

INQ 241: How to Think Like a Computer

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Office Hours: MW 09:40-10:40 AM, 2:20-3:20 PM, or by appointment

Zoom: <https://roanoke-edu.zoom.us/j/87142274652>

Office: Trexler 365B

Class: MWF 10:50-11:50 AM, Miller Hall 114

Course Objectives

Across various facets of our of our lives, computers play an integral role. But what exactly is computation, and how do computers perform it? In this course, we will embark on a journey to address these inquiries on a broader scale. Rather than delving into intricate mathematical intricacies that formally define computation, our focus will be on a high school-level mathematics approach that highlights the overarching concepts. We will explore the pivotal role of logic as the bedrock of computation and utilize the Turtle graphics library within the Python programming language to provide visual insights into computational fundamentals. The course has been structured with the following objectives in mind:

1. **Provide a High-Level Comprehension of Computation:** Our primary goal is to equip students with a comprehensive grasp of computation's fundamental concepts.
2. **Explore the Role of Logic in Computation:** We aim to elucidate how logic serves as the cornerstone of computational processes.
3. **Introduction to Python Programming:** Through the course, students will be introduced to programming using the Python language.
4. **Enhance Quantitative and Computational Reasoning:** Our curriculum is designed to enhance students' proficiency in quantitative and computational reasoning.
5. **Develop Effective Communication Skills:** We endeavor to cultivate students' ability to articulate both technical content and well-structured arguments through written communication.

Intended Learning Outcomes

At the end of the course the successful student will be able to:

1. Write clearly about the things we learn in the course.
2. Read and make sense of numbers and data related to what we're studying.
3. Tell when computers are being used to solve problems.
4. Create simple computer programs in Python to solve basic problems.
5. Express ideas regarding computation and logic in a lucid and effective manner.

Course Content

Text

Is Math Mathematics Invented or Discovered? (a series of articles on the topic) (download from Inquire),

Think Python: How to Think Like a Computer Scientist, 2nd Edition (available for free online) (Optional)
Easy Writer, Eighth Edition, Andrea A. Lunsford.

Homework

On all assignments, your name must be written clearly **as it appears on Inquire**. Your homework must be neat and legible, you will **lose points** for submitting rough work.

Exams

To maintain the integrity of the examination process and ensure a focused environment, please note that restroom breaks will not be permitted during the duration of the exams. Kindly plan accordingly.

Activities: Programming activities will use Colab, an online Python programming environment. Colab runs in the Google Chrome browser. The programming activities are designed to give students the opportunity to practice the theoretical concepts covered in class.

Co-curricular Requirement: The Mathematics, Computer Science and Physics department offers a series of discussions that appeal to a broad range of interests related to these fields of study. These co-curricular sessions will engage the community to think about ongoing research, novel applications and other issues that face these disciplines. Each student is required to attend at least **two** of these sessions, and turn in a short paper describing the contents of the session, and your critical reflections about the topic and content. **All papers must be submitted by email before April 30**. List of all talks can be found [here](#).

Reflection is an important skill to practice! Good reflection gives you an opportunity to think about what you've experienced and how it applies to your outlook. Mere restatement of events is insufficient (and, frankly, hardly worth your time). To make the task or reflection worthwhile, it should be more about you than about the event.

Here are some questions to help you write Your MCSP Co-Curricular Reflection:

1. Summarize the main ideas presented in the talk you attended.

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2. How did the topics in the talk relate to math, computer science, or physics? How did these topics relate to specific courses you've taken?
 3. Which topics or ideas were most confusing to you? Which topics would you like to learn more about? Elaborate on your answer! (There may be overlap in these questions)
 4. How did your perspective on the main topics change after attending this talk?
 5. What questions do you have about the topics presented in the talk?
 6. What is something new you learned about yourself from attending this talk? Please provide a concrete example.
 7. What did you learn from this talk that may help you as you move forward in your education, career, and/or life?

Course Policies

Grading Policy

The final grade will be computed based on the grades in the exams, home works, papers, and programming assignments according to the following weights:

- 2%: Co-curricular 38%: Assignments 20%: Papers
20%: Midterm 20%: Final exam

The final course grade will be calculated as follows.

- [92, 100]%: A [90, 92]%: A- [86, 90]%: B+ [83, 86]%: B [80, 83]%: B- [76, 80]%: C+
[73, 76]%: C [70, 73]%: C- [66, 70]%: D+ [63, 66]%: D _____
- [60, 63]%: D- [0, 60]%: F-

Where $[a, b)$ is the set of all numbers greater than or equal to a and less than b .

During Class

Always come to class with writing materials.

Please do not multitask during class. I encourage you to take hand written notes as you may be allowed use them during exams.

Attendance Policy

Regular attendance in class is highly recommended. Regardless of attendance, students are responsible for all material covered or assigned in class.

Policies on Incomplete Grades and Late Assignments

Late assignments will be accepted for no penalty if a valid excuse is communicated to the instructor before the deadline. Otherwise, **you will receive no credit.**

Academic Integrity and Honesty

Students are expected to adhere to the Academic Integrity policies of Roanoke College. All work submitted for a grade is to be strictly the work of the student unless otherwise specified by the instructor. The policies as outlined in the Academic Integrity handbook will be enforced in the course.

