# Course Syllabus ⩗

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TMATH 402 Autumn 2020

This is a proof based course on group theory with an introduction to rings and fields. Topics include: cosets, Lagrange's theorem, homomorphisms, normal subgroups, quotient groups, the first isomorphism theorem, cyclic and symmetric groups, Cauchy's theorem, automorphisms, and elementary properties of rings and fields. Prerequisites: 2.0 in TMATH 300.

Contact Information:

- Instructor:Ruth Vanderpool
- email: rvanderp@uw.edu
- Drop-In Zoom: **https://washington.zoom.us/my/rvanderp** ☑ **(https://washington.zoom.us/my/rvanderp)**
  - Tuesdays 3:30-4:00pm (changed on 10/29), Thursdays 9-10am, & by appointment
- website: **http://faculty.washington.edu/rvanderp/** ☑ **(http://faculty.washington.edu/rvanderp/)**
- ☑ **(https://washington.zoom.us/my/rvanderp)** Office: MDS 303C (do not expect me there!!)

Class Time: synchronously Tuesdays & Thursdays 10:10am to 12:10pm through zoom (**https://washington.zoom.us/j/92079054398** ☑ **(https://washington.zoom.us/j/92079054398)**).

For class structure or content questions I have created the "Technical or Course Related Discussion Board" which I would encourage you to use instead of emailing me. Generally I'll check and post answers there more quickly than through email and would encourage others in the class to answer questions posted there as well.

Course Objectives:

By the end of the course students should be able to:

- define and identify groups, rings, and fields, both abstractly and in applications,
- derive and prove elementary results about groups
- identify and arrange all subgroups of basic groups into a lattice ordered by containment,
- build a well-defined homomorphism and identify its kernel,
- use the Isomorphism Theorems to prove results about groups,
- apply abstract algebra to a science, educational, or engineering project of their choosing.

The course supports the following Mathematics Program Student Learning Objectives

- comprehend, discover, and communicate common principles from algebra, geometry, and analysis
- recognize, understand and also make his/her/their own mathematically rigorous arguments
- interpret and present results to a technical audience both in writing and verbally, and
- apply quantitative theory, modeling, or mathematical principals to other disciplines to solve problems.

These objective relate to the UW Tacoma-wide objective: Student will acquire skills and familiarity with modes of inquiry and examination from diverse disciplinary perspectives, enabling them to access interpret, analyze, quantitatively reason, and synthesize information critically.

Rights of the Learner

As a student in this class, you have the right:

- to be confused,
- to make a mistake and to revise your thinking,

- to speak, listen, and be heard, and
- to enjoy doing mathematics.

Opportunities for Mastery:

- Daily Homework that provides feedback and support in a low stakes manner.
- Up to four missing Daily Homework assignments excused from course percentages.
- Existing tokens that allow for either a late Written Homework submission or regrade.
- Opportunities for additional presentations beyond those required so as to replace lowest presentation marks.

Required Items:

- Textbook (freely available & open-source): **Dana Ernst, An Inquiry Based Learning approach to Abstract Algebra** 2019 edition from **http://danaernst.com/teaching/mat411f19/** ⬈ **(http://danaernst.com/teaching/mat411f19/)**
- Optional supplement textbook (freely available & open-source):
- Thomas Judson, *Abstract Algebra: Theory and Applications* August 1, 2019 edition from **http://abstract.ups.edu/download.html (http://abstract.ups.edu/download.html)**
- Calculators: Either scientific or graphing are welcome. Although no internet tools are allowed during exams, you are welcome to use Desmos Test Mode on a smart device if you have one.

Grades:

The following weights are used to determine your total score in the course:

Daily Homework Assignments   20%

In Class Presentations   15%

Written Homework   20%

Assignments Including a final
portfolio

Midterm	20%
Final	25%
Total	100%

Your final percentage, x, will then be converted to the UW 4.0 scale by the piece-
wise defined function

f(x)=4.0 if 90<x,

f(x)=.1x-5 if 57<=x<=90, or

f(x)=0 if x<57.

