

# CISC 102: Discrete Structures

## Course Syllabus

### Course Information

#### General Course Information

**Course:** CISC 102

**Course title:** Discrete Structures

**Pre-requisites:** None

**Semester and year:** Winter 2026

**Number of credits:** 3.00

**Learning hours:** 120

**Modality:** On campus

#### Course Description

An introduction to the fundamental mathematical structures and reasoning techniques used in computer science. Topics include propositional and predicate logic, set theory, functions, sequences, relations, and graphs. The course emphasizes algorithmic thinking, combinatorial analysis, and proof construction, providing the theoretical foundations for later study in algorithms, data structures, and discrete system design.

#### Topics

The following schedule outlines the planned coverage of course material. Please note that it is subject to change based on the pace of the class and instructional needs.

---

Week	Module	Topic
1	Foundations: Logic and Proofs	Propositional Logic, Applications of Propositional Logic, Propositional Equivalences, Predicates and Quantifiers, Nested Quantifiers
2	Foundations: Logic and Proofs	Rules of Inference, Introduction to Proofs, Proof Methods and Strategy
3	Basic Structures: Sets, Functions, Sequences, and Sums	Sets, Set Operations, Functions, Sequences and Summations, Cardinality of Sets, Matrices
4	Algorithms	Algorithms, The Growth of Functions, Complexity of Algorithms

---

---

Week	Module	Topic
5	Number Theory and Cryptography	Divisibility and Modular Arithmetic, Integer Representations and Algorithms, Primes and Greatest Common Divisors, Solving Congruences, Applications of Congruences, Cryptography
6	Induction and Recursion	Mathematical Induction, Strong Induction and Well-Ordering, Recursive Definitions and Structural Induction, Recursive Algorithms, Program Correctness
7	Counting	The Basics of Counting, The Pigeonhole Principle, Permutations and Combinations, Binomial Coefficients and Identities, Generalized Permutations and Combinations, Generating Permutations and Combinations
8	Discrete Probability	An Introduction to Discrete Probability, Probability Theory, Bayes' Theorem, Expected Value and Variance
9	Advanced Counting Techniques	Applications of Recurrence Relations, Solving Linear Recurrence Relations, Divide-and-Conquer Algorithms and Recurrence Relations, Generating Functions, Inclusion–Exclusion, Applications of Inclusion–Exclusion
10	Relations	Relations and Their Properties, n-ary Relations and Their Applications, Representing Relations, Closures of Relations, Equivalence Relations, Partial Orderings
11	Graphs	Graphs and Graph Models, Graph Terminology and Special Types of Graphs, Representing Graphs and Graph Isomorphism, Connectivity, Euler and Hamilton Paths, Shortest-Path Problems, Planar Graphs, Graph Coloring
12	Trees	Introduction to Trees, Applications of Trees, Tree Traversal, Spanning Trees, Minimum Spanning Trees

---

### Additional Skills

In addition to the core topics covered in this course, students will be introduced to various technological tools, such as the Jape software for proof verification. Gaining familiarity with these tools will not only deepen your understanding of logical reasoning but also provide valuable skills applicable to broader academic and professional contexts.

### Course Learning Outcomes

Upon successful completion of this course, students will be able to:

1. Apply principles of propositional and predicate logic to construct, analyze, and validate mathematical arguments and proofs.
2. Use set theory, relations, and functions to model and reason about computational structures and data relationships.

3. Analyze algorithmic processes through recurrence relations, counting principles, and asymptotic growth of functions.
4. Employ combinatorial and probabilistic reasoning to solve discrete problems relevant to computing and information systems.
5. Represent and manipulate discrete structures such as graphs, trees, and Boolean expressions to support algorithm and circuit design.
6. Demonstrate critical thinking and problem-solving skills by connecting theoretical concepts to real-world applications in computer science.

## Important University Dates

Please visit the Faculty of Arts and Sciences Sessional Dates website for all academic deadlines.

## Inclusion

### Land Acknowledgement

Queen's University is situated on the territory of the Haudenosaunee and Anishinaabek. Ne Queen's University e'tho nón:we nikanónhsote tsi nón:we ne Haudenosaunee táhnon Anishinaabek tehatihsnonhsáhere ne onhwéntsya. Gimaakwe Gchi-gkinoomaagegamig atemagad Naadowe miinwaa Anishinaabe aking.

