# CSc 144 (Discrete Math for CS I) Syllabus
# Spring 2023



## General Catalog Information:

**Description:** The first of a two-course sequence introducing mathematical concepts for Computer Science. Topics include: sets, functions, and relations; propositional and predicate logic; foundational combinatorics; discrete probability; modular arithmetic; and recurrence relations.

**Lecture:** Mondays, Wednesdays, and Fridays, 2:00 - 2:50 p.m., Harvill 150

**Enrollment Requirement(s):** PPL 60+ or SAT I MSS 640+ or ACT MATH 26+ or (C or higher in MATH 112) or one course from MATH 113, 116, 120R, 122A, 122B, or 125.

In particular, you are expected to know and be able to apply the basics of algebra to solve mathematical problems.

**Credits:** 3

**Final Exam:** Friday, May 5, 2023, 1:00 p.m. - 3:00 p.m. The final is required, is comprehensive, and will be given on this date at this time. Make your travel plans accordingly.

## Class Personnel:

| | *Name* | *Office* | *Email (@arizona.edu)* | *Phone* | *Office Hours* |
|---|---|---|---|---|---|
| **Instructor** | Prof. Lester I. McCann | G-S 819 | mccann | 621-3498 | See Piazza |
| **Coord. UGTA** | Caroline Hyland | ----- | cchyland | ----- | ... or D2L |
| **C-i-T UGTA** | Ellie Laton | ----- | elaton | ----- | ... for the OHs |
| **UGTA** | Angel Benavides | ----- | angelbenavides | ----- | ... schedule! |
| **UGTA** | Jake Bode | ----- | bode1 | ----- | " |

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|---|---|---|---|---|---|
| **UGTA** | Federico Fernandez | ----- | fbf | ----- | " |
| **UGTA** | Miles Gendreau | ----- | milesgendreau | ----- | " |
| **UGTA** | Daniel Gil | ----- | gilurias0922 | ----- | " |
| **UGTA** | David McLain | ----- | davidmclain | ----- | " |
| **UGTA** | Adrian Moore | ----- | adrianmoore | ----- | " |
| **UGTA** | Sartaj Rauf | ----- | sartaj | ----- | " |
| **UGTA** | Kekhrie Tsurho | ----- | ktsurho | ----- | " |
| **UGTA** | Utkarsh Upadhyay | ----- | upadhyay2 | ----- | " |

Each of the TAs has successfully completed this class (or its equivalent) and is compensated by the Department of Computer Science to help me help you learn the material. They grade homeworks, do the bulk of grading on the exams, let me know what topics seem to be especially baffling to the students, and even hold office hours. I expect that you'll find the TA group to be a valuable resource.

We will each offer in-person office hours. The schedule will be announced as soon as we can create it. Please keep in mind that it is possible to meet with each of us outside of office hours, too. Contact us to make an appointment.

General assistance with CS classes is available from the CS Tutor Center. Check the tutor schedule for the availabilities of tutors who are able to help with this class.

## Information Resources:

**D2L:** CSC 144 SP23 001 All class materials will be available from this D2L page, but most of it is hosted on the class web site (see next link).

**Homepage:** http://u.arizona.edu/~mccann/classes/144/ When you follow a link from D2L, unless it's a video, odds are that the link will take you here.

**Textbook:** Discrete Mathematics and its Applications (Rosen), U.S. 8th ed., McGraw-Hill, 2019, is the required text. **Do not buy an international edition or an earlier edition!** The best deal I know of is the D2L "inclusive access" ebook price.

My work-perpetually-in-progress Kneel Before Zodd covers roughly half of the class material. See the KBZ post on Piazza for access information.

You may find other books to be useful:

- Student Solutions Guide (8th edition, Kenneth Rosen, McGraw-Hill, 2019) is a more complete collection of solutions to the odd-numbered end-of-chapter exercises in the textbook.
- Several proof-centric books have been published, including:
  - How To Prove It (3/e, Velleman, Cambridge, 2019)
  - Book of Proof (Richard Hammack, 2018)
- Some free discrete structures books exist on-line, including:

- Connecting Discrete Mathematics and Computer Science (David Liben-Nowell, 2021)
- How to Write Proofs (Larry W. Cusick, undated)
- An Active Introduction to Discrete Mathematics and Algorithms (Charles A. Cusack, David A. Santos, 2021)
- Introduction to Higher Mathematics (Patrick Keef, David Guichard, undated)

**Class Discussions:** We will be using Piazza for outside-of-class questions, discussions and announcements. Click here to access the CSc 144 Q&A board .

**CS Helpdesk:** Need help with your `lectura` account, computers in the G-S 930 lab, etc.? Visit the Computer Science Lab Helpdesk for FAQs and the ability to submit a help ticket.

## Course Goal, Objectives and Expected Learning Outcomes:

- **Course Goal:** Students will learn about the mathematical concepts and practices that are most generally useful in the study of computer science.

- **Course Objectives:** Students will:
  1. Learn and apply principles of logic to construct sound arguments.
  2. Learn several proof forms and construct complete proofs using those forms.
  3. Learn a variety of fundamental mathematical principles and apply them to solve problems relevant to the study of computer science.

