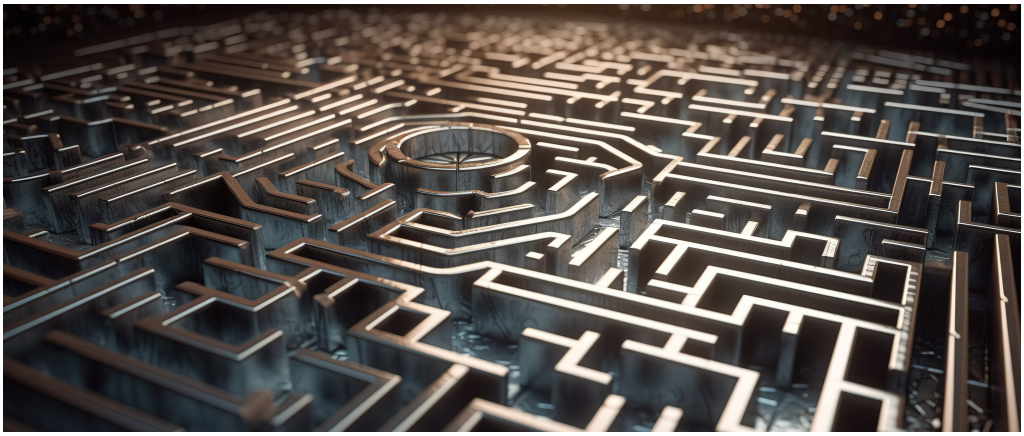

cs.berry.edu/csc320

CSC 320

TH 12:30-1:45pm
MAC 214

Algorithm Design and Analysis (3-0-3)

In this Syllabus

Catalog Description

Principles and techniques for the design, analysis, and implementation of efficient algorithms. Topics include greedy algorithms, divide-and-conquer, dynamic programming, heuristics, and probabilistic algorithms. Applications to areas such as searching, graph theory, optimization, and string processing. Methods for establishing bounds on computational complexity.
PR: CSC/MAT 219 and CSC 225.

Purpose of the Course

The ability to design and analyze algorithms is fundamental to all areas of computer science. Algorithms are computational "recipes" for solving problems and have been around since at least 300 BCE. Innovative algorithms are the greatest contribution of the field of computer science to everyday life.

A successful software developer must have a solid understanding of the core principles of algorithm design and analysis. Previous courses have already given you a taste of "algorithmic thinking." The purpose of this course is to help you deepen your algorithmic intuition and develop the intellectual tools and skills needed to design and analyze algorithms on your own.

Upon completion, you will be well-acquainted with the basic methods and results related to the design and analysis of algorithms. You should be able to recognize the application of these methods to problems from different fields and contexts. Furthermore, you should be able to reason about the efficiency and correctness of algorithms, and communicate such reasoning in an effective manner.

Student Learning Outcomes

By the end of this course, you will:

- Understand and apply the concepts of asymptotic analysis, complexity classes, time and space tradeoffs, and the use of recurrence relations in analyzing recursive algorithms.
- Be familiar with a variety of algorithmic strategies, including brute-force, greedy, divide-and-conquer, dynamic programming, backtracking, and heuristics.
- Solve problems using fundamental graph algorithms, including depth-first and breadth-first search, shortest paths, topological sort, and minimum spanning tree algorithms.
- Define the classes P and NP, identify problems as being NP-hard or NP-complete, and explain the significance of NP-completeness.
- Develop and convey clearly written algorithmic solutions to computational problems, and argue their correctness and efficiency.

Assessment Measures

The determination of how well a student meets the learning outcomes will be assessed by their overall grade in the course, based on performance on assignments and exams, as detailed on page 3 ('Evaluation Components'). A satisfactory level of competency will be demonstrated by earning a grade of 75% or higher on those components of the course.

RESOURCES & POLICIES

TEXTBOOK

Jeff Erickson: ***Algorithms***, © Copyright 2019 Jeff Erickson. The free electronic version (full-color PDF) is available at **https://jeffe.cs.illinois.edu/teaching/algorithms/**. A link to buy a black-and-white paperback edition from Amazon is provided on that page.

TECHNOLOGY REQUIREMENTS

You are recommended to have a computing device on which you are able to install software. We will be using **Gradescope** and **Discord** for course materials and interaction. You will need to have/create accounts on these services.

Discord channel link: https://discord.gg/XStVzYDqZZ

It is recommended that you use LaTeX to typeset your work for this course. You can download LaTeX for your operating system here: https://www.latex-project.org/get/ . This quick cheat sheet of math symbols may be handy, as well as the Detexify tool for finding the LaTeX commands of a symbol (just draw the symbol!).

ACCOMMODATION STATEMENT

The Academic Success Center provides accessibility resources, including academic accommodations, to students with diagnosed differences and/or disabilities. If you need accommodations for this or other classes, please visit berry.edu/asc for information and resources. You may also reach out at 706-233-4080. Please note, faculty are not required, as part of any temporary or long-term accommodation, to distribute recordings of class sessions.

