Syllabus for CSC-580
Advanced Software Engineering
Winter 2024
Four Credit Hours

Instructor: John Hart
Course Location: Zoom Classroom
Course Times (in-person):
> Tuesday from 5:00PM – 6:45PM via Zoom – REGISTER HERE

Virtual Office Hours, Breakout and Discussion (Zoom):
> Wednesday from 5:00PM to 6:00PM [Optional] (Zoom Classroom)

Learning Management System: Canvas
Email: johnha@umich.edu
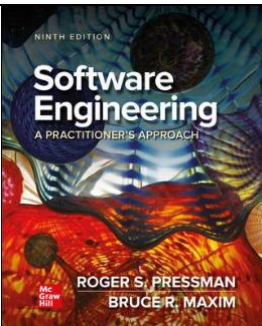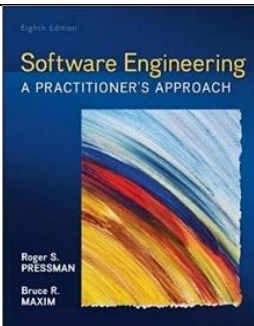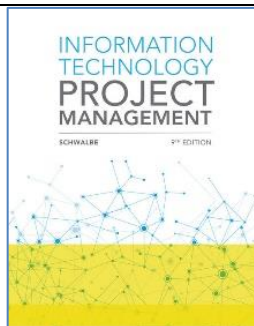**Phone:** (517) 599-4829 (Text Messages Preferred)

Prerequisites:
Admission to the MS in CSIS program or with Instructor-approved Override

Course Description:
Advanced topics in software engineering; advanced design methods including formal methods, component-based design, design with patterns and frameworks, and architectural-based designs. Modern software processes such as Extreme Programming and Agile software development. Issues and problems associated with large-scale software project failures and techniques for preventing them. Additionally, we will be examining the project management methodology for software development and how utilizing a strong mix of SE and PM practices will assist in project success.

Textbook: (Choose One (1) from Recommended Textbooks)

Software Engineering- A Practitioner's Approach by Pressman, 9th edition (Recommended – SE opt. 1)	*Software Engineering- A Practitioner's Approach* by Pressman, 8th edition (Recommended – SE opt. 2)	*Information Technology Project Management* by Schwalbe, 9th edition (Recommended PM opt.)

Other Good Reference Books (likely referenced in discussion):
- *Software Engineering* by Sommerville
- *Object-oriented Software Engineering* by Jacobson
- *Use Cases – requirements in context* by Kulak and Guiney
- *Writing Effective Use Cases* by Cockburn
- *Using CRC Cards* by Wilkinson
- *The Object Primer* by Ambler
- *Design Patterns Explained* by Shallow and Trott
- *Software Architecture* by Shaw and Garlan

Course Information:
This course provides an overview of advanced software engineering, enterprise architecture concepts and industry project management practices. It focuses on how software engineering processes and methodologies can be utilized to design, manage, and support effective software applications. How enterprise framework and architecture styles may hasten and improve the software development process. And how the tight collaboration with a project manager will assist in keeping the project schedule on track, the work in-scope, and the financials in the black. The instructor's goal is to provide a comprehensive perspective of the roles that software engineers, enterprise architects, and project managers can play to manage and control the development of a software, or hardware, product. Topics discussed are drawn from a variety of sources and are intended to provide the students with the knowledge of a variety of software engineering process models, techniques and standards utilized for software development.

Course Objectives:
The course objective is to provide you with the management techniques, and skills required, to be an effective software engineer and future SE manager. As a future engineering professional, you have a responsibility to know what the latest industry standards, and software engineering processes, are and how they can be successfully applied. The objectives of this course are as follows:

- Provide understanding of software engineering processes.
- Enable you to clearly articulate the key issues associated with managing a software project.
- Give you an in-depth understanding of Object Modeling and UML
- Explore Component-based Software Engineering
- Provide you with a detailed understanding of Design Patterns
- Clearly understand the role of architecture in software design.
- Introduce Formal Methods in Software Engineering
- Provide you an understanding of software project management methodologies and approaches.

