MATH 122: Calculus II
Fall 2020

Professor: Dr. Maggie Rahmoeller (aka Dr. Maggie)
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Class Meetings: MWF: 10:50 AM - 11:50 AM in Trexler 374 OR via Zoom (personal preference by student)

Office Hours: All office hours will be via Zoom. Available time includes
        MWF 9:30 – 10:30AM
        T/TH 2:30 – 4:00PM

The Zoom link for office hours is:
https://roanoke-edu.zoom.us/j/6576322388?pwd=UVU5OTRtUm9FSjhUR2wzbkI1ZGQxZz09,
which can also be found on Inquire.

Course Description: This course provides a continuation of the study of calculus. Topics to be studied include applications and techniques of integration, applications and the calculus of functions of several variables, and sequences and series and their applications.

Intended Learning Outcomes: By the end of this course, successful students will be able to:
- apply the theory of differentiation and integration to model and solve real-world problems.
- apply techniques of differentiation and integration to solve problems involving functions of two or more variables.
- determine the behavior of infinite series and understand the role of power series and Taylor series in modern mathematics.
- recognize the role of technology in Calculus, understand when it should be used, and be aware of its limitations.

Required Materials:
        Textbook: Calculus: Early Transcendental Functions, by Smith and Minton, 4th Edition
        Technology: Laptop with Mathematica installed
        Mathematica Free Download: see https://apps.roanoke.edu/mathematica/
        Calculator: A calculator (optional)
        Prerequisite: MATH 121 (Calculus I) or the equivalent

Commitment Hours: This course expects you to spend at least 12 hours of work each week inside and outside of class.

Grading: The following table lists the weights for the various forms of assessment for this class.

    Practice Problems 20%   Worksheets 20%   Labs 35%   Mastery 25%

A grade scale will be determined after final grades are computed, but will be no worse than the scale given below:

		B+	87-90	C+	77-80	D+	67-70		
A	93-100	B	83-87	C	73-77	D	63-67	F	0-60
A-	90-93	B-	80-83	C-	70-73	D-	60-63		

Course Expectations

Class Structure: Students will attend class physically or virtually (student's personal preference). There may be some days, however, for which we all meet via Zoom (due to the nature of the activities in class). **Students are expected to complete work during class time every class period.**

In-Class Policies: Face masks must be worn over the mouth and nose by all students and instructors in classrooms and hallways of academic buildings (among other places). By wearing face coverings, we protect our college community and its most vulnerable members. Students who come to class without a face mask that is being worn properly will be asked to leave and will only be readmitted after they are wearing one.

Students will attempt to maintain a distance of 6 feet from other students and the instructor at all times. Students will limit side conversations (unless told to chat with others by instructor). Wearing masks makes hearing more difficult and we want to limit the amount of white noise.

Zoom Policies: Every student is expected to participate in Zoom days; and students not attending class physically are expected to attend via Zoom every class period. To download the Zoom Client for Meetings App, click here: https://zoom.us/download. If you scroll down, you will also see Zoom Mobile Apps - you can use the app on your phone. However, Zoom on a computer is better.

By *participate*, I mean:
- Your video will be on in such a way that I can see your face
- your Zoom name consists of your name (nickname is good) - both first and last
- you will stay muted unless you are asking a question or responding to a question
- you take notes, ask questions (either verbally or through chat), and are awake
- if I have you work in small groups through Zoom breakout sessions, you join your breakout group and collaborate with your group members

Attendance Policy: If you have a temperature of 100.4 or higher or other coronavirus symptoms, **don't attend class physically!** Call Health Services immediately. Do not go to any public area on campus!

Do keep up with all readings, assignments, and deadlines (everything will always be laid out on Inquire and in the tentative schedule - email me if you are unsure). **Do attend class via Zoom!!**

In order for your absence to be excused, you must give Health Services permission to notify me that you have consulted them about coronavirus symptoms (whether or not you actually have the virus). If Health Services informs you that you should isolate and not attend class for multiple days or weeks, inform me so that we can make a plan to keep you current in the course. Note - if you are in isolation, I expect you to be fully capable of keeping up with Zoom class meetings. I, of course, will always be available for Office Hours to help answer your questions about ANY of the material.

