

Math 208: Discrete Mathematics

Self-paced Enroll Anytime Online Course

This is an unofficial syllabus and is subject to change at any time. The official course syllabus is posted in Blackboard and is also available upon request.

Credits: 3

Prerequisites: Appropriate score in the Placement Testing Program or MATH 103 or MATH 107 or MATH 146 or MATH 165.

Instructor: Dr. Jeremiah Bartz

Email: Visit the Blackboard course for contact information.

*If you have any course questions prior to enrollment, please email und.online@und.edu

Textbook

The textbook for this course was written and published by the UND Mathematics department. It is free and available for download in the Blackboard course.

Department of Mathematics, University of North Dakota. *Math 208: Discrete Mathematics*. 3rd ed.

Course Description and Objectives

Discrete mathematics covers a wide range of topics that are particularly important to the areas of computer science and mathematics. There are far too many topics included in the area known as discrete mathematics to be covered in a single semester. The course given here introduces some of the highlights of the subject, highlights which will appear repeatedly in future computer science and mathematics courses. The main topics to be covered are symbolic logic, set theory, relations in general and equivalence relations in particular, proof techniques including proofs by induction, arithmetic and geometric sequences, recursively defined sequences and sets, number theory including modular arithmetic and greatest common divisors, linear diophantine equations, a variety of counting techniques, solving recurrence relations, and graph theory.

There are a few more topics treated in the text that will not be covered in this course. The main omitted topics are (1) algorithms and Big-oh notation (Chapters 17, 18), (2) growth of functions (Chapter 19), integers in bases besides base 10 (Chapter 27), and more challenging counting problems (Chapter 33). These are important topics too, of course, but there is only so much time in a semester, so a few cuts have to be made.

Discrete mathematics has a well-deserved reputation as one of the more challenging sophomore level mathematics courses, so be prepared to work hard!

Part of the reason discrete mathematics is difficult is that it has a significantly different flavor than the mathematics classes students have typically taken up to this point. As is evident from the list above, many of the topics will be totally unfamiliar. In addition, unlike college algebra or calculus, learning about the concepts and point of view of discrete mathematics is at least as important as mastering various computational techniques.

The methods used to describe and solve problems in discrete mathematics are as varied as the topics. You will learn about permutations, combinations, inclusion-exclusion counting, characteristic polynomials for recurrences, rules of logical and methods of doing proofs, and properties of sets, and other tidbits along the way.

Besides vocabulary and methods, another central goal of discrete mathematics is learning to understand definitions and to read and construct proofs, particularly writing proofs using the method of induction. Induction is certainly one of the basic tools of both computer science and mathematics. You might find learning to read and do proofs will be the greatest challenge in this course. Don't try to read a proof the way you read a story. Think about each step in the proof. As you read through the proof, you should have pencil and paper handy so you can fill in missing steps in the reasoning, or work out small examples, anything to help you understand what is happening. It isn't easy, but the extra effort will pay off in the end.

Technical Requirements

The [UND Technical Support webpage](#) contains information on your UND email and how to download a free version of Microsoft Office.

- Students are expected to use their official UND email in the course.
- Adobe Acrobat Reader is required for this course and can be downloaded free [from Adobe's website](#).
- Homework is submitted as a single PDF file. You need a printer and scanner or camera.
- The exams are proctored using Honorlock as the proctoring method. Visit the exam folders in Blackboard or the [Self-Paced Enroll Anytime Exams webpage](#) for more information on the exam process and technical requirements.
- [View the basic technical requirements](#) for every online course.

Course Mechanics

The course is comprised of eighteen lessons and three examinations. Each lesson covers about the amount of material that would normally take several hours of class time during a regular semester. The best approach would be to first watch the lecture videos, paying close attention to the examples. Additionally, notes corresponding the lecture videos are provided. It will be helpful to complete and add your own comments while watching the videos.

