CS5319/7319 Software Architecture and Design

1. Instructor Information

Dr. LiGuo Huang

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Office: Caruth Hall 421
Office Hours: TBD
Email communication: I strive to respond to course-related emails within 24 hours on weekdays. Inevitably I may overlook some messages; if more than 24 hours has passed during the week days, feel free to send me a reminder.
Phone: (214)-768-3709

2. Course Description

As the size of software system increases, the algorithm and data structures of the computation no longer constitute the major design problems. When systems are constructed from many components, the organization of the overall system -- the software architecture -- presents a new set of design problems. Software architecture has become an area of intense research in the software engineering community. A number of architecture modeling notations and support tools, as well as new architectural styles, have emerged. The focus of architecture-based software development is shifted from lines-of-code to coarser-grained building blocks and their overall interconnection structure. Explicit focus on architecture has shown tremendous potential to improve the current state-of-the-art in software development and alleviate many of its problems. In order to successfully master the required content, students are expected to attend class regularly and participate (as directed) in class discussions.

This course assumes that you have a good background in software technology such as data structures and programming languages (Java, C++, C#, Python, etc.), and concentrates on the software architecture and design issues. Some homework assignments require simple Java programming skills. CS5319/7319 will be organized as a research seminar, with active student participation. This course attempts to enhance the advanced research component in the SMU's software engineering program. It is particularly suited for students interested in pursuing a Ph.D. degree or Doctor of Engineering in software engineering, and for MS/SE students who want to get a firsthand knowledge about the software architecture research affecting their field of study. It comprises the core curriculum of SMU Master of Science majoring in Software Engineering.

3. Course Topics

The course covers the following topics on software architecture and design:

- The key concepts of software architecture
  - Architectures in context
  - Basic concepts in software architecture (components, connectors, etc.)
  - Choosing connectors
  - Designing architectures (architectural styles, patterns, processes, etc.)
- The nuts and bolts of applying the concepts
  - Architecture modeling and notations
  - Architecture recovery
  - Architecture visualization
  - Architecture analysis
- Special topics on software architecture (if time allows)
4. Specific Goals for the Course:

**ABET Outcomes:**
- **CAC (c).** An ability to design, implement, and evaluate a computer-based system, process, component, or program to meet desired needs
- **EAC (c).** An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability

**Other Outcomes:**
- This course includes but is not limited to content that supports the Computer Science and Engineering Program Educational Objectives and Outcomes.

5. Selected Student Learning Outcomes

- Understand roles of software architecting in software engineering process
- Understand key concepts of software architecture
- Master software architectural styles, patterns
- Identify key design problems and select the optimal architectural design
- Recognize and apply architecture modeling techniques
- Recognize and apply architecture visualization techniques
- Perform architecture analysis and implementation

6. Textbooks and Course Material

- Posted lecture notes and papers
- **Recommended:** Mary Shaw and David Garlan, “Software Architecture: Perspectives on an Emerging Discipline”, 1st edition Prentice Hall, 1996

7. Workload and Grading

The course grade each student receives will reflect the weighted average of 3-4 homework assignments, two exams, a final project proposal and final project presentation, demo and deliverables.

A tentative weight of course grading is as follows (Please note that the distribution may be subject to adjustment.):

- Homework (34%)
- Final Project Proposal (2%)
- Final Project Presentation, Demo and Deliverables (19%)
- Exam 1 (22%)
- Exam 2 (23%)

Homework and Project assignments will be posted on the course webpage and submitted onto Canvas. Exams must be submitted in hardcopy. Grades for course assignments (i.e., homework, projects, exams) will be posted on Canvas. Final letter grades will be based on the curve (grade distribution) of the entire class and posted on my.smu. Undergraduate students in CS5319 section will be curved and graded separately with the graduate students in CS7319 sections.
Final project:
Please refer to Project Proposal Guideline and Final Project Presentation, Demo and Deliverable Guideline for details.

Assignment Submission: Please put your Name, SMU ID, Class Section #, Email Address on your title page. In addition, Canvas tends to become slow or unavailable right before the deadline time (depends on your connection speed and traffic to Canvas system). We will not be able to help you if you cannot get your assignment in on time, so submit early. It is you own risk to submit right before the deadline time.

- On-campus students: Homework is due by 11:59pm on the specified due date for on-campus students, unless otherwise noticed.
- Off-campus students: Homework is due by 11:59pm on the specified due date for off-campus students, unless otherwise noticed.

Late Assignment Submission Policy: Late homework will receive a 25% penalty per day. In case of emergencies, please talk to me to make special arrangements. If you are out of town for a non-emergency (e.g., an interview), you should arrange to turn in the assignment early, rather than late, to avoid a penalty.

Collaboration and Attribution: Collaboration is an essential skill for software engineering. I encourage student to collaboration on discussing and studying the course materials. Please do not, however, share answers, code, designs that solve an assignment directly with other students. Solutions to homework should be written or typed from scratch and must not be pieced together from other students.

