

MATH 218, Spring 2021

Instructor: Dr. Rachel Schwell

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Office Hours: M 1:00 – 2:00 pm; T 4:30 – 6:00 pm*; R 11:00 am – 12:30 pm; F 12:30 – 1:30 pm; or by appt.

Office Hours link: <https://us.bbcollab.com/guest/84484ad35d864b49ac9b1db170f02c80>

Studying math taught me to think, to reason, to persevere when I wanted to quit. I don't use anything from my math major in terms of subject matter. But my life is better off because I can think, I can keep going when I don't understand, I'm confident that if I just keep trying (most) things will come clear.

-A random friend of a friend on Facebook

Good mathematics is not about how many answers you know...it's about how you behave when you don't know.

-Unknown (I have this on a t-shirt)

[Right before I fell], *I could feel myself getting stronger.*

-Jessie Graff, after almost being only the second woman ever to complete an American Ninja Warrior city final

Course Content: Topics include logic, set theory, functions, elementary number theory, and a variety of proof methods including induction. As this course also serves as a bridge to upper-level proof-based math courses, it will be heavily focused on mathematical argumentation and language.

More specifically, by the end of the course you should be able to

- Read and use mathematical language and notation
- Read a mathematical definition, analyze it, and construct examples and non-examples
- Critically read mathematical proofs and understand them, including identifying errors in reasoning and recognizing sound logic
- State and prove mathematical theorems
- Use a variety of proof techniques and recognize when certain techniques may be more appropriate than others
- Communicate sound reasoning in the language of mathematics with proper English grammar
- Defend a proof to others both orally and in writing

Logic, reasoning, and proof are the cornerstones of mathematics. The material you will encounter in this class might feel quite different from what you are used to from calculus. This may throw you off at first, because you will be looking for numbers and won't find many! But, one way to thus see this course is as a fresh start, if you struggled in more computational math courses.

Class Times: The class will meet MWF 10:50 – 12:00 online via Blackboard Collaborate (or Zoom).

Text: None! Handouts/Notes only.

*Starting 2/16. Until then, Tuesday office hours will be 1:30 – 3:00 pm.

Setup of the Course: We will be learning via inquiry this semester. What does that mean?

Everyone will tell you that they've learned the most throughout their lives by doing (and by explaining it to others), rather than simply watching. So, you will be center stage in this learning experience and I will be your guide on the side throughout. That does mean you will stumble, but real learning includes and requires productive struggle. An important part of learning is making mistakes, and learning how to fix them. If you are perfect all the time, and never make a mistake, I venture that you are not really learning and certainly not challenging yourself. It's important to realize that *everyone* struggles at some point in mathematics, even me. What's most important is what you do in that situation, i.e. if you give up or if you rise to the occasion, embrace the process, and feel yourself getting stronger because of it.

In 2002, the Partnership for 21st Century Learning (or P21) was founded with members that included The National Education Association, AOL Time Warner, Apple, Cisco, Dell, Microsoft, Etc. to create a national discussion of what constitutes "21st-century skills". This included what they called the "Four Cs", which were developed based on research studies of deeper learning competencies:

- Collaboration
- Communication
- Critical Thinking
- Creativity

With this in mind, the class will consist of three main portions: group work, presentations, and hand-in homework (which will ultimately be transformed into a final portfolio). Presentations will be posted online (by you!) using GoReact, with your classmates asking questions and providing commentary. The beginning of every class period we will go over the presentations and accompanying discussion as a group, and the rest of the class time will be spent working on problems in groups of 3-4 people.

Presentations: Problems from the course notes will be posted in a list in a google spreadsheet with tentative dates for presentation. You can claim problems by writing your name next to them as soon as they are posted. That means it will be your responsibility to present on the designated date, so you should start preparing it as soon as you feel you've solved it. Problems will be presented online via GoReact, accessible through Blackboard ("Getting Started" document with training video: <https://help.goreact.com/hc/en-us/articles/360041342731>).