It is also good practice to read the textbook. There is a large number of detailed examples in the text as well as a number of sample problems with detailed solutions. These should be a help for self-study. Be sure you follow the reasoning in all the examples before trying the homework problems. To get the most benefit from the sample problems with solutions provided, it would be a good idea to try the problems yourself before reading the solutions.

Also several links to supplemental videos are listed to provide additional study material from other sources. These resources are intended to provide additional discussions and perspectives on certain topics in the course.

For each lesson there will be a number of problems to be written up and submitted for grading. They will allow me to gauge your understanding of the material. These assignments should take couple of hours or so to complete. **Remember that the answer to a problem must be justified by showing the reasoning that leads to the answer. To get credit for a homework problem, be sure to show how the answer is obtained.** Use the solutions provided for the selected exercises as models of how your solutions should look. Learning to write mathematics is an important portion of all mathematics courses.

Assignments are submitted in Blackboard as .pdf files. No other file format is accepted. Details for attaching your homework problems are in Blackboard. Assignments submitted via Blackboard will normally be graded within two to three days. To submit an assignment through Blackboard, the best method is to write solutions out on paper (use black pen on white unlined paper for best results), then scan or take a digital picture of the work and save it as a .pdf file. If the assignment is more than a single page, merge the files into a single .pdf file before uploading it to Blackboard. The mark-up software used to grade papers does not render very well on pdfs produced from digital photos. If you find the comments difficult to read, it can help a bit if you magnify to document in Adobe Reader.

All grades will be posted in Blackboard.

To ensure that you devote sufficient time to assignments and to give me enough time to grade assignments for all students in a timely fashion, do not expect more than three assignments to be graded in any seven day period.

If you have any questions about the course notes, you can send your questions to me at jeremiah.bartz@und.edu. E-mail is normally answered within two days, and usually much more quickly than that. Hints will also (usually) be provided for the homework problems if you get stuck. Send an e-mail to the address above explaining how far you can get on a problem, and what has you confused. I'll provide a hint, often in the form of a question for you to think about, to get you going again.

The following topics are covered in the course:

Lesson 1	Propositional Logic
Lesson 2	Predicate Logic
Lesson 3	Sets and Set Operations
Lesson 4	Proof Techniques
Lesson 5	Relations and Equivalence Relations
Lesson 6	Functions and Special Functions
Lesson 7	Exam 1
Lesson 8	Sequences and Recursive Definitions
Lesson 9	Recursively Defined Sets
Lesson 10	Induction
Lesson 11	Integers and the Divides Relation
Lesson 12	Greatest Common Divisors and the Euclidean Algorithm
Lesson 13	Prime Numbers and Linear Diophantine Equations
Lesson 14	Exam 2
Lesson 15	Modular Arithmetic and the Fundamental Counting Rules
Lesson 16	Permutations, Combinations, and the Binomial Theorem
Lesson 17	Inclusions/Exclusion Counting and the Pigeonhole Principle
Lesson 18	Counting by Recursion
Lesson 19	The Method of Characteristic Equations
Lesson 20	Graphs
Lesson 21	Final Exam

Course Organization

This course contains 21 lessons designed to focus your study of discrete mathematics. Each lesson contains the following structural elements:

- Lesson objectives and to-do list
- Required reading and lecture videos
- Optional supplemental reading and videos
- Assessment (i.e. homework assignment or exam)

Assessment and Grading

Each of the eighteen assignments will be graded on a scale from 0 to 100, and an overall average of the eighteen assignments will be computed. That average will count as 1/4 of your final grade, so be sure to do a good job on the homework to earn those easy points!

There will be a total of 400 points distributed as follows:

Lesson 7: Examination I - Lessons 1-6	100 points
Lesson 14: Examination II - Lessons 8-13	100 points
Lesson 21: Examination III - Lessons 15-20	100 points
Average of 18 written assignments:	100 points

There are no assignment or exam redo options, and there are no extra credit options for this course.