Homework:

Homework will be assigned for each class meeting, and students are expected to
complete (or try their best to complete) each assignment before walking into the
next class period. All assignments should be *carefully, clearly, and cleanly written*.
Among other things, this means your work should include proper grammar,
punctuation, and spelling. You should write a draft of a given solution before you
write down the final argument, so do yourself a favor and get in the habit of
differentiating your scratch work from your submitted assignment. There are two
kinds of homework:

Daily Homework:

The Daily Homework will generally consist of reading texts, completing exercises
and proving theorems. On the day that a Daily Homework is due, the majority of the
class period will be devoted to students presenting some subset (maybe all) of the
proofs/solutions that are due that day. At the end of each class session, students
should submit their write-ups for all of the proofs that were due that day. Daily

Homework will be graded using a ✓-system. Note that in order to earn complete marks all problems must have been attempted and the Daily Homework must be uploaded by its due time. You can miss up to 4 Daily Homework assignments without impacting your score but I would advise you minimize this as it adversely effects both your and your presentation group's learning!

Students are allowed (in fact, encouraged!) to modify their written proofs in light of presentations made in class; however, you are required to do so in a different color. This will allow me to differentiate the work done in class versus the work you completed before class. The grade you receive on an assignment will be determined by the work you completed prior to class.

Written Homework:

Due most every Wednesday by 8 pm will be 1-3 formally written proofs. Typically, these problems will come directly from the Daily Homework assigned the previous week. You are encouraged to work with others in the class but please indicate at the start of the problem who your teammates were (always give credit where credit is due!). Your answer should, however, be *your own* work. Yes, you can have your peers read and provide feedback and edits on your answers, but your answer should look different than theirs if you write them up on your own! Similarly, if you use other resources to help you with a problem, you are expected to cite where you received help at the start of the problem. Again note, if you are writing up your own answer with your own words, your answer should still differ significantly from a source that you use.

You are encouraged to type your submission (I recommend using (Overleaf) LaTeX; MSWord is OK) but it is not required. Submit write-ups online thru Canvas in pdf format, (CamScanner is a free app that does this well for handwritten assignments.)

Each problem on the Writing Homework assignments is subject to the following rubric:

Grade Criteria

4	This is correct and well-written mathematics! Solutions are typed.
3	This is a good piece of work, yet there are some mathematical errors or writing improvements that need addressing.
2	There is some good intuition here, but there is at least one serious flaw.
1	I don't understand this, but I see that you have worked on it; come see me!
0	I believe that you have not worked on this problem enough or you didn't submit any work.

Tokens:

You start the quarter with **2 tokens**.

- You may exchange one token for the opportunity to *rework and resubmit a written homework.* The new work will replace the original score only if the new score is higher.
- You may exchange one token to submit a late written homework without penalty.

Late written homework without tokens will be penalized 50% if marked at all.

At the end of the quarter, any unused tokens will accumulate extra credit towards your score on the final exam.

In Class Presentations:

Though the atmosphere in this class should be informal and friendly, what we do in the class is serious business. In particular, the presentations made by students are to be taken seriously since they spearhead the work of the class. *You must present 10 problems during the quarter (think presentations every week).* If you present more than 10 problems, you may keep presenting and in this way replace the lowest scoring presentation marks.

Here are some of my expectations:

- The purpose of class presentations is not to prove to me that the presenter has done the problem. It is to make the ideas of the solution clear to the other students.
- Presenters should explain their reasoning as they go along, not simply write everything down and then turn to explain.
- Fellow students are allowed to ask questions at any point and it is the responsibility of the person making the presentation to answer those questions to the best of his or her ability.
- Since the presentation is directed at the students, the presenter should frequently pause to connect with the students in class and provide time for questions to arise.

Presentations will be graded using the rubric below.

Grade Criteria

4	Completely correct, clear solution/proof, and well paced. Yay!
3	Solution/proof has minor technical flaws, some unclear language, or

lacking some details. Essentially correct.

