CS 668: Applications of Computability

Spring 2026 Instructor Information

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Course Information

Ball State University Course Catalog Description CS 668: Concepts of graph theory. Algorithms for graph traversal, shortest paths, connectivity, spanning trees, and matchings. Applications of graphs to computer programming, software engineering, VLSI design, networks and flows, bioinformatics, and parallel programming.

Prerequisites

CS 601 or CS 617, and 602 with a minimum grade of C or permission of the graduate program director

Learning Outcomes

By the end of the course, you will be able to:

1. Demonstrate a working knowledge of the basic graph theoretic properties and standard graph algorithms.
2. Identify the underlying graph models in applications in software engineering, networks and related areas, and analyze those models with graph applications.
3. Apply graphs as models in solving problems in computer science and related disciplines.
4. Implement graph algorithms.
5. Utilize standard graph algorithm tools and software.
6. Use specific applications in fields such as industrial engineering, social networks, and bioinformatics.

Course Modality and Structure

This course is offered in an online, asynchronous format through Coursera. Course content and assignments are arranged in weekly modules. Each module is composed from the following items: recorded lectures, reading assignments, LaTeX reports of your research project, discussion boards, reflective essays, quizzes, and exams. Students can work through each module's material at their own pace.

Course Time Commitment

At Ball State University, it is expected that students will spend approximately 2 hours of study time for every one credit hour of class. Since this is a 3-credit hour class, you should expect to spend up to 9 hours on this class each week: approximately 3 hours of "in class" work (watching lectures and contributing to discussions, completing reflective practice work, projects, and exams when scheduled) plus up to 6 hours per week of study time (reading assignments, writing project and other assignments, and related work).

Course Materials

Textbook: Graph Algorithms the Fun Way, Jeremy Kubica, No Starch Press. ISBN 978-1-7185-0386-1

LaTeX Resources: *You will use the online LaTeX editor available at* www.overleaf.com
Instructions on setup and use will be provided in the content of the Modules.

Other resources may also be provided.

Computer Requirements

A computer is required for this class, either Windows or Mac. Any modern computer should work, as all assignments can be done using a browser on the Coursera platform. All assignments need to be submitted through the Coursera interface. You will be introduced to some tools for using the typesetting system LaTeX. You may also use standard Python to complete three programming assignments.

Research Project and Report

One of the objectives of this class is for each learner to

- Formulate a research project to investigate and solve one or more problems

· Design and develop a Research Project

· Report findings in a Research Report in a prescribed format and by using a prescribed tool.

Detailed instructions will be provided in the content of Modules so you can complete this objective.

Course Grading Formula and Assignments

Grading Summary

Assignment Type	**Percent of Final Grade**
3 Quizzes (5% each)	15%
3 Exams (10% each)	30%
3 Programming Assignments (5% each)	15%
Research Project Activities	25%
2 Peer Reviews (7.5% each)	15%
Total	**100%**

A standard grading scale will be used

100-93% **A**	92-90% **A-**	89-87% **B+**	86-83% **B**
82-80% **B-**	79-77% **C+**	76-73% **C**	72-70% **C-**
69-67% **D+**	66-60% **D**	59-0% **F**	

Description of Assignments

Ungraded Work

Students are expected to watch the recorded lectures and coding examples, as well as complete the assigned readings and other ungraded work. However, since this work is assessed through the application of this learning to other assignments, completion of this work is not directly graded.

Peer Reviews

The peer reviews are designed to review your research project reports by some other students, and in turn your work to be reviewed by some other students in the class.

Python Programming Assignments

You will use standard Python to complete three program assignments based on topics in the class.

Module Quizzes and Exams

The content learned for each module will be assessed through three quizzes and three exams. These assignments will consist of multiple-choice problems and similar assessments designed to measure your learning.

The three quizzes will be given at the end of Modules 2, 7 and 12. The three exams will be given at the end of Modules 5, 10 and 15.