Class Format:
The class will provide an active learning environment for everyone. Most in-person class sessions will consist of a traditional lecture, as well as real-time, interactive discussions. The second type of sessions (on-line - Zoom) will be used to break out and work in groups to reinforce the concepts covered in the lecture portion of the class period. Additionally,

there will be supplemental (previously recorded) project management-related lectures that may be used to augment the student's learning. Since the instructor's desire is to grow student's skills in Software Engineering and grow their Project Managment knowledge, the student is encouraged to partake in additionally content, meant to grow their project management knowledge and skill.

Class Location:
This course is being offered in a hybrid modality – the primary lecture will be held on campus with synchronous Zoom session (recorded) offered for distance learners. And a secondary session which will be held fully online and will be delivered via Zoom.
Please register and ensure your UMich login is functional – both must be completed before you will be granted entry into the Zoom cyber classroom for lecture.

Cyber classroom: Zoom will be our virtual classroom – Registration Required!!!
***Please REGISTER HERE – *__Be sure that your browser is signed in using your UMich Account__*!
After registering, you will receive a confirmation email containing information about joining each of the meetings.
***Note: you must also log into Umich.zoom.us with your UMich Credentials before you may enter the cyber classroom.

1) Zoom Classroom URL: Zoom UMich
2) Click Sign In (use UMich credentials)
3) Join Class Session (for that date)

Assessment Mechanisms:
- Your understanding of the course objectives will be assessed by the following deliverables:
    - Project Management Assignment Deliverables will be graded.
        - Progressive assignment that builds throughout the semester
    - Breakout Deliverables (**will be graded as practice for exams**)
        - Assignments that mimic topics (simplified) seen on exams
    - Midterm and Final exams

Software Engineering Tools:
- *Microsoft Visio* - (drawing tool) Educational license available through Azure Edu
- *Draw.IO* – Freeware, web-based diagramming tool available here
- *Visual Paradigm* - Evaluation licenses available – Community Edition licenses free of charge (available at Visual Paradigm)
- *Visible Analyst* Student Edition (available at Visible Analyst for $49/term)

Project Management Tools:
- *Microsoft Project* - (project management scheduling and forecasting tool) Educational license available through Azure Edu

Grading:
- Project Management Assignments, Breakouts, Midterm and Final – combine to 500 points total for 100%.
  - PM Assignment Series: 240 pts., Breakout: 60 pts., Midterm: 100 pts., and Final: 100 pts. – **All Deliverables Below: Groups Highly Encouraged!**
    - PM Assignment is a series of seven graded deliverables (1-6 are mandatory; #7 will be used as make-up points [up to 5 points]).
    - Breakout Assignments is a series of seven graded deliverables (1-7 are mandatory; #8 will be used as make-up points only) each worth 8.6 points.
    - Exams will be lengthy and will be worth 100 points each – please plan to dedicate 20-30 hours to each exam.
    - Each student will be pursuing 495+ points to achieve an A+ in the course.
      - NOTE: No curving will be provided, please do not ask!
    - Class participation is an expected portion of the course work and may be used to improve (round up) a final score.

- Grading Scale:

A's	B's	C's	D's and E
99-100: A+	87-89: B+	75-79: C+	65-69: D+
92-98.9: A	82-86.9: B	72-74.9: C	62-64.9: D
90-91.9: A-	80-81.9: B-	70-71.9: C-	60-61.9: D- | 59.9-0: E

Detailed Guidelines and Rubrics for Grading of Homework:

NOTE: For all written essay-type homework in this class, a page is single space, 12-point font, with one inch or less side margins, and 1.5 inch or less top and bottom margins. Write in complete sentences and provide references as needed. DO NOT SIMPLY GOOGLE ANSWERS AND CUT AND PASTE AS THAT IS PLAGIARIZING!!!

