Northeastern
College of Engineering

CSYE 7230 Software Engineering

Course Information

Course Title: CSYE 7230 - Software Engineering
Course Number (CRN): 14735 (Boston)
Term and Year: Fall 2024
Credit Hours: 4.0
Course Format: Livecast, Link: Teams
Classroom: Ryder Hall 153
Meeting times: Saturday, 12 PM EST

Instructor Information:

Full Name: Maged Elaasar
Email Address: m.elaasar@northeastern.edu
Office hours: S 11am EST (or by appointment)

Instructor Biography:

Dr Elaasar is a Senior Computer Scientist at NASA Jet Propulsion Lab, the California Institute of Technology, where he leads several R&D teams pushing the state of the art and practice in the area of Systems Engineering. He is also the lead of the openCAESAR project. Prior to that, Dr Elaasar was a Software Architect at IBM leading the development of commercial Software Modeling tools. He also founded Modelware, a firm specialized in software/systems engineering consultancy. In addition, Dr. Elaasar is a part-time professor at both the University of California Los Angeles and Northeastern University. He earned his Ph.D. in Systems Engineering from Carleton University ('12), M.Sc. in Computer Science from Carleton University ('03) and B.Sc. in Computer Science from the American University in Cairo ('96). His research interests include software/systems engineering, semantic web, autonomy, & AI.

Teaching Assistant Information

Full Name: Sravanti Kanchi
Email Address: kanchi.s@northeastern.edu
Office Hours: Wednesday and Friday, 10 AM - 1 PM (EST)

Course Prerequisites:

Graduate level CSYE 6200 Minimum Grade of C-

Course Description:

This course is at the intersection of computer science and engineering. It provides both theory and hands-on experience with the development of large-scale software systems. You will learn systematic methods for large-scale software development including: agile process, software analysis, architecture patterns, design patterns, code generation, unit testing, regression testing, code review, code refactoring and DevOps. You will get to practice these methods in the context of a software project developed in collaboration with other students. However, this course will not focus on coding; and students are expected to already have basic knowledge of Java, which will be used for basic coding exercises and to demonstrate coding examples.

Course Learning Outcomes

Based on satisfactory completion of this course, a student should be able to:
CLO1: Understand the various software development process models
CLO2: Understand how to manage a software development project using the Scrum process
CLO3: Understand how to analyze requirements and capture it with UML notation.
CLO4: Understand how to choose the right software architecture and architectural patterns.
CLO5: Understand the common design problems and their common design solutions.
CLO6: Understand the process of model driven development and code generation
CL07: Understand the process of process of software testing with various techniques
CL08: Understand the process of code review using Hoare Logic
CL09: Understand how to identify bugs (code smells) and how to refactor the code to improve it
CD10: Understand how to deploy code, and setup a continuous integration/delivery pipeline

Required Tools and Course Textbooks.

Lecture notes and online resources

Course Outline:

Date	Topic	Description	Deliverables (Subject to Change)
Week 1 9/07	Software Process	Introduction, software process models, focus on Scrum.	Project part A release
Week 2 9/14	Software Analysis	UML notation (use case class, sequence, activity,, and state machine diagrams) and how to use it to analyze requirements.	Project part A due Project part B release ***Assignment 1 release***
Week 3 9/21	Software Architecture	Different architectural patterns at the landscape, structural and user interface levels, and how to choose the right ones.	
Week 4 9/28	Software Design 1	SOLID Design Principles and Gang of Four design patterns (creational, structural).	***Assignment 1 due*** *Assignment 2 release*

Week 5 **10/5**	Software Design 2	Gang of Four design patterns (behavioral)	
Week 6 **10/12**	Software DevOps + Midterm Exam Review	Differences between dev and ops challenges, principles of DevOps, tools for Devops.	Project part C release Project part D release ***Assignment 2 due***
Week 7 **10/19**	**Midterm Exam**	In classroom	
Week 8 **10/26**	Software Code Generation	Model Driven Development, abstraction and automation, and design of code generators.	Project part B due Part B Presentations
Week 9 **11/2**	Software Testing 1	Code coverage criteria, white box testing, unit testing.	***Assignment 3 release***
Week 10 **11/9**	Software Testing 2	symbolic execution, regression testing, and mutation testing	
Week 11 **11/16**	Software Code Review	Hoare Logic and its usage to detect software bugs	***Assignment 3 due*** ***Assignment 4 release***
Week 12 **11/23**	Software Evolution and Maintenance	Identifying code smells and software refactoring techniques. Final exam review.	Project part C is due
Week 13 **11/30**	Thanksgiving Recess		***Assignment 4 due***
Week 14 **12/7**	**Final Exam**	In classroom	
Week 15 **12/14**	Final Project Presentations	In classroom	Project part D due