### Equity, Diversity, and Inclusivity Statement

Queen's University recognizes that the values of equity and diversity are vital to and in harmony with its educational mission and standards of excellence. It acknowledges that direct, indirect, and systemic discrimination exists within our institutional structures, policies, and practices and in our community. These take many forms and work to differentially advantage and disadvantage persons across social identities such as race, ethnicity, disability, gender identity, sexual orientation, faith, and socioeconomic status, among other examples. In this class I will work to promote an anti-discriminatory, anti-racist and accountable environment where everyone feels welcome. Every member of this class is asked to show respect for every other member.

### Building a Classroom Community

University is a place to share, question, and challenge ideas. Each student brings a different set of lived experiences. You can help to create a safer, more respectful classroom community for learners by following these guidelines:

- Make a personal commitment to learn about, understand, and support your peers.
- Assume the best of others and expect the best of them.
- Recognize and value the experiences, abilities, and knowledge each person brings to the course.
- Acknowledge the impact of oppression on other people's lives and make sure your words and tone are respectful and inclusive.
- Encourage others to develop and share their ideas.

- Pay close attention to what your peers say/write before you respond. Think through and re-read what you have written before you post online or send your comments to others.
- Be open to having your ideas challenged and challenge others with the intent of facilitating growth.
- Look for opportunities to agree with one another, building on and intentionally referencing peers' thoughts and ideas; disagree with ideas without making personal attacks, demeaning, or embarrassing others.

## Fostering Accessibility

All of us have a shared responsibility for reducing barriers to learning and fostering accessibility and promoting meaningful inclusion of those with disabilities. The Accessibility Hub at Queen's University's Human Rights & Equity Office offer a host of tutorials that provide us all with practical tips for:

- creating accessible documents
- emails
- meeting practices.

## Name/Pronoun

If, for whatever reason, you wish to change how your name appears in onQ and/or on class lists, please follow these steps. You may also use this process to add your pronouns to the appearance of your name.

1. Log into SOLUS.
2. Click on Personal Information tab.
3. Click on the Names tab
4. Click on the Add New Name tab
5. Choose Preferred from the Name Type drop down menu
6. Enter the name you would like to appear in onQ and/or on class lists.
7. Click Save.

Please allow 24 to 48 hours for your name to be registered within the system. If you have further questions or concerns, please contact ITS at Queen's University.

## Course Materials and Technologies

### Recommended Course Textbook

Course Textbook	Edition	Publisher	Availability	Cost	Library?
<i>Discrete Mathematics and Its Applications</i> by Kenneth H. Rosen	ISE	McGraw-Hill Education (2025)	online vendors	\$129.95	No

The recommended textbook for this course is *Discrete Mathematics and Its Applications* by Kenneth H. Rosen (International Student Edition, McGraw-Hill Education, 2025 Release; ISBN 1266191542 · 9781266191541). The course will primarily cover Chapters 1 through 13, with selected additional topics

introduced as time permits. Purchasing the textbook is optional. There are no restrictions on the use of second-hand or older editions of the textbook for this course.

To support your learning, the instructor will provide a comprehensive set of lecture notes. Additional instructional resources will be made available as appropriate throughout the course.

## Copyright of Course Material

Course materials created by the course instructor, including all slides, presentations, handouts, tests, exams, and other similar course materials, are the intellectual property of the instructor. It is a departure from academic integrity to distribute, publicly post, sell or otherwise disseminate an instructor's course materials or to provide an instructor's course materials to anyone else for distribution, posting, sale or other means of dissemination, without the instructor's express consent. A student who engages in such conduct may be subject to penalty for a departure from academic integrity and may also face adverse legal consequences for infringement of intellectual property rights.

## Questions about the Course and Contacting the Teaching Team

If you have any questions, you can email the course instructor at [xu.wang@queensu.ca]. For questions regarding grades, you can contact the teaching assistant.

## Queen's Email

The university communicates with students via Queen's email. Please check your email regularly to ensure you do not miss important information related to your course.

