

**The University of Texas at El Paso
Department of Computer Science
CS 4387/5387 – Software Integration and V&V
Spring 2023 Syllabus**

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General Information

Instructor:

| | |
|---------------|--|
| Name: | Bhanukiran Gurijala |
| Email: | bgurijala@utep.edu |
| Office: | CCSB 3.0604 |
| Office Phone: | (915) 747-5827 |
| Office Hours: | MW 3:00 – 4:00 PM Or By appointment |
| Dates: | January 17, 2023 – May 12, 2023 |

Class Information

| | | |
|-------|---------------------|--|
| CRN: | 22491/21614 | |
| Time: | R 6:00 PM – 8:50 PM | CCSB G.0208 |
| TA: | Jannatun Jotey | injotey@miners.utep.edu |

Important Dates:

January 17, 2023 – First Day of Classes

February 1, 2023 – Census Day

March 30, 2023 – Drop/Withdraw Deadline (Automatic W)

May 4, 2023 – Last day of Classes

May 5, 2023 – Dead Day

May 11, 2023 – Final Exam (7:00 PM – 9:45 PM)

Please communicate with the instructor or TA anytime you have questions, concerns, or wish to discuss anything. Reach out as often and frequently as necessary so that you may succeed.

NOTE: When emailing the instructor or TA please use [CS 4387/5387 SP23] in the subject.

Course Description:

This course will provide students with an in-depth study of software validation and verification. Topics include the limits of testing, professional responsibility and liability, testing, management of the testing process, automated testing tools, coverage metrics, software quality, non-testing quality assurance, static and dynamic validation techniques, inspections, and audits.

Prerequisites:

CS 3331 with a grade of C or better

- Knowledge of software development life cycles
- experience in the development of software-reliant systems
- some familiarity with modern software engineering concept

Supplemental Book (Not required):

- Aditya Mathur, *Foundations of Software Testing*, Pearson Publishing, 2008.
- Paul Jorgensen, *Software Testing, A Craftsman's approach*, Auerbach Publications, 2007
- Lee Copeland, *A practitioner's Guide to Software Test Design*, STQE Publishing, 2004

Objectives & Outcomes

Course Objectives:

The objective of this course is to prepare students to understand the role of ensuring quality in software development, recognizing its role from the elicitation, analysis, and specification of requirements through to the delivery and operation of a software system. The focus will be achieving quality through sound software engineering practices. Students will learn techniques for analyzing software artifacts throughout the life cycle and how to incorporate these techniques in software development activities to help ensure quality.

Course materials:

All the course materials will be available through **Blackboard**. Please check Blackboard regularly to stay updated with the class.

Learning Outcomes

Level 1: Knowledge and Comprehension

Level 1 outcomes are those in which the student has been exposed to the terms and concepts at a basic level and can supply basic definitions. The material has been presented only at a superficial level.

Upon successful completion of this course, students will be able to:

- 1a. Know the purpose of and differentiate among audits, inspections, and walk-throughs.
- 1b. Define quality attributes such as availability, correctness, efficiency, interoperability, maintainability, portability, reliability, reusability, security, simplicity, testability, and usability.
- 1c. Describe different categories of test coverage of code.
- 1d. Describe different test levels (including unit, integration, system, acceptance, regression, installation, alpha and beta, performance, stress, usability, and reliability).
- 1e. Describe the test development techniques including those based on ad-hoc, exploratory, equivalence class, boundary value, data flow, and control flow.
- 1f. Discuss the main ethical considerations related to software assurance.
- 1g. Describe the differences between traditional and object-oriented testing.

Level 2: Application and Analysis

Level 2 outcomes are those in which the student can apply the material in familiar situations, e.g., can work a problem of familiar structure with minor changes in the details.

Upon successful completion of this course, students will be able to:

- 2a. Conduct a technical review including inspections, walkthroughs and audits.
- 2b. Use software testing tools and frameworks for verification and validation tools.

Level 3: Synthesis and Evaluation

Level 3 outcomes are those in which the student can apply the material in new situations. This is the highest level of mastery.