- **Learning Outcomes:**
  1. Reconstruct concept definitions and explain how more advanced concepts are defined in terms of more basic concepts.
  2. Given a set of hypotheses, determine whether or not a given conclusion logically follows from them.
  3. Given a non-trivial provable conjecture, construct a complete and logically sound proof that convincingly argues the truth of the conjecture.
  4. Demonstrate ability to convert between logic and set expressions.
  5. Given a counting problem, produce the correct quantity of potential outcomes by identifying and applying the appropriate counting concepts.
  6. Apply course concepts to problem-solving via computer programming.

## Topic Outline and Schedule:

- **Topic Outline:** Be advised that this is just an outline. It does not list every topic to be covered in the class. Reliance upon it is not a good substitute for attending lectures.

  Unlabeled section numbers are in the Rosen text. "(M)" refers to my in-progress "Kneel Before Zodd" chapters, available from the class web page with access info available on Piazza.

| *Topics and Subtopics* | *Sections In Text* | *Sample Learning Objectives* |
|---|---|---|

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|---|---|---|
| 1. Mathematical Review | | |
| a. Fractions | (M)App A | • Know how to algebraically manipulate fractions |
| b. Rational Numbers | (M)App A | • Identify rational numbers in fractional and decimal forms |
| c. Set Basics | (M)App A, 2.1 | • Basic operators, Venn diagrams |
| d. Associativity, Commutativity, Distributivity, Transitivity | (M)App A | • Correctly apply to given operators and domains |
| e. Properties of Inequalities | (M)App A | • Be able to correctly merge inequalities |
| f. Summation and Product Notation | (M)App A, 2.4 | • Evaluate summations and products of sequences |
| g. Integer Division | (M)App A, 4.1 | • Distinguish the division operators |
| h. Evens and Odds | (M)App A | • Know multiple ways to identify them |
| i. Logarithms and Exponents | (M)App A | • Knowledge of and ability to use basic identities |
| k. Positional Number Systems | (M)App A , 4.2 | • Work with and convert between number systems |
| 2. Logic | | |
| a. Background | (M)1 | • Distinguish mathematical and philosophical logic |
| b. Propositions | (M)1, 1.1 | • Identify propositions in natural language<br>• Use logical operators to construct compound propositions<br>• Evaluate propositions |
| c. Conditional Propositions | (M)1, 1.1 | • Construct inverses, converses, and contrapositions<br>• Translate to and from conversational English |
| d. Application of Equivalences | (M)1, 1.3 | • Simplify expressions via application of equivalences |
| 3. Quantification | | |
| a. Predicates | (M)2, 1.4 | • Distinguish predicates from propositions |
| b. Universal Quantification | (M)2, 1.4, 1.5 | • Convert U.Q. between logic and English |

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| c. Existential Quantification | (M)2, 1.4, 1.5 | • Convert E.Q. between logic and English |
| d. Evaluating Quantified Expressions | (M)2, 1.4, 1.5 | • Determine the veracity of such expressions |
| e. "Exactly n" Expressions | (M)2, 1.5 | • Convert such expressions to and from logic notation |
| 4. Arguments | | |
| a. Arguments | (M)3.1 | • Distinguish inductive and deductive reasoning |
| | (M)3.2, 1.6 | • Distinguish valid and sound arguments |
| b. Rules of Inference | (M)3.3, 1.6 | • Know the basic rules of inference<br>• Use the rules of inference to construct valid arguments<br>• Recognize common fallacious arguments |
| 5. Proofs of "p implies q" | | |
| a. Background | (M)4, 1.7 | • Know the purpose of proofs |
| b. Direct Proofs | (M)4.3, 1.7, 1.8 | • Read and construct such proofs<br>• Recognize Proof by Cases as a form of direct proof<br>• Distinguish good proofs from bad |
| c. Disproving Conjectures | (M)4.4, 1.8 | • Show how to demonstrate that a conjecture is false |
| 6. Additional Set Concepts | | |
| a. Properties | (M)App. A, 2.1, 2.2 | • Know the basic characteristics of sets |
| b. Set Operators | (M)6.2, (M)6.3, 2.1, 2.2 | • Demonstrate knowledge of set operator behavior<br>• Use set identities appropriately |
| c. Set Proofs | (M)6.4, 2.2 | • Prove set properties using logic and set identities |
| 7. Relations | | |
| a. Binary Relations | (M)8.1, 9.1 | • Know how they are distinguished from other types |
| b. Representations | (M)8.3, (M)8.5, 9.3 | • Be able to work with graph and matrix forms |
| c. Properties | (M)8.4, (M)8.6-8.8, 9.1, 9.5, 9.6 | • Identify reflexive, symmetric, antisymmetric, and transitive relations |