## Course Feedback

At various points during the course, you may be asked to take part in a variety of feedback activities, such as surveys and questionnaires. This feedback enables the teaching team to improve the course. All surveys are anonymous and are directly related to activities, assessments, and other course material.

## Assessments

The course assessment consists of online weekly quizzes, three in-class mini tests, two assignments, one reflection portfolio, and live poll participation. All components will be graded numerically and contribute to your final grade according to the breakdown below.

In accordance with Academic Regulation 6.1 and the grading policy, no make-up or retake opportunities will be provided for missed quizzes or tests. However, students with approved academic consideration requests may be provided an alternative opportunity. Final grades will be calculated based on the overall numerical average and converted to a letter grade using Queen's official grade conversion scale.

## Weighting and Alignment with Course Learning Outcomes (CLOs)

Assessment	Alignment with CLOs	Weighting
Online Weekly Quizzes ( <i>onQ</i> , best 10 of 12)	1–6	4% × 10
Mini Tests ( <i>in class</i> , best 2 of 3)	1–6	12% × 2
Assignments (2 total)	1–6	13% × 2
Reflection Portfolio ( <i>onQ submission</i> )	1–6	5% × 2
	<b>Total</b>	<b>100%</b>

### Assessment Details

The course uses frequent low-stakes assessments to support continuous learning, while allowing flexibility through drop policies.

**Online Weekly Quizzes (OnQ, best 10 of 12) – 40%** You will complete twelve short online quizzes through OnQ, each designed to reinforce key concepts introduced that week. Each quiz is open for a full week and may be completed at any time during that period. Each quiz contains three questions, including both foundational and more challenging problems; full credit can be earned by correctly completing either one challenging question or two foundational questions. Each quiz is designed to take approximately 20 minutes, with up to 30 minutes allowed per attempt. Only the best ten quiz scores will count toward your final grade, with each quiz contributing 4%, for a total of 40%. These quizzes are open-note and are intended to provide continuous practice and immediate feedback to support your learning progress.

**Mini Tests (in class, best 2 out of 3) – 24%** Three in-class mini tests will be administered throughout the semester during regular class time. Each mini test is worth 12%, with the best two out of the three counting toward your final grade, for a total of 24%. Each mini test will assess your ability to apply key concepts from the preceding modules and is designed to take approximately 30 minutes, with up to 45 minutes allowed for completion.

The mini tests are scheduled to take place during the Thursday class of the following calendar weeks:

Mini Test	Date
Mini Test #1	Jan. 29 (Thursday)
Mini Test #2	Feb. 26 (Thursday)
Mini Test #3	Mar. 26 (Thursday)

**Assignments (2 total) – 26%** You will complete two graded assignments that emphasize problem-solving and analytical reasoning. Each assignment will build upon lecture materials and encourage you to connect theoretical concepts with real-world applications in computer science. Assignments must be submitted electronically through onQ by the posted deadline. Each assignment is worth 13% of the final grade.

**Reflection Portfolio (onQ submission, 2 total) – 10%** You will complete two short reflection portfolios, each worth 5%, submitted through onQ. Each reflection is due one week after the corresponding mini test grade is released. In each portfolio, you will submit a brief post-assessment reflection (no more than 100 words) that addresses one or two aspects of your learning experience up to that point in the course. Possible reflection prompts include, but are not limited to: identifying a concept you initially misunderstood or found challenging and how your understanding has changed after reviewing the assessment; reflecting

on a problem-solving approach that was ineffective and how you would improve it in future assessments; or evaluating your exam preparation or time management, including what worked well and what specific change you would make next time. These reflections are intended to help consolidate learning and provide feedback that supports reciprocal improvement of both student learning and course instruction. Reflection portfolios are graded primarily on completion and thoughtful engagement, rather than on correctness, writing style, or exam performance.

## **Class Feedback and Continuous Improvement**

To promote reciprocal learning and continuous course improvement, a live poll feedback link will be provided after each lecture. You are encouraged to submit anonymous feedback about which concepts you found unclear or topics that you would like to see revisited in the next class. This process allows the instructor to identify areas of confusion and address them promptly in the following session. Your constructive suggestions and questions help shape the ongoing refinement of the course and ensure that the learning environment remains responsive and inclusive.

