

Instructors

Sections 006 (CRN 17231), 007 (CRN 17232):

Professor: Mike Reep, Ph.D.
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Office: ENG 4417
Office Hours: Tuesday and Thursday, 10:30 – 11:30 am or by appointment
Class: CS 321 006 – 12:00-1:15, T/TH, Horizon Hall, Room 3010
CS 321 007 – 1:30-2:45, T/TH, Peterson Hall, Room 2413

Section 009 (CRN 20386):

Professor: Steve Ernst
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Office Hours: Following class session or by appointment
Class: CS 321 009 – 5:55-7:10, M/W, Enterprise Hall, Room 174

Section 010 (CRN 20501):

Professor: Tariq Islam
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Office Hours: Following class session or by appointment
Class: CS 321 010 – 5:55-7:10, T/TH, Horizon Hall, Room 4014

Overview

Prerequisites: Grade of C or better in CS 310 AND ENGH 302 or equivalent

Textbook

The text is required as there is much more fundamental knowledge about Software Engineering than we can cover in lectures. The text is available at no-charge through the GMU library for up to 100 simultaneous users.

- *Beginning Software Engineering, 2nd Edition*, Rod Stephens, Wiley, 2023

Catalog Description

An introduction to concepts, methods, and tools for the creation of large-scale software systems. Methods, tools, notations, and validation techniques to analyze, specify, prototype, and maintain software requirements. Introduction to object-oriented requirements modeling, including use of case modeling, static modeling, and dynamic modeling using the Unified Modeling Language (UML) notation. Concepts and methods for the design of large-scale software systems. Fundamental design concepts and design notations are introduced. A study of object-oriented analysis and design modeling using the UML notation. Students participate in a group project on software requirements, specification, and object-oriented software design.

Specialized Designation: Writing Intensive in Major

Course Objectives

Upon completion of the course, students should have:

1. An understanding of all phases of the software engineering lifecycle (requirements, design, implementation, testing, deployment, maintenance).
2. An understanding of several lifecycle models including both prescriptive and Agile methodologies and knowledge of tradeoffs among the methodologies.
3. An ability to document software requirements and design artifacts.
4. An ability to analytically evaluate software usability.
5. An understanding of fundamental techniques used to lead a software team.
6. An ability to apply software engineering techniques to create a minimum viable product.

Writing Assignments

CS 321 includes Writing Intensive (WI) activities that, together with those of CS 306 (Ethics course), meet the GMU WI Requirements in the BS CS Program (<http://wac.gmu.edu>). This means you will write 1750+ graded words (or about 7 standard pages).

WI Learning Outcomes: All Writing-intensive courses should integrate the following learning outcomes into their course designs:

- **Writing-to-Learn:** students will use informal or formal writing in ways that deepen their awareness of the field of study and its subject matter.
- **Writing-to-Communicate:** students will compose one or more written genres specific to the field of study in order to communicate key ideas tailored to specific audiences and purposes; genres may be academic, public, or professional.
- **Writing-as-a-Process:** students will draft and revise written works based on feedback they receive from instructors and peers, using strategies appropriate to the genre, audience, and purpose.

For the first writing assignment, you will pick a topic related to the learning modules and write a paper expanding on that topic including a literature review (3 of which are from peer-reviewed publications/journals) and citations. This assignment addresses the Writing-as-a-Process outcome by following a multi-step process. At the end of the semester, you will present a summary of your topic to the class in order to gain experience in technical presentations.

The second writing assignment is integrated into the group project. You and your teammates will prepare documentation throughout the project. This documentation will then be peer-reviewed in

addition to the grade-focused review. The documentation will be updated throughout the project to incorporate the feedback and deliver a final paper at the completion of the project. This assignment addresses the Writing-to-Communicate and Writing-as-a-Process outcomes.