Graded programs are subject to the Roanoke College Academic Integrity policies. Copying a program or a portion of a program (even a single line) or reading another person's program to obtain ideas for solving a problem is plagiarism. Other examples of integrity violation include writing code for someone else, using code written by someone else, telling someone else how to solve a problem or having someone tell you how to solve a problem. These cases apply to any work that is handed in for a grade under the instructor's assumption that the work is your own. Unless specified otherwise by the instructor, discussion among students should be limited to general discussion of concepts and language details, not specific aspects of a solution to the assigned problem.

Students are allowed to incorporate generative AI tools such as ChatGPT to enhance the quality of their assignments. It is essential, however, that you provide the base solution and understand the enhancements provided by the AI. You cannot use an AI to provide a solution you can not competently defend. In the context of papers, AI can be employed to critique and offer suggestions for changes in sentence structure. Whenever significant AI assistance is utilized, it is mandatory to acknowledge it in your work and provide a brief description of the specific ways in which it was applied.

Subject Tutoring

Subject Tutoring, located on the lower level of Fintel Library (Room 5), is open 4 pm – 9 pm, Sunday – Thursday. We are a Level II Internationally Certified Training Center through the College Reading and Learning Association (CRLA). Subject Tutors are friendly, highly-trained Roanoke College students who offer free, one-on-one tutorials in a variety of general education and major courses such as: Business, Economics, Mathematics, INQ 240, Modern Languages, Lab Sciences, INQ 250, and Social Sciences (see all available subjects at www.roanoke.edu/tutoring). Tutoring sessions are available in-person or online in 30 or 60-minute appointments (please specify if you prefer to meet with a tutor online or in-person when you make your appointment). All in-person appointments will maintain at least 6 feet of physical distance, desks will be cleaned between appointments, and masks must be worn in all indoor, public spaces. In the event that all classes go online this semester, Subject Tutoring will remain available online, too. Schedule an appointment at www.roanoke.edu/tutoring or contact us at 540-375-2590 or subject_tutoring@roanoke.edu.

We hope to see you soon!

Writing Center

The Writing Center @ Roanoke College, located on the Lower Level of Fintel Library, offers tutorials focused on writing projects and oral presentations for students working in any field. Writers and presenters at all levels of competence may consult the Writing Center at any point in their process—including brainstorming, drafting, organizing, editing, or polishing presentation skills—to talk with trained

peer tutors in informal, one-on-one sessions. Schedule a virtual or in-person appointment by going to www.roanoke.edu/writingcenter, where our staff members and workshops are also posted. If it becomes necessary to temporarily discontinue face-to-face services at any time, online tutorials will still be available. Questions? Email writingcenter@roanoke.edu or call 375-4949.

Disability Support Services

The Office of Disability Support Services, located in the Goode-Pasfield Center for Learning and Teaching in Fintel Library, provides reasonable accommodations to students with identified disabilities. Reasonable accommodations are provided based on the diagnosed disability and the recommendations of the professional evaluator. In order to be considered for disability services, students must identify themselves to the Office of Disability Support Services. Students requesting accommodations are required to provide specific current documentation of their disabilities. Please contact Rick Robers, M.A., Coordinator of Disability Support Services, at 540-375-2247 or e-mail robers@roanoke.edu. If you are on record with the College's Office of Disability Support Services as having academic or physical needs requiring accommodations, please schedule an appointment with Mr. Robers as soon as possible. You need to discuss your accommodations with him before they can be implemented. Also, please note that arrangements for extended time on exams, testing, and quizzes in a distraction-reduced environment must be made at least one week before every exam.

Topics

This course expects you to spend at **least 12 hours** of work each week inside and outside of class.

- Week 1: Defining Computation, Reading: Section 1.0
- Week 2: Computation in Python: Turtle Graphics, Programming Assignment 1
- Week 3: Computation in Python: Arithmetic Operators, Reading: Section 2.1, Programming Assignment 2
- Week 4: Computation in Python: Variables, Reading: Section 2.1.1, Programming Assignment 3
- Week 5: Computation in Python: Logical Operators, Reading: Section 2.2, Paper 1
- Week 6: Computation in Python: Iteration, Reading: Section 2.4, Midterm
- Week 7: Introduction to Algorithms, Reading: Section 3.1, Programming Assignment 4
- Week 8: Positional Numbering System and Representing Numbers in Binary,

Reading: Binary Number (Wikipedia) Programming Assignment 5

- Week 9: Representing Numbers in Other Bases, Paper 2
- Week 10: Binary logic,
Reading: Boolean Algebra (Wikipedia)
Programming Project
- Week 11: Truth Tables
Reading: Truth Table (Wikipedia)
- Week 12: Computing with Bits
Reading: Adder (electronics) (Wikipedia)

Exams

Midterm: Monday, February 26th

Final: Wednesday, April 24th