All absences caused by consultation with Health Services about coronavirus symptoms or isolation ordered by Health Services will be excused.

All non-coronavirus-related absences will be handled as follows. Any absence that is not discussed with the instructor prior to the missed class is considered unexcused. Unexcused absences may result in the lowering of the final grade (for example, a B to a B-), depending on the sheer number of absences. When absent, excused or unexcused, you are responsible for all material covered in class.

Late Work: This policy depends on the type of assignment:

- **Labs** - If a lab is turned in between 1 and 24 hours late, I will deduct 10% from your grade; between 24 and 48 hours late, I will deduct 20% from your grade; and I won't accept it 48 hours after the time it's due.

- **Practice Problems** - Practice Problems will be due by the start of the following class. If a set of practice problems is turned in later that day, 5% will be deducted. If they are turned in the next day, 15% will be deducted. I will not accept them for a grade after that. However, you may email me your work in order to receive feedback from me.

- **Worksheets** - Worksheets will be due by the start of the following class. Since I may answer questions about the worksheets in class, I cannot accept any worksheets after the start of class time on the day they are due.

- **Mastery** - I will not accept late Mastery attempts.

Academic Integrity: Students are expected to adhere to the Academic Integrity policies of Roanoke College (https://www.roanoke.edu/inside/a-z_index/academic_integrity). All work submitted for a grade is to be your own work! You may work with other students in your class on practice problems, but you must individually write up solutions. If you are looking at another person's work or asking someone what to do next while writing up your problem solutions, then you are in violation of the academic integrity policy of Roanoke College.

You may work with others on worksheets and practice problems. You may work with a partner on Labs, with the understanding that your name on the submitted lab work means that you have put in equal amounts of effort and collaborated to the best of your abilities. You may not work with anyone on Mastery problems - however, you may ask me questions. Use of Subject Tutoring is encouraged; however, students are not to work on practice problems, labs, or Mastery with Subject Tutoring until after deadlines for work submission have passed.

You may use any resources from Inquire (including videos, worksheets, solutions, resources, etc that are posted on our Inquire page) to help with any assignment (practice problems, labs, worksheets, and Mastery). You may use your textbook, a calculator, and/or Mathematica to help with any assignment. You may ask me questions via email or a scheduled office hour appointment. BUT - you may NOT use any other internet source (no Google searches, no homework help sites, NOTHING) for assignments that are graded.

What If ???
If the college is forced to suspend in-person attendance (as was done during Spring 2020), we will continue to meet via Zoom at our regular class time. I will distribute an amended syllabus. Instead of a hybrid structure, we will only have Zoom days. You will need internet connectivity. If you have technology challenges, I need you to email me as soon as the decision is made to go remote so that we may discuss how you will keep up with the course.

COURSE ASSIGNMENTS

Practice Problems: I will assign practice problems practically every class period. Students will submit work for these problems to Inquire before the class following the class the problems were assigned (e.g. problems assigned Monday are due before class on Wednesday). Problems will be graded both based on completeness and correctness. Extra study problems (optional) from the textbook will be listed on Inquire. I encourage students to work these as needed.

Worksheets: Worksheets will either be in word document format OR in Mathematica format and will be assigned occasionally to help aid students in learning new material. They may be accompanied by short videos to help introduce material. Often these worksheets will include practice problems. Worksheets must be submitted by the start of the next class period (e.g. assigned Monday, due Wednesday before class). They will be graded on correctness and completeness.

Labs: Labs are one of two ways of demonstrating mastery of topics in this course (the other method being mastery problems). Students may work with a partner (you must work with a different person each time) or individually. The six labs are more involved and may contain several components - so start these assignments early! If I hear that one person in a pair is doing most of the work, I reserve the right to grade accordingly.

Tests: There will be two take home written tests. The first test will emphasize concepts about statistics (test selection - when to use what hypothesis test, assumptions for tests, data transformations, terminology, etc.). The second test will emphasize both concepts about modeling (describing differential equations, rates of change and instantaneous rates of change, equilibrium and stability, etc.) and computation for modeling. You will need your laptops to complete these tests.

Mastery: We will be making use of "Mastery-Based Examination," a testing system that is probably very different from what you are used to; do not hesitate to ask me questions in class, during office hours, or by email at any time. In the mathematics community, many are working with and researching this technique, and one of the best starting sources for understanding can be found at https://mbtmath.wordpress.com. Much of what you'll find on this syllabus is taken from this resource.

