SWE-619 – Object-Oriented Software Specification and Construction

Master of Science in Computer Science

Course Information

Course Section:
Course Term: Summer 2023

PROGRAM OBJECTIVES

1) **Foundations of Computer Science**: apply mathematical foundations and algorithmic principles in the modeling and design of computing systems.
2) **Computer Systems Fundamentals**: apply fundamental concepts in computer systems to model, design, and implement a computer-based system, process, or program that meets desired needs.
3) **Information Processing Fundamentals**: apply fundamental concepts in information processing to model, design, and implement a computer-based system, process, or program that meets desired needs.
4) **Advanced Computer Systems**: use advanced concepts in computer systems to design, implement, and evaluate a computer-based system, process, component, or program.
5) **Advanced Information Processing**: use advanced information processing concepts to design, implement, and evaluate a computer-based system, process, component, or program.

COURSE DESCRIPTION

In-depth study of software construction using modern, object-oriented language with support for complex data structures. Specifications, and abstraction techniques, including procedural, data, iteration, type, and polymorphic. Information hiding, classes, objects, and inheritance. Exception handling, event-based systems, and concurrency. Offered by Computer Science. 3 Credits. May not be repeated for credit.

Prerequisites: SWE foundation courses or equivalent. Knowledge of Java (intermediate or better)

COURSE METHODOLOGY

Each week, learners will:

- Study content in Blackboard, including video lectures, tutorials, and interactive media.
- Practice writing code, checking results, and updating code as needed
- Work on discussions, assignments, quizzes, and exams (when due)
- Attend weekly synchronous office hours, which will be recorded

COURSE OBJECTIVES

After completing the course, learners will be able to:

- Construct modern high quality software systems and reason about them.
- Properly define software specifications and rep-invariants.
- Leverage immutability to properly construct threat safe programs.
- Explain object-oriented concepts such as information hiding, encapsulation, data and type abstraction, and polymorphism.
- Properly use exception handling.

- Identify when it is appropriate to use inheritance and generics.

Instructor Information

Email: wmasri@gmu.edu
Office Hours (live/recorded): Wednesdays 8pm-9:30pm – https://gmu.zoom.us/j/6944454727
Refer to the Blackboard course shell for instructor biography

Course Resources

TEXTBOOKS AND READINGS

REQUIRED

- Liskov, B., & Guttag, J. (2001). Program Development in Java. Addison Wesley. ISBN 0-201-65768-6. Read from O'Reilly Safari. Read from O'Reilly Safari.
  Direct Safari Link
  General Safari Link (off campus)
- Joshua Bloch. (2017). Effective Java. Third Edition. Addison-Wesley Professional. ISBN 978-0-13-468599-1. Read from O'Reilly Safari.
  Direct Safari Link
  General Safari Link (off campus)

RECOMMENDED

- Online resources to acquire an intermediate knowledge of Java. Also, the following textbook is a good resource "Cay Horstmann. Core Java Vol. I – Fundamentals. Prentice-Hall, 10th edition or later".
- Note that you can access the Java 8 APIs at the Oracle site.

Note on the course materials: We'll start with Liskov. Don't worry about the publication date; Liskov ages remarkably well. We're interested in contracts, mutability, data abstraction, and type abstraction. Bloch is concerned about the same things, but explores them in more detail and in more up-to-date Java. Bloch also corrects some important points that weren't well understood when Liskov's text came out.

COMPUTER REQUIREMENTS

HARDWARE

You will need access to a Windows or Macintosh computer with at least 2 GB of RAM and to a fast, reliable broadband Internet connection (e.g., cable, DSL). The recommended computer monitor and laptop screen size is at least 13 inches. Computer speakers or headphones are recommended for recorded content. A headset microphone is recommended for live audio sessions using course tools like Blackboard Collaborate. Computer hard disk space must allow for:

- Installing the required and recommended software.
- Saving your course assignments.

For hardware and software purchases, visit Patriot Computers.

You are strongly encouraged to back up all contents of your computer on a regular basis. Loss of data will not excuse late or unsubmitted assignments.

