Discrete Math

MATH - 2200 401

READ:

Welcome to Discrete Mathematics! This syllabus has a lot of information. Please take time to read through it and re-read relevant parts when questions about the course arise later. This will help you be familiar with the course. Ask your instructor questions you have that are not directly addressed in the syllabus; frequent communication with your instructor is highly recommended. Ignorance regarding information in the syllabus, the course's due dates, assignments, exams, etc., is not accepted nor excused. Be aware and be prepared. Work well and work hard. If you do, then you will learn a lot in this course, and consequently, you will develop mathematically and intellectually, which is part of its many purposes. Have a great semester!

Course Description

This course is an introduction to discrete mathematics with an emphasis on reading, understanding, and crafting mathematical arguments (proofs). This course prepares one for further study in more advanced mathematical courses, e.g., introductory abstract algebra, real and complex analysis, and point-set, algebraic, and differential topology. Topics include:

- Reading, Writing/Communicating Mathematics, and correct/common diction/meta-diction, e.g., common usage of terms: lemma, proposition, theorem, corollary
- Common set-theoretic and first-order logic notation, e.g., arbitrary unions, intersections, complements, quantifiers, etc.
- Basic Set Theory, including axioms of Zermelo-Fraenkel Set Theory with the Axiom of Choice (ZFC), Choice Functions, Brief introduction to Von Neumann Ordinals, and

the Peano Axioms (this is largely conducted at an industry "naive" level)

- Ordered Pairs, Cartesian Products (an application of the Axiom of Choice), Relations, and Functions, which all are consequences of the achieved efficacy of ZFC
- Propositional Logic, Truth Tables, Basic First-Order Logic, and relevant definitions, e.g., conjunction/conjuncts, disjunction/disjuncts, negation, material implication/conditional, antecedent, consequent, biconditional, tautology, contingency, contradiction, contrapositive, converse, existential and universal quantifiers, and vacuous truth
- Methods of Deductive Proof:

1. Direct Proof, Proof by Contrapositive
2. Existence Proofs
3. Proof by Contradiction (indirect proof or reductio ad absurdum)
4. Standard Mathematical Induction (not transfinite induction)
5. Strong Mathematical Induction

- Well-Ordering (of the Natural Numbers) and the logical equivalence of induction, strong induction, well-ordering, and countable choice
- Partitions of sets, Equivalence Relations, Congruence Relations, Basic Modulo Arithmetic, Cardinality, countable/uncountable, Cardinal Numbers (optional topics include transfinite arithmetic and induction)
- Partially Ordered Sets (PO Sets)
- Basic LaTex, a typesetting programming language (more on the writing and communicating of mathematics; one such project is assigned)

Course Prerequisites

This course is for students who, within the past year, have successfully completed at least a second semester Calculus course, such as MATH 1220, with a grade of C or better (preferably, a B or better).

Required Text

"*Mathematical Proofs: A Transition to Advanced Mathematics*," third edition, or later, by Gary Chartrand, Albert D. Polimeni, and Ping Zhang

For more information on text accessibility, contact Accessibility & Disability Services at ads@slcc.edu.

Brief Description of Assignments/Exams

Homework:

You are expected to work assigned homework exercises from each section covered in the text. Moreover, all this course's homework is ***written, or typeset***. Of course, the primary aim of all homework is on the quality and comprehensiveness of learning, and we are convinced of the value in learning to read and write *technical* literature.

Further details of exactly what homework is assigned, where it is, how and when to submit homework, and all other due dates, etc., will be discussed in class and/or posted in Canvas. Ask your instructor if you have questions! Please keep current on your homework and ask questions about the homework when/if needed. It is very easy to feel overwhelmed if one gets too far behind. Don't allow that to happen! Be and remain diligent.

Of course, regular and often intense practice is essential for learning and retaining mathematics, like learning any demanding subject. You should be prepared to spend *at least* two hours studying outside of the class for each hour of class. However, many students find that much more time is required to perform as well as they desire on exams. You are encouraged to work more exercises than those assigned, say, from the text, for extra practice. Do what is necessary for you to perform well. At higher levels of mathematics, it is not uncommon to spend 60-80 per week studying for just 3 classes. This is simply what it most often takes.