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| | | • Identify partial and total orders, and equivalence relations |
| d. Compositions | (M)8.2, 9.1 | • Be able to work with graph and matrix forms |
| 8. Functions | | |
| a. Definitions | 2.3 | • Know the basic properties |
| b. Types | 2.3 | • Identify injective, surjective, and bijective functions |
| 9. "Contra" Proofs | | |
| a. Proof by Contraposition | (M)5.1, 1.7 | • Read and construct such proofs |
| b. Proof by Contradiction | (M)5.2, 1.7 | • Explain the logic behind the technique<br>• Read and construct such proofs |
| 10. Integers | | |
| a. Prime Numbers | 4.3 | • Learn the Fundamental Theorem of Arithmetic |
| b. GCD and LCM | 4.3 | • Define them and their properties |
| 11. Sequences and Strings | | |
| a. Sequences | 2.4 | • Know the basic terminology and properties<br>• Understand the connection with summation notation |
| b. Strings | 2.4, Lecture | • Know the basic terminology and properties |
| c. Countability | 2.5 | • Distinguish countable, countably infinite, and uncountable |
| 12. Counting | | |
| a. Pigeonhole Principle | 6.2 | • Appreciate its utility |
| b. Product and Sum Rules | 6.1, 8.5 | • Recognize when each applies<br>• Generalize to Principle of Inclusion-Exclusion |
| c. Permutations | 6.3, 6.5, 6.6 | • Know that order matters<br>• Generalize to counting with indistinguishable objects |
| d. Combinations | 6.3 - 6.6 | • Distinguish from permutations<br>• Generalize to counting with indistinguishable objects<br>• Learn connection to (and applications of) binomial coefficients |

13. Finite Probability

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| a. Basics | 7.1 | • Learn terminology and notation |
| b. Independent Events | 7.2 | • Distinguish dependence from independence |
| c. Binomial Distribution | 7.2 | • Recognize examples and compute their probabilities |
| d. Variance | 7.4, Lecture | • Compute a distribution's expected value and variance |
| e. Probabilistic Reasoning | 7.1, Lecture | • Recognize connection to logical arguments |

Topics may be added, removed, or reordered as time and circumstances dictate.

- **Topic Schedule:** The University requires that all syllabi include an expected schedule of topics and class events (e.g., exams). Please be aware that any number of unforeseen circumstances can cause a schedule to become inaccurate. Thus, you should not rely on this schedule. It is your responsibility to pay attention to, and adhere to, changes announced in class, by email, and/or via the discussion board.

| Week | Date | Class # | Scheduled Topics | Assigned Today | Due Today |
|---|---|---|---|---|---|
| 1 | 1/11 | 1 | Syllabus | Survey | --- |
| | 1/13 | 2 | 1 | --- | --- |
| 2 | 1/16 | -- | MLK Day | --- | --- |
| | 1/18 | 3 | 1 | --- | --- |
| | 1/20 | 4 | 1 | Homework #1 | --- |
| 3 | 1/23 | 5 | 2 | --- | --- |
| | 1/25 | 6 | 2 | --- | --- |
| | 1/27 | 7 | 2 | Homework #2 | Homework #1 |
| 4 | 1/30 | 8 | 2 | --- | --- |
| | 2/01 | 9 | 2 | --- | --- |
| | 2/03 | 10 | 2 | Homework #3 | Homework #2 |
| 5 | 2/06 | 11 | 3 | --- | --- |
| | 2/08 | 12 | 3 | --- | --- |
| | 2/10 | 13 | 3 | --- | Homework #3 |
| 6 | 2/13 | 14 | 4 | --- | --- |
| | 2/15 | 15 | 4 | --- | --- |
| | 2/17 | 16 | Exam #1 | --- | --- |
| 7 | 2/20 | 17 | 5 | --- | --- |
| | 2/22 | 18 | 5 | --- | --- |
| | 2/24 | 19 | 6 | Homework #4 | --- |
| 8 | 2/27 | 20 | 6 | --- | --- |
| | 3/01 | 21 | 6 | --- | --- |
| | 3/03 | 22 | 7 | Homework #5 | Homework #4 |
| [---------- S P R I N G | B R E A K ----------] | | | | |
| 9 | 3/13 | 23 | 7 | --- | --- |
| | 3/15 | 24 | 7 | --- | --- |
| | 3/17 | 25 | 7 | --- | Homework #5 |
| 10 | 3/20 | 26 | 8 | --- | --- |
| | 3/22 | 27 | Slack | --- | --- |
| | 3/24 | 28 | Exam #2 | --- | --- |
| 11 | 3/27 | 29 | 8 | --- | --- |
| | 3/29 | 30 | 8 | --- | --- |
| | 3/31 | 31 | 9 | Homework #6 | --- |
| 12 | 4/03 | 32 | 9 | --- | --- |

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| | 4/05 | 33 | 10 | --- | --- |
| | 4/07 | 34 | 10 | Homework #7 | Homework #6 |
| 13 | 4/10 | 35 | 11 | --- | --- |
| | 4/12 | 36 | 11 | --- | --- |
| | 4/14 | 37 | 12 | --- | Homework #7 |
| 14 | 4/17 | 38 | 12 | --- | --- |
| | 4/19 | 39 | Exam #3 | --- | --- |
| | 4/21 | 40 | 12 | --- | --- |
| 15 | 4/24 | 41 | 13 | --- | --- |
| | 4/26 | 42 | 13 | --- | --- |
| | 4/28 | 43 | 13 | --- | --- |
| 16 | 5/01 | 44 | 13 | --- | --- |
| | 5/03 | 45 | Slack | --- | --- |
| Final | 5/05 | -- | Final Exam (Fri 1:00pm) | --- | --- |

We will stick to the exam dates if at all possible. The rest of the dates are less firm, but we'll try to stick to them, too.