Class Approach

Class Format

The class implements Active Learning as the predominant approach. Rather than extensive lectures with long PowerPoint presentations, the class uses a step-by-step approach to develop proficiency in the topic while focusing class time on reviewing key concepts and hands-on exercises. Each week addresses a different aspect of software engineering with specific learning outcomes provided. The primary steps used in the class include:

- Assigned readings (and videos) to provide an introduction on the topic and which allows the student to participate and understand the classroom discussions
- Quizzes on the readings are based on the learning objectives to help encourage timely completion and keep up with the material (which is cumulative)
- Class times are in two parts:
 - Lecture that focuses on reviewing key and/or complex concepts along with introducing relevant supporting material from industry (But does not repeat all the reading material)
 - Hands-on exercises that begin using the materials in sample situations – often directly related to the group project
- Group project that implements software engineering concepts, practices and techniques in a defined scenario. This approach allows each student the opportunity to develop an understanding and hands-on participation for every step in the process.

Course Website

Blackboard will be used for this course. You can access the site at <http://mymasonportal.gmu.edu>. Login and click on the “Courses” tab. You will see CS 321. NOTE: Username and passwords are the same as your Mason email account. You must have consistent access to an Internet connection in order to complete the assignments in this course through Blackboard (<http://mymason.gmu.edu>). The Blackboard site will be used by all three sections following this course structure.

Discussion Board

Piazza is used to maintain communications between classroom sessions and allow students the opportunity to interact with each other on the group project. An "Ask the Professor" is provided for any questions or topics that may be of interest to the entire class including the other sections. These types of inquiries are not accepted by email and must be posted on the Discussion Board for all to see. (Personal or sensitive topics are still handled via email.)

All electronic postings must be professional, respectful, positive and courteous. The [Core Rules of "Netiquette"](#) provide guidelines on how to carefully craft your communications in the online classroom to avoid misinterpretation.

Readings

Readings, as given on the schedule page, allow you to understand the concepts and the theory behind the applications. The readings provide insights, background and information in more detail and scope than we can cover in class but are critical for your success (academic and professional). The readings are needed to perform at an A level on the project, exams and quizzes.

In order to fully participate in class and score well on the associated quiz, the assigned readings need to be completed by the first class for that lesson.

Quizzes

We will have in-class quizzes starting the second week and these will be given in the first class for a lesson. The primary purpose of the quiz is to encourage students to complete the assigned readings and have a basic understanding of the material **prior** to the first class for each lesson. This approach enables us to focus on addressing questions and more complex topics in class plus some preparation for doing in-class exercises based on the weekly topic. Therefore the quizzes will focus on the assigned readings for that lesson with an emphasis on the weekly learning objectives.

Quizzes are available on Blackboard in the first ten minutes of class. Quizzes submitted after the ten minute limit will be assessed a 10% late penalty unless an accommodation is already in place. Quizzes are closed-book, no access to other web sites, and no other assistance allowed. A one-page **printed** note sheet is allowed to help with the quiz. These notes will then form the basis for your own personal study guide for the exams. Failing to follow the quiz procedures will result in a zero for the quiz.

The quizzes consist of a combination of multiple-choice, true/false, and fill-in-the-blank to evaluate understanding of the terms and concepts. There are no-retakes or make-up quizzes but the lowest three scores are dropped.

Participation

Learning can only happen when you are playing an active role. It is important to place more emphasis on developing your insights and skills, rather than transmitting information. Knowledge is more important than facts and definitions. It is a way of looking at the world, an ability to interpret and organize future information. An active learning approach will more likely result in long-term retention and better understanding because you make the content of what you are learning concrete and real in your mind.

Although an active role can look differently for various individuals, it is expected in this class that you will work to explore issues and ideas under the guidance of the professor and your peers. You can do this by reflecting on the content and activities of this course, asking questions, striving for answers, interpreting observations, and discussing issues with your peers. A participation grade will be awarded based on attendance, classroom contributions, peer-review interactions, and the successful completion of in-class exercises throughout the semester.

NOTE: Almost every class will allocate the last section of the time period to group meetings. Therefore regular attendance is even more critical to support your fellow group members in a successful project.

Group Project

CS 321 includes a software engineering project that requires students to participate in working teams where students organize, manage, and practice the software engineering lifecycle. The team project will cover software requirements, architecture, design, coding, and testing. Note that coding (software development) is only one aspect of the project and not the focus of the effort. The group project goal is providing a framework for you to engage and participate in all aspects of software engineering processes.