When presenting, keep in mind that your audience is not me, your instructor. Your audience is your classmates, and so your presentations must be aimed toward your peers, to ensure that they understand and are convinced of any claims you are making. Presentations will be graded as simply P or NP. You should be able to receive a "P" as long as you put in a good-faith effort to present a correct, coherent solution and to respond to feedback given and learn from it. You will not be graded on the technical quality of your presentation, although extremely poor technical quality could detract sufficiently from the communication to degrade the mathematical discussion. You are expected to present your work with both a visual and audio aspect; i.e., describing and explaining aloud the written work that is seen on camera. Within this framework you have plenty of flexibility: sharescreen using LaTeX or powerpoint, use your phone as a document cam, film yourself with a whiteboard, etc.

You should be proud of your solution, but keep in mind that your presentation is also meant to be a learning experience/opportunity for the audience. So, you shouldn't race through it in an attempt to show off. (The audience will still be impressed even if they understood what you did. Maybe even more impressed. ☺)

On the other side of that coin, if there is any point in your presentation in which you are unsure, you should feel free to express that. It will be a good discussion point for the class.

As an online audience member, you will be expected to watch every presentation and take ownership of your own understanding, meaning, if you have questions or don't understand you should definitely ask them! Once we have gone over all comments for a given presentation, it will not be revisited as a class. Do not feel embarrassed to ask a question: chances are that if you have a particular question, then someone else in the class has a similar or even identical one.

You are also expected to be supportive of your classmates in your comments on their presentations. We are all in this together, and so attempting to boost your own standing by putting others down will not be met with success. This should be distinguished from genuine attempts to learn, understand, and follow along, which will always be welcomed and encouraged. You are most certainly expected to watch all presentations.

Hand-in Homework: We will be using a mastery grading system on the written homework, meaning, there are only three possible grades you can achieve on a given problem:

M – Mastered: you've got the concept and you're good to go (worth 2 points)

P – Progressing: there's still something important that you're missing but you're on your way (worth 1 point)

N – Not yet: you're missing the overall concept and should go back and maybe start fresh in your understanding of the concept (worth 0 points)

In addition to these grades, you will receive plenty of written feedback of course. You may rewrite problems as many times as you want in order to achieve an "M"; however, a maximum of six submitted problems per week (including rewrites) are allowed. You should submit problems as soon as they are completed; you do not need to (and should not) wait to have your three for the week completed. Problems submitted after they have been presented on GoReact can receive at most a grade of "P" (will be designated as P* if they were completed at an "M" level).

When you are writing up your homework problems, and you are not sure how much of an explanation to include, always remind yourself that you should think of your audience as *your classmates*. In other words, *if you were to hand your write-up to a classmate would they understand it?* If not, more detail is needed.

Any problem you turn in or present to the class should be written in your own words. When you present or turn in a problem, you will be asserting that you have not received any unauthorized help on the work or used any outside sources, and that you understand the argument you are presenting. You must not look to any source other than your classmates or me for solutions to problems: this includes books, magazines, the internet, completed solutions of your fellow students and notes from students who have taken this class in previous semesters. If you are unsure of the permissibility of a source, please ask me. Make sure that you are not parroting someone else's solutions, because not only will it be obvious when you present, it will be obvious to me. And not to mention, you won't really be learning!

All homework must be done in LaTeX, free math typesetting software that is what mathematicians use to type their work. Please see the introductory video posted on Blackboard (under "Videos").

Portfolios: These will take the place of exams. A portfolio will be comprised of at least 10 "chapters", where each "chapter" consists of the following:

- A final solution of a problem which ultimately received a grade of "M" or "P*"
- All drafts (including feedback) of the problem, and/or any scrap work
- 1-3 paragraphs describing why you chose this problem, the process you underwent to solve it including any false starts you made, and what you learned from the process of solving it and writing it up. This is very important, and very much the point of the portfolio. This part will not be graded on the writing, but on the analysis of your learning of the concept. This part may also be broken up as annotations on the drafts and scrap work submitted.

The portfolio will be submitted and checked three times throughout the semester, including at the end in place of a final exam. At each of these checkpoints, it will receive an "E" for "excellent", an "S" for "satisfactory", or an "I" for "incomplete". A portion that receives a grade of "S" or "I" will be rechecked at the next checkpoint; a portion that received an "E" will not.