Upon successful completion of this course, students will be able to:

- 3a. Develop white-box and black-box test cases.
- 3b. Conduct unit and integration testing.
- 3c. Develop a test plan for a large system.
- 3d. Develop test cases that meet white box coverage criteria such as branch, condition, and def-use coverage.

- 3e. Develop test cases based on decision tables.
- 3f. Develop test cases that meet functional coverage criteria.

Policies & General Information

Grading:

| | |
|---|------------------------------|
| Attendance and Participation | 5% |
| Homework/In-class Assignments | 15% |
| Quizzes | 10% |
| Midterm | 20% (Undergrads) 15% (Grads) |
| Final Exam | 25% (Undergrads) 20% (Grads) |
| Team Project and Presentations | 25% |
| Research Work Deliverable and Presentations | 10% (Grad only) |

The nominal percentage-score-to-letter-grade conversion is as follows:

- 90% or higher is an A
- 80-89% is a B
- 70-79% is a C
- 60-69% is a D
- below 60% is an F

The instructor reserves the right to adjust these criteria downward, e.g., so that 88% or higher represents an A, based on overall class performance. The criteria will not be adjusted upward, however.

Anyone found cheating on an exam will receive an automatic F in the course.

Attendance and Participation:

Attendance and participation in all lecture sessions are critical factors of your success in this course. Students should be **on time** for all scheduled sessions and **attend the entire session**. Attendance will be taken at every session and will count towards your grade. Attendance may be taken through iClicker, Blackboard, sign-in sheets, rollcall, visual attendance by instructional team, or other means. It is required that you attend each session. Failure to attend the class will result in poor performance in the course. Please come prepared for all sessions. Please inform the instructor and TA if you will be late or absent from class.

Students should notify the instructor prior to missing a session if possible, and certainly right after if earlier was not possible. It is the student's responsibility to obtain the content covered during missed class(es). Participation points also include participating in class discussions, completing post-lecture online quizzes (when applicable) that are administered as surveys to monitor students' overall progress and potential struggles. Any assignments due on the date of the absence will be considered late if not turned in as specified by the assignment guidelines unless an exception is granted by the instructor. Points lost due to an unexcused absence may not be made up. Any points lost due to an excused absence will need to be made up by arrangement with the instructor.

Homework/In-Class Assignments:

Reading, non-programming homework, in-class exercises, special reports, and programming assignments will be posted on Blackboard. It is your responsibility to check Blackboard for all assignments. The work can be individual, or group based as specified in the instructions of the assignment. If you need help, consult the TA, or the instructor. All assignment submissions must be newly attempted, never used original work. A late penalty of 10% will be assessed for every 24 hours. The work will be accepted up to five (5) days from the submission deadline with late penalty, beyond which it will not be accepted. There is no make-up for in-class exercises.

Quizzes:

The purpose of each quiz is to ensure that you are staying current with the class content weekly reading and to verify that you have acquired the skills developed in class. Quizzes will usually be paper-based, or online quizzes on Blackboard, or other platform(s) as mentioned in the class. Quizzes may make use of test proctoring software such as, Respondus Lockdown Browser and Respondus Monitor inside of Blackboard to promote academic integrity. You are encouraged to learn more about how to use these programs prior to the first quiz. There will be **no make-up** for missed quizzes.

Exams:

There will be one midterm and one final exam. Exams may be posted and submitted through Blackboard with appropriate due dates listed. The purpose of the exams is to allow you to demonstrate mastery of course concepts.

The purpose of the midterm exams is to allow you to demonstrate mastery of course concepts covered thus far during the semester. Mid-term exams will take place during the regular lecture session. You will receive an announcement (i.e., in-class, email, Blackboard, etc.) at least one week prior to an exam. The midterm exam is worth 20% of the course grade for undergraduate students and 15% of the course grade for graduate students.

The final exam will be comprehensive. You must take the final exam during the time shown in the schedule for the lecture section that you normally attend. If you have a scheduling conflict (e.g., if you are taking a final at EPCC) or if you are scheduled for three final exams in one day, see your instructor in advance for accommodation. The final exam is worth 25% of the course grade for undergraduate students and 20% of the course grade for graduate students.

