



# SSW565: Software Architecture and Component Based Design

School of Systems and Enterprises  
Spring 2024

Instructor: Ying Wang

Canvas Course Address: <https://sit.instructure.com/courses/67078>

Course Schedule: Wed 6:00pm – 8:00pm

Contact Info: [ywang6@stevens.edu](mailto:ywang6@stevens.edu), Cell: 540-921-7437

Office Hours: Office Hours and by appointment

Prerequisite(s): SSW 540 or equivalent experience

## COURSE DESCRIPTION

This course provides the student with a working knowledge of the terms, principles and methods of Software Architecture and Component-Based Design, introducing students to a wide variety of processes and alternatives that can be deployed in creating and/or evaluating software architectures and designs. Numerous case studies of working software architectures are studies and the student will acquire an appreciation of the role that software architecture and design activities play in the acquisition and/or development of complex software-intensive systems.

Special consideration is given to the role of architecture and design in software assurance for dependability, including performance, reliability and security, Recent advances in design techniques, software patterns, component-based design and design refactoring are introduced.

## STUDENT LEARNING OUTCOMES

After successful completion of this course, students will be able to...

- Construct an architecture using the "4+1" model, emphasizing architectural styles and nonfunctional requirements
- Base software design on components, patterns and classes using a domain driven approach

- Re-factor code to improve understanding or modification
- Apply a continuous learning approach to software architecture and design

## **COURSE FORMAT AND STRUCTURE**

This course is online synchronous class. To access the course, please visit [stevens.edu/canvas](https://stevens.edu/canvas) . For more information about course access or support, contact the Technology Resource and Assistance Center (TRAC) by calling 201-216-5500.

### **Course Logistics**

Weekly modules consist of presentation material (slides and recorded video for live sessions), assigned and sometimes optional reading, as well as discussions and assignments. Each week, we will have a live online zoom session for the main presentation. This online zoom meeting will be recorded, and posted on canvas. For student who can not attend the live online session, the recordings can be reviewed. The time of the live meeting will be finalized after the week0, to fit most students' needs and schedule.

Graded discussions (on Canvas) are a key component of this course. To participate in a weekly discussion, you must provide your initial contribution to the discussion by two days before the class of that week at mid night and respond to at least one other student's contribution by the day of the class at 11:59pm. Contributions must be substantive--just saying that you agree or disagree without providing reasons is not sufficient to fulfill the assignment. Points will be deducted for initial contributions, and contributions and comments cannot be provided after the discussion closes at 11:59pm on the day before the class. (All time refers to Eastern Time).

Graded Assignments and Group Assignments are due on the day before the class meeting at 11:59pm.

Course project will be released at the 3<sup>rd</sup> week. Mid-point check at 6<sup>th</sup> week, Final report and presentation are required for the final week.

A final examination covering the entire course's content will be given during the Final Exam and Review period.

### **Instructor's Online and In-office Hours**

I will be available via email and respond as soon as I am available (generally within 24-48). For the online discussions, I will check in at least three times per week. Keep in mind that it is not possible for me to respond to every single posting every week (nor is it pedagogically appropriate), but I will be sure to respond to various postings and students each week and attempt to assure equality in terms of responses to students. Furthermore, there is a specific discussion forum that you can use to ensure that you have my attention – to ask questions or to call my attention to a particular discussion you are engaged in that you would like me to take a look at. If you feel you are being neglected in any way, please contact me. When emailing me, please place in the subject line the course number/section and the topic of the email (i.e.,

SSW 565 – Assignment 2 Question). This will help me tremendously in locating your emails quicker.

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### **Office Hours**

Office Hours are a synchronous session (in person or Zoom) to discuss questions related to weekly readings and/or assignments. Office hours will be determined first week of class.

### **Online Etiquette Guidelines**

Your instructor and fellow students wish to foster a safe online learning environment during the online sessions. No matter how different or controversial they may be perceived, all opinions and experiences must be respected in the tolerant spirit of academic discourse. You are encouraged to comment, question, or critique an idea, but you cannot attack an individual. Our differences, some of which are outlined in the University's inclusion statement below, will add richness to this learning experience. Please consider that sarcasm and humor can be misconstrued in online interactions and generate unintended disruptions. Working as a community of learners, we can build a polite and respectful course ambiance. Please read the Netiquette rules for this course:

- Do not dominate any discussion. Allow other students to join in the discussion.
- Do not use offensive language. Present ideas appropriately.
- Be cautious in using Internet language. For example, do not capitalize all letters since this suggests shouting.
- Avoid using vernacular and/or slang language as it could lead to misinterpretation.
- Keep an "open-mind" and be willing to express even your minority opinion.
- Think and edit before you push the "Send" button.
- Do not hesitate to ask for feedback.