## **Policies**

### **Class Attendance**

Your presence and participation in class contributes to the knowledge and skills that you will develop throughout this course. I expect that you attend class regularly, participate in class conversations and learning activities. These types of activities provide active engagement, promote a deeper understanding of the course content, and contribute to your success in this course.

### **Academic Support**

All undergraduate students face new learning and writing challenges as they progress through university: essays and reports become more complex; effectively incorporating research into writing becomes more important; the types of assignments become more diverse; managing your time and developing the skills you need to read and think critically gets more challenging. I encourage students to contact Student Academic Success Services (SASS). SASS offers many different ways to receive support:

- Free online or in-person appointments to get personalized support on writing and academic skills from expert staff and trained peers.
- Workshops and drop-in programs. SASS' Events Calendar lists events coming soon.
- Online resources that provide strategies for academic skills and writing development at university.
- If English is not your first language, SASS has specific resources for English as Additional Language students, including weekly programs and EAL academic skills appointments. You can meet on an ongoing basis with an EAL consultant to work on your academic writing, speaking, listening, and reading skills.

### **Accommodations for Disabilities**

Queen's University is committed to working with students with disabilities to remove barriers to their academic goals. Queen's Student Accessibility Services (QSAS), students with disabilities, instructors, and faculty staff work together to provide and implement academic accommodations designed to allow students with disabilities equitable access to all course material (including in-class as well as exams). If you are a student currently experiencing barriers to your academics due to disability related reasons, and you would like to understand whether academic accommodations could support the removal of those barriers, please

visit the QSAS website to learn more about academic accommodations or start the registration process with QSAS by clicking Access Ventus button at Ventus | Accessibility Services | Queen's (queensu.ca)

VENTUS is an online portal that connects students, instructors, Queen's Student Accessibility Services, the Exam's Office and other support services in the process to request, assess, and implement academic accommodations.

To learn more, please visit the Ventus student guide: [queensu.ca/ventus-support/students](https://queensu.ca/ventus-support/students)

## Academic Consideration for Students in Extenuating Circumstances

Academic Consideration is a process for the University community to provide a compassionate response to assist students experiencing unforeseen, short-term extenuating circumstances that may impact or impede a student's ability to complete their academics. This may include but is not limited to any extenuating circumstance (illness, bereavement, traumatic event, injury, family emergency, etc.) which is short-lived, begins within the term, and will not last longer than 12 weeks – see Academic Consideration webpage for details (<https://www.queensu.ca/artsci/undergraduate/student-services/academic-consideration>)

Each Faculty has developed a protocol to provide a consistent and equitable approach in dealing with requests for academic consideration for students facing extenuating circumstances. For more information, undergraduate students in the Faculty of Arts and Sciences should consult the Faculty's webpage on Academic Consideration in Extenuating Circumstances and submit a request via the Academic Consideration Request Portal. Students in other Faculties and Schools who are enrolled in this course should refer to the protocol for their home Faculty.

Students are encouraged to submit requests as soon as the need becomes apparent and to contact the instructor as soon as possible once academic consideration has been granted. Any delay in contact may limit the options available for academic consideration. Each instructor has discretion in deciding whether or how to apply the Academic Consideration. For more information on the Academic Consideration process, what is and is not an extenuating circumstance, and to submit an Academic Consideration request, please see the Faculty of Arts and Science's Academic Consideration website. ASO courses include links to information on Academic Consideration on your Course Homepage in onQ.

Please see the Teaching Team page for contact information for your instructor and TA(s), where relevant.

For more information, please see the Senate Policy on Academic Consideration for Students in Extenuating Circumstances.

## Queen's Policy Statement on Academic Integrity

Queen's University is dedicated to creating a scholarly community free to explore a range of ideas, to build and advance knowledge and to share the ideas and knowledge that emerge from a range of intellectual pursuits. Each core value of academic integrity, as defined in the Senate Academic Integrity Policy, gives rise to and supports the next.

Honesty appears in presenting one's own academic work, whether in the context of an examination, written assignment, laboratory or seminar presentation. It is in researching one's own work for course assignments, acknowledging dependence on the ideas or words of another and in distinguishing one's own ideas and thoughts from other sources. It is also present in faithfully reporting laboratory results even when they do not conform to an original hypothesis. Further, honesty is present in truthfully communicating in written and/or oral exchanges with instructors, peers and other individuals (e.g. teaching assistants, proctors, university staff and/or university administrators).

