Texas Tech University
Department of Computer Science

Course Name: Special Topic in Software Engineering: Software Security
(This course was offered as Secure Software Development in Summer 2020; Must not take this course if you took Secure Software Development previously.)

Number: CS4331-D11; CS5332-D03/D10 **Semester:** 1st Summer, 2021
Class room: Online class **Class Hours:** 10:00 -11:50 (MTWRF)

Instructor: Michael (Eonsuk) Shin **Office:** EC311 **Email:** michael.shin@ttu.edu
Instructor Office Hours: 12:00-1:00 (MWF)

TA: Samira Talebi **TA-Office:** TBA **TA-Email:** stalebi@ttu.edu
TA-Office Hours: 9 am - 10 am (MTWRF)
Zoom Meeting with TA:
https://us04web.zoom.us/j/8287391449?pwd=ZFJHL25IZENJRFFDdjFyS1BabmZRQT09
Meeting ID: 828 739 1449
Passcode: v87Y7V

Catalog Listing: Fundamental concepts and engineering processes to specify and design secure software. Topics include threat modeling, secure software requirements modeling, secure architectural design, and secure development.

Text (required): No Textbook

References:

- Sommerville, "Software Engineering," 10th edition, 2015.
- C. P. Pfleeger and S. L Pfleeger, "Security in Computer," 4th edition, Prentice Hall, 2006.
- H. Gomaa, "Software modeling and design: UML, use cases, patterns, and software architectures," Cambridge University Press, 2011.
- M. Schumacher, E.B. Fernandez, D. Hybertson, F. Buschmann, and P. Sommerlad, "Security Patterns: Integrating Security and Systems Engineering," Wiley, 2006.
- E. Fernandez-Buglioni, "Security patterns in practice: designing secure architectures using software patterns," John Wiley & Sons, 2013.
- Selected Papers

Course Objectives:

The purpose of this course is to introduce theories, methods, and tools for software security to develop secure software systems. Students who succeed in this course will:
1. Understand the basic concepts of security
2. Understand threat modeling
3. Know specification and analysis of secure requirements
4. Understand the approaches for designing secure software
5. Know techniques for security program analysis and assurance

Key Topics:

Basic concepts and theory of information security Threat modeling and analysis Specification and analysis of secure requirements Design of secure software architecture Analysis of security program Security assurance

Course Prerequisites: CS 3365 (Software Engineering) or CS5373 or Instructor Permission

Expected prior knowledge and skills: The successful student should have competent object-oriented modeling, web or app-based, multi-threaded programming, and software engineering skills.

Lectures and Videos:

- All lectures will be given in real-time (synchronously) at a class time using Blackboard Collaborate Ultra.
- You can attend real-time lectures by clicking "Online-Lecture" on the left of the blackboard for this class, which leads you to class sessions. Click the class date session to join the class.
- Recorded class videos may be available on Mediasite at https://engrmediacast.ttu.edu/mediasite/mymediasite/channels/0a2e1016622049bfbabc2e2d6414ab8c5f
- Class material, including lecture notes, homework, project, and exams, is available on the blackboard.

Grading Policy:

The final grade for this course is based on homework, project, and exams:

- Homework: 20%
    - Homework must be submitted to the blackboard by the due.
    - Late submission will not be accepted. However, your late submission may be graded with a 30% penalty if you get instructor permission and submit it by the new deadline.
    - Your wrong or empty homework files submitted to the blackboard will not be graded. However, your new submission can be graded with a 30% penalty if you get instructor permission and submit it by the new deadline.
    - You must email your homework to TA with CC to the instructor immediately if you cannot submit your assignment to the blackboard because of its technical problems.
    - Check if you have uploaded your homework to the blackboard successfully after your submission.
    - Review your homework with your TA in a given period if you have any questions.

- Project: 35%
    - The instructor will give you a team-based project with the description.
    - CS 4331:
        - There is just one project.
            - The instructor will give you a team-based project with the description.
        - Project: Secure application development (35%)
            - Threat modeling, security requirements modeling
            - Implementation

        - Web-based (or app-based) or multi-threaded based implementation
        - Presentation

    - CS5332
        - Project 1: Secure application analysis and design (20%)
            - Threat modeling, security requirements modeling, and design of secure software architecture, presentation (if we have time), but no implementation.
        - Project 2: Survey of Application Security (15%)
            - Investigate the security challenges and possible countermeasures,
            - summarize it with a PowerPoint and present it, but no need to write a document (or paper).
            - The instructor will give a list of the applications.
    - The instructor and TA will organize the project teams in the class, each of which will have three or four members.
    - Cross Evaluation
        - A member in a team will evaluate the other members' project contributions in the team at the end of the project due.
        - The instructor will give you a template to assess your team members.
        - For example, suppose that Alex receives its contributions, 70%, 70%, and 70%, by the other three contributed 100% each. Alex's final contribution is 70%, and each three member's contribution is 110%. 100 – 70 = 30%; 30/3=10%. Each three-member will get 10% extra. Note that only the members who have contributed 100% can receive the extra contribution.
        - If you evaluate other members with less than 100%, you must submit the justification of your evaluation.
        - Your final project grade is a portion of your contribution to the team project grade.