SOFTWARE

Software applications include the following:

- Web browser (See Blackboard Support for supported web browsers)
- Adobe Acrobat Reader (free download)
- Microsoft Office (purchase)
- Blackboard Collaborate (select from the course menu)

UPDATING YOUR COMPUTER
Please be sure to update your computer and prepare yourself to begin using the online format BEFORE the first day of class.

COMPUTING RESOURCES REQUIRED FOR THIS COURSE
- Java JDK (Java IDE optional)

Grading Information

GRADING SCALE
The following table describes the grading system:

GRADE	PERCENTAGE
A	90 or higher
B	75 or higher
C	60 or higher

A score of 90% or higher guarantees an A grade, 75% or higher a B grade, and 60% or higher a C grade.

LETTER GRADING DESCRIPTIONS:
Listed below are grades and academic standards for each grade awarded.

- **A:** Consistently performs above and beyond the course/assignment requirements
- **B:** Meets and occasionally exceeds the course/assignment requirements
- **C:** Minimally meets the course/assignment requirements
- **F:** Fails to meet the course/assignment requirements

CATEGORIES AND WEIGHTS
The following table lists the types of graded activities in this course and each category's weight in the final course grade.

CATEGORY	% OF OVERALL COURSE GRADE
Peer Evaluation	5%
Group Assignments	15%
Quizzes	80%
TOTAL:	**100%**

Note that all activities are each out of 100 points.

QUIZ MAKEUP POLICY
No make-ups are allowed.

LATE ASSIGNMENTS

A submission is considered on time if submitted electronically on Blackboard on or before required submission date/time. Late submissions are NOT allowed.

UNGRADED ITEM DESCRIPTIONS

DISCUSSIONS (UNGRADED)

Discussions are designed for you to work with your group to gain familiarity with various concepts. Discussions are unique in the sense that you will have an opportunity to see how other groups approach the exercises because all groups will be able to see each other's posts. Elect one member of your group to submit your group's answers to the discussion forum. Note your group name/number in the subject of your post. Everyone in your group is expected to actively contribute and is responsible for the solution provided. You are encouraged to utilize discussions to openly engage in conversation with your peers about the concepts and strategies.

GRADED ITEM DESCRIPTIONS

ASSIGNMENTS

Assignments are designed for you to work with your group to gain familiarity with various concepts. Assignments are generally problem-based but can vary depending on the concept being explored. Elect one member of your group to submit your group's answers to the assignment link in the course. Note your group name/number in your submission. Everyone in your group is expected to actively contribute and is responsible for the solution provided. While you will work closely with your group to complete each assignment, since it is submitted via the assignment link in the course, your group's solution will not be viewable to other groups in the course.

Peer Evaluations

You will work closely with your colleagues on the discussions and assignments. You will have an opportunity to share feedback based on your colleague's contributions through a Peer Evaluation. Please note that the peer evaluation is confidential and will only be reviewed by your instructor.

QUIZZES

Quizzes must be completed individually using Respondus. Do not consult with your peers about quizzes (before, during, or after) the completion of your quiz assessment. Quizzes are timed and will often require you to submit answers to one or more questions about concepts covered in the current module or previous ones. Many quiz questions will ask you to explain concepts in your own words, re-write code, diagnose issues, and justify your responses. Instructions are in the course on how to set up Respondus and test it in advance of attempting quizzes.

ASYNCHRONOUS LEARNING

This course is online and asynchronous which means that you can access activities, learning units, and other homework through the online classroom. There are no scheduled weekly meeting times where you need to meet "live" with your instructor. However, due dates must be strictly adhered to for all activities to receive a grade and your group is encouraged to establish a regular meeting schedule to accomplish your work on-time.

GROUP WORK AND PARTICIPATION POLICY

You will work together in groups for some of the activities in this course. Just like the professional world of software development, you will need to collaborate with others in coming up with solutions to problems. You are expected to thoughtfully participate and actively contribute to your own learning as well as the learning of others through the group exercises in this course. Be prepared for all group meetings by having reviewed the materials for the Module, read the activity instructions, and be ready to engage with your classmates to achieve the deliverable.

Policies and Services

MASON HONOR CODE

To promote a stronger sense of mutual responsibility, respect, trust, and fairness among all members of the George Mason University community and with the desire for greater academic and personal achievement, we, the student members of the university community, have set forth this honor code:

Student members of the George Mason University community pledge not to cheat, plagiarize, steal, or lie in matters related to academic work.

