in relation to your own non-academic schedule.

Makeup Policies

Requirements for class attendance - and the makeup policy - in this course is consistent with university policies. See below for class policies for makeup content (by type of content).

- **Xronos**: There are no make-ups for Xronos since it is due at the end of the semester.
- **Quizzes:** Due to the extra quizzes, there are no makeups for quizzes.
- **Exams:** In order to get a makeup exam you must have a documented (and valid) reason to miss the exam. Otherwise you must rely on the half-final-grade option mentioned above.

You can find the UF guidelines on grading here: https://catalog.ufl.edu/UGRD/academic-regulations/grades-grading-policies/.

One Week Policy

Please be aware of the **One Week Policy**: Once you receive a graded paper back, you have **one week** to contest the grade and initiate any grade disputes. Once this one week passes, **there are no further disputes**. In particular, once the end of the semester nears, you *cannot* start disputing, say, grades from the first week or two.

Incomplete Policy

A grade of I (incomplete) will be considered only if you meet the Math Department criteria which is found at https://www.math.ufl.edu. If you meet the criteria you must see the instructor before the beginning of finals week to be considered for an I. A grade of I only allows you to make up your incomplete work. You cannot redo any previously completed work.

Additional Resources and Expectations

Online Course Evaluation

Students are expected to provide feedback on the quality of instruction in this course by completing online evaluations at https://gatorevals.aa.ufl.edu/. Evaluations are typically open during the last two or three weeks of the semester, but students will be given specific times when they are open.

Advising and Help

For all concerns with MAC2233, please talk to your TA or Instructor! Office hours will be posted and are regular times when they are available to answer questions, discuss grades, advise students on future classes, or help students in any available way. You do **not** need an appointment to visit during office hours. If you need to meet outside of office hours, please contact your TA for an appointment.

In addition, there are several other free resources available to you:

- The Teaching Center Math Lab, located at SE Broward Hall, offers free informal tutoring. You may want to attend different hours to find the tutors with whom you feel most comfortable. Also the Little 215 Tutoring Center provides free tutoring for courses up to Calculus 1. Go to https://www.teachingcenter.ufl.edu to find their hours. You can also request free one-on-one tutoring.

- A list of qualified tutors for hire is available at https://www.math.ufl.edu.

Honor Code

All students are required to abide by the Academic Honesty Guidelines which have been accepted by the University. The academic community of students and faculty at the University of Florida strives to develop, sustain and protect an environment of honesty, trust and respect. Students are expected to pursue knowledge with integrity.

Violations of the Academic Honesty Guidelines shall result in judicial action and a student being subject to the sanctions in paragraph XIV of the Student Code of Conduct. The conduct set forth hereinafter constitutes a violation of the Academic Honesty Guidelines (University of Florida Rule 6C1-4.017). You may find the Student Honor Code and read more about student rights and responsibilities concerning academic honesty at the link https://www.dso.ufl.edu/sccr/.

Students with Disabilities

Students with disabilities who experience learning barriers and would like to request academic accommodations should connect with the disability Resource Center by visiting: https://disability.ufl.edu/students/get-started/. It is important for students to share their accommodation letter with their instructor and discuss their access needs, as early as possible in the semester. If a student does not supply the appropriate documentation in a timely fashion, the instructor may not be able to accommodate the student in a timely manner.

Content Progression

In general, each week will involve a listed segment of Xronos to complete, which will involve somewhere between 3 and 5 concept videos and associated text - typically between 3 and 5 pages of reading. Each week will have a quiz on that week's material, and each of the listed modules below will culminate in an exam. Regular practice problems are given throughout the process, with a minimal number being required, but unlimited practice supplied via algorithmic problem generation. More on this is described in Canvas, along with a very specific assignment breakdown - which can fluctuate slightly from semester to semester due to various university and holiday constraints.

Included below is an outline of the *typical* weekly progression of content for the semester. **However** this list should be considered a generic outline, and specific dates or weekly content may change slightly in any given semester (for example, due to holidays or start or end dates corresponding to partial academic weeks). For this reason **you should check the Canvas shell for exact dates and recommended progression timelines**.

Module I: Precalculus Review and Assessment:

Duration: 2 Weeks

Description/Outline: The first two weeks is a self-driven review of precalculus concepts necessary for the Survey of Calculus course. This culminates in the needs assessment, which is an exam on precalculus concepts and mechanics that students must pass before continuing on to the rest of the course.

Module II: Limits:

Duration: 3 Weeks

Description/Outline: We spend three weeks on limits, which underpin all of calculus. Generally topics covered are: Geometric and analytic views of limits, one sided limits, limit laws, continuity, the intermediate value theorem, indeterminate forms, limits at infinity, and asymptotes. We finish the segment with a few applications of limits, including instantaneous velocity.

Module III: Theory of Derivatives:

Duration: 4 Weeks

Description/Outline: We spend four weeks developing the theory of derivatives, which covers how to take derivatives of functions quickly and easily, as well as some general techniques to tackle harder functions. Generally topics covered include: Analytic and geometric view of derivatives, derivatives as functions, decomposing a derivative using which includes the product rule, quotient rule, chain rule, and implicit differentiation, and logarithmic differentiation.

Module IV: Applications of Derivatives:

Duration: 3 Weeks

Description/Outline: We spend three weeks on applications of derivatives, which covers a number of classic and useful applications, particularly in business and industry. Generally topics covered include: Finding extrema of functions, finding points of inflection and curvature, the extreme value theorem, and a number of practical applications which include Newtonian mechanics, graphing, linear approximation, related rates, and optimization.

Module V: Integration:

Duration: 3 Weeks

Description/Outline: We conclude the semester with three weeks on integration. Generally topics include: Antiderivative of core functions, area under the curve, Riemann Approximation, indefinite and definite integrals, the fundamental theorem of calculus, and u-substitution.