Essay Grading Rubric (5 points possible)		
Area of Concern	**Levels of Performance**	**Points Awarded**
Grammar and Organization	Answer is easy to read.	1
	Answer is difficult to read due to grammatical errors and/or lack of organization.	0
Completeness	Answer should leave no 'why questions' and/or no missing technical content.	2
	Answer leaves some why questions and/or some missing technical content.	1
	Question is not fully answered.	0
Accuracy	All statements are accurate.	2
	Some statements are inaccurate.	1
	Mostly or completely inaccurate.	0

Diagram Grading Rubric (5 points possible)		
Area of Concern	**Levels of Performance**	**Points Awarded**
Diagram Organization	Diagram is professionally drawn.	1
	Diagram is sloppily drawn.	0
Completeness	Diagram fully captures the essence of the problem.	2
	Diagram misses some of the essence of the problem.	1
	Diagram misses considerable portions of the essence of the problem.	0
Accuracy	All structural aspects of diagram accurate.	2
	Some structural aspects of diagram are inaccurate.	1
	Structural aspects of diagram mostly or completely inaccurate.	0

NOTE: For all diagrammatic homework assignment answers, the diagrams must be done in an electronic tool (PowerPoint can be used as last resort). Any hand-written assignments will receive zero points.

Attendance:
- Regular class attendance is highly recommended unless student has informed the instructor that they are an approved distance learner. All students gain a higher learning experience when they participate in live lecture and the breakout sessions. Because of this, points will be given to teams for breaking out and completing an exercise together. It is recommended that the break-out exercise be completed during the class breakout session, but teams can meet virtually at their convenience if they are made up of traditional or distance learners.
- **Note: International students in the U.S. may not take the class as distance learners due to U.S. government F-1 visa requirements.**

Cyber classroom:
- The previously recorded videos for the classes can be found on:
  Canvas

Late Homework Policy:
There will be *NO* late deliverables accepted - submissions is due by end of class. Once class ends, the Canvas submission link will close, and late deliverables will not be accepted.

Academic Misconduct:
- Copying others work, plagiarizing external references without giving due credit, and cheating in exams are strictly forbidden. The following is extracted from the UM-Flint Course Catalog:
- Intellectual integrity is the most fundamental value of an academic community. Students and faculty alike are expected to uphold the highest standards of honesty

and integrity in their scholarship. No departure from the highest standards of intellectual integrity, whether by cheating, plagiarism, fabrication, falsification, or aiding and abetting dishonesty by another person, can be tolerated in a community of scholars. ***Such transgressions may result in action ranging from: reduced grade, or failure of a course, to expulsion from the University, or revocation of degree.***

- Please take pride in your own work, and feel free to ask me if you need help or assistance to maximize your learning. As shown above, the consequences for not doing your own work can be severe.
- If you have questions about what constitutes a violation of the University of Michigan's policies on Academic Integrity, please visit this page or contact me directly – I am happy to discuss (and explain) with any student.

Sexual Misconduct:
- The University of Michigan-Flint is committed to preventing sexual and gender-based misconduct and offering support to those who have been harmed. Sexual assault, harassment, discrimination, and all forms of sexual and gender-based misconduct have no place here. For more information, or to make a report, please visit the Equity, Civil Rights and Title IX Office (ECRT) at https://www.umflint.edu/ecrt.

