Kennesaw State University
College of Science and Mathematics
Department of Mathematics
Fall Semester 2021
MATH 2345: Discrete Mathematics (Sections 54 and 55)

Instructor: Dr. Timothy Faver
Email: `tfaver1_AT_kennesaw.edu` (this is the best way to contact me)
Website: `https://tefaver.com/math-2345-discrete-mathematics-fall-2021`
Lecture time/location: Section 53 — MWF 12:20 pm – 1:10 pm, Math Room D208
Section 54 — MWF 1:25 – 2:15 pm, Math Room D116
Office: D248 (Office phone: 470-578-6954, but please use email)
Office hours: MW 3:30 pm – 4:30 pm, F 10:30 am – 11:30 am (online only)

Learning outcomes. Upon completing this course students should be able to:

- Write the converse, contrapositive, and negation of a statement.
- Write a correct formal proof.
- Determine whether a relation is reflexive, symmetric, or transitive.
- Identify isomorphism invariants of graphs.

Who should take this course? If you are a Design or Software Engineering major (but not a Computer Science major), you may allowed to take Discrete Structures (CSE 2300) in lieu of this course; you should consult your advisor. If you are a Math major, you should take MATH 2390, not this course; consult your advisor. If you are not a Math major but are enjoying this course, we should talk about future math opportunities for you!

Course materials. The official course textbook is *Discrete Mathematics with Applications (Fifth Edition)* by Susanna Epp. You may wish to purchase the much less expensive eText instead of a hard copy; see the introductory email to the course for suggested buying options. Do not purchase an earlier (even if cheaper) edition, as the problem numbering will not necessarily correspond across editions.

I will post lecture notes to the course website for each class and update them after our discussions and interactions. Lecture notes will occasionally feature material for future classes watermarked "tentative"; this material is subject to change. Please alert me to typos, inconsistencies, and ambiguous phrasings in the notes.

Assignments, quizzes, exams, and solutions will also be posted on the website. Along with the problems assigned each Friday (see below) I will also provide recommended readings from Epp's book for the coming week. We will follow Epp's book in a rather nonlinear and selective manner; be prepared for the readings to jump around and omit various parts.

Grading. Your final grade will be calculated from your performance on four categories of work: quizzes, problem sets, three midterm exams, and a final exam. Each Friday of the term (after the first week) will feature a quiz, a problem set, or a midterm exam.

Exams. We will have three "midterm" exams and a final exam during the term. I will provide details on what topics an exam will cover and what sort of problems you can expect by at least the Friday before the exam. Each midterm exam will cover roughly four weeks of course material.

In order to be excused from an exam, you must notify me before the start of the exam (or as soon after as the circumstances allow) and provide official documentation (a doctor's note, etc.) excusing your absence in a timely manner. If you do not notify me in a timely manner, or you do not provide documentation for your missed exam, then you will receive a 0 on the exam. (For the purpose of exams, "official documentation" means a note from a doctor, employer, or other responsible party who can verify the reason for your absence.) All exam make-ups will be scheduled at a mutually convenient time during the final exam period.

The final exam will be cumulative and will only be offered during the scheduled university exam times:

$$\begin{cases} \text{Section 53: Friday, December 10, 1:00 pm – 3:00 pm} \\ \text{Section 54: Monday, December 13, 1:00 pm – 3:00 pm.} \end{cases}$$

Problem sets. When a problem set is due on the Friday of Week n, I will assign a list of problems from the textbook on the Friday of Week $n-1$. I will also assign some "recommended" problems along with the required problems. You will not submit these recommended problems with your required ones, but (eventually) doing all the problems is essential. I will not accept late problem sets, but I will drop your lowest problem set score in the calculations of your final grade. Problem sets will be due by 5 pm on their assigned Fridays.

Of the problems that you submit, I will select a subset to grade for correctness, and I will grade the other problems on the nebulous concept of "completeness" (i.e., for those other problems, you made a "substantial" effort to write out the full solution). I will not tell you in advance which problems are which. Because of this "completeness" component, your problem set grades may be inflated. As you are doing the problem sets, you should take care to identify areas that feel difficult and confusing and to spend extra time (by yourself, with other students, and with me) addressing those areas.

The purpose of the problem sets is to allow you the time and space to develop carefully written solutions, explanations, and proofs — in other words, to give your writing the opportunities and feedback that it needs to grow and shine. As I grade these problems, I will evaluate not only the correctness of your mathematics but also the quality, clarity, and effectiveness of your prose. For some problems I will require complete sentences (maybe even paragraphs!) instead of just symbolic connectives. Developing good mathematical writing techniques is a lifetime's work, and so I am looking more for ways to help you improve (or stay excellent) than to criticize or knock you down. I will take improvement in writing into account when assessing borderline grades at the end of the term.