Short Description: You only receive credit for answers that demonstrate you completely understand (have mastered) a topic. But, you get many chances to display mastery throughout the semester with no penalty at all for earlier attempts. There are 8 topics (look under "More on Mastery" section for more information) to master, and there will be 8 opportunities for mastering topics (see Tentative Schedule). If you don't master a topic during one attempt, you can try again at the next attempt on a different problem. Once you master a topic, you won't need to work any of the problems for that topic again.

Mastery opportunities will happen outside of class. You will have a few hours to attempt the topics you wish to attempt, and then you will upload your work to Inquire.

Co-Curricular Activities: The MCSP department and Roanoke College offer many opportunities to engage with mathematical ideas outside of classes. Members of this class are encouraged to attend many of these activities, however attending at least two is mandatory. Examples include MCSP Conversation Series talks (all offered through Zoom this semester) and student research showcases (should they happen this semester) - if you're unsure if a given activity makes sense for this purpose, please email me to ask. **Within one week of attendance** you must submit a brief response to the activity. This should not simply be a regurgitation of the content, but rather a personal contemplation of the experience. Each response will be worth 10 points and will count toward your practice problems grade.

RESOURCES

Accessible Education Services (AES) is located in the Goode-Pasfield Center for Learning and Teaching in Fintel Library. AES provides reasonable accommodations to students with documented disabilities. To register for services, students must self-identify to AES, complete the registration process, and provide current documentation of a disability along with recommendations from the qualified specialist. Please contact Laura Leonard, Assistant Director of Academic Services for Accessible Education, at **540-375-2247** or by e-mail at **aes@roanoke.edu** to schedule an appointment. If you have registered with AES in the past and would like to receive academic accommodations for this semester, please contact Laura Leonard at your earliest convenience to schedule an appointment..

Subject Tutoring: Subject Tutoring, located on the lower level of Fintel Library (Room 5), is open 4 pm - 9 pm, Sunday - Thursday. We are a Level II Internationally Certified Training Center through the College Reading and Learning Association (CRLA). Subject Tutors are friendly, highly-trained Roanoke College students who offer free, one-on-one tutorials in a variety of general education and major courses such as: Business, Economics, Mathematics, INQ 240, Modern Languages, Lab Sciences, INQ 250, and Social Sciences (see all available subjects at www.roanoke.edu/tutoring). Tutoring sessions are available in-person or online in 30- or 60-minute appointments (please specify if you prefer to meet with a tutor online or in-person when you make your appointment). All in-person appointments will maintain at least 6 feet of physical distance, desks will be cleaned between appointments, and masks must be worn in all indoor, public spaces. In the event that all classes go online this semester, Subject Tutoring will remain available online, too. Schedule an appointment at www.roanoke.edu/tutoring or contact us at 540-375-2590 or subject tutoring@roanoke.edu. We hope to see you soon!

The **Writing Center @ Roanoke College**, located on the Lower Level of Fintel Library, offers tutorials focused on writing projects and oral presentations for students working in any field. Writers and presenters at all levels of competence may consult the Writing Center at any point in their process - including brainstorming, drafting, organizing, editing, or polishing presentation skills - to talks with trained peer tutors in informal, one-on-one sessions. Schedule a virtual or in-person appointment by going to www.roanoke.edu/writingcenter, where our staff members and workshops are also posted. If it becomes necessary to temporarily discontinue face-to-face services at any time, online tutorials will still be available. **Questions?** Email **writingcenter@roanoke.edu** or call **540-375-4949**.

More on Master

Again, there are 8 topics to master, and there will be 8 opportunities for mastering topics (see Tentative Schedule). If you don't master a topic during one attempt, you can try again at the next attempt on a different problem. Once you master a topic, you won't need to work any of the problems for that topic again.

