CS 222.4: Advanced Programming

CRN: 36389

Department of Computer Science
College of Sciences and Humanities
Ball State University, Muncie, IN

Course Syllabus

Instructor	Mr. David L. Largent	Semester	Fall 2025
Phone	765-285-8641	Class meeting days	Tuesday, Thursday
E-Mail	dllargent@bsu.edu	Class meeting time	2:00-3:15 PM
Learner help hours	Posted in Canvas (or by appointment, or take your chance and drop by)		

Contents

I. University course catalog data

Description Project-intensive study of advanced topics and best practices in software development, including advanced language features, modular decomposition, and development tools.

Credits Upon successful completion of this course, the student will earn 3 credit hours.

Modality In-person, two times per week.

Prerequisite CS 121 with a C- or better.

Prerequisite or parallel ENG 104 or 114 or equivalent (e.g., testing or placement). Open only to students in majors, minors, certificate programs, and graduate students of the Department of Computer Science.

II. Course Student Learning Objectives

After successfully completing this course, you should be able to:

- Explain, justify, and follow heuristics of code quality, including: coding standards and style documents; refactoring as a technique for improving code quality; clear naming and language-specific naming conventions; using abstraction and decomposition to eliminate redundancy; prudent use of comments and version control commit messages.
- Demonstrate and justify software development practices that incorporate the compiler, debugger, version control, and testing features of a modern integrated development environment.
- Apply code review techniques to identify design and implementation defects.
- Create and analyze software following conventions of object-orientation, including the Single Responsibility Principle and model-view separation.
- Apply user-centered philosophy to design simple graphical user interfaces, justify usability considerations, and implement the user-interface in a high-level programming language.
- Plan, manage, present, and evaluate multi-week programming projects created by small teams using an incremental and iterative approach.
- Demonstrate reflective practice for professional improvement.

III. Support for being a learner

Students can benefit from free tutoring and coaching at the Learning Center, writing practice and feedback at the Writing Center, and public speaking assistance at the Speaking Center.

FERPA and Privacy As a student, your educational records are considered confidential. Under FERPA (Family Educational Rights and Privacy Act), your records are confidential and protected. Under most circumstances, your records will not be released without your written and signed consent. However, some directory information may be released to third parties without your prior consent unless a written request to restrict this is on file. You can learn more about student rights to privacy by reading **Ball State's FERPA and Privacy and Protection**.

IV. Support for being human

Students can benefit from mental health assistance at the Counseling Center, and assistance with basic needs at the Basic Needs Hub.

University statement 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.

Disability statement If you need course adaptations or accommodations due to a disability, please contact me as soon as possible. Ball State's Disability Services Office coordinates services for students with disabilities. You'll need to have documentation on file with them before any accommodations can be provided. You can contact them 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.

Title IX Ball State University is committed to providing a safe and inclusive learning environment for all students. If you or someone you know has experienced sexual harassment—including sexual assault, dating violence, domestic violence, or stalking, please know that you are not alone. The University offers support services and resources. For more information or to report an incident, please visit bsu.edu/titleix or contact the Title IX Coordinator at 765-285-1545 or at titleix@bsu.edu.

As your instructor, I am a mandatory reporter under the Title IX policy and required to report any information I receive about possible sexual harassment. This includes information shared in class discussions, assignments, or private conversations.

What happens after I report? The Title IX Coordinator will email the person who experienced sexual harassment (complainant) and invite them to schedule a meeting. If the complainant **chooses** to meet with the Title IX Coordinator,

- Title IX Coordinator will offer supportive measures (e.g., counseling, extensions on deadlines, course-related adjustments, changes to work or class schedules, and/or referrals to campus offices), review the policy, and discuss options to move forward.
- If a complaint is filed by the complainant or the University, an investigation will begin following University policy.

V. Course policies: Grades

Late work Completing and submitting your work on time will facilitate your learning in this course. Many assignments are based on your understanding of previous assignments. If you get behind on assignments, this will have a negative impact on your understanding of later assignments. I expect you to submit your work by the due date and time I set. By doing so, you stay current, and it is more efficient for me to evaluate your assignment at the same time as I review other learners'. ***However, all assignments may be submitted after the due date, with no penalty*** *(except for the Projects)*. Simply submit it; no explanation is needed. The only absolute due date is the end of finals week for this semester, after which no work may be submitted.