Exams are written, timed (generously), and proctored. The exams are proctored using Honorlock as the proctoring method. Visit the exam folders in Blackboard or the [Self-Paced Enroll Anytime Exams webpage](#) for more information on the exam process and technical requirements. Each exam has a 2½ hour time limit. No books, no calculators, and no cell phones are allowed during the exam.

Grades will be determined as follows:

360 - 400 total points	Final grade of A
320 - 359 total points	Final grade of B
280 - 319 total points	Final grade of C
240 - 279 total points	Final grade of D
0 - 239 total points	Final grade F

About UND Self-Paced Enroll Anytime Courses

You have 3 to 9 months to complete this course from the time of your enrollment. You may work at your own pace and complete lessons/exams on your own schedule, submitting up to 3 per week for grading.

After you finish your course, your final grade will be posted in Blackboard. Please **allow 3-5 business days for your final grade to appear** on your transcript in Campus Connection. You will receive a confirmation email from the Enroll Anytime staff once the final grade is officially posted on your transcript. You may then order an official transcript, if desired.

If you have an **administrative** question regarding course enrollment dates, extensions, withdrawals, questions regarding your transcript, or need exam assistance, please contact the **Office of Extended Learning** at und.courses@UND.edu or 701-777-0488.

Questions regarding **coursework** should be directed to the **instructor**.

For **technical support** including username and password help, assignment submission, or other technical assistance in the course, contact [University Information Technology](#).

Student Resources

Many services are available to online students such as writing assistance from the UND Writing Center, free online tutoring, and more. Visit the [Student Resources page](#) for more information. You can also access the resources webpage from the *Student Resources* link in your Blackboard course menu.

University of North Dakota Policies & Resources

Academic Integrity

Academic integrity is a serious matter, and any deviations from appropriate behavior will be dealt with strongly. At the discretion of the professor, situations of concern may be dealt with as a scholastic matter or a disciplinary matter.

As a scholastic matter, the professor has the discretion to determine appropriate penalties to the student's workload or grade, but the situation may be resolved without involving many individuals. An alternative is to treat the situation as a disciplinary matter, which can result in suspension from the University, or have lesser penalties. Be aware that I view this as a very serious matter, and will have little tolerance of or sympathy for questionable practices. A student who attempts to obtain credit for work that is not their own (whether that be on a paper, quiz, homework assignment, exam, etc.) will likely receive a failing grade for that item of work, and at the professor's discretion, may also receive a failing grade in the course. Read more in the [Code of Student Life](#).

Disability Support and Medical Services

The University of North Dakota is committed to providing equal access to students with documented disabilities. To ensure access to your classes and program, please contact [Disability Services for Students](#) (DSS) to engage in a confidential discussion about accommodations for the classroom, clinical and/or online course settings.

Accommodations are not provided retroactively. Students are encouraged to register with DSS at the start of their class/program. More information can be obtained by email UND.dss@UND.edu or by phone at 701.777.2664.

If you receive an exam accommodation from Disability Services for Students, share the letter with the Office of Extended Learning at UND.courses@UND.edu.

Religious Accommodations

UND offers religious accommodations, which are reasonable changes in the academic environment that enable a student to practice or observe a sincerely held religious belief without undue hardship on the University. Examples include time for prayer or the ability to attend religious events or observe a religious holiday. To request an accommodation, complete [student religious accommodation request form](#). If you have any questions, you may contact the [Equal Opportunity & Title IX Office](#).

Pregnancy Accommodations

Students who need assistance with academic adjustments related to pregnancy or childbirth may contact the Equal Opportunity & Title IX Office or Academic Affairs to learn about your options. Additional information and services may be found at [Pregnancy Resources](#).

Resolution of Problems

Should a problem occur, you should speak to your instructor first. If the problem continues to be unresolved, go to the department chair, and next to the college Dean. Should the problem persist, you have the right to go to the Provost next, and then to the President.