8. Class Attendance and Participation Policy

On campus students: I expect all on-campus students to attend classes and participate in class discussions. I understand that occasionally circumstances may arise to prevent you from attending class. This is fine, but I would appreciate if you send me an email in advance letting me know the reason that you won’t be able to attend class. Chronically missing class is not acceptable, and I reserve the right to penalize the course grade in the event of persistent absence.

Off campus students: I expect all off-campus students to first watch the class video for the latest course announcements and lectures before delivering your questions. If questions asked have been clearly announced or addressed in the lecture video, I reserve the right to penalize the course grade due to the missing class attendance.

9. Academic Integrity

Academic misconduct of any kind is prohibited by the SMU Student Honor Code. Students must work independently on all individual assignments; collaborating on individual assignments is considered cheating and will be penalized accordingly. All SMU students are responsible for reading and following the SMU Student Honor Code., which prohibits plagiarism of any kind. Some examples of behavior that is not allowed are: copying all or part of someone else’s work (by hand or by looking at others’ files, either secretly or if shown), and submitting it as your own; giving another student a copy of your assignment solution; consulting with another student during an exam; and copying text from published literature without proper attribution. If you have questions about what is allowed, please discuss it with the instructor.

Students who violate University standards of academic integrity are subject to disciplinary sanctions, including failure in the course and suspension from the University. Since dishonesty in any form harms the individual, other students, and the University, policies on academic integrity have been and will be strictly enforced.
10. University Policies

Academic Dishonesty. Academic dishonesty may be defined broadly as a student's misrepresentation of his or her academic work or of the circumstances under which the work is done. This includes plagiarism in all papers, projects, take-home exams, or any other assignments in which the student represents work as being his or her own. It also includes cheating on examinations, unauthorized access to test materials, and aiding another student to cheat or participate in an act of academic dishonesty. Failure to prevent cheating by another may be considered as participation in the dishonest act.

Honor Code. Intellectual integrity and academic honesty are fundamental to the processes of learning and evaluating academic performance; maintaining them is the responsibility of all members of an educational institution. The inculcation of personal standards of honesty and integrity is a goal of education in all the disciplines of the University. The faculty has the responsibility of encouraging and maintaining an atmosphere of academic honesty by being certain that students are aware of the value of it, that they understand the regulations defining it, and that they know the penalties for departing from it. The faculty should, as far as is reasonably possible, assist students in avoiding the temptation to cheat. Faculty must be aware that permitting dishonesty is not open to personal choice. A professor or instructor who is unwilling to act upon offenses is an accessory with the student offender in deteriorating the integrity of the University. Students must share the responsibility for creating and maintaining an atmosphere of honesty and integrity. Students should be aware that personal experience in completing assigned work is essential to learning. Permitting others to prepare their work, using published or unpublished summaries as a substitute for studying required materials, or giving or receiving unauthorized assistance in the preparation of work to be submitted are directly contrary to the honest process of learning. Students who are aware that others in a course are cheating or otherwise acting dishonestly have the responsibility to inform the professor and/or bring an accusation to the Honor Council. Students and faculty must mutually share the knowledge that any dishonest practices permitted will make it more difficult for the honest students to be evaluated and graded fairly, and will damage the integrity of the whole University. Students should recognize that their own interest, and their integrity as individuals, suffer if they condone dishonesty in others. (SMU Honor Code)

The Honor System. All undergraduate students at SMU are under the jurisdiction of the Honor Code, and as such will be required to sign a pledge to uphold the Honor Code. The Honor Council is composed of 22 students appointed by the Student Senate to represent the undergraduate schools and classes of the University. The Council’s responsibility is to maintain and promote academic honesty. Students are required to warn or to report to the Honor Council or faculty any student suspected of violating the Honor Code, and to inform the instructor of a course in which violations are suspected that he or she may not be achieving an atmosphere conducive to academic honesty. Suspected violations reported to the Honor Council by a student or by an instructor will be investigated and, if the evidence warrants it, a hearing will be held by a Board composed of five members of the Honor Council. Suspected cases of academic dishonesty may be either handled privately by the appropriate faculty member in whose class the alleged infraction occurred, or referred to the Honor Council. Appeals of actions by the Honor Council shall be submitted to the All-University Judicial Council in writing no later than three class days after the hearing. Appeals of actions taken by instructors independently of the Honor Council may be made through the traditional academic routes.

Disability Accommodations: Students needing academic accommodations for a disability must first register with Disability Accommodations & Success Strategies (DASS). Students can call 214-768-1470 or visit http://www.smu.edu/Provost/SASP/DASS to begin the process. Once approved and registered, students will submit a DASS Accommodation letter to faculty through the electronic portal DASS Link and then communicate directly with each instructor to make appropriate arrangements. Please note that accommodations are not retroactive and require advance notice to implement.