Quiz/Exam	Covers Topics from
Quiz 1	Modules 1 and 2
Exam 1	Modules 1, 2, 3, 4, and 5
Quiz 2	Modules 6 and 7
Exam 2	Modules 6, 7, 8, 9 and 10
Quiz 3	Modules 11 and 12
Exam 3	Modules 6, 7, 8, 9 and 10

Research Project Activities

Seeing it all come together into a final larger project is important. You will achieve this objective selecting a topic for your research, formulating a research proposal, conducting the research, and reporting the results of your research by creating a research Report in a prescribed format. You will use the typesetting system LaTeX to produce all the documents for your research activities.

Course Policies and Advice

Attendance and Participation Policy

- This course is designed with weekly activities, discussion, and other activities designed to build a scaffold and improve your understanding over time. The best way to learn the course material is to write frequent small programs, so be sure to keep up with the assignment schedule as much as possible.
- Be sure to log into Coursera frequently. Continuous participation throughout the week is much better for learning than trying to “cram” the whole week’s assignments

in one sitting. Please try to spread out your work over a few days, to give your brain time to digest what it has learned.

University and Course Policies

We are committed to ensuring that all members of the community are welcome, through valuing the various experiences and worldviews represented at Ball State and among those we serve. We promote a culture of respect and civil discourse. If you need course adaptations or accommodations because of a disability, please contact the instructor of record as soon as possible. Ball State's Disability Services Office coordinates services for students with disabilities; documentation of a disability needs to be on file in that office before any accommodations can be provided. Disability Services can be contacted at 765-285-5293 or dsd@bsu.edu.

Freedom of Expression

In this course, we are committed to fostering a learning environment that values intellectual diversity, encourages free expression, and promotes open inquiry. As members of the Ball State Community, we treat each person in the Ball State community with civility, courtesy, compassion, and dignity and respect and learn from differences in people, ideas, and opinions. Please review Ball State University's Statement on Freedom of Expression, the resources on Ball State's Freedom of Expression webpage, and Ball State's Beneficence Pledge.

Ball State Academic Ethics Policy

Honesty, trust, and personal responsibility are fundamental attributes of the university community. Academic dishonesty and other forms of academic misconduct threaten the foundation of an institution dedicated to the pursuit of knowledge and will not be tolerated. To maintain its credibility and reputation, and to equitably assign evaluations of scholastic and creative performance, Ball State University is committed to maintaining a climate that upholds and values the highest standards of academic integrity. Visit the VPAA's academic integrity website (Students tab) for resources on understanding academic integrity, citing sources properly, and avoiding inadvertent academic dishonesty. To learn about BSU's academic integrity expectations and students' rights, please read the University Student Academic Ethics Policy.

Course Academic Ethics and Plagiarism Policy

When completing assignments for this class, the intent is that you are learning how to program and need to practice in order to improve. All resources that you need to complete the solutions are covered in the course, and assignments are scaffolded to help you build your understanding. When you use online solutions, AI assistants, or others to complete your

work for you, you are doing yourself a disservice and not really learning the material. Using these resources is considered academic dishonesty and plagiarism. **For this course, the use of online solutions and AI assistants such as Gemini or ChatGPT are prohibited**. Use of such resources violates the course Academic Ethics policy and may result in failing the course.

You are probably familiar with how plagiarism applies to written work, such as essays. For a programming class, plagiarism is similar – your "essay" is your code. There are many different ways to successfully solve each programming problem, and so code that is independently written is usually different than other work submitted by your classmates. You *can* discuss with each other in general terms how to approach solving a problem, but should never share specific code, either verbally or in written form. Unless otherwise indicated for all assignments, you must work independently by yourself. Never email or directly share your code with other students, post it online, or otherwise disseminate solutions to assignments.

Potential Violations

Examples of academic integrity violations include but are not limited to:

- Working with another person on any assignment.
- Sharing or allowing others to access your files, whether done with permission or not.
- Use or possession of a file created by someone else.
- Reusing work from another semester, course, or section.
- Soliciting others to complete work for you, both human and AI assistants such as ChatGPT, Gemini, or other LLM-based tool.

Course Schedule

The most current version of the schedule will always be available on Coursera. I encourage you to check Coursera regularly for updates and contact me if you have any questions.

Subject to Change Statement

This syllabus and schedule are subject to change in the event of extenuating circumstances.