Grade Breakdown:

Participation (in-class quizzes)	3%
Assignments (4 assignments)	12%
Team project	35%
Midterm Exam	25%
Final Exam	25%

Grading: Graduate Programs Final Grading Scale

97-100%	**A+**	**87-89%**	**B+**	**77-79%**	**C+**	69.9% or below F
93-96%	**A**	**83-86%**	**B**	**73-76%**	**C**	
90-92%	**A-**	**80-82%**	**B-**	**70-72%**	**C-**	

Attendance Policy

Students registered in MGEN courses (INFO, CSYE, and DAMG) are allowed **a maximum of 2 absences per course, with 3 or more absences resulting in an automatic 'F' for that course.** Students are expected to inform their instructors of any absences in advance of the class; if a student is sick long-term or experiences a medical issue that prevents class attendance, it is strongly encouraged that they speak with their Academic Advisor (coe-mgen-gradadvising@northeastern.edu) to learn more about the Medical Leave of Absence. Should a student anticipate being unable to attend 3 or more classes, they should discuss their situation with their Academic Advisor to explore other types of leave in accordance with the University's academic and global entry expectations. International students should review the Office of Global Services webpage to understand their visa compliance requirements.

Teaching Assistants (TAs) or Instructional Assistants (IAs) will be present at each class to collect student attendance.

Late Work Policy

Students must submit assignments by the deadline in the time zone noted in the syllabus. Students must communicate with the faculty prior to the deadline if they anticipate work will be submitted late. Work submitted late without prior communication with faculty will not be graded.

Participation

You are expected to attend and participate in all lecture sessions of this class. Participation will be measured by answering quizzes posted during class. You will be allowed to miss up to 20% of the quizzes. This should allow you to address circumstances like being sick, having schedule conflicts, etc. without losing marks. So, plan accordingly, and do not ask your instructor or TA for make ups.

Homework

You will be given **4 homeworks** in this class with questions that are representative of those you will get on tests. Homework is individual (not team) effort (zero tolerance for collaboration). You should plan to submit them by the due date. Late submission may be allowed (for 1 or 2 extra days) with a penalty. There might be a third optional assignment for extra credit.

Exams

You will write two exams in this class. The first is a Midterm that is given in class midway. The second is a Final that is given in the finals week. Exams are always an individual (not team) effort (zero tolerance for any kind of collaboration).

Team Project

You will practice the software engineering process and methods that you learn in class to develop a software application as an open-source project on Github. The project will be carried by a team of 5 students (you will form such a team in the first week).

You will have the opportunity to propose your own unique app idea that can be developed in 12 weeks. You will have the freedom to choose programming languages and a technology stack to realize your app. Hence, it would be prudent to choose ones that team members already have expertise with or can manage to learn within this timeframe.

You are expected to showcase your project work incrementally over time through a set of deliverables (shown below). You will also be asked to present those deliverables, as well as provide constructive feedback on other teams' deliverables.

Your TA will be in charge of setting expectations for and grading your project deliverables. The focus will be on the quality of following the development process and the best practices taught in class, justifying/communicating your decisions, and the quality of the final product. Students in the same team may not always receive the same grade, as TA will consider your individual contribution/effort and your teammates' feedback when giving individual grades.

Project deliverables:
Part A: Application Concept, Milestones, Feasibility, and Technology Stack (3%)
Part B: Application Analysis, Architecture and Design Descriptions (14%)
Part C: Application Implementation, Testing, and Deployment (12%)
Part D: Application Demonstration (Youtube video) and Project Retrospective (6%)

End-of-Course Evaluation Surveys

Your feedback regarding your educational experience in this class is particularly important to the College of Professional Studies. Your comments will make a difference in the future planning and presentation of our curriculum.