University Grade Appeal Policy If you believe you received a final course grade that does not reflect your performance due to fairness or a procedural issue, you have the right to file an appeal within 5 school days after final grades are posted by the Office of the Registrar. Review the University Grade Appeal Policy and Process.

VI. Course policies: Technology

E-mail So that I can verify your identity, you must send e-mail to me from your BSU account, or through Canvas. I may ignore e-mail sent from other accounts. Monitor your BSU Canvas and e-mail accounts on a regular basis, *at least daily*. Your lack of seeing an announcement or e-mail does not constitute an excuse for making up, or turning in, late work. You can expect an e-mail response from me within 12 to 18 hours, usually much quicker. However, I only commit to monitor my BSU e-mail account actively Monday through Friday from 8:00 AM to 5:00 PM. Although you may find that I read and reply to e-mail at many other times and days, do not *depend* on me doing so.

VII. Course policies: Learner and instructor expectations

Attendance policy I am required to establish an attendance policy for my courses and communicate it in this document. In some cases, I may be asked to provide the last date of attendance for a learner in association with financial aid requirement. Learners are expected to review this policy regarding absence guidelines and follow these guidelines. Course attendance policies must be consistent with University policy. The University has several specific policies regarding student absences that are housed within different areas. Explore Ball State course attendance policies.

Regular and consistent attendance is necessary for you to do well in this course because absence results in the loss of classroom interaction for you, your peers, and me. Much of what you will learn will come from experiences we have in class and the learning will require your participation. My experience shows that learners do better in this course if they attend class regularly, even if they think they already know the material. Ball State University expects students to attend and participate in the courses for which they are registered. Attendance will be taken during each class session. As defined in the final course grade table provided in the "Learner effort and basis for final grade" section of this document, your attendance may impact your final course grade.

Engagement Expectations To support a respectful and engaging academic community that encourages the free exchange of ideas and civil discourse, we will follow these ground rules:

- **Respect different perspectives.** Share your ideas and let others share theirs.
- **Challenge ideas, not people.** Disagree respectfully. No personal attacks or put-downs. Focus on exploring ideas critically and constructively.
- **Listen to understand.** Stay curious, ask questions to understand, and give others space to speak.
- **Assume good intentions.** Approach discussions with curiosity and compassion.
- **Keep it private.** What is shared in class stays in class. Do not share others' words or work without permission.
- **Be respectful.** Avoid hurtful language, stereotypes, or content that may demean others. Keep feedback constructive.

Online etiquette Professional behavior is required online as well. The first rule of netiquette is to "remember the human" when you are communicating with me or with your peers. The second rule is to "adhere to the same standards of behavior online that you follow in real life." It is not likely that you would yell at, mock, or belittle another learner in a face-to-face class so do not do it online. The feeling of anonymity that some people have when they are online can lead to those sorts of behaviors, but they are **not acceptable** here or in any other class.

Student 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.

Academic integrity violations include giving or receiving an unfair academic advantage (cheating), presenting someone else's ideas or work as your own (plagiarism), and falsifying academic records. Unless otherwise indicated, you must work independently by yourself. Check with me if you are unsure whether something constitutes academic dishonesty. Examples of academic integrity violations include but are not limited to:

- Using resources not authorized by the faculty member (including devices, AI tools, hidden notes, and open books)
- Using commercial study websites to find answers to graded assignments (Chegg, Course Hero, StudyPool, OneClass, etc.).
- Without the instructor's written permission, giving away, buying, or selling graded assignments class notes, exams, study guides, or other course materials to other students or to third-party vendors (Course Hero, Chegg, 24HourAnswers, etc.).
- Working with another person on any assignment other than authorized group projects.
- Sharing or allowing others to access your files, whether done with permission or not.
- Reusing your own work from another semester, course, or section.
- Sharing answers with others during exams (passing notes, texting, whispering, gesturing)
- Discussing exam questions and answers with students who have not taken the exam.
- Soliciting others to complete work for you.

Generative AI Statement The use of Generative AI tools, including ChatGPT, Gemini, or other generative AI applications is permitted in this course for learners who wish to use them. You may choose to use AI tools to help brainstorm assignments or to revise existing work you have written. However, you must cite any AI-generated material that informed your work. Using an AI tool to generate content without proper attribution constitutes a violation of Ball State University's Student Academic Ethics Policy. Also understand that the code AI generates may not be considered clean code, and very likely will not follow Test-Driven Development practices, both of which are expected in this course. You are expected to be able to explain any code you submit for assessment, regardless of its source.

