CptS 487 - Software Design & Architecture

Course Number:	CptS 487	Semester:	Spring
Credit Hours:	3	Year:	2021
Class Location:	Via Zoom (see Blackboard)	Class Meeting Time:	TuTh 12:05 – 1:20pm

Instructor/TA

Instructor: Bolong Zeng

Office Location:	Everett 427	Office Hours:	TuTh 3-4:30pm (via zoom, link to be announced)
		Email:	bzeng@wsu.edu
TA: Haoran Yang, :	Ebenezer Ewumi	Email:	haoran.yang2@wsu.edu ebenezer.ewumi@wsu.edu

Textbooks

Required:

[1][BASS] L. Bass, P. Clements, R. Kazman. Software Architecture in Practice, 3rd ed., Addison-Wesley, 2012

[2][GAMMA] E. Gamma, R. Helm, R. Johnson, J. Vlissides. Design Patterns: Elements of Reusable Object-Oriented Software. 1st ed. Addison-Wesley, 1994

Recommended:

[3][MARTIN] R. C. Martin. Agile Software Development: Principles, Patterns and Practices, 1st ed., Pearson, 2002

[4][CLEMENTS] P. Clements et al., Documenting Software Architectures: Views and Beyond, 2nd ed., Pearson Education, 2010

Recommended Reading:

- MonoGame official documentation: http://www.monogame.net/documentation/?page=main
- LibGDX official documentation: https://libgdx.badlogicgames.com/documentation/
- GameFromScratch has tutorials for both MonoGame and LibGDX
    - https://www.gamefromscratch.com/page/MonoGame-Tutorial-Series.aspx
    - https://www.gamefromscratch.com/page/LibGDX-Tutorial-series.aspx
- OODesign.com: useful reference for design patterns - https://www.oodesign.com/

Course Overview

This course teaches students about fundamental software design principles and design methodologies. Students will learn how to build and document the static and dynamic aspects of a software design, as well as when and how to apply common solutions to recurring design problems and how to recognize common poor design solutions as well as how to improve them. The course will also teach techniques to evaluate software quality, introduce students to different architectural styles, and expose students to good and poor architectural practices.

Course Objective

Learning outcomes and evaluation:

At the end of the course students will be able to:

1. Explain key concepts in software design and construct professional design documents.

2. Explain and apply software design principles.

3. Design a software system to account for key issues such as concurrency, security, and data persistence.

4. Identify opportunities to apply common design patterns and identify poor design decisions and propose alternative solutions.

5. Critique a proposed software design in terms of quality attributes; select and apply techniques to evaluate the quality of a software design.

6. Describe the main software architectural styles and select the appropriate style for a given software system.

7. Identify reusable components for the system to be developed.

8. Describe common architectural patterns and apply them when appropriate.

9. Produce architectural diagrams representing the various views of the system.

Mapping student learning outcomes, course topics, and evaluations:

Student Learning Outcomes	Course topics/dates	Evaluation of Outcome
1	Software design concepts and documentation (weeks 1, 2, 3, 4, 9)	Homework; project
2	Software design principles (week 3, 4)	Homework; project; midterm
3	Key issues during design (week 7)	Project; final exam
4	Design patterns and anti-patterns (weeks 2, 3, 6, 9, 13)	Homework; project; midterm
5	Software design quality (week 8)	Project; final exam
6	Software architectural styles (weeks 10 and 11)	Homework; project; final exam
7	Software reuse; libraries, frameworks and	project

Student Learning Outcomes	Course topics/dates	Evaluation of Outcome
	components (11 and 12)	
8	Architectural patterns and anti-patterns (weeks 10, 11, 12)	Homework; final exam
9	Documenting software architecture (weeks 10, 11, 12)	Weekly discussion; project

Prerequisites

- CptS 321 & 322 with C or better
- Assumptions: Familiar with UML diagrams and tools; Familiar with git version control.

Project and homework

Project is an important component in a software design class. You will complete the project in a team environment (each team will have 4-5 students). The project is to provide a platform on which you can exercise OO and SE design methodologies. Details on the project will be posted in the Project Description document.

The outcomes of project will be demonstrated not just by the quality of your design and the final product, but also by the quality of the documents developed during the course of the project.

Project teams will consist of 4 or 5 students. One member in your team would serve as a liaison for the team, and will be responsible for the communications of your team with the instructor and TA.

Project deliverables will be turned in as a team (i.e., one submission per team). Unless posted, project documents shall be submitted electronically. The progress of semester-long project will be measured by milestones. The objectives, requirements, and deadline of each milestone will be posted. At each milestone, you may be required to submit a written report, code, or test cases to demonstrate your progress.

Late penalty is 10% point deduction per day. Late project deliverables may be turned up to one week after the original due date. Exceptions/extensions can be given to teams with valid excuse. Teams need to provide evidence for their excuse and must notify the instructor beforehand for the late submission. The grading rubrics that will be used to evaluate your project deliverables will be available on the course website.