Course Grading: We continue the mastery grading theme.

In order to pass, everyone must submit at least three new homework problems per week for at least 10 weeks of the semester.

This requirement is part of what will be the Base Assignments (small assignments along the way that are not necessarily related to course content, or just blanket requirements overall). Any assignment designated as being in this category is required in order to pass the class.

Beyond that, below are the specifications for each grade category:

To earn an A you must do all of the following:

- Earn at least 95 points in the "Homework" category
- Present at least six times with a grade of P, in at least four different chapters
- A grade of "E" on all three portions of the final portfolio
- Provide substantive feedback on at least one-third of the presentations (according to the "Substantive Feedback Guidelines")

To earn a B you must do all of the following:

- Earn at least 80 points in the "Homework" category
- Present at least four times with a grade of P, in at least three different chapters
- A grade of "E" on at least two portions of the final portfolio and at least an "S" on the other
- Provide substantive feedback on at least one-quarter of the presentations (according to the "Substantive Feedback Guidelines")

To earn a C you must do all of the following:

- Earn at least 65 points in the "Homework" category
- Present at least two times with a grade of P, in at least two different chapters

- A grade of at least an “S” on all three portions of the portfolio
- Provide substantive feedback on at least one-sixth of the presentations (according to the “Substantive Feedback Guidelines”)

To earn a D you must do all of the following:

- Earn at least 50 points in the “Homework” category
- Present at least once with a grade of P
- A grade of “S” on at least one portion of the portfolio
- Provide substantive feedback on at least several presentations (according to the “Substantive Feedback Guidelines”)

If you do not meet all of the D requirements, you will receive an F.

The distinctions of “+” within each letter grade will be based on “extra” achievements such as more presentations and/or homework problems, or where your exam grades fall within the range for that letter grade, as well as your participation in class. If you have achieved all but one level in a given category (and that level is still at the requirement for the grade level immediately below it), you will receive the “-” grade for that letter.

I reserve the right to make allowances in determining an individual’s final grade at the end of the semester based on the understanding I have seen demonstrated; however, that should not be counted on.

Time Expectations: You should expect to put in the standard expected amount of out-of-class time, which is two hours for every credit hour, or eight hours total per week for this course. That is an average: some students may require more time, some students may require less. There is no shame in requiring more time for mastery.

Your out-of-class prep time should generally consist of:

- Reading through the notes and working through the exercises on your own in preparation for in-class discussions with your group
- Solving problems on your own to the extent you are able
- Typing up (in LaTeX) the final drafts of the problems you have already solved
- Revising problems previously submitted which have not yet earned an “M” or “P*”
- Preparing and posting your presentations on GoReact
- Commenting on classmates’ presentations on GoReact

Not every category will receive equal time. As we start progressing through the course, you will get a better idea of where you personally need to focus your time more.

Piazza: We will be using the online course system Piazza to communicate with each other, for a nominal fee of \$8. I will post announcements and information there, and you may post at any time with a question or comment, either to me privately or to the whole class. This can be accessed via Blackboard; you will see a link to it on the left when you log in and click on this course. There is also an app which you can use on your portable devices.

A Few Final Notes:

1. Writing and rewriting are a key part of your learning and success in this class. I expect that many of your first attempts won't be perfect and will need revision, but that by addressing the comments I give you, you will *learn*. Along these lines, expect your papers to be covered in comments, especially when you are learning a new topic! But it is because I *care*, and want you to learn, and know that you can.
2. Even though you will not be turning in or presenting all the problems, you should work on all of them, because you are certainly expected to know all the concepts and will be tested on them.
3. Do not expect to be able to read the notes, and math in general, like a novel. It could take you an hour to parse one sentence – that is normal in math.
4. You may have understood by now that an online course (and also a mastery-based grading system) requires a lot more proactivity than an on-ground one. You won't be able to just join class and absorb (which isn't usually the case from an on-ground course either, but it can be easy to fall into that trap.) You will need to make sure you are logging into the various course platforms frequently and keeping up with the checkpoints along the way.
5. We all know from experience now that technology can all too easily fail for all sorts of reasons. Nevertheless, you should try to control what you can control: Make sure you understand how to access material on Blackboard, Piazza, and GoReact, how to record yourself on your phone or computer, how to join and participate in synchronous class sessions, etc. While I might be able to troubleshoot some things, you will definitely get better technology support by emailing or calling the IT HelpDesk: techsupport@ccsu.edu or (860 832-1720).
6. I understand we are in crazy times, and that crazy things can come up. I just ask that you keep me in the loop as to if this is what's going on in your life. Email me to check in if I won't see you or hear from you on a day we have class or in a week where you were supposed to present. I can be flexible given the circumstances, but if I don't know your situation I'll just be following the guidelines set out in this syllabus.