Plagiarism I have read, and firmly believe, "the one who does the work does the learning."[1] Therefore, to facilitate your learning and to protect the integrity of learning in this course, I have established the following policy:

> **Plagiarism is not acceptable.** You are probably familiar with how plagiarism applies to written work, such as essays. For a programming course, plagiarism is similar—your "essay" is your code. There are many ways to successfully solve each programming problem, so code that you independently write is usually different from work submitted by your classmates. You may discuss with each other, in general terms, how to approach solving a problem, but you should never share specific programming code, either verbally or in written or electronic form. Never email or directly share your code with other learners, post it online, or otherwise disseminate solutions to assignments, and do not copy from another learner or website. **Using generative AI tools to complete an assignment is a violation of Ball State's Academic Ethics Policy** unless I explicitly approve the use of AI. In general, you may not submit any work generated by an AI program as your own, as doing so would be plagiarism. **Unless I explicitly designate an assignment as a group assignment, work must be yours alone.**

If you violate the Academic Ethics Policy I will lower your final grade, possibly to an F, and will report the incident to the appropriate university administrators. You should be aware of the fundamentals of copyright law and the university's intellectual property policies for student-created work.

VIII. Course format

I create a learning environment for this course using a combination of short discourse, discussion, peer instruction, pair programming, small group activities, significant programming projects, and reflection.

Preparation expected **I expect you to come to class prepared**, which includes having completed the assignments and readings. During class, I may quiz you over the material, have you enter into short discussions about the material with other learners, and have you work in pairs or small groups on activities related to the material. We will be using the best tools for the job, recognizing that learning these tools is also part of your education. You will almost certainly encounter something new that will challenge you—and occasionally frustrate you!—but by working through this, you will gain valuable knowledge and skills.

The course involves significant hands-on programming projects which will be completed outside of class. The projects will serve to bridge the gap between theory and practice and will count towards a very significant portion of your final course grade.

IX. Course schedule

The semester will be divided into three parts. For the first few weeks, we will explore fundamental topics of contemporary software development, including tools and techniques to help you be a

[1] Terry Doyle (2011) *Learner-Centered Teaching.* Routledge. 222 pages. ISBN-13: 978-1579227432.

more productive programmer. During this time, you will individually complete a series of rigorous assignments that will have you studying best practices.

After the introductory weeks, you will work with one other learner for a brief time on a project, which will provide an opportunity to bring these new ideas into practice by programmatically manipulating data pulled from a public source. This will give you the perspective needed to think more critically about dealing with the challenges and ambiguities of programming.

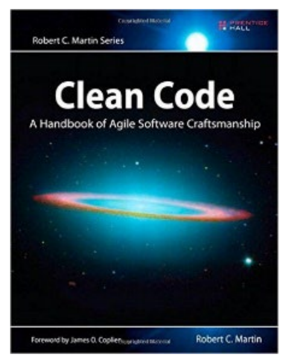
At the end, you will spend most of the semester developing your learner-designed final project, which you will complete with small teams in three iterations. This project will be your most important artifact this semester, representing all that you have learned so far as a Computer Science student. Note that I may make occasional assignments during the project portion of the semester to help keep everyone on track.

have posted a day-by-day course schedule as a separate document in Canvas. To support a learning experience that is responsive to the needs, interests, and pace of our class community, the course schedule may shift over the semester. The most current version of the schedule will always be available on Canvas.

X. Required texts and materials

For more information about obtaining required course materials, see Ball State First Day.

Title: **Clean Code: A Handbook of Agile Software Craftsmanship**
Author: Robert C. Martin
ISBN-10: 0-13-235088-2
ISBN-13: 978-0-13-235088-4
Publisher: Prentice Hall
Edition: 1
Copyright: 2009
Format: Paper; 464 pages



Additional reading material will be provided in Canvas.

Technology requirements for this course are listed in Canvas, including computer, internet, software, and accounts. As per the undergraduate catalog, Computer Science majors are expected to have a laptop capable of running contemporary software development tools and to bring that computer to class meetings.

XI. Learner effort and basis for final grade

How can you best succeed in this course?