### **Class Schedule:**

Module	Week of	Topic	Text Book Chapter	Assignment	Optional Reading	Assignment Due date
1	01/17/24	What is Software Architecture	1-3	Why arch is important(discussion)	1Password upgrade Discussion	01/23/24
2	01/24/24	Building Architecture	4	Quality attribute scenarios(group)		01/30/24
3	01/31/24	Tactics for Quality Attributes	5-6	Group Assignment		02/06/24
4	02/07/24	Tactics for Quality Attributes	7-8	Group Assignment		02/13/24
5	02/14/24	Tactics for Quality Attributes	9-10	Group Assignment		02/20/24
6	02/21/24	Monday Class Schedule on Wed				
7	02/28/24	Tactics for Quality Attributes	11-12	Applying tactics(group)		03/06/24
8	03/07/24	Patterns, Styles & Tactics	13	Using patterns	Garland & Shaw 1994	
9	03/14/24	Spring break				03/13/24
10	03/21/24	Modeling Architecturally Significant Requirements	16	Utility tree construction		03/27/24
11	03/28/24	Solutions of Architectures	16-18	Solutions of Architecture		04/03/24
12	04/04/24	Design strategies	17	Architectural epics(discussion)	Kruchten et al. 2009	04/10/24
13	04/11/24	Documenting architecture, Testing& Arch Reconstruction	18, 19, 20	Arch documentation(discussion)		04/17/24
14	04/18/24	Architecture Evaluation& Economic Analysis	21,23	Checklists	Maranzano 2005	04/23/24
15	04/25/24	Architecture and the Organization	25			
16	05/01/24	Quantum Computing	26			

## COURSE MATERIALS

Textbook(s):

Software Architecture in Practice, 4<sup>th</sup> Edition, by Len Bass, Paul Clements and Rick Kazman. Addison-Wesley are the primary source material for the course; The textbooks are also available online at Stevens library accessing <https://stevens.on.worldcat.org/v2/oclc/825819423> (Links to an external site.).

## COURSE REQUIREMENTS:

**Participation:** Graded Discussions are required for participation. The discussion for each week is due at each Friday noon.

**Homework:** Homework are assigned each week. The homework is due midnight on the day before each week live class meeting.

**Exams:** Midterm and Final exams are required. Both are open-book, take home exam.

## TECHNOLOGY REQUIREMENTS

Baseline technical skills necessary for online courses

- Basic computer and web-browsing skills
- Navigating Canvas

Technology skills necessary for this specific course

- Live web conferencing using Zoom, please update to the latest version as the course progress.
- Recording a slide presentation with audio narration
- Recording, editing, and uploading video via Kaltura

Required Equipment

- Computer: current Mac (OS X) or PC (Windows 7+) with high-speed internet connection
- Webcam: built-in or external webcam, fully installed
- Microphone: built-in laptop or tablet mic or external microphone

Required Software

- Microsoft Word
- Microsoft Excel
- Microsoft PowerPoint

## GRADING PROCEDURES

Grade Item	Assignment	Graded Discussion	Project	Final Exam
% of Final Grade	40%	10%	40%	10%

Grade	Percentage
A	$\geq 93$
A-	$\geq 90$ and $< 93$
B+	$\geq 87$ and $< 90$
B	$\geq 83$ and $< 87$
B-	$\geq 80$ and $< 83$
C	$\geq 70$ and $< 80$
F	$< 70$

## Late Policy

Each week you will be given an assignment. You should submit answers to Canvas. Late submissions may be penalized up to 20% of grade.

## Academic Integrity

### Undergraduate Honor System

Enrollment into the undergraduate class of Stevens Institute of Technology signifies a student's commitment to the Honor System. Accordingly, the provisions of the Stevens Honor System apply to all undergraduate students in coursework and Honor Board proceedings. It is the responsibility of each student to become acquainted with and to uphold the ideals set forth in the Honor System Constitution. More information about the Honor System including the constitution, bylaws, investigative procedures, and the penalty matrix can be found online at <http://web.stevens.edu/honor/>

The following pledge shall be written in full and signed by every student on all submitted work (including, but not limited to, homework, projects, lab reports, code, quizzes and exams) that is assigned by the course instructor. No work shall be graded unless the pledge is written in full and signed.

***"I pledge my honor that I have abided by the Stevens Honor System."***

### Reporting Honor System Violations

Students who believe a violation of the Honor System has been committed should report it within ten business days of the suspected violation. Students have the option to remain anonymous and can report violations online at [www.stevens.edu/honor](http://www.stevens.edu/honor).

### Graduate Student Code of Academic Integrity

All Stevens graduate students promise to be fully truthful and avoid dishonesty, fraud, misrepresentation, and deceit of any type in relation to their academic work. A student's

submission of work for academic credit indicates that the work is the student's own. All outside assistance must be acknowledged. Any student who violates this code or who knowingly assists another student in violating this code shall be subject to discipline.