The course has been boiled down to 20 essential "topics", but rather than have 20 mastery topics, several of these topics will be assessed through Labs. The remaining 8 topics and your mastery of questions on these topics is assessed through 8 mastery testing days, which includes the final exam period. Each problem submitted is graded as either "mastered" or "not mastered" and a grade of "mastered" indicates that you have demonstrated full understanding of the concept being tested and further work on the topic is not necessary. Once you have mastered a problem you need not ever attempt it again on a future exam, including the final exam. There is no penalty whatsoever for multiple attempts taken to achieve mastery. If you don't master a topic during one attempt, you can try again at the next attempt on a different problem.

Your overall exam grade is then determined by the number of topics you have mastered throughout the semester; see below for more about how the number of topics translates to a grade for the exam portion of the class and what the topics are!

Why such a different examination policy? A typical policy that has four tests on which material on test 1 is not revisited until the final exam promotes a "fixed mindset" mentality and does not encourage growth in learning; allowing multiple attempts to achieve mastery on a single topic is a "growth mindset" – we firmly believe that you can all do this! It may just take some of you a little longer or shorter for certain topics. Rather than thinking "I can't do this" you should be thinking "I can't do this, yet" and work towards getting it done.

Notes on Mastery-Based Examination (in no specific order, credit to Austin Mohr):
- Clear content objectives, students continually know exactly what they need to work on to improve.
- Credit only for eventual mastery. No partial credit.
- Multiple attempts with complete forgiveness.
- A points-based system sets arbitrary deadlines by which time perfection must be attained or else penalties apply.
- Perseverance:
    - Points: Try a problem once, maybe twice, hope for the best.
    - Mastery: Keep trying until you succeed (and I know you can).
- Use of feedback on exams:
    - Points: Do you agree with the instructor's grading?
    - Mastery: What can I do to fully demonstrate that I understand the concept (improvement!)?
- Reduced Anxiety:
    - Points: Every exam has the potential to damage your GPA.
    - Mastery: No one exam can harm your grade.
- Intelligent Test Preparation: You may actually choose to skip problems on a test. Better to achieve mastery on some than to demonstrate mediocrity on all. Given time constraints of the latter tests, most students will only be able to focus on 3-6 problems in 60 minutes.
- Formative Assessment:
    - Points: How many points is this error worth?
    - Mastery: Will the student benefit from studying the concept again?
- No longer will any of us have to wonder just what exactly a 7/10 means on a problem compared to an 8/10.
- In most points-based systems, a blank exam question is a heavy blow to a student's grade. On the other hand, a student who provides a couple relevant formulas and something resembling the beginning of a

solution may receive half credit or more. In the presence of constrained study time, a good strategy is to learn some basics about every test item. Such a student may earn half credit on most items together with a few lucky shots on easier items, which amounts to a passing grade overall. Take a moment to consider whether this experience has adequately prepared the student to apply mathematical thinking to nontrivial problems in the future.

The "broad and superficial" strategy employed above earns no credit under a mastery-based system. Instead, a student who wishes to earn a passing exam grade must fully understand an appreciable subset of the main ideas of the course, and a student wishing to earn an A grade must fully understand most or all of the main ideas of the course. Even if students spend no time studying a particular item, we contend that the experience of pursuing deep understanding on the other items leaves them in a stronger position to engage deeply with the troublesome topic when it is needed in the future. Moreover, depth of understanding is critical to one's ability to apply existing mathematical knowledge in novel domains.

There are eight mastery opportunities listed on the day-by-day schedule part of this syllabus. On these days (outside of class), you will have the opportunity to attain mastery in any of the topics we have covered up to that date...with one caveat: **you must attempt to master any new topics available that day.**

The mastery portion of your course grade will be based on the number of topics mastered; here is a conversion of the number mastered to a percentage for the exam portion of the grade.

Topics Mastered	8	7	6	5	4	3	2	1
Exam Percentage	100	92	85	75	65	50	35	20

Note: If you don't master any topics, then your mastery grade will be a 0.

Mastery Topics:

Topic #	Name	Textbook Section
1	Applications of Integration: Work	5.6
2	Applications of Integration: Hydrostatic Force	5.6
3	Multivariable Functions: Core	12.1 & 12.2
4	Multivariable Functions: Extrema	12.7
5	Multivariable Functions: Double Integrals	13.1, 13.2, 13.3
6	Sequences/Series: Core	8.1, 8.2
7	Sequences/Series: Ratio Test & Power Series	8.5, 8.6
8	Sequences/Series: Taylor Series	8.7