To succeed in this course, you should…

- Put forth honest effort, think, and reflect
- Attend classes and participate in them consistently

- Adequately prepare before attending class
- Read regularly and on time
- Seek and utilize provided resources
- Work collaboratively with classmates
- Complete assignments, and submit them in as they are due
- Show respect to both me and your peers

How assessment (i.e., grading) will work I expect that you are participating in this course out of a desire to grow and learn as a human being, and that your standards for personal success are high. Accordingly, I have set high standards for success in this course. I take what we do here seriously, and I expect you to do so as well and meet those standards. **Assessment in this course is probably unlike anything you have experienced before. Please read this carefully so you understand how I will assess your work.**

Research reveals that adults learn most effectively when expectations are both clear and challenging. In this course, **I use a methodology called *specifications grading* in which your final course grade directly reflects your level of achievements in satisfying learning objectives**. Each assignment comes with a specific set of requirements (also called "specifications" or "specs"), and **I will only consider submissions that meet all the requirements to be complete**. That is, I will mark any assignment as incomplete that does not meet the specifications, and you will earn no credit for it. Prior research shows that this approach is both more accurate and more transparent than traditional points-based grading.

I will evaluate all your work for the course (except the projects) on a complete/incomplete model with the standard for passing set at a high B level. I will provide detailed and precise specifications to you for each assignment. This applies to everything we do except for your final course grade, which must be on an A-F scale (see below). I want you to take the course and your work in it very seriously. The goal is to give you freedom to experiment, be creative, and learn, without having to worry about what I want from you for you to earn the grade you want.

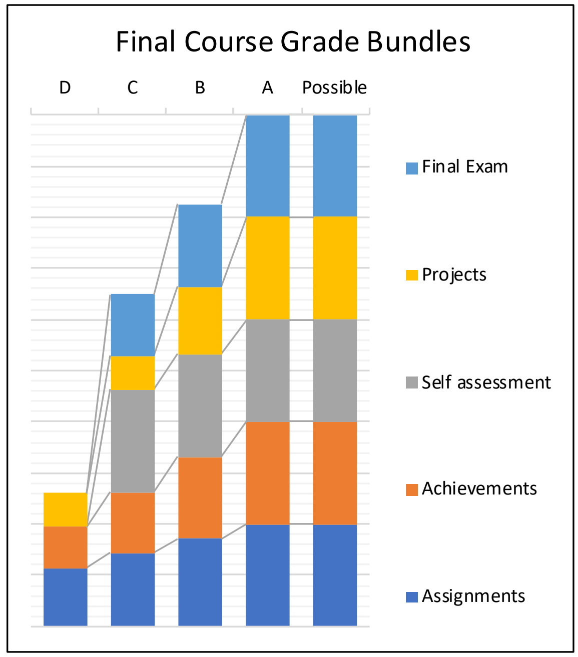
This approach to grading is promoted by Dr. Linda Nilson as described in her 2014 book *Specifications Grading*[2]. The essence of the logic behind it is this:

- With a very detailed and clear specification of what the instructor wants, the learner does not need to guess. This makes the evaluation process very transparent, usually to the point where the learner can accurately forecast their own grade.
- With flexible deadlines and the ability to resubmit multiple times, learners are provided with incentives to try to understand the material rather than beat the deadline. It removes the pressure of trying to get 100% on everything because the average of your grades will not determine your final course grade.
- It reduces grading time for the instructor because the instructor does not need to justify the difference between a 75 and an 80 (which likely takes more time than learners think). The instructor just needs to determine if the assignment is complete enough to be satisfactory or not. If it is not Satisfactory, the learner gets to resubmit, addressing the

[2] Linda B. Nilson (2014) *Specifications Grading: Restoring Rigor, Motivating Students, and Saving Faculty Time.* Stylus Publishing; Reprint edition (October 22, 2014). 184 pages. ISBN-13: 978-1620362426, ISBN-10: 1620362422.

feedback of what is needed to improve the assignment. With the "extra" time, the instructor can provide better feedback to the learner.

Final course grade Although I will evaluate each assignment as complete/incomplete, your final course grade will be on the A-F scale, as per university policy. I will assign a variety of assessment items, listed in the table below, throughout the semester. The chart to the right broadly illustrates the "bundles" for each course grade level; the higher the grade, the more you need to complete in each assessment category.



I will provide a detailed explanation (with an evaluation rubric) when I make an assignment, however a brief description of each assessment category follows the table below. I have provided the approximate amount of time (including class time and based on earning an A) you can expect to spend doing each during the semester. I have provided a day-by-day course schedule in a separate document, which is posted in Canvas.