Notice of Nondiscrimination

It is the policy of the University of North Dakota that no person shall be discriminated against because of race, religion, age, color, gender, disability, national origin, creed, sexual orientation, gender identity, genetic information, marital status, veteran's status, or political belief or affiliation and the equal opportunity and access to facilities shall be

available to all. Concerns regarding Title IX, Title VI, Title VII, ADA, and Section 504 may be addressed to Donna Smith, Assistant Vice President for Equal Opportunity & Title IX and Title IX/ADA Coordinator, by calling 701.777.4171 or emailing UND.EO.TitleIX@UND.edu. Concerns can also be directed to the Office for Civil Rights, U.S. Department of Education, 230 S. Dearborn St., 37th Floor, Chicago, IL 60604, or any other federal agency.

Reporting Discrimination, Harassment, or Sexual Misconduct

If you or a friend has experienced sexual misconduct, such as sexual harassment, sexual assault, domestic violence, dating violence, or stalking, please contact the [Equal Opportunity & Title IX Office](#) or UND's Title IX Coordinator, Donna Smith, for assistance: 701.777.4171; donna.smith@UND.edu. You may also contact the Equal Opportunity & Title IX office if you or a friend has experienced discrimination or harassment based on a protected class, such as race, color, national origin, religion, sex, age, disability, sexual orientation, gender identity, genetic information, pregnancy, marital or parental status, veteran's status, or political belief or affiliation.

Faculty Reporting Obligations Regarding Discrimination, Harassment, and Sexual Misconduct

It is important for students to understand that faculty are required to share with UND's Title IX Coordinator any incidents of sexual misconduct or of discrimination or harassment based on a protected class they become aware of, even if those incidents occurred in the past or are disclosed as part of a class assignment. This does not mean an investigation will occur if the student does not want that, but it does allow UND to provide resources to help the student continue to be successful at UND. If you have been impacted by discrimination, harassment, or sexual misconduct, you can find information about confidential support services at the [Equal Opportunity & Title IX Office](#).

UND Cares Program

The [UND Cares program](#) seeks to educate faculty, staff and students on how to recognize warning signs that indicate a student is in distress.

How to Seek Help When in Distress

We know that while college is a wonderful time for most students, some students may struggle. You may experience students in distress on campus, in your classroom, in your home, and within residence halls. Distressed students may initially seek assistance from faculty, staff members, their parents, and other students. In addition to the support we can provide to each other, there are also professional support services available to students on campus through the Dean of Students and University Counseling Center. Both staffs are available to consult with you about getting help or providing a friend with the help that he or she may need. Visit the [UND Cares program](#) webpage for more additional information.

How to Recognize When a Student is in Distress

The term "distressed" can mean any of the following:

- Student has significant changes in eating, sleeping, grooming, spending, or other daily activities.
- Student has cut off or minimized contact with family or friends.
- Student has significant changes in performance or involvement in academics, sports, extracurricular, or social activities.
- Student describes problems (missing class, not remembering, destructive behavior) that result from experiences with drinking or drugs.
- Student is acting withdrawn, volatile, tearful, etc.
- Student is acting out of character or differently than usual.
- Student is talking explicitly about hopelessness or suicide.
- Student has difficulty concentrating or difficulty carrying on normal conversation.
- Student has excessive dependence on others for company or support.
- Student reports feeling out of control of one's emotions, thoughts, or behaviors.

Land Acknowledgement Statement

Today, the University of North Dakota rests on the ancestral lands of the Pembina and Red Lake Bands of Ojibwe and the Dakota Oyate - presently existing as composite parts of the Red Lake, Turtle Mountain, White Earth Bands, and the Dakota Tribes of Minnesota and North Dakota.

We acknowledge the people who resided here for generations and recognize that the spirit of the Ojibwe and Oyate people permeates this land. As a university community, we will continue to build upon our relations with the First Nations of the State of North Dakota - the Mandan, Hidatsa, and Arikara Nation, Sisseton-Wahpeton Oyate Nation, Spirit Lake Nation, Standing Rock Sioux Tribe, and Turtle Mountain Band of Chippewa Indians.