Homework: There will be 3 to 4, maybe more homework assignments throughout the semester. These assignments are designed to help you get familiar with in course contents and prepare for the exams. You are encouraged to take advantage of office hours if you have questions for homework assignments.

Each student will turn in homework assignments individually.

- Acceptable file formats include: **PDF**, and for graphics or scanned documents, GIF or JPEG.
- The homework assignments and their deadlines will be posted on the course website.
- Homework submission deadline is the midnight of its posted due date.
- Homework assignments shall be submitted electronically via the Blackboard system.
- **Late penalty is 10% point deduction per day. Late assignments may be turned in up to one week after the original due date.**

Quiz: There may be a few quizzes in class to help you practice.

Exams

There will be one midterm and one final. Midterm will cover all material covered until the midterm date. Exams will be available as a take-home assignment on Blackboard where you need to finish in a limited time. Details to be announced.

Midterm exam date is to be determined.

Final exam date is on Tuesday, May 4 2021, 10am-2pm.

Grading

Overall Grading:

1. Midterm……………………………………………………………..…… 20% (individual grade)
2. Final…………………………………………………………….....…..… 20% (individual grade)
3. Project……………………………………………………………….…… 40% (team grade + individual grade)
4. Homework assignments…………………………………………….20% (individual grade)

TOTAL…………………………………………………………………... **100%**

Refer to the project specs for the weights of the project deliverables. All grades will be given based on a 100 point grade scale. Letter grades will be assigned based on the scale shown below:

Total Score	**Letter Grade**
93% - 100%	A
90% - 92.99%	A-
86% - 89.99%	B+
83% - 85.99%	B
80% - 82.99%	B-
76% - 79.99%	C+
73% - 75.99%	C
70% - 72.99%	C-
66% - 69.99%	D+
60% - 65.99%	D
0% - 59%	F

Team vs. Individual Performance

Each team member is expected to carry their own weight. If they do, all team members will get the same grade. However, we will be looking “into” the teams to see if some students are underperforming; if so, they will get lower scores than their teammates. Similarly, excellent work can be rewarded by providing higher grades. For the project deliverable documents and products, you will be asked which parts of the document/code were done by each team member.

Other

Student Work Load for CptS 487

CptS 487 is a 3-credit course. The 3-credit designation normally implies that on average the student is expected to spend 3 hrs. (lectures) + 6 hrs. (homework/project) = 9 hours per week working on this course.

Protecting Intellectual Property (IP)

Teams have an obligation to protect IP they develop and IP that the mentor and sponsor share with them. WSU employees, including faculty, staff and graduate students are legally bound to protect intellectual property. Do not post IP at non-password-protected websites. Questions about IP should be directed to your mentor or directed to WSU attorneys trained in IP issues. Similar comments apply to information that government and military entities label as "sensitive" or "classified". Ask the instructor if you need contact information for WSU professionals working with these issues.

Statement of Reasonable Accommodation

Students with Disabilities: Reasonable accommodations are available for students with a documented disability. If you have a disability and need accommodations to fully participate in this class, please either visit or call the Access Center (Washington Building 217; 509-335-3417) to schedule an appointment with an Access Advisor. All accommodations MUST be approved through the Access Center. For more information contact a Disability Specialist on your home campus:
Pullman or WSU Online: 509-335-3417 http://accesscenter.wsu.edu Access.Center@wsu.edu
Everett: 509-335-3417 https://everett.wsu.edu/academics/disability-resources/

Statement of Academic Integrity

I encourage you to work with classmates on assignments. However, each student must turn in original work. No copying will be accepted. Students who violate WSU's Standards of Conduct for Students will receive an F as a final grade in this course, will not have the option to withdraw from the course and will be reported to the Office Student Standards and Accountability. Cheating is defined in the Standards for Student Conduct WAC 504-26-010 (3). It is strongly suggested that you read and understand these definitions.

Safety and Emergency Notification

Washington State University is committed to enhancing the safety of the students, faculty, staff, and visitors. It is highly recommended that you review the Campus Safety Plan (http://safetyplan.wsu.edu/) and visit the Office of Emergency Management web site (http://oem.wsu.edu/) for a comprehensive listing of university policies, procedures, statistics, and information related to campus safety, emergency management, and the health and welfare of the campus community.

ABET Student Learning Outcome

A: An ability to apply knowledge of computing and mathematics appropriate to the discipline. In particular, students should be able to apply this knowledge in a way that demonstrates comprehension of the trade offs involved in the modeling, design and development of software systems of various scales and complexity.

B: An ability to analyze a problem, and identify and define the computing requirements appropriate to its solution.

C: An ability to design, implement, and evaluate a computer-based system, process, component, or program to meet desired needs.

F: An ability to communicate effectively with a range of audiences.

I: An ability to use current techniques, skills, and tools necessary for computing practice.

WSU Everett Resources

For Everett campus:

Rave Emergency Alert System (all of you should sign up as well if not currently registered)

To receive information about school closures or emergencies, sign up for Rave at https://www.getrave.com/login/everettcc