Each final course grade (A, B, C, D, F) will have a defined set of items you must complete in the assessment categories described below. Your final course grade will be the highest grade for which you have met (or exceeded) all specifications defined for it in each assessment category. **To earn a given course grade, you <u>must satisfy all specifications in that grade's column</u>.** For example, to earn an A you must meet (or exceed) the specifications for all assessment categories at the A level. If you have one or more categories where you have only met the B level, then you will earn a B.

Your final course grade will be determined based on your ability to meet the specifications as broadly defined in the following table and described above. The specific number of assignments and specification requirements are posted in Canvas, to allow flexibility in the learning environment to adapt to student needs during the semester.

	Hours of effort	**Course Grade Earned**				
Assessment category		**A**	**B**	**C**	**D**	**F**
Assignments, including readings	15	Meet A level specs	Meet B level specs	Meet C level specs	Meet D level specs	If you do not meet the specs for A, B, C, or D, you will earn an F.
Achievements	10	Meet A level specs	Meet B level specs	Meet C level specs	Meet D level specs	
Mid-semester self-assessment report	2	Meet A level specs	Meet B level specs	Meet C level specs	Meet D level specs	
Projects	60	Meet A level specs	Meet B level specs	Meet C level specs	Meet D level specs	
Final exam	3	Meet A level specs	Meet B level specs	Meet C level specs	Meet D level specs	

I may award plus or minus grades in a situation where all your assessment categories are at a higher grade, except for one or two categories. When determining plus or minus grade adjustments, more weight will be given to the projects and exams assessment categories and will be limited by your classroom engagement assessment category. If you do not meet the minimum classroom engagement threshold listed in the following table, you will not be eligible for the grade adjustment shown. Note, however, that meeting the threshold does not automatically result in you earning a higher adjusted course grade; you must meet the other criteria described below to do so.

	Hours of effort	To be eligible for a plus/minus grade adjustment to				
Assessment category		**A- or B+ from B**	**B- or C+ from C**	**C- or D+ from D**	**D- from F**	**F**
Classroom engagement	45	Meet B level specs	Meet C level specs	Meet D level specs	Meet F level specs	N/A

Assessment categories I briefly describe each assessment category below. *Assignment details, including instructions, relevant readings, due dates, and evaluation criteria/rubrics will be posted and updated in Canvas. Please check Canvas regularly to stay informed and on track.*

Classroom engagement: Be present, participate, and make sure you sign the attendance sheet each class day, when asked. By being actively engaged, you will have the opportunity to interact with, and learn from your peers.

Assignments: Reading, activity, and writing designed to help you learn fundamental course skills. By successfully completing these assignments, you will be practicing the new skills being presented.

Achievements: Encourages your independent exploration of related course topics. Involves reading, research, attending a presentation, interviewing, and/or activity, as well as writing. Reviewed by a peer before submission. You choose what topics you want to learn more about.

Mid-semester self-assessment report: A structured reflection report in which you will evaluate how you are doing in the course and reflect on what you need to do during the remainder of the semester to earn the grade you want.

First Project and **First Project with GUI**: You and a partner will develop a non-trivial software application (as specified) within a short time frame. This will bring into practice all the techniques we studied in the first few weeks of the semester. This involves a class presentation. I believe a finer granularity is appropriate when evaluating large assignments. As such, I will evaluate your submission based on specifications in tiers, rather than using a complete/incomplete model. The assessment tiers are listed here, with a brief description of each.

- Master: Your submission met or exceeded all specifications
- Proficient: Your submission met most specifications, but there is room for improvement
- Starter: Your submission met a few specifications, but can be greatly improved
- Un-assessable: Your submission demonstrated little understanding of the material

I will provide project specifications and an evaluation rubric in Canvas.

Final Project: Working with a small team, you will design and develop a significantly non-trivial software application of your choosing. It will be developed over three iterations, each of which will produce an executable release. This will further bring into practice all the techniques we studied in the first few weeks of the semester. This involves a class presentation for each iteration. Like the other projects, I will evaluate your submission based on specifications in tiers, using the assessment tiers listed for the other projects. I will provide project specifications and an evaluation rubric in Canvas.

Final exam: Let us just call it a final experience. Not an exam in the normal sense, but it will cause you to consider what you have learned—and not learned—this semester. Writing will be involved.

XII. Subject to change

I reserve the right to make reasonable changes to any part of this document in extenuating circumstances. Should a change become necessary, I will provide you with as much notice as is reasonable by making announcements in class, Canvas, and/or via e-mail.

Last updated on 08/15/2025.