All graduate students are bound to the Graduate Student Code of Academic Integrity by enrollment in graduate coursework at Stevens. It is the responsibility of each graduate student to understand and adhere to the Graduate Student Code of Academic Integrity. More information including types of violations, the process for handling perceived violations, and types of sanctions can be found at [www.stevens.edu/provost/graduate-academics](http://www.stevens.edu/provost/graduate-academics).

### **Special Provisions for Undergraduate Students in 500-level Courses**

The general provisions of the Stevens Honor System do not apply fully to graduate courses, 500 level or otherwise. Any student who wishes to report an undergraduate for a violation in a 500-level course shall submit the report to the Honor Board following the protocol for undergraduate courses, and an investigation will be conducted following the same process for an appeal on false accusation described in Section 8.04 of the Bylaws of the Honor System. Any student who wishes to report a graduate student may submit the report to the Dean of Graduate Academics or to the Honor Board, who will refer the report to the Dean. The Honor Board Chairman will give the Dean of Graduate Academics weekly updates on the progress of any casework relating to 500-level courses. For more information about the scope, penalties, and procedures pertaining to undergraduate students in 500-level courses, see Section 9 of the Bylaws of the Honor System document, located on the Honor Board website.

## **LEARNING ACCOMMODATIONS**

Stevens Institute of Technology is dedicated to providing appropriate accommodations to students with documented disabilities. The Office of Disability Services (ODS) works with undergraduate and graduate students with learning disabilities, attention deficit-hyperactivity disorders, physical disabilities, sensory impairments, psychiatric disorders, and other such disabilities in order to help students achieve their academic and personal potential. They facilitate equal access to the educational programs and opportunities offered at Stevens and coordinate reasonable accommodations for eligible students. These services are designed to encourage independence and self-advocacy with support from the ODS staff. The ODS staff will facilitate the provision of accommodations on a case-by-case basis.

For more information about Disability Services and the process to receive accommodations, visit <https://www.stevens.edu/office-disability-services>. If you have any questions please contact: Phillip Gehman, the Director of Disability Services Coordinator at Stevens Institute of Technology at [pgehman@stevens.edu](mailto:pgehman@stevens.edu) or by phone 201-216-3748.

### **Disability Services Confidentiality Policy**

Student Disability Files are kept separate from academic files and are stored in a secure location within the Office of Disability Services. The Family Educational Rights Privacy Act (FERPA, 20 U.S.C. 1232g; 34CFR, Part 99) regulates disclosure of disability documentation and records maintained by Stevens Disability Services. According to this act, prior written consent by the student is required before our Disability Services office may release disability

documentation or records to anyone. An exception is made in unusual circumstances, such as the case of health and safety emergencies.

## **INCLUSIVITY**

### **Name and Pronoun Usage**

As this course includes group work and class discussion, it is vitally important for us to create an educational environment of inclusion and mutual respect. This includes the ability for all students to have their chosen gender pronoun(s) and chosen name affirmed. If the class roster does not align with your name and/or pronouns, please inform the instructor of the necessary changes.

### **Inclusion Statement**

Stevens Institute of Technology believes that diversity and inclusiveness are essential to excellence in academic discourse and innovation. In this class, the perspective of people of all races, ethnicities, gender expressions and gender identities, religions, sexual orientations, disabilities, socioeconomic backgrounds, and nationalities will be respected and viewed as a resource and benefit throughout the semester. Suggestions to further diversify class materials and assignments are encouraged. If any course meetings conflict with your religious events, please do not hesitate to reach out to your instructor to make alternative arrangements.

You are expected to treat your instructor and all other participants in the course with courtesy and respect. Disrespectful conduct and harassing statements will not be tolerated and may result in disciplinary actions.

## **MENTAL HEALTH RESOURCES**

Part of being successful in the classroom involves a focus on your whole self, including your mental health. While you are at Stevens, there are many resources to promote and support mental health. The Office of Counseling and Psychological Services (CAPS) offers free and confidential services to all enrolled students who are struggling to cope with personal issues (e.g., difficulty adjusting to college or trouble managing stress) or psychological difficulties (e.g., anxiety and depression). Appointments are can be made by phone (201-216-5177).

## **EMERGENCY INFORMATION**

In the event of an urgent or emergent concern about the safety of yourself or someone else in the Stevens community, please immediately call the Stevens Campus Police at 201-216-5105 or on their emergency line at 201-216-3911. These phone lines are staffed 24/7, year round. For students who do not reside near the campus and require emergency support, please contact your local emergency response providers at 911 or via your local police precinct. Other 24/7 national resources for students dealing with mental health crises include the National Suicide Prevention Lifeline (1-800-273-8255) and the Crisis Text Line (text "Home" to 741-741). If you are concerned about the wellbeing of another Stevens student, and the matter is *not* urgent or time sensitive, please email the CARE Team at [care@stevens.edu](mailto:care@stevens.edu). A member of the CARE Team will respond to your concern as soon as possible.