Course Folder: In case of human or computer error, it is highly recommended that you keep all homework, projects, and exams in a folder (hardcopy or digital) until you have

received a final grade for the entire course. Protect yourself!

Late Homework: All assignments are expected to be completed by the due date. No late work will be counted for credit unless otherwise agreed upon in class.

LaTex Project: There is one required project. This involves learning basic LaTex, a typesetting programming language. Each student will choose a few problems from the text or from outside the course, which are approved by the instructor, to typeset into LaTex. The point of the project is to learn some industry-standard LaTex programming and to effectively communicate mathematics in writing (like in a text). Details of how to get started with LaTex will be discussed in class; see you instructor for more information.

Regular Exams: There will be 4 regular exams. **No** sample regular exams or problem lists will be given to students by the instructor for any regular exams (this is a Math Departmental Rule) nor the final exam.

Final Exam: There is a mandatory, comprehensive, proctored final exam. Its format will be paper, and pen-or-pencil, show-your-work problems, no multiple choices. Students will show/write their work for each problem and all final exams will be graded according to the work shown. Partial credit is possible for relevant, partially correct work. Final exams are not given early or late (plan now). All students must take the final exam to pass the class. Final exams can only be taken once a semester. Final exams are **not** returned to students, not even upon request. The Math Department keeps final exams on record for up to a few years for data collection, samples of student work, and to help prevent cheating in following semesters.

Exam Rules: *Every* Math 2200 exam is proctored. No note cards, notes, texts, collaboration, internet devices, programming/graphing calculators, or external aid of any kind are allowed on any exam, including the final exam. Blank scratch paper and a standard scientific, non-graphing, non-programmable calculator are allowed, e.g., TI30 but **not** TI36 or higher; see the Calculator Rule below. All exam-work to be graded must be (re)written on each exam's pages; scratch paper will **not** be graded. There are no regular exam retakes, no resubmissions, and no exam corrections of any kind for extra points. This rule holds for the final exam too.

60% Final Exam Rule: The Math Department's 60% Final Exam Rule is that if a student scores less than 60% on their final exam then their total course grade will be the lower of a D or their grade as calculated according to the grading weights on the syllabus. Thus, if a student fails their final exam (scores less than 60%), then the highest total course grade that they can earn for the course is a D.

This is an important departmental rule, which must be enforced to help ensure the success of students taking courses that have Math 2200 as a prerequisite. Moreover, it sets a meaningful standard. Rules such as this also help make, "seamless," transfers to other USHE institutions possible. Without such rules/standards, your SLCC Math 2200 credit might not transfer to other higher ed institutions!

The Dates and Times of

Regular Exams and the Final Exam

Exam 1: 9/16

Exam 2: 10/7

Exam 3: 11/4

Exam 4: 11/20

Final Exam: Tuesday, 12/16, 1:30-3:30 PM

SLCC's Final Exam Schedule This link is for in-person classes, whose final exams are conducted according to this schedule. We include for mere convenience in case it applies.

Math Department's Testing Rule: *All* SLCC math exams, regular exams and final exams, must be taken in person in a live proctored/monitored environment for *all* modalities (in-person, hybrid, broadcast, or online). Online and broadcast students are required to take their exams at an SLCC testing center facility or, if outside a 50-mile

radius, coordinate with the Testing Center for a proctoring site nearer to their home. Any accommodations to this rule must be approved by the SLCC Math Department Associate Dean. Students are encouraged to make arrangements early in a semester with employers and families to ensure they are free during the scheduled exam periods; see the disclaimer below.

Math 2200's In-Person Testing Disclaimer: It is a student's responsibility to make arrangements early with employers, family, etc. to be free during all scheduled exams. **Missing an exam for work, for example, is not excused** as students are aware of exam dates the first day of classes. Any student not willing or not able to comply with in-person testing in their classroom, or at an SLCC Testing Center, during scheduled times should not register, or remain registered, for Math 2200.

Grading Scale

Grade Weights:

The breakdown percentages are as follows.