## Academic Dishonesty (*i.e.*, Cheating):

*SEE ALSO:*

- The Department of Computer Science Course Policy on Collaboration: http://www2.cs.arizona.edu/policies/collaboration.html
- The University of Arizona Code of Academic Integrity: https://deanofstudents.arizona.edu/policies/code-academic-integrity
- The Arizona Board of Regents list of Prohibited Conduct: https://public.azregents.edu/Policy%20Manual/5-303-Prohibited%20Conduct.pdf
- The Arizona Board of Regents Student Code of Conduct: https://public.azregents.edu/Policy%20Manual/5-308-Student%20Code%20of%20Conduct.pdf (in particular, see part F, "Prohibited Conduct")

Most, if not all, assignments in this class will be individual assignments, to be worked on outside of class. *All individual work assigned to you in this class is to be completed only by you*. It is not acceptable for you to `borrow' (a.k.a. steal, copy, coerce, etc.) solutions or parts of solutions from other people or have other people write part or all of your solutions for you. Yes, getting answers and solutions via the Internet is a violation of academic dishonesty! However, it **IS** acceptable (and encouraged!) for students to help one another understand the assignment requirements and other high-level issues. In short, do your own work, but feel free to discuss conceptual difficulties with each other. Of course, you may always ask me or a TA for help, but don't expect that we'll just hand you solutions; we'll make you work for them. Doing is learning!

The class policy on cheating is simple: If we determine by a preponderance of the evidence that a student or students violated one or more of the policies of academic conduct governing this class, at minimum **all** complicit students will receive no points for the academic activity or activities in question. Additional sanctions are possible depending on the circumstances of the offense(s) and the policies of the department, university, and Arizona Board of Regents, up to and including expulsion from the university. Academic integrity infractions are reported to both the Dean of Students and the Dean of the College of Science. If you have a history of violations, the penalty is likely to be much worse than just a zero on an assignment. *Multiple violations in this class will result in a recommendation of a failing course grade, at minimum*. We take academic dishonesty very seriously, as you should be able to tell; we expect you to take it just as seriously.

**Please** take the time to read the references linked above. Ignorance of the policies is not an acceptable excuse for their violation. For your convenience, here is the section of the University's Code of Academic Integrity entitled "Prohibited Conduct":

> Conduct prohibited by this Code consists of all forms of academic dishonesty, including, but not limited to: 1. Cheating, fabrication, facilitating academic dishonesty, and plagiarism as set out and defined in the Student Code of Conduct, ABOR Policy 5-308-E.11, and F.1. 2. Submitting an item of academic work that has previously been submitted or simultaneously submitted without fair citation of the original work or authorization by the faculty member supervising the work. 3. Violating required disciplinary and professional ethics rules contained or referenced in the student handbooks (hardcopy or online) of undergraduate or graduate programs, or professional colleges. 4. Violating discipline specific health, safety or ethical requirements to gain any unfair advantage in lab(s) or clinical assignments. 5. Failing to observe rules of academic integrity established by a faculty member for a particular course. 6. Attempting to commit an act prohibited by this Code. Any attempt to commit an act prohibited by these rules shall be subject to sanctions to the same extent as completed acts. 7. Assisting or attempting to assist another to violate this Code.

The bottom line: **Do your own work!** If you have any doubts, please come talk to us -- **before** you do something you might regret.

## Grades and Grading:

*SEE ALSO:*
- UA General Catalog's Grades and the Grading System: http://catalog.arizona.edu/policy/grades-and-grading-system
- Family Educations Rights and Privacy Act (FERPA): http://www.registrar.arizona.edu/personal-information/family-educational-rights-and-privacy-act-1974-ferpa

- **Assignment Weighting:** Details for each component can be found in the following subsections.

| | | |
|---|---|---|
| Homeworks | = | 28 % total |
| Quizzes | = | 16 % total |
| 3 Midterm Exams | = | 42 % total |
| Comprehensive Final Exam | = | 14 % |
| Total | = | 100 % |

By department policy, the final exam is *required*.

I use the common 90-80-70-60 grading scale. It's possible (though unlikely) that final grade cutoffs will be lowered a little (from 89.5% to 88.5% for the bottom of the 'A' range, for example) but they will never be raised. I make such determinations only at the end of the term, after the final exam has been graded.

- **Class Attendance:**

*SEE ALSO:* • UA General Catalog's Class Attendance Policies: http://catalog.arizona.edu/policy/class-attendance-and-participation

• Dean of Students Attendance and Absences page: https://deanofstudents.arizona.edu/policies/attendance-policies-and-practices

We do not take (and so do not grade you on) attendance during lectures. That said, we strongly recommend that you attend all of the lectures. Experiencing, and participating in, "live" lectures is a valuable learning experience. Please be aware that there is no guarantee of due-date extensions or any other accommodations when you are absent from class and/or miss a deadline.

UArizona policies for the 2022-3 academic year strongly encourage both faculty and students to participate in on-campus, in-person classes. Thus, this class will be offered **in-person only**. Accommodations will be made for DRC students, as usual; contact http://drc.arizona.edu/students to arrange for your health condition(s) and/or disability to be evaluated for accommodations.