- Exam 45% (Exam1: 15%, exam2: 15%, Final Exam: 15%)
    - Exam dates scheduled:
        - Exam 1: 6/11/2021
        - Exam 2: 6/18/2021
        - Exam 3: 6/25/2021
    - The instructor can give you a make-up exam if you justify it. You may get a 30% penalty if the instructor does not accept your justification.

- The usual grading scale is **A (90-100), B (80-89), C (70-79), D (60-69), F (0-59)**.
    - This scale may be subject to class performance.
- It is your responsibility to attend the class and check the blackboard regularly to get any announcements.
- Beyond the conditions described above, the instructor will make all decisions.

Course Schedule: This schedule is tentative and may be changed depending on the student's comprehension of the material and time.

Week 1: June 2-4
- Introduction to software security
- Security Basics

Week 2: June 7-11

- 25 Top Software Security Errors
- Use case model, class model, and object interaction model
- Threat modeling

Week 3: June 14-18

- Secure requirements modeling
- Security Failure Tolerant requirements specification
- Secure software architecture

Week 4: June 21-25

- Secure connectors
- Secure software architectural patterns
- Analysis for secure software
- Security assurance
- Secure programming – Java and security (if available)

Week 5: June 28 – July 1

- Project presentation
- Wrap up class

July 5 – Final Grade Due

Student Name and Gender Identity. Class rosters are provided to the instructor with the student's legal name. I will gladly honor your request to address you by an alternate name or gender pronoun. Please advise me accordingly early in the semester so that I may make appropriate changes to my records.

Inclusive Language. You are expected to treat your instructor and all other participants in the course with courtesy and respect. Your comments to others should be factual, constructive, and free from harassing statements. You are encouraged to disagree with other students, but such disagreements need to be based upon facts and documentation (rather than prejudices and personalities). It is the instructor's goal to promote an atmosphere of mutual respect in the classroom. Please contact the instructor if you have suggestions for improving the classroom environment. It is preferable if students discuss issues directly with the instructor.

Religious Holy Day Statement: "Religious holy day" means a holy day observed by a religion whose places of worship are exempt from property taxation under Texas Tax Code §11.20. A student who intends to observe a religious holy day should make that intention known in writing to the instructor prior to the absence. A student who is absent from classes for the observance of a religious holy day shall be allowed to take an examination or complete an assignment scheduled for that day within a reasonable time after the absence. A student who is excused under section 2 may not be penalized for the absence; however, the instructor may respond appropriately if the student fails to complete the assignment satisfactorily.

Discrimination, Harassment, and Sexual Violence Statement: Texas Tech University is committed to providing and strengthening an educational, working, and living environment where students, faculty, staff, and visitors are free from gender and/or sex discrimination of any kind. Sexual assault, discrimination, harassment, and other Title IX violations are not tolerated by the University. Report any incidents to the Office for Student Rights & Resolution, (806)-742-SAFE (7233) or file a report online at titleix.ttu.edu/students. Faculty and staff members at TTU are committed to connecting you to resources on campus. Some of these available resources are: TTU Student Counseling Center, 806-742-3674, https://www.depts.ttu.edu/scc/ (Provides confidential support on campus.) TTU 24-hour Crisis Helpline, 806-742-5555, (Assists students who are experiencing a mental health or interpersonal violence crisis. If you call the helpline, you will speak with a mental health counselor.) Voice of Hope Lubbock Rape Crisis Center, 806-763-7273, voiceofhopelubbock.org (24-hour hotline that provides support for survivors of

sexual violence.) The Risk, Intervention, Safety and Education (RISE) Office, 806-742-2110, https://www.depts.ttu.edu/rise/ (Provides a range of resources and support options focused on prevention education and student wellness.) Texas Tech Police Department, 806-742-3931, http://www.depts.ttu.edu/ttpd/ (To report criminal activity that occurs on or near Texas Tech campus.)

LGBTQIA Support Statement*: I identify as an ally to the lesbian, gay, bisexual, transgender, queer, intersex, and asexual (LGBTQIA) community, and I am available to listen and support you in an affirming manner. I can assist in connecting you with resources on campus to address problems you may face pertaining to sexual orientation and/or gender identity that could interfere with your success at Texas Tech. Please note that additional resources are available through the Office of LGBTQIA within the Center for Campus Life, Student Union Building Room 201, www.lgbtqia.ttu.edu, 806.742.5433.