Drugs and Alcohol:
- *It is important for university employees and students to abide by the University of Michigan-Flint's Alcohol and Other Drugs (AOD) policy. It is your responsibility to familiarize yourself with the policy which is located here.*

Accessibility and Disability Statement:
The University of Michigan–Flint strives to make learning experiences as accessible as possible and complies with Section 504 of the Rehabilitation Act of 1973 and the American with Disabilities Act. The university provides individuals with disabilities reasonable accommodations to participate in educational programs, activities, and services. Students with disabilities requiring accommodations to participate in class activities or meet course requirements must self-identify with Disability and Accessibility Support Services as early as possible at (810) 762-3456 or dassflint@umich.edu. The office is located at 264 University Center, inside the CAPS Office. Once your eligibility for an accommodation has been determined you will be issued an Accommodation Letter. Please present this letter to each faculty member in each class at the beginning of the term, or at least two weeks prior to the need for the accomm. (tests, project, etc.).

Planned Schedule: (Note this schedule is subject to change)

Week	Topics
Week 1 (1/9/24) Discussion Only (1/10/24)	**Lecture:** Class Introduction and Syllabus Review **Read (outside of class):** - Schwalbe: Chapter 1 – Intro to Project Mgmt.

Week 2 (1/16/24) Discussion Only (1/17/24)	**Lecture:** Introduction to Software Engineering **Read (before class):** - Pressman 8th: Chapters 1 and 2 - Pressman 9th: Chapter 1 **Read (outside of class):** - Schwalbe: Chapter 2 – Project Mgmt. and the IT Context
Week 3 (1/23/24) Discussions Only (1/24/24)	**Lecture:** Waterfall and Agile Software Development Methodologies **Read (before class):** - Pressman 8th: Chapters 4 and 5 - Pressman 9th: Chapter 2, 3 and 4 **Read (outside of class):** - Schwalbe: Chapter 3 – Project Mgmt. Process Groups
Week 4 (1/30/24) Breakout & Discussion (1/31/24)	**Lecture:** Systems Engineering & Business Process Models (Zachman) **Read (before class):** - Zachman (**critical**) - Pressman 8th: Chapter 7 - Pressman 9th: Chapters 5 and 6 **Read (outside of class):** - Schwalbe: Chapter 4 – Project Integration Mgmt. **Breakout Session 1:** Scope section of Zachman **Homework Assigned: PM part 1 (due no later than: 4/17/24 @ 11:59PM)**
Week 5 (2/6/24) Breakout & Discussion (2/7/24)	**Lecture:** Object-oriented Analysis I – UML Overview & Use Cases Homework Due: PM part 1 (Recommended) Breakout Due: Breakout Session 1 **Read (before class):** - Pressman 8th: Chapter 8 - Pressman 9th: Chapter 7

	Read (outside of class): - Schwalbe: Chapter 5 – Project Scope Mgmt. **Breakout Session 2:** Use Case Diagram and Text Use Case **Homework Assigned: PM part 2 (<u>due no later than</u>: 4/17/24 @ 11:59PM)**
Week 6 (2/13/24) Breakout & Discussion (2/14/24)	**Lecture:** Object-oriented Analysis II – Activity Diagrams, Swim Lane Diagrams & CRC Cards Homework <u>Due</u>: PM part 2 (Recommended) Breakout <u>Due</u>: Breakout Session 2 **Read (before class):** - Pressman 8th: Chapter 9 - Pressman 9th: Chapter 8 (8.3 and 8.5) **Read (outside of class):** - Schwalbe: Chapter 6 – Project Schedule Mgmt. **Breakout Session 3:** Activity Diagrams, Swim Lanes & CRC Cards
Week 7 (2/20/24) Breakout & Discussion (2/21/24)	**Lecture:** Object-oriented Analysis III – Class Diagrams & Associations, Aggregations, Dependencies Breakout <u>Due</u>: Breakout Session 3 **Read (before class):** - Pressman 8th: Chapter 10 - Pressman 9th: Chapter 7 and 8 **Read (outside of class):** - Schwalbe: Chapter 7 – Project Cost Mgmt. **Breakout Session 4:** Associations, Aggregations, Dependencies **Homework Assigned: PM part 3 (<u>due no later than</u>: 4/17/24 @ 11:59PM)**
Week 8 (2/27/24 and 2/28/24) No Class and	**No Classes Held – Spring Break**