**COVID-19:** As we enter the semester, our health and safety remain the university's highest priority. To protect the health of everyone in this class, students are required to follow the university guidelines on COVID-19 mitigation. If you feel sick, or may have been in contact with someone who is infectious, stay home. Except for seeking medical care, avoid contact with others and do not travel. Notify your instructor(s) if you will be missing up to one week of course meetings and/or assignment deadlines. **If you must miss the equivalent of more than one week of class and have an emergency**, the Dean of Students Office is the proper office to contact (DOS-deanofstudents@email.arizona.edu). The Dean of Students considers the following to be qualified emergencies: the birth of a child, mental health hospitalization, domestic violence matters, house fires, hospitalization for physical health (concussion/emergency surgery/coma/COVID-19 complications/ICU), death of immediate family, Title IX matters, etc.

Please understand that there is no guarantee of an extension when you are absent from class and/or miss a deadline. This includes students who enroll in the class after the first day of class. Please contact me to discuss your situation.

- **Late Enrollment:**

  If you enroll in the class after the first graded activity has been assigned, please see the instructor to discuss possible adjustments to due dates.

- **Administrative Drops:**

  Every semester, students enroll in introductory CS classes but do not submit any work, resulting in a grade of 'E' at the end of the term. To prevent this, after the end of the second week, I will be administratively dropping all students who have not submitted any work.

- **Supplemental Instruction:**

  This class includes, and strongly encourages (but cannot *require*) you to attend, a number of weekly supplemental instruction sessions, run by the TAs. Details about their dates, times, and content will be announced soon.

- **Homeworks:**

  The idea behind the homework assignments is to help you get more hands-on experience with the material as preparation for the exams. The more practice you get, and the more you 'step back' and examine the context of the exercises as you do them, the more you will benefit.

  - *Quantity and Frequency:*

    Expect to complete seven homework assignments during this course. Homeworks are typically due a week from the date on which they are assigned. There will be weeks without homeworks due. Usually, these are the weeks of, or the weeks just after, an exam.

  - *Facilities:*

    For the most part, the homework assignments in this class are "written" (e.g., word-processed, or neatly hand-written and scanned), although you can expect that we'll ask you to program a little bit, too, now and then. When programs are required, you can use the department instructional machines, or your own computer(s), as the situation permits.

  - *Legibility:*

    We expect your written work to have your answers clearly marked, to include sufficient detail to enable us to follow your reasoning, and to be legible so that we can easily read your words, understand your explanations, and decipher your diagrams. Difficulties in any of these areas will likely result in a loss of points. This isn't high school; you are preparing yourselves for careers, and as such you need to get in the habit of preparing your work in a professional manner. Here's another way to look at it: Make it easy for us to see that you know your stuff.

    You are encouraged (but not required) to learn and use the scientific document preparation package *LaTeX 2e* to typeset your homework submissions. Not only will this help you produce readable answers, you will be ready for future classes that may require the use of this tool. *LaTeX 2e* tutorials and samples are available from the class web page.

  - *Incomplete or Incorrect Homeworks:*

    On the due date, turn in what you have accomplished, whether or not it is complete. If you feel that you deserve an extension of the due date based on *exceptional* circumstances, contact me and I will consider your request.

    Each homework problem will be worth a certain number of points. A complete, correct, and legible answer will receive full credit. We will award partial credit to incomplete and/or semi-legible answers when appropriate. If you feel that your homework was graded improperly, first please contact a TA to discuss your concerns.

  - *Discussing Your Score:*

    We deduct points from imperfect homework answers so that you know where you need to improve on future assignments. If you don't understand why you lost points for a particular problem, or you would like to hear specific suggestions for improvement, we want you to talk with us about your concerns.

For this discussion to be most productive, you should contact a TA and arrange a mutually-agreeable meeting time. Come to the meeting with your graded homework at hand and a list of your specific questions and concerns (so that you don't forget anything).

If, after this meeting, you are not satisfied, make an appointment to discuss your concerns with me. Always meet with a TA first; they have first-hand knowledge of the grading.

To keep grading discussions from dragging out across the semester, *you need to let a a member of the class staff know about your grading concerns within one week of the class (not you individually) receiving the graded assignment*, unless there are exceptional circumstances that prevent you from doing so. Any complaints about scores received after that week will not result in any score changes (but we'd still be happy to talk about your concerns).

- *Returning of Graded Assignments:*

  We expect to be able to grade and return assignments before the next like assignment is due. For example, expect the first homework to be graded before the second homework is due.

- *Late Assignment Policy:*

  Each assignment will have a clearly stated due date and time. Typically, the time will be five minutes after the start of class on the due date. Electronic submissions received after that time will be considered late. Assignments submitted within the first 24 hour period after the due date and time are considered to be one day late. Any day of the week, including Saturdays, Sundays, and all holidays, count as days for the purpose of determining lateness.

  At the start of the term, you are granted three no-penalty late days that can be used on the seven graded homeworks. You are allowed to use at most one late day on a homework. If you have exhausted your late days and turn in another homework one day late, the maximum possible score on that homework is 75%. In the absence of extreme circumstances (see the Exam section, below), homeworks more than one day late will not be accepted, regardless of how many late days you possess. We have these limits to give the TAs adequate time to grade homeworks.

- **Quizzes:**

I am planning to give about a dozen unannounced quizzes this semester. Why "about" a dozen? I expect to average one quiz per non-exam week of the semester. This means that there will be weeks with no quiz, but there are likely to be weeks with multiple quizzes. The quizzes will not be on predictable days of the week, but are usually given at the end of the class period so that students who finish early can leave early.