Office of LGBTQIA, Student Union Building Room 201, www.lgbtqia.ttu.edu, 806.742.5433 within the Center for Campus Life, the Office serves the Texas Tech community through facilitation and leadership of programming and advocacy efforts. This work is aimed at strengthening the lesbian, gay, bisexual, transgender, queer, intersex, and asexual (LGBTQIA) community and sustaining an inclusive campus that welcomes people of all sexual orientations, gender identities, and gender expressions.

Ethical Conduct: Although students are encouraged to discuss ideas and problems with the TA, instructor, and other students, academic dishonesty will not be tolerated. Unless stated otherwise by the instructor, you are not allowed to share code or answers, use or even look at code or answers obtained from online sources, friends, or classmates. It is your responsibility to educate yourself about actions that constitute academic dishonesty. If you are not sure whether a specific action is allowed, talk to the instructor and the TA before you indulge in it. All submitted code and assignments will be randomly checked for plagiarism. Academic dishonesty of any kind, if discovered, will result in one or more of the following sanctions: a grade of 0 for the corresponding graded item, a grade of "F" in the course, and further action according to the TTU operating procedures: http://www.depts.ttu.edu/opmanual/OP34.12.pdf.

- Cheating will not be tolerated on any work done throughout the semester.
- The first offense will result in an F for that assignment, and the second offense will result in an F in the course. Both offenses must be reported to Student Judicial Programs.
- Cheating is considered to be any collaboration beyond basic discussion for anything unless specifically announced by the instructor. See Statement of Academic Conduct for Engineering Students, College of Engineering, for further information.
- "Students are expected to assist in maintaining a classroom environment that is conducive to learning. In order to assure that all students have the opportunity to gain from time spent in class unless otherwise approved by the instructor, students are prohibited from engaging in any form of distraction. Inappropriate behavior in the classroom shall result, minimally, in a request to leave class."

Student with Disabilities: Any student who, because of a disability, may require special arrangements in order to meet the course requirements should contact the instructor as soon as possible to make any necessary arrangements. Students should present appropriate verification from Student Disability Services during the instructor's office hours. Please note instructors are not allowed to provide classroom accommodations to a student until appropriate verification from Student Disability Services has been provided. For additional information, you may contact the Student Disability Services office at 335 West Hall or 806-742-2405.

Civility in the Classroom Statement: Texas Tech University is a community of faculty, students, and staff that enjoys an expectation of cooperation, professionalism, and civility during the conduct of all forms of university business, including the conduct of student-student and student-faculty interactions in and out of

the classroom. Further, the classroom is a setting in which an exchange of ideas and creative thinking should be encouraged and where intellectual growth and development are fostered. Students who disrupt this classroom mission by rude, sarcastic, threatening, abusive, or obscene language and/or behavior will be subject to appropriate sanctions according to university policy. Likewise, faculty members are expected to maintain the highest standards of professionalism in all interactions with all constituents of the University (www.depts.ttu.edu/ethics/matadorchallenge/ethicalprinciples.php).

Center for Campus Life: The Center for Campus Life can assist in notifying the campus community of student illnesses, immediate family deaths and/or student death. Generally, in cases of student illness or immediate family deaths, the notification to the appropriate campus community members occurs when a student is absent from class for four consecutive days with appropriate verification. It is the student's responsibility for missed class assignments and/or course work during their absence.

Illness Based Absence Policy: If at any time during this semester you feel ill, in the interest of your own health and safety as well as the health and safety of your instructors and classmates, you are encouraged not to attend face-to-face class meetings or events. Please review the steps outlined below that you should follow to ensure your absence for illness will be excused. These steps also apply to not participating in synchronous online class meetings if you feel too ill to do so and missing specified assignment due dates in asynchronous online classes because of illness.