No Breakout or Discussion Session	
Week 9 (3/5/24)	**Lecture:** Object-oriented Analysis IV – Sequence Diagrams & State Diagrams
Breakout & Discussion (3/6/24)	Homework Due: PM part 3 (Recommended)
	Breakout Due: Breakout Session 4
	Read (before class): - Pressman 8th: Chapter 11 - Pressman 9th: Chapter 8 (8.4 and 8.5)
	Read (outside of class): - Schwalbe: Chapter 8 – Project Quality Mgmt.
	Breakout Session 5: Sequence Diagrams & State Diagrams
	Homework Assigned: PM part 4 (due no later than: 4/17/24 @ 11:59PM)
Week 10 Midterm Exam (3/12/24 and 3/13/24)	**No Class Held – Midterm Exam Study Day**
	Breakout Due: Breakout Session 5
No Class and No Breakout or Discussion Session	**Midterm Exam (take home)** – Assigned: 3/5/24 @ 7:00PM	Due: 3/13/24 by 11:59PM
Week 11 (3/19/24)	**Lecture:** Software Architecture I
Breakout & Discussion (3/20/24)	Homework Due: PM part 4 (Recommended)
	Read (before class): - Pressman 8th: 13 - Pressman 9th: 10
	Read (outside of class): - Schwalbe: Chapter 9 – Project Resource Mgmt.
	Breakout Session 6: Non-functional Req. Evaluation and Rating
Week 12 (3/26/24)	**Lecture:** Software Architecture II
Breakout & Discussion	Breakout Due: Breakout Session 6
	Read (before class):

(3/27/24)	- Pressman 8th: 13 - Pressman 9th: 10 **Read (outside of class):** - Schwalbe: Chapter 10 – Project Communications Mgmt. **Breakout Session 7:** Architecture Evaluation and Selection **Homework Assigned: PM part 5 (<u>due no later than:</u> 4/17/24 @ 11:59PM)**
Week 13 (4/2/24) Discussion Only (4/3/24)	**Lecture:** Designing for Reuse & Component-based Development Homework <u>Due</u>: PM part 5 (Recommended) Breakout <u>Due</u>: Breakout Session 7 **Read (before class):** - Pressman 8th: Chapter 14 - Pressman 9th: Chapter 11 **Read (outside of class):** - Schwalbe: Chapter 11 – Project Risk Mgmt. **Homework Assigned: PM part 6 (<u>due no later than:</u> 4/17/24 @ 11:59PM)**
Week 14 (4/9/24) Breakout & Discussion (4/10/24)	**Lecture:** Frameworks and Design Patterns Homework <u>Due</u>: PM part 6 (Recommended) **Read (before class):** - Pressman 8th: Chapter 16 - Pressman 9th: Chapter 14 **Read (outside of class):** - Schwalbe: Chapter 12 – Project Procurement Mgmt. **Breakout Session 8:** Framework Evaluation and Selection (Non-functional Requirements Copied from Architecture Selection) **Homework Assigned: PM part 7 (optional) (<u>due no later than:</u> 4/17/24 @ 11:59PM)**
Week 15 (4/16/24) Discussion Only	**Lecture:** Software Testing Homework Due: PM part 7 (optional)

(4/17/24)	Breakout Due: Breakout Session 8
	
	Read (before class):
	    - Pressman 8th: Chapters 22, 23, and 24
	    - Pressman 9th: Chapters 19 and 20
	
	Read (outside of class):
	    - Schwalbe: Chapter 13 – Project Stakeholder Mgmt.

Week 16 Final Exam (4/23/24 and 4/24/24) No Class and No Breakout or Discussion Session	**No Class Held – Final Exam Study Day** **Final Exam (take home)** – Assigned: 4/16/24 @ 7:00PM | Due: 4/24/24 by 11:59PM