Make-up exams will be given only in extremely unusual circumstances. If you must miss an exam, please meet with the instructor BEFORE the exam. Unless in extreme circumstances and at the discretion of the instructor, students who miss an exam will not be able to make-up the exam.

Exams may make use of test proctoring software such as, Respondus Lockdown Browser and Respondus Monitor inside of Blackboard to promote academic integrity. You are encouraged to learn more about how to use these programs prior to the first exam. You may be required to provide a photo ID (i.e., Miner Gold card, Drivers License, etc.) to your exam. You may also be required to have an assigned seat during the exam. Students should avoid leaving the classroom during exams – you may be requested to submit your exam prior to leaving.

Team Project and Presentations:

Students will work in teams for the team project to gain hands-on experience in software testing, V&V, and quality assurance practices (may involve developing a software product). Each team will be required to deliver a set of artifacts associated with the different levels of software testing. The individual student grade on the project will be a combination of an evaluation of the overall completeness and quality of the product deliverables, project presentations and reviews, and the contribution of the individual to the team effort (that may be measured by self and peer evaluations and other means as will be discussed). A late penalty of 10% will be assessed for every 24 hours. Accompanying reports if any must be turned in with the source code, should be typed and submitted as a PDF. The project parts may need to be demoed to the TA, or instructor. The team will demo their final project deliverable and present it to the entire class.

Research Work Deliverables and Presentations:

The research work deliverable and presentations component are only applicable to graduate students. All graduate students will be surveying some topics related to software integration and V&V as assigned by the instructor or approved by the instructor. They will create a report of their findings and present it to the entire class. This component is worth 10% of the course grade for graduate students only.

Technology:

Course content is delivered via the Internet through the Blackboard learning management system (LMS), supplemented by Microsoft Teams, Zoom, or the like. Ensure your UTEP MINERS account is working and that you have access to the Internet. You may use any of the primary Web browsers—Edge, Google Chrome, Firefox, Safari, etc. When having technical difficulties, try switching to another browser.

The use of laptops, cell phones, or tablets of any kind, will be necessary for this course (homework). It may be necessary to have a cell phone with a PDF Scanning App (Adobe Scanner, Notes (iPhone), CamScanner, etc.) to scan homework assignments. You may use a tablet (iPad, Surface Pro, etc.) to handwrite certain homework assignments and submit as PDF documents.

You may need to have access to a computer/laptop, printer, scanner, a webcam, and a microphone. Additionally, you may be required to submit video recordings during the semester – this can be done using a phone camera, webcam, and/or video camera. You will need to download or update the following software: Microsoft Office, Adobe, Flash player, Windows Media Player, QuickTime, and Java. Check that your computer hardware and software are up-to-date and able to access all parts of the course. If you encounter technical difficulties of any kind, contact the [Help Desk](#).

You are not authorized to use any online services that is not licensed by UTEP, including, but not limited to Discord, Twitch, WhatsApp, or GroupMe. You should not use these services for communication, collaboration, or the like in any way with respect to this course. You are only permitted to use Microsoft Teams, Microsoft Office (Licensed through your Miners account), and Blackboard.

Students are permitted to use iPad/Tablets to handwrite notes. Students are not permitted to use their iPad/Tablet to browse the internet or use any other applications that are not related to the course. Students who use unauthorized applications during class time will be no longer be permitted to use the iPad/Tablet for note taking. Students should take notes by hand and not by typing. Students should avoid the use of laptops or cell phones during class unless indicated by the instructor.

Incomplete Policy:

Incomplete grades may be requested only in exceptional circumstances after you have completed at least half of the course requirements. Talk to me immediately if you believe an incomplete is warranted. If granted, we will establish a contract of work to be completed with deadlines.

Drop Policy:

You will not be dropped by the instructor in this course. However, if you feel that you are unable to complete the course successfully, please let me know and then contact the Registrar's Office to initiate the drop process. If you do not, you are at risk of receiving an "F" for the course.