2	A partial explanation or solution is provided but a significant gap still exists.

1	Minimal progress has been made that includes relevant information & could lead to a solution/proof.

0	You were completely unprepared.

However, you should not let the rubric deter you from presenting if you have an idea about a solution/proof that you'd like to present, but you are worried that your solution/proof is incomplete or you are not confident your solution/proof is correct. You will be rewarded for being courageous and sharing your creative ideas! Yet, you should not come to the board to present unless you have spent time thinking about the problem and have something meaningful to contribute.

In general, I will curate the list of student presenters. However, students are welcome to volunteer. This type of behavior will be rewarded. If more than one student volunteers, the student with the fewest number of presentations has priority. The problems chosen for presentations will come from the Daily Homework. Each student in the audience is expected to be engaged and respectful during another student's presentation.

Exams

- **Tuesday, Nov. 3rd**: Midterm exam.
- **Thursday, Dec 17th:** Final comprehensive exam.

The exams are to be done individually and synchronously within the assigned two hour class time while proctored. Both exams may have a take-home portion that will be distributed the class day before and collected at the beginning of the synchronous exam times. One one-sided page of 8.5 by 11 inch paper of notes is allowed for each exam with what ever you would like written/typed/photo copied/etc on it and will be digitized with the rest of the exam answers and turned in.

Make-up tests will only be given for absences deemed justifiable by the instructor (e.g., illness, family emergency), and may be considerably more difficult than the original test. If you must be absent for an exam, I will only give a make-up exam if notified in advance.

A device that can connect video through the class zoom meeting must be secured for the exam dates. Many computers and smart phones suffice but also note that UWT has laptops that are available for an extended checkout period. During the exam the camera connected to zoom will be pointed at your hands so that your progress can be monitored. If you use Desmos TestMode you will need to make sure the video connection is made on a separate device than the one running Desmos TestMode.

The exams will be provided in a pdf format through Canvas email and can be printed (if a printer is convenient) or remain on the screen of an internet accessing device while you write your answers on a separate sheet. Submission through Canvas will have the same protocol as Written Homework.

Getting Help:

(https://www.google.com/url?q=https://docs.google.com/document/d/1h-9ks1Rj1AswJswn4qgjn-veRxVH9WkAfS6Cu89JCHY/edit&sa=D&ust=1585007673675000) Many resources exist, are available, and are intended to help you with math, technology, and personal issues and questions. A few of the most helpful are listed **here (https://www.google.com/url?q=https://docs.google.com/document/d/1h-9ks1Rj1AswJswn4qgjn-veRxVH9WkAfS6Cu89JCHY/edit&sa=D&ust=1585007673676000)** .

Tips for Success:

A few, class-specific things to do that will help you get the most out of this class.

General Policies:

Campus-wide and class policies regarding inclement weather and emergency procedures are posted **here (https://www.tacoma.uw.edu/teaching-learning-technology/e-syllabus-campus-information-resources-policies-expectations)** .

Final thoughts:

It should go without saying, but I'm going to say it anyway...life happens and the best laid plans come sometimes fall apart. If you find yourself in a situation where you are going to have to miss a test---please make arrangements with me beforehand for make-ups rather than after the fact (in as much as that can happen.)

As your instructor, I want you to succeed. I will do my best to help you navigate the campus resources, understand policies, and clarify expectations.

Course Summary:

Date	Details	Due
Thu Oct 1, 2020	📅 **Abstract Algebra I: TMATH 402 Au 20 (https://canvas.uw.edu/calendar? event_id=1751295&include_contexts=course_1403089)**	10am to 12:30pm
Tue Oct 6, 2020	📅 **Abstract Algebra I: TMATH 402 Au 20 (https://canvas.uw.edu/calendar? event_id=1751296&include_contexts=course_1403089)**	10am to 12:30pm
	📝 **DHW1 (https://canvas.uw.edu/courses/1403089/assignments/5745814)**	due by 8pm