You are expected to familiarize yourself with and adhere to the Honor Code. Student members of the George Mason University community pledge not to cheat, plagiarize, steal, and/or lie in matters related to academic work.

For additional important information, including the Honor Code definitions of cheating, plagiarism, stealing, and lying, see the George Mason University Academic Integrity page.

All work performed in this course will be subject to Mason's Honor Code.

(Note: in 2021-22 close to 50 students were dismissed from the CS/MS program due to cheating)

ACADEMIC INTEGRITY EXPECTATIONS

1. Working online requires dedication and organization. Proper preparation is expected every week. You are expected to log in to the course each week and complete the assignments and activities on or before the due dates.
2. Students must check their GMU email messages on a daily basis for course announcements, which may include reminders, revisions, and updates.
3. It is expected that you will familiarize yourself with and adhere to the Honor Code. Student members of the George Mason University community pledge not to cheat, plagiarize, steal, and/or lie in matters related to academic work.
4. It is essential that you promptly communicate any questions or problems to the instructor.

INDIVIDUALS WITH DISABILITIES

The university is committed to providing equal access to employment and educational opportunities for people with disabilities.

Mason recognizes that individuals with disabilities may need reasonable accommodations to have equally effective opportunities to participate in or benefit from the university educational programs, services, and activities, and have equal employment opportunities. The university will adhere to all applicable federal and state laws, regulations, and guidelines with respect to providing reasonable accommodations as necessary to afford equal employment opportunity and equal access to programs for qualified people with disabilities.

Applicants for admission and students requesting reasonable accommodations for a disability should call the Office of Disability Services at 703-993-2474. Employees and applicants for employment should call the Office of Equity and Diversity Services at 703-993-8730. Questions regarding reasonable accommodations and discrimination on the basis of disability should be directed to the Americans with Disabilities Act (ADA) coordinator in the Office of Equity and Diversity Services.

EMAIL POLICY

Web: masonlive.gmu.edu

Mason uses electronic mail to provide official information to students. Examples include notices from the library, notices about academic standing, financial aid information, class materials, assignments, questions, and instructor feedback. Students are responsible for the content of university communication sent to their Mason e-mail account and are required to activate that account and check it regularly.

Students are also expected to maintain an active and accurate mailing address in order to receive communications sent through the United States Postal Service

ADDITIONAL SERVICES AND POLICIES

UNIVERSITY POLICIES
Students must follow the university policies. See University Policies.

DIVERSITY
George Mason University promotes a living and learning environment for outstanding growth and productivity among its students, faculty and staff. Through its curriculum, programs, policies, procedures, services and resources, Mason strives to maintain a quality environment for work, study and personal growth.

RESPONSIBLE USE OF COMPUTING
You are expected to adhere to the university policy for Responsible Use of Computing. See University Policies/Computing.

STUDENTS WITH DISABILITIES
Students with disabilities who seek accommodations in a course must be registered with the George Mason University Office of Disability Services (ODS) and inform their instructor, in writing, at the beginning of the semester.

UNIVERSITY LIBRARIES
University Libraries provides Library services for distance students.

WRITING CENTER
The George Mason University Writing Center staff provides a variety of resources and services (e.g., tutoring, workshops, writing guides, handbooks) intended to support students as they work to construct and share knowledge through writing.

You can now sign up for an Online Writing Lab (OWL) session just as you may sign up for a face-to-face session in the Writing Center, which means YOU set the date and time of the appointment.

COUNSELING AND PSYCHOLOGICAL SERVICES (CAPS)
The George Mason University Counseling and Psychological Services (CAPS) staff consists of professional counseling and clinical psychologists, social workers, and counselors who offer a wide range of services (e.g., individual and group counseling, workshops and outreach programs) to enhance students' personal experience and academic performance.

FAMILY EDUCATIONAL RIGHTS AND PRIVACY ACT (FERPA)
The Family Educational Rights and Privacy Act of 1974 (FERPA), also known as the "Buckley Amendment," is a federal law that gives protection to student educational records and provides students with certain rights.