Accommodations Policy:

UTEP is committed to providing reasonable accommodations and auxiliary services to students, staff, faculty, job applicants, applicants for admissions, and other beneficiaries of University programs, services and activities with documented disabilities in order to provide them with equal opportunities to participate in programs, services, and activities in compliance with sections 503 and 504 of the Rehabilitation Act of 1973, as amended, and the Americans with Disabilities Act (ADA) of 1990 and the Americans with Disabilities Act Amendments Act (ADAAA) of 2008. Reasonable accommodations will be made unless it is determined that doing so would cause undue hardship on the University. Students requesting an accommodation based on a disability must register with the UTEP Center for Accommodations and Support Services (CASS); please contact the office at (915) 747-5148, or by email to cass@utep.edu. Students are required to discuss their accommodations with the instructor for a proper plan to be made.

Standards of Conduct, Academic Dishonesty, and Other Information

Copyright Statement for Course Materials:

All materials used in this course are protected by copyright law. The course materials are only for the use of students currently enrolled in this course and only for the purpose of this course. It is not permitted to share, reproduce, or alter any assignment for any purpose. Students are not permitted from sharing code, uploading assignments online in any form, or viewing/receiving/modifying code written from anyone else. Assignments are part of an academic course at The University of Texas at El Paso and a grade will be assigned for the work produced individually by the student.

Class Recordings:

Course lectures may be recorded by the instructor/department. Students are not permitted to record the course (i.e., video, audio, etc.) without expressed permission from the instructor.

The use of recordings will enable you to have access to class lectures, group discussions, and so on in the event you miss a synchronous or in-person class meeting due to illness or other extenuating circumstance. Our use of such technology is governed by the Federal Educational Rights and Privacy Act (FERPA) and UTEP's acceptable-use policy. A recording of class sessions will be kept and stored by UTEP, in accordance with FERPA and UTEP policies. Your instructor will not share the recordings of your class activities outside of course participants, which include your fellow students, teaching assistants, or graduate assistants, and any guest faculty or community-based learning partners with whom we may engage during a class session. **You may not share recordings outside of this course.** Doing so may result in disciplinary action.

COVID-19 Precautions:

Please stay home if you have been diagnosed with COVID-19 or are experiencing COVID-19 symptoms. If you are feeling unwell, please let the instructor know as soon as possible, so that appropriate accommodations can be made. If you have tested positive for COVID-19, you are encouraged to report your results to covidaction@utep.edu, so that the Dean of Students Office can provide you with support and help with communication with your professors. The Student Health Center is equipped to provide COVID 19 testing.

The Center for Disease Control and Prevention recommends that people in areas of substantial or high COVID-19 transmission wear face masks when indoors in groups of people. The best way that Miners can take care of Miners is to get the vaccine. If you still need the vaccine, it is widely available in the El Paso area. For more information about the current rates, testing, and vaccinations, please visit epstrong.org.

Netiquette:

Always consider audience. Remember that members of the class and the instructor will be reading any postings. Respect and courtesy must be always provided to classmates and to instructor. No harassment or inappropriate postings will be tolerated. When reacting to someone else's message, address the ideas, not the person. Post only what anyone would comfortably state in a F2F situation. Blackboard is not a public internet venue; all postings to it should be considered private and confidential. Whatever is posted on in these online spaces is intended for classmates and professor only. Please do not copy documents and paste them to a publicly accessible website, blog, or other space. If students wish to do so, they have the ethical obligation to first request the permission of the writer(s).

Plagiarism Detection:

All coursework and assignments are subject to be submitted to plagiarism detection software including, but not limited to SafeAssign.

Support Services:

Technology Resources

- **Help Desk:** Students experiencing technological challenges (email, Blackboard, software, etc.) can submit a ticket to the UTEP Helpdesk for assistance. Contact the Helpdesk via phone, email, chat, website, or in person if on campus.

Academic Resources

- UTEP Library: Access a wide range of resources including online full-text access to thousands of journals and eBooks plus reference service and librarian assistance for enrolled students.
- University Writing Center (UWC): Submit papers here for assistance with writing style and formatting, ask a tutor for help and explore other writing resources.
- Math Tutoring Center (MaRCS): Ask a tutor for help and explore other available math resources.
- History Tutoring Center (HTC): Receive assistance with writing history papers, get help from a tutor and explore other history resources.
- RefWorks: A bibliographic citation tool; check out the RefWorks tutorial and Fact Sheet and Quick-Start Guide.