Exams

The exams will cover the learning objectives listed for each lesson. The mid-term will address the first half of the semester and the final will focus on the second half of the semester (but may include key topics from earlier on). A laptop is required to complete the on-line exams during the assigned time periods. A study guide will be provided to facilitate preparation at least one week prior to the exam. The exam is closed book, notes, phone, tablet or any other type of assistance.

Course Grades

- Quizzes/Participation: 10%
- Writing Assignments: 30%
- Group Project: 30%
- Mid-Term: 15%
- Final Exam: 15%

The Quizzes/Participation grade is allocated as follows:

- Quizzes: 75%
- Classroom Engagement: 10%
- Classroom Exercises and Peer-Reviews: 15%

The following scale will be applied to compute final course letter grades:

A+ (>= 97.0%) A (>= 92.0%) A- (>= 90.0%)

B+ (>= 87.0%) B (>= 82.0%) B- (>= 80.0%)

C+ (>= 77.0%) C (>= 72.0%) C- (>= 70.0%)

D (>= 60.0%) F (< 60.0%)

Submission Deadlines

All assignments are due by midnight on the assigned date unless otherwise noted on the schedule or assignment listing. Late submissions are subject to a 10% penalty for missing the deadline, are accepted after 48 hours with a 25% deduction and are not accepted after one week without prior permission. Assignments will be submitted in Blackboard via the Assignment feature. You are expected to verify your own Blackboard responses by returning to the appropriate place in Blackboard after the work has been posted.

Grading

Most project and assignment grading will be completed by the Graduate Teaching Assistants (GTAs) based on the rubric provided with the assignment. If you disagree with the grades assessed, contact the GTA first with the basis of your request and the grade you believe should have been assigned. If you and the GTA are unable to come to a resolution, escalate the matter to your Professor along with the email thread for the GTA discussion.

Class Policies

E-mail

We will occasionally send important announcements to your Mason email account. If an instructor is running late for the class or has some other issue that will impact the class, we will make that announcement through Blackboard. Emails sent to instructors should start the subject line with "CS 321" and then include a topic.

Questions about the technical material, class policies, discussions or other topics of interest to the entire class **must** be posted on the associated Piazza discussion board or *Ask the Professor* discussion board and not sent by email. E-mails of this type will not be answered and redirected to Piazza.

Our goal is to answer emails and board postings within one business day. In accordance with GMU policy, all email communication will be sent only to your Mason email account.

Before sending an email, please check the following unless the email is of a personal nature:

1. Syllabus and Schedule
2. *Ask the Professor* discussion board
3. On-demand Blackboard videos on how to use Blackboard features, and

Technical Requirements.

Feel free to respond to other students in the *Ask the Professor* forum if you know the answer.

Schedule

Every attempt is made to adhere to the posted Blackboard schedule. All schedule updates will be announced on Blackboard. Changes are made to facilitate learning, provide opportunities to thoroughly address topics within the class or address unforeseen circumstances. Changes are announced via Blackboard and the revised schedule is posted on the Blackboard site.

If the University is closed for snow-days or similar situation, classes will be conducted via Zoom.

Recordings

We may record classes for the use of students who can't make an individual session or for review afterwards. These are not a substitute for attending in-person classes, are not guaranteed to be available, are not edited and may have issues such as audio, readability of the slides and boards, or focus. These videos will only be posted to Blackboard.

All course materials posted to Blackboard or other course site are private to this class; by federal law, any materials that identify specific students (via their name, voice, or image) must not be shared with anyone not enrolled in this class.

Video recordings -- whether made by instructors or students -- of class meetings that include audio, visual, or textual information from other students are private and must not be shared outside the class.

Live video conference meetings (e.g. Collaborate or Zoom) that include audio, textual, or visual information from other students must be viewed privately and not shared with others in your household or recorded and shared outside the class.

Technology

You will need a reliable computer with sufficient capabilities for tasks such as compiling and running web servers, functional camera and microphone, and Internet access to view course materials in Blackboard, take the quizzes and exams, complete the coding for the group project, and record assignments for the group project which captures the screen and voice.