*I will not be giving any make-up quizzes*. Why not? Of the dozen quizzes I anticipate giving, at most your best ten quiz scores will count. If the class response rate on the end-of-semester Student Course Survey (a.k.a. class evaluations) exceeds 50%, only your best nine will count. If the rate exceeds 75%, only your best eight will count. This gives you multiple opportunities to have an off-day, or to miss a quiz for whatever reason, and still be able to have a solid quiz average at the end of the semester.

The use of electronic devices (e.g., calculators) is NOT permitted on quizzes unless warranted by special circumstances.

As with homeworks, *we will entertain quiz grade reconsideration requests only within one week after*

*the time the quiz was returned to the class* (not to you individually).

- **Exams:**

Exam formats will be fairly consistent throughout the semester. Exams will contain short answer and problem-solving questions, but true/false, multiple choice, fill-in-the-blank, and code-writing questions are also possible. The use of calculators or any other electronic devices is NOT permitted on exams unless warranted by special circumstances.

I expect all students to take the exams at the announced exam times. I give make-up exams only in *extreme* circumstances. I decide if a circumstance is "extreme." For example, being in a documented car accident on the way to the exam is likely to count as an extreme circumstance. Circumstances that are **not** considered to be extreme include losing a cell phone, breaking up with a significant other, forgetting to set/heed an alarm clock, having the sniffles, consoling a depressed house plant, etc. Please be aware that missing a midterm exam isn't necessarily a disaster; see below.

- *Midterm Exams:*

  General Information: Midterms will focus on the material covered in class and on the assignments since the time of the previous midterm (or the start of the term in the case of the first midterm). As new material in this class usually builds upon the old, you should expect that your knowledge of material covered by previous exams will be necessary for success on subsequent exams.

  Grading Timetable: We will do our best to return graded midterm exams within two class meetings of the date of the exam.

  Regrade Requests: After midterm exams are graded, they will be returned to you. If you feel that your exam was graded improperly, prepare a brief memo that explains which problems concern you and why. *Within one week of the date on which the exam was returned to the class*, submit the memo to me. **I will regrade the entire exam**, paying particular attention to the concerns you highlighted in the memo. Because errors in grading can cause scores to be too high as well as too low, it is possible that your grade will go down as a result of the regrade. Be sure to review your entire exam before you ask for a regrade.

- *Comprehensive Final Exam:*

  *SEE ALSO:* • Final Exam Schedule: https://registrar.arizona.edu/final-exams-spring-2023

  By department policy, final exams are *required* in all undergraduate classes. By university policy, final exams must be held during the time slot assigned by the final exam schedule. I have listed that time near the beginning of this syllabus. (If you see that I have listed the exam time incorrectly, please let me know.) **The final will be comprehensive** and will have a format similar to that of the midterms. If you miss the final under less than extreme circumstances, you will receive a score of zero for the final.

  At the end of the semester, I will replace your lowest midterm exam score with a percentage-equivalent copy of your final exam score, but only if the final score is higher than at least one of your midterm scores. (Thus, this is a potential bonus but never a penalty.) I do this to reward you for demonstrating an improved mastery of the material over the course of the semester. However,

it can also help you if you should miss a midterm because your car broke down, your alarm clock didn't go off, you purchased an ill-advised tattoo, or any other non-extreme quirk of fate. Please note that should you miss multiple midterms under sub-extreme circumstances, you will definitely get a zero for those additional missed midterms.

- *Exam Seating:*

  If room capacity permits, leave a seat vacant between you and your neighbor. If need be, we will reseat students before or even during an exam to maintain an honest evaluation environment for all students. Don't be surprised if you see me taking pictures of the class during the exam. That action probably doesn't mean that we think that someone is cheating; it also happens to be a convenient way to document attendance.

## Class Policies:

- **Classroom Behavior:**

  *SEE ALSO:* • Office of Diversity and Inclusion: http://diversity.arizona.edu/

  - *Maintain an Effective Learning Environment:* To foster a positive learning environment, students and instructors have a shared responsibility. We want a safe, welcoming, and inclusive environment where all of us feel comfortable with each other and where we can challenge ourselves to succeed. To that end, our focus is on the tasks at hand and not on extraneous activities (e.g., texting, chatting, reading a newspaper, making phone calls, web surfing, etc.).

  - *No Audible Alerts:* While class is in session, please disable all audible alerts on your communication devices in favor of an inaudible alert mode, or just turn the device off. If you receive a call or message that requires an immediate verbal response, kindly leave the class before replying.

  - *Use of Electronic Devices During Lecture:* I ask that you limit your in-class use of electronic devices (laptop computers, tablets, cell phones, etc.) to activities that are directly relevant to the class. Such activities may include taking notes and running example programs from the class web page. Playing games, following your friends on social media, and watching TV shows, movies, and cute cat videos are all examples of activities you should not be doing in class. You're paying a lot of money to be in this class; you should pay attention and get your money's worth. Your classmates are also paying to be here; your behavior should not distract them, either. Should your activities become a distraction to me or to your classmates, I'll ask you to either stop or to leave the room until you are able to focus on the class material.

  - *Asking Questions:* Is encouraged! During class, feel free to interrupt with questions whenever they occur to you. I may ask you to hold off on your question for a few moments if I'm in the middle of an explanation, but I'll come back to you. If I forget, just remind me.