Individual Resources

- Military Student Success Center: Assists personnel in any branch of service to reach their educational goals.
- Center for Accommodations and Support Services: Assists students with ADA-related accommodations for coursework, housing, and internships.
- Counseling and Psychological Services: Provides a variety of counseling services including individual, couples, and group sessions as well as career and disability assessments.

Standards of Conduct:

You are expected to conduct yourself in a professional and courteous manner, as prescribed by the UTEP Standards of Conduct.

A fundamental principle for any educational institution, academic integrity is highly valued and seriously regarded at The University of Texas at El Paso. More specifically, students are expected to maintain absolute integrity and a high standard of individual honor in scholastic work undertaken at the University. At a minimum, you should complete any assignments, exams, and other scholastic endeavors with the utmost honesty, which requires you to:

- Acknowledge the contributions of other sources to your scholastic efforts.
- Complete your assignments independently unless expressly authorized to seek or obtain assistance in preparing them.
- Follow instructions for assignments and exams, and observe the standards of your academic discipline; and
- Avoid engaging in any form of academic dishonesty on behalf of yourself or another student.

Graded work, e.g., homework and tests, is to be completed independently and should be unmistakably your own work (or, in the case of group work, your team's work), although you may discuss your project with other students in a general way. You may not represent as your own work material that is transcribed or copied from another person, book, or any other source, e.g., a web page.

Any student who commits an act of scholastic dishonesty is subject to discipline. Scholastic dishonesty includes, but not limited to cheating, plagiarism, collusion, the submission for credit of any work or materials that are attributable to another person.

- **Cheating**
 - Copying from the test paper of another student
 - Communicating with another student during a test
 - Giving or seeking aid from another student during a test
 - Possession and/or use of unauthorized materials during tests without authorization (i.e., Crib notes, class notes, books, etc.)
 - Substituting for another person to take a test
 - Falsifying research data, reports, academic work offered for credit
- **Plagiarism**
 - Using someone’s work in your assignments without the proper citations
 - Submitting the same paper or assignment from a different course, without direct permission of instructors
- **Collusion**
 - Unauthorized collaboration with another person in preparing academic assignments

Collaboration:

Collaboration among students is strongly encouraged.

It is acceptable to:

- Talk with other students about approaches and ideas.
- Get ideas and extra information from the internet, books, etc.

However, it is not acceptable to:

- Share code with another student (if a piece of code is submitted by two or more students, both students are guilty of cheating, regardless of who wrote the original code).
- Use code acquired from an outside source (the internet, a friend, etc.)
- Look at another student’s code
- Debug another student’s code

Software to detect plagiarized programs are used; appropriate disciplinary actions will be taken as necessary. A full description of the University Standards of Conduct and Academic Dishonesty can be found in the Handbook of Operating Procedures. Professors are required to -- and will -- report academic dishonesty and any other violation of the Standards of Conduct to the Dean of Students and OSCCR.

Tentative Schedule

Please note that this schedule is subject to change at any time without advance notice. You should not assume that the exams scheduled below are finalized.

| <u>Week</u> | <u>Topic</u> |
|-------------|--|
| 1 | Introduction to Software Engineering Introduction to Software V&V |

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|-----------|--|
| 2 | Software Formal Reviews and Inspections |
| 3 | Software Inspections: Requirements, Design, and Code Inspections |
| 4 | Introduction to Software Testing and System Test Planning |
| 5 | Unit Testing: Black-box Testing |
| 6 | Unit Testing: Black-box Testing |
| 7 | Midterm |
| 8 | Unit Testing: White-box Testing |
| 9 | Unit Testing: White-box Testing |
| 10 | Integration Testing |
| 11 | System Testing |
| 12 | Usability Testing |
| 13 | Research Work Presentations |
| 14 | Team Project Presentations |
| 15 | Team Project Presentations |
| 16 | Final Exam |