You are welcome and encouraged to collaborate on problem sets. However, each student should submit an individually written assignment; remember, the point is to work on your individual writing as much as on "getting the right answer." Please indicate the name(s) of fellow students with whom you discussed particular problems.

Quizzes. When a quiz is due on the Friday of Week n, I will assign a list of problems from the textbook on the Friday of Week $n-1$. The quiz will consist of some problems from that list, so you will know all the possible quiz problems in advance. As with problem sets, I may also assign some "recommended" problems on quiz weeks; these problems will not be candidates for quiz problems, so you don't have to do them immediately, but they will provide further essential practice (like for exams).

By 5 pm on the Wednesday of Week n, I will post the quiz to the course website. The quiz will be due by 5 pm on the Friday of Week n. Between that Wednesday and Friday afternoon, you must take the quiz in a single 20-minute session during which you may not consult any sources, including but not limited to other students, the textbook, your notes, your previously worked out solutions to the assigned problems, or the internet. These rules will be repeated at the top of every quiz, and you must write the sentence "I have followed the quiz rules" at the top of your solutions. Once you are done with the quiz, you should submit it to D2L; you do not have to factor the scanning/uploading time into your 20 minute limit, but you should not do any more work on the quiz in the submission process. I will not accept late quizzes, but I will drop your lowest quiz score.

The purpose of the quizzes is to make you work under pressure without any resources but your own memory and practiced skill. Consulting outside sources during the quiz may enable you to get a perfect score, but it will not give you this "practice under pressure and without external support" that is one of the necessary components of internalizing and mastering mathematical techniques.

Submission directions. You will submit problem sets and quizzes to the appropriate assignment on D2L. Make sure that your scans are clear and legible; I can't give credit for work that I can't read. Please submit only `jpeg` or `pdf` files. I encourage you to type your solutions in LaTeX, and I am happy to talk about LaTeX formatting and technique. Please start each problem on a new page. It is fine to continue the work for a given problem on a subsequent page, including multiple parts of the same problem. (So, if you are assigned Problems 1 and 2 from Section 2.1 in Epp's book, you could put parts (a) and (b) of Problem 1 on the same page(s), but you need to start Problem 2 on a new page. This arrangement will make it rather easier for me to parse your work.)

Plan to submit your work comfortably in advance of the 5 pm deadlines in case you encounter internet or D2L problems. Make sure that you have submitted the correct file to the appropriate assignment slot (not an older file or a file from a different class!). Please do not submit problem sets by email.

Problem scoring. Problem sets have two types of problems: those graded for completeness and those graded for correctness. Quiz problems (since you will submit fewer than on problem sets) will only be graded on correctness.

• Problems graded for completeness will be scored out of 3 points, with 0 points assigned for no work, 1 to 2 points assigned for incomplete or highly disorganized work, and 3 points assigned for full and clear (though not necessarily correct) work. This applies only to problem sets.

• Problems graded for correctness will be scored out of 5 points, with 0 points assigned for no work, a minimum of 1 point assigned for a reasonable effort, and 5 for fully correct work; each significant error will reduce the score by a point. This applies to both problem sets and quizzes.

Final scores on problem sets and quizzes will be normalized to the interval $[0, 10]$; final scores on exams will have values in $[0, 100]$.

Grade calculations. Your grade will be the higher of the following two options.

Item	**Option 1**	**Option 2**
Quizzes	10%	10%
Problem sets	10%	10%
Lowest midterm	20%	15%
Middle midterm	20%	20%
Highest midterm	20%	22.5%
Final exam	20%	22.5%

Your final letter grade will be no worse than the following correspondence of numerical intervals and letters.

[90,100]	**[80,90)**	**[70,80)**	**[60,70)**	**[0,60)**
A	B	C	D	F

Zulip. Our course has a discussion forum available at Zulip.com. An invitation link and the password are available in the announcements on D2L. The format of Zulip offers some advantages over D2L, notably the ability to write in LaTeX. You can post questions (or observations and opinions) about course topics, problems, exams, and anything related to discrete math. If you have a question, it's likely other people do, too. To keep the chat organized, please review the different available streams and select the appropriate one before posting. Feel free not to use your real name when posting. I will monitor the chat and respond, but feel free to beat me to it and answer someone else's question yourself. This is good practice for you!

Of course, you should contact me individually via email for any private or personal matters related to the course. When writing in public or in private, please treat others with the same respect that you desire for yourself.

How to succeed.