- Homework: 20%
- Regular exams: 40%
- LaTeX Project: 10%
- Final exam: 30%

Total numeric course grades are mapped to letter grades according to the following partition, using interval notation:

A [94%, 100%] C [73%, 77%)

A- [90%, 94%) C- [70, 73%)

B+ [87%, 90%) D+ [67, 70%)

B [83%, 87%) D [63, 67%)

B- [80%, 83%) D- [60, 63%)

C+ [77%, 80%) E [0%, 60%)

Take note that grades are not, “rounded up“ or curved.

Incompletes: Typically, incompletes are only considered when a student has completed at least 70% of total course work and is passing the class at the time the incomplete is requested. In Math 1050, this amounts to all course work being completed minus the final exam. Thus, if a Math 1050 student has completed all work except the final and is passing, then their instructor may consider, but does not have to grant, an incomplete grade to a requesting student; it is the instructor's prerogative. Incompletes are not given for more time to learn material or to avoid an undesirable grade. They are given primarily in the case of an emergency that prevented a student from being able to submit final papers/exams/etc.

Math 2200's Calculator Rule

Programmable calculators, graphing calculators, and any calculators capable of algebraic manipulations, are not allowed on in-class quizzes, regular exams, or the final exam.

Prohibited calculators include all the various makes of the following base models: TI36, TI83, TI84, TI86, TI89, TI92, TI-Nspire, HP48, as well as other similar models and brands. **An example of an acceptable standard, scientific, non-graphing calculator is the TI30**, which is relatively inexpensive. Your instructor can verify if a calculator is acceptable for use during quizzes or exams. How to use graphing software, e.g., Maple/Mathematica or the like, will not be taught in Math 2200, but it will also not be assessed.

Occasionally, a standard scientific calculator, say, a TI30, may be required for basic approximation of radicals, logarithmic expressions, and the like, even on exams, like the final exam. It is advised that students always have a basic calculator with them for quizzes and exams just in case that one is allowed or needed. Note that it is the instructor's prerogative to give quizzes, tests, or portions of tests that do not allow any calculator. Not having a calculator does not excuse a student from being responsible for taking a quiz or exam at the assigned time or completing problems.

Students are expected to be able to perform basic calculations such as fractional arithmetic, finding exact simplified root values, manipulating algebraic expressions at the course level, etc., without a calculator. While a few homework problems and applications may require the use of a graphing calculator or online app, e.g., Desmos, questions on in-

person quizzes or exams will only test basic facts that must be demonstrated by students without aid beyond blank scratch paper and a standard, scientific, non-graphing calculator. A student's performance will be measured primarily on their understanding of the course's pertinent definitions/concepts and their competency in solving/proving pertinent mathematical problems/theorems rather than a mere ability to use technology (pushing buttons) to get answers. Full credit will only be awarded on exam questions when answers are justified by legible and valid arguments.

Assignment Schedule

Due Date	Assignment Name	Assignment Type	Points
	Introduce Yourself	Discussion	0
9/9/25	Written HW 1	Assignment	10
9/16/25	Exam 1	Assignment	100
9/16/25	HW Journal Unit 1	Assignment	10
9/16/25	Unit 1 Reflection	Assignment	10
9/16/25	Written HW 2	Assignment	10
9/29/25	Unit 2 Reflection 1	Assignment	10
9/30/25	Written HW 3	Assignment	10
10/7/25	Exam 2	Assignment	100
10/7/25	HW Journal Unit 2	Assignment	10
10/7/25	Written HW 4	Assignment	10
10/13/25	Unit 2 Reflection 2	Assignment	10
10/23/25	Unit 3 Reflection 1	Assignment	10
11/4/25	Exam 3	Assignment	100
11/4/25	HW Journal Unit 3	Assignment	10

Due Date	Assignment Name	Assignment Type	Points
11/4/25	Written HW 5	Assignment	10
11/5/25	Unit 3 Reflection 2	Assignment	10
11/20/25	Exam 4	Assignment	100
11/20/25	HW Journal Unit 4	Assignment	10
11/20/25	Unit 4 Reflection	Assignment	10
12/11/25	LaTeX Project	Assignment	100
12/11/25	Written HW 6	Assignment	10
12/15/25	HW Journal Unit 5	Assignment	10
12/15/25	Unit 5 Reflection	Assignment	10
12/16/25	Final Exam	Assignment	160

Student Conduct

Students are expected to follow the SLCC Student Code of Conduct at Student Code of Conduct.