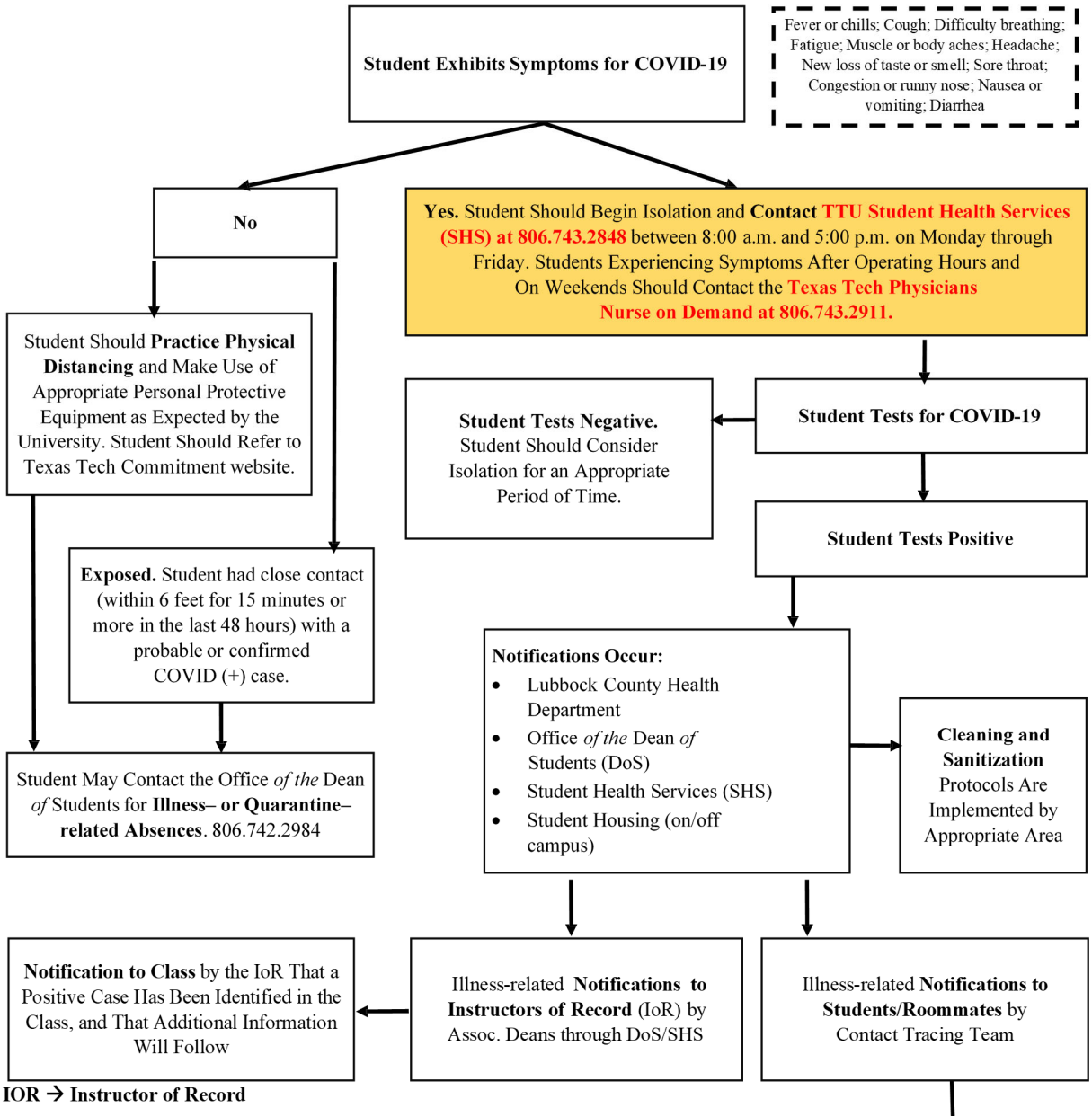
1. If you are ill and think the symptoms might be COVID-19-related:
   a. Call Student Health Services at 806.743.2848 or your health care provider.
   b. Self-report as soon as possible using the Office of the Dean of Students website. This website has specific directions about how to upload documentation from a medical provider and what will happen if your illness renders you unable to participate in classes for more than one week.
   c. If your illness is determined to be COVID-19-related, all remaining documentation and communication will be handled through the Office of the Dean of Students, including notification of your instructors of the period of time you may be absent from and may return to classes.
   d. If your illness is determined not to be COVID-19-related, please follow steps 2.ad below.

2. If you are ill and can attribute your symptoms to something other than COVID-19:
   a. If your illness renders you unable to attend face-to-face classes, participate in synchronous online classes, or miss specified assignment due dates in asynchronous online classes, you are encouraged to visit with either Student Health Services at 806.743.2848 or your health care provider. Note that Student Health Services and your own and other health care providers may arrange virtual visits.
   b. During the health provider visit, request a "return to school" note;
   c. Email the instructor a picture of that note;
   d. Return to class by the next class period after the date indicated on your note.

Following the steps outlined above helps to keep your instructors informed about your absences and ensures your absence or missing an assignment due date because of illness will be marked excused. You will still be responsible to complete within a week of returning to class any assignments.

TEXAS TECH UNIVERSITY
Student Affairs

COVID-19 Positive Student Test Notification and Protocol



** IOR → Instructor of Record

This document is intended to be a general guide. Circumstances regarding individual students will vary.

The COVID-19 Helpline is available for students, staff, and faculty at TTU and TUHSC. Callers who think they may have COVID-19 will be able to speak with a nurse.

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