Religious Observance: Religiously observant students wishing to be absent on holidays that require missing class should notify their professors in writing at the beginning of the semester, and should discuss with them, in
advance, acceptable ways of making up any work missed because of the absence. (https://www.smu.edu/StudentAffairs/ChaplainandReligiousLife/ReligiousHolidays).

**Excused Absences for University Extracurricular Activities:** Students participating in an officially sanctioned, scheduled University extracurricular activity should be given the opportunity to make up class assignments or other graded assignments missed as a result of their participation. It is the responsibility of the student to make arrangements with the instructor prior to any missed scheduled examination or other missed assignment for making up the work. (See 2020-2021 SMU Undergraduate Catalog under “Enrollment and Academic Records/Enrollment Policies/Excused Absences.”).

**Student Academic Success Programs:** Students needing assistance with writing assignments for SMU courses may schedule an appointment with the Writing Center through Canvas. Students wanting support with subject-specific tutoring or success strategies should contact SASP, Loyd All Sports Center, Suite 202; 214-768-3648; https://www.smu.edu/sasp.

**Caring Community Connections (CCC) program:** This is a resource for anyone in the SMU community to refer students of concern to the Office of the Dean of Students. Faculty play a critical role in identifying students who are experiencing challenges, as you may be the first to notice a change in behavior such as class attendance or performance. The online referral form can be found at smu.edu/deanofstudentsccc. After a referral is submitted, students will be contacted to discuss the concern, strategize options, and be connected to appropriate resources. Additionally, should you have concerns about students and are unclear about what to do, please see the CCC Reference Guide, or contact the Office of the Dean of Students at 214-768-4564.

**Pregnant and Parenting Students:** Accommodations for pregnant and parenting students: Under Title IX students who are pregnant or parenting may request academic adjustments by contacting Elsie Johnson (elsiej@smu.edu) in the Office of the Dean of Students, or by calling 214-768-4564. Students seeking assistance must schedule an appointment with their professors as early as possible, present a letter from the Office of the Dean of Students, and make appropriate arrangements. Please note that academic adjustments are not retroactive and, when feasible, require advance notice to implement.

**Covid-19 Attendance Statement:** Students who are experiencing COVID-19 symptoms or who have been notified through contact tracing of potential exposure and need to self-quarantine or isolate must follow the protocols laid out in SMU’s Contact Tracing Protocol. To ensure academic continuity, students in these situations will not be penalized and will be provided appropriate modifications to assignments, deadlines, and testing. Please also note that SMUFlex classes might, in rare circumstances, go remote for two week periods to accommodate COVID-related issues. To ensure these necessary accommodations, affected students must:

- Provide as much advance notification as possible to the instructor about a change in circumstances. Students must notify their instructor about a potential absence as well as plans for a return to class. For cases in which students test positive for COVID-19, they should fill out a CCC form at this link
- Communicate promptly with the instructor to establish, as necessary, alternative assignments and/or changes to deadlines and exams. Students are then responsible for meeting the expectations laid out in these alternative arrangements.
- Continue participation in class via Zoom, as health circumstances permit. Attend class regularly, when not in a situation outlined above, in accordance with safety measures laid out by SMU CAN in the Pledge to Protect (including wearing masks, maintaining social distancing, and cleaning personal space after class). In-person participation in SMUFlex classes is required on students’ assigned red/blue rotation days except in cases when students are experiencing illness, are in self-quarantine or in isolation.
- Students facing multiple or extended COVID-19-related absences or illness can work with the Office of the Dean of Students to consider options such as fully remote learning or medical withdrawal.

This policy, aligned with the SMU Honor Code and the SMU Pledge to Protect relies on mutual trust and respect between students and faculty to ensure safety, academic integrity, and instructional continuity.

**Sexual Harassment:** All forms of sexual harassment including sexual assault, dating violence, domestic violence and stalking are violations of SMU’s Title IX Sexual Harassment Policy and may also violate Texas law. Students who wish to file a complaint or receive more information about the grievance process may contact Samantha Thomas, SMU’s Title IX Coordinator, at accessequity@smu.edu or 214-768-3601. Please note that faculty are mandatory reporters. If students notify faculty of sexual harassment, they must report it to the Title IX Coordinator. For more information about sexual harassment including resources available to assist students, please visit [www.smu.edu/sexualmisconduct](http://www.smu.edu/sexualmisconduct).

**11. COVID-19 Special Instructions and Policies**

To be announced in class.

**12. Make-up Class Due to Inclement Weather**

- Pre-recorded lecture via zoom is uploaded to Canvas to make up the cancelled class on Wednesday, Feb. 17
- **Reading Day, Tuesday, May 4:** Make-up day (virtual class on zoom) for the class cancelled Wednesday, Feb. 17,

**13. Disclaimer**

Please note that this syllabus is subject to change based on the learning progress in class during the semester.