At the end of this course, please take the time to complete the evaluation survey at **https://neu.evaluationkit.com**. Your survey responses are **completely anonymous and confidential**. For courses 6 weeks in length or shorter, surveys will be open one week prior to the end of the courses; for courses greater than 6 weeks in length, surveys will be open for two weeks. An email will be sent to your Husky Mail account notifying you when surveys are available.

Academic Integrity

A commitment to the principles of academic integrity is essential to the mission of Northeastern University. The promotion of independent and original scholarship ensures that students derive the most

from their educational experience and their pursuit of knowledge. Academic dishonesty violates the most fundamental values of an intellectual community and undermines the achievements of the entire University.

As members of the academic community, students must become familiar with their rights and responsibilities. In each course, they are responsible for knowing the requirements and restrictions regarding research and writing, examinations of whatever kind, collaborative work, the use of study aids, the appropriateness of assistance, and other issues. Students are responsible for learning the conventions of documentation and acknowledgment of sources in their fields. Northeastern University expects students to complete all examinations, tests, papers, creative projects, and assignments of any kind according to the highest ethical standards, as set forth either explicitly or implicitly in this Code or by the direction of instructors.

Go to http://www.northeastern.edu/osccr/academic-integrity-policy/ to access the full academic integrity policy.

MGEN Student Feedback

Students who would like to provide the MGEN unit with anonymous feedback on this particular course, Teaching Assistants, Instructional Assistants, professors, or to provide general feedback regarding their program, may do so using this survey: https://neu.co1.qualtrics.com/jfe/form/SV_cTIAbH7ZRaaw0Ki

University Health and Counseling Services

As a student enrolled in this course, you are fully responsible for assignments, work, and course materials as outlined in this syllabus and in the classroom. Over the course of the semester if you experience any health issues, please contact UHCS.

For more information, visit https://www.northeastern.edu/uhcs.

Student Accommodations

Northeastern University and the Disability Resource Center (DRC) are committed to providing disability services that enable students who qualify under Section 504 of the Rehabilitation Act and the Americans with Disabilities Act Amendments Act (ADAAA) to participate fully in the activities of the university. To receive accommodations through the DRC, students must provide appropriate documentation that demonstrates a current substantially limiting disability.

For more information, visit https://drc.sites.northeastern.edu.

Library Services

The Northeastern University Library is at the hub of campus intellectual life. Resources include over 900,000 print volumes, 206,500 e-books, and 70,225 electronic journals.

For more information and for education specific resources, visit https://library.northeastern.edu.

24/7 Canvas Technical Help

For immediate technical support for Canvas, call 617-373-4357 or email help@northeastern.edu

Canvas Faculty Resources: https://canvas.northeastern.edu/faculty-resources/

Canvas Student Resources: https://canvas.northeastern.edu/student-resources/

For assistance with my Northeastern e-mail, and basic technical support:
Visit ITS at https://its.northeastern.edu
Email: help@northeastern.edu
ITS Customer Service Desk: 617-373-4357

Diversity and Inclusion

Northeastern University is committed to equal opportunity, affirmative action, diversity, and social justice while building a climate of inclusion on and beyond campus. In the classroom, members of the University community work to cultivate an inclusive environment that denounces discrimination through innovation, collaboration, and an awareness of global perspectives on social justice.

Please visit http://www.northeastern.edu/oidi/ for complete information on Diversity and Inclusion

Title IX

Title IX of the Education Amendments of 1972 protects individuals from sex or gender-based discrimination, including discrimination based on gender-identity, in educational programs and activities that receive federal financial assistance.

Northeastern's Title IX Policy prohibits Prohibited Offenses, which are defined as sexual harassment, sexual assault, relationship or domestic violence, and stalking. The Title IX Policy applies to the entire community, including male, female, transgender students, faculty, and staff.

In case of an emergency, please call 911.

*Please visit **https://www.northeastern.edu/ouec** for a complete list of reporting options and resources both on- and off-campus.*