ACADEMIC INTEGRITY

Students are expected to have read carefully and understood the rules governing breaches of academic integrity that are to be found in the *College Catalog*.

All assignments turned in for this course must be your own work. You should not have another person/entity engage in writing any substantive portions of any assignment for this course. This includes the use of AI tools like ChatGPT. If you use any online or written sources to inform your own written work, you must clearly cite these sources in your submission and, if applicable, use quotations to clarify the scope of attribution.

Any violations of academic integrity will be reported to the Office of the Provost and will result in sanctions ranging from loss of credit for the assignment to an overall F or withdrawal from the course.

LATE WORK

Assignments and RFCs should generally be submitted/posted on time. For every day an assignment is late, a grade penalty of 10% will apply.

Exams will only be rescheduled for college-sanctioned excused absences, with advance notice (whenever reasonably possible). A zero will be assigned for exams due to an unexcused absence. Documentation must be submitted prior to making up a missed exam.

COLLABORATION

Collaboration is important for facilitating learning, and your peers can be a great resource. You are encouraged to discuss problems and general approaches with each other, but do not share actual solutions.

It is okay to share general approaches, directions, and ideas. If you have an issue that needs clarification, contact the instructor.

Evaluation Components & Grading Scale

overall average	>= 90%	80-89	70-79	60-69	< 60
letter grade	A	B	C	D	F

At the end of the semester, +/- grades will be assigned, at the instructor's discretion, based on your level of class participation, Discord activity (insightful questions, answering peer RFCs*, constructive discussion) and thoroughness of homework submissions.

EXAMS

45%

Exams will take place in-class and will not be cumulative. You may use any printed material during the exam, but no computing devices. Each exam will contribute 15% to the overall course average.

- Exam 1 - Thursday, February 8th, 2024
- Exam 2 - Tuesday, March 19th, 2024
- Final Exam - Tuesday, April 30th, 2024 (11am - 1pm)

HOMEWORK

35%

Generally due Monday evenings.

Homework will be assigned weekly, often based on the textbook exercises. PDF files of the homework will be posted in a Github repository, linked from the course Canvas web page, along with LaTeX source files, in case you wish to use them.

Homework solutions may be written up neatly by hand or typed up and submitted as a PDF file. In either case, you will submit your file(s) to Gradescope for grading.

ATTENDANCE & PARTICIPATION

10%

Attendance in class is essential and will be recorded on the course website. Our class meetings will consist of a mixture of lecture, discussion, and group activities. You will be expected to read assigned material prior to the class session and to participate actively in class.

Missing three or more classes without justifiable reason (and advance notice/appropriate documentation) will be considered excessive absence and will be grounds for being administratively withdrawn from the course.

RFCs *

10%

Generally due Thursday afternoons.

**** Requests For Clarification***

As you complete each week's assigned reading, you are to come up with (at least) two questions of your own about the material that you are unclear about or want more explanation/clarification. These questions should be posted in the "rfc" thread on the course Discord server. You should discuss or attempt to answer each other's RFCs.

I will address outstanding RFCs during lecture each week, directly on Discord, or in recorded screencasts, as appropriate.

Your RFCs should be genuine and compelling – not lame, trivial questions.

Course Website

http://cs.berry.edu/csc320

It is your responsibility to check the **web site** and the **Discord channel** for this course regularly throughout the semester, as they will be regularly updated with announcements, lecture notes, assignments, code, etc.

Instructor

Nadeem Abdul Hamid
office: MAC 354B
phone: 706.368.5632
email: nhamid@berry.edu
discord: @nadeemabdulhamid

best way to contact

Student Hours

- Mon/Wed 10am - 12pm
- Mon/Tue 3pm - 5pm
- Tue 9am - 11am

or by appointment.

During these times I should be in my office or the Cyber Space (MAC 349), unless otherwise announced on Discord.

Note: During the weeks of March 10th through April 10th, my Mon/Tue afternoon hours will be suspended.

Tentative Schedule *

Week	Topic / Reading
1-2	Introduction / Review: induction, asymptotic analysis, recurrence relations (Ch. 0, App I, & supplementary reading)
3	Recursion & Backtracking (Ch. 1 & 2)
4-5	Dynamic programming (Ch. 3)
6	Greedy algorithms (Ch. 4)
7	Basic graph algorithms (Ch. 5)
8	Depth-first search / applications (Ch. 6)
9	Minimum spanning trees (Ch. 7)
10	Shortest paths (Ch. 8)
11-12	Network flow (Ch. 10 & 11)
13-14	NP-hardness (Ch. 12)

✶ *All policies and schedules on the syllabus subject to change at the instructor's discretion.*

NOTE: It is to be expected that you will get stuck repeatedly while working on assignments for the course. Never hesitate to ask a question in that case – I am here to help you learn how to learn, so I anticipate and expect that you should be asking me questions. Otherwise, something is not right.