University Policies:

1. If you are a student with a documented disability, and would like to request academic accommodations, you are encouraged to contact Student Disability Services (SDS) at 860-832-1952, or email disabilityservices@ccsu.edu. Please visit the SDS website at <http://www.ccsu.edu/sds/> to download an Intake form and documentation requirements. Temporary impairments may also qualify for accommodations. Central Connecticut State University provides reasonable accommodations in accordance with the Americans with Disabilities Act and Section 504 of the Rehabilitation Act for students with documented disabilities on an individualized basis.

2. The last day to withdraw from a course is Monday, April 19. Approvals for withdrawal are not required; however, it is strongly recommended that students consult with their academic advisors prior to deciding to withdraw. Cessation of attendance, notice to the instructor, or telephone calls to the Enrollment Center are not considered official notice of a student's intention to drop the course.

After April 19 withdrawals are allowed only under extenuating circumstances and require approval of the course instructor, department chair and dean of the School of Arts and Sciences.

Poor academic performance is not considered an extenuating circumstance.

3. You are responsible for understanding and abiding by the University's policy on academic integrity. Please be careful! The internet is a useful place for information, but a dangerous place for risk of plagiarism. Do not tempt it. Not only will you not learn and thus fail the course anyway, you will also get yourself in trouble. Information on the University's policy may be found at <http://www.ccsu.edu/AcademicIntegrity/>. This policy is rigorously enforced by your instructor and by the Department of Mathematical Sciences.

Title IX Information:

Statement on Discrimination and Harassment

Central Connecticut State University strives to maintain our campus as a place of work and study for faculty, staff, and students that is free of all forms of prohibited discrimination and harassment based upon age; ancestry, color; gender identity and expression; intellectual disability; learning disability; mental disorder; physical disability; marital status, national origin; race; religious creed; sex, (including pregnancy, transgender status, sexual harassment and sexual assault); sexual orientation; or any other status protected by federal or state laws.

Any student who has concerns about should contact the Office of Equity & Inclusion(OEI)at 860-832-1652, Student Affairs at 860-832-1601, or their faculty member. **The OEI is located on the main floor of Davidson Hall, room 119.**

Sexual Misconduct, Intimate Partner Violence and Stalking

Central Connecticut State University (CCSU) will not tolerate sexual misconduct against students, staff, faculty, or visitors in any form, including but not limited to: sexual assault, sexual exploitation, sexual harassment, or stalking, as defined in CCSU policies. For additional information, please consult the CCSU policy at <https://www.ccsu.edu/diversity/policies/index.html>. **All faculty members and staff have a duty to report incidents of sexual harassment including sexual misconduct, intimate partner violence and stalking to Pamela Whitley, Title IX Officer, Office of Equity & Inclusion, Davidson Hall, 119.**

To file a report, contact: Equity & Inclusion(860-832-1652), Student Conduct (860-832-1667) or Student Affairs (860-832-1601). For criminal complaints, contact the University Police (860-832-2375).

For support and advocacy, contact: Office of Victim Advocacy at 860-832-3795 or jflanagan@ccsu.edu; Student Wellness Services at 860-832-1945(confidential); Women's Center at 860-832-1655; the local YWCA's Sexual Assault Crisis Services Hotline at 860-223-1787 (confidential) and Prudence Crandall Center for Domestic Violence (confidential) at 888-774-2900 (24-hour hotline).