1. Come to class. Pay attention. Ask questions and feel free to raise doubts, disagreements (politely, please), or alternative approaches. It is very likely that the method I present will

not be the only way to address the problem at hand.

2. Do as many problems as you can — certainly all of the "required" problems for submitted problem sets and quizzes.

3. Reread your class notes and the lecture notes. Try to solve examples from class without looking at the solutions. It is often possible to find a different solution or proof from the one that I present. Read the textbook. We will often cover different examples from the textbook, so that will be a source of new examples and perspectives for you.

4. We will start each Wednesday class with questions about the problems assigned on the previous Fridays. Spend some serious time with the problems before Wednesday so that you can raise questions in class (and not rush to address confusion on the Fridays when work is due).

5. Ask questions. Ask questions during a lecture, during our Wednesday question time, during office hours, via email, and on Zulip. If you don't have questions, lurk on Zulip from time to time and read other people's questions. Respond, too, if you feel comfortable.

6. Make liberal use of email. Feel free to send me a (clear!) photo/scan of some work that is giving you trouble. Often a short hint or comment from me can set you on the right path. Please put "Math 2345" in the subject of your email.

7. If you need to miss class (e.g., due to quarantine requirements), the posted lecture notes will contain every single example, solution, and proof that I put on the board (albeit in more polished language than I will probably use in class). The lecture notes should be your first recourse to fill in gaps from a class that you miss — or that you attend, but don't fully understand.

Calendars. This calendar contains the dates for all the graded activities (quizzes, problem sets, and exams) in the course.

Friday	Activity
8/20	No graded activity
8/27	Quiz 1
9/3	Problem set 1
9/10	Quiz 2
9/17	Exam 1
9/24	Problem set 2
10/1	Quiz 3
10/8	Problem set 3
10/15	Exam 2
10/22	Quiz 4
10/29	Problem set 4
11/5	Quiz 5
11/12	Exam 3
11/19	Problem set 5

11/26	No class: Thanksgiving
12/3	Quiz 6

Formal matters.

Federal, BOR and KSU Student Policies.

`https://cia.kennesaw.edu/instructional-resources/syllabus-policy.php`

KSU student resources.

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Academic integrity statement. Every KSU student is responsible for upholding the provisions of the Student Code of Conduct, as published in the Undergraduate and Graduate Catalogs. Section 5c of the Student Code of Conduct addresses the university?s policy on academic honesty, including provisions regarding plagiarism and cheating, unauthorized access to university materials, misrepresentation/falsification of university records or academic work, malicious removal, retention, or destruction of library materials, malicious/intentional misuse of computer facilities and/or services, and misuse of student identification cards. Incidents of alleged academic misconduct will be handled through the established procedures of the Department of Student Conduct and Academic Integrity (SCAI), which includes either an "informal" resolution by a faculty member, resulting in a grade adjustment, or a formal hearing procedure, which may subject a student to the Code of Conduct's minimum one semester suspension requirement.

Course catalogue description.

3 Class Hours 0 Laboratory Hours 3 Credit Hours

Prerequisite: MATH 1113 or MATH 1190

An introduction to the fundamentals of discrete mathematics. Topics include sets, formal logic, methods of proof, counting relations, functions, graphs and trees, and finite state automata.

Notes: Not intended for mathematics or mathematics education majors.

COVID statements.

Course delivery. KSU may shift the method of course delivery at any time during the semester in compliance with University System of Georgia health and safety guidelines. In this case, alternate teaching modalities that may be adopted include hyflex, hybrid, synchronous online, or asynchronous online instruction.

COVID-19 illness. If you are feeling ill, please stay home and contact your health professional. In addition, please email your instructor to say you are missing class due to illness. Signs of COVID-19 illness include, but are not limited to, the following:

- Cough
- Fever of 100.4 or higher
- Runny nose or new sinus congestion
- Shortness of breath or difficulty breathing
- Chills
- Sore throat
- New loss of taste and/or smell

COVID-19 vaccines are a critical tool in "Protecting the Nest." If you have not already, you are strongly encouraged to get vaccinated immediately to advance the health and safety of our campus community. As an enrolled KSU student, you are eligible to receive the vaccine on campus. Please call (470) 578-6644 to schedule your vaccination appointment or you may walk into one of our student health clinics.

For more information regarding COVID-19 (including testing, vaccines, extended illness procedures and accommodations), see KSU's official Covid-19 website.

Face coverings. Based on guidance from the University System of Georgia (USG), all vaccinated and unvaccinated individuals are encouraged to wear a face covering while inside campus facilities. Unvaccinated individuals are also strongly encouraged to continue to so-

cially distance while inside campus facilities, when possible.