Classroom Deportment: Each student is responsible for their own behavior. Any student who shows a pattern of disrespect for others, or who at any time displays egregious disrespect for others, will be subject to penalties as per the student code of conduct.

Attendance: Class attendance and/or participation, whether in-person, broadcast, or online, are expected. They are typically essential to achieve satisfactory results. It is the student's responsibility to be aware of all material covered, in-class announcements, tests dates, assignment due dates, etc.

Electronic Devices in the Classroom: Absolutely no video or audio recording in the classroom is allowed without prior written authorization from the instructor. Cell phones and other electronic devices should be in silence mode during classes, tests, and final exams. Moreover, such devices should not be on desks during lectures, tests, and the final exam unless they are part of the class's participation activities.

Cell phones and tech in-class: In case of emergency, or otherwise, students should exit the classroom before they e-mail, text, or use their cell phones. If students choose to use a computer or electronic device in class to take notes, they may do so without distracting their classmates. Computer activities that are not directly related to the class should not be done in-class, e.g., watching YouTube or the like. Students who text, scroll on their phones, talk on their cell phone, or use their computers to do activities not directly related to the class will be asked to leave the classroom.

Math 2200's Cheating Rule: Cheating on any Math 2200 assignment or exam will minimally result in a failing grade of 0% for that assignment without any possibility for that work to be made up, resubmitted, or for the failing grade to be substituted by any other work's grade. Moreover, cheating on a single assignment or exam can result in a failing grade for the entire class; this is typically the prerogative of the individual instructor. Cheating is not tolerated, so, take heed and do honest work to learn and develop intellectually. For more details about academic dishonesty, consult the Student Code of Conduct, where this topic is addressed in section C (see below too):

Policies and Student Affairs.

Sanctions for Academic Misconduct (taken from the Student Code of Conduct): Faculty, program directors, associate deans, deans, and the provost for Academic Affairs are authorized to impose any one or a combination of the following sanctions after finding a student responsible for acts of academic misconduct. The possible sanctions include, but are not limited to

- verbal warning and reprimand,
- restriction of privileges, such as access to lab facilities, library facilities, or testing centers,
- failure of the exam, quiz, project, or other assessment,

- failure for the course,
- withdrawal from the course, or
- withdrawal from the academic program.

Upon the circumstance of catching a student cheating, even if the infraction seems minor or the student is remorseful, instructors are expected to fill out the following form (the Dean of Students uses these forms to establish patterns of behavior):

Academic Misconduct Violation Reporting Form.

How to Navigate to Canvas

Institutional Policies

As members of our academic community, we would like to invite you to review the Institutional Syllabus which covers important policies and procedures. This document contains important links for students on the code of student rights and responsibilities, academic integrity, and grading policies, Title IX and other important acknowledgements. By familiarizing yourself with this information, you can help us create a safe and respectful environment for everyone.

For more information, navigate to the Institutional Policies tab on the Institutional Syllabus page.

Learning Support and Tutoring Services

We are pleased to offer a range of tutoring and learning support services to help you achieve your academic goals. Whether you need assistance with a specific subject or want to improve your study skills, you have many options for tutoring or other support.

To learn more about the services we offer and how to access them, visit the Institutional Syllabus page under the Tutoring and Learning Support tab. We encourage you to take advantage of these resources to help you succeed in your studies. If you have any

questions or would like to schedule a tutoring session, please don't hesitate to reach out to us. We are here to support you in any way we can.

Advising and Counseling Support Services

At our institution, we are committed to supporting your academic and personal growth. That's why we offer a range of advising and counseling services to help you navigate the challenges of college life. To learn more about the resources available to you and how to access them, visit the Institutional Syllabus page under the Advising and Counseling Support Services tab. Our advising team and the support centers across campus are here to support you in achieving your goals and overcoming any obstacles you may face.