  - *Answering Questions:* Is also encouraged! I frequently ask questions of the class during lectures to judge the level of understanding (and to break up the monotony). Some students really like answering questions, sometimes to the point of discouraging anyone else from answering. If you are an eager answerer, pace yourself; let someone else answer an easy one once in a while, and save the hard ones for yourself.

- *Chatting with Your Classmates:* Sometimes you can't resist making a comment to your friend. I don't want you to injure yourself by trying to hold it in. Go ahead and whisper that comment. Just don't let it grow into a conversation. If what you have to say is that irresistibly juicy, write a note or hold the thought until after class. We're confident that the passage of time will not diminish its wit and hilarity. The point, of course, is to avoid distracting the instructor and/or other students.

- **Response Time:**

  The instructor and the TAs will attempt to reply to email and discussion board postings from students within 24 hours (48 hours on weekends/holidays). This means that if you wait until the evening before an assignment is due to post a question, you may not get a reply before the due date and time. There's a classic sentence that covers this: *A failure to plan on your part does not constitute an emergency on our part*. We want to help, but, like you, we have tasks other than email and discussion board postings that require our attention.

  Important note: We encourage you to answer the posted questions of other students if and when you are able to do so. This is why we have a discussion board that is open to the entire class.

  To help your email stand out in our inboxes, please prefix your subject lines with "CSc 144:", as in "CSc 144: My virtual pet ate my digital homework!". Doing this will help reduce the chance that your email is inadvertently marked as 'spam'.

- **Extra Credit:**

  *There will be no opportunities for extra credit points*. Use your time to concentrate on doing well on the assigned work. If your grade in this class is important to you, start taking this class seriously **now**, not just after you do poorly on the first exam.

- **Missed Classes:**

  *SEE ALSO:* • Religious Accommodation Policy http://policy.arizona.edu/human-resources/religious-accommodation-policy

  All holidays or special events observed by organized religions will be honored for those students who show affiliation with such religions. Absences pre-approved by the UA Dean of Students office will be honored when it is reasonable to do so. No matter the reason for missing class, the student is always responsible for the missed material.

- **Auditing:**

  *SEE ALSO:* • Audit Policy: http://catalog.arizona.edu/policy/audit-policy

  • Change of Schedule Instructions: https://registrar.arizona.edu/records-enrollment/enrollment/change-schedule

  If you are auditing this class, you may continue to attend lectures. You may turn in assignments if the TAs agree to accept them. You may not take exams.

## University and Department Policies:

- **Computer Science Academic Advising:**

  *See Also:*
  - CS Academic Advising: https://www.cs.arizona.edu/undergraduate/advising
  - UA Advising Resource Center: https://advising.arizona.edu/

  If you have questions about your academic progress this semester, or your chosen degree program, consider contacting your CS academic advisor (see link above). Your academic advisor and the UA Advising Resource Center can guide you toward university resources to help you succeed. Computer Science major students are encouraged to email advising@cs.arizona.edu for academic advising related questions.

- **On Dropping a Class:**

  *See Also:*
  - Dates and Deadlines Calendar: https://registrar.arizona.edu/dates-and-deadlines
  - UA Course Withdrawal Policy: https://catalog.arizona.edu/policy/grades-and-grading-system#Withdrawal

  If you find yourself thinking about dropping this (or any other) class, first make sure that that's what you really want to do. Chatting with the instructor and your academic advisor may help. If you drop within the first two weeks of the semester, there will be no notation on your transcript; to an employer, it will be as though you'd never enrolled. During the third through the tenth weeks, a drop will be recorded on your transcript by a 'grade' of "W" ("withdrawn"). After the tenth week, dropping becomes a challenge, because you will need to provide documentation to the dean's office explaining why you were unable to drop the class during the first ten weeks of the semester.

- **Grades of `Incomplete':**

  *See Also:*
  - Registrar's Incomplete (I) Grade page: https://registrar.arizona.edu/faculty-staff-resources/grading/grading-policies/incomplete
  - UA General Catalog's Grades and the Grading System page: http://catalog.arizona.edu/policy/grades-and-grading-system

  The university's course catalog contains all of the details about incompletes, but this is the key sentence:

  > The grade of I may be awarded only at the end of a term, when all but a minor portion of the course work has been satisfactorily completed. The grade of I is not to be awarded in place of a failing grade or when the student is expected to repeat the course; in such a case, a grade other than I must be assigned.

  The phrase "a minor portion" is accepted to mean "20% or less." To qualify for an incomplete, a student must have maintained a passing grade for the class until the term is nearly complete, and then, due to an unusual and substantiated cause beyond the student's control, the student is unable to complete the class work. In short, you can't get an "I" just because you aren't happy with your grade.

- **Accessibility and Accommodations:**

*SEE ALSO:*
- UA Disability Resource Center Information for Students: http://drc.arizona.edu/students (520-621-3268)
- UA SALT Center: http://www.salt.arizona.edu

The university and the Disability Resource Center (DRC) have asked all instructors to include in class syllabi the following information about the availability of reasonable accommodations for students with disabilities:

> Accessibility and Accommodations:
> At the University of Arizona we strive to make learning experiences as accessible as possible. If you anticipate or experience barriers based on disability or pregnancy, please contact the Disability Resource Center (see above) to establish reasonable accommodations.