Trust exists in an environment in which one's own ideas can be expressed without fear of ridicule or fear that someone else will take credit for them.

Fairness appears in the proper and full acknowledgement of the contributions of collaborators in group projects and in the full participation of partners in collaborative projects.

Respect, in a general sense, is part of an intellectual community that recognizes the participatory nature of the learning process and honours and respects a wide range of opinions and ideas. However, “respect” appears in a very particular sense when students attend class, pay attention, contribute to discussion and submit papers on time; instructors “show respect by taking students’ ideas seriously, by recognizing them as individuals, helping them develop their ideas, providing full and honest feedback on their work, and valuing their perspectives and their goals” (“The Fundamental Values of Academic Integrity”, 3rd Edition, p. 8).

Ultimately, responsibility is both personal and collective and engages students, administrators, faculty and staff in creating and maintaining a learning environment supported by and supporting academic integrity.

Courage differs from the preceding values by being more a quality or capacity of character – “the capacity to act in accordance with one’s values despite fear” (“The Fundamental Values of Academic Integrity”, 3rd edition, p. 10). Courage is displayed by students who make choices and integrous decisions that are followed by action, even in the face of peer pressure to cheat, copy another’s material, provide their own work to others to facilitate cheating, or otherwise represent themselves dishonestly. Students also display courage by acknowledging prior wrongdoing and taking proactive measures to rectify any associated negative impact.

All of these values are not merely abstract but are expressed in and reinforced by the University’s policies and practices.

## Statement for Generative Artificial Intelligence (AI) Tools

Using generative AI writing tools such as ChatGPT in your submitted work is not permitted in this class. This type of use constitutes a departure from academic integrity. Original work, completed wholly by you, is expected to be submitted in this course.

Queen’s Student Academic Success Services (SASS) offers a self-directed, online academic integrity module which we encourage all students to take which will help with:

- Understanding the nature of the academic integrity departure
- Understanding the expectations of and role of sources in scholarly writing
- Integrating sources into your writing (paraphrasing, quoting, summarizing)
- Understanding when and how to cite your sources
- Managing your time effectively to avoid the need for shortcuts
- Taking effective notes to ensure accuracy of source material and correct attribution

## Turnitin Statement

This course makes use of Turnitin, a third-party application that helps maintain standards of excellence in academic integrity. Normally, students will be required to submit their course assignments through onQ to Turnitin. In doing so, students’ work will be included as source documents in the Turnitin reference database, where they will be used solely for the purpose of detecting plagiarized text in this course. Data from submissions is also collected and analyzed by Turnitin for detecting Artificial Intelligence (AI)-generated text. These results are not reported to your instructor at this time but could be in the future.

Turnitin is a suite of tools that provide instructors with information about the authenticity of submitted work and facilitates the process of grading. The similarity report generated after an assignment file is submitted produces a similarity score for each assignment. A similarity score is the percentage of writing that is similar to content found on the internet or the Turnitin extensive database of content. Turnitin does not determine if an instance of plagiarism has occurred. Instead, it gives instructors the information they need to determine the authenticity of work as a part of a larger process.

Please read Turnitin's Privacy Policy, Acceptable Use Policy and End-User License Agreement, which govern users' relationship with Turnitin. Also, please note that Turnitin uses cookies and other tracking technologies; however, in its service contract with Queen's Turnitin has agreed that neither Turnitin nor its third-party partners will use data collected through cookies or other tracking technologies for marketing or advertising purposes.

For further information about how you can exercise control over cookies, see Turnitin's Privacy Policy.

Turnitin may provide other services that are not connected to the purpose for which Queen's University has engaged Turnitin. Your independent use of Turnitin's other services is subject solely to Turnitin's Terms of Service and Privacy Policy, and Queen's University has no liability for any independent interaction you choose to have with Turnitin. Portions of this document have been adapted, with permission, from the University of Toronto Centre for Teaching Support and Innovation tip sheet "Turnitin: An Electronic Resource to Deter Plagiarism". Copyright use statement: Queen's University Copyright Policy