In-Class Computer Use

Computers will be used extensively during in-class exercises, quizzes, discussions, and examples. Outside note taking and referring to class slides, their use during lectures should be minimized as a courtesy to your fellow students. Complaint(s) about specific students using computers inappropriately or their inappropriate use in class will result in the loss of their use during lectures and a deduction in their participation grade.

AI Use

ChatGPT or other Generative-AI models may not be used in this course as an assistant in the project, white paper, or other assignments unless otherwise specifically stated by the instructors.

In terms of learning in this class and the associated software development processes, students who replace their own learning and project work with materials prepared by Generative-AI models:

- Sacrifice the opportunity to acquire the knowledge, skills, and critical thinking taught in the course.
- Risk being unable to perform to expectations in the academic environment when Generative-AI models are unavailable, such as in exams
- Ultimately endanger their employability if they are unable to produce work other than that produced by Generative-AI models

Social Media

We accept LinkedIn requests from current and former students – please be sure to include the class and year in the request. In general, we do not accept other social media requests on my personal accounts from school or work.

GMU Writing Center

Take advantage of the Writing Center space (<https://writingcenter.gmu.edu/>) and peer consultants as you work on written assignments in this course. You can book a free 45-minute appointment to meet with a consultant in person or on Zoom or to submit a draft for written feedback. Consultants will work with you on any phase of a writing project. They can help you develop your ideas, provide feedback on a draft, answer your questions, and show you strategies for brainstorming, organizing, drafting, revising, and editing. Schedule your appointment to allow plenty of time for revising your paper afterwards. To make an appointment, go to writingcenter.gmu.edu, register with the center, and make an appointment using the online scheduler. Watch this short video (<https://www.youtube.com/watch?v=BTubKJbVse4>) for more detailed guidance on making an appointment and send any questions wcenter@gmu.edu .

Religious Holidays

If you need accommodations for a religious holiday, it is your responsibility to let us know the dates of major religious holidays on which you will be absent or unavailable due to religious observances within the first two weeks of the semester. The university calendar is available at <https://ulife.gmu.edu/religious-holiday-calendar/> for your reference.

Honor Code Statement

As with all GMU courses, CS 321 is governed by the GMU Academic Standards (more below) and the CS Department Honor Code <https://cs.gmu.edu/resources/honor-code/> (which provides technical guidance). In this course, all quizzes and exams carry with them an implicit statement that it is the sole work of the author. On the writing assignment, peer reviews are permitted but the content must be your own. When joint work is authorized, including on the group project, all contributing students must be listed on both the submission and individual sections of the assignment but must not include students who did not participate. Guidance on the group project coding will be provided in the project description and must be adhered to in order to avoid

violations. Any deviation from the above guidance is considered an Honor Code violation, and as a minimum, will result in failure of the submission and as a maximum, failure of the class.

Common Policies Addendum

Academic Standards

Academic Standards exist to promote authentic scholarship, support the institution's goal of maintaining high standards of academic excellence, and encourage continued ethical behavior of faculty and students to cultivate an educational community which values integrity and produces graduates who carry this commitment forward into professional practice.

As members of the George Mason University community, we are committed to fostering an environment of trust, respect, and scholarly excellence. Our academic standards are the foundation of this commitment, guiding our behavior and interactions within this academic community. The practices for implementing these standards adapt to modern practices, disciplinary contexts, and technological advancements. Our standards are embodied in our courses, policies, and scholarship, and are upheld in the following principles:

- **Honesty:** Providing accurate information in all academic endeavors, including communications, assignments, and examinations.
- **Acknowledgement:** Giving proper credit for all contributions to one's work. This involves the use of accurate citations and references for any ideas, words, or materials created by others in the style appropriate to the discipline. It also includes acknowledging shared authorship in group projects, co-authored pieces, and project reports.
- **Uniqueness of Work:** Ensuring that all submitted work is the result of one's own effort and is original, including free from self-plagiarism. This principle extends to written assignments, code, presentations, exams, and all other forms of academic work.