Please allow students with accessibility needs first chance at the accessible table(s) and chair(s) in the classroom.

Additional help is available from the UA Strategic Alternative Learning Techniques (SALT) Center. SALT provides fee-based services for students with various learning disabilities.

Under the guidelines of the Rehabilitation Act of 1973 and the Americans with Disability Act of 1990, students are obligated to notify the school that they need accommodation.

- **Helping Students in Need:**

*SEE ALSO:*
- Student Assistance Program from the Dean of Students: https://deanofstudents.arizona.edu/support/student-assistance (520-621-2057, DOS-deanofstudents@email.arizona.edu)
- UA Campus Health: https://health.arizona.edu/ (520-621-9202, after hours 520-570-7898)
- UA Campus Health Counseling and Psych Services (CAPS): https://health.arizona.edu/counseling-psych-services (24/7 hotline: 520-621-3334)
- UA "Notice.Care.Help." Form: https://arizona-advocate.symplicity.com/care_report/index.php/pid928981?
- UA Ombuds: https://ombuds.arizona.edu/
- Office of Institutional Equity: https://equity.arizona.edu/
- Campus Pantry: https://campuspantry.arizona.edu/
- Survivor Advocacy Program: https://survivoradvocacy.arizona.edu/ (520-621-5767)

If you know of a student (including yourself) who appears to be struggling and in need of help, of any form, the university offers a range of services. Help is available from the links above; please don't hesitate to take advantage of those resources.

The UA Ombuds Office helps with a wide variety of issues, concerns, questions, conflicts, and challenges. The primary mission of the Ombuds Program is to assist individuals in resolving conflict, facilitating communication, and assisting the University by surfacing issues and providing feedback on emerging or systemic concerns. Communications with the Ombuds Committee are informal and off-the-record. The Ombuds Committee is governed by the following standards: (1) Confidentiality; (2) Impartiality; (3) Informality; and (4) Independence.

Please be aware that UA faculty are required to report allegations of sex discrimination to the Title IX office. This means that if you tell me about a situation involving sexual harassment, sexual assault, dating violence, domestic violence, or stalking that involves another student or employee, or that happens on campus or in a UA program, I must share that information with the Title IX Coordinator.

- **Department of Computer Science Code of Conduct**

  *SEE ALSO:*
  - Department of Computer Science Code of Conduct: https://www.cs.arizona.edu/code-conduct
  - UA Student Code of Conduct: https://public.azregents.edu/Policy%20Manual/5-308-Student%20Code%20of%20Conduct.pdf

  The Department of Computer Science is committed to providing and maintaining a supportive educational environment for all. We strive to be welcoming and inclusive, respect privacy and confidentiality, behave respectfully and courteously, and practice intellectual honesty. Disruptive behaviors (such as physical or emotional harassment, dismissive attitudes, and abuse of department resources) will not be tolerated. The complete Code of Conduct is available on our department web site. We expect that you will adhere to this code, as well as the UA Student Code of Conduct, while you are a member of this class.

- **Safety on Campus:**

  *SEE ALSO:*
  - UA Police Department https://uapd.arizona.edu/ (Emergency: 911; Non-Emergency: 520-621-UAPD(8273))
  - UA CIRT (Critical Incident Response Team) https://cirt.arizona.edu/

  Acts of violence at educational institutions are increasing in frequency. Should you find yourself in such a situation, CIRT recommends that you first try to escape. If you cannot escape, find a place to hide. As a last resort, fight.

  The university offers UAlert, a free service that notifies users of active incidents on or near campus. You can register for email and/or text notifications at the CIRT page, above.

- **Disruptive and/or Threatening Behavior by Students:**

  *SEE ALSO:*
  - UA Nondiscrimination and Anti-harassment Policy: http://policy.arizona.edu/human-resources/nondiscrimination-and-anti-harassment-policy
  - UA Policy on Disruptive Behavior in an Instructional Setting: http://policy.arizona.edu/education-and-student-affairs/disruptive-behavior-instructional-setting

• UA Policy on Threatening Behavior by Students: http://policy.arizona.edu/education-and-student-affairs/threatening-behavior-students

• Hazing Policy of the University of Arizona: http://policy.arizona.edu/education-and-student-affairs/university-arizona-hazing-policy

The University of Arizona is committed to creating and maintaining an environment free of discrimination. In support of this commitment, the University prohibits discrimination, including harassment and retaliation, based on a protected classification, including race, color, religion, sex, national origin, age, disability, veteran status, sexual orientation, gender identity, or genetic information. For more information, including how to report a concern, please see the "UA Nondiscrimination and Anti-harassment Policy" link, above.

The university takes a very dim view of antisocial behaviors. In particular, if you're upset with me or an TA, please talk directly with us, calmly and with facts at hand, about your concerns.

## Caveat:

The information contained in this syllabus, other than the grade and absence policies, are subject to change with reasonable advance notice, as deemed appropriate by the instructor. Whenever possible, changes will be announced to the class before the on-line version of this document is altered.

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This syllabus follows the Undergraduate Course Syllabus Policy passed by the University of Arizona Faculty Senate January of 2016 and effective starting with Summer 2016 classes. The policy is available from http://policy.arizona.edu/faculty-affairs-and-academics/course-syllabus-policy-undergraduate-template

If you have any comments about this page, drop me a note at mccannl@acm.org