UTAH VALLEY UNIVERSITY

COURSE SYLLABUS – Fall 2023

CS 3450 – Section 2

3 Credit Hours

CS 504: T,Th 4:00-5:15 PM

Instructor: **Neil B. Harrison**

Contact Info: Neil.Harrison@uvu.edu, CS 520, 863-7312

Best contact method: above email (avoid Canvas and Teams messaging) I answer emails promptly

Office Hours: MW, 9:00-10:00, 1:00 – 2:00. **Other hours by appointment or chance walk-in: Come by any time, and I will often make time to see you.**

It's (relatively) easy to sling code. You can write a lot of code, and even debug it. But that doesn't mean that it is designed well! Programs that are well designed are easy to understand, easy to extend, and easy to debug. Unfortunately, good design is hard, and most programs are not designed very well.

There are principles of software design that help one create better software designs. In addition, software designers have identified patterns of effective software design. Software that follows these patterns and principles tends to be designed better. In this course we hope to teach you how to design software better, and teach you patterns and principles that you can use as tools in your design.

Course Objective

This course is all about becoming a better programmer. You will not only program but learn how to use principles of good (mainly OO) programming. You will also learn common OO design patterns, as well as software patterns in general. We will study the motivation for design patterns, the design principles on which they're based, and the commonly used patterns as introduced in the Gang of Four book. The goal is to arrive at a point where you more or less automatically follow good programming principles. In addition, patterns should become a part of your everyday vocabulary, and you can recognize places where patterns can be applied and see how new patterns can emerge.

Course Learning Outcomes

Upon completion of this course, students should be able to:

1. Apply the key principles that underly the design of quality software,
2. Identify which patterns support which design patterns,
3. Detect when design principles are violated and which patterns are needed to improve a design,
4. Comprehend the design patterns in common use in professional software development,
5. Produce designs that are orthogonal and reusable,
6. Discuss designs at a high level using patterns terminology,
7. Identify patterns that balance the forces in a given design problem.

Course Materials

- Freeman & Freeman, *Head First Design Patterns*, O'Reilly. SECOND EDITION
    - A PDF of the first edition is available on Canvas
- References:

- Gamma et al, *Design Patterns*, Addison-Wesley, 1994. (the famous "Gang of Four" book)
- Fowler, *UML Distilled,* Addison-Wesley, 2004.
- Fowler, *Refactoring: Improving the Design of Existing Code,* Addison-Wesley, 1999.
- Kierevsky, *Refactoring to Patterns,* Addison-Wesley, 2005.
- Martin, *Agile Software Development*, Prentice-Hall, 2003.
- Coplien, *Software Patterns*, SIGS Books, 1995
- Buschmann et al, *Pattern-Oriented Software Architecture, Vol. 4,* Wiley 2007
- Utas, *Robust Communication Software,* Wiley 2005
- Hanmer, *Patterns for Fault-Tolerant Software,* Wiley, 2007
- Arjona, *Patterns for Parallel Software Design,* Wiley, 2010

Attendance

I won't take attendance. However, you need to come to class, every time. The material is challenging enough that if you miss class often, you will feel the Gandalf effect ("You shall not pass!") Quizzes will be given in class occasionally, partly as a way to encourage you to attend class. Quizzes cannot be made up.

Grading

Your performance on the following will determine your course grade:

Homework	15%	
Programs	45%	
1 Mid-term Exam	20%	
Final Exam	20%	
Unannounced Quizzes	extra credit	(up to 2.5% bonus)

(Note: I reserve the right to change the above weights, generally to improve your results.)

You are responsible for all material in the text, readings, and class discussions. Grades will be assigned according to the following schedule:

93 – 100% A
90 – 92% A-
87 – 89% B+
83 – 86% B
80 – 82% B-
77 – 79% C+
73 – 76% C
70 – 72% C-
67 – 69% D+
63 – 66% D
60 – 62% D-
0 – 59% E

You are responsible for knowing all important university deadlines for students (e.g., last day to add/drop, etc.)

Programming Assignments:

There are two types of assignments, homework assignments and programming projects. The homework assignments are small, and should take you a small amount of time. A few require writing a small amount of code. The programming projects are exactly that: a program you must write. Please note the following:

- You may write code in C++, C#, D, Java, Python, or Javascript. If it's anything other than these languages, see me first.