Violations of these standards—including but not limited to plagiarism, fabrication, and cheating—are taken seriously and will be addressed in accordance with university policies. The process for reporting, investigating, and adjudicating violations is outlined in the university's procedures. Consequences of violations may include academic sanctions, disciplinary actions, and other measures necessary to uphold the integrity of our academic community.

The principles outlined in these academic standards reflect our collective commitment to upholding the highest standards of honesty, acknowledgment, and uniqueness of work. By adhering to these principles, we ensure the continued excellence and integrity of George Mason University's academic community.

Student responsibility: Students are responsible for understanding how these general expectations regarding academic standards apply to each course, assignment, or exam they participate in; students should ask their instructor for clarification on any aspect that is not clear to them.

Accommodations for Students with Disabilities

Disability Services at George Mason University is committed to upholding the letter and spirit of the laws that ensure equal treatment of people with disabilities. Under the administration of University Life, Disability Services implements and coordinates reasonable accommodations and disability-related services that afford equal access to university programs and activities. Students can begin the registration process with Disability Services at any time during their enrollment at George Mason University. If you are seeking accommodations, please visit <https://ds.gmu.edu/> for detailed information about the Disability Services registration process. Disability Services is located in Student Union Building I (SUB I), Suite 2500. Email: ods@gmu.edu. Phone: (703) 993-2474.

Student responsibility: Students are responsible for registering with Disability Services and communicating about their approved accommodations with their instructor in advance of any relevant class meeting, assignment, or exam.

FERPA and Use of GMU Email Addresses for Course Communication

Student privacy is governed by the Family Educational Rights and Privacy Act (FERPA) and is an essential aspect of any course. Students must use their GMU email account to receive important University information, including communications related to this class. Instructors will not respond to messages sent from or send messages regarding course content to a non-GMU email address.

Student responsibility: Students are responsible for checking their GMU email regularly for course-related information, and/or ensuring that GMU email messages are forwarded to an account they do check.

Title IX Resources and Required Reporting

As a part of George Mason University's commitment to providing a safe and non-discriminatory learning, living, and working environment for all members of the University community, the University does not discriminate on the basis of sex or gender in any of its education or employment programs and activities. Accordingly, all

non-confidential employees, including your faculty member, have a legal requirement to report to the Title IX Coordinator, all relevant details obtained directly or indirectly about any incident of Prohibited Conduct (such as sexual harassment, sexual assault, gender-based stalking, dating/domestic violence). Upon notifying the Title IX Coordinator of possible Prohibited Conduct, the Title IX Coordinator will assess the report and determine if outreach is required. If outreach is required, the individual the report is about (the "Complainant") will receive a communication, likely in the form of an email, offering that person the option to meet with a representative of the Title IX office.

For more information about non-confidential employees, resources, and Prohibited Conduct, please see University Policy 1202: Sexual and Gender-Based Misconduct and Other Forms of Interpersonal Violence. Questions regarding Title IX can be directed to the Title IX Coordinator via email to TitleIX@gmu.edu, by phone at 703-993-8730, or in person on the Fairfax campus in Aquia 373.

Student opportunity: If you prefer to speak to someone confidentially, please contact one of Mason's confidential employees in Student Support and Advocacy (SSAC), Counseling and Psychological Services (CAPS), Student Health Services (SHS), and/or the Office of the University Ombudsperson.

Weekly Topics

The planned course topics are found below. The specific reading and course assignments will be posted on the Blackboard schedule.

- Lesson 1: Introduction to Software Engineering
- Lesson 2: Agile Overview
- Lesson 3: Requirements and User Experience
- Lesson 4: Architecture
- Lesson 5: Design
- Lesson 6: Database Design and Configuration Management
- Lesson 7: Extreme Programming/Test Driven Development
- Lesson 8: Mid-Term plus Construction/Scrum
- Lesson 9: Project Management/On-going Activities
- Lesson 10: Testing
- Lesson 11: Deployment/DevOps/Cloud Introduction
- Lesson 12: Maintenance/Lean/Containers
- Lesson 13: Security and Secure Lifecycles
- Lesson 14: Enterprise Development