Student Academic Calendar

As students you should be aware of all important dates in the semester, such as the day that courses begin and end, as well as the drop date and the last day to withdraw. To learn more about those dates, navigate to the Student Academic Calendar below:

SLCC Student Academic Calendar

Contingency Remote Workday/Learning Plan

Under Utah legislation, the governor can now call a "Remote Workday" given certain circumstances. These remote workdays can be due to inclement weather, pollution, or natural disasters.

1. Each math instructor (full or part-time) will **check-in/communicate** with the Math AD, say, with an email that acknowledges the remote workday and their relative plan for it.
2. The Math AD will verify whether a class will still meet on a campus if something happens at the campus, etc.
3. Each instructor will make a **Canvas class announcement and communicate with students**, informing them of the remote learning day and what their relative plan is for the day's class. Announcements will include pertinent info for the remote day and/or any adjustments to the next class:

- What are the assigned readings, video lectures to watch, practice problems to work?
- Is the instructor holding a Zoom meeting in lieu of the in-person class? The Zoom meeting must be optional and should be conducted at the same time as the regularly scheduled class, if possible. Moving to livestream modality is only an option, not required of the instructor or students. The Zoom meeting could simply be to answer student questions.
- Any test that was scheduled on a remote learning day will be postponed, either to the next class or possibly later scheduled through the Testing Center. Instructors will let students know that the exam has been postponed in their Canvas announcement.

General Learning Support & Tutoring Services

General Learning Support & Tutoring Services provide support for SLCC students enrolled in any class at the College. You may also ask your instructor about discipline-specific learning support and tutoring services. The following resources are provided free-of-charge.

- In your Canvas course, there is a (blue) tab, "Online Tutoring," in the left column of tabs. This literally provides free online tutoring during hours of operation.
- For in-person Redwood campus help in math, the next resource is highly recommended: **STEM Center** in SI building, which offers free STEM tutoring.

STEM Center Hours (may vary by semester): Monday-Thursday, 10:00 a.m.-9:00 p.m.
Friday and Saturday, 10:00 a.m.-5:00 p.m.

Tutoring: This is an index of tutoring resources.

STEM Learning Centers: Provides free assistance in Math, Science, Accounting, CSIS and Allied Health Classes at 6 campus locations.

Student Writing Center: Provides in-person and online feedback on all writing assignments.

Library Services: Provides research help, print and online resources, computers and study space.

ePortfolio Lab: Provides drop-in assistance for all ePortfolio questions.

eLearning Support: Provides support for navigating online and hybrid classes.

Accessibility and Disability Services: If you have a disability and want an accommodation, please contact:

 Phone: 801-957-4659

 Email: ADS@slcc.edu

 Website: ADS

Course Description

Fundamentals of logic, set theory, order, relations, functions. Elementary number theory, modular arithmetic. Combinatorics; counting permutations, generating functions, matrix operations. Basic algebraic structures; groups, rings. Discrete probability. Introduction to graphy theory, trees, search optimization problems. Boolean algebra.

Pre-Requisite: Within the last year, MATH 1220 w/C grade or better or instructor permission.
Semester: Fall & Spring

Course Student Learning Outcomes

- Use common set-theoretic and logical notation effectively in writing proofs.
- Solve basic problems using axioms of Zermelo-Fraenkel Set Theory with the Axiom of Choice (ZFC), Choice Functions (nonempty Cartesian Products) and equivalents, Von Neumann Ordinals, and the Peano Axioms.
- Prove basic facts about set-theoretic versions of ordered pairs, Cartesian products, relations, and functions.

- Demonstrate proficiency in propositional and first-order (quantifier) logic.
- Read, understand, and craft mathematical arguments (proofs), i.e., employ methods of deductive proof, including mathematical induction (strong or not), well-ordering, direct proof, indirect proof, contrapositive, etc.
- Solve problems about partitions, equivalence relations, including modulo arithmetic, and PO sets.
- Typeset using basic LaTeX.