- Some assignments require associated UML diagrams. Please follow standard UML; you will lose points if your diagrams are not accurate UML. (Part of good design is communicating your design to others, and UML is a standard way of doing so.) Consult UML Distilled and the UML description sheet for details.
    - Note that Visual Studio does NOT generate correct UML class diagrams.
    - Hand-drawn are actually often easiest, but MAKE THEM LEGIBLE and COMPLETE!
- Programming assignments will be graded on the following:
    - Do they work?
    - Do they implement the specified pattern correctly?
    - Do they follow the principles we have studied to that point?
- For programs and homework that requires programming, submit:
    - An executable (runnable on Windows WITHOUT installing additional dlls.) (Java programmers: create an executable jar file.)
    - Source code. I cannot grade programs without examining the source code. (C++ programmers: be sure it is standard C++, not VS C++, in case I need to compile it.)
    - Do NOT submit a complete VS project. Find the .exe and source files yourself!
- This is a software design class! It's not just the patterns! While the programming projects are about one or two patterns, they are ALSO about general software design. They are design and implementation problems with substantial meat!

Assignments are due at 11:59 PM on the due date, except where noted. They should be submitted via Canvas. Paper materials (where applicable) are to be handed in at the beginning of class.

Late assignments*:** Except where noted, late assignments are accepted with a ***20% penalty per day late. **A key to success is to turn assignments in on time.**

There is no makeup work.

Exams

The exams are hard. They are harder than the assignments. You will be expected to show mastery of the material; to show that you not only understand the design principles and patterns, but how and where to apply them.

Expect the exams to be hard. Got that? However, I tend to compensate by grading generously. Exam averages are typically around 81%.

One double-sided cue sheet is allowed for all tests. (Size: for tests in the testing center, ½ a sheet; for final exam in class, a full 8.5 x 11 sheet)

The Final is comprehensive. It will be given in class at the university-mandated exam time.

Accommodations

Students who need accommodations because of a disability may contact the UVU Office of Accessibility Services (OAS), located on the Orem Campus in LC 312. To schedule an appointment or to speak with a counselor, call the OAS office at 801-863-8747. Deaf/Hard of Hearing individuals, email nicole.hemmingsen@uvu.edu or text 385-208-2677.

Harassment

Title IX makes it clear that violence and harassment based on sex and gender (which includes sexual orientation and gender identity/expression) is a civil rights offense subject to the same kinds of accountability and the same kinds of support applied to offenses against other protected categories such as race, national origin, color, religion, age, status as a person with a disability, veteran's status or genetic information. If you or someone you know has experienced or experiences harassment or sexual assault including, dating and domestic violence, stalking or sexual exploitation, you are encouraged to report it to the Title IX Coordinator in the Office for Equal Opportunity and Affirmative Action, BA-203, (801) 863-7999.

Please be aware that all faculty members and university employees are considered "Responsible Employees" and are required to report incidents of sexual misconduct and relationship violence and thus cannot guarantee confidentiality. Please know that you can seek confidential resources at UVU Student Health Services, SC-221, (801) 863-8876. Please visit https://www.uvu.edu/equalopportunity/ for more information.

Honesty

I assume **you are here to learn**. You learn (and earn your grade) through **honest work**. If you cheat your way through this course, you are only cheating yourself, and it will catch up with you in a subsequent course, since this course is the gateway to upper division work. It will also catch up with you in your career, and shape your future.

I strongly encourage you to find a friend, or better yet, a group of friends to study with for this course. It often helps to have someone else explain an idea, or explore a different solution to a problem. However, I expect that all work that you hand in will be **your own**. **Never copy anyone else's work, whether personally or from a web search**. Working with others is for discussing ideas and concepts. You should be able to explain your work to anyone, including tutors. Do not ask tutors for solutions.—they are instructed not to do so. If I find that you have copied all or part of someone else's work, I will give you (**and** the people you copied from) a zero on that particular assignment. On the second offense, you will be subject to being **dropped from or will fail the course**. Please read the CS Imperative of Ethics and Conduct before you continue with the course. Violations of academic honesty will be **swiftly dealt with**.